TOWARDS AN ORNITHOLOGY OF THE HIMALAYAS: SYSTEMATICS, ECOLOGY AND VOCALIZATIONS OF NEPAL BIRDS

by

JOCHEN MARTENS & SIEGFRIED ECK

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INTRODUCTION

This study of Himalayan birds has been a long time in the making. The idea germinated in 1969, when I traveled in Nepal for the first time and, while considering various zoological questions, found my attention drawn to the birds. The field work, carried out in the course of seven trips to the region, occupied a total of two years and included four complete breeding periods. During this time I had an opportunity to become familiar with all the basic floristic, faunistic and climatic subdivisions of the country, some of which had probably never before been visited by a zoologist. A rich trove of data accumulated, and a number of crucial specimens were collected. From the very beginning the documentation of song was an important concern; in fact, it resulted in the discovery of a new species.

Eventually so much information had been gathered that it began to seem impossible to assemble into a detailed treatment of the subject as a whole. Acquaintance with Siegfried Eck, however, renewed my enthusiasm for reviving this plan and bringing it to fruition. He took over the work of identifying the specimens and analyzed them according to a variety of systematic and metric criteria. This result of our joint efforts cannot be a complete book of the birds of Nepal; instead, it relates our personal experiences with a limited sample of these birds. What stimulated us most was the opportunity to consider the birds of a complex mountain system from two points of view and then combine our different interpretations. Observation of the birds in their strictly delimited habitat necessarily raises questions of quantitative morphology, and this approach in turn leads back into the field – as well as to the links between related taxa that replace one another ecologically within the mountain range or, in the broader expanse of Asia, geographically as well.

Although many reports of vocalizations have been merely descriptive and detailed analysis has not been possible, closer examination often presents surprises when, as here, large-scale comparisons are undertaken. In many cases they add an extra dimension to the questions of taxonomy and evolutionary biology raised in abundance by mountain birds.

Comparative research on Himalayan birds is still in its infancy; we are only now formulating questions, and the discussions in this book must reflect this state of affairs. Therefore we have tried to set out the facts in a delicately judged degree of detail and to avoid generalizations as far as possible. They would only get in the way of further research. At this point, however, we should recall Gerd Diesselhorst and his "Beiträge zur Ökologie der Vögel Zentral- und Ost-Nepals" (1968), an exemplary work that remains stimulating to this day. Diesselhorst's meticulousness stands as a goal for modern students of the Himalayas.

ACKNOWLEDGEMENTS

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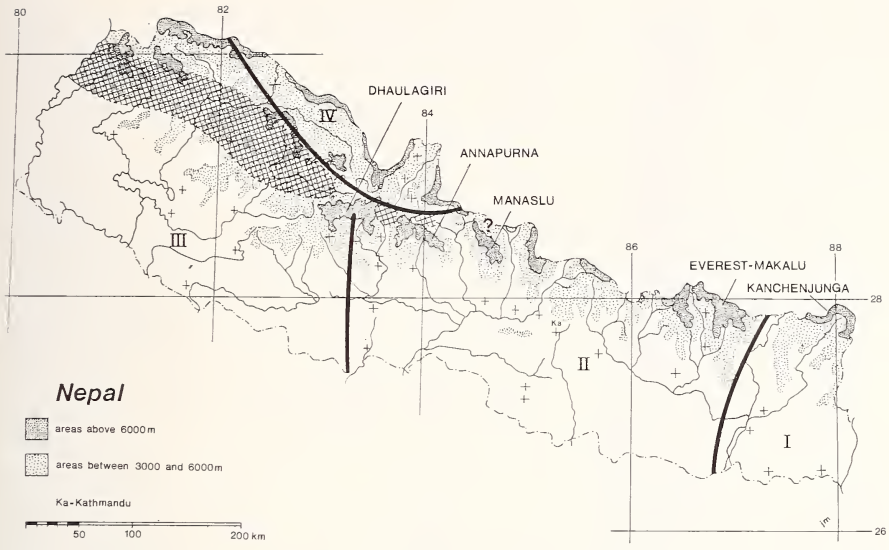

Fig.1: Map of Nepal to show main massifs of the Himalayan axis, the general vertical structure of the landscape, the river system and major phytogeographical subdivisions (see Fig.3). Hatched areas indicate dry forest vegetation, to the E patchily distributed and restricted to the Inner Valleys.

THE FORESTS OF NEPAL

From the viewpoint of biology, the geographical position of the Himalayas is significant in several respects:

The Himalayas separate the uplands of Central Asia from the Indian subcontinent, thereby forming an effective barrier between two large areas of Asia that are quite different climatically: cold High Asia and tropical South and Southeast Asia.

The forest flora and forest composition play an important role for bird life in the entire Himalayan region. In order to understand the origin and ecology of Himalayan birds, a rough look at the forest vegetation of the region is indispensable. Himalayan vegetation has been described by Schweinfurth (1957); Troll (1967) included the flora in a climatic and geographical classification of the Himalayas. Stainton (1972) analyzed the various types of forest in Nepal, and Dobremez (1976) and in more detail Miehe (1991) dealt with them from the ecological standpoint. Apart from incorporating my own experience, the following account draws chiefly on the last three standard works.

Number of species – The wealth of forms, including botanical species, in the central Himalayas is almost legendary. The variety is due to the enormous vertical distance – about 6000 m – over which plant life occurs. Within this altitude range, quite different climatic influences operate, and thus indirectly the climates of the various geobotanical regions that border on the Himalayas also exert an effect. According to modern thinking, the Himalayan

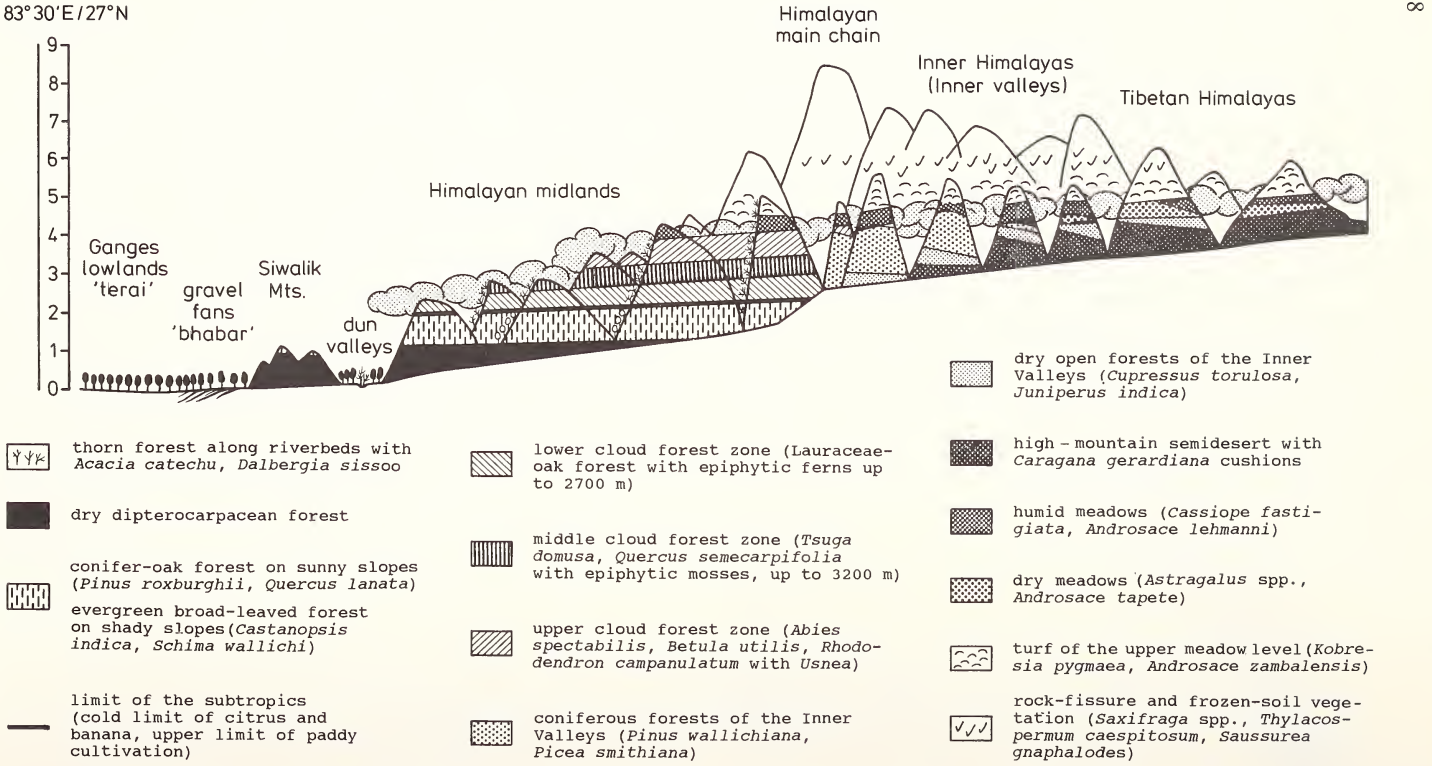

Fig.2: Vegetational profile of the C Himalayas (longitude of the upper Kali Gandaki Valley) to show vegetational patterns from the Outer via the Inner to the Tibetan Himalayas. – Adapted from Miehe (1991).

range constitutes a geobotanical region in its own right (Dobremez 1972, 1976). It is estimated that there are about 10,000 species of higher plants, including 500 species of trees, in the central Himalayas.

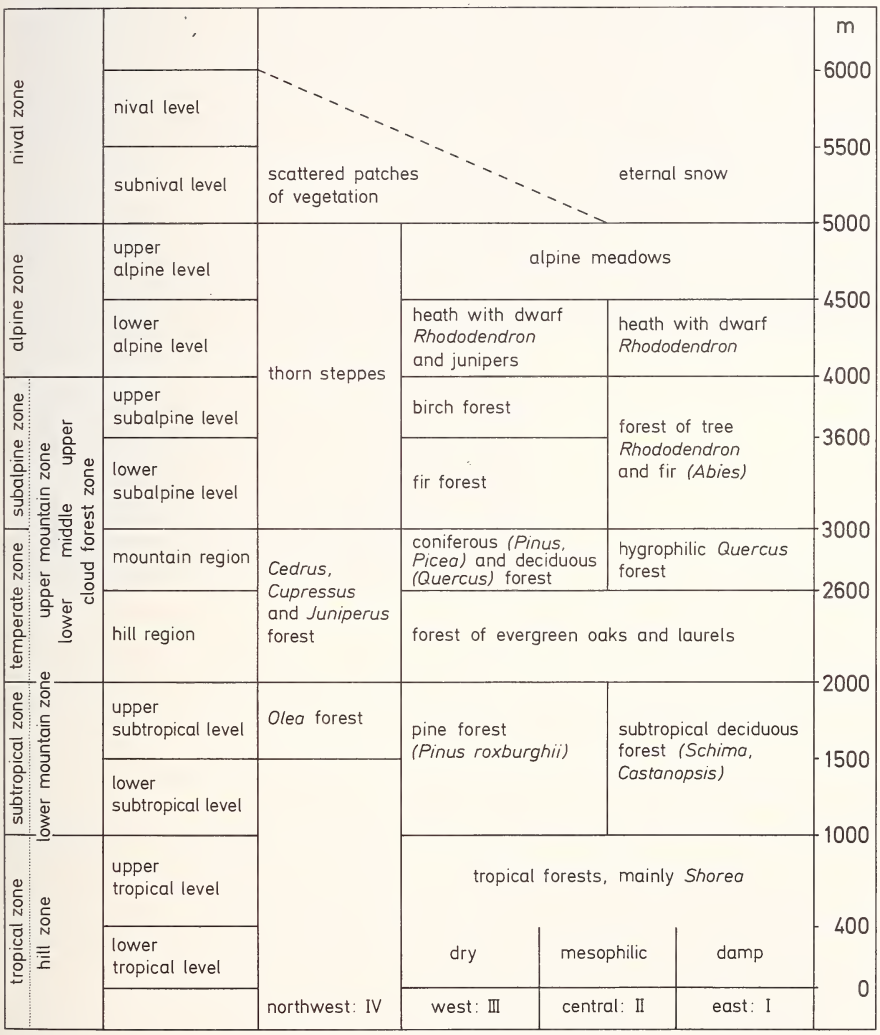

Fig.3: Scheme of the vegetational belts to show the most important plant communities in Nepal. The Roman numerals on the bottom correspond to those in Fig.1 and indicate the main floral regions of Nepal (after Dobremez 1972 and Miehe 1991).

Fig.4: Outer Himalayas, tropical zone. Recently deforested Bhabar plain S of Siwalik Mts. near Kutnabari, Ilam Distr., 250 m, 6.IV.1988

J. Martens.

Vertical structure: the forest belts

Dobremez (1976) and Miehe (1991) divided up the vegetation of Nepal into six large vertical belts: I. Tropical zone = foothill zone (up to 1000 m), II. Subtropical zone = lower montane zone (1000-2000 m), III. Temperate zone = lower cloud-forest zone (2000-3000 m), IV. Subalpine zone = upper cloud forest zone (3000-4000 m [locally up to 4200 m]), V. Alpine zone (4000-5000 m [locally up to 5500 m]), VI. Nival zone (up to 6200 m). Only the first four include forest vegetation (Figs. 1, 2, 3).

The tropical zone (foothill zone) – up to 1000 m – (Figs.5-10)

The mean annual temperature at the upper limit of this belt is 20-21°C, and in the lower section (at around 100 m) 25°C. Frost never occurs. The upper boundary is characterized by the limit of the range of the most important forest tree species found here, namely the Sal *(Shorea robusta)* – this is endemic to the northern and northeastern Indian subcontinent and the sole representative of the Dipterocarpaceae in Nepal (Fig.5). Locally *Pinus roxburghii* is present.

The tropical zone is divided into an upper and a lower level. The lower level includes the actual Terai plains (Fig.4; also the broad Dun valleys north of the Siwaliks up to an altitude of 400-450 m; Figs. 6-8). These forests stand mostly on alluvial gravels and support a rich range of tree species (e.g. the bombax *Bombax ceiba* and several species of *Bauhi-*

Fig.5: Outer Himalayas, tropical zone. S slope of Siwalik Mts., Sal *(Shorea robusta)* forest N Sunichare, Ilam Distr., 250 m, 5.IV.1988
J. Martens.

nia). In gallery forests along the rivers the index species are the Indian Rosewood *(Dalbergia sissoo)* and the Catechu *(Acacia catechu)* (Fig.8). The Sal forests in the upper level grow on ferruginous soils. Because of the relief and exposure, the climatic conditions are harsher: the winter is drier and the insolation more intense. Here, the Sal tree is the dominant species; the species that accompanied it lower down no longer appear. In addition, *Shorea* penetrates far into the hill zone, wherever the altitude is low enough.

The bird species of this zone largely represent outposts of the tropical Indian fauna, with few species of Indomalayan rainforests: A few typical representatives are: *Butastur teesa, Gallus gallus, Pavo cristatus, Ceryle rudis, Treron pompadora, Ducula badia, 4 Psittacula* species, *Buceros bicornis, Megalaima zeylanica, M. lineata, Muelleripicus pulverulentus, Pitta brachyura, Oriolus xanthornus, Dicrurus remifer, D. caerulescens, Pericrocotus roseus, Aegithina tiphia, Hypsipetes flavala, Garrulax pectoralis, Hypothymis azurea, Dicaeum cruentatum, Aethopyga siparaja, Amandava amandava.* Inskipp (1989) calls the tropical forests the richest for Nepal birds, with a total of 204 breeding species.

Fig.6: Outer Himalayas, tropical zone. Dun valleys, Nodia Khola valley, 320 m, Ilam Distr., 6.IV.1988 J. Martens.

Fig.7: Outer Himalayas, tropical zone. Dun valleys, Rapti Valley S Tekouli, N slope of Siwalik Mts. in the background, 350 m, Chitawan Distr., II 1970 J. Martens.

Fig.8: Outer Himalayas, tropical zone. Dun valleys, Rapti Valley S Tekouli, riparian forest with *Dalbergia sisso* and *Acacia catechu* on river banks. 350 m, Chitawan Distr., II 1970 J. Martens.

The subtropical zone (lower montane zone) – 1000–2000 m – (Figs.11-14)

This extends over a broad hilly region in the Mahabharat Mts. (Fig.2) and to the north of this submountain range. It is the most densely populated region of Nepal. This extremely high settlement density on steep slopes that are susceptible to erosion has meant that at this altitude the forest has nearly completely disappeared over large areas and extensive mountain slopes have been entirely terraced. The climatic conditions, in particular the precipitation, vary greatly from place to place and depend on exposure. Only the temperatures remain constant from west to east, locally frost may form on the ground a few nights per year. The mean annual temperature at 1000 m is between 20 and 21°C, and at 2000 m between 15 and 16°C.

The subtropical zone can also be subdivided into an upper and a lower level. The lower level, which extends from 1000 m to 1500 m, is not uniform but varies according to the eastern or western exposure and thus according to the different influence of the monsoons. In the "Annapurna type" – the western formation from Buri Gandaki to Kali Gandaki (Fig.3) – the dominant species are *Schima wallichii* (Fig.12), *Castanopsis indica* (Fig.15) and *Engelhardtia spicata*. Further eastward in the "central Nepal type", there is less precipitation; consequently the range of species is limited; *Castanopsis* and *Engelhardtia* are lacking. In the "east Nepal type" the composition is very much richer, because many more eastern

Fig.9: Outer Himalayas, tropical zone. Buri Gandaki Valley, tree-rich agricultural land with fodder trees at the village edge, 900 m, Gorkha Distr., 29.VII.1983 J. Martens.

plant species penetrate into this region. The sometimes extensive forests of Chir Pine (*Pinus roxburghii;* Fig.13), which is a species that has penetrated eastward from the western Himalayas, also belong in the lower subtropical level. This species requires relatively dry sites or sites where large amounts of precipitation rapidly evaporate or are carried away. Pine forests of this type with a natural composition of trees probably no longer exist. Fires are set each year to encourage grass growth, and they destroy young plants and more sensitive species which are normally mixed in with the stands. This type of forest is nowadays greatly endangered by over-aging.

The upper level commences at altitudes of 1500 m in western and central Nepal, 1300 m in eastern Nepal. The species from the lower level are joined by many temperate species, which may display hygrophilic, mesophilic or xerophilic adaptation. A strictly defined plant community is typical of this level (but extends into the lower temperate zone), namely gallery forests composed of the Nepalese Elder (*Alnus nepalensis;* Fig.14) along streams and rivers, an extremely rapidly-growing tree, with numerous Urticaceae (nettles) forming the undergrowth. At this altitude, there is considerably more convectional precipitation, and unstable soils that are preferentially colonized by this elder community form at many points on sliding shales and gravels. Some species that are most widespread in the temperate zone (see below) penetrate into the subtropical zone but are restricted entirely to the upper level and thus are never found in the lower level: *Rhododendron arboreum* and the oaks *Quercus glauca, Qu. incana* and *Qu. lanuginosa.*

Fig.10: Outer Himalayas, tropical zone. Arun gorge below Num, 950 m, Sankhua Sabha Distr., 6.VI.1988
J. Martens.

Some of the few vestigial forests of the upper subtropical level that remain in Nepal are to be found in the SE Kathmandu Valley on Phulchoki, a mountain above the village of Godavari (Fig.17). The area is famous for its variegated flora and fauna and also numerous bird species. At the present time (last observations in 1995), however, the oak *(Quercus)* zone of Phulchoki forest is being so intensively exploited that its ultimate disappearance can be predicted. It seems urgently necessary to set up a "national monument"; this project should on no account be postponed. In addition, in spring 1980 large areas of the Phulchoki forest were devastated by a terrible forest fire (for details see Inskipp 1989).

Bird species of the subtropical zone in some cases colonized the area from the Indian lowlands and reach their upper limit in the lower level, but others moved onto the S flanks of the Himalayan arc from tropical SE Asia. Subtropical forests support a wide variety of birds totalling 183 breeding species. A small proportion of subtropical species (6%) are confined to this zone in the breeding season (Inskipp 1989). Species predominantly confined to this belt are: *Spilornis cheela, Falco peregrinus, Treron sphenura, Psittacula himalayana, Apus melba, Megalaima virens, Delichon nipalensis, Hypsipetes mcclellandii, Monticola*

cinclorhyncha, Enicurus schistaceus, Prinia criniger, Niltava macgrigoriae, Pnoepyga pusilla, Garrulax leucolophus, G. rufogularis, G. squamatus, Minla cyanouroptera, Yuhina zantholeuca, Aethopyga saturata, Dicrurus remifer, Dendrocitta formosae.

The temperate zone (lower and middle cloud-forest zone) – 2000-3100 m (locally differing 1700-2700/2800 m) – (Figs.15-20)

This is located above the subtropical zone and forms a belt extending over a vertical distance of between 1000 m and 1100 m (Figs.2, 3). It extends from an altitude of 2000 to 3100 m in C Nepal and from 1700 to 2700/2800 m in E Nepal. The mean annual temperature varies between 15°C at the lower limit and 8-9°C at the upper limit. The amounts of precipitation vary considerably depending on the exposure; far to the west there are in fact two dry seasons. Here, again, a distinction can be made between two levels, namely the (lower) hill region (lower cloud-forest zone, 2000 to 2500/2600 m) and the (upper) mountain region (middle cloud forest region, 2500/2600 to 3000 m).

The hill region (2000-2600 m) is the most important distribution area of the evergreen oaks of the genus *Quercus,* 8 species of which can be found in Nepal alone. All of them have spread along the Himalayas from southern China. Also, there are other trees belonging to the Fagaceae, of the genera *Lithocarpus* (Fig.20) and *Castanopsis,* which dominate the forest formations. In the hill region, many types of forest can be distinguished, mainly on the basis of the local amount of precipitation. Only a few of these can be mentioned here, and there are marked differences between W, C and E Nepal.

Fig.11: Outer Himalayas, subtropical zone. Tree-rich agricultural land NW Pokhara, 1200 m, Kaski Distr., IX 1969 J. Martens.

Starting in W Nepal, forests of Himalayan Cedar *(Cedrus deodara)* are adapted to dry conditions in accordance with the main distribution range of this species in the western Himalayas, where precipitation is strongly reduced. At the northwestern Dhaulagiri massif it reaches the eastern limit of its range. It is frequently accompanied by an Olive tree *(Olea cuspidata)* and by the Himalayan Cypress *(Cupressus torulosa)* – both originating from the Mediterranean. However, the Cypress ranges much further to the east (as far as Indochina, with a large gap extending from central Nepal to western Sikkim) and its ecological requirements are different from those of the Cedar and Olive tree. The Pindrow Fir *(Abies pindrow)* is another xerophilic species that has invaded from the west and just reaches the western boundary of Nepal. However, on the wetter sites in central and eastern Nepal, the oaks play a major role in determining the composition of the forests. The main species that should be mentioned here are *Quercus incana, Qu. lanata, Qu. glauca* and *Qu. dilatata.* Hygrophilic communities contain mainly *Qu. lamellosa* and laurels (Lauraceae) (Fig.16). At such sites the precipitation exceeds 1500 mm per annum. East of Sun Kosi (87°E) the chestnut *Castanopsis tribuloides* is the dominant species in many forests (Fig.15). On sun-exposed slopes ericacean forest dominates *(Rhododendron arboreum, Gaultheria, Lyonia).*

Fig.12: Outer Himalayas, subtropical zone. Mixed *Schima wallichii/Pinus roxburghii* forest, ascent from Tada Khola to Khebang, 1200 m, Taplejung Distr., 25.IV.1988 J. Martens.

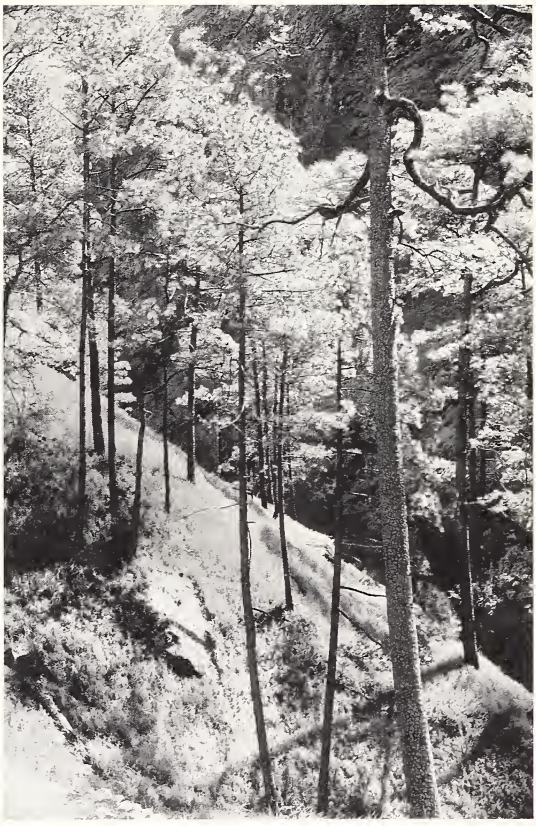

Fig.13: Outer Himalayas, subtropical zone. Artificially opened *Pinus roxburghii* forest, Buri Gandaki Valley below Nyak, 1700 m, Gorkha Distr., 1.VIII.1983 J. Martens.

The lower limit of the mountain region of the temperate zone (middle cloud forest zone, 2500-3000 m) coincides with the upper limit of permanent settlements in the outer Himalayas (southern macroslope). This limit frequently marks a lower condensation level of the monsoon precipitation, hence permanently high humidity. This belt is also dominated by oaks, but now the species change. All the tropical components of the flora, in particular the laurels, finally disappear. Deciduous tree species, in particular maple *(Acer),* 13 species of which are found throughout Nepal, occur more frequently (Hara & Williams 1979). The number of species and the density of the arboreal *Rhododendron* stands increase considerably, and even the conifers gain in significance.

The amounts of precipitation vary greatly from place to place. In addition, snow is present for 2 to 2 1/2 months throughout the mountain region wherever the slopes are shaded. In its western part, the mountain region extends from an altitude of 2700 m to 3200 m, and in the east from 2400 m to 2900/3000 m.

Only a few of the many different types of forest, arranged according to increasing precipitation rates at the sites, will be mentioned here. An important role is played in many

Fig.14: Outer Himalayas, subtropical zone, *Alnus nepalensis* riparian forest, between Khebang and Yamputhin, 1700 m, Taplejung Distr., 30.IV.1988 J. Martens.

Fig.15: Outer Himalayas, temperate zone. *Castanopsis* forest remnant, near Mai Pokhari, 2150 m, Ilam Distr., 10.IV.1988 J. Martens.

Fig.16: Outer Himalayas, temperate zone. *Quercus* forests of the lower Gunsa Khola, 2450 m, Taplejung Distr., 12.IX.1983 J. Martens.

places by the Blue Pine *Pinus wallichiana.* This is an astonishingly euryoecious tree with a vertical distribution ranging from 1400 to 4000 m; it also tolerates very widely varying amounts of precipitation, namely 750-2500 mm. Therefore it is present in many forest communities; however, in terms of stand size it is found mainly in the mesophilic western region and in the dry Inner Valleys between or to the north of the main chain, e.g. in southern Dolpo, in Thakkhola and in Manang and, to a lesser extent, to the east as far as Everest (87°E). On a few dry sites the pine is joined by the Himalayan Spruce *Picea smithiana,* which is a xerophilic species that likewise originated in the west; its range extends eastward only as far as the Trisuli Valley (85°E).

Within the hygrophilic oak forests *Quercus semecarpifolia* (Fig.17) is the most important species in the mountain region. It occurs throughout Nepal and is largely lacking only in the particularly moist region east of Tamur in E Nepal. In W Nepal this oak forest is sparse and often intermixed with *Pinus wallichiana.* In its typical form it grows from Marsyandi to the ridges that divide the Arun and Tamur valleys. A rich growth of epiphytes indicates high moisture levels during the monsoon. Often the Hemlock Fir *(Tsuga dumosa)* is intermixed with the oak, and in places it even forms stands by itself (Fig.18). Bush and forb

layers are well developed. One peculiarity of the forest formation of E Nepal are the stands of the oak *Lithocarpus pachyphylla.* The species is native to the Himalayas; it has a very reduced range in the eastern Himalayas, but in parts of E Nepal large stands exist (Fig.20). – The tallest forest trees grow in this region of both the temperate and subalpine zone: *Tsuga dumosa* and *Quercus semecarpifolia* reach 40 m, and *Arundinaria* bamboo is also locally common, growing 2-8 m high (Fig.19). Monsoon-green evergreen epiphytic ferns are common. In rain-rich areas (up to 5000 mm) of C Nepal physiognomy and species composition of the forests resemble those in Sikkim or Assam.

Bird communities of the temperate zone are rich in genera and species and harbour both Indomalayan (Oriental) and Palaearctic components. There are 176 breeding species in the lower temperate zone, but only 10% of lower temperate forest species are restricted to this belt (Inskipp 1989). Typical representatives confined to this belt are: *Anas platyrhynchos, Arborophila torqueola, Catreus wallichi, Cuculus sparverioides, Dendrocopos himalayensis, D. darjellensis, D. hyperythrus, Luscinia brunnea, Monticola rufiventris, Turdus boulboul, Ficedula hyperythra, Pnoepyga immaculata, Pteruthius xanthochlorus, Alcippe chrysotis, Yuhina flavicollis, Sylviparus modestus, Certhia discolor, C. himalayana.*

The subalpine zone (upper cloud-forest zone) – 3000-3800/4200 m – (Figs.21-27)

Above the mountain zone, which is characterized by evergreen and/or deciduous trees, comes a belt of coniferous trees extending all the way to the tree line – as in most high mountain regions in Europe and Asia. This is the subalpine zone. This belt also covers a

Fig.17: Outer Himalayas, temperate zone. *Quercus semecarpifolia* forest, Phulchoki Mt., 2600 m, Lalitpur Distr., I 1970 J. Martens.

Fig.18: Outer Himalayas, temperate zone. *Tsuga dumosa* forest, near Puspati, 2600 m, Panchthar Distr., 16.IV.1988 J. Martens.

vertical distance of about 1000 m, with the lower limit at 3000/3100 m and the upper limit at 4200 m in the drier western part and at 3800 m in the wet eastern part (Fig.3). Here, too, we can divide the zone into an upper and a lower level:

At the lower subalpine level (3000-3600 m) the Himalayan Fir (*Abies spectabilis,* often referred to as *A. densa* in E Nepal; Figs.23-24) is the index species (Fig.25). It often forms pure stands by itself, but it avoids the driest areas in the west and north and is present in the extremely wet areas S and SW of Kanchenjunga (Fig.23, 24). To the west of Dhaulagiri *A. spectabilis,* mixed with *Quercus semecarpifolia,* grows in sparse, tall stands. At the dry sites these trees are also joined by a tall-growing juniper *(Juniperus indica),* which reaches heights of 30 m (Fig.26). In some remote Inner Valleys in C and E Nepal (and further east also in Sikkim and Bhutan) larches of this size also occur, namely the Himalayan Larch *(Larix himalaica)* and the Griffiths Larch *(L. griffithiana)* (Fig.37). Isolated occurrences outside the large Chinese range of this genus extend from Shensi to Yunnan and northern Burma. Both species are native to the Himalayas, and *L. himalaica* was not discovered as a species in its own right until 1975.

Fig.19: Outer Himalayas, temperate zone. Mixed broad-leaved forest with *Juglans regia, Abies spectabilis* on the ridge, *Arundinaria* bomboo in the foreground, Chadziou Khola above Ghasa, 2600-2900 m, Mustang Distr., X 1969 J. Martens.

Fig.20: Outer Himalayas, temperate zone. *Lithocarpus pachyphylla* forest, near Puspati, 2750 m, Panchthar Distr., 28.VIII.1983 J. Martens.

The upper subalpine zone forms the upper limit of the forest and is permeated by the Himalayan Birch *(Betula utilis),* which grows on both dry and wet sites. This species is native to the C Himalayas and occurs only in Nepal, Sikkim and Bhutan.

The number of tree species is greatly reduced at the upper subalpine level. Where clearings occur, the wealth of forb vegetation in the alpine zone is evident.

In the dry areas of western Nepal, *Betula utilis* forms the upper limit of the forest. Here, one also finds the occasional steppe plant from central Asia, namely low bushes of the genera *Caragana* and *Lonicera.* But the spruce *Picea smithiana* (Fig.34) also figures prominently here. Together with the birch it attains the upper limit of tree growth in Nepal at an altitude of 4200 m. Only a few other trees, namely two species of *Sorbus (S. foliolosa, S. microphylla)* and especially the bushy *Rhododendron campanulatum,* have found their way into the mesophilic birch forest which grows everywhere in Nepal except in the extreme dry west and in the extremely wet east. In addition, *Juniperus indica* and *J. recurva* occur, mostly on ridges and summit slopes.

The *Rhododendron* species are an important component of the subalpine forests, where they account for the largest number of species and individuals (Fig.22), even though occasionally some species descend into the upper subtropical level *(R. arboreum, R. dalhousiae)* or even, in the form of inconspicuous bushes, advance far into the alpine zone (Fig.28). Their ecological diversity is enormous, and up to 10 species may grow at close quarters, from the size of man-high bushes up to tall trees. The main distribution range of the genus is in S China, where about 350 species are known; in Nepal so far 34 species have been

Fig.21: Outer Himalayas, subalpine zone. Dhorpatan Valley, looking SW, mixed coniferous forest on the N-exposed slopes, valley bottom 2950-3000 m, Pabat Distr., IV 1970 J. Martens.

Fig.22: Outer Himalayas, subalpine zone. Upper Simbua Khola Valley, mixed broad-leaved-coniferous forest with *Tsuga dumosa* and *Rhododendron falconeri*, 3000 m, Taplejung Distr., 9.V.1988 J. Martens.

found. The number of species declines rapidly along the Himalayan axis: there are 84 in Sikkim, about 30 in E Nepal and only 5 in W Nepal, and their ranges extend further to the west.

For birdlife the subalpine forests are of great international importance, although they are poorer in species (103 breeding species have been recorded) than zones of lower altitudes. The high proportion of 28% of the species are restricted to this belt (Inskipp 1989). They mainly belong to the groups of West Chinese Himalayan and the West Asian Himalayan species, all Palaearctic in origin (Fig.39). The following species are typical and worth mentioning: *Brachypteryx stellata, Tarsiger cyanurus, Tarsiger indicus, Phoenicurus caeruleocephalus, Ph. schisticeps, Hodgsonius phaenicuroides, Phylloscopus trochiloides, Ph. inornatus, Regulus regulus, Parus rufonuchalis, P. rubidiventris, P. ater, Sitta leucopsis, Certhia familiaris, Pinicola subhimachala, Mycerobas affinis, M. carnipes.*

The alpine zone (3800/4200-4800/5500 m) – Figs.28-29

On the southern slope of the Himalayas the meadow level ascends from the upper boundary of the dwarf forest to the region where the closed plant cover breaks up. Closed alpine

Fig.23: Outer Himalayas, subalpine zone. Upper Simbua Khola Valley, *Abies densa/Rhododendron* forest, 3200 m, Taplejung Distr., 11.V.1988 J. Martens.

Fig.24: Outer Himalayas, subalpine zone. Pasture Lassetham above Yamputhin, mixed *Abies densa*/species-rich *Rhododendron* forest, 3400 m, Taplejung Distr., 7.V.1988 J. Martens.

Fig.25: Outer Himalayas, subalpine zone. *Abies spectabilis* in the Chuling Khola W Nyak, 3200 m, Ghorka Distr., 3.VIII.1983 J. Martens.

Fig.26: Outer Himalayas, subalpine zone. *Juniperus indica* forest in the Chuling Khola W Nyak, 3350 m, Ghorka Distr., 6.VIII.1983 J. Martens.

Fig.27: Outer Himalayas, subalpine zone. Moss- and lichen-covered trees in mixed coniferous/*Rhododendron* forest in the upper Simbua Khola, 3630 m, Taplejung Distr., 13.V.1988. J. Martens.

meadow can extend as high as 5500 m, e.g. on the S slope of Mt. Everest. An extremely differentiated vegetational mosaic is produced by microclimatic variation, shaded slopes being protected by snow for long periods in winter, while insolation dries out the opposite slopes.

At the lower alpine level dwarf shrubs dominate; about 40 species have been documented, chief among them the dwarf *Rhododendron* species (Fig.28) *lepidotum, setosum, anthopogon* and *nivale* (the latter forming the highest dwarf-shrub heaths, up to 4800 m), as well as 3 *Juniperus* species. There is a striking change in growth form with increasing altitude; plants 50 cm high shrink to 5 cm (Fig.29). The lower alpine level in monsoon regions is above the zone of highest precipitation, but the precipitation is mainly rain and heavy overcast shields this level from the sun.

At the upper alpine level, woody plants are less abundant and cyperacean meadows and cushion-plant communities dominate. The two levels are not strictly demarcated; the boundary rises from 4500 m to 5000 m. In monsoon regions this level is close to the upper condensation level; the clouds are thin, so that insolation produces greater warming.

Bird life in the alpine belt is much reduced, for no forest species are present. This belt mainly harbours components of C Asian origin, species otherwise widely distributed in Ti-

Fig.28: Transition of Outer and Inner Himalayas, alpine zone. Upper Ladza Khola W Walungchung Gola looking eastward, N-exposed slope with dense *Rhododendron* bush layer, 4150 m, Taplejung Distr., 22.V.1988.

bet which here occupy splinters of their area. A few reached the central Himalayas from China along the uppermost mountain ridges. Typical representatives are: *Lerwa lerwa, Tetraogallus himalayensis* and *T. tibetanus, Eremophila alpestris, Prunella collaris, P. fulvescens, P. rubeculoides, P. strophiata, Carpodacus puniceus, Phoenicurus ochruros, Ph. erythrogaster, Phylloscopus fuligiventer, Pseudopodoces humilis, Corvus corax, Cinclus cinclus, Troglodytes troglodytes, Luscinia pectoralis, Carduelis flavirostris, Leucosticte nemoricola, L. branati, Carpodacus rubicilloides, C. rubicilla.*

The nival zone – up to 6300 m

This zone is restricted to a few rocky ridges and scree slopes, between the lower protrusions of the glaciers and the closed plant cover of the meadows at the upper alpine level. The few pioneers among the vascular plants belong to the genera *Saussurea, Saxifraga, Stellaria* and *Potentilla.* No breeding birds migrate to these altitudes in summer, as the food sources are too few and their production too meagre. The highest altitude for breeding is most probably at the transition from the alpine to the nival zone; no bird will breed above 5500 m. Candidates for highest-altitude breeders include *Eremophila alpestris, Phoenicurus ochruros, Ph. erythrogaster, Tetraogallus himalayensis, T. tibetanus,* and *Lerwa lerwa.* Swan (1962) mentioned a breeding record of *Lerwa lerwa* at 19,000 ft.

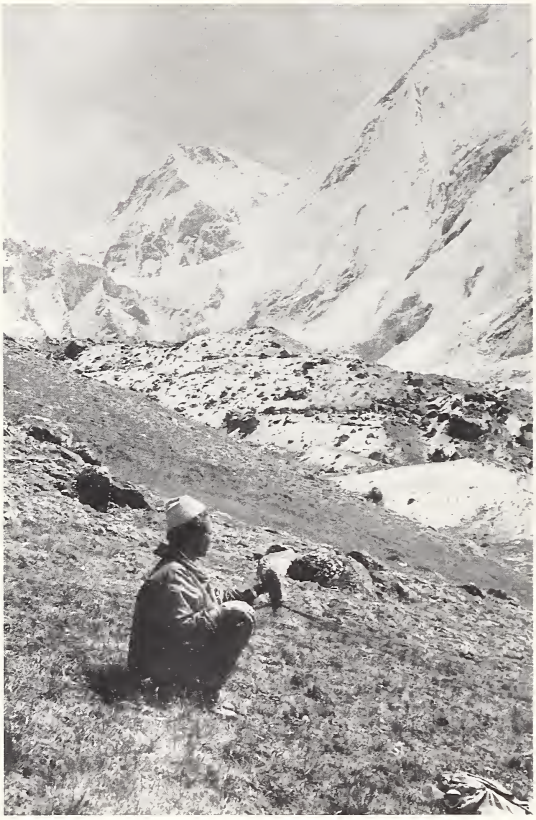

Fig.29: Transition of Outer and Inner Himalayas, alpine zone. Gorak Shep SW Mt. Everest, side moraine with dwarf *Salix* sp., 5200 m, Solukhumbu Distr., IX 1970.

Horizontal structure – the threefold subdivision of the Himalayas

The subdivision of the Himalayan system into the Outer, Inner and Tibetan Himalayas (Schweinfurth 1982) is based on the amount of local precipitation (wet – moderately wet – dry).

The Outer Himalayas (Figs.4-27)

To the Outer Himalayas belong the south-facing macroslope of the main chain and the Mahabharat and Siwalik ranges to the south. It is the rainiest part of the Himalayas, which to a great extent creates its own climate, because of the monsoon precipitation it receives. We have described it in the section "Vertical structure: the forest belts".

The Inner Himalayas (Figs.30-37)

The Inner Himalayas, usually referred to as the Inner Valleys, have a special place in this system with regard to their ecology. They are forested, but they receive distinctly less pre-

Fig.30: Inner Himalayas. Upper Kali Gandaki Valley, looking SE from above Marpha, mesophilic coniferous forests (*Pinus wallichiana, Abies spectabilis,* locally *Picea smithiana* and *Juniperus; Betula utilis* near the treeline). Deforested triangle near the right margin is the forest clearing Thaksang above Tukche, cf. Fig.31; (3150 m at lower edge), Mustang Distr., III 1974 J. Martens.

cipitation because of their protected position within the mountain chain. On the shaded slopes and in gorges grow *Abies* and *Picea,* trees of moderately wet regions, while the sunny slopes are characterized by *Pinus, Cupressus* and *Juniperus.* In the particularly well protected valleys topographic wind systems produce an arid valley floor with its own characteristic vegetation. The "outer" and "inner" slopes are remarkably different. In the evergreen mountain forests of the fringing mountain chains the local precipitation can be as great as 5000 mm annually (Lumle, S Annapurna), whereas only 55 km N, in the rain shadow of the main chain, it falls to between 89 and 451 mm (Kali Gandaki Valley, Jomosom; Miehe 1991).

The Inner Valleys are also special from an ornithological viewpoint, in several respects.

a. They have an intermediate position in the N-S direction. As precipitation diminishes, the fauna of the monsoon-wet Outer Himalayas (S macroslope) becomes progressively more sparse, and only the robust Palaearctic species reach the Inner Valleys (Fig.1). This tendency is amplified by the effect of altitude; none of these valleys is below 2400 m and most are higher, so that most tropical and many subtropical species cannot find suitable habitats there. With respect to the Palaearctic species, these valley systems have still more to teach us. Species that live in the rainy Outer Himalayas (S macroslope), usually up to the tree line, also routinely occupy the Inner Valleys, but here their vertical area has a distinctly lower limit. The same birds here are often found at altitudes so low that the forest vege-

Fig.31: Inner Himalayas. Upper Kali Gandaki Valley, forest clearing Thaksang, *Pinus wallichiana, Abies spectabilis* forest, abandoned and overgrown terraces with hedges of *Rosa, Berberis, Spiraea, Ribes, Viburnum,* locally small *Arundinaria* bamboo, 3150 m, Mustang Distr., 7.VII.1970 J. Martens.

tation is outside the range of strong monsoon influence. Species of open country are affected in just the same way. In these valleys there is a relationship between precipitation and altitude ("regional reduction of the lower boundary of vertical distribution"), but the intermediate factors that control it are unknown. Striking examples are: *Phoenicurus ochruros, Pyrrhocorax pyrrhocorax, P. graculus, Parus ater, Carpodacus erythrinus, Hodgsonius phaenicuroides, Phylloscopus affinis, Ph. trochiloides, Certhia familiaris, Tarsiger cyanurus.*

b. In the W-E direction, the forest vegetation of the Inner Valleys exerts just as strong an influence on the fauna. It channels the immigration of dry-adapted species from the W Himalayas (Fig.1), locally on a very small scale, into sheltered parts of the C Himalayas immediately adjacent to monsoon regions. Only where protected from rain in these Inner Valleys can plant communities with *Abies pindrow, Cedrus deodara, Picea smithiana* and *Cupressus torulosa* today form established islands, with the "appropriate" fauna; towards the south this fauna is blocked by high precipitation, and towards the north by Tibetan aridity and treelessness. The individual tree species that form stands here, like the bird species, are distributed one after another towards the west. The insular nature of these areas, limited to narrowly circumscribed parts of the valleys, is striking in the eastward direction. For instance, *Certhia himalayana* has reached the isolated dry valley of Manang (N of Annapurna), while *Parus rufonuchalis* has gone only as far as Thakkhola (Figs. 30, 31), equal-

ly isolated but situated further west (river gorge between Dhaulagiri and Annapurna). Today there is no longer an exchange of individuals between the populations W (S Dolpo) and E (Thakkhola) of Dhaulagiri *(P. rufonuchalis)* or W (Thakkhola) and N (Manang) of Annapurna *(C. himalayana)* – even though these areas are less than 100 km apart. Movement between them is prevented by unforested sections to the north of the main chain and monsoon-influenced forest formations to the south. The two nuthatches *Sitta leucopsis* and *S. cashmirensis,* moving in from the west, have not even colonized Thakkhola, although their habitat requirements would be well satisfied by the presence of highly differentiated conifer forests. Why is this? During a postglacial warm phase pine and birch forests grew in S Tibet, enabling the migration of aridity-loving faunal elements N of the mountain crest. Under present-day climatic conditions, the link has been broken (Li Tianchi 1988, fide Miehe 1991). This old bridging function of the Himalayas is still more impressive in another example: *Sitta leucopsis, Certhia himalayana* and also *Aegithalos niveogularis* live in the dry W Himalayas and separately in mountains of SW China to the east of the Himalayas (Fig.100), where they again occupy regions of reduced monsoon influence. The vegetation that once bridged the gap is no longer discernible, not even remnants in the form of adequate forest islands. Comparable W-E disjunctions of the Himalayan flora are also regarded as secondary, relatively recent and a result of climatic change (Miehe 1993).

The Tibetan Himalayas

This region is an alpine semidesert in the rain shadow of the main Himalayan chain; it extends northward to the oasis of the Tsangpo River. Only a small part of this subdivision of

Fig.32: Inner Himalayas. Upper Kali Gandaki Valley, Titi Lake, looking eastward from Titi village, slopes with *Pinus wallichiana* forest, 2700 m, Mustang Distr., III 1974 J. Martens.

the Himalayas is in Nepal, including the far northern sections of the upper Kali Gandaki (:Mustang; Fig.38) and parts of the northern Dolpo. Here closed plant cover persists only as relicts depending mainly on precipitation, which is only minimal here; that is, the distribution results largely from aridity. Nowhere do the climatic conditions permit the existence of woody plants, to say nothing of (potential) stands of *Betula* and *Pinus.*

The region is locally important for the existence of Snowfinches *(Montifringilla adamsi, M. taczanowskii, Pyrgilauda blanfordi, P. ruficollis),* which are closely associated with mouse hares *(Ochotona). Oenanthe deserti* also lives there.

Man's impact on vegetation

The vegetational subdivisions of the central Himalayas described in the preceding sections are not now entirely natural. Humans have lived in the Himalayas for a long time, producing a montane agricultural landscape (Miehe 1991). Farmers must always create their fields at the expense of forest cover, and in the Himalayas they have used a variety of methods to do so. Burning is probably the most ancient way to obtain pastures and land for crops, foliage has been cut from trees to feed livestock (Fig.9), logging has provided firewood and building material and these are only the major factors in the disappearance of forests (Martens 1981, 1983, Schweinfurth 1983, Schmidt-Vogt 1990, Miehe 1991). From a zoological viewpoint it is important to know the extent to which human activities have so far affected the forest vegetation and whether the continuity of bird life has already suffered

Fig.33: Inner Himalayas. Upper Kali Gandaki Valley, barren slopes, partly terraced, Dzong village between Kagbeni and Muktinath, 3600 m, Mustang Distr. 21.IV.1980 J. Martens.

Fig.34: Inner Himalayas. Suli Gad Valley, steep slopes covered with *Picea smithiana* forest, valley bottom appr. 3000 m, Dolpo Distr., VI 1970 J. Martens.

as well. In fact, large parts of Nepal at intermediate altitudes have been deforested, and the local existence of many bird species is now in question.

In the lower region of the foothill level (up to 1000 m) the changes over the last 25 years have been particularly dramatic. The Terai lowland has been extensively deforested during this period, to make room for rice paddies (Fig.4). National parks (primarily Chitawan) show what the countryside was once like everywhere. The Siwalik Mts. and parts of the Mahabharat Mts. are dry due to the nature of the soil and in less danger of agricultural encroachment; limited pasturing opens up the forests but does not destroy them.

The lower montane level (1000-2000 m) is widely devastated; there is no longer anything that could be called a coherent or even locally extensive forest cover. The density of human settlements is high, and large areas of the mountain slopes have been terraced for dry (maize, wheat) or wet (rice) agriculture. Nevertheless, in places the cultivated land can be considered "tree-rich". Trees kept for shade (tall *Ficus religiosa, F. bengalensis)* and to prune for fodder are species of the original deciduous forest at this altitude. Only a small fraction of the bird species native to this altitude (e.g. *Megalaima asiatica, M. virens, Cucu-*

lus micropterus, Eudynamys scolopacea, Copsychus malabaricus, Otus spilocephalus, Pycnonotus species) have been able to survive here; a fauna comprising the few species typically associated with human habitations has developed. The same applies to the tree-poor agricultural regions (e.g., *Saxicola torquata, Melophus lathami, Motacilla cinerea, Prinia criniger*).

Similarly severe intervention has also occurred in the lower cloud forests of the montane level (up to 2500 m), but this zone is at the upper limit of village settlements on the southern side of the Himalayas. Above it, the forests have been distinctly less exploited; large-scale deforestation has occurred at only a few places, but here longer-term effects of less spectacular but regular intervention can be discerned.

The upper montane level (cloud-forest level; 2500-4000 m) has been much less densely settled. Nevertheless, where humans are present, direct exploitation can prevail. Because forests are usually immediately accessible, there is no need to plant fodder trees close to home. The forest is interrupted by small meadows for spring pasture; during the monsoon, these are abandoned for higher pastures. The forest belt from about (locally varying) 2500 m to the tree line is still continuous in many places and hence available to the typical fauna.

At the upper cloud-forest level (3000-4200 m) the high pastures grazed during the monsoon (VI-M IX) are found. In places trees have been felled to form isolated clearings, but

Fig.35: Inner Himalayas. Phoksumdo Lake, mixed coniferous forest with *Pinus wallichiana* and *Cupressus torulosa*, lake 3600 m, Dolpo Distr., 1.VI.1970 J. Martens.

the plants growing here are the same as those in the interior of the forest. The proportions of the various species of ground-covering herbs and shrubs are altered, though, because the plants rejected by the livestock can thrive. The natural tree line is probably still present at only a few places in the Nepal Himalayas. Grazing has pushed it down from the subalpine zone. Even in *Abies-Rhododendron* forest with a natural or nearly natural appearance, human influence is unmistakable. Large *Abies* trunks are felled to make shingles, leaving most of the tree unused. Where the trees have been cut, *Abies* seedlings germinate, but the *Rhododendron campanulatum* grows faster and prevents the formation of a closed *Abies* canopy (Schmidt-Vogt 1990).

Intensive pasturing has also changed the composition of the fauna on the high meadows at the alpine level. Where once there were expanses of dwarf bushes, they have been replaced by shrubs and graminaceous formations, often overgrazed and in some cases so severely that the soil is exposed. Here *Tarsiger chrysaeus* and *Phylloscopus fuligiventer* lose their potential breeding sites.

A mostly negative influence of man on the fauna and flora is detectable in all Himalayan forest habitats. At intermediate altitudes (1000-2500 m), over the centuries it has reached catastrophic proportions, large parts of the fauna having vanished along with the forest or shrunk to tiny remnants. In the cloud-forest zone the situation is better in the sense that the forest cover is still continuous over great distances, even though no longer in its ori-

Fig.36: Inner Himalayas. Charka village in upper Barbung Khola Valley; barley fields, overgrazed slopes with dwarf and scattered bushes, mainly *Caragana* and *Lonicera,* 4300 m, 23.VI.1973
J. Martens.

Fig.37: Inner Himalayas. Tributary of Gunsa Khola near Gunsa, mixed *Abies densa/Larix griffithiana* forest, 3370 m, Taplejung Distr., 10.X.1973 J. Martens.

ginal state. The most damage in very recent times has been done to the Terai forests, which have almost disappeared within 30 years, and with them the entire large mammal fauna of northern India (Elephant, Great Indian Rhinoceros, Gaur, Tiger). *Aceros nipalensis* has thus also disappeared from Nepal.

The forest fauna of the Central Himalayas is undeniably in extreme danger today, though to different degrees in different places. The human population is increasing, with all the familiar consequences, so the prognosis is not good. It looks as though especially vulnerable species below the cloud-forest level in the Central Himalayas will soon have shrunk to insignificant residual populations or will have given up this part of their area altogether. Not a few of these species, however, belong to endangered forest communities for which Nepal is at present still a major part of their area (Inskipp 1989). The large-scale creation of nature reserves by the Royal Nepalese government alleviates the problem but will not be able to stop the trend. If all the plans are implemented, and if the rules for these reserves are actually followed, 10% of the area of the country should be protected. But even this area is far from sufficient to protect all the endangered species (Inskipp 1989).

Fig.38: Tibetan Himalayas. Upper Kali Gandaki Valley, looking northeastward across Tangbe village, standpoint about 4300 m, Mustang Distr., 23.VI.1970 J. Martens.

ZOOGEOGRAPHY

Himalayan birds – an immigration fauna

The sharp climatic separation by the Central Himalayas is of great importance biologically and in many respects influences the distribution of the plants and animals of the mountain chain. The Himalayas are regarded as a region of contact between the two great biogeographic realms, which meet and intermesh in various ways. The criteria for classification differ somewhat for phytogeography and zoogeography, but both show that the Himalayas are a meeting place for floras and faunas of different origins and ecological requirements. All areas north of the Central Himalayas belong to the Palaearctic realm, as do the highest parts of the southern flanks occupied by animals. The lower and lowest altitudes of the southern flanks are associated with the Indomalayan (Oriental) realm. The border between the two regions is, however, not striking and abrupt, but over vast distances forms a transition area in which the species of each realm are represented in varying combinations. Diesselhorst (1969) analyzed the Nepal bird fauna composition on the family level and included distributional and ecological views. Nazarenko (1985, 1990) scrutinized the post-Pleistocene development of Himalayan and adjacent E Palaearctic bird faunas in combination with vegetational changes. His papers are most stimulating.

As far as birds are concerned, the lower limit of fir *(Abies)* forests is a good indicator of the increased presence of Palaearctic species. This vegetational border coincides with the lower limit of the upper cloud forest zone (= subalpine zone).

Within the general terms Palaearctic and Indomalayan, however, we find a great variety of plant and animal groups of different geographical origin. We must take into account that the Himalayan fauna is predominantly one which invaded the Himalayas at the time of or after the uplift of the mountain chain during the Tertiary and that only certain members of the Himalayan fauna have undergone an evolution of its own, at least as far as land-living vertebrates are concerned. Thus, the percentage of Himalayan endemic bird species is minute. As we might expect, recent distributions reflect the route by which individual species or species groups migrated into the Himalayas and can be deduced from the habitat or forest community to which each species is adapted.

As the Himalayas are predominantly covered by forest, at least on the southern slopes and in many areas of the Inner Valleys, it is, as we have seen, analysis of the forest vegetation that will provide the first indications of the origin and vertical distribution of the exceedingly rich fauna. For Himalayan faunas, we can distinguish five main areas of origin, three in the Palaearctic, two in the Indomalayan region. In each of them different climatic conditions prevail and the flora and fauna have undergone different development during the Pleistocene.

The Faunal Components (Fig.39)

Central Asian species – Species of the high steppe and of the mountains above timberline. Predominantly these are adapted to cold temperate climates at high altitudes and are always found in open habitats: in the rock and rubble zone with sparse vegetation, on the high mountain steppes and naturally above the timberline, not usually below 4000 m, but upwards to the limits of animal life near 6000 m and locally even higher (Swan 1961). In Nepal, the species in question have reached the Himalayas from Tibet and most do not extend southwards further than the northern slopes, but a few followed the uppermost mountain ridges from E to reach the C Himalayas. Thus a few live in the uppermost parts of the southern flanks. The areas of these species in Nepal are confined to the main range, in the W to Tibetan facies in N Dolpo and N Mustang.

West Asian Himalayan species. – Species of the xerophilic forests, which penetrate into the Central Himalayas from the West (Fig.1). These species belong to the West Asian fauna and correspond largely to the Mediterranean subregion of the Palaearctic. They are adapted to relatively dry forest habitats, much less exposed to the monsoon. The forest habitats in question reach into the C Himalayas as a narrow belt, mainly to NW Dhaulagiri and also, though with fewer typical species, as far as N Annapurna and N Manaslu (see "Inner Valleys").

West Chinese Himalayan species. – These have reached Nepal from the E, from various areas of W China. They are distributed mainly in a narrow belt extending westward along

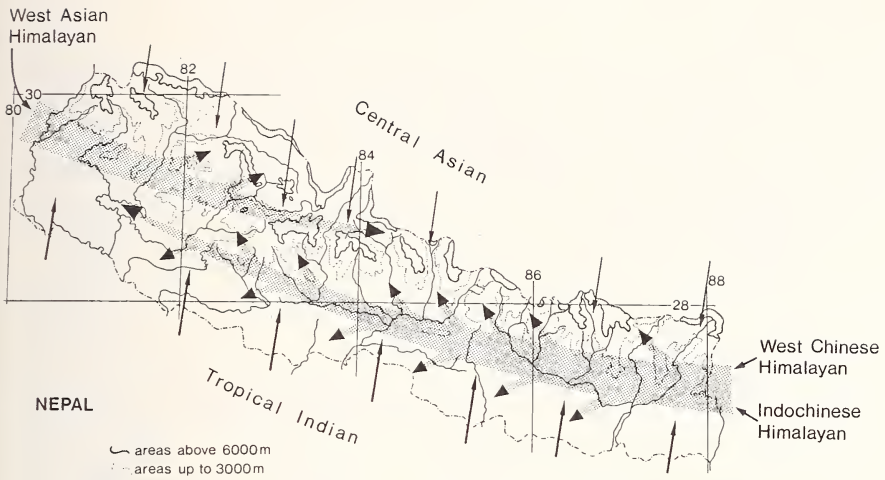

Fig.39: Map of Nepal indicating the main immigration routes of faunal components into the C Himalayas (from Martens 1984).

the S slopes of the main chain. The species concerned are not well adapted to the high precipitation rates typical of the E and C Himalayas, but they tolerate them, and so we find many of them in both the E and wetter and in the W and drier forest types. Vertically, they are found from the temperate *Rhododendron*-coniferous zone to the timberline, that is from about 2800 m to 4200 m (subalpine zone = upper cloud-forest zone). The zoogeographic relationships of this species group are clearly indicated by the fact that many geographic representatives and closely related species are found in northern parts of the Palaearctic.

Indochinese Himalayan species. – Those species migrated westward in large numbers, along the southern lower slopes of the Himalayas. The main distribution area of many of the species in (sub)tropical Indochina and predominantly S of the areas of the West Chinese Himalayan species (see above). Their diversity is greatly reduced from east to west in response to the diminishing monsoon rainfall. Within the zone of *Castanopsis-Quercus*-laurel forest (2000-2600 m; lower cloud-forest level of the temparate zone) and partly within the tree *Rhododendron* belt (up to roughly 3000 m, middle cloud-forest zone), they are distributed in a great variety of genera and families, and only higher up in the subalpine coniferous forest are they greatly reduced in numbers.

Tropical Indian species. – These reach the southern Himalayan mountains from the south and along deeply cut river valleys, and may penetrate right into the main mountain chain. Their vertical distribution rarely exceeds 2000 m, and is in many cases much less.

Thus, the Himalayan birds, though emphasized by various authors, are not an independent faunal element confined to the Himalayas, but are a mixture of species groups which invaded the Himalayas from various directions. Himalayan palaeo-endemic bird species are few (see below).

Vertical distribution

Birds breed in the Central Himalayas within an altitude belt about 5500 m wide, from the Terai lowlands into the alpine zone of the main chain. In Nepal, over 500 species of breeding birds manage to coexist in this belt, particularly many of them on the S flank of the monsoon-wet Outer Himalayas. The width of the vertical area of the individual species varies enormously. Some species outside the tropical regions of Nepal occupy strips that may be narrower than 1000 m *(Blythipicus pyrrhotis, Monticola rufiventris, Tarsiger indicus, Cutia nipalensis, Alcippe chrysotis, Prunella rubeculoides, Carpodacus thura).*

For many species that certainly breed in Nepal not one brood has yet been documented; many aspects of vertical distribution are still conjectural. However, the available evidence suggests that area belts 1500-2000 m in vertical extent are the rule. Remarkably few species exceed this limit. These are euryoecious, penetrating into the Inner Valleys or even reaching the Tibetan region on the N side of the main chain: *Falco tinnunculus, Streptopelia orientalis* and *Cuculus canorus* probably occupy the widest vertical belt of all non-passerines and can be found in almost all climatic zones – the falcon and the dove even above 4000 m in the Tibetan Himalayas. *Passer montanus* inhabits a belt 4300 m wide, the most extensive vertical area of all passerines, followed by *Chaimarrornis leucocephalus,* but the former is always strictly associated with human settlements (but see *Myiophonus caeruleus*).

However, one must be careful not to generalize about vertical belts estimated from observations in different massifs, for they do not necessarily apply to the whole central region of the Himalayas. The data carefully collected by Diesselhorst (1969) at Mt. Everest now reveal that the vertical distributions on the individual massifs of the main chain in Nepal can be quite different. Often the lower limits are further down in parts of the Inner Himalayas less influenced by the monsoon. To be precise, the vertical distribution should be determined separately for each of the large massifs.

Notably wide vertical areas are also occupied by certain species strictly associated with brooks. Those of *Chaimarrornis leucocephalus, Rhyacornis fuliginosus* and *Cinclus pallasii* may be considerably wider than 3000 m. In these cases the local climate at the various altitude levels seems to be less important as a determining factor than the uniformity of the microbiotope over all levels. However, this is not a general correlation. The *Enicurus* species, despite being strict brook-dwellers, are confined to narrrow vertical areas, as are *Motacilla alba* and in particular those species which, although they follow the watercourses, depend on the brookside bush and tree vegetation (*Phylloscopus magnirostris, Stachyris nigriceps, Pnoepyga pusilla, Brachypteryx montana;* see Fig.40).

The upper limit of the vertical distribution of birds in the alpine (and nival) zone has not been established, and it would be particularly difficult to determine for individual species. The populations at the upper area limit are thin, and proof of breeding is hard to obtain. *Eremophila alpestris* (which see), *Prunella collaris, Carpodacus puniceus* and *Phoenicurus erythrogaster* clearly breed above 5000 m. Swan (1961) reported finding the nest of a "Snow Partridge" (presumably *Lerwa lerwa*) at almost 19,000 feet (about 5800 m), probably the highest-altitude breeding recorded for a bird in the Himalayas.

Fig.40: The Himalayan torrent-accompanying bird community. – Riverbed species (a: *Rhyacornis, Chaimarrornis;* b: 5 *Enicurus* species, 3 *Motacilla* species; c: 2 *Cinclus* species); soil-layer species (d: *Pnoepyga pusilla);* exposed bush-layer species (e: *Alcedo atthis);* cryptic bush-layer species (f: 2 *Niltava* species; 2 *Brachypteryx* species; *Cinclidium leucurum; Stachyris nigriceps);* canopy species (g: *Phylloscopus magnirostris;* h: *Myiophonus caeruleus);* rockface species (i: *Tichodroma muraria).*
Original by K. Rehbinder.

There is nearly no vertical sequence of subspecies in Nepal except for three cases. In the Stonechat (*Saxicola torquata,* which see), the subspecies *S. t. indica* penetrates into the lower Himalayas from N India up to 2500 m. The Tibetan subspecies *S. t. przewalskii* descends from the Tibetan plateau to the Inner Valleys as far as the N rim of the main chain, down to 3800 m. However, they do not meet and there is a belt of about 1500 m devoid of Stonechats. The Hoepoe (*Upupa epops,* which see) may be represented by the subspecies *U. e. ceylonensis* at lower altitude up to appr. 1500 m altitude and by *U. e. epops* above this altitude, the latter being present only in W Nepal. The Black Kite (*Milvus migrans,* which see) inhabits the C Himalayas by a lowland subspecies *(M. m. govinda)* and an upland subspecies *(M. m. lineatus).* Breeding records are sparse and nothing is known about a contact zone.

In *Corvus macrorhynchos,* formerly believed to represent one lower and one upper subspecies in Nepal, actually 2 full biological species are concerned, which are parapatric near 2000 m on the S macroslope (see *Corvus japonicus, C. levaillantii*).

List of the breeding bird species of the Himalayas

We regard 608 bird species as breeding birds of the Himalayas, the mountain chain between the Indus knee in the W and the Tsangpo/Brahmaputra knee in the E, and from the Siwalik Mts. in the S (excluding the Bhabar gravel fans, cf. Fig.2) to the Indus and Tsangpo rivers in the N. This is an area bordering the Palaearctic and Indomalayan (= Oriental) Regions. The character of a border region is stressed by the fact that there exist only a small number of endemic species, namely 30 (= 5%). However, the proportion of Indomalayan species is high (300 = 49%), followed by 172 (= 28%) Palaearctic species. In addition, there are 106 species (= 17%), native to more than one region.

Of the 608 Himalayan species 148 (= 24%) possess more than one geographical form, 50 species in Nepal alone. Of this total of 148 species only 3 (= 2%) belong to the Himalayan endemics, while 67 species (= 45%) are Indomalayan (Oriental), 45 species (= 30%) Palaearctic and after all 33 species (= 22%) are distributed over more than one Asian region.

Conversely, the percentage of geographically varying species within each of the zoogeographic groups is as follows: they make up 10% of the Himalayan endemics, 22% of the Indomalayan, and 26% of the Palaearctic species and 22% of the species with extended areas.

Numbers in the list refer to the synopsis of Ali & Ripley (1982). Abbreviations are as follows: **O:** main distribution in the Oriental (Indomalayan) Region, **P:** main distribution in the Palaearctic Region; **C:** distribution comprising more than one zoogeographical region; **H** Himalayan endemic species; **subsp.:** one or several subspecies confined to the Himalayas.

3 *Podiceps cristatus:* C
5 *Tachybaptus ruficollis:* C
?26 *Phalacrocorax carbo:* C
– *Ardea cinerea:* C
42 *Ardeola grayii:* O
– *A. bacchus:* O
44 *Bubulcus ibis:* C
49 *Egretta garzetta:* C
52 *Nycticorax nycticorax:* C
?62 *Ciconia episcopus:* O,C
82 *Anser indicus:* P
100 *Anas platyrhynchos:* P,C
90 *Tadorna ferruginea:* P
– *Aythya nyroca:* P
121 *Mergus merganser:* P,C
125 *Aviceda jerdoni:* O
128 *A. leuphotes:* O
130 *Pernis ptilorhynchus:* C
133 *Milvus migrans:* C
136 *Accipiter gentilis:* P,C
138 *A. badius:* O,C
144 *A. trivirgatus:* O
148 *A. nisus melaschistos:* P
149/150 *A. virgatus* subsp.: O
153 *Buteo rufinus:* P
– *B. hemilasius:* P
156 *B. buteo* subsp.: P
– *Butastur teesa:* O
158 *Spizaetus nipalensis:* O,C
160 *S. cirrhatus* subsp.: O
164 *Hieraaetus pennatus:* C
166 *Aquila chrysaetos:* P
172 *Ictinaetus malayensis:* O
– *Haliaeetus leucoryphus:* C
177 *Ichthyophaga humilis:* O
178 *Sarcogyps calvus:* O
179 *Aegypius monachus:* C
180 *Gyps fulvus:* C
181 *G. himalayensis:* P
185 *G. bengalensis:* O
186/7 *Neophron percnopterus* subsp.: C
188 *Gypaetus barbatus:* C
196 *Spilornis cheela* subsp.: O
203 *Pandion haliaetus:* C
?204 *Microhierax caerulescens:* O
213 *Falco subbuteo:* P

214 *F. severus:* O
219 *F. chicquera:* O
222/3 *F. tinnunculus* subsp.: C
227-31 *Tetraogallus tibetanus* subsp.: P
232 *T. himalayensis:* P
233 *Tetraophasis szechenyii:* P
235/6 *Alectoris chukar* subsp.: P
238/9 *Francolinus francolinus* subsp.: C
248 *Perdix hodgsoniae* subsp.: P
250 *Coturnix coturnix:* P
256 *Perdicula asiatica:* O
266/7 *Arborophila torqueola* subsp.: O
270 *A. rufogularis* subsp.: O
272 *A. atrogularis:* O
273 *A. mandellii:* H
281-4 *Ithaginis cruentus* subsp.: P
285 *Tragopan melanocephalus:* H
286 *T. satyra:* H
287 *T. blythi* subsp.: O
289 *T. temminckii:* C
290 *Lophophorus impejanus:* P
291 *L. sclateri:* O
292 *Crossoptilon crossoptilon:* O
293-6 *Lophura leucomelana* subsp.: O
304-6 *Pucrasia macrolopha* subsp.: P
307 *Catreus wallichii:* H
309 *Polyplectron bicalcaratum:* O
316 *Turnix suscitator:* O
327 *Rallus aquaticus:* P
337 *Porzana pusilla:* C
341 *Amaurornis bicolor:* H
346 *Gallicrex cinerea:* O
347 *Gallinula chloropus:* C
350 *Fulica atra:* C
358 *Hydrophasianus chirurgus:* O
429 *Rostratula benghalensis:* C
430 *Himantopus himantopus:* C
433 *Ibidorhyncha struthersii:* P
379 *Charadrius dubius:* C
384 *Ch. mongolus* subsp.: P
393 *Tringa totanus:* P
401 *T. hypoleucos:* P
404 *Gallinago solitarius:* P
405 *G. nemoricola:* O
409 *G. gallinago:* C
411 *Scolopax rusticola:* P
454 *Larus brunnicephalus:* P
458 *Chlidonias hybrida:* C
465 *Sterna hirundo* subsp.: C
485 *Syrrhaptes tibetanus:* P
493 *Treron apicauda:* O
494 *T. sphenura:* O
495 *T. curvirostra* subsp.: O
501 *T. bicincta:* O
510 *Ducula badia:* O
513/4 *Columba leuconota* subsp.: P
515 *C. rupestris:* P
516 *C. livia:* P
519 *C. palumbus:* P
520 *C. hodgsonii:* O
523 *C. pulchricollis:* O
526 *Macropygia unchall:* O
531/2 *Streptopelia orientalis* subsp.: P
535/6 *S. tranquebarica* subsp.: C
537/40 *S. chinensis* subsp.: O
541 *S. senegalensis:* C
554 *Psittacula derbyana:* O
559 *P. roseata:* O
561 *P. intermedia:* H
562 *P. himalayana:* C
563 *P. finschii:* O
570 *Clamator jacobinus:* C
572 *Cuculus sparverioides:* O
575 *C. fugax:* C
576 *C. micropterus:* O
578/9 *C. canorus* subsp.: P
580 *C. saturatus:* C
581 *C. poliocephalus:* P
584 *Cacomantis passerinus:* O
586 *Chrysococcyx maculatus:* O
588 *Surniculus lugubris:* O
593/4 *Rhopodytes tristis* subsp.: O
597 *Taccocua leschenaultii:* O
609 *Phodilus badius:* O
611/2 *Otus spilocephalus* subsp.: O
616 *O. sunia:* C
619/24 *O. bakkamoena* subsp.: C
626-7 *Bubo bubo* subsp.: C
628 *B. nipalensis:* O
633 *B. flavipes:* O
635 *Glaucidium brodiei:* O
639/40 *G. castanopterum* subsp.: O
642 *Ninox scutulata:* C
649 *Athene noctua* subsp.: P
650/1 *A. brama* subsp.: O
658 *Strix leptogrammica:* subsp.: O
661/2 *S. aluco* subsp.: P
663 *Asio otus:* C

665 *Aegolius funereus:* C
667 *Batrachostomus hodgsonii:* O
670 *Caprimulgus indicus:* C
675 *C. macrurus:* O
– *C. affinis:* O
683 *Collocalia brevirostris:* O
684a *C. maxima:* O
688 *Chaetura caudacutus:* C
694 *Apus melba* subsp.: C
696 *A. apus:* P
700 *A. pacificus:* C
703-5 *A. affinis* subsp.: C
713/4 *Harpactes erythrocephalus* subsp.: O
716 *H. wardi:* O
717/8 *Ceryle lugubris* subsp.: O
721 *Alcedo hercules:* O
– *A. atthis:* C
727 *Ceyx erithacus:* O
746 *Merops apiaster:* P
750 *M. orientalis:* C
754 *Coracias garrulus:* P
755-7 *C. benghalensis* subsp.: O
758 *Eurystomus orientalis:* C
763/4 *Upupa epops* subsp.: C
771 *Aceros nipalensis:* O
772 *Rhyticeros undulatus:* O
777-9 *Megalaima virens* subsp.: O
?784 *M. lineata:* O
787 *M. franklinii:* O
789 *M. australis:* O
792 *M. haemacephala:* O
793-5 *Indicator xanthonotus* subsp.: O
798 *Picumnus innominatus:* O
800 *Sasia ochracea:* O
802/3 *Micropternus brachyurus* subsp.: O
807 *Picus squamatus:* subsp.: P
808 *P. xanthopygaeus:* O
809/10 *P. canus* subsp.: C
812/3 *P. flavinucha* subsp.: O
814/5 *P. chlorolophus* subsp.: O
824 *Dinopium shorii:* O
827 *Gecinulus grantia:* O
?828 *Muelleripicus pulverulentus* subsp.: O
831a *Dryocopus martius:* P
832/3 *Dendrocopos hyperythrus* subsp.: C
836/7 *D. himalayensis* subsp.: P
838 *D. darjellensis:* O
840/40a *D. cathpharius* subsp.: O
842/3 *D. auriceps* subsp.: P
845 *D. macei:* O
848/9 *D. canicapillus* subsp.: C
855 *Picoides tridactylus* subsp.: P
857 *Blythipicus pyrrhotis:* O
860/1 *Chrysocolaptes lucidus* subsp.: O
864 *Serilophus lunatus:* O
?865 *Psarisomus dalhousiae:* O
?866 *Pitta nipalensis:* O
867 *P. brachyura:* O
869 *P. sordida:* O
871 *P. cyanea:* O
880 *Ammomanes deserti:* P
– *Calandrella cinerea:* P,(C)
888 *C. acutirostris:* P
893-4 *Melanocorypha maxima* subsp.: P
– *Galerida cristata:* P
895-7 *Eremophila alpestris* subsp.: P,(C)
904-5 *Alauda gulgula* subsp.: C
910 *Riparia riparia:* P,(C)
913 *Ptyonoprogne rupestris:* P
916-7 *Hirundo rustica* subsp.: P,(C)
925 *Cecropis daurica* subsp.: P
930 *Delichon urbica:* P
931 *D. dasypus* subsp.: P
932 *D. nipalensis:* O
944/5 *Lanius tephronotus* subsp.: P
946/8 *L. schach* subsp.: C
953 *Oriolus oriolus:* P
955 *O.*sp. *tenuirostris:* O
958 *O. xanthornus:* O
961 *O. traillii:* O
962 *Dicrurus adsimilis* subsp.: C
965/6 *D. leucophaeus* subsp.: C
970 *D. annectans:* O
971 *D. aeneus:* O
972 *D. remifer:* O
973 *D. hottentottus:* O
976 *D. paradisaeus:* O
984 *Saroglossa spiloptera:* O
987 *Sturnus malabaricus:* O
994 *S. pagodarum:* C
1006 *Acridotheres tristis:* C
1009-11 *A. fuscus* subsp.: O
1015 *Gracula religiosa:* O
1020/1 *Garrulus glandarius* subsp.: P

1022 *G. lanceolatus:* P
10236 *Cissa chinensis:* O
1025/6 *Urocissa flavirostris* subsp.: O
1027 *U. erythrorhyncha* subsp.: O
1029/30 *Pica pica* subsp.: P,(C)
?1030a *Dendrocitta vagabunda:* O
1035 *D. frontalis:* O
1037/8 *D. formosae* subsp.: C
1041 *Pseudopodoces humilis:* P
1042-4 *Nucifraga caryocatactes* subsp.: P
1045 *Pyrrhocorax graculus:* P
1046/7 *P. pyrrhocorax* subsp.: P
– *Corvus splendens:* O
1053 *C. monedula:* P
1054-6 *C. "macrorhynchos"* subsp.: C (see *C. japonicus, C. levaillantii)*
1058 *C. corone:* P
1060 *C. corax:* P,(C)
1064 *Hemipus picatus:* O
1067 *Tephrodornis virgatus:* O
1072 *Coracina macei:* O
1077 *C. melaschistos:* O
1079 *C. melanoptera:* O
1080 *Pericrocotus flammeus:* O
1084 *P. brevirostris:* O
1085/6 *P. ethologus* subsp.: C
1088 *P. solaris:* O
1089 *P. roseus:* O
1098 *Aegithina tiphia:* O
1106 *Chloropsis hardwickii:* O
1115 *Pycnonotus melanicterus:* O
1125 *P. leucogenys* subsp.: P
1126/31 *P. cafer* subsp.: O
1133/4 *P. striatus* subsp.: O
1140 *Criniger flaveolus:* O
1146 *Hypsipetes mcclellandii:* O
1147 *H. flavalus:* O
1148 *H. madagascariensis* subsp.: C
1153 *Pellorneum ruficeps:* O
?1160 *P. palustre:* O
?1164 *P. albiventre:* O
?1166 *Trichastoma tickelli:* O
1167 *T. abbotti:* O
1168/9 *Pomatorhinus horsfieldii* subsp.: O
1178/9 *P. ruficollis* subsp.: O
1181-3 *P. erythrogenys* subsp.: O
1185 *P. hypoleucos:* O
1186/6a *P. ferruginosus* subsp.: O
?1189 *P. ochraceiceps:* O
1191/2 *Xiphirhynchus superciliaris* subsp.: O
1193 *Rimator malacoptilus:* O
1194 *Napothera brevicauda:* O
1196 *N. epilepidota:* O
1197/8 *Pnoepyga albiventer* subsp.: O
– *P. immaculata:* H
1199 *P. pusilla:* O
1200 *Spelaeornis caudatus:* H
1205 *S. troglodytoides* subsp.: C
1206 *S. formosus:* O
1210 *Stachyris ruficeps:* O
1211 *S. pyrrhops:* H
1212 *S. chrysaea:* O
1214 *S. nigriceps:* O
?1218 *S. oglei:* O
1236 *Conostoma aemodium:* C
1237 *Paradoxornis unicolor* subsp.: P
1238/9 *P. fulvifrons* subsp.: O
1239a-43 *P. nipalensis* subsp.: O
1245 *P. atrosuperciliaris* subsp.: O
1247/8 *P. ruficeps* subsp.: O
1249 *P. gularis* subsp.: O
1251 *P. flavirostris:* C
1254 *Turdoides caudatus:* C
?1265 *T. striatus:* O
1269 *T. nipalensis:* H
1271-3 *Babax waddellii* subsp.: P
1273/4 *Garrulax albogularis* subsp.: O
1275/6 *G. monileger* subsp.: O
1277/8 *G. pectoralis* subsp.: O
1279-82 *G. striatus* subsp.: O
1283 *G. leucolophus:* O
1289/90 *G. variegatus* subsp.: H
1292-4 *G. rufogularis* subsp.: O
1297 *G. maximus:* P
1298/9 *G. ocellatus* subsp.: C
1300 *G. caerulatus* subsp.: O
1303 *G. ruficollis:* O
1314-6 *G. lineatus* subsp.: P
1319 *G. squamatus:* O
1320 *G. subunicolor:* O
1321 *G. henrici:* H
1322/3 *G. affinis* subsp.: O
1324-26 *G. erythrocephalus* subsp.: O
1331 *G. phoeniceus* subsp.: O
1333 *Leiothrix argentauris:* O

1335/6 *L. lutea* subsp.: O
1338 *Myzornis pyrrhoura:* O
1339 *Cutia nipalensis:* O
1340 *Pteruthius rufiventer:* O
1341 *P. flaviscapis:* O
1342/3 *P. xanthochlorus* subsp.: C
1345 *P. melanotis:* O
1347 *Gampsorhynchus rufulus:* O
1348/9 *Actinodura egertoni* subsp.: O
1352/3 *A. nipalensis* subsp.: O
1354 *A. waldeni* subsp.: O
1357 *Minla ignotincta:* O
1358-60 *M. strigula* subsp.: O
1362 *M. cyanouroptera:* O
1363/4 *Yuhina castaniceps* subsp.: O
1366 *Y. bakeri:* O
1367/8 *Y. flavicollis* subsp.: O
1371/2 *Y. gularis* subsp.: O
1373 *Y. occipitalis:* O
1374 *Y. nigrimenta:* O
1375 *Y. xantholeuca:* O
1376 *Alcippe chrysotis:* C
1378 *A. cinerea:* O
1379 *A. castaneceps:* O
1380-2 *A. vinipectus* subsp.: O
1384 *A. cinereiceps:* O
?1385a *A. striaticollis:* P
1386/7 *A. rufogularis* subsp.: O
?1388 *A. brunnea:* O
1392 *A. nipalensis:* O
1395 *Heterophasia annectans:* O
1396-8 *H. capistrata* subsp.: H
1400 *H. pulchella:* O
1401 *H. picaoides:* O
1406 *Muscicapa sibirica:* P
1407 *M. dauurica:* P
1409 *M. ruficauda:* O
1410 *M. ferruginea:* O
1413 *Ficedula subrubra:* H
1414 *F. strophiata:* O
1415 *F. monileger:* O
1417 *F. hyperythra:* O
1418 *F. hodgsonii:* O
1419/20 *F. westermanni* subsp.: O
1422 *F. superciliaris:* C
1423/4 *F. tricolor* subsp.: C
1426 *F. sapphira:* C
1428 *Niltava grandis:* O
1429/30 *N. macgrigoriae* subsp.: O
1431/2 *N. sundara* subsp.: O
?1433 *N. vivida:* O
1436/7 *N. poliogenys* subsp.: O
1439 *N. unicolor:* O
1440 *N. rubeculoides:* O
1441 *N. banyumas:* O
1445 *Muscicapa thalassina:* C
1447 *Niltava hodgsoni:* O
1448 *Culicicapa ceylonensis:* O,(C)
1450 *Rhipidura hypoxantha:* O
1454-56 *R. albicollis* susp.: O
1471 *Tesia cyaniventer:* O
1472 *Tesia olivea:* O
1473 *T. castaneocoronata:* O,(C)
1477/8 *Cettia fortipes* subsp.: C
1479 *C. major* O,(C)
1481 *C. flavolivacea:* O
1484 *C. acanthizoides* subsp.: O
1485-7 *C. brunnifrons* subsp.: O
1489/90 *Bradypterus thoracicus* subsp.: C
1491 *B. major:* P
1493 *B. luteoventris:* O
1498 *Cisticola juncidis:* C
1501 *Prinia rufescens:* O
1502 *P. hodgsoni:* O
1507 *P. cinereocapilla:* H
1527 *P. criniger* subsp.: C
1529 *P. atrogularis* subsp.: O
1536 *Orthotomus sutorius:* O
1540 *O. atrogularis:* O
1541 *O. cucullatus:* O
1550 *Acrocephalus stentoreus:* C
?1559 *A. concinens:* P
1570 *Sylvia althaea:* P
1576 *Phylloscopus sindianus:* P
1577 *Ph. neglectus:* P
1578 *Ph. tytleri:* H
1579 *Ph. affinis:* P
1581 *Ph. griseolus:* P
1582/3 *Ph. fuligiventer* subsp.: H
– *Ph. armandii:* P
1587/8 *Ph. pulcher* subsp.: O
1590/1 *Ph. inornatus* subsp.: P
1593 *Ph. subviridis:* C
1594/5 *Ph. proregulus* subsp.: C
1597-9 *Ph. maculipennis* subsp.: O
1601 *Ph. magnirostris:* P,(C)
1602-4 *Ph. trochiloides* subsp.: P
1606 *Ph. occipitalis:* P

1608-10 *Ph. reguloides* subsp.: C
1612 *Ph. cantator:* O
1613 *Seicercus affinis:* O
1614/5 *S. burkii* subsp.: O
1616/7 *S. xanthoschistos* subsp.: O
1620 *S. poliogenys:* O
1621 *S. castaniceps:* O
1622/3 *Abroscopus superciliaris* subsp.: O
1624/5 *A. schisticeps.* subsp.: O
1626 *A. albogularis:* O,(C)
1627 *A. hodgsoni:* O
1629-31 *Regulus regulus* subsp.: P
1632 *Leptopoecile elegans:* P
1633/4 *L. sophiae* subsp.: P
1635 *Brachypteryx stellata* subsp.: O
1636 *B. hyperythra:* O
1639 *B. leucophrys:* O
1640 *B. montana:* O
1646 *Luscinia svecica:* P
1647/8 *L. pectoralis* subsp.: P,(C)
1650 *L. brunnea:* C
– *L. pectardens:* P
1654/5 *Tarsiger cyanurus* subsp.: P
1657/8 *T. chrysaeus* subsp.: O
1659 *T. indicus:* O
1660 *T. hyperythrus:* O
?1661 *Copsychus saularis:* O
1669 *Phoenicurus erythronotus:* P
1670 *Ph. caeruleocephalus:* P
1671/2 *Ph. ochruros* subsp.: P
– *Ph. hodgsoni:* P
– *Ph. auroreus:* P
1675 *Ph. frontalis:* P,(C)
1676 *Ph. schisticeps:* P
1678 *Ph. erythrogaster:* P
1679 *Rhyacornis fuliginosus:* C
1680 *Hodgsonius phaenicuroides:* C
1681 *Cinclidium leucurum:* O
1682 *C. frontale:* O
1683 *Grandala coelicolor:* P
1684 *Enicurus scouleri:* C
1685 *E. immaculatus:* O
1686 *E. schistaceus:* O
1687 *E. leschenaulti:* O
1688/9 *E. maculatus* subsp.: C
1690 *Cochoa purpurea:* O
1691 *C. viridis:* O
1697 *Saxicola torquata* subsp.: C
1700 *S. caprata:* C
1705 *S. ferrea:* O
1709 *Oenanthe deserti* subsp.: P
1714 *Oe. alboniger:* P
1716 *Chaimarrornis leucocephalus:* C
1723 *Monticola cinclorhyncha:* C
1724 *M. rufiventris:* O
1726 *M. solitarius* subsp.: C
1729 *Myiophonus caeruleus:* C
1731 *Zoothera wardi:* O
1733 *Z. citrina:* O
1738/9 *Z. mollissima* subsp.: C
1740 *Z. dixoni:* O
1741 *Z. dauma* subsp.: O
1745 *Z. monticola:* O
1746 *Z. marginata:* O
1748 *Turdus unicolor:* H
1749 *T. albocinctus:* H,(C)
1750 *T. boulboul:* O
1752 *T. merula* subsp.: C
1758 *T. rubrocanus:* P
– *T. kessleri:* P
1768 *T. viscivorus:* P
1769-71 *Troglodytes troglodytes* subsp.: P,(C)
1773/4 *Cinclus cinclus* subsp.: P
1775/6 *C. pallasii* subsp.: P,(C)
1777-9 *Prunella collaris* subsp.: P
1780 *P. himalayana:* P
1781 *P. rubeculoides:* P
1782/3 *P. strophiata* subsp.: P
1784 *P. fulvescens* subsp.: P
1788 *P. immaculata:* P
1791-3 *Parus major* subsp.: C
1799 *P. monticolus:* C
1802/3 *P. ater* subsp.: P
1804 *P. rufonuchalis:* P
1805/6 *P. rubidiventris* subsp.: P
1807/8 *P. dichrous* subsp.: P
1809 *P. xanthogenys* subsp.: O
1812 *P. spilonotus:* O
1813/4 *Sylviparus modestus* subsp.: C
1815 *Cephalopyrus flammiceps:* P
1818/9 *Aegithalos concinnus* subsp.: C
1821 *Ae. leucogenys:* P
1822 *Ae. niveogularis:* H
1823 *Ae. iouschistos:* H
1824 *Sitta cashmirensis:* H,(P)
1827/8 *S. castanea* subsp.: O

– *S. europaea:* P
1832 *S. leucopsis:* P
1834 *S. himalayensis:* O
1837 *S. formosa:* O
1839 *Tichodroma muraria:* P
1842-4 *Certhia familiaris* subsp.: P
1845-8 *C. himalayana* subsp.: P
1849 *C. discolor:* O
1851 *C. nipalensis:* H,(C)
1852 *Anthus hodgsoni:* P
1855 *A. trivialis:* P
1859 *A. rufulus:* O
1865 *A. roseatus:* P
?1867 *A. similis:* C
1873 *A. sylvanus:* C
1876 *Motacilla flava:* P
1883 *M. citreola:* P
1884 *M. cinerea:* P
1885-7 *M. alba* subsp.: P
1892 *Dicaeum agile:* O
1895 *D. chrysorrheum:* O
1896 *D. melanoxanthum:* O
1901 *D. concolor:* O
1904 *D. cruentatum:* O
1905 *D. ignipectus:* O
1906 *Anthreptes singalensis:* O
1919 *Aethopyga gouldiae:* C
1922/3 *Ae. nipalensis* subsp.: O
1925/6 *Ae. saturata* subsp.: O
1927/8 *Ae. siparaja* subsp.:
1930 *Ae. ignicauda:* O
1932 *Arachnothera magna:* O
1938/9 *Passer domesticus* subsp.: P
1941 *P. montanus:* C
1946 *P. rutilans:* C
1952 *Montifringilla adamsi:* P
– *"M." taczanowskii:* P
– *Pyrgilauda ruficollis:* P
– *P. blanfordi:* P
1957-9 *Ploceus philippinus* subsp.: O
?1967 *Lonchura striata:* O
– *L. punctulata:* O
1982 *Mycerobas icterioides:* P
1983 *M. affinis:* P
1984/5 *M. carnipes* subsp.: P
1986 *M. melanozanthos:* O
1989 *Carduelis carduelis:* P
1990-2 *C. spinoides* subsp.: O
– *C. spinus* (JBNHS 78: 386-387, 1981): P
1996 *C. flavirostris:* P
1993 *C. thibetana:* H
1998 *Serinus pusillus:* P
– *Leucosticte sillemi:* H
1999/2000 *L. nemoricola* subsp.: P
2003 *L. brandti:* P
1997 *Callacanthis burtoni:* H
2009 *Rhodopechys sanguinea:* P
2006 *Bucanetes githagineus:* P
2011 *Carpodacus erythrinus:* P
2014/5 *C. nipalensis* subsp.:
2016 *C. rubescens:* P
2017 *C. rhodochrous:* H
2017a *C. vinaceus:* O
2018 *C. rhodochlamys:* P
2019 *C. rhodopeplus:* H
2020/1 *C. thura* subsp.: C
2023/4 *C. pulcherrimus* subsp.: P
2025 *C. rubicilla:* P
2028 *C. rubicilloides:* P
2030/1 *C. puniceus* subsp.: P
2032 *Loxia curvirostra:* C
2033 *Pinicola subhimachala:* O
2034 *Haematospiza sipahi:* O
2035 *Pyrrhoplectes epauletta:* O
2036/7 *Pyrrhula nipalensis* subsp.: C
2038 *P. erythaca:* P
2039 *P. erythrocephala:* H
2040 *P. aurantiaca:* H
2048 *Emberiza stewarti:* P
2051/2 *E. cia* subsp.: P
2055 *E. fucata* subsp.: P
2060 *Melophus lathami:* O

Subspecies and their distributional limits within Nepal

Within the Nepal borders more than 1 subspecies of each of 50 species meet; surprisingly, most of them form transition zones in 4 restricted areas (Fig.41).

1. Karnali catchment transition area, centred on 81°E.
14 species are concerned, namely *Lophura leucomelana, Streptopelia tranquebarica, Picus flavinucha, Dendrocopos auriceps, Dendrocitta formosae, Corvus "macrorhynchos"* (see *Corvus* in the Species Account section), *Garrulax ocellatus, Minla strigula, Heterophasia capistrata, Rhipidura albicollis, Phylloscopus pulcher, Seicercus xanthoschistos, Sitta castanea, Emberiza cia.*

2. Dhaulagiri transition area, centred on 83°30'E.
4 species are concerned, namely *Phylloscopus proregulus, Prunella strophiata, Parus ater, Aethopyga nipalensis.*

3. Kathmandu transition area, roughly between 85°E and 86°E. This is a relatively broad transition area; Kathmandu is nearly in the middle of it, hence the name chosen.
21 species are concerned, namely *Francolinus francolinus, Streptopelia orientalis, Cuculus canorus, Otus spilocephalus, Coracias benghalensis, Megalaima virens, Picus chlorolophus, Chrysocolaptes lucidus, Lanius schach, Garrulus glandarius, Urocissa flavirostris, Pnoepyga albiventer, Paradoxornis nipalensis, Garrulax striatus, G. rufogularis, Pteruthius xanthochlorus, Actinodura nipalensis, Yuhina flavicollis, Heterophasia capistrata, Parus rubidiventris, Sitta castanea.*

4. Arun catchment transition area, roughly between 87°E and 87°30'E.
8 species are concerned, namely *Dendrocopos canicapillus, Corvus "macrorhynchos", Pomatorhinus ruficollis, Garrulax affinis, G. erythrocephalus, Alcippe vinipectus, Cettia fortipes, Luscinia pectoralis.*

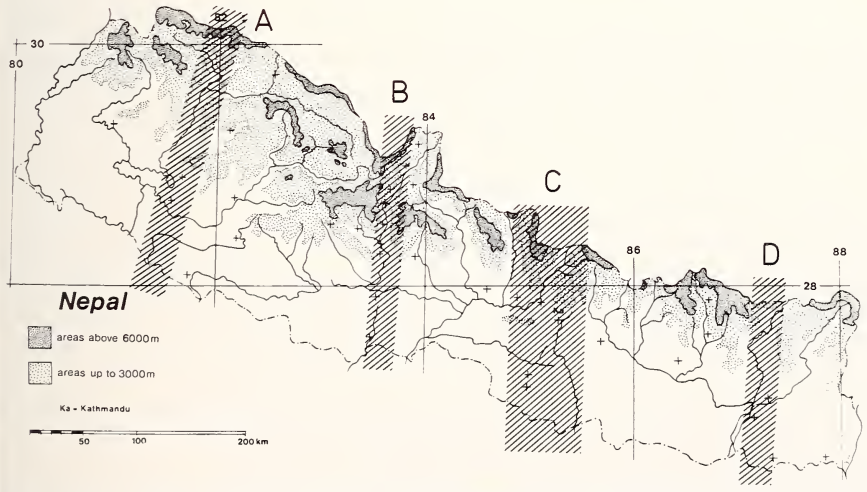

Fig.41: Map of Nepal to show subspecies' transition areas. A: Karnali catchment transition area; B: Dhaulagiri transition area; C: Kathmandu transition area; D: Arun catchment transition area.

Three species belong to 2 of the transition zones (*Corvus "macrorhynchos*" (A, D), *Heterophasia capistrata* (A, C), *Sitta castanea* (A, C). They are represented by 3 subspecies each within Nepal.

This marked subspecific diversity within the area of Nepal continues to the E and the W, in some cases involving the same species, though others are also concerned. One may speculate about this phenomenon and its causes. It may simply be that the rugged mountain chain gives rise to many isolating factors. But the fact that the transitional areas are well marked geographically may indicate the possibility that small populations were isolated during Pleistocene periods and hence developed distinct characters, after which the formerly isolated areas may have fused. More detailed studies are needed, including the whole Himalayan chain.

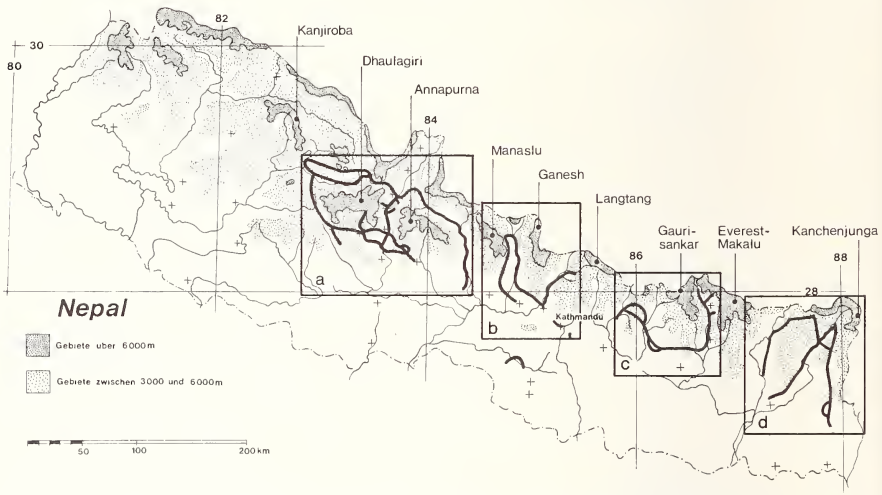

Fig.42: Map of Nepal to show main expedition routes from 1969 to 1988. a: see Fig.43; b: see Fig.44; c: see Fig.45; d: see Fig.46, 47.

ITINERARY

The following accounts give localities and dates of stay for every day of fieldwork between 1969 and 1995. The localities are the village or place where we set up camp in the evening of a day. The date or the period of a longer stay follows in brackets. Altitudes refer to the camp site or village nearby. For details concerning geography compare the maps (Fig.42-47).

Nepal 1969-1970 (Figs.43, 45). – Duration: 2.IX.1969-1.XII.1970
Sponsorship: Deutscher Akademischer Austauschdienst.

1st Trek: 24.IX.-21.XII.1969. – Participants: Jochen Martens, Christian Kleinert, Christine Kleinert.

Fig.43: Expedition routes in the Dhaulagiri/Annapurna area in 1969/70, 1974, 1980 and 1995.

This was a tour to the Kali Gandaki Valley between the Dhaulagiri and Annapurna massifs in Kaski, Parbat and Mustang Districts. Many excursions to the side valleys and slopes to the East and the West brought insight into the different vegetation formations up to about 5100 m near Dapa Col. Bird migration phenomena, especially the huge flocks of cranes, were very impressive in October.

Flight from Kathmandu to Pokhara, camp site at the edge of the town (24.IX.); ascent to Naudara ridge (1520 m, 25.IX.); Bhuka (1750 m, 26.IX.); ascent to Ghorapani pass (2850 m, 27.IX.); descent to Tatopani in Kali Gandaki Valley (1240 m, 28.IX.); Kabre (1770 m, 29.IX.); Lete (2550 m, 30.IX.), Tukche (2550 m, 1.-7.X., small excursions near the village, on horseback to Jomosom (2750 m, 4.X.); start to Dapa Col, camp in a rock shelter at 3950 m (7.X.); camp at 4830 m (8.X.); Dapa Col, camp at 5020 m (9.-10.X.); descent to the rock shelter (3925 m, 10.-14.X.); back to Tukche (14.-21.X.); Choya, camp at riverside (21.X.); Chadziou Khola, camp at 2600 m in mixed forest (22.X.-4.XI.); back to below Nabrikot (4.XI.); Nabrikot and surrounding slopes (2700 m, 5.-13.XI.); back to Tukche (14.XI.); Thaksang, a forest clearing on the left bank of Kali Gandaki above Tukche (lower part 3150 m, 15.-25.XI.); lower Dambush Khola Valley near Tukche (26.-28.XI.); Tukche (29.XI.); Nabrikot (30.XI.); Taglung (2500 m, 1.XII.); from Titi Lake (2700 m) to Lete

(2.XII.); camp on right bank of Lete Khola, damp mixed forest (2600 m, 3.-7.XII.); down along Kali Gandaki river, Rupshesara (1800 m, 8.XII.); ascent to Ghorapani pass (2900-3100 m, 9.-14.XII.); descent to Modi Khola, Birethanti (1100 m, 15.XII.); Suiketh (1100 m, 16.XII.); Pokhara (900-1000 m, 17.-20.XII.); by plane back to Kathmandu (21.XII.).

2nd Trek: 8.-19.I.1970. – Participants: Jochen Martens, Christian Kleinert.

This was a short stay in Jiri and the surrounding slopes, at that time a Swiss agricultural farm. We crossed without porters parts of Sindhu Palchok and Ramechap Districts.

By bus from Kathmandu to Lamosanghu (8.I.); Surke (1500 m, 9.I.); via Kirantichap to Bothe Kosi bridge (850 m, 10.I.); Sikri (11.I.); Jiri (1800 m, 12.-19.I., excursion to top of Mt. Chordung, 3690 m, 18.I.); back to Kathmandu by plane (19.I.).

3rd Trek.- 25.I. to 1.II.1970. – Participant: Jochen Martens.

Excursion to the southwestern fringe of the Kathmandu Valley, Godavari village (1550-1700 m) and Phulchoki Mt. (2767 m). Stay partly in the Godavari fish farm, partly near top of Phulchoki in a small road worker camp. Skinner Ang Tsering Sherpa was hired during this stay.

4th Trek: 7.-25.II.1970. – Participant: Jochen Martens.

Excursion to the Rapti Valley in Chitawan District. By bus to Hetaura and to near Tekouli (7.II.); elephant camp on Rapti bank S Tekouli (300 m, 8.-15.II.); camp S of the Rapti river at the N Siwalik foothills, camp at forest edge (about 350 m, 15.-20.II.); back to Hetaura (20.II.); by bus to Daman, Mahabarat Mts., camp in horticultural farm (2700 m, 21.-25.II.); by lorry back to Kathmandu (25.II.).

5th Trek: 16.III.-1.VIII.1970. – Participant: Jochen Martens.

This longest continuous field trip I ever had in Nepal was mainly devoted to the natural history of the Dhaulagiri Massif, especially to the dry northern parts. I visited Kaski, Baglung, Dolpo, Mustang, and Parbat Districts and encircled the Dhaulagiri massif within 4 and a half months.

By bus from Kathmandu to Pokhara (16.III.); Suiketh Valley below Naudara ridge (1180 m, 17.III.); Tilhar (1000 m, 18.III.); Kusma (1000 m, 19.III.), near Beni, Kali Gandaki Valley (about 800 m, 20. Ill.); lower Myagdi Khola (about 1000 m, 21.III.); Darapani (22.III.); ascent to Muri (2100 m, 23.III.-5.IV., camp above the village, 2300 m, 31.III.-2.IV.); Dara Khola upstream, ascent to Jalja La (2300 m, 5.IV.); crossing Jalja La (3568 m), descent along Uttar Ganga river (3120 m, 6.IV.); Dhorpatan Valley (2950 m, 7.-26.IV., stay in three camps in different parts of the valley, mainly at a small river course at 2950 m, excursions to various parts in the surrounding hills); near Bobang S of Dhorpatan (2500 m, 26.IV.-1.V.); back to Dhorpatan (1.-4.V.); departure in direction of Tarakot, up to below the pass, camp at 3680 m (4.V.); crossing the pass (4110 m) to Thankur, a forest clearing and pasture (3400 m, 5.V.); Pelma, Emaka (2600 m, 6.V.); resting place Dhule, no settlement (3350 m, 7.V.); camp in resthut in Cheng (Seng) Khola (4000 m, 8.V.); crossing Jungla Banjyang (4530 m), descent to 4300 m (9.V.); Tarakot (2900 m, 10.V.); village Gompa above Tarakot,

back to Tarakot (11.V.); camp near Gompa/Tarakot (3300 m, 12.-16.V.); back to Tarakot (16.-17.V.); downstream Barbung Khola to Dunahi (2350 m, 18.V.); upstream Suli Gad, passing Rohagaon (19.V.); Rako, up to bridge crossing Suli Gad (3130 m, 20.V.); Ringmo on Phoksumdo Lake (3600 m, 21.V.-5.VI., excursions to the surrounding hills up to 4000 m); down stream Suli Gad (6.V.); Parila (2600 m, 7.VI.); Barbung Khola Valley floor ahead of Tarakot (2400 m, 8.VI.); short distance beyond Tarakot (2400 m, 9.VI.); camp short distance E of confluence of Tarap Khola and Barbung Khola (2500 m, 10.VI.); upriver Barbung Khola, to bridge near Kakkot (11.VI.); camp below Pimring (3250 m, 12.Vl.); Tarang (3580 m, 13.-16.Vl.); Mukut (4000 m, 16.-18.VI.); Tarang upriver (18.VI.); Parung (4000 m, 19.VI.); crossing Parung La (5200 m), descent to 4900 m (20.VI.); crossing Sangda La (= Dudje La, 5060 m); descent to 4700 m (21.VI.); Sangda (3800 m, 22.VI); Kagbeni in Kali Gandaki Valley (2800 m, 23.VI.); Tukche (2650 m, 24.-27.VI.); downriver to Chadziou Khola, Deorali (2570 m, 27.VI.); camp in Chadziou Khola Valley (2600 m, 28.VI.-3.VII.); Titi Lake (2700 m, 3.VII.); back to Tukche (4.VII.); ascent to forest clearing Thaksang (3150 m, 5.-10.VII.); back to Tukche (10.-12.VII.); ascent to Dapa Col, up to 3970 m (12.VII.); ascent to Dapa Col, camp just below, 5030 m (13.-17.VII., excursions to the Hidden Valley just below the pass, northern side, and the surrounding mountains up to 5700 m at 15.VII.); descent to Tukche, down to 3970 m (17.VII.); Tukche (18.-19.VII.); Jomosom and surroundings (up to about 3000 m, 19.-20.VII.); Tukche (20.-22.VII.); Ghasa (2300 m, 22.VII.); Sikha (2270 m, 23.VII.); Ghorapani Pass (2800 m, 24.-29. VII.); Birethanti in Modi Khola Valley (1100 m, 29.VII.); Hyangja (1000 m, 30.VII.); Pokhara (800 m, 31.VII.), flight back to Kathmandu (1.VIII.).

6th Trek: 4.-7.VIII.1970. – Paricipants: Jochen Martens, Herbert Franz.
Short excursion to the Sun Kosi Valley, Sindhu Palchok Distr. – By jeep to Barabise (950 m, 4.VIII.); ascent to the E slopes to Kortali (1950 m, 4.VIII.); Durumtali (2050 m, 5.VIII.); return to Durumtali (6.VIII.); descent to Barabise, back by bus to Kathmandu (7.VIII.).

7th Trek: 29.VIII.-29.X.1970. – Participants: Jochen Martens, in high Khumbu temporarily Peter Arctander (Copenhagen).

This was a two months' excursion to the Mt. Everest region from Jiri eastward to the Everest basecamp on Khumbu glacier. I worked in Ramechap and Solukhumbu Districts.

By plane from Kathmandu to Jiri (1800 m, 29.VIII.); Mt. Chordung (2900 m, 30.VIII.-2.IX., excursions up to 3100 m); back to Jiri (2.IX.); Thodung (3200 m, 3.-7.IX.); back to Jiri (7.-8.IX.); Deorali (8.IX.); Shete (2600 m, 9.IX.); crossing Lamjura Pass (3500 m); Junbesi (2700 m), at night in Phangmoche Monastery (10.IX.); back to Junbesi, Dudh Kosi Valley (2100 m, 11.IX.); Kharikhola (2300 m, 12.-14.IX.); upriver Dudh Kosi Valley, Banjyang (2800 m, 14.IX.); Ghat (2490 m, 15.IX.); Khumjung (3800 m, 16.-19.IX., with excursions to the surrounding hills including Khumde); Milinggo (3820 m, 19.IX.); Phulung Kharpo (4343 m, 20.IX.); Lobuche (4900 m, 21.IX.); Gorak Shep (5200 m, 22.-27.IX., with excursions to Everest base camp, 5300 m, 24.IX., and Kala Pattar, 5545 m, 26.IX.); Mingbo (4800 m, 28.IX.); Tengpoche (3870 m, 29.IX.); confluence of Phunki- and Imja Drangka (3300 m, 30.IX.-4.X.); Khumjung, Namche Bazar and back to Khumjung (4.IX.); Thame Og (3800 m, 5.-7.IX.); Tarnga (4050 m, 7.IX.); Lunak at Cho Oyu glacier (5050 m, 8.-11.IX.,

excursion to Ladze, 5100 m, 10.IX.); back to Tarnga (11.-13.IX.); Pare (3550 m, 13.-17.IX.); Khumjung (17.-20.IX.), including excursion to construction site of Everest Hotel; Ghat (2550 m, 20.IX.): Lughla (2900 m, 21.-24.IX.); start without porters and luggage to Kharte (24.IX.): Ringmo (25.IX.); Shete (26.IX.); Jiri (27.-28.IX.); flight back to Kathmandu (29.IX.).

Nepal 1973 (Fig.44, 45). – Participants: Jochen Martens, Dietrich Plath, H.S. Nepali. Duration: 12.III.-28.VII.1973. Sponsorship: Deutsche Forschungsgemeinschaft.

During this stay three separate treks were undertaken in E, C and W Nepal. I visited Ramechap, Dolakha, and Sindhu Palchok Districts (1st trek), Nuwakot and Rasuwa Districts (2nd trek), and Myagdi, Dolpo, Mustang, Parbat, and Kaski Districts (3rd trek). Dhaulagiri was encircled from May 6 to July 16 for the 2nd time. Concerning time available, this was, at least in regard to vertebrates, the most successful stay in Nepal. Short tours were undertaken within the Kathmandu Valley between the long treks, but are not mentioned here separately.

1st Trek: 27.III.-16.IV.1973.

By chartered plane from Kathmandu to Jiri, ascent to the forest ranger hut at Chordung Mt. (2900 m, 27.III.-3.IV.); via Shivalaya to Thodung (3200 m, 3.-9.IV.); back to Jiri (1800 m, 9.IV.): ascent to pass N of Jiri, Cherakapti, Shershepu (1800 m, 10.IV.); Bikuti on Bothe Kosi, Darapani in Dama Khola Valley (1600 m, 11.IV.), ascent to Ting Sang La up to Tsuitang (2320 m, 12.IV.); Ting Sang La, camp near the pass (3200 m, 13.-16.IV.); descent to Barabise, by bus to Kathmandu (16.IV.).

2nd Trek: 20.-29.IV.1973

By bus to Trisuli Bazar (570 m, 20.IV.); upstream Trisuli river, Ramche (1800 m, 21.IV.); Dhunche (2000 m, 22.IV.); ascent to dairy Syng Gyang (3200 m, 23.-27.IV.); back to Grang (27.IV.); Trisuli (28. IV.); back by bus to Kathmandu (29.IV.).

3rd Trek: 6.V.-16.VII.1973

Flight from Kathmandu to Pokhara (6.V.); charter flight from Kathmandu via Pokhara to Dhorpatan (3000 m, 7.-25.V.); Thankur (3350 m, 25.-28.V.): bridge across Gustung Khola (2700 m), Pelma and Emaka (2270 m, 28.V.); pasture Baldebas (2650 m, 29.V.); Dhule (3100 m), Sheng Khola (3450 m, 30.V.); resthut Phurbang (4250 m) below Jungla Banjyang (31.V.); crossing Jungla Banjyang (4526 m), descent to Gompa village near Tarakot (3250 m, 1.-7.VI.); Tarakot, Dunahi (2350 m, 7.VI.); Suli Gad Valley, passing Rohagaon (appr. 3000 m), camp at 2770 m (8.VI.); Suli Gad valley (camp at 3150 m, 9.VI.): Ringmo on Phoksumdo Lake (3600 m, 10.-15.VI.); descent to Manduwa (3400 m, 15.VI.); crossing Bagar La (5080 m), down to 4450 m, camp at river side (16.VI.); crossing Namu La (5220 m), descent to Kangar in Tarap Valley (4200 m, 17.-18.VI.); ascent in side-valley to 4700 m (18.VI.); crossing Zö La (4900 m), down to 4650 m, crossing Büko La (4880 m), camp at 4660 m (19.VI.); crossing Mo La (4820 m) to Charka in upper Barbung Khola (4250 m, 20.-25.VI.); upriver Barbung Khola, then upriver left tributary Yalung Khola, camp at

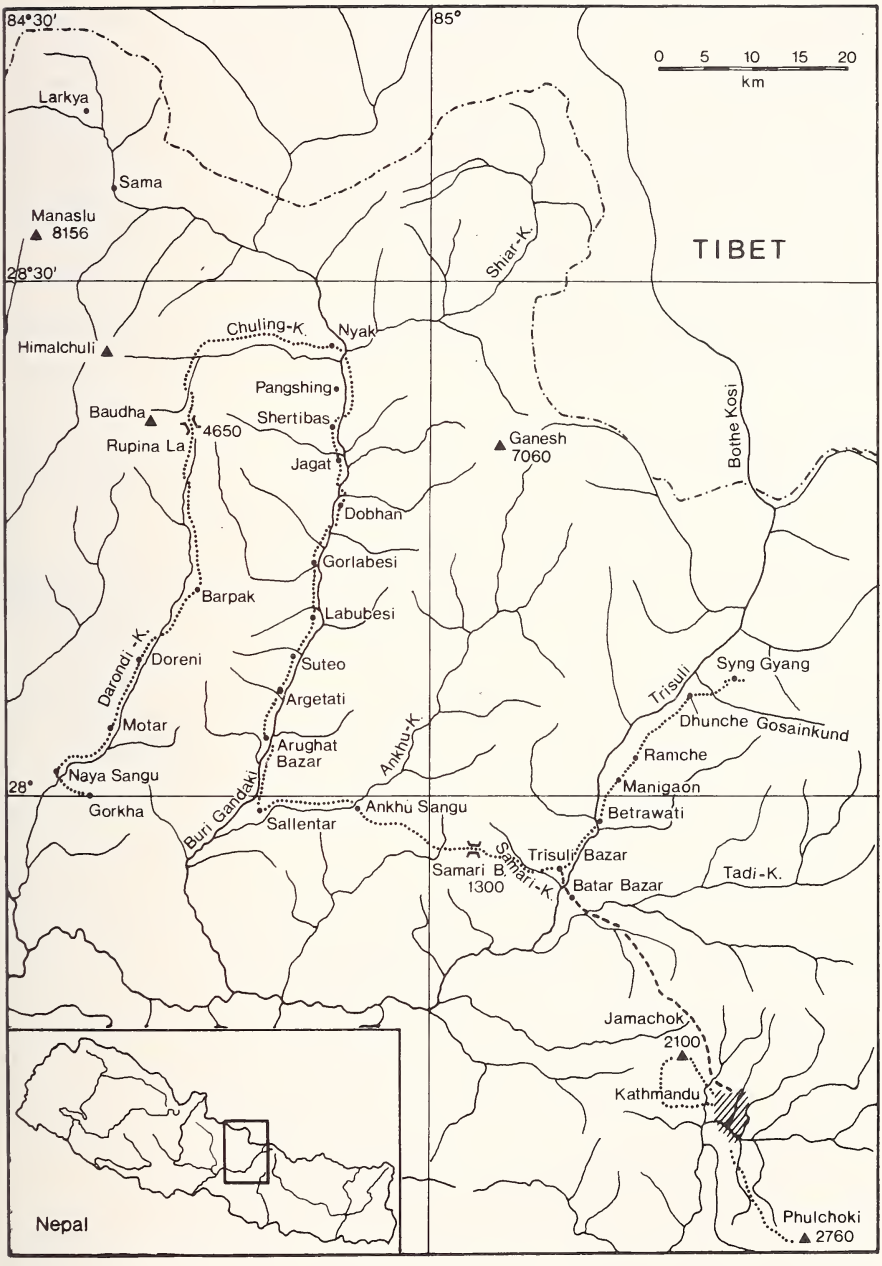

Fig.44: Expedition routes in the Langtang/Manaslu area in 1973 and 1983.

4500 m, (25.VI.); upstream to below Sangda La (Dudje La), camp at 4850 m (26.VI.); crossing Dudje La (5300 m, plateau only 5000 m), then Kewar La (4950 m), winter village Sangda (4000 m), crossing Cha Lungpa, camp at opposite side (3900 m, 27.VI.); passing above Sangda, crossing into Kali Gandaki Valley, camp at 3900 m (28.VI.); Dangarjong (3100 m), Jomosom (2750 m, 29.VI.); Tukche (2650 m, 30.VI.-1.VII.); Thaksang above Tukche (3150 m, 1.-5.VII.); Marpha (2700 m, 5.VII.); Purano Marpha (3200 m, 6.-7.VII.); back to Marpha (7.VII.); Lete (2500 m, 8.VII.); Dana (1650 m, 9.VII.); Sikha (2270 m, 10.VII.); Ulleri (2000 m, 11.-14.VII.); Chandrakot (1500 m), Baundur (1650 m, 14.VII.); Pokhara (15.VII.); by bus back to Kathmandu (16.VII.).

Nepal 1974 (Fig.43). – Participants: Jochen Martens, Wolfgang Beck. Duration: 13.II.-2.IV.1974. Sponsorship: privately.

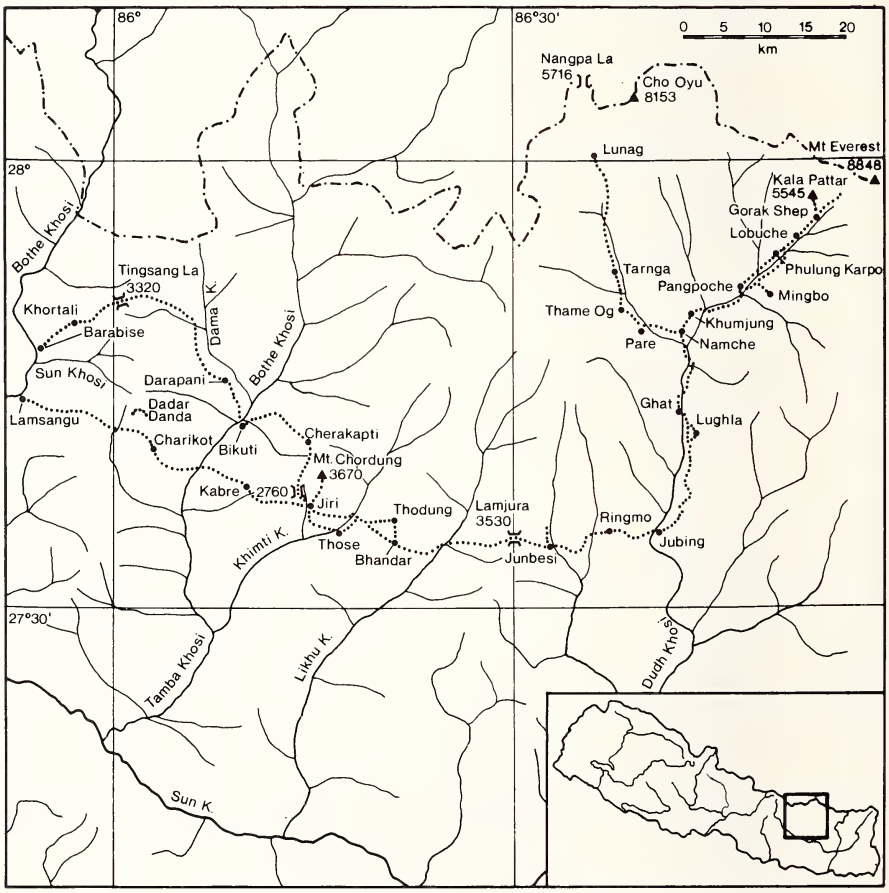

Fig.45: Expedition routes in the Mt. Everest region in 1970 and 1973.

Besides short collecting excursions within the Kathmandu Valley, mainly to the Balaju Park, only one extended trek was carried out: Kaski, Parbat and Mustang Districts, from Pokhara along the southern foothills of Annapurna to the Kali Gandaki Valley (see 1st trek in 1969).

By plane from Kathmandu to Pokhara (20.II.); Kharé, British Camp (1800 m, 21.II.); Ulleri (2000 m, 22.II.); Tatopani in Kali Gandaki Valley (1300 m, 23.II.); lower village Ghasa (2050 m, 24.II.); Titi (2700 m, 25.II.); Tukche (2650 m, 26.II.); forest clearing Thaksang (3150 m at the lower fringe, 27.II.-12.III., long stay mainly because I could not walk due to an injured right knee); Marpha (2700 m, 12.III.); Purano Marpha (3200 m, 13.20.III.); descent to Marpha (20.III.); Jomosom (2700 m, 21.-27.III, excursions to the E valley slopes, up to 3350 m on 23.III.); lower village Ghasa (27.III.); Ulleri (28.III.); Pokhara (29.III.; walk from Jomosom to Pokhara effected in 2 days and 6 hours); by bus from Pokhara to Kathmandu (30.III.).

Nepal 1980 (Fig.43, 46). – Participants: Jochen Martens, Albert Ausobsky, Bärbel Frühbeis. Duration: 16.III.-16.V. 1980. Sponsorship: Deutsche Forschungsgemeinschaft.

Besides short stays on Mt. Phulchoki at the SW fringe of Kathmandu Valley (19.III., 21.-22.III., 14.V.), two longer treks were undertaken: In the Ihapa and Ilam Districts in the very E of Nepal, and in the Tanhu, Lamjung, Manang, Mustang, Parbat, and Kaski Districts, which together nearly encircle the Annapurna massif.

1st Trek: 23.III.-3.IV.

By bus from Kathmandu to Birtamode (180 m, 23.Ill.); bus change to Ilam (1250 m, 24.III.); Mai Pokhari (2150 m, 25.-27.III.); upper Gitang Khola Valley (2400 m, 27.III.); upper Gitang Khola Valley, *Lithocarpus pachyphylla* forest (2600 m, 28.-31.III.); Mai Pokhari (31.III.); Ilam (1.IV.), Karkabita (180 m, 2.IV.); back to Kathmandu by bus (3.IV.).

2nd Trek: 7.IV.-12.V.

By bus to Dumre (400 m), upriver Marsyandi Valley to Turture (530 m, 7.IV.); Purkot, Syuribar (620 m, 8.IV.); Bhulbulé (820 m, 9.IV.); Senghe (1050 m, 10.IV.); Jagat (1250 m), Dharapani (1850 m, 11.IV.); Bagarchap and surroundings including the shepherd settlement Thimang (2100-2250 m, 12.-17.IV.); Thanjok (2500 m), Chame (2550 m), Pisang (3000 m, 17.IV.); Manang (3380-3450 m, 18.-19.IV.); ascent to Thorung Pass (4400 m, 19.IV.); crossing Thorung Pass (5300 m), descent to Muktinath (20.IV.); Kagbeni (2800 m), Purano Marpha (3200 m, 22.-25.IV.); Tukche (25.IV.); forest clearing Thaksang above Tukche (3150 m, 26.-29.IV.); back to Tukche (29.IV.); Lete (2400 m, 30.IV.-2.V., including two short walks to Titi, 2700 m, 1. and 2.V.); Dana (1650 m, 2.V.); Tatopani (1200 m), Sikha (2150 m, 3.V.); forest clearing near Chitre (2800-2900 m, 4.-7.V.); Ghandrung (2700 m, 7.V.); forest above Dhumpus (2100 m, 8.-10.V.); Mahendra Cave and Pokhara (11.V.); back to Kathmandu by bus (12.V.).

Nepal 1983 (Figs. 44, 46). – Participants: Jochen Martens, Beate Daams; Wolfgang Schawaller only during the 1st trek. Duration: 17.VII.-26.IX.1983. Sponsorship: partly Deutsche Forschungsgemeinschaft, partly private.

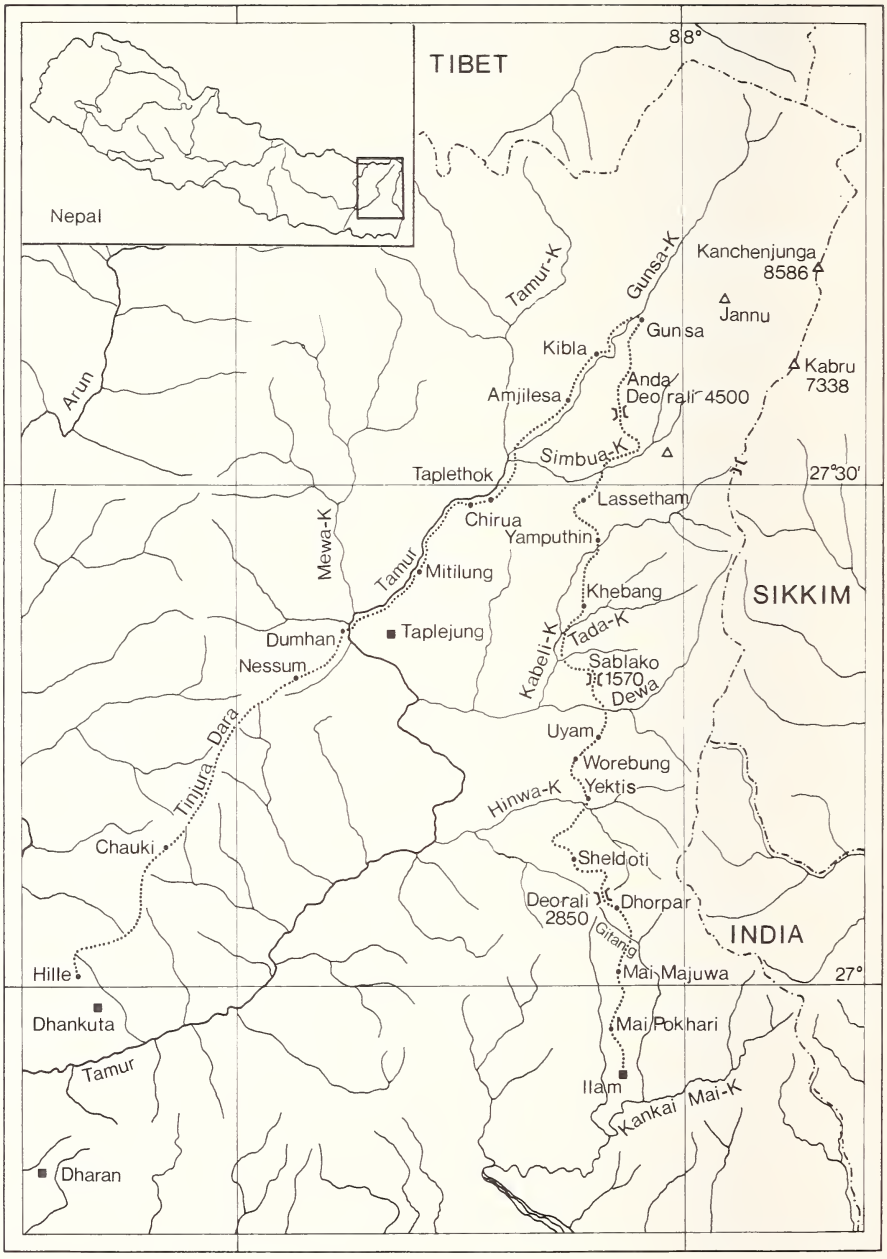

Fig.46: Expedition routes in the Kanchenjunga area in 1980 and 1983.

Besides a one-day excursion to Mt. Jamacok (Nagarjung ridge above Balaju, Kathmandu valley, 18.VIII.), two longer treks were carried out. The first trek took us to Nuwakot, Dhading and Gorkha Districts in the E and SE parts of Manaslu massif including Buri Gandaki and Darondi Khola rivers. The 2nd covered the Ilam, Panchthar, Taplejung, Therhathum and Dhankuta Districts in E Nepal to the S fringe of Kanchenjunga massif at Gunsa.

1st Trek: 21.VII.-15.VIII.1983

By bus From Kathmandu to Trisuli Bazar (560 m, 21.VII.); Samari Khola upriver to Kagune (800 m, 22.VII.); crossing Samari Banjyang (1300 m), Topal Khola, Thorpu (1300 m, 23.VII.); Kordunje (900 m), descent to Ankhu Khola Valley, downriver to Ankhu Sanghu (650 m, 24.-26.VII.); Sellentar (750 m), Arughat Bazar (600 m, 26.VII.); Suteo (700 m, 27.VII.); Labubesi (900 m, 28.VII.); Gorlabesi (1000 m, 29.VII.); Dobhan (1100 m), Jagat (1300 m, 30.VII.); right river bank up to opposite Pangshing (1750 m, 31.VII.); leaving bottom of Buri Gandaki, ascent to above Nyak (2450 m, 1.VIII.); lower Chuling (= Chulwang = Chyul-wang) Khola Valley, no permanent settlements there, names refer to pastures, 1st camp (2800 m, 2.VIII.); Djinshi Kharka, 3400 m (3./morning 5.VIII.); Djongshi Kharka, Meme Kharka (3400 m, 5./morning 6.VIII.); crossing W Manaslu glacier, camp at the swamp site Kalo Pokhari, no settlement (3500 m, 6.VIII.); crossing Baudha glacier at 3800 m (7.VIII.), Tabruk Kharka, 4000 m (7.-9.VIII.); crossing Rupina La (4450 m), Darondi Khola downriver to 3600 m (9.VIII.); forested slopes above Barpak, camp in shepherd huts (3000 m, 10.VIII.); down to Barpak, camp in the village (2200 m, 11.VIII.); to Doreni (900 m, 12.VIII.), Motar (750 m, 13.VIII.); crossing Darondi Khola at Naya Sanghu (700 m), ascent to Gorkha (1300 m, 14.VIII.), back to Kathmandu by bus (15.VIII.).

2nd Trek: 21.VIII.-20.IX.1983

By bus from Kathmandu to Birtamode (180 m, at night 21./22.VIII.); bus change to Ilam, camp in Ilam, (1250 m, 22.VIII.); Mai Pokhari (2150 m, 23.-26.VIII.); upper course of Mai Majuwa Khola (2200 m, 26.VIII.); head of Mai Majuwa Khola, Dhorpar Kharka (2700 m, 27.VIII.); crossing Deorali pass above Dhorpar (3000 m); Puspati, Sheldoti (2500 m, 28.VIII.); Paniporua (2200 m), descent to Hinwa Khola, camp on a chautara (about 1000 m, 29.VIII.); Yektin (1400 m) to Worebung (1950 m, 30.VIII.); down to Hiwa Khola (950 m) and to below Sablako Pass (1300 m, 31.VIII.); crossing Sablako Pass, Limbudin (1200 m), down to Kabeli Khola (900 m), upriver to 1200 m, camp on river terrace (1.IX.); steep ascent to Khebang, Tada Khola (1800 m), ascent to small pass above Khebang (2100 m, 2.IX.); crossing into Khabeli Khola Valley, down to Yamputhin (1650 m, 3.IX., stay to morning of 5.IX.); ascent to western slopes of Kabeli Khola above Yamputhin, crossing small pass, down to small river, camp in Omje Kharka in unoccupied shepherd hut (2300 m, 5.IX.); ascent to ridge Lasse Dhara up to unused pasture Lassetham (3500 m, 6.-8.IX.); descent to Simbua Khola Valley (3100 m), upriver Simbua Khola to below pasture Yalung within the forest zone, camp in unoccupied shepherd hut (3450 m, 8.IX.); ascent to western slopes of Simbua Khola Valley to Pass Anda Deorali (4500 m), gentle descent to Gunsa Valley, camp below rock (4250 m, 9.IX.); descent to Gunsa (3400 m, 10. to late morning of 11.IX.); downriver Gunsa Khola to Kibla (2700 m, 11.IX.); descent to Amjilesa (2400 m, 12.IX.); confluence of Gunsa Khola and Tamur, down to Thapletok, camp on riverbank (1300 m,

13.IX.); Mitilung, camp in public resthouse (950 m, 14.IX.); Dumhan (Dobhan, 750 m, 15.IX.); ascent to Tinjura Dara via Nessum (1200 m), camp in forest (2250 m, 16.IX.); on Tinjura Dara to Chauki (2550 m, 17.IX.); to Basantapur (2550 m) and near Hille, camp at the new still unused road (2300 m, 18.IX.); to Hille (2100 m); by bus to the Tamur bridge still under construction (300 m), bus change, to Dharan (300 m, 19.IX.); bus at night to Kathmandu, arrival late morning (20.IX.).

Nepal 1988 (Fig.47). – Paricipants: Jochen Martens, Gabi Geduldig, Wolfgang Schawaller. – Duration: 29.III.-28.VI.1983. Sponsorship: Deutsche Forschungsgemeinschaft, Universität Mainz.

The stay was confined to one extended field trip to the S and SW Kanchenjunga area in E Nepal. The Ilam, Panchthar, Taplejung and Sankhua Sabha Districts were covered.

Departure from Kathmandu by bus (2.IV.); arrival in Birtamod (130 m, 3.IV.), northward to Sunichare and the S piedmont of Siwalik Mts., camp site (270-300 m, 3.-5.IV.); from Siwalik camp site via Kutunabari (230 m); crossing Siwalik Mts. ridge (320 m) to Nodia Khola (240 m, 6.IV.);); via Soktim (500 m), crossing a pass at 800 m, descent to Mai Valley, campsite on banks of Mai Khola (470 m, 7.IV.); to Ilam (1200 m) and direction towards Mai Pokhari, camp site at 1600 m, (8.IV.); Mai Pokhari (2150 m, 9.-10.IV.); from Mai Pokhari to Gitang Khola Valley (1730 m, 11.-12.IV.); ascent to Dhorpar Kharka (2700 m, 13.-15.IV.); departure from Dhorpar Kharka to Paniporua (2300 m, 16.-19.IV.); departure from Paniporua to Hinwa Khola Valley (1350 m), ascent to Yektin, camp site (1500 m, 20.IV.); ascent to Worebung pass (2000 m) descent to Uyam (1300 m, 21.IV.); ascent to Sablako pass, descent to Kabeli Khola Valley (950 m, 22.IV.); upriver to confluence of Kabeli and Tada Khola (1000 m, 23.-24.IV.); from Tada Khola ascent to Khebang (1670 m) and pass above Khebang (2100 m), descent to Kabeli Khola Valley close to Yamputhin (2100 m, 25.IV.); descent to Kabeli Khola Valley below Yamputhin (1650 m, 26.-30.IV.); ascent to pasture Omje Kharka (2400 m, 1.-5.V.); ascent to pasture Lassetham (3350 m, 6.-8.V.); descent to Simbua Khola Valley (camp site at 3250 m and 3350 m, 9.-14.V.); Simbua Khola Valley downstream, ascent to pasture Lassetham, descent to Yamputhin on right banks of Kabeli Khola (15.V.); ascent to Deorali Pass (3420 m, 16.V.); descent to Hellok (17.V.); along Tamur river to Lungthung (1870 m, 18.V.); Tamur upriver to small side valley (2450 m, 19.V.); ascent to Walungchung Gola (3200 m, 20.V.); ascent to Ladza Khola Valley (4150 m, 21.-22.V.); ascent to Tangje La (5050 m), descent to Kangla Khola (4150 m, 23.-24.V.); descent to Thudam (3550 m, 25.-26.V.); ascent Gabri Khola (4250 m, 27.V.); ascent to Merapapa La (4690 m), crossing into Yamuthanga Valley (4300 m, 28.V.); ascent to Pomri La (4780 m), descent to upper Pahakhola Valley (3900 m, 29.V.); descent to Pahakhola village (2530 m, 30.V.); ascent to forests above Pahakhola (2750 m, 31.V.-3.VI.); descent to confluence of Pahakhola system (Ikua Khola) with Arun, Karmarang (1400 m, 4.VI.); downriver along Arun to Arun bridge below Hedagna (950 m, 5.-7.VI.); ascent to Num (1600 m), campsite between Mure and Hurure (2100 m, 8.-16.VI.); to Chichila (1970 m, 17.-19.VI.); descent to Darapangma (1400 m, 20.VI.); descent to Tumlingtar (550 m, 21.VI.); flight back to Kathmandu (22.VI.). – Excursion to Sheopuri Mt. (25.VI.).

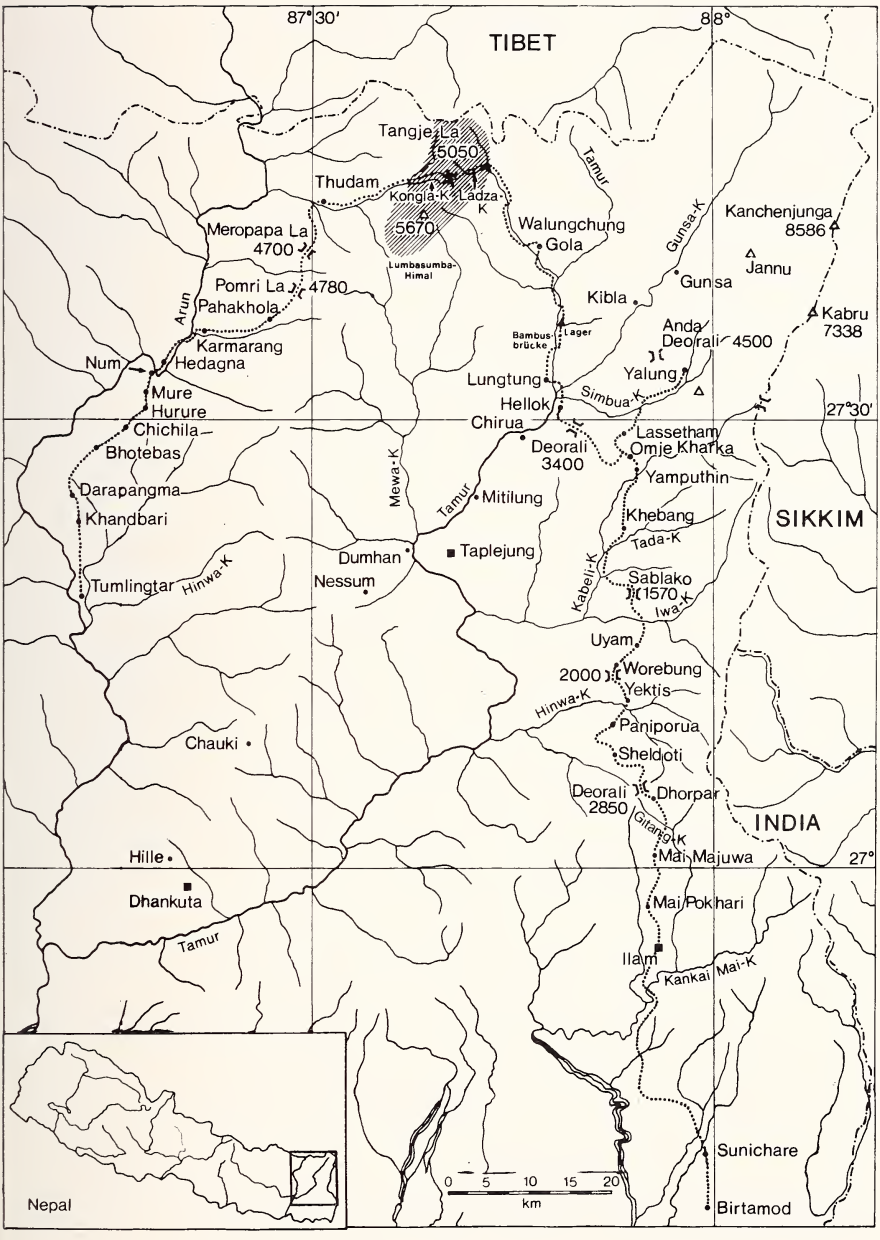

Fig.47: Expedition routes in the Kanchenjunga area in 1988.

Nepal 1995 (Fig. 43). – Participants: Jochen Martens, Christel Iglesias, Wolfgang Schawaller. – Duration: 16.IV.-4.VI.1995. Sponsorship: Deutsche Ornithologen-Gesellschaft; Universität Mainz.

One short field trip to the Kalinchok Mt. area (Dolakha Distr.) and one extended one to the Annapurna and Dhaulagiri massifs were carried out. The Kaski, Parbat, Mustang and Myagdi Districts were covered.

Departure from Kathmandu by bus via Lamosangu und Muldi to below Dadar Danda (19.IV.), ascent to Dadar Danda SW Mt. Kalinchok (3150-3200 m, 19.-23.IV.); return to Kathmandu by bus (23.IV.). – One-day excursion to Phulchoki Mt. (Lalitpur Distr. 26.IV.).

By bus to Pokhara (800 m, 26.IV.); Dhumpus (1700 m) to near Potana (2000 m; 27.-29.IV.); Tolka, Landrung (1600 m) to Ghandrung (2000 m, 29.IV.); Tadapani (2650 m), Banthanti (2650 m, 30.IV.); Deorali Pass (300 m), camp on a small forest clearing on the way to Chitre (2700 m, 1.-3.V.); Chitre (2300 m), Sikha (1900 m), Tatopani (1200 m, 3.5.); Rupshesara (1600 m), upper village Ghasa (2100 m, 4.V.); camp on right bank of Lete Khola opposite Lete (2400 m, 5.-8.V.); Tukche, Marpha (2650 m; 8.V.); Purano Marpha (= Jhong, 3200 m, 9.-12.V.); Purano Marpha, Alubari (3400 m) to Yak Kharka above Marpha on the way to Dapa Col (= Dampus Pass 4000 m, 12.V.); descent to Tukche (2560 m), downvalley to Lete (2460 m, 13.V.); Tatopani (1200 m, 14.V.); Beg Khola (1050 m, 15.V.); ascent to Bega (1650 m), camp below Bega Deorali (2450 m, 16.V.); Chimkhola (1700 m), Thulo Khola Valley, crossing river (1600 m), ascent to small village on right bank (1750 m, 17.V.); along Thulo Khola Valley northward, ascent to small side valley near Rakhor, ascent to pass (2700 m), descent to Kuinekani (2300 m, 18.V.); Marangpa (2000 m) to pass (2700 m), descent to below Khibang (1400 m, 19.V.); upper Myagdi Khola to Boghara (1800 m, 20.V.); forest pasture Dobang (2400 m, 21.V.); upstream Myagdi Khola, camp at 2950 m (21.-24.V.); descent to Dobang (2400 m, 24.-26.V.); Boghara (1800 m, 26.V.); downstream to relict forest patch at 1450 m (27.-29.V.); descent to Myagdi Khola bridge (1300 m), Bim on lower Marang Khola (1150 m, 29.V.); Tatopani (900 m, 30.V); Beni (800 m), Baglung (950 m, 31.V.); by bus to Kathmandu (1.VI.).

SPECIES ACCOUNTS

Material and Methods

Each entry for a given species includes various subsections depending on the information available for that species, as follows.

Taxonomy: The species are presented in the same sequence as in Inskipp & Inskipp (1991); all data from skin specimens have been processed by the conventional metric methods. The chief concern has been to position specimens within the spectrum of geographic variation. It was usually possible to determine the subspecies to which the specimens belong, but not in some cases *(Dendrocopos darjellensis, Sylviparus modestus, Passer domesticus, P. montanus).* Then the geographic variation appeared to be either unclear, distinctly mosaic in nature, or subtly structured in some other way. The text for each species is headed by the species name either with the name of the author (in which case it is a monotypic species) or without it (because it is a polytypic species, for which author names belong after the subspecies names; Eck 1987a). If only one subspecies of an otherwise polytypic species lives in Nepal, the subspecies designation is included in the first line. Where no specimens of a species are available, the subspecies and author have not been given. A bird species is either an isospecies (Amadon & Short 1992; an "isolated species" according to Meunier 1964, which does not belong to a superspecies) or an allospecies, which forms a superspecies with other (more or less sharply) geographically vicariant allospecies. Species belonging to the latter category are so identified by inserting the superspecies name on the second line. Isospecies and superspecies together are termed geospecies (= zoogeographical species, Mayr & Short 1970) (S.E.).

Introduction: Brief remarks characterize genera with more than one breeding species in Nepal. General patterns of horizontal and vertical distribution are pointed out here, as well as possible ecological interdependences and vicariances (J.M.).

Taxonomic notes: These refer to new findings related to taxonomic problems of Nepal birds and often extensively discuss populations of other parts of Asia and, where necessary, the relations to closely related species (S.E.).

Material: This paragraph lists all specimens of the 218 species collected on J.M.'s expeditions to Nepal. Localities, altitude, collection date and sex are fully detailed here. The collection is housed in the Zoologisches Forschungsinstitut und Museum A. Koenig in Bonn, Germany (S.E.).

Single bold-face letters refer to larger political subdivisons of the country, the zones. Most of the zones, narrow parts of the country, stretch from the N to the S border:

D Dhaulagiri	**J** Janakpur
G Gandaki	**S** Sagarmatha
N Narayani	**K** Kosi
B Bagmati	**M** Mechi

Measurements (and age): These have been taken from the collected specimens (wing length, tarsus length, bill length, tail length, wing/tip index, tail/wing index as a minimum). In many cases additional Nepal material (mostly from the Diesselhorst collection) has been

included, but material of related subspecies/species from Palaearctic Asia in various museum collections has also been used in order to point out tendencies of variation, mainly in the proportions of remiges and rectrices (S.E.).

We have used the following age-class terms: pull. (pullus); in most cases this term refers to pull. II, i.e. 1st generation of body-feathers and of remiges and rectrices. A synonymous term is the German "Nestkleid" (feathers gained during the nest and fledgling period). – Juv. (juvenis) = 2nd body-feather generation but with remaining 1st generation of remiges/rectrices (in a few Passeres, such as larks, starlings, and sparrows, the juv. stage is reached by a complete moult, i.e. in 2nd body-feather and 2nd remiges/rectrices generation); – ♂ or ♀ without addition refer to adult ♂ or ♀; o sex unknown. We did not succeed, however, in classifying every skin according to these age classes. In using the above terms, especially those for non-adults, we follow the recommendations of Kleinschmidt, Stresemann and Bährmann (cf. Eck 1984:1).

Wing-L (wing length) is taken by the maximum chord method.
Tail-L (tail length) is taken from the point of emergence of the central tail feather pair (T1) to their tip in the normally formed tail.
Graduation refers to the distance between shortest and longest tail feather of fork-shaped or wedge-shaped tails.
Tarsus-L (tarsus length) is measured from the depression at the rear of the upper joint diagonally to the distal end of the last complete scale of the front scale cover.
Bill-L (bill length) is measured with compasses from the beginning of the rhamphotheca, which is often hidden in the forehead feathers, to its tip. Bill **height** and bill **width** are the maximal bill dimensions insofar as no other distances are given.
P (primary, primaries) are numbered outwards from the carpal joint; consequently, P1 adjoins S1.
S (secondary, secondaries) are numbered inwards from the carpal joint.
T (tail feather/s) are numbered outwards from the centre (T1).
WTI (wing/tip index) is the length of the wing tip (= distance between tip of S1 and tip of the longest P) in percent of the wing length.
TWI (tail/wing index) is tail length in percent of the wing length. Additional measurements and indices have been used in a few cases; they are explained in the relevant passage (S.E.).

Horizontal: This paragraph lists all (or most) of the important recordings of the relevant species (localities, dates, but years in most cases are omitted; but see itinerary section for those details). District names are given once for all localities of a given district and are preceded by a colon (e.g. ":Mustang"). A short discussion of the records is added (J.M.).

Vertical: The altitudinal belt is analyzed here. Comparison of the situation in the various massifs of the main chain is stressed wherever data are available. Differences between N and S of the main chain, if both regions are inhabited, are also discussed (J.M.).

Habitat: Ecological requirements are described from my personal observations and experiences throughout the year, including 5 breeding seasons. Except for the far W all the main parts of Nepal have been visited, so that local variations could be worked out. Plant and forest communities, being sensitive indicators of local altitudinal and climatic conditions,

were incorporated into this section wherever possible. The discrepancies between N and S flanks of the main chain are discussed throughout (J.M.).

Breeding: The cycle of breeding acitivity is analyzed insofar as the mostly scanty evidence allowed: gonadal state, nest finds, fledglings and other data were combined to elucidate at least the main part of the breeding season in order to present, so far as possible, more precise data (J.M.).

Migration: We have no data of our own for most species and only scanty information was available (J.M.).

Vocalizations: Descriptions were nearly exclusively based on tape recordings originating from Nepal. Data on individual and inter-individual variation are presented and substantiated by sonagrams (produced on a Kay Sona-Graph DSP 5500; only original prints were reproduced). Whenever appropriate, mainly to show regiolect variation of closely related populations outside Nepal, additional tape recordings were used and illustrated by sonagrams. All sound recordings are by J.M. unless otherwise stated in the legends. Tape recorders: 1969-1983: various models of the UHER series, 1988, 1995: Nagra SN; microphones: 1969-1980 Sennheiser MD 211 N in parabolic screen 80 cm in diameter, 1988 directional microphone Sennheiser ME 88 combined with module K3N, 1995 Telinga Pro in parabolic screen 60 cm in diameter (J.M.).

ARDEIDAE

Ardeola grayii grayii (Sykes)

Ardeola [speciosa] grayii

Material: 1 specimen: **B** Lalitpur Distr., Kathmandu Valley, Godavari, 1600 m, 26.I.1970: ♀ juv.

Measurements: **Wing**-L 192 mm. – **Tail**-L 70 mm. – **Bill**-L 57, -**Height** 12,2 mm. – **Tarsus**-L 51,5 mm – **WTI** 29,2% – **TWI** 36,5%.

Horizontal, vertical: The Pond Heron is common up to about 1500 m and breeds even in the Kathmandu Valley. Detailed data are not given here except: confluence of Suli Gad and Thulo Bheri, near Dunahi, 2300 m, 1 sp. (19.V. :Dolpo). This is an exceptionally high altitude record (see Inskipp & Inskipp 1991).

CICONIIDAE

Ciconia nigra

Horizontal, vertical: Dhorpatan, 2950 m, 1 sp. and 4 sp. (26.IV.1970, 7.V.1973 :Myagdi); – Naudara ridge NW Pokhara, 1150 m, 1 sp. (17.III.1970 :Kaski). – The Black Stork is a winter visitor and passage migrant in Nepal and has already been observed in the Dhorpatan Valley. This locality provided the highest and latest spring data (IV, V) within Nepal (Inskipp & Inskipp 1991), and one may wonder why the area is so attractive for late birds.

Ciconia episcopus

Horizontal, vertical: Tilhar near Pokhara, 1000 m, breeding record (18.III. :Kaski); – Kali Gandaki Valley, N Kusma, 750 m, 2 sp. (20.III. :Parbat); – Marsyandi Valley, between Turture and Syuribar, 600 m, 3 sp. (9.IV. :Lamjung); – Darondi Khola valley between Doreni and Motar, W of Gorkha, 1 sp., 800 m (13.VIII. :Gorkha).

Habitat, breeding: All observations are from tree-rich agricultural land, including some paddy-fields. The nest near Tilhar was on a flowering but still leafless tree on a river bank appr. 15 m high, hilly, partly steep slopes with narrow paddy-fields, scattered bushy vegetation and houses nearby; adult breeding. This record is close to the upper regular distributional limit of the Woolly-necked Stork in Nepal and the highest breeding record in Nepal (Inskipp & Inskipp 1991).

Ephippiorhynchus asiaticus

Horizontal, vertical: Rapti Valley S Tekouli, 270 m, 1 sp. (10.II. :Chitawan); – near Birtamode, 1 sp. (23.III. :Ilam). – In Nepal scarce as passage migrant and resident.

Leptoptilus javanicus

Horizontal, vertical: In 1980 (23.III.) and 1988 (3.IV.) individuals or flocks of up to 6 birds were seen in the terai W of Birtamod, appr. 180 m (:Ilam) along the roadside during the bus drive. – The Lesser Adjutant Stork is said to be most common in the eastern terai (Inskipp & Inskipp 1991).

THRESKIORNITHIDAE

Pseudibis papillosa

P. [papillosa] incl. *davisoni*

Horizontal, vertical: Rapti Valley S Tekouli, 270 m, 5 sp. (11.II. :Chitawan). – The Red-naped Ibis is widely distributed in the terai and duns and was confirmed as a breeding bird in Chitawan (Inskipp & Inskipp 1991).

ANATIDAE

Tadorna ferruginea

T. [ferruginea] incl. *cana*

Horizontal, vertical: below Jomosom, 1 sp. 26.III., flying northward, returning later flying downstream, 2700 m (:Mustang). – The Ruddy Shelduck is a local breeding bird in upland Nepal, an extension of the Tibetan parts of the area.

Anas penelope

Horizontal, vertical: Titi Lake, 2700 m, 1 ♂ (25./26.II. :Mustang).

Anas crecca

Horizontal, vertical: Titi Lake, 2700 m, 1 ♂ (25./26.II. :Mustang).

Anas platyrhynchos

A. [platyrhynchos] incl. *poecilorhyncha, luzonica,* etc.

Horizontal: Kali Gandaki Valley, Lake Titi, 2♂ 8♀ (1./2.XII.1969); 2♀ with 5 ducklings each (3.VII.1970); 2♂ 7♀ (25./26.II.1974); 12♂, 4♀, one of them with ducklings (1.V.1980), 12♂ 7♀, one of them with 7 ducklings (2.V.1980 :Mustang).

Vertical: Lake Titi is at 2700 m altitude, 2620 m according to Inskipp & Inskipp (1991).

Habitat, breeding: The breeding locality (Martens 1972) is a small lake approximately 200 m above the Kali Gandaki valley floor, close to Titi village. It is encircled by a broad belt of Cyperaceae and there is no access to the open water on foot (Fig.32). This locality coincides more or less with the main Himalayan axis and is situated close to full main monsoon influence, but the vegetation *(Pinus wallichiana* forest) indicates that precipitation is already slightly reduced here. The lake does not freeze, and Mallards seem to be present all year round. Beside 1970 and 1980 (see Horizontal), breeding was confirmed in 1977 (J.O.M. Roberts 1978). On May 1, there were newly hatched ducklings, on July 3 not yet full-grown pulli, perhaps already able to fly. This is the only known breeding place of the Mallard in Nepal, perhaps one of the very few in the Himalayan region altogether (see Ali & Ripley 1968:163, T.J. Roberts 1991) and very likely the most southern within the Palaearctic.

Mergus merganser

Horizontal, vertical: Kali Gandaki Valley SE Beni, 750 m, 1 ♂ (20.III. :Parbat); – Bothe Khosi, bridge between Charikot and Khabre, 850 m, 4 sp. (10.I. :Ramechap). – A regular winter visitor in Nepal.

ACCIPITRIDAE

Milvus migrans

Horizontal: My records extend from NW Dhaulagiri to the Darjeeling border. – Tarakot (10./15.V.); Gompa near Tarakot (12.V. both :Dolpo); – Dhorpatan (10.IV./23.IV./4.V.); Muri (23./26.III.); Muri-Nerwang (21.III. all :Myagdi); – Thini above Jomosom (23./26.III.); Tingri (19.VII.); Chinga below Muktinath (21.IV.), Marpha (12./13./19./21.III., 25.IV., 5.VII.); Purano Marpha (14./19.III.), Tukche (8.VII.), below Nabrikot (8.VII.), S Lete (30.IV. all :Mustang); – near Landrung (8.V.); between Dhumpus and Suiketh (10.V.); Pokhara (20.II.), between Tilhar and Kusma (19.III. all :Kaski); – Marsyandi Valley, Phalesangu (9.IV. :Lamjung); Manang (18.IV. :Manang); – Kathmandu Valley; Balaju, Chauni (17./18.III. :Kathmandu); – Namche Bazar (16.IX.); Thame (5.X., 2 sp.); Tarnga (11.X. all :Khumbu); – Tumlingtar (22.VI. :Sankhua Sabha); – Mai Pokhari (26.III. :Ilam).

Vertical: Records during the presumed breeding season (IV-VI): from 500 m (Tumlingtar) and 630 m (Phalesangu) to 3300 m (Gompa/Tarakot) and 3500 m (Manang). All data range as follows: 500-1000 m: 3 localities; 1000-2000 m: 4 loc.; 2000-3000 m: 7 loc.; 3000-3500 m: 3 loc. – Two subspecies exclude each other altitudinally. According to Inskipp & Inskipp (1991), *govinda* summers up to 2300 m, *lineatus* (occasionally) up to 4900 m and even 5330 m (Ali & Ripley 1968,1:229). As concerns breeding records, only the Kathmandu Valley is a proved locality, and details regarding the interrelations of the two subspecies are largely lacking. It would be worthwhile looking for a possible contact zone.

Habitat: All kinds of open landscape, most often agricultural land at relatively low altitude *(M. m. govinda),* often close to cities and villages. At medium and higher altitudes, the species *(M. m. lineatus* ?) is not common and is only locally more often seen, especially in upper Thakkhola (between Tukche and Muktinath). Evidently, in continuation of the Tibetan population, the species also inhabits the rain shadow areas N of the main chain (:Mustang), but I did not find it in Dolpo except the southern parts (Tarakot).

Migration: See Diesselhorst (1968:129) and Martens (1971) for trans-Himalayan migration in Khumbu.

Neophron percnopterus

Horizontal: Our records extend from lower Dolpo to the Marsyandi Valley. – Tarakot (10.V.); Rohagoan (19.V. both :Dolpo); – Dhorpatan (25.IV., 1.V.); Muri (21./22.III. both :Myagdi); – Kusma (20.III.); near Beni (21.III.); between Dhumpus and Suiketh (10.V.); Hyangya NW Pokhara (10.V. all :Kaski); – between Kalopani and Lete (30.IV. :Mustang); – between Ghara and Sikha (3.V.); below Ghandrung (8.V. both :Parbat); – between Dumre and Turture (7.IV. :Tanhu).

Vertical: These records range between 400 m (Dumre/Turture) and 3100 m (Rohagaon); above 1000 m as follows: 1550 m Dhumpus/Suiketh; 1750 m below Ghandrung; 2050 m Ghara/Sikha; 2100 m Muri; 2400 m Kalopani/Lete; 2900 m Tarakot; 3000 m Dhorpatan; 3100 m Rohagaon. – The upper limit of the breeding distribution in Nepal is not known, for breeding records are largely lacking.

Habitat: Open agricultural land, often near human habitations. All records refer to single specimens except those near Kalopani/Lete (2 sp.) and Hyangja (6 sp.).

Gypaetus barbatus

Horizontal: Observations from Thakkhola to the Arun Valley. – Between Kalopani/Lete (30.IV.); near Titi Lake, 2 sp. (2.V.); Thaksang/Tukche (27.II.; 12.III.); Purano Marpha (14.-16.III.; 7.VII.); Jomosom, 2 sp. (21.III.); Thini (22.III. all :Mustang); – Lumlé (22.II.); above Suiketh (10.V. both :Kaski); – Marsyandi Valley: near Bahundaunda (10.IV.); between Senghe and Tal, breeding record (11.IV. both :Lamjung); Thimang (15./16.IV. :Manang); – Trisuli Valley, near Manigaon (21.IV. :Nuwakot); – Dhunche (22.IV. :Rasuwa); – Pahakhola (31.V. :Sankhua Sabha).

Vertical: It is currently known that the Lammergeier, being a powerful glider, roams about most altitudes of Nepal, but is rarely to be seen below 1000 m. My lowest observations are

from 1150 m (Bahundaunda, 10.IV.), 1200 m (Manigaon, 21.IV.), 1250 m (Senghe/Tal, 11.IV.).

Habitat: Besides the high altitude habitat above timberline, the Lammergeier is a regular guest in the forest zone and does not at all avoid cultivated land and close proximity to human habitations in Nepal. Most records below 2500 m refer to the midlands, which at most parts of the country are largely converted into agricultural land and densely settled, especially in C and E Nepal. In the area NW of Pokhara, mainly the Naudara ridge, the species can be seen nearly all year round. Though the species seems to be widely distributed, there are no estimates of its actual numbers, and breeding records remain few.

Breeding: A nesting site was discovered in the Marsyandi Valley between Senghe and Tal at 1250 m, 11.IV.1980. It was situated about 30 m above the valley floor in a cliff-face in a narrow gorge of the main valley. A nearly fully grown pullus was in the nest with both adults being present at the discovery. This record was then the third breeding record for Nepal and at an extroardinarly low altitude, among the lowest ever recorded in the Himalayas. Ali & Ripley (1968,1:316) give 1200-4200 m as breeding belt for the whole mountain chain, without detailed information. The two other records from Nepal are not specified as to altitude (Inskipp & Inskipp 1991).

Gyps

Four species are on the Nepal list: *bengalensis, indicus, himalayensis, fulvus;* the first three breed. *Indicus* and *bengalensis* are the two typical lowland species, *indicus* being even more restricted than *bengalensis.* But both coexist over vast areas of the Nepal lowlands. *Himalayensis* is the mountain representative of the genus, with tendencies to breed in dry habitats. The status of *fulvus* requires careful examination.

Gyps bengalensis

Gyps [bengalensis] incl. *africanus*

Horizontal, vertical: path from Landrung to Dhumpus, 1830 m and 1800 m, 1 sp. each (10.V. :Kaski). – Both observations at the upper limit of the regular altitudinal area of the species.

Gyps himalayensis

Gyps [fulvus] himalayensis

Horizontal: Ringmo/Phoksumdo Lake, 1 sp. (25.VI. :Dolpo); – Dana, several (24.II.); Thaksang above Tukche, singles to several (28.II.-9.III., 27.IV.); Marpha, 15 sp. (13.III.); Purano Marpha, 5 sp. (14.III.); Dapa Col above Tukche, 5 sp. (18.VII.); Jomosom, 2 sp. (25.III. all :Mustang); – near Landrung, 2 sp. (7.V.); above Dhumpus, 1 sp. (9.V. both :Kaski); – Marsyandi Valley, Thimang above Bagarchap, singles (15./16.IV. :Manang); – Buri Gandaki Valley, Nyak, about 20 sp. (1.VIII. :Ghorka); – Trisuli Valley, near Dhunche, 1 sp. (22.IV. :Rasuwa); – Omje Kharka NW Yamputhin, 1 sp. (2.V. :Taplejung); – Mai Pokhari, 2 sp. (26.III. :Ilam).

Vertical: The above observations refer to localities between 1650 m (Dana, 24.II.) and 3800 m (near Dapa Col, 18.VII.). However, the Himalayan Griffon Vulture being a powerful glider, they hardly give any hint to actual breeding localities. Even during the breeding season, immatures may straggle around in search of carcasses. For two nesting records (Thakkhola, Marsyandi Valley) altitude is not given (Inskipp & Inskipp 1991). Among the Himalayan *Gyps* species, *himalayensis* certainly occupies the highest altitudinal belt all over the year.

Habitat: In general, mountainous open country. Presently the species seems to depend mainly on carcasses of livestock, large mammals being rare in mountainous Nepal. Domestic animals are to be found commonly all over Nepal, but *himalayensis* is not commonly distributed. It should be taken into account that the species seems to be most abundant where two practices coincide: animal grazing at high altitude and Indian-Tibetan trade with pack animals. The latter even cross the Himalayan main axis extending into dry inner-Himalayan areas, especially Thakkhola and into Tibet. Both economic sectors produce a lot of food in the form of dead animals and the species is common there. In addition, it should be taken into consideration that the Himalayan Griffon, though observed all over the country, may be mainly a species of the drier parts of the Himalayas, at least as concerns the breeding places. Both Nepal nest records are situated in the Inner Valleys, and it is a common species in Tibet (Schäfer 1938).

Gyps fulvus

Horizontal, vertical: Lower Myagdi Khola, above Dharbang, 1060 m, 5 sp. feeding on mule carcass (30.V.); Potana, 2000 m, 1 sailing (28.IV. both :Myagdi). – The distribution of the Eurasian Griffon Vulture is not well understood in Nepal and misidentifications of juvenal stages may frequently occur.

Sarcogyps calvus

Horizontal: My records from W Dhaulagiri to the Trisuli Valley. – Pelma (6.V.); Bobang S Dhorpatan (30.IV., 2 specimens); Muri/Myagdi Khola (3.IV.); near Dharbang, 2 sp. feeding on mule carcass (30.V.; all :Myagdi); – Kusma (19.III.); above Landrung (8.V., 2 sp.); between Dhumpus and Suiketh Valley (10.V. all :Kaski); – Gara (23.II., 2 sp. :Parbat); – near Phalesangu, at carcass (9.IV. :Lamjung); – Manigaon (21.IV. :Nuwakot).

Vertical: Records during the presumed breeding season (IV, V): 700 m Phalesangu, 1060 m Dharbang, 1200 m Manigaon, 1750 m Dhumpus/Suiketh, 1860 m Landrung, 2100 m Muri, 2500 m Bobang, 2600 m Pelma. According to Inskipp & Inskipp (1991) records above 2000 m are sparse in Nepal. Breeding records are completely lacking within Nepal, so that the actual breeding belt in Nepal is unknown and the season undetermined. – Outside the breeding season: 1000 m Kusma, 1700 m Ghara (2 specimens).

Habitat: The Red-headed Vulture is to be met in open country, very often agricultural land, mostly sailing in search of carcasses, singly or in twos (see Horizontal). Apart from the preference for low and medium altitudes, no habitat specialisation is discernible at present.

Aegypius monachus

Horizontal, vertical: Marpha, 2750 m, 1 specimen circling together with about 15 *Gyps himalayensis* near the village (13.III. :Mustang).

Spilornis cheela

Horizontal: Records from SW Dhaulagiri to S Kanchenjunga. – Muri (23.III., 2 sp. displaying; :Myagdi); – between Tatopani and Ghara (3.V., 2 sp.); Chitre (4.V. both :Parbat); – Birethanti (29.VI.); near Landrung (9./10.V.); above Suiketh (10.V., 3 sp.); near Pokhara (11.V. all :Kaski);– Chichila (18.-20.VI., 1 pullus; :Sankhua Sabha); – Worebung pass (24.IV.); above Uyam (24.IV. both :Panchthar); – ascent to Khebang (25.IV. :Taplejung).

Vertical: Records during the presumed breeding season or close to it (III-VI) extend from 1000 m (Birethanti) to 2450 m (Chitre) and cover quite well the altitudinal range already known. The Chitre record extends the known continuous belt. The apparent breeding record near Chichila was at 2100 m.

Habitat: The Crested Serpent Eagle is commonly seen sailing over cultivated land and seems to be well adapted to open landscape. But it may well be able to cover great distances, and the breeding places are said to to be confined to forested area. The Chichila pullus was in a patch of forest.

Circus aeruginosus

Circus [aeruginosus], incl. *spilonotus* etc.

Horizontal, vertical: Upper Kali Gandaki Valley, Thakkhola, Titi Lake, 2700 m (2.V., 1 ♂; :Mustang).

Circus melanoleucus

Horizontal, vertical: Eastern Terai, Karkavita, 200 m (2.IV., 1 sp.; :Ilam).

Accipiter

The Nepal list comprises five species *(gentilis, virgatus, nisus, trivirgatus, badius);* all are likely to breed *(gentilis, trivirgatus)* or do breed. Altitudinally, *badius* and *trivirgatus* are low-altitude species, *virgatus* lives at medium altitude, *nisus* and *gentilis* at high altitudes, *nisus* at least up to timberline. Generally, little is known about the distribution and ecology of all Himalayan *Accipiter* species.

Accipiter gentilis

Accipiter [gentilis] incl. *melanoleucus* etc.

Horizontal, vertical: Purano Marpha, 3200 m (24.IV., ♂ and ♀; :Mustang): – upper Simbua Khola, 3350 m (14.V. :Taplejung).

Habitat: The Marpha specimens were in thick *Abies* forest with *Pinus* and *Cupressus* close by, the Simbua Khola specimen circled above the heavy *Abies/Rhododendron* forest of the lower valley slopes. In Nepal, the Goshawk seems to be confined to heavy forests in the upper forest zone. Only few detailed observations have been published and breeding records are entirely lacking.

Accipiter nisus

Accipiter [nisus], incl. *striatus* etc.

Horizontal: My records from NW Dhaulagiri to Mt. Everest. – Ringmo/Phoksumdo Lake (5.VI.1970, 13.VI.1973 1 sp. each; :Dolpo); – between restplace Dhule and Cheng Khola Valley (8.V. :Myagdi): – above Ghasa (25.II.); Thaksang above Tukche (9./10.III.); Marpha (12./21.III. all :Mustang); – Tengpoche (19.IX.); between Phunki and Khumjung (3.X.); Thame Teng (6.X.); Tarnga (8.-11.X. daily observations, up to 4 specimens); Arye (11.X. 2-3 sp. all :Solukhumbu).

Vertical: During the presumed breeding season (V-VI): 3760 m (Dhule/Cheng Khola), 3900 m, 4000 m (Ringmo/Phoksumdo Lake). Inskipp & Inskipp (1991) give the breeding belt for the local ssp. *melaschistos* as 2440 m to 3965 m, but they overlooked the only actual breeding record in the Khumbu area by Diesselhorst (1968:131) at 4200 m. – Outside the breeding season: the records range between 2100 m (Ghasa) and 4300 m (Arye). They may refer to North Palaearctic winter guests (ssp. *nisosimilis)* as well as local breeding birds (ssp. *melaschistos).*

Habitat: The local breeding population is largely bound to forests, but specimens are often seen in open places, edges, clearings etc. The Sparrowhawk penetrates to the timber line as a breeder and even hunts beyond in open country over rocks and low bush. The dry northern slopes of the main chain are regularly inhabited wherever forest vegetation is still present (Phoksumdo Lake).

Buteo buteo

Horizontal, vertical: Thaksang above Tukche, 3200 m, 1 sp. circling above the forest clearing (2.III. :Mustang). – Tail of one colour, but with very narrow dark terminal band.

Aquila chrysaetos

Aquila [chrysaetos] incl. *audax, verreauxi*

Horizontal, vertical: Purano Marpha, 3200m, 1 specimen circling at close range near the houses, 16.III. (:Mustang).

Hieraaetus pennatus

Hieraaetus [pennatus], incl. *kienerii* etc.

Horizontal, vertical, breeding: Purano Marpha, 3200 m (24./25.IV.1980 :Mustang). A nest with incubating adults was discovered in the fir forests *(Abies spectabilis)* close to Purano Marpha above Marpha, Thakkhola. This large and dense patch of forest was on a steep slope allowing observation of the nest at close range, appr. 25 m, and providing good views. On 25.IV. the nest was observed for several hours: The ♀ (?) was incubating all the time, but upon calls of the ♂ left the nest. The nest was on a large fir tree about 12 m above ground. The species was also present there in V 1995.

The Booted Eagle is said to be not an uncommon breeding bird in the W Himalayas (Bates & Lowther 1952, Ali & Ripley 1968,1:269, Roberts 1991), but breeding records are scanty. Apparently the species is confined to the western drier part of the mountain range. Very conspicuously, this and the only other Nepal breeding record (Braga, upper Marsyandi

Valley. Thiollay 1978) originate from the dry Inner Valleys, both from high altitudes (3850 m, 3200 m). Under these circumstances, the Kali Gandaki and Marsyandi Valleys may harbour the easternmost Himalayan breeding populations.

Microhierax caerulescens

Microhierax [caerulescens] incl. *fringillarius*

Horizontal, vertical: Only 1 observation between Turture and Syuribar, 600 m (8.IV. :Tanhu), in open tree-rich agricultural land.

FALCONIDAE

Falco

Eleven species are on the Nepal list: *tinnunculus, chicquera, subbuteo, severus* and *peregrinus* breed, while *naumanni, verspertinus, columbarius, jugger, cherrug* and *pelegrinoides* are well represented or only rare winter visitors. None of the breeding species, except *tinnunculus,* are common or even widely distributed. Even *tinnunculus* is much less common than, for example, in Central Europe. All other breeding species are to be classified as rare or even scarce *(chicquera, subbuteo, severus, peregrinus).* Consequently, there is no noticable interaction between any of the species during the breeding season.

Falco tinnunculus

Falco [tinnunculus] incl. *moluccensis, cenchroides*

Horizontal: Our records from NW Dhaulagiri to the Darjeeling border. – Near Mukut (16.VI.); above Tarakot (10.VI.); Gompa near Tarakot (11.V.); Suli Gad Valley near Rohagoan (19.V.), Ringmo/Phoksumdo Lake (10.VI. all :Dolpo); – Thankur (27.V.); Dharbang/Darapani (22.III.), Muri/Myagdi Khola (23.-31.III., daily observations), Dhara Khola to Lumsum (5.IV. all :Myagdi); – near Jomosom (25.III.); Tukche (10.VII., 2 sp.; 13.VII. both :Mustang); – N Kusma (20.III.); Suiketh Valley (10.V. both :Kaski); – Marsyandi Valley, above Jagat (11.IV. :Lamjung); – Khimti Khola, between Thodung and Jiri (9.IV. :Ramechap); – Tumlingtar (26.VI. :Sankhua Sabha); – Sunichare (6.IV.); Mai Pokhari (26.III. both :Ilam).

Vertical: During the presumed breeding season and close to it (IV-VI): Records extend from 240 m (Sunichare, 6.IV.), 500 m (Tumlingtar, 26.VI.) to 3500 m (Ringmo, 10.VI.) and 3600 m (Mukut, 11.VI.); details: 240-1000 m: 3 records, 1000-2000 m: 1 rec., 2000-3000 m: 4 rec., 3000-3600 m: 5 rec. – Observations in III: 750 m (Kusma), 1000 m (Dharbang/Darapani), 2100 m, 2300 m (Muri), 2150 m (Mai Pokhari), 2750 m (Jomosom).

The altitudinal distribution of the Kestrel is one of the most extended among the Nepal birds. Though breeding records are still largely lacking, its range seems to extend from the foothills (Tumlingtar) at least to the timberline and perhaps beyond. Diesselhorst (1968:136) observed specimens likely to breed up to 5000 m in Khumbu. Confirmed breeding: Kathmandu Valley 1350 m (Thiede & Thiede 1973). Bigu 2100 m (Diesselhorst 1968:136), upper Kali Gandaki Valley without altitudinal indication, probably about 2700 m (Inskipp & Inskipp 1991).

Habitat: In general, open landscape, often cultivated land, with scattered trees and bushes, but there is no close affinty to human habitations as in, e.g., Europe; sometimes in ravines where nests are believed to be situated in cliffs (Jagat). Due to the vast altitudinal belt, local conditions of habitat structure vary. At the upper limit, habitats less influenced by man prevail: pastures, moraines, rocky slopes. The dry northern slopes of the main range are inhabited, too. Tarakot, Phoksumdo Lake, Mukut (all :Dolpo), Jomosom (:Mustang).

Falco subbuteo

Falco [subbuteo], incl. *severeus, longipennis*

Horizontal: My observations refer to monsoon-reduced areas around Dhaulagiri. – Suli Gad Valley near Manduwa (21.V.), Kangar (18.VI.), Gompa near Tarakot, displaying pair (13./14.V.1970, 2.-4.VI.1973; all :Dolpo); – Titi Lake, 2 sp. (2.V. :Mustang).

Vertical: These records, all within the presumed breeding season, range between 2700 m (Titi Lake), 3200 m (Suli Gad Valley), 3300 m (Gompa/Tarakot) and 4200 m (Kangar), thus covering a vertical belt of 1500 m. The observations above 3000 m are considerably higher than stated by Inskipp & Inskipp (1991) for Nepal ("up to 3050 m"). The altitudes of the two breeding records cited there are not given. Status of the species in Nepal remains unclear.

Habitat and nesting: All above localities have in common reduced monsoon influence, but otherwise they differ greatly. The Titi specimen hunted for insects over the lake, which is situated within open *Pinus wallichiana* forest, the Manduwa specimen hunted over *Picea smithiana* stands, and the one at Kangar was passing the village in the treeless Tibetan landscape of the broad Tarap Valley. Observations happened to last only seconds or a few minutes and cannot be considered signs of local breeding. Only the *Picea smithiana* forests near Gompa/Tarakot hosted a pair in 1970 and 1973, and at virtually the same part of the forest edge the pair courtshiped on 13./14.V. and 2.-4.VI. in different years: flying pairwise along the forest edge and over the forest canopy, both partners sitting close together in a spruce tree, where the ♂ uttered long series of "kee-kee-kee..." calls, also when flying.

Falco peregrinus

Falco [peregrinus], incl. *pelegrinoides*

Horizontal, vertical, habitat: Two observations: (i) 1 specimen flying over the ridge at the foot of Hanumante Mt. between Jiri and Shivalaya (:Ramechap) at 2300 m, 3.IV.1973. – (ii) 2 fully grown fledglings were flying in front of a high cliff bordering the steep and rocky Pahakhola Valley between Pahakhola and Karmarang (:Sankhua Sabha) at 2300 m, 4.VI.1988. According to their behaviour, the falcons had very likely been bred in this or nearby cliffs. Characters of the 2 specimens that could be seen from the path above the cliff: upper side dark steel-grey, marked mustache, below light with brownish streaks.

This record, if accepted as proof of breeding, is the second for Nepal according to Inskipp & Inskipp (1991).

PHASIANIDAE

Lerwa lerwa

Horizontal, vertical: J.M. observations only between upper Arun and Kanchenjunga: Camp near pasture Yamuthanga NS of Thudam, in groups of two to 10 specimens, 4300-4500 m, 29.V.1988; – Gabri Khola above Thudam, singles and groups of 4 and 5 sp., 27./28.V.1988, 4250 m (both :Taplejung); – Ladza Kharka E Walungchung, 4250 m, 2 sp. 22. and 23.V.1988 (:Sankhua Sabha).

Habitat: Most of the above observations fall into the zone of (artificially scattered) dwarf bushes, mainly *Rhododendron*, well above the tree line, and into alpine pastures. All localities included occasional steep rocky outcrops, preferred lookouts of the small flocks. Despite sometimes conspicuous signs of man's interference, mainly destruction of plant cover by grazing cattle and erosion, especially in Gabri Khola and Ladza Kharka, Snow Partridges apparently used the area; they were not shy, sometimes even curious, and approached the observer freely.

Breeding activity: No signs. Small flocks were present even E V; no courtship behaviour was noted.

Tetraogallus

Two resident species occur in Nepal (*tibetanus* and *himalayensis*). Both inhabit the alpine zone around 5000 m and beyond. *T. himalayaensis* seems to be confined to the dry W part of Nepal, living only N of the main range, while *tibetanus* has a much wider horizontal range. The interactions of the 2 species are unrecorded, but both have been found together above Tukche in the upper Kali Gandaki Valley at the same altitude in winter.

Tetraogallus tibetanus aquilonifer R. & A. Meinertzhagen

Tetraogallus [altaicus] tibetanus

Material: 2 specimens: D Dolpo Distr., ascent to Namu La departing from Ringmo/Manduwa, 5000 m, 17.VI.1973: pullus, about 4-5 days old. S Solukhumbu Distr., Gorak Shep, 5180 m, 27.IX.1970: ♀.

Measurements: ♀, **Wing**-L 262 mm. – **Tail**-L 152 mm. – **Bill**-L 31.9 mm. – **Tarsus**-L 63 mm. – **WTI** 31.3% – **TWI** 58%.

Notes: Pullus bill black, feet yellow-flesh-coloured, iris yellow-greyish green.

Horizontal: Ascent to Pass Namu La from Ringmo/Manduwa, VI (see Material); – N and S face of Pass Jungla Banjyang, several times seen 9.-10.V.1970 (both :Dolpo); – ascent to pass Thorong La from E, several single specimens 20.IV.1980 (:Manang); – Gorak Shep, SW face of Everest, flocks of up to 8 specimens, 22.-27.IX.1970, remnants of 1 sp. found dead, apparently taken by a raptor (:Khumbu).

Vertical: My records range from 4500 m (9./10.V.) to 4800 m (20.IV.), 5000 m (fledglings, 17.VI.), and 5150-5200 m (E IX).

Habitat: Barren and rocky slopes, but does not penetrate onto cliffs; even the lowest record at 4500 m is well above the zone of dwarf bushes of *Juniperus* and *Rhododendron*. Above 5000 m the vegetation is only patchily distributed in some places but may form a dense layer covering old moraine slopes (Gorak Shep). The pullus from a clutch of 5 was gui-

ded by the ♀ und must have been bred nearby, the fledglings being only about 5 days old (this record is given as Nam La in Inskipp & Inskipp 1991).

Breeding: Beginning of the egg-laying season can now be narrowed down to the first third of V with newly hatched fledglings in mid VI (see above) – quite early in view of the still rough weather conditions with regular frosts and even snowfall at 5000 m. Diesselhorst (1968:139) found pulli, apparently slightly older ones, in VIII in Khumbu. The Tibetan Snowcock has been previously recorded as a breeding bird in Dolpo and further NW in Langu (Inskipp & Inskipp 1991), and in Khumbu near Everest by Diesselhorst (1968:139).

Alectoris chukar

Alectoris [rufa] chukar

Horizontal: My records extend from NW Dhaulagiri to the Khimti Khola Valley. – In detail: Ringmo and Manduwa/Phoksumdo Lake (1.VI.), Suli Gad Valley, Parila (19.V., 7.VI.), Tarakot (11.V. all :Dolpo); – Thakkhola: between Muktinath and Jomosom (21.IV.), Jomosom (26.III.), Purano Marpha (14.-16.III., 7.VII.), Thaksang above Tukche (2.-11-III. all :Mustang) – Chordung Mt. N Jiri (3.IV.), ascent from Khimti Khola Valley to Jiri (9.IV. both :Dolakha).

Vertical: The 10 altitudinal records are between 2000 m (Khimti Khola) and 3750 m (Phoksumdo Lake), in Dolpo from 2700 to 3750 m, in Thakkhola from 2750 to 3600 m, and the easternmost records are situated only at about 2000 m (Khimti Khola) and 2200 m (Chordung Mt.). Inskipp & Inskipp (1991) give 2100-3960 m as vertical distribution.

Habitats: *A. chukar* penetrates the Himalayas from NW, the Nepal records being the easternmost in this narrow area along the mountain chain (see Harrison 1982:112). Consequently, it is most common in the drier monsoon-protected areas north of the main range, were I found it in the forested parts of Dolpo and Thakkhola; localities are fewer and population density declines further east. The area near Jiri (:Dolakha; see above) is inhabited by the easternmost population (Rand & Fleming 1964:504) within strong monsoon influence. In general, habitats are open and include bushy slopes, often close to forest edges. Sometimes the Chukar penetrates even into dense forest (Purano Marpha, III), but spacious open areas are generally close by. Quite often, the frequented places are heavily used cultivations, terraces, sometimes overgrown, even close to villages (Tarakot, V), also overgrazed slopes (above Jiri, B IV). Flocks of up to 15 birds in Thakkhola (III).

Breeding: Small pulli on the terraces of Purano Marpha (7.VII. 3200 m).

Francolinus

The Nepal list comprises 3 resident species *(francolinus, pondicerianus, gularis).* The 2 latter are local and rare species in the Terai lowlands while the former also inhabits the lowlands but ascends to altitudes as high as about 2000 m.

Francolinus francolinus

Francolinus [francolinus], incl. *pictus, pintadeanus*

Horizontal: My records are from S Dhaulagiri to Jiri. – In detail: Lower Myagdi Khola,

between Darapani and Dharbang (30.V. :Myagdi); – Dana (3.V., 9.VII.). Suikibagar below Dana (3.V. all :Mustang); – Sikha (3.V.), Ghandrung (8.V. :Parbat); – Ramche (22.IV. :Rasuwa); – Jiri (9.IV. :Ramechap).

Vertical: Lowest record out of eight is 150 m (Dharbang/Darapani), highest at 2100 m (Sikha), three at 1800 m (Jiri, Ramche, below Ghandrung). Upper limit of the area belt, which extends from the Terai lowlands, during summer is about 2000 m (Inskipp & Inskipp 1991).

Habitat: All records in cultivation, mainly fields and all more or less close to villages. Especially the area around Sikha is nearly devoid of natural vegetation and heavily cultivated.

Coturnix coturnix

Horizontal, vertical: 1 specimen singing in the fields of Kagbeni (:Mustang), 23.VI.1970, 2900 m. Among the few records this is the highest from the breeding season in Nepal (cf. Inskipp & Inskipp 1991).

Ithaginis cruentus

Horizontal, vertical: The few records of my own are from SW Dhaulagiri (northern slopes of Dhorpatan Valley, 3400 m, IV.1970, 2 specimens :Myagdi) and from upper Simbua Khola (3250 m, V.1988, in pairs and small flocks of up to 5 sp. :Taplejung).

Habitat: The birds from Dharpatan were in an open bushy area close to grassy slopes, those in the Simbua Khola in virgin forest of *Abies spectabilis*, various tree *Rhododendron* species and *Sorbus* sp., the ground covered in most places with a thick layer of mosses.

Tragopan satyra

Horizontal: My records are scattered from Thakkhola and Annapurna to near the Sikkim/Darjeeling border. – In detail: Thakkhola, Chadziou Khola above Ghasa, 1 sp. taken by local hunter (X :Mustang); – S Annapurna; Chitre below Gorapani Pass; descent to Ghandrung (5.-7.V. both :Parbat); – Trisuli Valley, Syng Gyang (26.IV. :Rasuwa); – pass Ting Sang La (15.IV. :Dolakha); – Thodung (IV :Ramechap); – descent from pass Deorali to Hellok in Tamur Valley (17.V.); Omje Kharka NW Yamputhin (2.-3.V.); between Khebang and Yamputhin, 3-4 sp. calling (26.IV. all :Taplejung); – Dhorpar Kharka, several calling (26.IV. :Panchthar).

Vertical: Records in 9 localities range (in IV/V) between 2000 (Khebang/Yamputhin) and 3200 m (Syng Gyang; Ting Sang La; Thodung), others are between 2400 and 2850 m. Inskipp & Inskipp (1991) state the summer records as "mainly 2590 to 3800", but the altitude bar starts at about 2100 m (no details given).

Habitat: As mentioned by Diesselhorst (1968:143), *satyra* is predominantly a secretive forest dweller, difficult to observe but detected best by its voice (see below). It lives mainly in virgin mixed broad-leaved forest of various composition, e.g. *Quercus semecarpifolia, Lithocarpus pachyphylla,* several *Rhododendron* species, *Magnolia campbelli, Tsuga dumosa* (Dhorpar Kharka, 2700 m): many broad-leaved tree species, especially *Quercus, Magnolia, Rhododendron* (Omje Kharka, 2400 m); *Quercus semecarpifolia,* several

Rhododendron species, *Abies spectabilis* (Thodung, 3200 m). The highest records around 3800 m, as given by Inskipp & Inskipp (1991), are at the altitude of the subalpine coniferous belt, a very different habitat from that normally preferred by this species; details are needed. I never met *satyra* in open, lumbered forests, and it inevitably seems to disappear quickly when human activities severely affect the forest structure.

Vocalizations: During the breeding season, the presence of the species is indicated unmistakably by the advertising call of the ♂, a loud nasal sound lasting about 1 s, which is repeated every 5 to 10 s. Diesselhorst (1968:144) gives it as the bleating of a sheep. This call is heard over long distances, and sometimes the voices of 3-4 evenly spaced out ♂ can be heard simultaneously.

Lophophorus impejanus

Taxonomic note: In respect to geograpy, one might be inclined to unite all 3 *Lophophorus* species (or at least the 2 southern *L. impejanus* and *L. sclateri*) in one superspecies. According to characteristics of coloration and morphology, however, one should be cautious (cf. Delacour 1951:89 and colour plate opposite p. 98). More probably the 3 species are relics of a species group comprising additional species in former times. The areas of *L. impejanus* and *L. sclateri* overlap (Davison 1978:117).

Material: 1 specimen: **J** Dolakha Distr., Thodung, 3200 m, 6.IV.1973: ♀.

Measurements: **Wing**-L 250 mm. – **Tail**-L 169 mm. – **Bill**-L 50 mm. – **Tarsus**-L 68 mm. – **TWI** 67.6%.

Horizontal: My records are from NW Dhaulagiri to Thodung. – NW Dhaulagiri, summer pastures Baldebas and Dhule (30.V. :Dolpo); – below pasture Thankur in Gustung Khola Valley (6.IV.); Dhorpatan (13.-15.IV. both :Myagdi); – Thodung (6.IV., see Material, :Ramechap).

Vertical: The few observations range between 2800 and 3500 m and indicate only a minor part of the vertical belt during breeding season. Lowest are Baldebas/Dhule (2800-3000 m), Gustung Khola (3000 m), Dhorpatan (3100-3200 m) and Thodung (3200 m), considerably lower than the range given by Inskipp & Inskipp (1991): 3300-4750 m.

Habitat: Diesselhorst (1968:144) gives a detailed account of habitat requirements and also migrations within or shortly after the breeding season. Thus the low-altitude records in IV and V (see above) are to be treated as signs of for local breeding activity, but not or at least not all of the observations near or above timberline. During breeding season *impejanus* is a forest dweller, but it is not as shy and secretive as *Tragopan satyra*. My records cover different forest types according to the altitude concerned. The lowest were in rich deciduous forest with some coniferous trees interspersed (Gustung Khola) to mixed broad-leaved/coniferous including *Rhododendron* (Thodung, Dhorpatan) or pure coniferous stands of *Abies spectabilis* and a few *Pinus wallichiana* (Dhorpatan).

Lophura leucomelanos

Lophura [nycthemera] leucomelanos

Horizontal, vertical: Only observations in the Katmandu Valley and in E Nepal: Phulchoki Mt., 1850 m, 2 sp. (25.IV. :Lalitpur); – descent to Pahakhola, 3500 m, 1 ♂ ♀, (:Sankhua Sabha, V); – Omje Kharka NW Yamputhin, 2400 m, 1 ♀ (5.V. :Taplejung). The altitude of

the first locality is close to the maximum (3700 m) recorded for this species in Nepal (Inskipp & Inskipp 1991). Two of the sites were situated within virgin forest, mixed coniferous-*Rhododendron* (3500 m) and species-rich broad-leaved, one in secondary broad-leaved (Phulchoki).

RALLIDAE

Gallinula chloropus

Gallinula [chloropus] incl. *tenebrosa*

Horizontal, vertical: Kali Gandaki Valley, Titi Lake, 2700 m, 1 sp. (26.II. :Mustang).

Fulica atra

Fulica [atra] incl. *cristata, americana, caribaea, leucoptera*

Horizontal, vertical: Kali Gandaki Valley, Titi Lake, 2700 m, 1 sp. (1./2. V. :Mustang).

GRUIDAE

Anthropoides virgo

Horizontal, vertical: Kali Gandaki Valley, Tukche, 2750-4000 m (1.-11.X.1969 :Mustang). – One of the major "flyways" of Demoiselle Cranes from the Siberian breeding areas to their winter quarters in India across the Himalayas runs along the deeply cut upper Kali Gandaki Valley – a spectacular sight at E IX/B X. When the phenomenon was first discovered, roughly 31,350 specimens passing by were estimated from 1.-11.X. (Martens 1971), the count certainly missing many birds which must have already passed E IX. Massive migration was also mentioned by Inskipp & Inskipp (1991) and Thiollay (1979) for the same area and the same season, with numbers up to 63,000.

IBIDORHYNCHIDAE

Ibidorhyncha struthersii

Horizontal, vertical: Dhorpatan Valley, 2950 m (:Myagdi). – I noticed the Ibisbill in the Valley of Dhorpatan during both stays: 8.IV.1970 4 sp., apparently 2 pairs on pebbles fields at the river banks. – On 21.V.1973 2 sp., on 22.V. 3 and 5 sp., nearly at the same spot. – H.S. Nepali collected 1 sp. on the clearing Thankur, 3350 m, NW Dhorpatan (:Myagdi). On 26.V.1973 it showed still undeveloped testes, – a non-breeding specimen ? – As late as in M X a flock was seen in the Dhorpatan Valley; 1 sp. moulted body feathers (Morioka 1985) and apparently belonged to the local population.

Habitat: *Ibidorhyncha* requires as breeding sites large pebble fields in broad, flat and long valleys. It is known as a breeding bird in Nepal from the Langtang Valley (:Rasuwa) at 3800 m (Pierce 1985) and from Khumbu (Diesselhorst 1968:152).

BURHINIDAE

Burhinus oedicnemus

Horizontal, vertical: 2 sp. in a large river pebble field N Sunichare (:Ilam), 5.IV.1988, 250 m.

CHARADRIIDAE

Hoplopterus spinosus

Horizonal, vertical: Mai Khola banks below Ilam, 470 m (7./8.IV. :Ilam). – 2 and 3 sp. on sandy and stony banks of the Mai Khola within forested area. – A species common in the lowlands.

Hoplopterus indicus

Horizontal, vertical: Marsyandi Valley, between Dumre and Turture (7.IV. :Tanhu). Several specimens in paddy fields. – A species common in the lowlands.

SCOLOPACIDAE

Gallinago solitaria

Probably *G. solitaria solitaria* Hodgson

Material: 1 specimen: **J** Ramechap Distr., Thodung, 3200 m, 8.IV.1973: ♂.

Measurements: **Wing**-L: 166 mm. – **Tail**-L: 68 mm. – **Bill**-L: 69 mm. – **Tarsus**-L: 33 mm. – **WTI:** 43.4% – **TWI:** 41%.

Notes: Testes very small. Bill horn-coloured, the end darkest. Feet yellow with greenish tinge.

Horizontal, vertical: This specimen had its resting place on the banks of a small stream in tall *Abies-Rhododendron* forest (3200 m) and was noticed on 4.,5.,6. and 8.IV. always at the same spot. According to the gonadal development it was not (yet) at its breeding place. Inskipp & Inskipp (1991) mention finds of the Solitary Snipe only outside the breeding season in Nepal.

Scolopax rusticola

Horizontal: Only a few records between Dhaulagiri und Kanchenjunga: Dhorpatan (7.-9.V.); pasture Thankur (26.V. both :Myagdi); – Trisuli Valley, Syng Gyang, up to 2 sp. displaying (23.-26.IV. :Rasua Garhi); – pasture Lassetham NW Yamputhin, several displaying (8.V. :Taplejung).

Vertical: The records from 2 years (1973, only Lassetham 1988) are situated between 2950 m (Dhorpatan), 3200 m (Syng Gyang) and 3350 m (Thankur; Lassetham), i.e. in a very small vertical belt. All observations refer to displyaing ♂. Inskipp & Inskipp (1991) enlarge the vertical belt for the summer (months?) from 1980 m to 3900 m.

Habitat: Forests with clearings and open stands in the *Abies-Rhododendron* zone.

Tringa ochropus

Horizontal. vertical: Dhorpatan, 2950m, 1 sp. (8.IV. :Myagdi); – Marsyandi Valley, Braga, 3450m, 2 sp. (18.IV. :Manang). – The Green Sandpiper is a common winter visitor and passage migrant (Inskipp & Inskipp 1991).

Tringa hypoleucos hypoleucos L.

Material: 2 specimens: **D** Myagdi Distr., Dhorpatan/Uttar Ganga plain, 2950 m, 16. and 17.V.1973: 1♂, 1♀.

Measurements: **Wing**-L: ♂ 106; ♀ 111 mm. – **Tail**-L: ♂ 53, ♀ 56 mm. – **Bill**-L: ♂ 25 ♀ 25.5 mm. – **Tarsus**-L: ♂ 24, ♀ 25 mm. – **WTI:** ♂ 46,2, ♀ 46.0%. – **TWI:** ♂ 50, ♀ 50.5%.

Notes: ♂: Testes slightly swollen. Bill above blackish, lighter at the lower base, horn-brown. Feet grey-yellow. Back bronze-greenish with pronounced crosswise markings. – ♀: Bill black-brown, basis lighter, feet light grey, back violet-grey, pronounced lengthwise markings.

Horizontal: According to months: 21.III.1970 1 sp. near Beni/Kali Gandaki (:Parbat); – 21.IV.1973 3 sp. on sandy banks close to the power station Trisuli (:Rasuwa); – 10.-17.V.1973 in the plain of the Dhorpatan Valley, several (see Material; :Myagdi); – 19.VII.1970 1 sp. at tributary of the Kali Gandaki near Tingri (:Mustang).

Vertical, habitat: The only indication of breeding is provided by the specimens from Dhorpatan from V, 2950 m (see Material). Several specimens performed courtship display including loud singing every night close to the small river at the southern fringe of the Valley. ♂ gonadal development still low (7 mm); ♂ and ♀ were very fat. Presumably, the Spotted Sandpipers were at the breeding place there. The specimen from Tingri (VII) might have been an early migrant (hitherto, data from VII are not known from Nepal). – The W Himalayas is regularly inhabited eastward only to Garhwal (Ali & Ripley 1969,2:271); breeding further to the E always needs confirmation.

COLUMBIDAE

Columba

Six species are on the Nepal list (*livia, rupestris, leuconota, palumbus, hodgsonii, pulchricollis*); all breed except *palumbus,* which is an erratic winter visitor. *C. livia* is widespread vertically as well as horizontally, and in many towns and cities associated with man. *C. leuconota* and *rupestris* are high-altitude species and breed above timberline, and the latter is, in addition, confined to arid areas of the NW. *C. hodgsonii* and *pulchricollis* are mainly inhabitants of the subtropical belt; their breeding behaviour in Nepal is unknown.

Columba livia

C. [livia] incl. *rupestris*

Taxonomic notes: In Nepal as well as in the whole Indian subcontinent the Rock Pigeons belong to the ssp. *intermedia* Strickland, except in the NW Himalaya, where ssp. *neglecta* Hume lives. *C. l. intermedia* has grey lower back, not contrasting with white as in *neglecta* (Bates & Lowther 1952, Ali & Ripley 1969, 3, Roberts 1991; but see Vaurie 1965 for *neglecta*). In towns and cities, strikingly in Kathmandu and especially on the temple hill

Swayambunath, live large flocks of "City Pigeons", which do not seem to differ from the wild progenitors. On the other hand, variable phenotypes occur in Kathmandu, even reddish ones, which are clearly domesticated. I could not learn about economic use of the House Pigeon in Kathmandu, but in Ilam this practice seems to be widespread in view of the many dovecotes. Possibly the wild progenitors of present-day House Pigeons moved into the cities of their own accord and were only locally used economically. That the city birds hardly differ from the wild type is good evidence for this. Whether immigration into human settlements happened in the Himalayan midlands or/and in other parts of the vast *intermedia* area, to be followed by successive dispersion of (semi-) domesticated forms by man, is difficult to judge (for C Europe see Glutz v. Blotzheim & Bauer 1980, 9). Rock Pigeons on the fields in Thakkhola (:Mustang) in II, III, IV and VII were always homogeneously coloured without contrasting rump. House Pigeons in Jomosom proper, however, were all domesticated and multicoloured (IV 1980): I never saw them on the fields. Rock Pigeons did not move into the high-altitude villages of the Himalayan main chain (cf. *C. rupestris*).

Horizontal: Sightings from Dhaulagiri and Annapurna massifs and the foothills; also in towns and cities. – Upper Barbung Khola between Tarakot and Dunahi, flocks of up to 5 sp. (18.V., 7.VI. :Dolpo); – Kali Gandaki Valley between Ghasa and Lete, flock of appr. 50 sp. (25.II.); Marpha (12.III., 2 sp.; 21.III., 50 sp.; 6.VII., 20-30 sp.); near Jomosom, few (22.IV.); Thini, 7 sp. (23.III.); Kagbeni, 5 sp. (21.IV. all :Mustang); – near Pokhara, Seti Gorge (11.V. :Kaski); – Marsyandi Valley near Boulboule, several on rock faces (10.IV. :Lamjung). – In towns and cities: Ilam (:Ilam); Kathmandu, common in the city, locally in the outskirts, e.g. temple hill Swayambunath.

Vertical: My own finds range between 900 m (Boulboule, IV) and 2900 m (Kagbeni, IV), not including occurrences in towns, and the sites at 10 different altitudes are nearly evenly distributed, many of them accumulated between 2000 and 2900 m in the arid areas of Thakkhola and Dolpo.

Habitat: The Rock Pigeon lives in large flocks in many towns, some of them fairly small, but I did not come across it in villages; it also occupies steep rock faces and the narrow gorges of streams, where it apparently breeds: Boulboule, 900 m; near Pokhara, 1000 m; Tarakot/Dunahi, 2500 m; Kagbeni, 2900 m. All other records refer to flocks mostly below 10 sp., rarely more (20-30 sp., Marpha, 6.VII.1973; – 40 sp. 25.II.1974), always on fields in search of food. There they like to join together with other "Field" Pigeons but in most cases they will segregate by species when taking off (e.g. 7 *livia,* ca. 15 *leuconota,* Thini, 2900 m, 23.III.1974).

Columba rupestris turkestanica Buturlin

Columba [livia] rupestris

Material: 6 specimens: **D** Dolpo Distr., headwaters of Barbung and Yulung Khola, 4600 m, 26.VI.1973: 1♂ * upper Barbung Khola Valley, Charka, 4250 m, 22.VI.1973: 1♂ * Ringmo/Phoksumdo Lake, 3700 m, 10.-15.VI.1973: 4♀.

Measurements: **Wing**-L ♂ (2) 239 and 243 mm; ♀ (4) 228-236 mm, $\bar{x}$=232.5. – **Tail**-L ♂ (2) 128 and 132 mm; ♀ (4) 121-126 mm, $\bar{x}$=123.5. – **Bill**-L ♂ twice 15 mm; ♀ (3) 15-16.5 mm. – **Tarsus**-L twice 28 mm; ♀ (4) 28-30 mm, $\bar{x}$=29.1. – **WTI** (6) 47.2-49.0%, $\bar{x}$=48.3. – **TWI** (6) 51.9-55.3%, $\bar{x}$=53.4.

Notes: Testes of the 2 ♂ markedly developed (ca. 10 x 7 mm), ovaries becoming active. Bill grey-black (♂) and black (♀), feet of all specimens coral-red, iris reddish-white (♀).

Moult of wings and tail:
1) ♂ P1-3 new, 4 growing, 5 germinating, 6-10 old; S new. – 2) ♂ P1-3 new, 4-10 old; S new. – 3) ♀ P1-2 new, 3 germinating, 4-10 old; S new. – 4) ♀ P1-3 new, 4 germinating, 5-10 old; S new; T4 left germinating, remainder T not new. – 5) ♀ P1-5 new, 6 germinating, 7-10 old; A new; T (except for T1 right) new. – 6) ♀ P1-2 new, 3 growing, 4-10 old; S and T new.

Horizontal: My records are only from the arid areas N and E of Dhaulagiri. – Ringmo/Phoksumdo Lake (3.VI.1970, 10.-15.VI.1973; see Material); Kangar/Tarap Valley (17./18.VI.); upper Barbung Khola Valley: Kakkot (12.VI), between Kakkot and Pimring (12.VI.), Pimring (13.VI.), Parung (20.VI.), Charka (21./23.VI., see Material); Mukut (16.VI.); ascent to Dudje La (26.VI., see Material; all :Dolpo); – below Muktinath (21.IV.); Kagbeni (23.VI.); Marpha (25.IV. all :Mustang).

Vertical: Observations in VI (breeding season) between 2900 m (Kagbeni) and 4700 m (below Dudje La), within this 1800-m-wide belt even distribution of the appr. 15 sites. – Close to breeding season: IV: 2750 m (Marpha), 3600 m (below Muktinath). – Breeding record in Charka (4250 m) und in Shey Gompa; the latter by Fleming et al. (1976).

Habitat: The Hill Pigeon inhabits the monsoon-protected N flanks of Dhaulagiri and Annapurna, a southern splinter of its main distribution in C High Asia. Consequently, it is strictly dry-adapted; only this fact explains the occurrence in Nepal. Within this climatic zone, the lowest parts – mainly below 3000 m, locally heavily forested (e.g. Thakkhola) – are only sparsely or not at all incorporated into the breeding area. Breeding only within open parts of the upper forest zone (Barbung Khola, Ringmo) up to far beyond the timberline; however, the uppermost records (above 5000 m, Fleming et al. 1976) do not tell us anything about the upper limit of the breeding zone. In the small Nepal area the Hill Pigeon lives locally in close association with man, and it breeds regularly on houses of Tibetan style villages. In Charka (Fig. 36), the uppermost constantly inhabited village of Nepal, in VI 1973 20-30 pairs were living, the nests being situated in clefts and niches of house walls and wall projections. They are very tame there, walking amidst the local inhabitants and on the flat roofs. In the open landscape, they are only slightly shyer. The habitat preferences outside villages are difficult to judge, especially in relation to *C. leuconota*. The latter avoids man and prefers moister microhabitats, and its vertical area belt extends to lower altitudes. Consequently, the two species meet in Dolpo only by chance, and in the extremely high-altitude parts of the area *leuconota* seems, but probably unjustly, to be the rarer species. Information about close association with man is given by Schäfer (1938) for Tibet, Grummt (1961) for Mongolia, and Stegmann (1930) for Amurland. One is inclined to ask why the Hill Pigeon did not become domesticated like the Rock Pigeon.

Even in the breeding months *rupestris* can be seen flockwise, e.g. up to 10 specimens 18.VI. in Kangar; 6 sp. 12.VI. near Kakkot; 20 sp. 26.VI. path to Dudje La; during spring larger flocks: 21.IV. 20-30 sp.. Muktinath.

Breeding: Juveniles left the nest in Charka on 23.VI. Gonadal state (see above) also identifies VI as an important breeding month. *Re* early onset of the season in Mongolia, by III, see Piechocki et al. (1981), *re* extremely late breeding activity until IX in Tibet see Schäfer (1938).

Columba leuconota leuconota Vigors

Material: 5 specimens: **D** Dolpo Distr., ascent from Manduwa to Bagar La, 3600 and 4100 m, 16.VI.1973: 2 ♀ ** Mustang Distr., Cha Lungpa Valley near Sangda, 4200 m, 28.VI.1973: 1 ♂ * Thakkhola, Thaksang above Tukche, 3150 m, 6.III.1974: 1 ♂ * Tukche, ascent to Dapa Col, 4000 m, 19.X.1969: 1 o.

Measurements: **Wing**-L ♂ 248 and 249 mm; ♀ 240 and 244 mm; o 242 mm. – **Tail**-L ♂ 134 and 138 mm; ♀ 131 and 132 mm; o 137 mm. – **Bill**-L ♂ 18 and 20 mm; ♀ 17.5 and 18.5 mm; o 17 mm. – **Tarsus**-L ♂ 30 and 31 mm, ♀ 30 and 33 mm; o 32 mm. – **WTI** (5) 42.7-44.6%, $\bar{x}$=43.5. – **TWI** (5) 54.0-56.6%, $\bar{x}$=54.9.

Notes: Testes of the VI-♂ strongly developed (15 x 10 mm). Feet of the X specimens coral-red, iris yellow.

Moult of wings, VI: A ♀ with old (T2-6) and new T. In a ♀ P1-2 growing, P3 germinating, P4-10 old. – X: (sex?) P9 growing, P10 germinating.

Horizontal: My own finds are scattered from NW Dhaulagiri and all other larger massifs of the main chain to the E border S of Kanchenjunga. – Dhaulagiri: Ringmo/Phoksumdo Lake (28.V.1970, 13.-16.VI.1973); ascent to Bagar La (16.VI., see Material); upper Barbung Khola, Charka (23.VI.), Kakkot, 40-50 sp. (12.VI.); Mukut (16./17.VI.); ascent to Parung La (20.VI. all :Dolpo); – Dhorpatan, flocks up to 100 sp. (7.-9.IV. :Parbat); – above Sangda (23.VI.; 28.VI., see Material); Thakkhola: Thini (23.III.); Purano Marpha (19.III.; 23./25.IV.); ascent to Dapa Col (19.X.; see Material); Thaksang/Tukche (6.-10.III., 27.IV., see Material); Titi (26.II. all :Mustang); – Marsyandi Valley: Manang, flocks of up to 40 sp. (19.IV. :Manang); – Trisuli Valley: Dhunche, flock of 20 sp. (23.IV. :Rasuwa); – E side valleys of Arun: Gabri Khola above Thudam (28.V.); Kangla Khola, descent to Thudam, up to 3 sp. (25.V.); Thudam, flocks of up to 15 sp. (25./26.V. all :Sankhua Sabha); – Ladza Khola (23.V.); Walungchung Gola (21.V. both :Taplejung).

Vertical: Close to breeding season (V and VI): data bounded by 3000 m (Kakkot :Dolpo, VI) and 4750 m (ascent to Dudje La :Dolpo, VI), within this belt even distribution of the appr. 25 sites; – far from breeding season (II, III, IV): by far the lowest site at 2000 m (Dhunche :Rasuwa, 23.IV.1973), in Thakkhola regularly down to 2750 m (II, III). Accordingly, the breeding belt might extend downwards, at least in the dry areas of Dolpo, to 3000 m. Lowndes'(1955) data from Manang, another arid Inner Valley area, hints at a similarly lower limit. According to gonadal states, VI is to be regarded as the most important breeding month. Diesselhorst (1968:155) encountered independent juveniles as early as B and M VII in Khumbu. – At present it is impossible to determine the upper breeding limit. In the relatively rain-rich but at high altitude somewhat drier Khumbu the breeding belt is generally higher than in the arid areas, at least concerning the lower limit, which is apparently no lower than 4000 m (Diesselhorst 1968:155). Nest find in the upper Arun (Inskipp & Inskipp 1991) is not specified as to altitude.

Habitat: In Nepal the Snow Pigeon, like the Hill Pigeon, is partial to open high-altitude regions. It, too, requires aridity, but to a less extreme degree. Less important is the altitude of the breeding zone. Records from the breeding month V in Dolpo are as low as 3000 m, thus within the dry coniferous belt. In the extremely wet Kanchenjunga massif (and further W) observations also extend down to 3200 m (Walungchung, V) and 3350 m (Thudam, V), but *leuconota* is a very sparse species there (only 5 encounters within 1 month, V 1988).

Food is always searched for among open and low vegetation: high-altitude pastures, meadows near streams and rivers and newly ploughed fields are especially favoured. Thus the Snow Pigeon is regularly, throughout the year, to be found close to human habitations and cultivations. Cultivated fields are apparently an important factor within the spectrum of feeding habitats, and they are visited even during the breeding season over large distances (e.g. Thudam, 3350 m, up to 15 specimens E V; see Diesselhorst 1968:155). – As an exception the species may forage in somewhat open *Pinus* forest: Purano Marpha, 3300-3400 m, 2-5 sp., 23.-25.IV.1980. – Snow Pigeons are to be found flock-wise even during the breeding season (e.g. flocks regularly of up to 50 sp., Ringmo, 3650 m, M VI), and more so in the months far from breeding (flocks of up to appr. 100 sp., Dhorpatan, 3000 m, B IV). Whether the flocks in V/VI comprise non-breeding birds or later split into breeding pairs is unknown.

Columba pulchricollis Blyth

Horizontal, vertical: Singles and flocks of up to 4 specimens close to the forest clearing Thaksang above Tukche (:Mustang), 3100 m, 29.IV.1980; observations close to the W border of the distributional area. Lete, the closest locality, is also in Thakkhola (Inskipp & Inskipp 1991).

Streptopelia

Five species occur in Nepal (*decaocto, tranquebarica, orientalis, senegalensis, chinensis*); all, perhaps except *senegalensis,* breed. *S. decaocto* and *tranquebarica* are confined to the lowland up to 400 m, *chinensis* up to 1500 m, while *orientalis* occupies a vast vertical belt and is regularly met from the lowlands to above 4000 m including dry trans-Himalayan areas – possibly the species inhabiting the widest vertical belt of all Nepal non-Passeres. Only *chinensis* is closely associated with man.

Streptopelia decaocto

S. [bitorquata] decaocto

Horizontal, vertical: Calling specimens in the Rapti Valley near Tekouli, 300 m, II 1970, in open dry cultivated land.

Vocalizations: Vocal impression of territorial songs does not differ from that of C European populations.

Streptopelia orientalis

Streptopelia [turtur] orientalis

Taxonomic note: The mixing area between *S. o. meena* (W) and *orientalis* (incl. *agricola,* E) apparently extends further westward than indicated on the map in Inskipp & Inskipp (1991). The specimen from Dhorpatan is very light in colour above, but the lower tail coverts and the terminal tail band are pale grey.

Material: 2 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 29.V.1970: 1 ♀ ** Myagdi Distr., Dhorpatan, 3000 m, 17.IV.1970: 1 o.

Measurements: **Wing**-L ♀ 188; o 188 mm. – **Bill**-L ♀ 15; o 18 mm. – **Tarsus**-L ♀ 25; o 25.5 mm – **WTI** 35.1 and 38.3%.

Horizontal: Regularly encountered in most of the main massifs from NW Dhaulagiri to near the E frontier; details may be omitted here.

Vertical: My own observations range from 1350 m (IV) to 4000 m (VI), and are concentrated between 2300 and 3200 m. The breeding area belt is surprisingly wide; documentations of breeding apparently range from appr. 300 m (Hitaura, Biswas 1960b) to at least 3500 m (Jarkot, Inskipp & Inskipp 1991). An even more extended upper limit may be expected.

Habitat: In accordance with the wide vertical range, very diverse; above all forests or forest-like vegetation, preferably spaced stands or edges of closed forests. The Oriental Turtle Dove has also penetrated into the arid areas on the N slopes of the main chain, which in their extreme variants are devoid of forests or where only local plantations of poplars (*Populus*) are present. This is demonstrated by a breeding record in Jarkot (:Mustang) on the N slopes of Nilgiris in the Annapurna group (see above), also by 2 specimens on a roof in Tukot in upper Barbung Khola (:Dolpo) on 20.VI.1970; here there are no trees or even large bushes.

Breeding: Display flights and courtship calls on top of Phulchoki Mt., 2650 m, 19.III.1980 (:Lalitpur). Biswas (1960b) indicates that his specimens from III and IV are in breeding condition, while Diesselhorst (1968:157) collected such birds as late as VIII and IX.

Streptopelia chinensis

Horizontal: My own data: lower Marsyandi Valley: between Dumre and Syuribar (7./8.IV. :Tanhu, :Lamjung); – Kathmandu (17.IV., 28.VI.); – Arun Valley (Darapangma, Tumlingtar, 22./23.VI. :Sankhua Sabha); – Uyam (22.IV. :Taplejung); – Sunichare and neighbouring villages (4.IV. :Ilam).

Vertical: From 280 m on the S piedmont of the Siwalik Mts. near Sunichare (:Ilam) up to 1450 m in Darapangma (:Sankhua Sabha). *S. chinensis* only exceptionally penetrates up to 2000 m (Inskipp & Inskipp 1991); the upper breeding limit is unknown, but the Kathmandu Valley is a regular breeding site. Furthermore the singing specimens from Darapangma apparently were at their breeding places (1450 m, VI).

Habitat: A common species in agricultural land, which prefers to stay in villages and the outskirts of towns, even in the tree-rich suburbs of Kathmandu, mostly in marginal areas at the transition to cultivated fields.

Vocalizations: Territorial song still heard in Kathmandu on 28.VI.1988.

Treron

Six species have been recorded for Nepal *(bicincta, pompadora, curvirostra, phoenicoptera, apicauda, sphenura);* all breed. All except *sphenura* are inhabitants of the tropics and in Nepal are normally confined to the lowlands up to 400 m. Only the latter avoids this low zone and lives in the subtropical belt, roughly between 1500 and 2500 m.

Treron sphenura sphenura (Vigors)

Material: 2 specimens: **M** Panchthar Distr., Sheldoti (ridge S Hinwa Khola, NW Maimajuwa); 2500 m, 28.VIII.1980: 2 fledged juveniles.

Measurements: **Wing**-L 164 and 165 mm. – **Tail**-L 105.5 and 109 mm. – **Bill**-L 20 and 21.5 mm. – **Tarsus**-L 22 and 23 mm. – **WTI** 35.4 and 37%. – **TWI** 64.3 and 66.1%.

Horizontal: between Mure and Hururе (9.-12.VI.); Bhotebas (20.VI. both :Sankhua Sabha); – Tamur Valley. Dobhan (15.IX. :Terhathum): – Sheldoti (28.VIII.: see Material); Paniporua (17.IV. both :Panchthar).

Vertical: 750 m (Dobhan, IX), 1800 m (Bhotebas, VI), 2100 m (Mure/Hururе, VI), 2300 m (Paniporua, IV), 2500 m (Sheldoti, VIII). Summary of the hitherto known observations in Nepal stresses the main distribution between 1500 and 2000 m (Inskipp & Inskipp 1991); the breeding record at 2500 m seems to be unusual.

Habitat: *T. sphenura* lives in the belt of evergreen broad-leaved cloud forests, preferably in the canopy of dense and closed stretches even if they are situated close to (artificial) edges, occasionally in isolated tall trees. Calling sites are always hidden high up in the canopy. Fledged juveniles (see Material) stayed in a degraded open forest patch with *Quercus semecarpifolia*, according to their "inexperienced" and tame behaviour suggesting that they were close to the breeding place. In IX a flock of ca. 15 specimens was in open agricultural land close to the Tamur River.

Breeding: Just-fledged juveniles at 28.VIII.1983 point to breeding activity (also) during the monsoon period; 1st breeding record for Nepal (cf. Inskipp & Inskipp 1991).

Vocalizations: The long, powerful up-and-down verses of the territorial song carry great distances and sound like a faraway howling.

PSITTACIDAE

Psittacula

The Nepal list presents 5 species, all breed (record still lacking for *himalayana; eupatria, krameri, cyanocephala, alexandri).* All are confined to the lowland, mainly up to 500 m except *himalayana* which occupies a belt predominantly between 1000 and 2000 m. This species and *alexandri* are the only ones which invaded the Himalayan arc from larger eastern parts of their areas. The interrelations of all Nepal Parakeet species during the breeding season are virtually unknown.

Psittacula eupatria

Horizontal, vertical: S Siwaliks N Sunichare, 250 m, small flocks, possibly with other unidentified *Psittacula* species (4.-6.IV. :Ilam).

Psittacula cyanocephala

Horizontal, vertical, breeding: S Siwaliks NW Sunichare, 240 m, 1 pair with fledged young in a tall solitary tree within a cultivated part of the plains S of the Siwalik Mts. (6.IV.

:Ilam). The many tree stumps within the fields were a sign that forests had recently been present in the area (Fig.4). According to Inskipp & Inskipp (1991) 2nd breeding record for Nepal.

CUCULIDAE

Cacomantis

Three species are on the Nepal list (*merulinus, passerinus, sonneratii*); the 2 latter breed, the status of *merulinus* is uncertain, perhaps a scarce breeding bird. *C. sonneratii* is confined to the lowlands including the dun valleys, *passerinus* extends its area in thinned-out populations to slightly above 2000 m, even in agricultural land.

Cacomantis passerinus

Horizontal, vertical: Observations only in the SE Dhaulagiri massif: below Khibang, 1400 m (20.V.); below Kuinekani, 2100 m (19.V.); Thulo Khola Valley near Chimkhola, 1700 m (17.V. all :Myagdi). These observations are near the upper distributional limit, where the species is quite rare and patchily distributed. Inskipp & Inskipp (1991) give the upper limit "rare up to 2135 m" without specification of months, Fleming et al. (1976, *merulinus*) also 2135 m.

Habitat: 2 observations in nearly treeless (Thulo Khola; Kuinekani), 1 in tree-rich agricultural land (Khibang). After playback of tape recording, birds approached the speaker over large distances, hundreds of meters, then, rather shy, disappeared and crossed a valley again for hundreds of meters. Despite conspicuous vocal behaviour in open landscape, the Grey-bellied Plaintive Cuckoo is difficult to observe.

Vocalizations: Territorial song (Fig.48a-d) consists of loose but regular repetition of a single note ("t-weer ..") at about 0.5 s intervals. In 3 ♂ the note proved to be very similar: a short angular introductory part, which is connected with a long-drawn-out slightly descending whistle by a short loop, the loop being always low in amplitude. Note length is near 0.5 s, but with variation between ♂ and, to a lower extent, within ♂ (Kuinekani: 0.49-0.51 s; Thulo Khola: 0.49-0.55 s; Khibang: 0.66-0.71 s). Frequency range is very narrow with slight variations between ♂ (Kuinekani: lower limit 2040 Hz, upper 2480-2560 Hz, range 440-520 Hz; Thulo Khola: lower limit 2240 Hz, upper 2520 Hz, range 280 Hz; Khibang: lower limit 1960-2040 Hz, upper 2480-2560 Hz, range 520 Hz).

Cuculus

The S slopes of the Central Himalayas are rich in *Cuculus* species, up to 6 of them depending on systematic grouping *(varius, sparverioides, micropterus, canorus, saturatus, poliocephalus);* all breed. They are exclusively forest-dwellers, mostly in closed stands, but *micropterus* is also partial to park-like vegetation at human settlements. Though all species inhabit distinct altitudinal belts, there is much vertical overlap and during the breeding season up to 5 species have been found syntopically at one restricted site (see Table 1). All coexisting species are quite different in size (*poliocephalus* being smallest, *sparverioides*

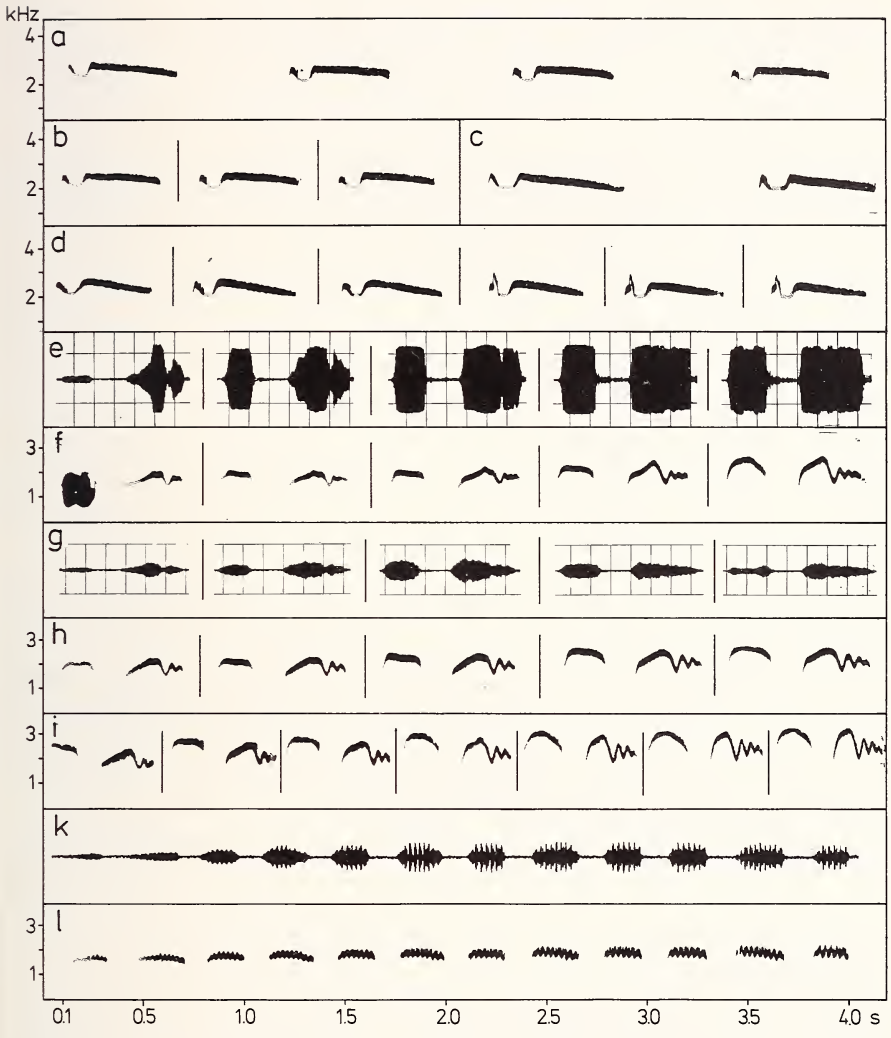

Fig.48: Territorial song of Cuculidae. – a-d) *Cacomantis passerinus;* a-b) 4 notes of a song sequence, natural distance and 3 additional notes of the same ♂, Thulo Khola 17.V.1995; c) 2 notes of a song sequence, natural distance, Khibang 20.V.1995; d) 6 notes of a song sequence to show slightly differing note form, Kuinekani 19.V.1995.
e-l) *Cuculus sparverioides.* – e-f) bout of 5 verses, waveform (e) and spectrographic (f) display, Mai Pokhari 26.III.1980; g-h) bout of 5 verses, waveform (g) and spectrographic (h) display, Paniporua 17.IV.1988; i) bout of 7 verses, Chichila 18.VI.1988; k-l) verse of ♀ song, waveform (k) and spectrographic (l) display, Paniporua 17.IV.1988.

largest) and this might be the most important trait to avoid competition; size also determines the different host species on which all congeners depend. *C. canorus* occupies one of the broadest vertical belts of all Himalayan non-passeriform birds being approximately 3000 m wide.

Tab.1: Syntopic occurrences of *Cuculus* species at various altitudes in E Nepal, all proven by ♂ calls; var *varius,* cano *canorus,* micr *micropterus,* polio *poliocephalus,* spar *sparverioides,* sat *saturatus.* Altitudes in m; all data from 1988 (except Dhumpus: 1980).

Date	alt.	locality	var	cano	micr	polio	spar	sat
6.IV.	250	Sunichare	–	–	–	–	–	+
22./23.VI.	500	Tumlingtar	–	+	+	–	–	–
22./23.IV.	1000	KabeliKh.	+	+	–	–	–	–
19.VI.	1900	Chichila	–	+	+	+	+	–
9.-17.VI.	2100	Mure/Hururе	–	+	+	+	+	+
9.V.	2100	Dhumpus	–	+	+	–	+	+
16./20.IV.	2300	Paniporua	–	+	–	–	+	+
1.-6.V.	2400	OmjeKharka	–	+	–	+	+	+
1.-4.VI.	2600	Pahakhola	–	+	–	+	+	+

Cuculus varius

Horizontal, vertical: Marsyandi Valley between Turture and Syuribar (530-620 m :Tanhu); – Uyam (1300 m :Panchthar); – confluence of Kabeli and Tada Khola (1000 m :Taplejung); all records by voice. Only on the Kabeli/Tada Khola is there naturally spaced forest of *Shima wallichi* and *Pinus roxburghii,* both other localities being situated in tree-rich cultivated land. Uyam is at the upper distributional limit.

Vocalizations: Territorial song very similar to *C. sparverioides,* but softer and more melodious.

Cuculus canorus

Cuculus [canorus] incl. *gularis*

Horizontal: My records extend from the arid areas of the NW and N flanks of Dhaulagiri across all parts of the country visited, as far as the Sikkim/Darjeeling border. This Cuckoo is nowhere common and certainly more sparse than in well populated Central European riverside habitats. But given the enormous vertical span which the Eurasian Cuckoo inhabits, it nevertheless may be the most individual-rich species among all congeners.

Vertical: Calling ♂ (III-VI) were noticed from 500 m (Tumlingtar, 23.VI.) up to 3900 m (above Pahakhola, 30.V. both :Sankhua Sabha), sight records up to 4250 m (Ladza Khola :Taplejung). This framework defines a vertical area belt 3750 m wide, but there is no proof of breeding all over this belt. Population density is not homogeneous everywhere. Most of the records fall within the belt between 1000 and 3000 m; below it I heard only 3♂, above I noted 6 specimens. Even within this zone of reduced density from 3000-4250 m the po-

pulation seems to be evenly distributed, though markedly thinned out. The relevant 6 observations originate from 3 spring/summer periods with stays for months at the altitudes in question.

Habitat: Within this vast vertical belt the preferred habitats are manifold, including nearly the whole vegetational spectrum of the S and partly of the N macroslope of the main chain and of the midlands. Preferred are open stands of trees and marginal zones of mature forests; I heard this cuckoo only rarely within closed forests. It regularly lives in old agricultural land with tall scattered trees (e.g. Tumlingtar, 500 m; Pokhara :Kaski, 1100 m; Kathmandu Valley, ~1350 m; Landrung :Kaski, 1830 m; area near Ghandrung :Parbat, 2100 m). This preference for light and scattered stands of trees including secondary growth may have caused the present wide distribution of the Cuckoo over large parts of midland Nepal. Even landscapes with bushy vegetation above timberline and the arid areas N of the main range hold sparse *canorus* populations: upper Barbung Khola between Tarang and Mukut (:Dolpo, 4000 m, 16.VI.1970); Ladza Khola (:Taplejung, 4250 m, 23.V.1988).

Vocalizations: The well-known "cuk..koo" territorial song matches that in Europe and any other part of the trans-Palaearctic area of the species so far investigated (Payne 1986, Martens 1993).

Cuculus sparverioides

Horizontal: Our records comprise the area from the S Dhaulagiri to Chordung Mt./Jiri and from Arun Valley to the eastern border. – Between Bega and Bega Deorali (16./17.V. :Myagdi); – Kali Gandaki Valley, about 3 km N of Kalopani (8.V. :Mustang); – Chitre (5.V.); between Chitre and Ghandrung (7.V. both :Parbat); – above Landrung (8.V. :Kaski); – Thimang above Bagarchap (14.IV. :Manang); – Phulchoki Mt. (25.IV., 14.V. :Lalitpur); – Sheopuri Mt. (25.VI. :Kathmandu); – Chordung Mt. near Jiri (29.III. :Ramechap); – Chichila (18.VI.); between Mure and Hurure (9.VI.); Pahakhola (1.-4.VI.; all :Sankhua Sabha); – Omje Kharka (1.-6.V.); between Khebang and Yamputhin (25.IV. both :Taplejung); – Worebung (21.IV.); Paniporua (16.-20.IV. :Panchthar); – upper Gitang Khola Valley (28.-31.III.); Mai Pokhari (26.III.; 1. and 9.IV. both :Ilam).

The Large Hawk-Cuckoo is regularly distributed there and easily to be discovered because of its conspicuous voice. Except for Thakkhola (see Habitat), I could not find it in valleys extending into the foothills of the main chain massifs: along the W flanks of Dhaulagiri between Dhorpatan and Tarakot (:Myagdi, :Dolpo); Simbua Khola at the upper foothills of Kanchenjunga (:Taplejung), and I met it only locally in the upper Kabeli Khola nearby. In the eastern parts of the country the species is common only in a quite narrow vertical zone, but it is there widely distributed.

Habitat: The Large Hawk-Cuckoo is a typical inhabitant of the subtropical cloud forests of the *Quercus* zone where it lives in closed parts as well as in open scattered stands or even in small remnant groves (Mai Pokhari :Ilam). In the upper Kali Gandaki Valley it extends northwards to the isolated patches of broad-leaved forests within the coniferous forest belt, slightly N of Kalopani. In the extreme case a single isolated decayed tree may serve as a regularly used display site. Only in such conditions can the Hawk-Cuckoo be seen exposed on a treetop; mostly they keep completely hidden in the canopy. This is the largest of

the local assemblage of *Cuculus* species; it is regularly to be found syntopically with several congeners (see Tab.1).

Vocalizations: Territorial song (Fig.48e-i) is displayed in bouts of spaced double notes (DN). Depending on the numbers of DN given per bout (5-21), the length of the bouts varies: 10.7 s (5 DN) to 15.4 s (7 DN). Intervals between the DN are less than 2 s long and slightly irregular (1.77-1.95 s in a 5 DN bout). Within a given bout of DN, there is threefold variation; (i) at the beginning of a bout only a part of the components of the DN is of high amplitude, and from DN to DN within a bout the loudest component tends to be the longest. The highest-amplitude components tend to occur at the end of the bout (Fig.48e-f), but rarely also in the verse center (Fig.48g-h). Maximum amplitude values are alike within an individual bout (Fig.48e). (ii) Notes become slightly longer within the bout (DN: 0.62 s to 0.66 s of a 5 DN bout; Fig.48e/f, g/h). (iii) Frequency range increases within a bout (min./max. value/range of 2nd note of DN: 1520/2000/480 Hz, 1520/2200/680 Hz; 1560/2360/800 Hz; 1600-2520/920 Hz; 1600/2680/1080 Hz; Fig.48f). – The DN, the basic part of the song, is extremely similar in all ♂ checked: (a) a shorter whistled note with little frequency modulation, always opening downwards; (b) a longer note with 1st slope always ascending, after descending it produces a threefold low-frequency zigzag structure. These characters give rise to a spectacular aural impression, a series of vigorous "pee-piye" calls produced as "a loud, shrill, insistent whistle, rather musical and even pleasant in small doses .... usually rising in scale to frantic pitch and breaking off abruptly" (Ali & Ripley 1969,3:199). These exceedingly loud far-carrying calls make this cuckoo (along with *Heterophasia capistrata)* vocally one of the most prominent bird species of the oak zone.

Females produce long (up to 4 s) homogeneous series of "drüü drüü drüü.." calls, which are strongly frequency modulated (Fig.48k-l; carrier frequency near 2 kHz). – Song activity of ♂ starts at least E III (26.3.1980 Mai Pokhari 2150 m; – 29.3.1973 Chordung Mt. 2900 m), extends to E VI (25.6.1988 Sheopuri Mt. 2300 m) and is still to be expected in VII.

Cuculus saturatus

Horizontal: Our records, all by the characteristic voice, extend from S Dhaulagiri to the Sikkim/Darjeeling border and are concentrated in the E. – Upper Myagdi Khola, Boghara (21.V. :Myagdi); – between Lete and Ghasa (2.V. :Mustang); – above Chitre (5.-7.V.); above Ghandrung (7.V. both :Parbat); – above Landrung (8.V.); between Landrung and Dhumpus (9.V. both :Kaski); – Marsyandi Valley, Thimang above Bagarchap (15.IV. :Manang); – between Mure and Hurure (14.VI.); Pahakhola (1.-4.VI. both :Sankhua Sabha); – Omje Kharka (1.-6.V.); Yamputhin (29./30.IV. both :Taplejung); – Paniporua and descent to Hinwa Khola (16.-20.IV. :Panchthar); – Mai Pokhari (1. and 10.IV.); upper Gitang Khola Valley (30./31.III.); N Sunichare (6.IV. all :Ilam).

Vertical: The records by voice range from 250 m (Siwalik Mts. N Sunichare :Ilam) up to 3000 m (S Annapurna, above Chitre :Parbat). But only between 1830 m (Landrung: Kaski) and the upper limit does there seem to be a continuous population with strongholds from 1900 to 2650 m; 16 out of 19 localities are concentrated within this belt. The fact that the only find in the lowlands (6.IV.) is separated from the next upper one by 1580 m implies

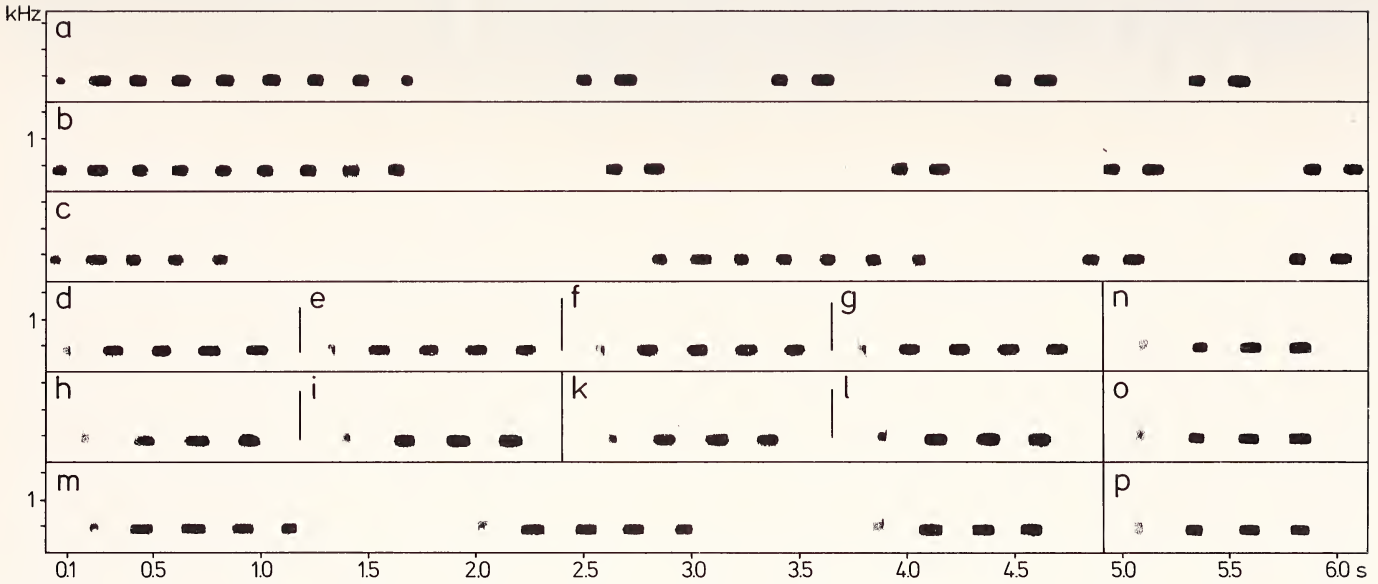

Fig.49: Territorial song of *Cuculus saturatus*. – a-c) *C. s. horsfieldi*. – a) initial part of a sequence, Russia, Amurland 15.VI.1990; b) initial part of a sequence, Russia, Ussuriland, Boitzovo NE Bikin 4.VI.1990; c) initial part of a sequence, 30 km NE Bikin 2.VI.1990.
d-p) *C. s. saturatus*. – d-g) 4 verses of 1 ♂, Chitre/Ghandrung 6.V.1980; h-i) 2 verses of 1 ♂, Mai Pokhari 10.IV.1980; k-l) 2 verses of 1 ♂, from Paniporua to Hinwa Khola 20.IV.1988; m) 3 consecutive verses of 1 ♂, natural length of intervals, Yamputhin 30.IV.1988; n-p) 3 verses of 1 ♂, Paniporua 19.IV.1988.

that the region in between does not belong to the breeding area. According to my data the vertical area belt comprises nearly 1200 m during the presumed breeding season (IV-VI). "Common between 1525 m and 3050 m in spring and summer.." (Inskipp & Inskipp 1991).

Habitat: The Oriental Cuckoo is a true forest cuckoo which I met only in closed forests, except for one observation only in tree-rich agricultural land (below Paniporua); it sings high in the canopy and is difficult to observe. The inhabited forest formations consist of evergreen broad-leaved tree species, in the upper part of the belt often *Quercus* and tree *Rhododendron.* The lower *(Pinus roxburghii)* and the upper coniferous belts *(Abies, Pinus wallichiana)* are just outside its vertical area.

Vocalizations: Territorial song (Fig.49d-p) of my recordings from Nepal (5 specimens checked) invariably consists of 3 or 4 dull mellow notes in a monotone and a preceding shorter introductory note of slightly higher pitch. All but 1 ♂ used exclusively 3 (Fig.49h-l, n-p) or 4 notes per note group (Fig.49d-g). 1 ♂ changed from 4- to 3-note verses within a long sequence (Fig.49m). Frequency of the note groups within a given ♂ is extremely constant, showing virtually no variation, and inter-male variation is only slight: 50 Hz within 5 ♂. The frequency jump from the higher 1st note to the note group is only minor: invariably between 30 and 60 Hz in the individual ♂ (1st note/note group: 450/390; ?/400; 475/430; 480/430; 470/440 Hz). Notes of the note group are near 0.1 s long with little inter-individual variation, the 1st one considerably shorter (about 0.4 s); the whole verse is between 0.8 and 1.0 s long depending on number of notes per verse. Verse intervals normally amount to several seconds, but may shrink to less than 1 s (Fig.49m). – Song activity recorded from 30.III. (1980, upper Gitang Khola, 2550 m) to 15.VI. (1988, Mure/Hurure, 2100 m).

There exists considerable regiolect variation of the territorial song of the northern ssp. *horsfieldi* on the one hand and nominate *saturatus* on the other hand (for ssp. *lepidus* of the SE continent and islands, and ssp. *insulindae* [Borneo] see Wells & Becking 1975).

Verse syntax of the ssp. *horsfieldi* (Fig.49a-c) differs from that of *saturatus* (Fig.49d-p): on the lower Amur and Ussuri a series of low whistled notes is followed by 2-note groups at longer intervals, resulting in sequences lasting up to half a minute or even longer. The introductory note group consists of notes of nearly equal length but shorter and longer notes may alternate (0.08-0.11 s in 1 ♂). Of the double-note group the 2 notes may be of equal length but in most cases the 1st note is slightly shorter than the 2nd (0.07/0.12 s). Intervals between the note-groups within 1 sequence range between 0.6-1.5 s in 3 ♂ (1st ♂: 0.6-0.75; 2nd ♂: 0.7-1.5; 3rd ♂: 0.6-0.7 s). Frequency of all notes in the individual ♂ is the same (400 and 420 Hz in 2 ♂) and thus consistent with that of nominate *saturatus.* – Song in the Amur/Ussuri population is very homogeneous, with only minor variation. This song type was clearly described by Jahn (1942) for Japan and most thoroughly detailed by Mauersberger (1980) for Mongolia and the Lake Baikal area. This information indicates song homogeneity over a wide range, from Lake Baikal to Japan including Mongolia. Song descriptions from western areas of the former Soviet Union in some cases differ considerably (summarized by Ernst 1992) and need clarification. Wells & Becking (1975) illustrate slightly deviating song variants for Japanese birds (5- and 3-note phrases following each other at short intervals), but their material is too limited for detailed consideration. For li-

terature review of *horsfieldi* song see Cramp (1985). – Vaurie (1965) states that *horsfieldi* and *saturatus* merge with one another in China. One should take into consideration that the marked vocal differences may act as isolating mechanisms, and contact zones should be carefully investigated.

Cuculus poliocephalus poliocephalus Latham

Cuculus [poliocephalus], incl. *C. rochii* from Madagascar

Material: 1 specimen: **M** Taplejung Distr., Omje Khola, pasture Omje Kharka, NW Yamputhin, 2400 m, 2.V.1988: ♂.

Measurements: **Wing**-L: 152 mm (P8 longest, 10 > 4). – **Tail**-L: 128,5 mm (graduation 42 mm). – **Bill**-L: 18,5 mm. – **Tarsus**-L: 17 mm. WTI: 48%. – **TWI:** 84,5%.

Notes: Plenty of subcutaneous fat present.

Horizontal: My records, all of singing ♂, extend from the S Dhaulagiri to the Sikkim/Darjeeling border. – Dhorpatan (18.V.), upper Myadgi Khola, Boghara (21.V. both :Myagdi); – Kathmandu Valley, Phulchoki Mt. (14.V. :Lalitpur); – Chichila (18.VI.); between Mure and Hurure (9.VI.); Pahakhola (1.-4.VI. all :Sankhua Sabha); – Walungchung Gola (20./21.V.); upper Tamur Valley below Walungchung Gola (19.V.); Deorali pass W Yamputhin (17.V.); upper Simbua Khola (10.V.); pasture Lassetham and descent to Kabeli Khola Valley (7.-9.V.); Omje Kharka NW Yamputhin (2.-.6.V. all :Taplejung).

In these areas this small cuckoo is distributed widely but sparsely everywhere, and is apparently lacking in the appropriate altitudinal belt at many places. To prove its presence is often quite difficult for it preferably sings at night or long before dawn, being silent for long periods during the day even in the middle of the calling season. It may consequently often be underrecorded.

Vertical: Lowest find near 250 m (S foothills of Siwalik Mts. :Ilam), on 4.IV.1988 apparently still outside the breeding belt, then from 1950 m (Chichila, 18.VI.) continuously up to 3400 m (Deorali pass between Yamputhin and Hellok :Taplejung, 17.V.1988), records concentrated between 1950 m and 2700 m (10 localities including many records by voice, all V/VI 1988), from 3200-3400 m only 6 finds (all V 1988 and 1995). The vertical breeding belt comprises approximately 1500 m, but is larger according to Inskipp & Inskipp (1991): summer residence chiefly between 1500 m and 3660 m. There exists no breeding record within Nepal borders yet.

Habitat: The Lesser Cuckoo is confined to closed and mainly dense parts of the evergreen broad-leaved cloud forests up to the *Quercus/Rhododendron* and coniferous forests of the subalpine zone beyond 3000 m. It always stays among the trees, mostly in the canopy, rarely in lower bushy zones but always close to the forest proper. Furthermore, this cuckoo keeps extremely well hidden and is rarely to be seen in the open.

Only at one locality, in the oak forests between Mure und Hurure (Arun Valley :Sankhua Sabha, VI 1988), did I find *poliocephalus* as a member of the Central Himalayan congeners' community comprising *C. canorus, C. micropterus, C. sparverioides* and *C. saturatus* (see Tab.1).

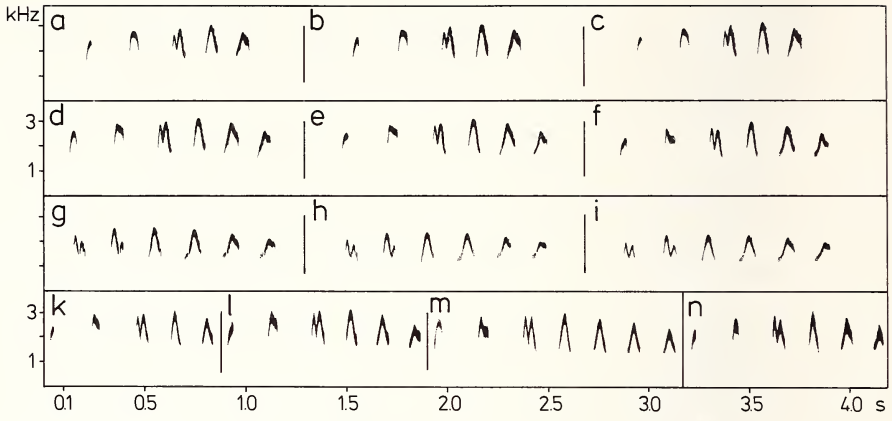

Fig.50: Territorial song of *Cuculus poliocephalus*. – a-i) verses of a complete bout of territorial song, verses of 3 different types (a-c, d-g, h-i), Omje Kharka 5.V.1988; k-m) 3 verse types of a bout, Phulchoki Mt. 14.V.1980; n) 1 verse type of a bout, Dhorpatan 18.V.1973. Note similarity of verse types of different ♂: a-c=k=n, d-f=l.

Vocalizations: Territorial song (Fig.50) of the Lesser Cuckoo is presented in bouts, i.e. long sequences of verses which vary in syntax and note form within each sequence according to a fixed scheme. Three different verse types have been observed within the bout. The 1st type (Fig.50a-c, k) consists of 5 notes, the 2 notes at the beginning being shortest and more widely spaced than the others; the 2nd type comprises 6 notes with syntax consistent with 1st type except for the addition of an angular note (Fig.50d-f, l, n); the 3rd type is more regular (comprising 6-7 notes) and its last half always consists of angular notes (Fig.50g-i, m). The different verse types are repeated with great accuracy within a bout and in different bouts. Furthermore, verse types of different ♂ are often identical except for minor details in frequency; in a few cases the number of notes and the verse syntax are altered (Fig.50g-i, m). Length of the bout varies considerably and often bouts remain incomplete. Full bouts are about 20 s long (9 verses) but may be longer if more verses are incorporated. Intervals between verses of a bout are longest at the beginning, shortest at the end (reduced from appr. 3.5 to 1 s). Frequency range of the verse is relativey wide, compared to other cuckoo species; the broadest note of the verse often covers the whole bandwidth, not exceeding 1.5 kHz. Length of the individual verse (of 3 ♂) ranges from 0.82 to 1.2 s. – Song activity was noticed from 4.IV. (Sunichare, 500 m) to 18.VI. (Chichila, 1950 m).

Cuculus micropterus

Horizontal: During the calling season I noticed (by voice) *micropterus* in nearly all larger parts of the expedition area from S Annapurna to near the eastern border. – Descent from Ghandrung to Modi Khola (9.V. :Parbat); – between Landrung and Dhumpus (9.V., 27.IV.): Hyangja, Tibetan Camp (10.V.); near Pokhara (11.V. all :Kaski); – Marsyandi Valley, between Turture and Syuribar (8.IV.); near Phalesangu (9.IV. :Lamjung); – Kathmandu, sub-

urb Balaju and Rani Ban (19.IV., 4./5.V. :Kathmandu); – Tumlingtar (22./23.VI.); from Dharapangma to Khandbari, common in agricultural land (22.VI.); Chichila (19.VI.); between Mure and Hurure (9.-12.VI. all :Sankhua Sabha); – Kabeli Khola Valley near confluence of Tada Khola (24.IV. :Panchthar).

The distribution is not well-balanced. In many apparently suitable valleys, regarding altitude and vegetation, for unknown reasons I did not hear *micropterus*. Nor did I come across it in any valley close to the main chain, e.g. Kabeli Khola near Yamputhin (:Taplejung), in the middle reaches of the Marsyandi (:Tanhu) or in Thakkhola, Kali Gandaki Valley (:Mustang).

Vertical: *C. micropterus* is a species of subtropically influenced vertical belts which stays well below 3000 m during the breeding season. 10 of the localities (records by voice) are located between 500 and 1400 m, 6 between 1600 and 1900 m, additional ones at 2100 m, 1 at 2850 m (E Chitre, S Annapurna :Parbat; 7.V.1980), the latter height being exceptional.

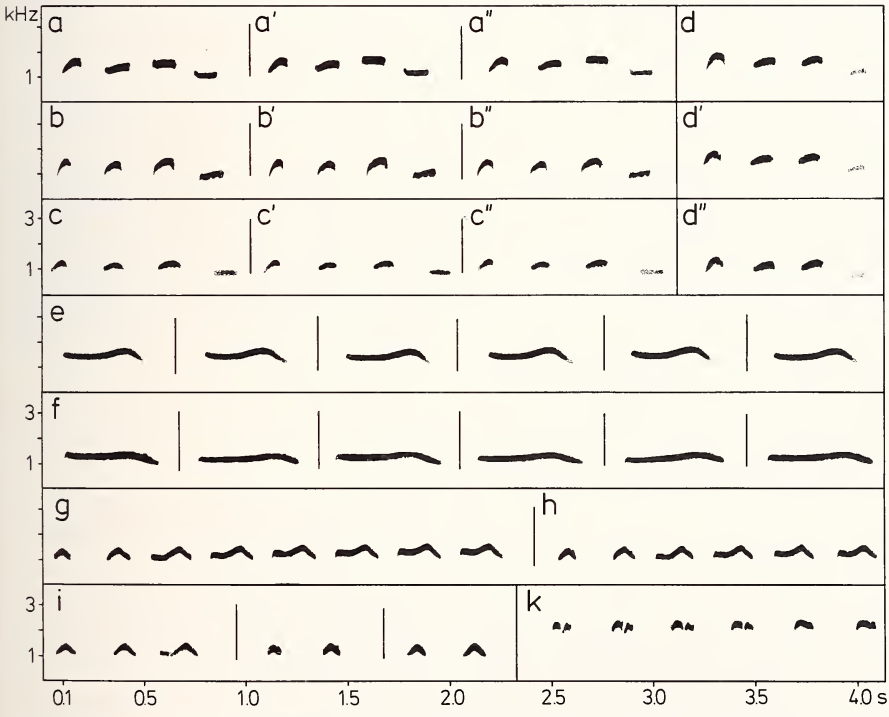

Fig.51: Territorial song of *Cuculus micropterus* and *Eudynamys scolopacea*. – a-a") *Cuculus micropterus*, 3 verses of 1 ♂, Kathmandu Valley, Balaju 4.V.1973; b-b") 3 verses of 1 ♂, Mure/Hurure 14.VI.1988; c-c") 3 verses of 1 ♂, Landrung/Dhumpus 9.V.1980; d-d") 3 verses of 1 ♂, Russia, Ussuriland, Bychikha S Khabarovsk 12.VI.1990.
e-k) *Eudynamys scolopacea*, e) 6 one-note verses from a longer song sequence, Kathmandu 19.IV.1973; f) one-note verses of two different types; g-i) "vyuk..." verses of different length; k) "kyek..." call series; all Baglung 31.V./1.VI.1995.

Assuming that all calling ♂ (IV-VI) belong to the breeding population, the vertical belt comprises about 2350 m. Inskipp & Inskipp (1991) give the vertical belt from the Terai lowlands to normally 2100 m (locally but rarely higher), data largely congruent with my own.

Habitat: The Indian Cuckoo prefers spaced forest formations, natural stands as well as scattered old trees in agricultural land, even within villages. It is the only *Cuculus* species thus living in close association with man. In the latter habitat it may be common: above Khandbari (:Sankhua Sabha, 1400-1150m, 22.VI.1988) a ♂ sang every 500 m; in village groves at the Tumlingtar airport 3♂ were to be heard at one site (500 m, 23.VI.). It regularly occurs in parks and groves close to Kathmandu City (IV/V 1973). In the Kabeli Khola Valley (:Taplejung), a locality with natural though thinned-out forest vegetation, ♂ sang in stands of *Shima wallichi* und *Pinus roxburghii* (23.IV.1988). – Regarding common occurrences with other *Cuculus* species see Tab.1.

Vocalizations: Territorial song (Fig.51a-d) is a short verse (0.8-0.92 s in 4 ♂ checked), which is repeated without noticeable length variation. It invariably consists of 4 whistled notes; those which are slightly angular are always opened downwards. Frequency width of the whole verse is narrow, ranging from 200 to 260 Hz in 4 ♂, but is invariable in the individual ♂. Relative frequency level of the notes of the verse is characteristic, with an alternation between high- and low-frequency notes (h-l-h-l in 4 ♂), the last note always being the lowest and the smallest in amplitude. Frequency range of the verses of 4 ♂ is from 960 to 1360 Hz, including a ♂ from Ussuriland. There is remarkably little variation in all characters checked within the 4 ♂ investigated (3 from Nepal and 1 ♂ from the lower Ussuri, Russia). This rhythmical and clear song is well known to the lowland Nepalis, who associate this call with the start of the ripening period of the fruits of a wide-spread Myricaceae species, *Myrica esculenta* ("kaphal") and combine both events to an onomatopoetic sentence ("káphal pákeo"). – Song activity noticed from 8. and 9.IV. (Marsyandi Valley, 530-700 m) to 23.VI. (Tumlingtar, 500 m); it certainly extends into B VII.

Eudynamys scolopacea

Eudynamys [scolopacea], incl. *melanorhyncha*

Horizontal, vertical, habitat: Baglung, 900 m (31.V./1.VI. :Baglung); – Pokhara, 800 m (27.IV. :Kaski); – Kathmandu, King's forest, 1350 m, (19.IV. :Kathmandu). – All specimens were heard in tree-rich agricultural land in city suburbs.

Vocalizations: Territorial song (Fig.51e-f) is a single note (0.41-0.42 s [Kathmandu]; 0.44-0.49 s and 0.56-0.58 s in 2 different note types [Baglung] of the 2♂ recorded); displayed approximately every 2 s. This mellow "ko-el" call is repeated very accurately and in individual ♂ variations are difficult to discern (Fig.51e), in others they are more pronounced (Fig.51f). Frequency range narrow: lower and upper note limit 1160/1640 Hz (480 Hz bandwidth) and 1080/1320 Hz and 1080/1480 Hz in a 2nd note type in the 2♂ recorded. Besides this one-note call other vocalizations are very likely also used in territorial context: accelerating soft "vyuk vyuk.." verses (Fig.51g-h) of different length (at least up to 2.2 s); note form similar to that of the "ko-el" call but shorter, frequency modulation more pronounced (lower/upper limit 1080/1440 Hz). Note types at the beginning differ from the re-

mainder of the verse. Those verses may be shortened (Fig.51i) until only the introductory notes remain. ♂ aroused by playback experiments use loud "kyek kyek.." series of higher pitch (2240 Hz mid-frequency) and different notes within the series (Fig.51k).

STRIGIDAE

Otus

Three species are recorded for Nepal *(bakkamoena, sunia, spilocephalus);* all breed. The 2 former species are mainly confined to the Terai lowlands and adjacent hills, only *bakkamoena* penetrates to slightly higher elevations. *O. sunia* lives in the midlands up to 2600 m. All species have been infrequently recorded and no interactions between any of them have ever been observed. Roberts & King (1986) claim, referring to differences in vocalizations, that *bakkamoena* may consist of 2 independent species *(O. bakkamoena, O. lempiji)* of largely allopatric areas, which are nearly parapatric in Nepal. The differing calls of the two have been identified in Nepal. More detailed field studies are needed, however. Whenever there is a good opportunity to collect tissue samples for genetic investigations, it should be grasped (see Sibley & Monroe 1993).

Otus sunia sunia (Hodgson)

Otus [scops] sunia

Material: 1 specimen: **N** Chitawan Distr., Rapti Valley S Tekouli, N piedmont of Siwalik Mts., 300 m, 20.II.1970: ♀.

Measurements: **Wing**-L 144 mm. – **Tail**-L 64 mm. – **WTI** 27.8% (P10 between P3 and P4), cf. Ali & Ripley (1969,3:263); compared to *scops, sunia* has very rounded wings. – **TWI** 44.4%.

Habitat: The specimen was mist-netted in a small clump of trees close to the Sal forest edge.

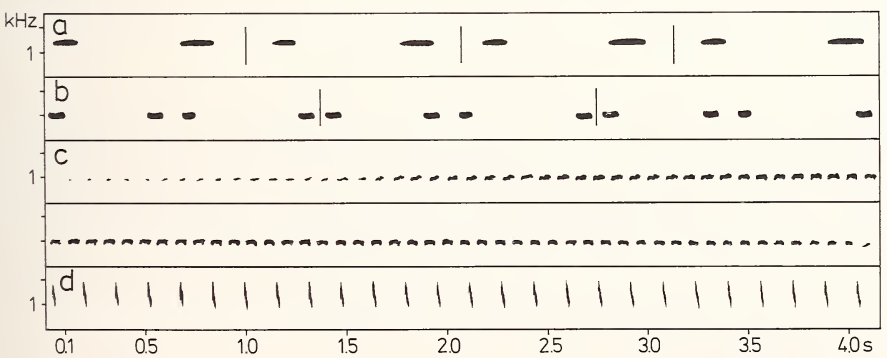

Fig.52: Vocalizations of Strigidae and *Caprimulgus indicus.* – a) *Otus spilocephalus,* 4 verses of 1 ♂, Khebang/Yamputhin 25.IV.1988; – b) *Glaucidium brodiei,* 3 verses of 1 ♂, Bega Deorali 18.V.1995; – c) *Glaucidium castanopterum cuculoides,* 1 verse, above Yektin 21.IV.1988; – d) *Caprimulgus indicus,* part of a continuous call series, Chitre/Deorali 3.V.1995.

Otus spilocephalus

Otus [spilocephalus] (Sibley & Monroe 1990)

Horizontal, vertical, habitat: Potana, 2000 m, 1 sp. calling (28.IV.1995 :Kaski); – between Khebang and Yamputhin, 2000 m, 1 sp. calling at dusk (25.IV.1988 :Taplejung), in open tree-rich cultural land with forest remnants nearby.

Vocalizations: The song (Fig.52a) given at dusk or in darkness consists of two clear whistling notes ("dew-dew") at 1350 to 1400 Hz, separated by an interval of 0.5 s or slightly less. Length of the notes 0.14-0.17 s (1st note) and 0.19 to 0.2 s (2nd note) in the only individual recorded. For additional sonagrams (Pakistan) see Roberts & King (1986).

Bubo

Three species are Nepal residents *(bubo, nipalensis, coromandus).* All have their strongholds at altitudes up to 2000, but due to the scarcity especially of the 2 latter species, details are virtually unknown. *B. bubo* may live in cultivated land close to human settlements if breeding sites on cliffs are available.

Bubo bubo

Bubo [bubo] , incl. *capensis, virginianus*

Horizontal, vertical: Above Balaju, N of Kathmandu City, people showed me 2 fledged juveniles on 1.V.1973 and tried to sell them. Months ago they had been taken from the nest situated in a rock face close to the Dike Pakeo cave near the village. At this locality I saw a flying adult bird, and pellets on the ground bore witness to the presence the Great Horned Owl. It has been known since Hodgson's time to inhabit the N parts of the Kathmandu Valley. – Pellets from this breeding place contained 4 *Suncus murinus,* 7 *Mus musculus,* 10 *Rattus rattus,* 18 *Bandicota bengalensis,* 1 *Bandicota indica,* about 3 birds, about 2 anurans, at least 5 large beetles, probably Scarabaeidae (J. Niethammer pers. comm. 15.IX.1973). This prey species composition reveals that the local pair hunted in agricultural land and close to human habitations.

Glaucidium

Three species occur in Nepal *(brodiei, radiatum, castanopterum);* all breed. Their vertical distributions extend from the Terai lowlands *(radiatum, castanopterum)* to the upper limit of the (sub) tropical belt to about 1600 m *(radiatum)* or up to the cloud forests at 2500 m *(castanopterum).* Only *brodiei* reaches the lower limit of the Palaearctic Region, at up to 3000 m, but avoids the lowlands. The 3 species may potentially occur together at altitudes around 1300-1500 m, and their interactions and possible segregations should be studied there.

Glaucidium brodiei

Horizontal, vertical: The only observation between Bega and pass Bega Deorali, 2350 m (17./18.V. :Myagdi).

Habitat: The above specimen sang all day long in somewhat degraded and opened broad-

leaved forest within the cloud-forest zone. The observation is near the upper limit of the regular occurence of the species in Nepal (Inskipp & Inskipp 1991).

Vocalizations: Territorial song (Fig.52b) is a verse of 4 notes, 2nd and 3rd placed close to each other, resulting in a rhythmic and most characteristic mellow "too-toto-too". In the only ♂ recorded the notes are slightly bent upwards (980-1040 Hz, mid-frequency close to 1000 Hz). Notes are less than 0.1 s long, shortest the 3rd one (0.07 s). The verse is invariably repeated for long sequences, also during daylight.

Glaucidium radiatum radiatum (Tickell)

Material: 1 specimen: **N** Chitawan Distr., Rapti Valley, S Tekouli, N of piedmont of Siwalik Mts., 300 m, 16.II.1970: ♂.

Measurements: **Wing**-L 135 mm. – **Tail**-L 72.5 mm. – **WTI** 22.2%. – **TWI** 53.7%.

Habitat: The only encounter was with the above bird mist-netted close to the Sal forest edge.

Glaucidium castanopterum

Horizontal: My records only close to the Sikkim/Darjeeling border. – Ascent to Sablako Pass from Yektin (21.IV.); Yektin (21.IV.); Paniporua (19.IV. all :Panchthar).

Vertical: Found only within the upper part of the species' vertical range: 1500 m (near Yektin), 2300 m (Paniporua). It extends from the Terai lowlands regularly up to 2000 m, but is rarely met beyond.

Habitat: In open woodland near forest edge (Paniporua) and tree-rich agricultural land (around Yektin). In all three cases the birds were heard at dusk or in the late morning.

Vocalizations: A prolonged quick "musical whistle 'wowowowowowowowo'" of increasing amplitude, maximum length of the individual note about 0.07 s (Fig.52c). Note structure changing within a narrow frequency range of about 50 Hz, from slight ascent to a knee with additional ascent, or, within the same verse notes with an ascent, a horizontal part and a similarly descending end. Main frequency of the note 1000 Hz, embracing a span of 50 Hz including the frequency modulations. Length of the verse 4-7 s (cf. Ali & Ripley 1969,3:290).

Athene

The 2 Nepal species *(brama, noctua)* are very different ecologically. *A. brama* is a tropical lowland species, which in many places is closely associated with man. *A. noctua* is confined to a few high-altitude localities of the Tibetan Himalaya in treeless areas N of the main range. The two will never meet in the area.

Athene brama indica (Franklin)

Athene [noctua] ?brama. The dark forms *A. n. impasta* and *A. b. poikila* live sympatrically in Sichuan.

Material: 1 specimen: **B** Kathmandu, 1350 m, 22.IX.1969: ♀.

Measurements: **Wing**-L 162 mm. – **Tail**-L 83 mm. – **WTI** 28.4%. – **TWI** 51.2%.

Habitat: A common and widespread species in the Kathmandu Valley floor.

Strix

Two breeding species are on the Nepal list *(aluco* and *leptogrammica).* The former inhabits the upper, predominantly Palaearctically infuenced forest belt; the latter is partial to the lower forests, which belong to the Indomalayan (Oriental) Region, but it has been only scantily recorded and its distribution is not well understood. Possible interactions of the two species have never been recorded.

Strix aluco nivicola (Blyth)

Material: 1 specimen: **D** Mustang Distr., Thaksang above Tukche, 3150 m, 21.XI.1969: ♂.

Measurements: **Wing**-L 290 mm. – **Tail**-L 170 mm. – **WTI** 31%. – **TWI** 58.6%.

Horizontal: Dhorpatan, skin in Coll. H.S. Nepali (V :Myagdi); – Thaksang above Tukche (21.XI.; see Material; :Mustang). – Vocalizations recorded at: Pahakhola (VI :Sankhua Sabha); – Paniporua (IV :Panchthar); – Dhorpar Kharka (IV :Ilam).

Vertical: The specimens originate from 2950 m (Dhorptan) and 3150 m (Thaksang); the remainder from 2300 m (Paniporua) and 2700 m (Dhorpar Kharka, Pahakhola).

Habitat: All my finds extend from forests of the upper zone of evergreen cloud forests near 2300 m through *Rhododendron/Quercus* forests near 2700 m to *Abies/Pinus* forests at 3000 m and even to the monsoon-protected belt N of the main range of the Kali Gandaki Valley in *Abies/Pinus/Betula* forests at 3150 m. Diesselhorst (1968:171) collected the Tawny Owl in VII even near 4000 m close to Mt. Everest. Consequently, it occupies a broad ecological band in the C Himalayas.

CAPRIMULGIDAE

Caprimulgus indicus

Horizontal, vertical: Upper Myagdi Khola, Boghara, 1800 m, 27.V. (:Myagdi); – between Chitre and Deorali pass, 2600 m, 2700 m (5.V.1980, 3.V.1995); Banthanti, 2650 m (30.IV.1995, all :Parbat); – Tamur Valley, Lungtung, 1870 m (18.V.1988 :Taplejung).

Habitat: All observations originate from well-forested sites. The Jungle Nightjar seems to prefer areas with rock faces; they were present in 3 of the 4 localities.

Vocalizations: Territorial song (Fig.52d) consists of "endless" "tk tk tk .." sequences, given at dusk, dawn and for long periods also at night. The individual notes are composed of short downstrokes, sometimes beginning with a short upstroke, the note ranging from 920 (lower) to 1920 Hz (upper limit). Note length is near 0.02 s; distance between notes in the only ♂ recorded always near 0.14 s with little variation.

APODIDAE

Collocalia brevirostris

C. [brevirostris] incl. *vulcanorum*

Horizontal, vertical: above Dhumpus, 2100 m, 15-20 sp. (9.V. :Kaski); – Arun Valley, Chichila, 1950 m, about 10 sp. (17.VI.); Karmarang, 950 m, several times single sp. (5.VI.);

Pahakhola, 2700 m, flock, about 10 sp. (4.VI. all :Sankhua Sabha); – ascent from Yamputhin to Lassetham, appr. 2000 m, about 5 sp. (1.V. :Taplejung). – Though a locally commonly distributed species, no breeding record is known from Nepal yet, consequently its breeding belt is also unknown. "Summers up to 4575 m" (Inskipp & Inskipp 1991) is the only generalized information in this respect.

Habitat: Hunts frequently in open country, including agricultural land, often close to the ground above meadows, fields or river surfaces. Other preferred habitats are difficult to locate.

Hirundapus caudacutus

H. [caudacutus] incl. *cochinchinensis*

Horizontal, vertical: between Thodung and Jiri, 2000 m, 1 sp. (9.IV. :Ramechap). – There are many observations scattered mostly over the eastern parts of the country, but no breeding record yet.

Apus

Four species occur in Nepal; all breed *(apus, pacificus, melba, affinis),* their ecologies and distributions being very diverse. *A. affinis* and *melba* are (sub)tropical species occurring up to about 2000 m, but only *affinis* is closely associated with man. *A. pacificus,* a Palaearctic species occupying an insular area in the Himalayas, occurs mainly between 2000 m and 3800 m in summer, far from human settlements. *A. apus* was only recently discovered as a summer visitor to the dry areas of the Inner Valleys of Annapurna and Dhaulagiri and in Dolpo where it is locally common.

Apus apus

A. [apus], incl. *niansae*

Horizontal: My records are only from Thakkhola and Dolpo. – Below Phoksumdo Lake, 6 sp. (6.VI.); Tarakot, 3 sp. (17.V.); and below, 2 sp. (10.VI.); Gompa/Tarakot, 5 sp. (11.V.); upper Barbung Khola, Kakkot, several calling (12.VI.); between Kakkot and Pimring, 7 sp. (12.VI.); ascent to Parung La from Tukot, 1 sp. (19.VI. all :Dolpo); – Sangda, several (22./23.VI.), 20 sp. (28.VI.); between Muktinath and Kagbeni, 1 sp. (21.IV.); Purano Marpha, singles and up to 10 sp. (9.-12.V., 7.VII.); Marpha, 5 sp. (8.VII. all :Mustang).

The small Nepal breeding range seems to be quite isolated. In the Himalayas, records during the breeding season are confined to the extreme W Himalayas (Ali & Ripley 1970,4:43). Vaurie (1972) could not spot any specimen in S Tibet, and Cheng (1987) excludes nearly all Tibet from the breeding area. One may search for scattered colonies along the Himalayan axis W of Dhaulagiri.

Vertical: The above observations from the presumed breeding season (V-VII) or close to it (IV) extend from 2300 m (below Tarakot, 10.VI.) to 4200 m (near Sangda, 23.VI.); 11 further localities are evenly distributed within this framework. All recordings except one (see below) refer to foraging parties and are not apt to delimit the breeding belt. Inskipp & Inskipp's (1991) altitudinal indication is unclear: 2000-3795 m during summer (M III to VII, IX) obviously includes localities within the monsoon area, but their altitude is not mentioned.

Habitat: During summer the Common Swift is confined to the dry Inner Valleys and the northern macroslope of the Dhaulagiri and Annapurna massifs. Our own records are limited to Thakkhola and Dolpo, the latter ones all from 1970, the first records for the species in Nepal. Within the monsoon-protected areas, no vertical limitation seems to exist, at least not for foraging flocks. Records from the Barbung Khola below Tarakot and at Marpha are close to moist monsoon-influenced areas, but apparently the Swifts strictly avoid them in summer (see *Ptyonoprogne rupestris).*

Breeding: 6 specimens flew along a high cliff in the Suli Gad Valley near the ascent to Phoksumdo Lake on 6.VI.1970, probably a breeding place. But none disappeared in cracks or holes, and a breeding record is still lacking for Nepal.

Apus pacificus

A. [pacificus] incl. *acuticauda*

Horizontal, vertical, habitat: Upper Simbua Khola, 3250m (10.V. :Taplejung). A flock of 7 sp. skimmed high over the forested valley early in the morning, apparently shortly after leaving the roosting place. – The Fork-tailed Swift is said to be quite common in Nepal, but there is only one breeding colony known (Inskipp & Inskipp 1991).

Apus affinis

Horizontal: Muri, Myagdi Khola (24.III.); near Beni (21.III. both :Parbat); – Marsyandi Valley, Phalesangu (9.IV. :Lamjung); – Kathmandu (noted as early as 16.III., probably present earlier); – Khandbari (20.VI.); Tumlingtar (23.VI. both :Sankhua Sabha).

Vertical, habitat: The above data agree with other information in that the House Swift inhabits the lowlands up to about 2100 m (Inskipp & Inskipp 1991, Fleming et al. 1976), but highest breeding records, though the species is easy to observe, have not been recorded in detail. The House Swift seems to depend entirely on human habitations in Nepal; no other breeding habitats have been noticed so far. It apparently nests only in larger settlements, not in single scattered houses or small villages. – Adults were seen entering nests in Kathmandu houses on March 16.

Apus melba

(= *Tachymarptis melba)*

Horizontal, vertical: Naudara ridge W Pokhara, 1300 m, 1 sp. (21.II. :Kaski); – Mai Pokhari, 2200 m, 4 sp. (26.III. :Ilam).

The record in II is considerably above the regular winter observations (mentioned rarely up to 915 m), and the one in III is at the upper limit of the regular summer occurrence (Inskipp & Inskipp 1991).

ALCEDINIDAE

Ceryle rudis

Horizontal, vertical: Pokhara, Phewa Tal, 800 m, 20.II.1974; – between Tilhar and Kusma, 1000 m, 2 sp. 18.III.1970 (both :Kaski); – lower Myagdi Khola close to Beni, 950 m, 21.III.1970 (:Myagdi).

Habitat: All observations in areas strongly influenced by man, on lake shore (Phewa Tal) or river banks.

Halcyon smyrnensis smyrnensis (L.)

Halcyon [smyrnensis], incl. *cyanoventris*

Material: 1 specimen: **N** Chitawan Distr.. Rapti Valley, S Tekouli, N foothills of Siwalik Mts., 300 m, 19.II.1970: ♂.

Measurements: **Wing**-L 125 mm. – **Tail**-L 87 mm. – **Bill**-L 67, -**Height** (at Gonys) 14.3 mm. – **Tarsus**-L 16.5 mm. – **WTI** 20.8%. – **TWI** 69.6%.

Horizontal: Records from Rapti Valley (19.II. :Chitawan; see Material); – Kusma (20.III. :Parbat); – between Dumre and Turture, between Turture and Syuribar (7.-8.IV. :Tanhu); – Phalesangu (9.IV. :Lamjung); – Kathmandu (19.IV.); – Yektin (21.IV. :Panchthar); – Mai Pokhari (1.IV. :Ilam); – Karkavita (2.IV. :Ihapa).

Vertical: My records extend from 180 m (Karkavita) up to 2100 m (Mai Pokhari), frequently encountered up to 750 m, above the level of the Kathmandu Valley only twice: 1500 m Yektin, 2100 m Mai Pokhari. Data coinciding with those given by Inskipp & Inskipp (1991).

Habitat: The White-breasted Kingfisher lives in a great variety of open landscapes in the tropical zone, often in agricultural land and even in close proximity to human settlements. It penetrates even into gardens within Kathmandu City to exploit small ponds.

Alcedo atthis

A. [atthis] incl. *semitorquata*

Horizontal, vertical: near Pokhara, 1000 m, 2 sp. (15.VII. :Kaski); – Trisuli, 570 m, 1 sp. (21.IV. :Nuwakot). – The Eurasian Kingfisher is a lowland species in Nepal, which is regularly seen up to 1000 m.

MEROPIDAE

Merops orientalis orientalis Latham

Merops [orientalis], incl. *boehmi*

Material: 2 specimens.: **N** Chitawan Distr., Rapti Valley S Tekouli, Hatisar, 300 m, 14.II.1970: 1♂, 1♀.

Measurements: **Wing**-L ♂ 91, ♀ 96.5 mm. – **Tail**-L ♂ up to T6 71 mm, up to T1 119.5 mm; ♀ up to T6 73 mm, up to T1 130 mm. – **Bill**-L ♂ 26.5; ♀ 30 mm (Fry 1984:105 measured in a different way). – **WTI** ♂ 33%; ♀ 34.2%. – **TWI** (if referred to Tail-L of T6 !) ♂ 78% and ♀ 75.6%.

Horizontal, vertical: During my few brief stays in the lowlands I met the Green Bee-eater regularly only in the Rapti Valley during II 1970.

Merops leschenaulti

Horizontal, vertical: Between Turture and Syuribar, 600 m, 2 specimens. 8.IV.1980; – several times singles near Phalesangu, (both :Tanhu), 750 m, 9.IV.1980; – N Sunichare (:Ilam), 250 m, 4.IV.1988, several times in the canopy of huge trees, Sal forest.

CORACIIDAE

Coracias benghalensis

Horizontal: Near Pokhara (11.V.), between Tilhar and Kusma (19.III. both :Kusma): – Marsyandi Valley, between Dumre and Turture (7.IV.): between Turture and Syuribar (8.IV. both :Tanhu): – Phalesangu (9.IV. :Lamjung): – Tumlingtar, 2 sp. (22.VI. :Sankhua Sabha): – Nodia Khola, Siwalik Mts. (6.IV.): N Sunichare, 2 sp. (5.IV. both :Ilam).

Vertical: The Indian Roller is confined to the tropical and parts of the subtropical lowlands and hills. The records presented here range up to 1000 m (Tilhar/Kusma; Pokhara): they are in accordance with the data in Inskipp & Inskipp (1991).

Habitat: Quite varied, in general wooded country with spaced stands of trees, therefore often in tree-rich cultivated land, even close to human settlements. It apparently avoids closed forest, but forest edges or thinned-out parts are occupied. Trees must be large enough to provide nest-holes.

Breeding: Courtship-flight display over agricultural land on 8.IV., specimen demonstrating possible nesthole in tree on 6.IV. including loud and piercing hissing when sitting close to the hole.

UPUPIDAE

Upupa epops

Horizontal: Own data from lower Dolpo (breeding season), Kathmandu (possibly breeding season), upper Khumbu (migration) and Terai (possibly breeding). – Ascent from Dunahi in Thulo Bheri Valley to Suli Gad Valley (8.VI.), between upper and lower Dunahi (8.VI.), between Tarakot and Gompa SE Tarakot (V), Gompa/Tarakot (11.V., 17.V. all :Dolpo): – Kathmandu New Baneshwar (17.IV.): – Khumjung (IX), Gorak Shep (IX), Thame Teng (X), Sumna, path to Lunag (X, all :Solukhumbu): – near Kosi Barrage (3.IV. :Sunsari).

Vertical: Breeding season or close to it: The observations from Dolpo range between 2350 and 2600 m (near Dunahi and ascent to Suli Gad Valley), 3000 m (near Tarakot) and 3300 m (Gompa above Tarakot), 1350 m (Kathmandu).

Habitat: Breeding population: The area in Dolpo is situated N of the main range but is quite low and therefore still within the general area of forest vegetation. This region is famous for western (Mediterranean) floral elements such as *Olea cuspidata*, *Punica granatum*, *Cedrus deodara* and *Picea smithiana*. Hoopoe localities were on sparsely covered barren slopes (near Dunahi), semi-cultivated land (between Tarakot and Gompa) and open bushy ground near cultivation and forest edge *(Picea, Betula)*. – Gardens with trees in Kathmandu suburbs.

Breeding: On 8.VI.1973 1 pair carried food and apparently approached the nest, which I could not search for (barren slopes above Dunhai, 2400-2600 m; additional observations of more adults nearby, same date).

The breeding area of the Hoopoe in Nepal, despite many observations during the presumed breeding season scattered over many parts of the country (Inskipp & Inskipp 1991),

has not yet been worked out and there are certain contradictions. At least, it is unanimously believed that the local breeding populations belong to several subspecies.

(i) *U. e. saturata* is the widespread subspecies of Tibet (Vaurie 1965), where it is locally common (Schäfer 1938:173). Ali & Ripley (1970,4:127) suggest that it breeds in a southward extension of this area in the Tibetan facies of the High Himalayas in Nepal; altitude 2500-4500 m (Ripley 1982:216) or 1700-4400 m (Inskipp & Inskipp 1991). But there is no proof or evidence for breeding activity in the upper part of this extended belt. Except for the observations at lower S Dolpo (see above), which is not a part of the Tibetan facies landscape in Nepal, I did not come across any specimen above 3300 m and not at all in N Dolpo between Phoksumdo Lake, Charka and Sangda or in Thakkhola (V, VI, VII 1970, 1973, 1980, 1995). As one might expect, in the humid high Himalayas S and W of Kanchenjunga there was also no sign of it (V, VI). Diesselhorst (1968:175), too, emphasizes that there is no breeding population of the Hoopoe in the upper, drier parts of Khumbu and states that all the *saturata* specimens he collected there (VIII, IX) were northern passing migrants.

(ii) *U. e. ceylonensis* is the low-altitude subspecies, extending from N India into S Nepal normally below 1500 m (Ali & Ripley 1970,4:128; Inskipp & Inskipp 1991) or below 1700 m (Ripley 1982:216). The few actual breeding records in Nepal extend as high as the Kathmandu Valley at about 1400 m (Fleming et al. 1976).

(iii) Nominate *U. e. epops* is said to extend as far E (between the areas of *saturata* and *ceylonensis)* as N Punjab (intermediates with *ceylonensis* even further E) (Vaurie 1965:679), or to Uttar Pradesh (Ripley 1982:216) and even through Garhwal to Kumaon (Ali & Ripley 1970,4:125), which is close to the W Nepal border. It is open to question whether the locally common W Nepal population consists of W Himalayan nominate *epops* and/or intermediates with *ceylonensis.* The lower Dolpo harbours easternmost populations of many dry-adapted Mediterranean (sensu lato) faunal elements (see plant species above), and the W Nepal Hoopoe population may belong to this category.

In the Nepal Midlands, the Hoopoe is a rare bird during breeding season and apparently absent over long distances. I never met it there except for the Kathmandu Valley.

Migration: All specimens from close to Everest represent migrants from Tibet or even further N (ssp. *saturata);* my observations range from 3800 m (Khumjung) to 5000 m (Gorak Shep). Autumn migration close to the high passes crossing from Tibet has been discussed by Diesselhorst (1968:175). In this area it starts late in VIII (first migrant 29.VIII., Diesselhorst, l.c.) and finishes in X (last one from 8.X., Martens 1971:122).

BUCEROTIDAE

Buceros bicornis

Horizontal, vertical: N Sunichare, 250 m (4.IV. :Ilam). The specimen flew within the canopy of tall trees in Sal forest *(Shorea robusta);* this observation was reported by Inskipp & Inskipp (1991). The Great Hornbill is now rare in Nepal due to large-scale deforestation of the lowlands. Its strongholds are likely to be in the eastern dun valleys and Siwalik Mts., where human settlements are still scanty but tending to increase.

CAPITONIDAE

Megalaima

Nepal harbours seven species; all breed *(virens, zeylanica, lineata, franklinii, asiatica, australis, haemacephala).* From the Terai lowlands upwards they occupy the whole tropical and subtropical belt up to 2500 m, but altitudinal belts of most species differ. The lowest are those of *australis, zeylanica* and *lineata,* all below 1000 m including the lowlands; *haemacephala* ranges up to 1400 m, *asiatica* up to 2000 m, *virens* from 900 to 2200 m, and *franklinii* from 1350 to 2400 m. At least two species may occur in close proximity *(haemacephala* and *asiatica,* Kathmandu Valley; *haemacephala, asiatica* and *virens,* outskirts of Pokhara). Several species colonized the Himalayas and their adjoining lowlands from their main areas in SE Asia *(virens, franklinii, lineata, asiatica).* They are absent from most parts of India except the NE. All Nepal Barbets are forest species, but prefer edges, open stands, groves and even small groups of trees, preferably the tall *Ficus* species *religiosa* and *bengalensis.* Therefore tree-rich cultivated land is occupied by all species except *australis* and perhaps *zeylanica.* This pre-adaptation to man-made open habitats may account for the widespread occurrence of Barbets in present midland Nepal.

Megalaima virens

Horizontal: Records from southern slopes of Dhaulagiri to the Sikkim/Darjeeling border. – Upper Myagdi Khola, Boghara (20., 27.V. :Myagdi); – above Dhumpus (9.V.); near Mahendra Gupa (11.V.); between Dobila and Kusma, flocks of 6-10 sp. in tall trees (19.III. all :Kaski); – Thodung, 2 sp. (6.IV. :Ramechap); – between Mure and Hurure (12./14.VI. :Sankhua Sabha); – Yamputhin (24.IV.); confluence of Thada and Kabeli Khola (24.IV.); ascent to Sablako Pass (22.IV. both :Taplejung); – Worebung Pass and ascent from S (21.IV.); Hinwa Khola below Yektin (20.IV. both :Panchthar).

Vertical: Main distributional zone is the subtropical belt within the *Castanopsis* zone. Our records include 900 m (wintering flocks in III) and from 1100 m (Mahendra Gupa) to 2100 m (Landrung/Dhumpus and Mure/Hurure) during the presumed breeding season (IV-VI). About 10 additional records are evenly distributed within this narrow belt, which is consi-

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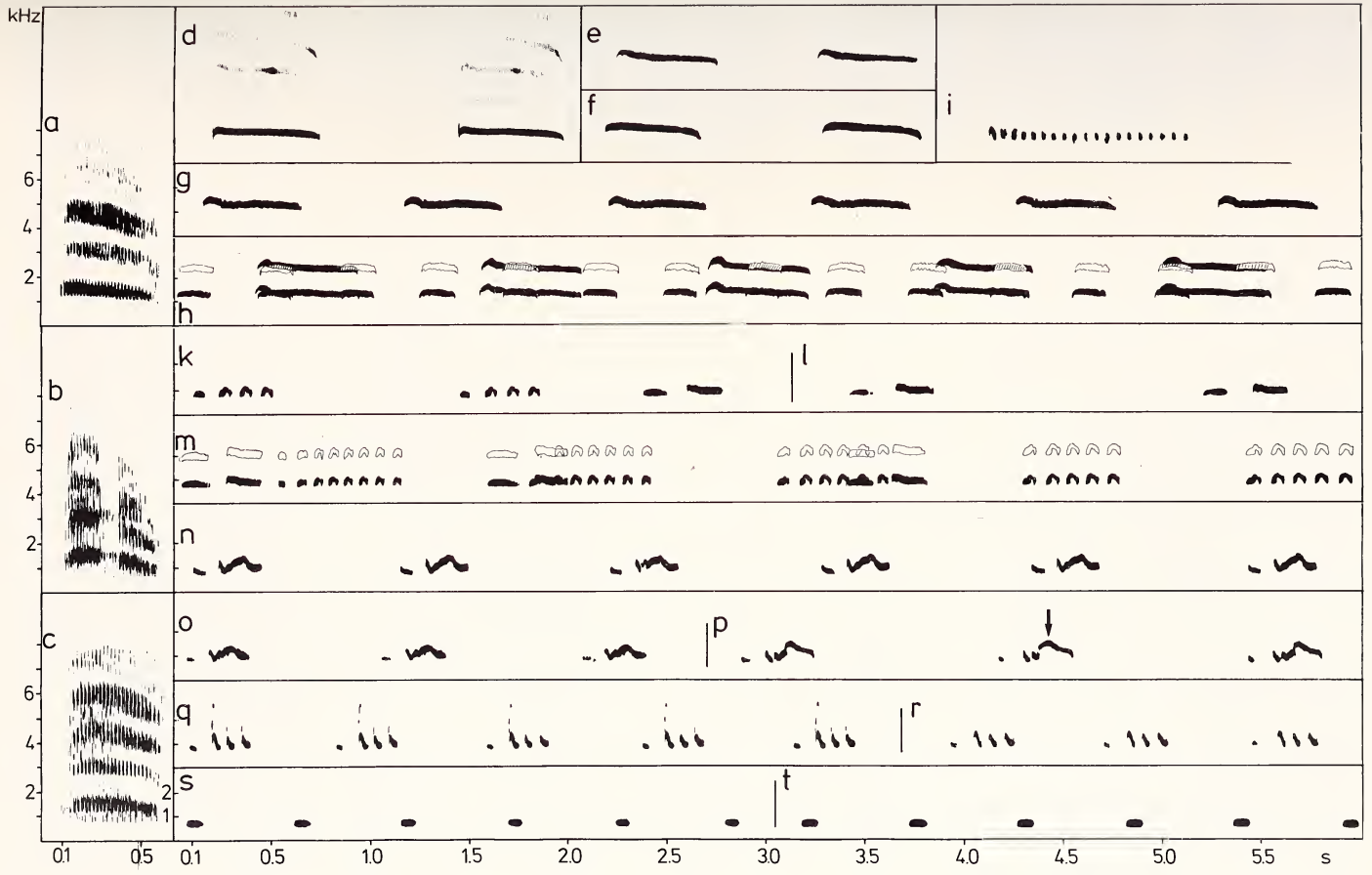
Fig.53: Vocalizations of *Megalaima* species. – a-h) *M. virens,* a-c: calls, a, c) Worebung 21.IV.1988 ("kirr"); b) between Mure and Hurure 12.VI.1988 ("kree-krää"); d-h: territorial songs ("piao"), d) 2 notes with harmonics, Kabeli Khola 24.IV.1988; e) Worebung pass 21.IV.1988; f) above Yektin 21.IV.1988; g) part of song sequence, above Dhumpus 9.V.1980; h) duetting of ♂ and ♀; lower (all black) sonagrams according to time and frequence scale, upper sonagrams to show ♂ and ♀ part, ♂ parts black, ♀ parts white; this part only according to time scale; Yamputhin 29.IV.1988.
k-m) *M. lineata,* territorial song, k) sequence of ♀ (2 note groups of 4 notes each) and ♂ (2 units); l) sequence of 2 ♂-note groups; m) duetting of ♂ and ♀; upper sonagrams to show irregular relation of ♂ and ♀ parts.
n-p) *M. franklini,* territorial song, parts of sequences of different ♂; arrows indicate change of note structure; all ♂ from Yamputhin; n) 29.IV.1988; o) 30.IV.1988; p) 26.IV.1988.
i, q-r) *M. asiatica,* territorial song, sequences of 2 ♂, i) call sequence ("pirrr"), below Khandbari 21.VI.1988; q) Kathmandu Valley 19.IV.1973; r) Khandbari 21.VI.1988.
s-t) *M. haemacephala,* territorial song, sequences of 2 ♂, s) Kathmandu Valley 19.IV.1973; t) Philippines, Leyte 19.II.1991.



stent with the report of Inskipp & Inskipp (1991). The observation of two specimens at Thodung, 3150 m, 6.IV.1973, is an extraordinarily high altitude.

Habitat: The Great Barbet is largely a forest species, but prefers forest edges and clearings. Tree-rich agricultural land is well colonized, but tall tress in clumps, mainly *Ficus bengalensis* and *F. religiosa,* which are commonly planted in or near midland villages, are important requirements for permanent residence.

Vocalizations (Fig.53a-h): The "mournful wailing ..'piao, piao' of great volume and far reaching quality" (Ali & Ripley 1970,4:148) has often been described. The single call of such series (Fig.53d-h) is a prolonged whistle with a constant length of about 0.5 s in the individual ♂ (0.47-0.48 s, n=4, in 1♂), produced at intervals close to 0.6 s. Each whistle rises to about 1.5 kHz at the beginning, then descends slowly and levels off near 1.3 kHz. Vocal interactions between ♂ and ♀ have been described as duetting (Ali & Ripley 1970,4:148, Fleming et al. 1976), but in the 2 recordings available no sychronization between the two partners' vocal contributions is recognizable (Fig.53h). The shorter ♀ part consecutively falls into varying ♂ parts. Evidently, both partners follow their own rhythm without time adjustment. The ♀ part comprises regularly spaced whistles ("tok tok ..") at frequencies being nearly identical to the ♂ calls. For calls see Fig.53a-c.

Megalaima lineata

Horizontal, vertical, habitat: Nodia Khola, Siwalik Mts. between Sunichare and Soktim, 320 m (7.IV. :Ilam). – 2 specimens were in tall trees at a forest edge adjacent to the open valley floor.

Vocalizations: Only one tape recording available, showing complex interactions (Fig.53k-m): 1 specimen starting with loud "do-daul" calls from the canopy, another flying to it from a short distance and joining it in series of different calls, loud voiced "p-pr-pr-pr" with up to 7 notes (Fig.53k); the first notes are less frequency-modulated than the following ones, the latter slightly more widely spaced. No clear duetting was recognizable, the parts of the two partners sometimes alternating, sometimes synchronous (Fig.53m). Presumably partners of a pair were concerned, the ♂ starting the series. Frequency of whistled "do-daul" calls 0.8 kHz (1st note) and 0.88-1.0 kHz (2nd note, slightly modulated from higher to lower frequency). The slight frequency jump is cearly audible. – Vocal interactions of pair partners have not been described in the Lineated Barbet and they may be similar to those of the Great Barbet.

Megalaima franklinii

Horizontal, vertical: Our records in the SE Dhaulagiri massif and close to the Sikkim border. – Myagdi Khola below Khibang, 1350 m (14.V. :Myagdi); – Kabeli Khola Valley, close to Yamputhin, 1650-1950 m (26.-30.IV. :Taplejung). – Inskipp & Inskipp (1991) give the vertical distribution for Nepal as "between 1500 m and 2400 m", but no details concerning seasons are available at present. The record from the Myagdi Khola is the westernmost of the species' range.

Habitat: All observations in the Yamputhin area and below Khibang refer to secondary forest with low trees and dense scrub. The singing ♂ were exposed in low trees and mostly

easy to see. In the riparian forests close to the banks and on the eastern slopes of the Kabeli the Golden-throated Barbet was encountered at several places and apparently locally quite common, but the individual ♂ were distinctly spaced. At no locality could two be heard.

Vocalizations: Territorial song (Fig.53n-p) consists of long series of monotonous rhythmic well-spaced note groups like "do-daul", similar to calls of *M. lineata* but distinctly more modulated, the note groups being almost invariably repeated. Only in rare cases do slight modifications occur (Fig.53n arrow). The note groups consist of two notes, a short low nearly mono-frequency introductory note and a whistled but well frequency-modulated main note, always starting with a downstroke. The note groups of the three recorded ♂ are extremely similar, but well discernible individually. Frequency in all 3 ♂ similar and not exceeding 1.5 kHz, lowest part 0.76 kHz, introductory note 0.4 kHz or less.

Megalaima asiatica

M. [asiatica] incl. *monticola*

Horizontal: Pokhara (11.V. :Kaski); – Marsyandi Valley, between Turture and Syuribar (8.IV. :Lamjung); – Kathmandu Valley, Raniban (20.IV. :Kathmandu); – Khandbari (21.VI. :Sankhua Sabha); – confluence of Kabeli and Tada Khola (24.IV.); – ascent to Sablako Pass (21.IV. both :Taplejung); – Hinwa Khola Valley below Yektin (20.IV. :Panchthar); – N Sunichare (4.IV. :Ilam).

Vertical: Our records range from 250 m at the S foothills of the Siwaliks to 1550 m in the midlands (Sablako Pass). The records, all from the breeding season or close to it, are evenly distributed over this belt. These data coincide with those given by Inskipp & Inskipp (1991), and there are only few records above this altitudinal limit.

Habitat: Like other Nepal barbets, the Blue-throated is predominantly a forest bird with preference for open stands and clearings (Sunichare). It is well able to live in tree-rich agricultural land, sometimes even single or small groups of tall trees (Khandbari: *Ficus* along roadside). In suitable areas population density may be high, ca. 5 calling ♂ within 2 km distance (Khandbari, 950-1250 m).

Vocalizations: The ♂ displays long series of note groups with little or no variation from one note group to another (Fig.53q-r). The single note group is built up of 4 notes: an extremely short and low whistle-like one, then a group of three mainly descending notes, at least the first of the three having a slightly broader frequency range than the last two. The single note group can be rendered as "ou chorr", the "o" closed; also noted as "chuperup" (Fleming et al. 1976). Variation between individual ♂ is minor and refers to distance between 1st and 2nd note (Fig.53q-r). Frequency does not exceed 1.5 kHz. The meaning of long "pirr..." calls (note groups; Fig.53i) has not yet been determined. Intense singing activity, indicated by long call series, still on 21.VI. (Khandbari).

Megalaima haemacephala

Horizontal, vertical: Pokhara and Suiketh Valley NW Pokhara, 1200 m (26.IV., 10.V.); near Mahendra Gupa N Pokhara, 1100 m (11.V. both :Kaski); – Kathmandu Valley, Rani Ban, 1350 m (19.IV. :Kathmandu). The Coppersmith Barbet regularly occurs up to 1350 m and

has been confirmed as a breeding bird in the Kathmandu Valley (Fleming et al. 1976). It prefers open lowland forests, but frequents tree-rich agricultural land as well; it preferably conceals itself in the huge *Ficus bengalensis* and *F. religiosa* trees in and around villages.

Vocalizations: Territorial song (Fig.53s-t) consists of endlessly and monotonously repeated, often for minutes, "tok tok.." notes, which are whistles always at the same pitch. There seems to be very little variation, for song characteristics in Nepal (Fig.53s) and in the Philippines (Leyte; Fig.53t) are alike: note length, ♂ from Nepal: 0.05 s; Leyte: 0.07 s in 2 specimens; interval between notes: Nepal 0.44-0.46 s (n=9), Leyte: 0.45-0.48 s (1st ♂, n=6), 0.47-0.48 s (2nd ♂, n=6); – frequency: Nepal 0.68 kHz in many notes without variation, Leyte 0.64 kHz (1st ♂) and 0.76 kHz (2nd ♂), no variation.

PICIDAE

Picumnus innominatus

Taxonomic notes: The present ♀ has upper head and neck predominantly grey; this does not fit the ssp. *innominatus* Burton.

Material: 2 specimens: **B** Rasuwa Distr., below Ramche/Trisuli Valley, 1500 m, 28.IV.1973: 1 ♀. **D** Myagdi Distr., upper Myagdi Khola, S Boghara, 1450 m, 28.V.1995: 1♂.

Measurements: **Wing**-L ♂ 58.5, ♀ 59 mm. – **Tail**-L ♂ 33 mm. – **Bill**-L ♂ 13, ♀ 12 mm. – **Tarsus**-L ♂ 12.5 mm. – **WTI** ♂ 14.5, ♀ 15.3% – **TWI** ♂ 56.4%.

Notes: Testes 2 and 2.5 mm long. Ovary undeveloped; bill blackish; feet grey.

Horizontal, vertical: The two specimens testify my only observations of this minute woodpecker. According to Inskipp & Inskipp (1991) the hitherto known finds are from altitudes between 915 m and 1830 m, not regarding seasons.

Picus

Five resident species are on the Nepal list *(chlorolophus, flavinucha, canus, xanthopygaeus, squamatus). Xanthopygaeus* (below 1000 m), *flavinucha* (up to 1500 m), *chlorolophus* (mostly up to 1800 m) and *canus* (up to 2000 m) are confined to the lowlands. The only high-altitude species is *squamatus* (1800-3700 m). Four species may potentially coexist at close range, but no interactions have hitherto been described. *P. squamatus* is confined to the W and C Himalayas; within its large Palaearctic/Oriental area *canus* settled the narrow Himalayan area strip from the E.

Picus canus

Horizontal: My finds are from the S Annapurna and from near the Darjeeling border. – Annapurna: between Tilhar and Kusma (19.III.); Modi Khola Valley, below Ghandrung (8.V.: both :Parbat); – Potana (28.IV.); between Landrung and Dhumpus (9.V. both :Kaski); – Siwaliks N Sunichare (7.IV. :Ilam); – Uyam (22.IV. :Panchthar); – confluence of Tada and Kabeli Khola (23.IV. :Taplejung).

Vertical: The above observations span a broad belt: 320 m (Siwalik Mts.) and 2100 m (Land-

rung/Dhumpus) are frame values; 5 additional localities are evenly distributed between 900 und 1450 m. Diesselhorst (1968:182) cites records from the breeding season up to 2600 m from the (extended) Everest area (overlooked by Inskipp & Inskipp 1991). Accordingly the Grey-headed Woodpecker inhabits the largest vertical area band among all woodpeckers of the C Himalayas.

Habitat: Manyfold according to the large vertical distribution, but broad-leaved forests prevail and the pattern from closed to open and spaced forest types is broad. Forest edges and any open formations are frequented, also groves of the tree-rich agricultural land (near Pokhara) are regularly inhabited, even single trees or small groups of tall trees are visited during the breeding season (Uyam); territorial display is presented there and the Grey-headed Woodpecker may breed in such places. This plasticity in selecting a large array of habitats may have been advantageous to live in the present-day landscape of midland Nepal, which is now largely deforested and where the species lives at many places (comp. Diesselhorst 1968:182).

Vocalizations: Verses of the territorial song (Fig.54b-c) consists of a sequence of loud and soft flute-like (3♂ recorded) notes of low frequency (between 1.84 and 2.24 kHz in 2♂; frequency band even narrower in the individual ♂). Every note slightly ascends at the beginning and descends at the end; at short interval a short click-like appendix finishes every whistled note. The verse slows down towards the end (i.e. pauses between the notes become longer: 1st ♂ beginning/end 0.18/0.25 s; 2nd ♂ 0.15/0.21 s). Note lengths vary from ♂ to ♂ nearly at the proportion of 1:2 (1st note of the verse in 2 ♂: 0.097 s and 0.18 s); Frequency descent low within the verse (1st ♂ verse with 7 notes: starts at 2.24 kHz, ends at 2.12 kHz; 2nd ♂ verse of 5 notes: 1.92 kHz/1.84 kHz) or descent completely lacking. – There exists marked regiolect difference compared to C European populations: harsher and slightly more notes which descend less marked in pitch.

Picus squamatus squamatus Vigors

Material: 1 specimen: **D** Dolpo Distr., Gompa near Tarakot, 3300 m, 14.V.1970: ♂.

Measurements: **Wing**-L 163+x mm. – **Tail**-L 114 mm. – **Bill**-L 44 mm. – **Tarsus**-L 28 mm. – **WTI** 20.9%. – **TWI** 69.9%.

Notes: Feathers of upperside strongly worn.

Horizontal: My records originate only from the Dhaulagiri massif: Gompa near Tarakot (14.V.; see Material; :Dolpo); – Dhorpatan (13.IV.1970; 9.V.1973; 1 specimen in Coll. H.S. Nepali; :Myagdi); – Titi (4.VII.), Thaksang above Tukche (9.VII. both :Mustang). – Within the Everest region the Scaly-bellied Woodpecker is at its eastern area limit.

Vertical: All my records are situated within a narrow span of 600 m, all stem from the potential breeding period or immediately afterwards: 2700 m (Titi), 3150 m (Thaksang), 3000-3300 m (Dhorpatan), 3300 m (Gompa). Inskipp & Inskipp (1991) cite 1850-3700 m, but records above 3100 m are scanty.

Habitat: Tall-trunk forests of different composition dependent from the local precipitation rate. Forests near Gompa/Tarakot and Thaksang are situated N of the Himalayan main range and are monsoon-protected. There exist *Picea smithiana* (Gompa), *Abies spectabilis, Pinus wallichiana* and sparsely *Picea* (Thaksang); near Titi open *Pinus* forest prevails, in the

Dhorpatan Valley (monsoon-exposed) *Abies* on the valley slopes, *Juniperus* on the valley bottom. All encounters locally happened only once, only in the Dhorpatan Valley the Scaly-bellied Woodpecker was met in 1970 and 1973.

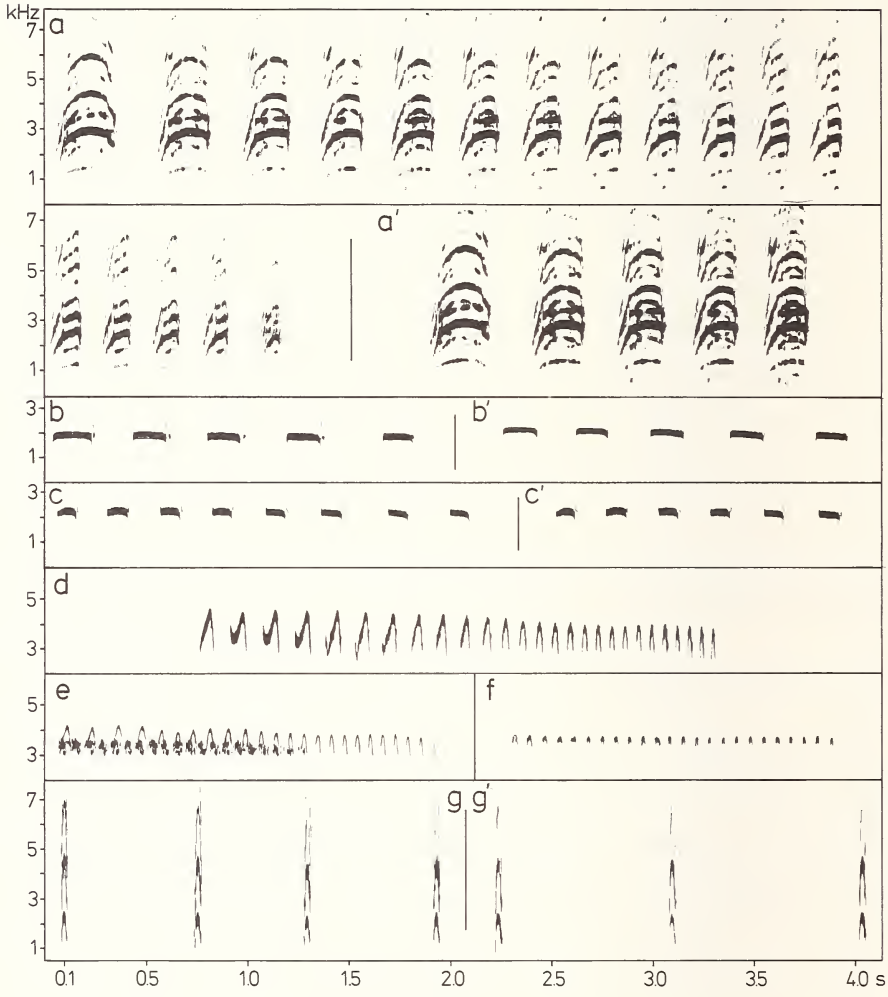


Fig.54: Vocalizations of Picidae species. – a-a') *Blythipicus pyrrhotis,* territorial song, complete verse (a) and part of a verse (a'), Mai Pokhari 1.IV.1980.
b-c) *Picus canus,* territorial song, 2 verses of 1 ♂ each; b/b') Nodia Khola 7.IV.1988; c/c') Uyam 22.IV.1988.
d-g) *Dendrocopos darjellensis,* territorial song (d-f) and warning calls (g/g'); d) ♂ verse, Chordung Mt. 28.III.1973; e) part of ♂ and part of ♀ verse partly simultaneously displayed, ♀ part out of focus of the parabolic screen, Chordung Mt. 28.III.1973; f) presumed ♀ verse, Gosainkund 26.IV.1973; g/g') warning calls at nest hole, natural sequence, g: ♂ calls, g': ♀ calls, above Pahakhola 30.V.1988.

Chrysocolaptes lucidus

Horizontal, vertical: Several times up to 3 specimens together and displaying courtship behaviour in the Sal forest of the S piedmont of the Siwalik range N Sunichare, 270 m (4.-5.IV.1988; :Ilam); 1 sp. Mai Khola Valley, ascent to Ilam, 900 m (8.IV.1988; :Ilam).

Blythipicus pyrrhotis

Horizontal: One observation from S Dhaulagiri and S Annapurna, more regular occurrence from Arun Valley to the E border. – Dhaulagiri: upper Myagdi Valley, Boghara (27.V.1995 :Myagdi); – Annapurna: between Landrung and Dhumpus (9.V.1980 :Kaski); – Arun Valley between Mure and Hurure (12.VI.1988); Chichila (19.VI. 1988, both :Sankhua Sabha); – Omje Kharka NW Yamputhin (3.V.1988); Yamputhin, left bank of Kabeli Khola (29.IV.1988, both :Taplejung); – Paniporua (17.IV.1988; :Panchthar); – Mai Pokhari (1.IV.1980 :Ilam).

Vertial: 1800 m (Boghara), 1900 m (Yamputhin), 1950 m (Chichila), 2100 m (Landrung/Dhumpus; Mure/Hurure; Mai Pokhari); 2300 m (Paniporua), 2400 m (Omje Kharka). – All observations originate from the months of the presumed breeding season (or close to it), IV, V and VI. There is good reason to suspect that *pyrrhotis* is confined to an extraordinarily narrow vertical area band of about 600 m during the breeding season and hence, in addition to its secretive habits, the only scarce observations of the species in Nepal might be explained. Inskipp & Inskipp (1991) cite recordings down to 1525 m and even 75 m.

Habitat: During the breeding months the Bay Woodpecker is partial to dense broad-leaved forests of the subtropical belt: mainly *Castanopsis, Acer, Quercus.* There it lives very secretively on the lower parts of the trunks and even close to the ground. By its colouration poor in contrast (except for the yellow bill) it is quite unconspicuous. I mainly succeeded to spot this woodpecker by its voice.

Migration: Vertical movements outside the breeding season probably occur. Diesselhorst (1968:188) and Inskipp & Inskipp (1991) enumerate finds down to 75 m (V), which altitudes do not belong to the breeding belt.

Vocalizations: Territorial song (Fig.54a-a') is a far-carrying sequence of up to 24 "kwäh" calls (length up to 6.5 s); amplitude descends to the verse end. The single notes become contiuously shorter towards the verse end (start 0.28 s, end 0.09 s; 16 notes); accordingly this happens with the pauses between the notes (1st pause 0.23 s, last pause 0.13 s; 16 notes). Note types within the verse are mostly identical, but note type change within the verse occurs when the bird is strongly aroused. By rich formation of harmonics notes are very complicately structured. Audial impression is very nasal, in cases similar to the C European Green Woodpecker *(Picus viridis),* but verses of *pyrrhotis* are markedly longer and therefore also different in rhythm.

Dendrocopos

Nepal harbours 9 resident species *(himalayensis, darjellensis, cathpharius, hyperythrus, mahrattensis, auriceps, macei, canicapillus, nanus).* They inhabit the forest belt from the lowlands up to 3500 m; the species assemblage leaves the upper subalpine zone void of any congener. Lowland species are *mahrattensis, nanus* (Terai), *macei* (up to 1850 m) and *canicapillus* (Terai and Duns); medium-altitude-species are *himalayensis, hyperythrus* (2000-3000 m), *darjellensis* (2000-3500 m), *auriceps* (1000-2500 m) and *cathpharius* (1500-2800 m). *Himalayensis* is confined to the dry W, *darjellensis* and *cathpharius* to the C and E parts of Nepal. Coexistence at close range and interactions of any of these species remain to be worked out.

Dendrocopos himalayensis himalayensis (Jardine & Selby)

Dendrocopos [major] himalayensis

Material: 3 specimens: **D** Dolpo Distr., Gompa near Tarakot, 3300 m, 14.V.1970 and 3./4.VI.1973: 3 ♀.

Measurements: **Wing**-L (3) 125-131+x mm. – **Tail**-L (measured to web's end) (3) 74-82 mm. – **Bill**-L (3) 27-29 mm. – **Tarsus**-L (3) 20.5-23 mm. – **WTI** (3) 25.0-29.6%. – **TWI** (3) 59.2-64.1%. – Bill ratio (= height in % of length) (3) 26.9-29.3%.

Notes: Ovary in 1 ♀ (V) slightly developed. Bill above dark grey, lower basis lighter (yellow-grey-blue), feet lead-grey.

Horizontal, vertical, habitat: My own observations are restricted to the forested areas above Gompa near Tarakot (:Dolpo). The Himalayan Woodpecker was common there in M V (1970) and A VI (1973), where it lived in *Picea smithiana* forest with few admixed *Betula utilis.*

The species reaches its eastern area limit in the W Dhaulagiri massif. Gompa (N flanks) and Dhorpaten (S flanks; Morioka 1985) have approximately the same E longitude and congruent altitude but differ markedly in the local precipitation rate: Gompa relatively dry during monsoon season, Dhorpatan opposite. Such a remarkable microgeographic pattern is parallelled by *Emberiza cia* (which see). Like the woodpecker the bunting's main area extends from the W Himalaya to the Dhaulagiri where it is strongly confined to arid regions except for the rain-rich Dhorpatan Valley.

Dendrocopos darjellensis (Blyth)

Taxonomic note: On the clinal geographical variation comp. Ali & Ripley (1970,4:218, footnote) and Short (1982:263).

Material: 2 specimens: **J** Dolakha Distr., Cherakapti N Jiri, 2350 m, 10.IV.1973: 1 ♀. **M** Ilam Distr., upper Gitang Khola Valley, N Mai Pokhari, 2500 m, 30.III.1980: 1♂.

Measurements: **Wing**-L ♂ 129; ♀ 125 mm. – **Tail**-L (measured to web's end) ♂ 77; ♀ 77 mm. – **Bill**-L ♂ 34 mm. – **Tarsus**-L ♂ 23; ♀ 21.5 mm. – **WTI** 24.8-25.6%. – **TWI** 59.7-61.6%. – Bill index (= height in % of length) 23.5%.

Notes: ♀ bill dark grey, feet grey, iris read (brown).

Horizontal: My records range from SW Dhaulagiri to the E border. – Upper Myagdi Khola, Dobang (27.V. :Myagdi); – near Chitre (5.V. :Parbat); – Trisuli Valley, Syng Gyang (25./26.IV. :Rasuwa, skin in Coll. H.S. Nepali); – Kathmandu Valley, Phulchoki Mt. (14.V. :Lalitpur); – Chordung Mt./Jiri (28.III.); between Jiri and Cherakapti (10.IV., see Material; both :Ramechap); – descent to Pahakhola and above Pahakhola, breeding record (30.V.-4.VI. :Sankhua Sabha); upper Simbua Khola (13.V.); pasture Lassetham (V, both :Taplejung); – upper Gitang Khola, near Dhorpar Kharka (29./30.III. :Panchthar). – The record from Myagdi Khola is the westernmost of the species' range.

Vertical: My finds are to be regarded as being situated within the breeding season or close to it (III-VI) and are concentrated within a narrow vertical belt less than 1000 m wide. Frame values: 2550 m (Gitang Khola, 30.III.), 3480 m (nest hole, V) und 3500 m (V), between them nearly 10 localities with even vertical distribution. Inskipp & Inskipp (1991) mention distribution all over the year between 1830 m and 3500 m but breeding season's records are not separated. In the Everest region Diesselhorst (1968:185) discovered *darjellensis* only between 3000 and 3450 m (V). It is unlikely that *darjellensis* breeds markedly below 2500 m; the upper limit is still to be determined.

Habitat: Forests but within the inhabited altitudinal belt preferences are not to be recognized yet; also in spaced and marginal structures of broad-leaved, coniferous and mixed forests (comp. Diesselhorst 1968:185).

Breeding: ♂ and ♀ feed juveniles still in the nest hole, dead *Betula* trunk, hole appr. 5 m high, 50 cm below the upper trunk's end (3480 m, 30.V.1988). Diesselhorst (1968:185) discovered 2 nests near Jiri and Bigu, in which youngs were being fed also at M and E V (overlooked by Inskipp & Inskipp 1991).

Vocalizations: Territorial song (Fig.54d-g) consists of trill verses 1.5-2 s long. Notes are angular-shaped and opened downwards. Verse rhythm accelerates towards the verse's end; note length and pause length become shorter. There exist 2 different note types, which probably apply to ♂ and ♀. The presumed ♂ verse (Fig.54d) has a wide frequency range (1.5-2 kHz), the presumed ♀ verse (Fig.54f) is much narrower (0.5 kHz and less). Fig.54e simultaneously illustrates both verse types, the ♀ part being out of focus of the directional microphone. Warning call (Fig.54g-g') of ♂ and ♀ near the nest hole is a strong "kick" given in long sequences. The note is narrowly angular-shaped, opened downwards and includes 1-2 harmonics.

Dendrocopos cathpharius cathpharius (Blyth)

Material: 1 specimen: **D** Myagdi Distr., upper Myagdi Khola valley, pasture Dobang, N Boghara, 2400 m, 25.V.1995: ♂.

Measurements: **Wing**-L 104 mm. – **Tail**-L 60.5 mm. – **Bill**-L 19 mm. – **Tarsus**-L 17 mm. – **WTI** 24%. – **TWI** 58.2%.

Horizontal, vertical, habitat: 1♀ above the left bank of Kabeli Khola opposite Yamputhin (:Taplejung), in undergrowth-rich mixed broad-leaved forest, 1900 m, 28.IV.1988. The ♂ from Dobang was in heavy moist broad-leaved forest; also *D. darjellensis,* a markedly larger species, lived there. The Myagdi Khola locality represents the westernmost outpost of

the species' range, but is situated still within the Kali Gandaki catchment area, from which the species is known.

Dendrocopos hyperythrus

Horizontal, vertical: 2 encounters of my own: nest hole at which ♂ and ♀ fed, on the slopes of the Dhorpatan Valley, 3000 m (15.V.1973; :Myagdi). – 1♂ and 1 ♀ around the pasture Lassetham, 3350 m (7.V.1988; :Taplejung).

Habitat: Both finds in the W and in the E of the country happened in the *Abies*/tree *Rhododendron* zone at spaced forest edges. The nest hole was built in nearly dead tree at an open place, surrounded by *Abies* forest. The Rufous-bellied Woodpecker likes to bore small holes in the bark (Fleming et al. 1976); the Lassetham fir forests showed many signs of such activity.

Breeding: Also Diesselhorst (1968:184) encountered the species between 3200 and 3400 m during the breeding season (V, gonadal states!); these data may point to a narrow vertical band width. Recordings below 3000 m are outside the breeding season (comp. Rand & Fleming 1957, Diesselhorst 1968:184).

Dendrocopos canicapillus

Dendrocopos [kizuki] canicapillus

Horizontal, vertical: 1♂ near Betrawati, Trisuli Valley, 1000 m (21.IV.1973 :Nuwakot), on *Ficus bengalensis* in cultural land, works on fruits.

ALAUDIDAE

Calandrella

Three species are recorded in Nepal *(cinerea, acutirostris, raytal);* the two latter breed and *cinerea* is a winter guest from Tibet. *C. acutirostris* is confined to high altitudes in dry NW Nepal N of the main range, *raytal* is a breeding bird along Terai rivers.

Calandrella acutirostris tibetana Brooks

Material: 4 specimens: **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4250 m, 21.-23.VI.1973: 1♂, 1♂ pull., 2♀.

Measurements: **Wing**-L ♂ 94 mm, ♂ pull. 84 mm (P10 14 mm long); ♀ 87 and 91 mm. – **Tail**-L ♂ 64 mm; ♀ 55 and 60 mm. – **Bill**-L/ **Height** (see below) ♂ 11/4.9 mm, ♂ pull. 7.5/4mm; ♀ 10.5/4.7 and 12/4.5 mm. – **Tarsus**-L ♂ 22 mm, ♂ pull. 20.5 mm; ♀ 19.5 and 20 mm. – **WTI** (3) 24.7-25.3%, pull. 24.4%. – **TWI** (3) 63.2-68.1%.

Notes: Bill height was measured near the forehead, bill length as usual in this volume at the margin of the forehead feathers. This explains the difference from the higher values of bill length presented by Vaurie (1951:478), who measured in a different way: "Bill from skull".

Horizontal, vertical, breeding: I traced Hume's Short-toed Lark only in the dry areas N of Dhaulagiri (:Dolpo) exclusively in close proximity to Charka village (see Material). Three pairs were breeding in the barley fields close to the village edge, several additional pairs near the village in the mountain desert-like dry slopes (Fig.36). E VI (stay 20.-25.VI.) birds

sang and collected food to feed already fledged young. 1st breeding record for Nepal; however, summer finds had been reported earlier from Dolpo (Inskipp & Inskipp 1991, Fleming et al. 1976). This distributional spot adjoins the Tibetan/Central Asian area, which produces limited offshoots to NW Nepal. The vertical belt of the Nepal population is unknown hitherto, but will probably not exceed 4500 m.

Alauda gulgula lhamarum R. & A. Meinertzhagen

Alauda [arvensis] gulgula (incl. *japonica)*

Material: 5 specimens: **D** Myagdi Distr., Dhorpatan, Uttar Ganga Valley. 2950-3350 m. 20.-23.V.1973: 3♂, 2♀.

Measurements: **Wing**-L ♂ (3) 100-103 mm; ♀ 94.5-98.5 mm. – **Tail**-L ♂ (3) 59-61 mm; ♀ (2) 56-59 mm. – **Bill**-L ♂ (3) 11.5-13 mm (**Height** in front of forehead: 5-5.2 mm); ♀ (2) 11-11.5 mm (**Height** 1 x 4.6 mm). – **Tarsus**-L ♂ (3) 21-25 mm; ♀ (2) 23-25 mm.

Tab.2: Wing/tip index (WTI) and tail/wing index (TWI) of 2 subspecies of *Alauda gulgula.*

	n	WTI (%)	x̄	TWI (%)	x̄
lhamarum	5	25.0–29.1	26.8	57.3–59.9	59.0
inopinata	13	23.7–27.9	25.7	59.7–64.8	62.5

Notes: Bill horn-brown, below grey, feet flesh-coloured. Testes of all ♂ strongly enlarged (9-12 x 5-7 mm), ovaries active. The larger *A. g. inopinata,* which does not breed in Nepal, shows slightly differing proportions (Tab.2).

Horizontal: A very locally breeding species, which I encountered only in the SW and W Dhaulagiri and in the W Annapurna area. – Dhorpatan (7.IV.-4.V.1970, 7.-25.V.1973); pass N Dhorpatan in direction to Tarakot, near the descent to the Thankur plain (5.V. both :Myagdi); – Muktinath and trail between Muktinath and Kagbeni down to Chinga, singing ♂ at several places (21.IV.1980 :Mustang). – Inskipp & Inskipp (1991) have cited the Dhorpatan Valley and the "Tibetan Plateau region" as breeding season sites; they called the subspecies *inopinata,* which is not correct.

Vertical: Singing ♂ displaying the typical advertising flight figure here indicate local breeding populations: Valley bottom of the Dhorpatan plain from 2950 m and on the S adjacent slopes up to 3400 m, to the NW on the open pass near 4100 m; on the NW Annapurna between 3400 m and 3600 m near Muktinath. If all singing ♂ represent breeding places, which seems to be beyond doubt, the vertical area belt would be ca. 1100 m wide. However, this belt is not continuous but is split into small to minute distributional islands, both N and S of the main chain.

Habitat: Open, spaced valley bottoms and adjacent grassy slopes; this landscape, at least in the Dhorpatan Valley (Fig.21), is man-made. Near Muktinath, far N of monsoon precipitation influence, arid and originally vegetation-reduced slopes are inhabited, locally also arable cultural land as in Central Europe. However, the Oriental Skylark is not always associated with agriculture in Nepal, as it avoids terraced landscapes all over the midlands.

Breeding: Song noted from 8.IV. onward, simultaneously still gathered in small flocks on the valley bottom. E V the local population scattered pairwise, gonads of maximum size (see above, Dhorpatan).

Vocalizations: Advertising song airborne as in *arvensis,* rarely given from the soil layer; rich in different elements. Differences between *gulgula* and *arvensis* remain to be worked out.

Eremophila alpestris elwesi (Blanford)

Eremophila [alpestris] incl. *bilopha*

Material: 9 specimens: **D** Dolpo Distr., descent from Namu La, direction toward Kangar, 4850 m, 17.VI.1973: 1♀ * between Zö La and Büko La (♀) and Büko La (♂), 4650 and 4880 m, respectively, 19.VI.1973: 1♂, 1♀ * upper Barbung Khola Valley, Charka, 4350 m, 22.VI.1973: 1♂ * headwaters of Barbung and Yulung Khola, 4950 m, 26.VI.1973: 1♂ * Dudje La, 4950-5000 m, 27.VI.1973: 3♂, 1♀.

Measurements: **Wing**-L ♂ (6) 118-123 mm, $\bar{x}$=120.4, s_d=2.33; ♀ (3) 110-112 mm. – **Tail**-L ♂ (6) 78-85 mm, $\bar{x}$=82, s_d=3.29. – **Bill**-L ♂ (6) 13-14.5 mm; ♀ (3) 11.5-13 mm. – **Tarsus**-L ♂ (6) 21-24 mm, $\bar{x}$=22.3, s_d=1.03; ♀ (3) 21-22 mm. – **WTI** ♂ (6) 30.5-32.8%, $\bar{x}$=31.8, s_d=1.07; ♀ (3) 27.9-30.9%. – **TWI** ♂ (6) 65.5-72.0%, $\bar{x}$=68.1, s_d=2.37; ♀ (3) 63.1-68.8%.

Notes: Moult: (1) ♂ P1-3, P7-9 well preserved, P4-6 worn. T1 very worn; (2) ♂ P1-3 new, P4-9 old; (3) ♂ P1-3 new, P4-9 old; (4) ♀ P1-3 new, P4-9 old, T1 very worn. – Bill and feet grey-black to black.

Horizontal: During breeding season, I encountered the Horned Lark only N of the Himalayan main chain in the Dhaulagiri massif (17.-27.VI. :Dolpo) NE of Phoksumdo Lake at high elevations between the Passes Namu La, Zö La, Büko La, Mo La, and descending to the valley of the upper Barbung Khola near Charka, slightly more to the SE in the valley of the Thajang Khola (=Yalung Khola) Valley to the pass Dudje La. At suitable places it was an ever-present breeding bird. – 1 specimen from the lower slopes of Mt. Chordung near Jiri collected when descending to Those (3.IV.1973 :Ramechap), refers to a late winter visitor (in coll. H.S. Nepali; already published with locality Mail Dala Jiri in Inskipp & Inskipp 1985, date in error 2.IV.1973). – The Horned Lark is known in Nepal only from the arid NW areas N of Annapurna (Lowndes 1955) and Dhaulagiri, in addition from Everest (Diesselhorst 1968:192). I was not able to trace it at the corresponding altitudes of Kanchenjunga massif (V 1988).

Vertical: The records in Dolpo, all during the breeding season, are restricted from 4300 m (Charka) to 5100 m (highest parts of Pass Dudja La). Most records are situated between 4600 and 4800 m close to the Passes Zö La and Büko La, but it was also still regularly seen at 5000-5100 m, including many singing ♂ (27.VI.1973). Diesselhorst (1968:192) delimits the breeding distribution of the Khumbu population (Everest) from 4900 to 5300 m, markedly more limited than in Dolpo. This may be related to preferences for arid landscapes and climates of ths ssp. *elwesi,* given that precipitation is reduced only at higher altitudes in the Everest region. The resulting vertical belt in Nepal is appr. 1000 wide; the upper limit of the breeding areas is imperfectly known.

Habitat: High altitude steppe in the monsoon-shielded region N of the Himalayan main chain, differing micro-habitats being accepted. Between Zö La and Büko La (4600-4900 m)

the Horned Larks lived on nearly vegetationless desert-like steppes, no closed cover of low perennial herbs or Gramineae being present, but locally scattered dwarf *Rhododendron* and *Caragana* bushes, in the Yulung Khola Valley on grassy plain along the river and on slightly sloping yak pasture with closed vegetation cover (4600-4900 m), much moister than the parts of Dolpo which are more distant from the main chain. On the plateau of Dudje La (5000-5100 m), which is rich in perennial herbs, it lived only on slightly inclined slopes, not on eroded slate boulders or areas with open soil. In the Everest area (Diesselhorst 1968:192) monsoon influence is much more pronounced, and, consequently, the lower part of the vertical area-belt of the Horned Lark is cut off.

Breeding: In 2nd half VI (1973) the whole spectrum of breeding activity was observed; in many cases birds kept pair-wise or single, occasionally in small flocks (families with fledged young?). Fledged young with adults on 22.VI. near Charka, simultaneously nearby an adult nest-building; testes maximally developed at this time. Nest on nearly vegetationless ground, only widely separated single dwarf bushes; nest below such a bush, still incomplete, ground pieces forming a small "path" leading to the nest.

Migration: Only insignificant; the Horned Larks mainly stay within the area of the main chain, only occasionally descending to Thakkhola which is close to the breeding grounds. The single bird near Jiri far S of the main range (2600 m, see Horizontal) is unusual.

HIRUNDINIDAE

Riparia

Two species occur in Nepal; *paludicola* breeds in the tropical and subtropical zones, *riparia* is a rare passage migrant and winter visitor.

Riparia paludicola chinensis (Gray)

Material: 2 specimens: **N** Chitawan Distr., S Tekouli, Hatisar, Rapti Valley, 300 m, 14.II.1970: 1♂, 1♂ pull.

Measurements: **Wing**-L 96.5 and 92 mm. – **Tail**-L 43 and 39.5 mm, tail graduation 4.5 and 3.5 mm. – **Tarsus**-L 11 and 10.8 mm. – **WTI** 49.2 and 50%. – **TWI** 44.6 and 42.9%.

Horizontal, vertical: The two specimens originate from a large colony in the Rapti Valley. Already in M II, the birds frequented the nest holes in sandy cliffs bordering the Rapti River. A small flock of about 15 sp. hovered over a small river near Kutunabari (:Ilam), 230 m, S piedmont of Siwalik Range, 6.IV.1988, together with other hirundines.

Ptyonoprogne rupestris

P. [rupestris] incl. *fuligula*

Horizontal: Quite restricted; our records are only from the dry parts of Dhaulagiri area. – Ringmo/Phoksumdo Lake (27.V., 6.VI.); Kangar (18.VI.); between Kakkot and Pimring (12.VI.); between Tukot and Parung (19.VI.); Charka (21.VI.); ascent to Dudje La from W (25./26.VI. all :Dolpo); – above Sangdak (22.VI., 28.VI.); Jomosom (21.-26.III., 21.IV.); Syang (31.III.); Purano Marpha (15./16.III., 7.VII.); Tukche (30.IV., 22.VII. all :Mustang).

Vertical: Presumed breeding season (V-VII): lowest data: 2650 m (Tukche, 22.VII.) and 3200 m (Purano Marpha, 7.VII.); 10 further localities range in a continuous row from 3300 m (Kakkot/Pimring, 12.VI.) to 4650 m (ascent to Dudje La, 26.VI.), all in Dolpo Distr. N of the main range. – Outside breeding season (III-IV): localities only in Thakkhola within the breeding season area but much more restricted in altitudinal range, at least partly due to absence of the observer at high altitudes during the season. Records are as follows: 2650 m (Tukche, 30.IV.); 2750 m, (Jomosom, 21.-26.III.); 2700 m (Syang, 21.III.): 3200 m (Purano Marpha, 15./16.III.). – The vertical range of the species in Nepal is little known, but its occurrence is obviously closely related to its strict ecological requirements (see Habitat). My lowest and highest data (2650 m, 4650 m) may approximately mark the vertical belt. An alleged breeding record near Pokhara at about 1000 m (Inskipp & Inskipp 1991), however, needs confirmation as the locality is extremely low and falls within full monsoon influence.

Habitat: This highly movable species stays mainly around crags and cliffs where the nests are constructed. Nothing is known about daily movements even during the breeding period. Thus the true breeding grounds are not easy to allocate. However, it is remarkable that all of my own records originate from the dry areas around Dhaulagiri (Thakkhola, Dolpo), where the species was commonly met with. I never came across it anywhere else. Except the alleged Pokhara record (see Vertical), all other breeding season observations stem from this very area. Dr. G. Groh (pers.comm. 14.III.1994) informs me that breeding pairs observed by him do not originate from near Ghasa (within monsoon area!) as quoted by Inskipp & Inskipp (1991), but were recorded by him between Larjung and Marpha (within dry area!). Obviously, the Crag Martin is confined in Nepal to dry, monsoon-protected areas of the Inner Valleys and of the northern macroslope. There, however, even comparatively low altitudes may be occupied (see Breeding).

Breeding: 2 nests were found glued on cliffs at the western ascent to Dudje La at 4650 m, 25.VI. There was much faeces on the nest walls, and the juveniles had already left the nests. Only once did an adult come to the nests. This may be the highest breeding record within the whole Himalayan chain. Adults and fledglings on the wing were seen at Purano Marpha, 3200 m, 7.VII. Most likely, the breeding places were close by, but there is no proof.

Hirundo

Three species are on the Nepal list, two breed *(rustica, smithii),* while *fluvicola* is a winter visitor. *H. rustica* and *Cecropis daurica* (which see) are closely associated with man but do not leave the subtropical belt and stay as breeders below 2000 m. *H. smithii* is confined to the western Terai.

Hirundo rustica

H. [rustica] incl. *tahitica, lucida, angolensis*

Horizontal: Charka, 2 sp. (21.VI. :Dolpo): – Dhumpus (27.IV.) between Dhumpus and Suiketh (10.V.); Pokhara and Phewa Tal, many (20.II. both :Kaski); – Pisang, about 5 sp.

(17.IV. :Manang): – Kathmandu. City (30./31.III.): Balaju (1.V. both :Kathmandu): – Arun Valley. Num (8.VI.); Khandbari (21.VI. both :Sankhua Sabha); – Ilam (1.IV.); upper Gitang Khola (27.III. both :Ilam).

Vertical: Proved or probable breeding places: 1100 m Khandbari (21.VI.); 1200 Ilam, nests under construction (1.IV.): 1350 m Kathmandu, fledglings (31.III.): 1450 m Balaju, juveniles (1.V.); 1550 m Dhumpus/Suiketh (10.V.); 1650 m Num, juveniles (8.VI.); 1700 m Dhumpus, young in nest (27.IV.). – Outside breeding places or breeding season: 800 m Pokhara. Phewa Tal, many wintering specimens (20.II.); 2460 m upper Gitang Khola, 2 sp. passing by (1.IV.); 2900 m Pisang, several around small lakes (17.IV.): 4300 m Charka, 2 sp. passing through the village (21.VI.). The latter observation refers to the highest record in Nepal.

Habitat: In Nepal, apparently only human habitations of various kinds are frequented as nesting sites, and towns (Ilam) and cities (Kathmandu) are preferred, but villages are also inhabited. As a consequence, the Barn Swallow is, at least during the breeding season, confined to agricultural land and other nearby open country. The local breeding population is confined to the subtropical zone and does not occur beyond 1830 m (Inskipp & Inskipp 1991), and many colonies may be situated even well below (Kathmandu, Ilam and others).

Breeding: At least locally, season starts quite early. Fledglings on the wing at 31.III. (Kathmandu City) point to start of oviposition already E II, much earlier than formerly believed. Juveniles on 27.IV. (Dhumpus), 1.V. (Balaju) and 8.VI. (Num) may belong to second broods.

Migration: Influx route of northern migrants into Nepal is unclear. High-altitude-migration observations are nearly completely lacking.

Cecropis daurica

C. [daurica] incl. *striolata*

Horizontal: Myagdi Khola, Babyachaur (31.V.): Kali Gandaki Valley, near Beni (21.III. :Myagdi) – Sikha (3.V. :Parbat); – Hyangja (10.V.); Pokhara (20.II. both :Kaski); – Marsyandi Valley, between Turture and Syuribar (8.IV.); Phalesangu (9.IV. both :Lamjung): – Kathmandu Valley, Kathmandu-Chauni (IX 1969); – Phulchoki Mt., flock of about 20 sp. near top (22.III. :Lalitpur): – Shershepu N Jiri (10.IV. :Ramechap): – Arun Valley, near Kandbari (11.VI.); Tumlingtar (22./23.VI.); Num (8.VI. all :Sankhua Sabha); – near Ilam (25.III.): Kutunabari (6.IV. both :Ilam).

Vertical: Records during the presumed breeding season (IV-VI): from 230 m Kutunabari (6.IV.) to 2150 m Sikha (3.V.); altogether 11 localities evenly distributed. As swallows may change locality quickly and regularly, breeding records should strictly depend on nests (see Breeding). Breeding records are known up to 1770 m (Inskipp & Inskipp 1991). – Outside breeding season: 800 m Pokhara (20.II.); 1000 m Beni (21.III.): 1500 m near Mai Pokhari (25.III.): 2700 m Phulchoki Mt., flock of 20 sp. (22.III.).

Habitat: Very probably nearly exclusively confined to human habitations and settlements, where it constructs the nests in houses of various styles. This may especially hold true at the upper limit of the breeding range, where the population fades out. In accordance with the nesting sites, the Red-rumped Swallow hunts near settlements during the breeding sea-

son, but can be seen at much higher altitude during migration. But there are no records above 3000 m (Inskipp & Inskipp 1991).

Breeding: Several specimens collect nesting material on banks of a stream and fly into houses at Syuribar 620 m, 8.IV. – Nest in a house in Kathmandu-Chauni 1350 m; in Hyangia, 1000 m; Babyachaur, 950 m.

Delichon

Two species, *nipalensis* and *dasypus,* breed in the area. Their vertical area belts are clearly separated altitudinally, *nipalensis* breeding in the lower, *dasypus* in the upper mountainous zone. Ecological preferences are not yet clearly determined and it is unknown whether they do breed at close range.

Delichon nipalensis nipalensis Horsfield & Moore

Material: 2 specimens: **M** Taplejung Distr., Gunsa Khola Valley between Kibla und Amjilesa, 2520 m, 12.IX.1983: 2 ad.

Measurements: **Wing**-L: (2) 91.5-94.5 mm. – **Tail**-L: (2) 38-39 mm. – **WTI:** (2) 51.9-53.4%. – **TWI:** (2) 41.3-41.5%.

Notes: One specimen shows moult of body-feathers; this confirms E. & V. Stresemann's (1969:46) assumption that moulting takes place in IX/X.

Horizontal: My observations originate from the Trisuli Valley to near the E border. – Trisuli Valley, between Ramche and Dhunche, flocks of up to 200 sp. (22. and 28.IV. :Rasuwa); – Pahakhola; flock of about 20 sp. gliding over abandoned terraced slopes (4.VI. :Sankhua Sabha); – Tamur Valley near Limbudin, small flock (23.IV.); near Lungtung, many flying above water surface, once flock of ca. 20-30 sp. (19.V.); descending to Hellok from Yamputhin (17.V.); Gunsa Khola near Kibla, singles and flocks gliding along rocky cliffs at the lower course of the river downstream to the mouth, colony (12.IX.1983, 18.V.1988; all: Taplejung); – between Ilam and Mai Pokhari, single sp., (25.III. :Ilam). – Many additional observations remained unidentified because of unsuitable field conditions. – Inskipp & Inskipp (1991) indicate localities from the breeding season from all C and E parts of the country.

Vertical: All dates that probably refer to breeding places are distributed between 950 m (Limbudin, 23.IV.), 1500 m (Ramche, 28.IV.), 1700 m colony up to 2000 m (lower Gunsa Khola, V/IX), 2000 m (Lungtung/Tamur Khola, 19.V.), 2000 m (Dhunche), 2400-2500 m (-above Hellok/Tamur). – The only breeding colony hitherto recorded for Nepal is not determined as to altitude (Inskipp & Inskipp 1991). *D. nipalensis* occupies the lower vertical part of the area inhabited by the genus *Delichon;* because of its extreme mobility, it is impossible to delimit its area belt width without localized colonies.

Breeding: A colony is situated ca. 2 km upriver from the confluence of Gunsa Khola with the Tamur (:Taplejung; Fig.55); in 1983 and 1988 it comprised 2 groups of appr. 60 and 45 nests, glued to the lower side of a horizontal rock overhang. It was impossible to determine their exact number because they were packed close together. The nest's overall form is domed, retort-like with a narrow and short entrance tunnel which usually points downward, sometimes even vertically. The nest construction is similar to that of the N Ame-

Fig.55: Colony of *Delichon nipalensis* on the lower Gunsa Khola, drawn from photographs taken on 18.V.1988. Original by K. Rehbinder.

rican *Hirundo pyrrhonota* as presented by Turner & Rose (1989). In these nest characteristics *nipalensis* differs markedly from *D. urbica* (and *D. dasypus* ?); the entrance of their nests is only a narrow hole at the upper margin of the nest and a tunnel is never attached to it. The often suspected close relationships of the genera *Hirundo* and *Delichon* (Mayr & Bond 1943, Turner & Rose 1989) are confirmed by these findings.

On 18.V. many adults visited the nests to feed the juveniles, even on 12.IX. young were still present in several nests and being fed, but only a few adults approached the nests. Many fledged and independent juveniles were present several kilometers up- and downriver from the colony. This colony remained more or less unchanged between my visits in 1983 and 1988. Extension of breeding season into autumn in *nipalensis* seems to be similar to that in C European *D. urbica* (comp. E. & V. Stresemann 1969).

Delichon dasypus cashmeriensis (Gould)

Delichon [urbica] dasypus

Material: 1 specimen: **G** Ghorka Distr., S of Rupina La, Manaslu massif, 3570 m, 10.VIII.1983: pullus.

Measurements: **Wing**-L ca. 89 mm, P9 is not yet fully grown but the fully grown pullus wing remains markedly shorter than the following wing feather generation. – **Tail** defective, beside others both T1 are lacking.

Horizontal: My observations originate from the Dhaulagiri, Annapurna, Manaslu and Kanchenjunga massifs. – Cheng Khola S of Jungla Banjyang, colony (8.V.1970 :Myagdi); – Suli Gad Valley near Rohagaon, appr. 50 sp. (19.V. and 7.VI.1970: :Dolpo); – Lete, appr. 25 sp. (5.V.1995); winter village Sangda, 1 sp. (22.VI.1970; both :Mustang); – between Pisang and Manang, appr. 40 sp. (18.IV.1980 :Manang); – N Rupina La, flocks of up to 20 sp. (7.-9.VIII.1983); S Rupina La; see Material (10.VIII.1983 :Gorkha); – near Thudam, appr. 10 sp. (26.V.1988 :Taplejung).

Vertical: Data from V and VI, presumably within the breeding season, are situated from 2400 m (Lete), 3100 m (Rohagoan), 3400 m (Rohagoan), 3550 m (Thudam), 3800 m (Sangda), 3600-4000 m (N and S Rupina La) and 3700 m to nearly 4000 m (Cheng Khola; colony). – The only other Nepal colony hitherto known is situated at 3500 m, Gapte (Inskipp & Inskipp 1991).

Breeding: The colony in the Cheng Khola Valley at 4000 m comprised ca. 10 nests, which were glued onto vertical rock faces. At 8.V. adults were present there and and at several other sites downriver to 3700 m. The specimen from near the Rupina La at 3600 m with still-growing wing feathers was certainly also near its breeding place.

Migrations: Lack of food urges the birds to leave the colony and its vicinity during winter. But as early as B III martins, very probably *dasypus,* can be seen at altitudes above 3000 m: Thaksang above Tukche 3150 m, small flocks of up to 10 sp. at 3.-6.III.1974; between Jomosom and Thini 2800-2900m singles and flocks of up to 30 sp. 23.III.1974 (:Mustang). Thunderstorms may drive (parts of) colonies considerably down far below the breeding belt (2400 m, Lete, 5.V.).

MOTACILLIDAE

Anthus

In Nepal 5 species breed *(rufulus, similis, hodgsoni, roseatus, sylvanus)* and except for *similis,* which is endemic to the W Himalayas, they inhabit the entire mountain chain; *sylvanus* is also endemic to the Himalayas. The whole vertical range, covering more than 4500 m from the Terai lowland *(rufulus)* into the alpine pasture zone *(roseatus),* is colonized by pipits. All the species are vertically vicariant, with local contact possible between *rufulus* and *sylvanus* and, far to the west, with *similis.* At the tree line there is a transition between *hodgsoni* and *roseatus,* though the two always seem to be separated by an uncolonized zone. So far nothing is known about interspecific contacts in Nepal.

Seven additional species are rare visitors in Nepal or migrants in transit, in some cases difficult to document *(richardi, godlewskii, campestris, trivialis, cervinus, spinoletta, rubescens);* furthermore, one of the breeding species *(hodgsoni)* is replaced or supplemented by a northern subspecies.

Anthus roseatus Blyth

Material: 4 specimens: **D** Dolpo Distr., S Jangla Banjyang Pass, Phurbang, appr. 4200 m, 31.V.1973: 2♂, 1♀ ** Mustang Distr., Cha Lungpa Valley near Sangda, 28.VI.1973, 4200 m: 1♂.

Measurements: **Wing**-L ♂ (3) 88-90 mm, ♀ 80 mm. – **Tail**-L ♂ (3) 64-66 mm, ♀ 56 mm. – **Bill**-L ♂ (3) 12-13 mm, ♀ 13 mm. – **Tarsus**-L ♂ (3) 22-23 mm, ♀ 22 mm. – **WTI** (4) 20-22.2%. – **TWI** (4) 70-73.3%.

Notes: Bill (♂ and ♀) nearly black, feet flesh-coloured. ♂ gonads strongly enlarged (8-9 x 5-7 mm), that of ♀ inactive. Feathers worn.

Horizontal: Own records only within the main chain from NW Dhaulagiri, Annapurna and the Kanchenjunga massif area. – N of Dhorpatan Valley (singing, 15.IV.), pass between Dhorpatan and pasture Thankur (5.V., all :Myagdi); – Cheng Khola (8.V.), Purbang (31.V., see Material.), pass Jungla Banjyang (9./10.V.), Ringmo/Phoksumdo Lake (22.V., 10.VI.); passes Bagar La (17.VI.), Zö La/Büko La (19.VI., all :Dolpo); – Sangda (28.VI., carrying food, see Material); below Dapa Col (17.VII., carrying food); Marpha (21.II., 14.V.); Thorung La, W slope (20.IV., all :Mustang); – E slope (19.IV. :Manang). – Kanchenjunga and westward: upper Simbua Khola Valley (12./13.V.), Ladza Khola above Walungchung (21.V., all :Taplejung); – Kangla Khola E Thudam (24.V.), Gabri Khola W Thudam (28.V.), Pomri La E Pahakhola (29.V., all :Sankhua Sabha).

Vertical: In or near breeding season (VI, VII): in accordance with the high altitude of the breeding sites, only these late dates apply to the resident breeders; locally as early as E V (for late immigrants see below): 3650 m Ringmo (V, VI), 4000-4100 m pass between Dhorpatan and Thankur (E V), 4050-4200 m at Sangda (E VI), 4200 m Phurbang (E V, see above), 4250 m Gabri Khola (28.V.), 4300 m Pomri La (29.V.), 4350 m Jungla Banjyang (M V), 4400 m ascent to Dapa Col (M VII), 4400-4900 m Dolpo passes landscape, N Dhaulagiri (VI).

This documentation defines a breeding belt 900 m wide (specimens from Ringmo not at breeding site, see below!), which is increased to a little over 1000 m by including data of Diesselhorst (1968:363). Inskipp & Inskipp (1991) give a lower summer (breeding) limit of 3350 m, clearly too low.

Habitat: At breeding time springlike wet places in the alpine meadow region; the Roseate Pipit mainly avoids rocky terrain. Cf. Diesselhorst (1968:364) for further data, which largely resemble those in the Dolpo. However, the N flank of the Dhaulagiri, where *roseatus* breeds at many sites, is much dryer than the Everest region. Wet places approaching moor conditions, which it prefers, are therefore scarce here, so that the population probably does not reach the high density emphasized by Diesselhorst (1968) with reference to Everest.

Breeding: Late onset because of uncertain snow conditions in the pasture zone. Food-carrying adults on 28.VI. at 4200 m, on 17.VII. at 4400 m. Hence breeding can be considered to begin in about the 2nd third of V, though this applies only to places permanently free of snow at this time, favorably exposed slopes at the lower boundary of the area. Breeding ends in the last third of VII. Similar data were obtained by Diesselhorst (1968:364) for the Everest region. Arrival in the breeding region gradual, according to the local snow conditions. At Phoksumdo Lake (:Dolpo, 3650 m), too low for *roseatus* to breed, individuals were seen on fields on 22.V.1970 and 1 pair as late as 10.VI.1973 (cf. Diesselhorst 1968:363 for such late arrivals). In the upper Simbua Khola on 12.-15.V.1988 violent snowfall drove flocks of up to 20 individuals down to 3350 m, again far below the breeding belt. Conversely, 1 ♂ sang at 4000 m as early as 15.IV.1970, though the breeding site was probably not there.

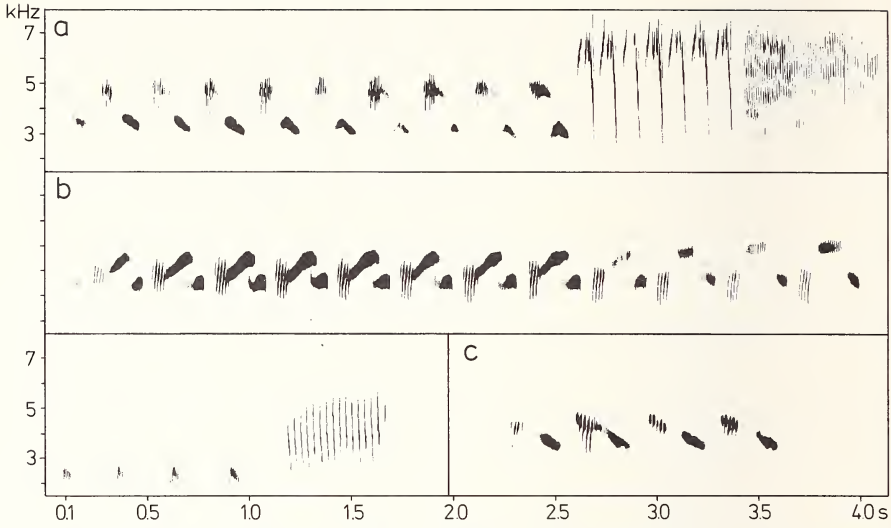


Fig.56: Territorial song of *Anthus roseatus*. – a) flight display sequence of 1 ♂, above Marpha 13.V.1995, b) flight display sequence of another ♂, Phurbang 31. V.1973, c) part of a flight display song, 2nd ♂ above Marpha 13.V.1995.

Vocalizations: Territorial song (Fig.56) is performed in the courtship flight and leads from the ground back to the ground or to an elevated site. The verses, which are about 4-6 s long, consist of three phrases. (i) Double-note units repeated up to 13 times. One of the constituents is at least partly heavily frequency-modulated, even cut into individual extremely short noise-like notes (Fig.56b). They cover different frequency bands. In both ♂ investigated, the 2-unit notes are partly produced simultaneously (Fig.56a-b). (ii) Part strongly varying in the 2♂ investigated: low notes of narrow frequency bandwidth (less than 1 kHz, Fig.56b) and angular or more complicated notes of wide bandwidth and strongly frequency-modulated (Fig.56a). (iii) Final trill at differing repetition rates, with differing bandwidth of the constituent trill notes in both ♂.

Anthus sylvanus (Blyth)

Taxonomic note: In beak shape and underside patterning (but not in tail shape) *A. sylvanus* resembles the African *A. lineiventris;* in its pointed tailfeathers, the Southern Indian *A. nilghiriensis.*

Material: 2 specimens: **G** Kaski Distr., Lumle, 1500-1600 m, 14.-15.VII.1973: 2♂.

Measurements: **Wing**-L 82 and 82.5 mm. – **Tail**-L 68 (1x) mm. – **Bill**-L (-height) 13 (5.1) and 13 (5.3) mm. – **Tarsus**-L 24 and 24 mm. – **WTI** 19.4 and 24.4% – **TWI** 82.9%.

Notes: Moult: ♂ 14.VII.: P1-4 new, 5-9 old, S except the coverts new, T (only 2 present) old. – ♂ 15.VII.: P 1-5 new, 6-9 old, S except the coverts new, T old. – Gonads large, 7-8 x 5 mm.

Horizontal: Own observations from NW (:Dolpo) and S Dhaulagiri (:Myagdi), S Annapurna (:Parbat, :Kaski), Trisuli Valley (:Rasuwa), N Jiri (:Ramechap), Arun Valley and side val-

ley (:Sankhua Sabha), S Kanchenjunga (:Taplejung, :Ilam). – In detail: Suli Gad Valley (8.VI.), Pelma (29.V.), between Yamakar und restplace Dhule (7.V. all :Dolpo); – Chimkhola (17.V.); between Darapani and Halegoan (23.III. both :Myagdi); – Gara (3.V. :Parbat); – near Landrung (8.V.), Lumlé and Baundur (14./15.VII. both :Kaski); – between Ramche and Dhunche (22.IV. :Rasuwa); – between Jiri and Shershepu (10.IV. :Ramechap); – Bhotebas (20.VI.), Pahakhola (4.VI. both :Sankhua Sabha); – ascent to Khebang from Tada/Kabeli Khola (singing 25.IV. :Taplejung), between Mai Pokhari and Mai Majuwa (singing 11.IV. :Ilam). – The two data from the Ilam district mark the eastern boundary of the area, which is currently considered to lie in Nepal (Ali & Ripley 1973, 9; Inskipp & Inskipp 1991).

Vertical: All data from within or near the breeding season, E III-B VII: 12 finds between 1350 m (E IV, below Khebang) and 1950 m (B V, Gara), only 3 higher: 2340 m Pahakhola, B VI; up to 3000 m Suli Gad Valley, B VI; 3000 m between Yamarkar and Dhule, B V. – Inskipp & Inskipp (1991) report summer sightings between 1830 and 2900 m.

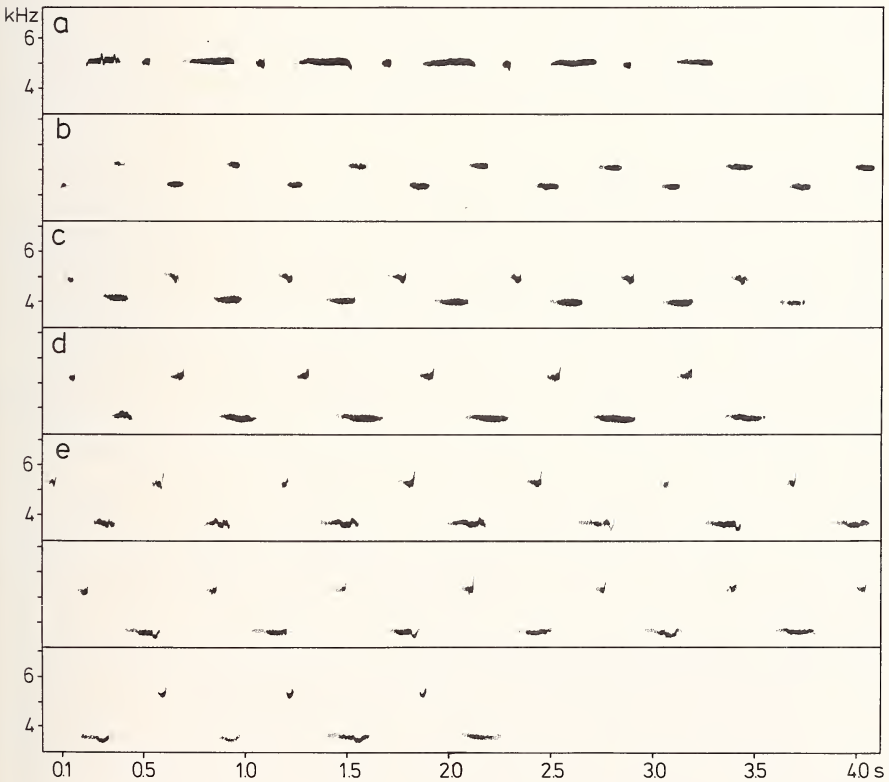


Fig.57: Territorial song of *Anthus sylvanus*. – Territorial song verses of 5 ♂; a) Pelma 29.V.1973, b) Thulo Khola 17.V.1995, c-d) 2 different verse types of 1st ♂, Khebang 25.IV.1988, e) verse of 2nd ♂, given in flight display, Khebang 25.IV.1988.

Habitat: The Upland Pipit occupies mainly open terrain, almost exclusively in the upper subtropic zone, which has been profoundly transformed by human activities so as to provide the large number of suitable habitats available today. As secondary habitats it employs open agricultural land, usually containing occasional bushes and trees: terraced plantations of all kinds including rice, as well as those that have returned to a disorderly, wild state and also grassy slopes. Only in the region of the Tada/Kabeli Khola did I also find *sylvanus* in sparse *Pinus roxburghii* woodland with many open spaces (25.IV.), where it was singing at several sites.

Breeding: Since the range shifts only slightly in winter, the breeding grounds are occupied early: singing and courtship flights on 23.III. (Dharapani/Halegaon), ♀ laying eggs 26.IV. (Diesselhorst 1968:365). Both specimens from M VII (see above) still with greatly (maximally?) enlarged gonads, and song activity still present at this site (however, cf. moulting of this specimen, above).

Vocalizations: Territorial song (Fig.57a-e) consists of a uniform sequence of 2 slightly modulated, whistle-like notes, which usually differ in frequency (1-1.5 kHz) but occasionally are nearly at the same frequency. Lowest mid-frequency distance measured is 160 Hz (Fig.57a). The characteristic rhythm of the song is due to the different lengths of the two notes and to the marked frequency jumps between the notes. In most cases the short note is the higher pitched one (but see Fig.57a). Measured verse lengths range between 3.1 and 10.5 s.

Anthus godlewskii (Taczanowski)

Taxonomic notes: If parapatry between *campestris* and *godlewskii* in Mongolia is accepted, the two constitute a superspecies (cf. Sibley & Monroe 1990:676 and, to clarify the relationship between these pipits, Stegmann 1929:213-215). And there is much evidence that they are the palaearctic representatives of *A. rufulus* – and then probably those of *A. novaeseelandiae* from the Australian region (see Roselaar, in Cramp 1988,5:312-313).

Material: 2 specimens: **S** Solukhumbu Distr., Khumjung, 3800 m, 18.X.1970: 1♂ * Gorak Shep, 5150 m, 25.IX.1970: 1 o.

Measurements: Nine specimens were examined including Diesselhorst's from Khumjung and Periche (2♂, 5♀, 2 o): **Wing**-L ♂ (2) 89, 96; o (2) 89, 90; ♀ (5) 89.5-91 mm, $\bar{x}$=90.2 – **Tail**-L ♂ (2) 68.5, 74; o (2) 67.5, 69; ♀ (5) 65.5-69.5 mm, $\bar{x}$=68.2. – **Bill**-L (1♂, 1o) 13.5 and 13 mm. – **Tarsus**-L (1♂, 1o) 27.5 and 28 mm. – **Hallux claw**-L ♂ (2) 12 and 12 mm; o (2) 11.5 and 12.5 mm; ♀ (5) 9.5-13.5 mm, $\bar{x}$=11. – **WTI** (9) 27.0-30.0%, $\bar{x}$=28.2, s_d=0.88. – **TWI** (9) 73.2-77.5%, $\bar{x}$=76.1, s_d=1.42. – *A. godlewskii* and *A. r. rufulus* (which see) are very similar with respect to WTI, but the latter has a relatively short tail.

Horizontal, vertical: The position of the two specimens in the autumn migratory events at the foot of Everest is as described by Diesselhorst (1968:362). Migration begins there in the last third of IX (1962) but continues into autumn beyond M X (see above) and hence is distinctly longer than previously thought. There are still no sightings west of Kathmandu.

Anthus rufulus rufulus Vieillot

For taxonomy, see *Anthus godlewskii*.

Material: 1 specimen: **B** Kathmandu, Chauni, 1350 m, 20.IX.1969: ♀.

Measurements: Including the birds collected by Diesselhorst at Kathmandu, Jiri and in the Rapti Valley as well as specimens from Nagarcot, Bisnumati and Basbari, 11♂ and 10♀ were examined: **Wing**-L ♂ (11) 80-88 mm, $\bar{x}$=84.6, s_d=2.23; ♀ (10) 76-83 mm, $\bar{x}$=79.8, s_d=2.08. – **Tail**-L ♂ (10) 55-64 mm, $\bar{x}$=60.8, s_d=2.74; ♀ (8) 54-59.5, $\bar{x}$=56.6, s_d=1.86. – **Bill**-L and **Tarsus**-L 1♀ 13.5 and 25 mm. – **Hallux claw**-L ♂ (12) 9-13, $\bar{x}$=10.7, s_d=1.29; ♀ (10) 9.5-13.5 mm, $\bar{x}$=11.8, s_d=1.23. – **WTI** (21) 23.7-30.0%, $\bar{x}$=26.1, s_d=1.55. – **TWI** (18) 69.2-74.4%, $\bar{x}$=71.3, s_d=1.58.

Horizontal, vertical: 1 specimen in slightly irrigated but not yet planted rice paddy near Uyam at 1300 m (:Taplejung, 22.IV.), where courtship flight was also occasionally seen. The bird, from the western outer region of Chauni in Kathmandu, green at that time of year, could belong to the local valley population.

For status and biology see Biswas (1961b), Diesselhorst (1968:361), Inskipp & Inskipp (1991).

Anthus hodgsoni

Anthus hodgsoni yunnanensis Uchida & Kuroda, winter visitors

Material: 5 specimens: **D** Mustang Distr., Tukche, 2600 m, 5.X.1969: 1♀. **B** Kathmandu, 1350 m, 4.II. and 11.III.1970: 3♂. **S** Solukhumbu Distr., Khumjung, 3800 m, 19.IX.1970: 1 o.

Measurements: **Wing**-L ♂ (3) 85-88; ♀ 86.5; o 86.5 mm. – **Tail**-L ♂ (3) 61-65.5; ♀ 62; o 64 mm. – **Bill**-L ♂ (3) 11.8-12; ♀ 11; o 11 mm. – **Tarsus**-L ♂ (3) 20.5-21; ♀ 20; o 20 mm. – **WTI** (5) 25.0-28.3% $\bar{x}$=27.1. – **TWI** (5) 71.7-75.3%, $\bar{x}$=73.3.

A. h. yunnanensis from a large breeding and wintering area have WTI (27) of 25.0-32.8%, $\bar{x}$=28.5, s_d=1.67. Among them are 2♂ (twice 25%, **Wing**-L 88 and 85 mm), which were collected in II and III 1970 in Kathmandu and which can be counted as this ssp. – **TWI** (26) $\bar{x}$=72.3%, s_d=2.35.

Horizontal, vertical, migration (see Material above): In the second half of IX the first visitors from the north, having crossed the main chain of the Himalayas, begin to trickle into the local high-altitude breeding populations (see above; cf. Diesselhorst 1968 for parts of the Everest region, Ali 1962:305 for Sikkim). The breeding birds remain in the breeding grounds until after at least M X (see below). In the Terai lowland and at middle altitudes *yunnanensis* is a common winter visitor, even coming into the gardens on the outskirts of Kathmandu.

Anthus hodgsoni hodgsoni Richmond, breeding birds

Material: 16 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 4000 m, 13.VI.1973: 1♂ (song specimen) * Gompa near Tarakot, 3250-3300 m, (14.) V.1970 and 6.VI.1973: 1♂, 2♀ ** Myagdi Distr., Dhorpatan, 3000 m, 15.-17.IV.1970: 1♂, 1o ** Mustang Distr., Thakkhola, Thaksang above Tukche, 3150 m, 8.VII.1970 and 3.VII.1973: 2♂. **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 30.III.1973: 1♂ (song specimen) * Thodung, 3200 m, 4.-5.IV.1973: 2♂. **S** Solukhumbu Distr., Thame Teng, 3900 m, 6.X.1970: 1♂, 1 o * Pare, Nangpa Tsango Valley, 3550 m, 15.X.1970: 1♀ * Khumjung, 3800 m, 18.-19.X.1970: 1♂, 1 o.

Measurements: **Wing**-L ♂ (10) 79-87 mm, $\bar{x}$=82.4, s_d=2.33; ♀ (3) 79-79.5 mm; o (3) 77-82.5 mm. – **Tail**-L ♂ (10) 55.5-63 mm, $\bar{x}$=59.4, s_d=2.20; ♀ (3) 56-60; o (3) 54.5-60 mm. – **Bill**-L ♂ (9) 10.5-12 mm, $\bar{x}$=11.6, s_d=0.53; ♀ 3 x 12 mm; o (3) 11-12 mm. – **Tarsus**-L ♂ (10) 20-23 mm, $\bar{x}$=21.4, s_d=1.02; ♀ (3) 21-22; o (3) 21-21.5 mm. – **WTI** (16) 22.8-26.7%, $\bar{x}$=24.5, s_d=1.19. – **TWI** (16) 69.4-75.5%, $\bar{x}$=72.1, s_d=1.48.

Notes: Gonads of a ♀ (14.V.) with oocytes measuring ca. 2 mm, those of three ♂ (30.III.-5.IV.) very large, 7-8.5 x 5 mm, the same for two ♂ on 6. and 13.VI.

♂: Beak dark gray-brown above with orange lower base, or blackish above and yellow-orange or reddish black below. Feet flesh-coloured or flesh-orange. – In the worn plumage on the upper surface, a greater or lesser admixture of gray.

Horizontal: Own records from NW Dhaulagiri, Annapurna, midland near Jiri and Thodung, Everest und Kanchenjunga massif area: Pahakhola E of Arun Valley, Kabeli Khola near the E border to Sikkim and Darjeeling. In detail: Ringmo/Phoksumdo Lake (13.VI.); Gompa/Tarakot (14.V., 6.VI. both :Dolpo); – Thankur N Dhorpatan (27.V.); Dhorpatan (15.-17.IV., 19.V. both :Myagdi); – near Sangdak (27.VI.); Thaksang above Tukche (26./27.IV., 2./3.VII. both :Mustang); – Marsyandi Valley, Pisang (18.IV. :Manang); – Chordung Mt./Jiri (30.III.), Thodung (4./5.IV. both :Ramechap); – Everest massif (Theme Teng, Pare, Khumjung; X. :Solukhumbu); – Kanchenjunga massif area: Pahakhola E of Arun Valley (31.V./1.VI. :Sankhua Sabha); – Yamputhin/Kabeli Khola (26.IV. :Taplejung); – Paniporua (17.IV.); Dhorpar Kharka (14.IV. both :Panchthar); – Mai Pokhari; Gitang Khola (26.III., 11.IV. both :Ilam).

Vertical: In and near breeding season (E III-B VII): observed at 20 sites (some confirmed in several years) situated between 1800 m and 4000 m, 14 of them restricted to 2200-3350 m. Three sites below 2200 m were concentrated at 1800 m: below Mai Pokhari (9.IV., 1 indiv. singing); Gitang Khola (11.IV., several singing); Yamputhin (26.IV., 2 indiv. on the ground in a wooded ravine). Over 3400 m: 3900 m near Sangda (28.VI., singing); 4000 m at Ringmo (13.VI., singing). The data from the lower limits also belong to the breeding belt, because the breeding season is very early (see below). The observations indicate a vertical distribution spanning 2200 m, a distinctly higher value than the 2900-4000 reported by Inskipp & Inskipp (1991).

Habitat: The Indian Tree Pipit prefers open forest vegetation with large glades. The number of trees may be greatly reduced, so that at least locally only a few large trees remain. Fairly dense bushes are tolerated, though some entirely free places with at most low grasses are needed for foraging. Hence *hodgsoni,* too, has become a species of well-wooded, moderately intensively cultivated agricultural land. Even there, however, it prefers the vicinity of forest-like structures, although single trees in plowed and terraced terrain are routinely used as singing stations. The upper limit of the area is the tree line. The occupied region thus extends nearly to that of *A. roseatus,* but the two are never close neighbours because *roseatus* breeds in alpine meadows free of dwarf shrubs, which begin at distinctly higher altitudes (see under *A. roseatus;* cf. Diesselhorst 1968:358). The dry N flank of the main chain is inhabited as long as some tree growth is present, though probably only the upper, sufficiently wet parts of the forest belt are occupied there (Ringmo/Phoksumdo Lake, 4000 m).

Breeding: Begins early: ♂ specimens from E III and B IV (Thodung) already had maximally enlarged gonads (see above). The intense singing activity, though limited by low morning temperatures, regularly observed by E III and B IV at 1800 m (26.III. Mai Pokhari) up to 3200 m (4.IV. Thodung) also clearly indicates early breeding activity. Accordingly, the observation of a not-yet independent chick on 6.VI. (Gompa/Tarakot, 3300 m)

indicates egg laying as early as E IV. Lively singing at B VII (Thaksang, 3200 m) suggests a second brood, even though gonad size begins to be reduced at this time (cf. Diesselhorst 1968:359, also nest find 3rd third of VII).

Migration: Although Diesselhorst (1968:369) found no more indiv. in the high-altitude breeding biotopes on Everest in IX, they do stay longer, as documented by specimens from B-M X (see Material). The northern *yunnanensis* migrants pass through before this time (see above). It is not known when the *A. h. hodgsoni* breeding on Everest finally depart.

Vocalizations: Territorial song (Fig.58) typically loud and pipit-like, performed from a tree-top or, distinctly more rarely, in courtship flight, with tone quality like that of *A. trivialis* but harsher. The individual verses are rich in notes, notes covering a range of frequencies as great as 5 kHz. Each ♂ has many notes in its repertoire and combines them to make a variety of verses (Fig.58a). Notes can be repeated to form phrases. Identical verses may be repeated at intervals during continuous singing. Song of *A. h. yunnanensis* is very similar to that of *A. h. hodgsoni;* no clear differences have yet been discerned (Fig.58b); comp. Wallschläger (1984) for Mongolian *yunnanensis* song.

Motacilla

In Nepal 3 species breed *(cinerea, alba, madaraspatensis),* together occupying a continuous vertical belt at least 4200 m wide. The closely related species *madaraspatensis* (lowland) and *alba* (midlands to alpine zone) are separated by a distribution gap; *alba* and *cinerea* are locally syntopic. 2 additional species are transient migrants or visitors: *flava,* for which 5 subspecies have been named, and *citreola,* in addition *Dendronanthus indicus.*

Motacilla flava ssp.

Horizontal, vertical: 2 ♂ (with completely gray head) on 13.III.1974 in a swampy spot near Marpha, 2750 m (:Mustang); 1 ♂ (with gray head and eye stripe) on 7.IV.1970 in the Dhorpatan Valley, 2950 m (:Myagdi). – Concerning the subspecies classification of Nepalese winter visitors/transients cf. Inskipp & Inskipp (1991).

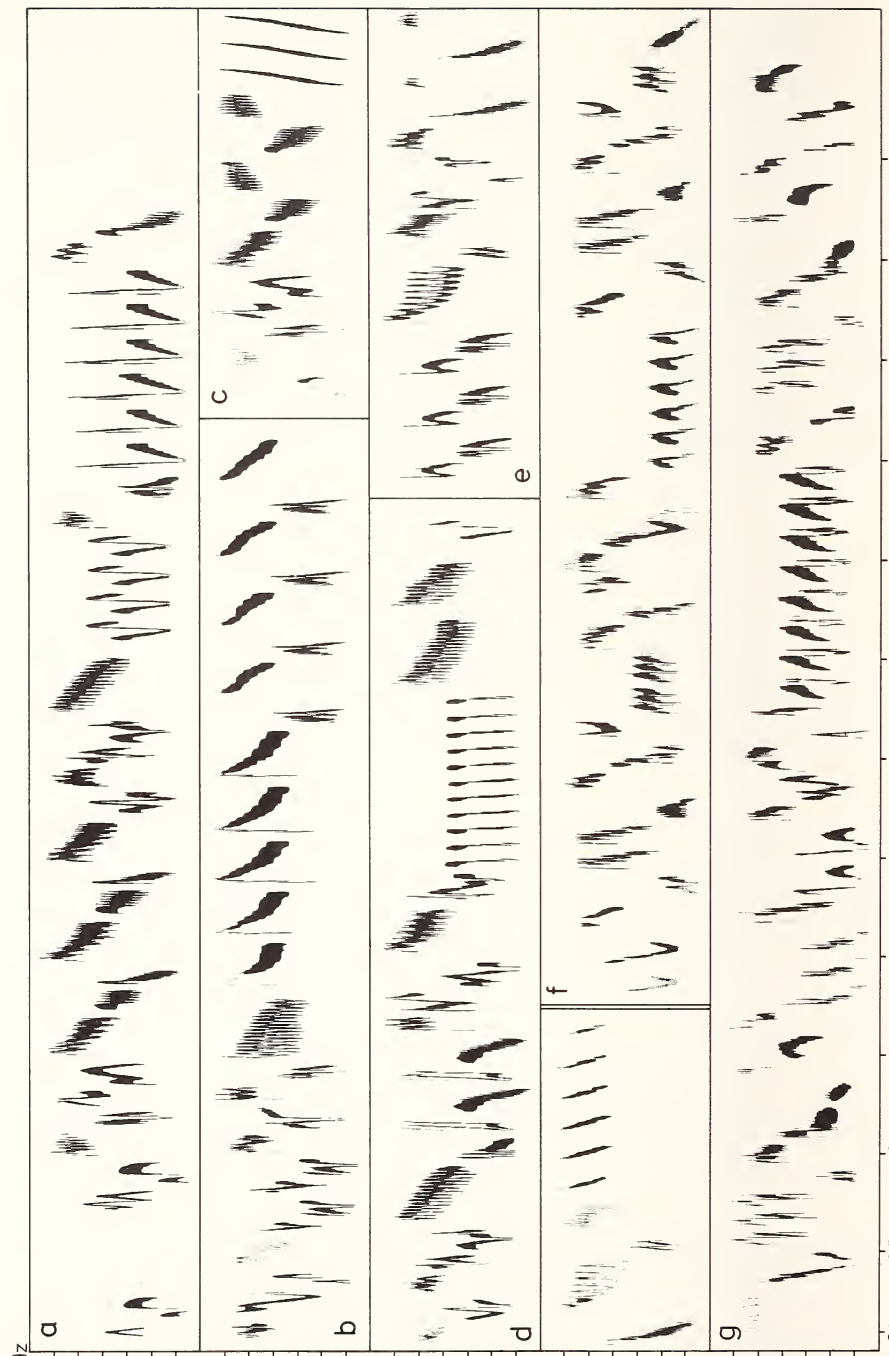
Motacilla cinerea ssp.

Motacilla [cinerea] incl. *clara, flaviventris*

Taxonomic note: Brief discussion of geographical variation of *M. cinerea* in Eck (1983:6), according to which the Gray Wagtails of Nepal decidedly tend toward the eastern, not the western palaearctic form.

Material: 6 specimens: **D** Myagdi Distr., Dhorpatan, 2950-3000 m, 15.-22.IV.1970, 12.-21.V.1973: 5♂, 1♀.

Measurements: Specimens collected by Diesselhorst in Kathmandu and Jiri were included. – **Wing**-L ♂ (7) 81-85 mm, $\bar{x}$=82.4, s_d=1.35; ♀ (4) 77-83 mm; o (2) 79.5-82 mm. – **Tail**-L ♂ (7) 88.5-94 mm, $\bar{x}$=90.6, s_d=1.79; ♀ (4) 85-95 mm; o (2) 87-91 mm. – **Bill**-L ♂ (5) 28-31 mm, $\bar{x}$=29.4; ♀ (1) 11.5 mm. – **Tarsus**-L ♂ (5) 19-20 mm, $\bar{x}$=19.5; ♀ (1) 20 mm. – **WTI** (13) 31.7-36.5%, $\bar{x}$=34.3, s_d=1.39 . – **TWI** (13) 106.5-115.9%, $\bar{x}$=110.6, s_d=2.63 (n=14 from C Europe: 111-125%, $\bar{x}$=116.9, s_d=4.02).



Horizontal: Own records from 30 sites from all parts of the Dhaulagiri area, Thakkhola, Annapurna, Kathmandu Valley and extending to the Arun Valley and the Kanchenjunga massif near the Sikkim and Darjeeling border. – In detail: Valley of the upper Barbung Khola to below Kakkot (11.VI. :Dolpo); – Thankur (5., 27.V.), Dhorpatan (15.-22.IV., 12.-21.V.); Myagdi Khola, Dharbang (22.III.), ascent to Pass Jalja La (6.IV. all :Myagdi); – regularly between Tukche (26.IV., 26.VI., 3.VII.) downstream to Dana (3.V., 9.VII. all :Mustang); – Landrung (8.V.), Suiketh W Pokhara (17.III. both :Kaski); – above Bagarchap (12.IV.), between Pisang and Chame (17.IV. both :Manang); – Kathmandu Valley, Godavari (14.V. :Lalitpur); – Arun and side valleys: Thudam (E V; :Sankhua Sabha); – Kanchenjunga: Walungchung Gola (21.V.), upper Simbua Khola (15.V.), Yamputhin (26.IV., 1.V.), ascent to Deorali Pass (16.V all :Taplejung); ascent to Sablako Pass (22.IV. :Panchthar), between Mai Pokhari and Gitang Khola Valley (27.III.-11.IV. :Ilam).

Vertical: In and near breeding season (IV-VII): The sites of the 28 finds lay in a belt from 1100 m (22.IV.) to 3550 m (25./27.V.) and were nearly uniformly distributed over the whole range: under 1550 m: 1100 m below the Sablako Pass (22.IV.); over 3100 m: 3120 m ascent to Jalja La (6.IV.), 3200 m Walungchung Gola (21.V.), 3400 m Thankur (B-E V), 3550 Thudam (E V). – These data indicate a potential breeding belt 2450 m wide, at a decidedly lower altitude than reported by Inskipp & Inskipp (1991; 2315-4115 m).

Occurrence in the high alpine zone is also denied by Diesselhorst (1968:366) and there is only meagre support by Polunin (1955), who collected specimens in the Langtang Valley at 3500 m and 4115 m between M VIII and M IX. – Outside the breeding season (II, III): 5 data: 1000 m Dharbang (22.III.); 1180 m Suiketh W Pokhara (17.III.); 1900 m Gitang Khola (27.III.); 2100 m Ghasa (25.II.); 2700 m Tukche (19.III.).

Habitat: Much like Central European forms, *cinerea* inhabits rapidly flowing mountain brooks, preferably staying near the banks, and is only rarely found at the banks of larger rivers (cf. data from Simbua Khola, Walungchung, Kabeli Khola near Yamputhin, individual data from Thakkhola). Only exceptionally is the immediate vicinity of the water left completely at breeding time; for instance, a pair suspected of breeding was found in the sparsely occupied region at Yamputhin (2100 m. 16.V.). The population density did not approach that in Central Europe except in Thakkhola. Elsewhere the Gray Wagtail is relatively uncommon in Nepal, despite the many fast-flowing streams.

Breeding: Onset evidently late, later than in *M. alba,* which is syntopic over extensive regions. Gonads entirely undeveloped on 15.IV. (♀) and 19.IV. (♂), on 22.IV. (♂) distinctly enlarged, maximal in the V specimens (Dhorpatan 3000 m, see Material); suspected breeding behaviour 3.V. at Dana 1550 m; feeding at nest 16.V. Bega Deorali 2400 m; independent young 6.VII. Marpha 2600 m; 9.VII. Dana 1650 m.

Vocalizations: Sonagrams of parts of the song in Martens & Geduldig (1990:127).

Fig.58: Territorial song of *Anthus hodgsoni.* – a-e) *A. h. hodgsoni,* 5 verses of 1 ♂: Mai Pokhari 26.III.1980 (no flight display).
f-g) *A. h. yunnanensis,* 2 verses of 1 ♂, Russia, Ussuriland, NE Bikin 2.VI.1990 (no flight display).

Motacilla alba alboides Hodgson

Motacilla [alba] incl. *grandis, madaraspatensis, aguimp.*

Material: 8 specimens: **D** Myagdi Distr., Dhorpatan, 2950-3000 m, 17.-22.IV.1970, 8.-21.V.1973: 4♂, 3♀ ** Mustang Distr., Thakkhola, Tukche, 2630 m, 8.VII.1973: pullus.

Measurements: **Wing**-L ♂ (4) 92.5-97 mm, $\bar{x}$=94.5; ♀ (3) 88-92.5 mm; pull. 93 mm. – **Tail**-L ♂ (4) 89.5-94 mm, $\bar{x}$=91.3; ♀ (3) 86-91.5 mm; pull. 91 mm. – **Bill**-L ♂ (4) 14.5-16.5 mm, $\bar{x}$=15.5; ♀ (3) 15-16 mm; pull. 14.5 mm. – **Tarsus**-L ♂ (4) 23-25.5 mm, $\bar{x}$=23.4; ♀ (3) 23-24 mm; pull. 24 mm. – **WTI** (8) 26.3-29.2%, $\bar{x}$=27.9, s_d=1.00. – **TWI** (8) 93.7-98.9%, $\bar{x}$=97.0, s_d=1.74.

Notes: Gonads strongly enlarged, in ♂ up to 9.5 x 6 mm. – Three specimens from IV (2♂, 1♀) with pale rose shade on the underside (no blood remnants!); this lacks in birds from V. Bill and feet black.

Horizontal: Most own records from the Dhaulagiri and Annapurna massifs, scanty observation around the Kanchenjunga. – In detail: Ringmo/Phoksumdo Lake (22.V.); upper Barbung Khola, confluence of Tarap Khola (10.VI.), Kakkot (12.VI.), Charka (21.VI.); Tarap Valley, Kangar (18.VI. all :Dolpo); – Thankur (5., 27.V.), Dhorpatan (7.-22.IV.- 8.-21.V. both :Myagdi); – Muktinath (20.IV.), Jomosom (21.III., 21./22.IV.), Marpha (12.III., 25.IV., 6.VII.), Tukche (8.VII.), Lete (30.IV.), Choya (2.V. all :Mustang); – Marsyandi Valley: Pisang (17.IV.), between Braga and Manang (18.IV. both :Manang); – Thudam (25./26.V. :Sankhua Sabha).

Vertical: In and near breeding season (E IV-B VII): Sites of 17 finds enclose a range from 2400 m (B V) to 4600 m (VI), the whole range being covered by the particularly data-rich Dhaulagiri massif. Most data (14) are uniformly distributed between 2400 and 3600 m, with only the following higher: 4200 m Kangar (17.VI.); 4300 m Charka (21.VI.); 4600 m between Büko La and Mo La (all :Dolpo; 20.VI.). If all data are taken to be associated with the breeding area, as is surely justified, its vertical span is 2200 m, considerably broader than the range 3600-4800 m given by Inskipp & Inskipp (1991). For our own sightings or indications of breeding see below (Breeding).

Habitat: More than in Central Europe, the White Wagtail in Nepal stays near flowing rivers at breeding time, especially large ones with gently sloping banks, in broad valleys flooded at high water to form easily reachable shallow pools. Small brooks are always avoided, also larger rivers as soon as they enter steep-sided valleys. Diesselhorst (1968:368) found the same for the High Khumbu at the foot of Everest. Only at extremely high altitudes, over 4000 m, are local waters, including swampy moor-like places in broad depressions, adequate to accommodate single pairs (Mo La – Büko La, 4600 m). For this reason alone the White Wagtail is only locally distributed in Nepal, which is not at all comparable with the situation in Central Europe. Furthermore, *alba* in the central Himalayas prefers the rain-poor dry regions in the interior and in valleys cutting into of the main chain. Only there does it reach local population densities comparable to that in Central Europe and there, moreover, the most sparsely occupied sites are located directly adjacent to the boundary of the monsoon-influenced region (from Choya 2400 m north to Jomosom 2750 m, :Mustang). Such low-altitude breeding sites are not occupied anywhere under the influence of the monsoon (there as far down as 3000 m, Dhorpatan, see above).

Breeding: In the Dhorpatan Valley (3000 m, monsoon zone) during observations beginning 8.IV.1970, groups of up to 20 indiv. regularly seen on fields and at the valley floor (always ssp. *alboides*?), 3 specimens from M IV with maximally developed gonads (see above),

nest under old tree bark with 4 eggs on 22.IV.1970, another under fallen treetrunk with 5 eggs on 18.V.1973. – In broad high valley of Kangar (4200 m, dry zone) nest building on 17.VI.1973. – Fledglings, some independent and some guided and fed by adults, at Tukche (2550-2650 m, dry zone) on 27.VI. and 1.-8.VII.1973.

Given the enormous climatic differences between the lower and upper parts of the breeding zone, a staggered breeding time is to be expected. At the lower altitudes (Thakkhola), 2 broods could be the local rule.

Motacilla madaraspatensis

Motacilla [alba] madaraspatensis

Horizontal, vertical: Lower Myagdi Khola, Tatopani, 900 m, ♂♀ carrying food to the nest (31.V.); above Beni, 850 m, ♂♀ carrying food to the nest (31.V., both :Myagdi); – Pokhara, 850 m, independent fledglings (26.IV. :Kaski); – bank of the Mai Khola below Ilam, 480 m, 3 indiv. (7.IV. :Ilam). – According to Inskipp & Inskipp (1991), the previous sightings of breeding birds range upward into the Kathmandu Valley, at ca. 1350 m. Hence *M. madaraspatensis* is separated from *M. alba* by a distribution gap of 1650 m, and even considerably more in most places (cf. under *M. alba).* The two species are not parapatric in Nepal in the strict sense; their vertical separation is not based on competition (cf. Haffer 1989).

Habitat, breeding: Banks of rivers and lakes, less frequently along streams; broad valleys seem to be important structures everywhere. – Independent fledglings were present along banks of Phewa Tal/Pokhara E IV, juveniles which were fed in the nest on 31.V. at 2 sites may hint to 2nd broods. Nests in Tatopani village (:Myagdi) and on a small rock island in Myagdi Khola.

CAMPEPHAGIDAE

Coracina

The Nepal list encompasses three species *(melanoptera, melaschistos, macei);* all breed, but records are sparse. *C. melanoptera* is widely distributed in peninsular India and penetrates into the Himalayan foothills from S. This holds true, too, for *macei,* but the ssp. *nipalensis* is predominantly Himalayan in distribution and an isolated area finger covers the NW Himalaya. *C. melaschistos* invaded the Himalayan chain from SE. Within Nepal all species are confined to the Oriental realm only slightly exceeding 2000 m.

Coracina melaschistos

Horizontal: My records originate only east of the Arun river. – Above Hellok (17.V.); Omje Kharka W Yamputhin (2.-3.V.); Yamputhin (27.-30.IV.); between Khebang and Yamputhin (26.IV. all :Taplejung); – Paniporua (19.IV. :Panchthar); – ascent to Dhorpar Kharka (13.IV. :Ilam).

Vertical: 7 records (6 localities), all from the presumed breeding season (IV/V), range from 1650 m (Yamputhin) to 2450 m (Hellok); at 2000 m (Khebang/Yamputhin) and above: 2300 m (Paniporua), 2400 m (Omje Kharka). The records above 2300 m are higher than those hitherto known from Nepal (Inskipp & Inskipp 1991).

Habitat: The Black-winged Cuckoo-shrike is generally to be met in forests. The few records close to or even at the upper limit of the vertical area suggest that it prefers at least partly open forest (several times around Yamputhin, above Hellok) and 1 ♂ was calling in a group of a few trees on a completely deforested slope (ascent to Dhorpar Kharka). Only 2 observations in mature forest: in a deeply cut small valley near Paniporua gliding from one slope to the opposite one (territory display?) and at Omje Kharka. – All forest types were mixed broad-leaved, simple in structure (pure riparian: *Alnus nipalensis* near Yamputhin) to luxuriantly species-rich (Omje Kharka).

Vocalizations: The territorial song (Fig.59a-e) is said to be a three-note whistling verse descending in pitch (Fleming et al. 1976, Ali & Ripley 1971,6:20). I have reorded only four- and five-note whistles; several of the individual notes may be quite short and are discernible only by sonagram. Frequency of the verse ranges only up to 2.8 kHz, and, consequently, the whistles are not adapted to overcome torrent noise (see Martens & Geduldig 1990).

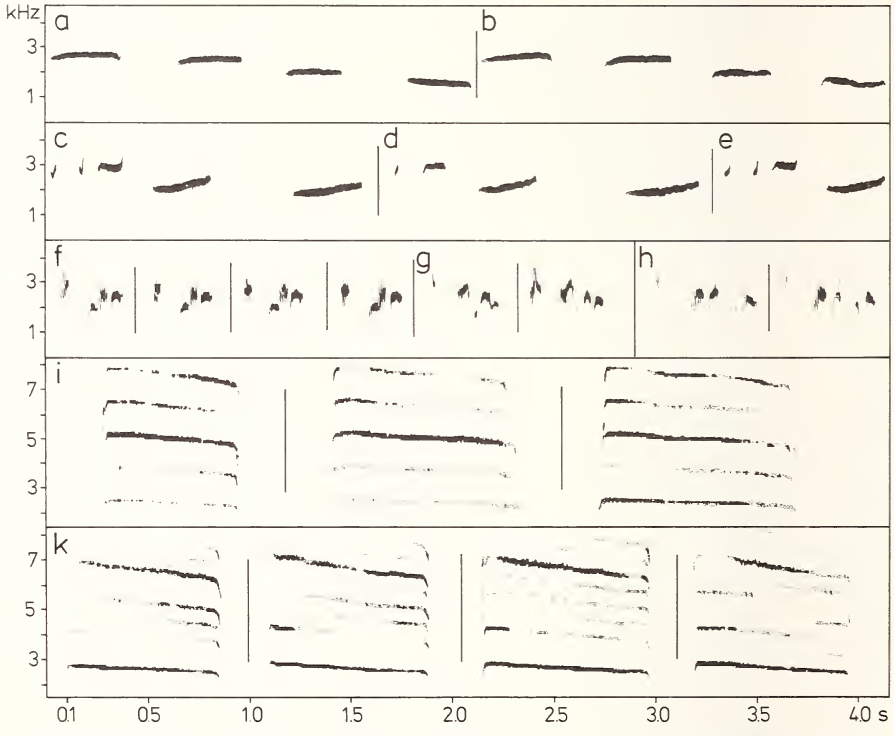


Fig.59: Territorial song of *Coracina melaschistos* and Pycnonotidae. – a-e) *Coracina melaschistos,* territorial song of 2 ♂; a-b) 2 verses of 1 ♂, below Dhorpar Kharka 13.IV.1988, c-e) 3 verses of another ♂, Yamputhin 28.IV.1988.
f-h) Territorial song of *Pycnonotus leucogenys,* f-g) 4 and 2 song verses of 2 song types of 1 ♂, opposite Darapani 29.V.1995, h) 2 verses of another ♂, below Worebung Pass 21.IV.1988.
i-k) Calls of *Hypsipetes leucocephalos,* i) 3 "eeet" calls of 1 ♂, upper Myagdi Khola 29.V.1995, k) 4 "eeet" calls of another ♂, Thulo Khola 18.V.1995.

Coracina macei

Coracina [caledonica] macei

Horizontal, vertical, habitat: The only observations are of 2 specimens each on the S slopes of the Siwalik Mts. N of Sunichare (:Ilam), 250 m, 4.IV. and near Potana (:Kaski), 2000 m, on 28.IV., in both cases at well-wooded sites, near clearings and forest edges at Potana.

Pericrocotus

Six species are recorded for Nepal *(flammeus, brevirostris, ethologus, solaris, cinnamomeus, roseus).* Probably all breed, but records, including the presumed breeding season, are sparse for *brevirostris, solaris* and *roseus,* and there are no breeding records at all. Except for *cinnamomeus,* which has an extensive distribution in peninsular India, all species occupy an entirely Himalayan area within the Indian subcontinent, which they reached from parts of SE Asia. Most of the species are mainly confined to the tropical and subtropical parts of the Himalayan southern macroslope, but *flammeus* reaches 2200 m, *brevirostris* 2750 m, and *ethologus* is regularly encountered above 3000 m, even within dry areas north of the main range.

Pericrocotus ethologus favillaceus Bangs & Phillips

Taxonomic note: On the discovery of the sibling species *P. brevirostris* and *P. ethologus* by Mayr see Ibis 1940:712-722.

Material: 4 specimens: **D** Dolpo Distr., Gompa near Tarakot, 3250 m, 6.VI.1973: 1♂ ** Myagdi Distr., Dhorpatan, 2950 m, 23.IV.1970: 1♀ (lower side, rump and upper tail-coverts orange-yellow) * Muri, 2300 m, 1.IV.1970: 1♀ (lower side lemon-yellow, rump and upper tail-coverts slightly richer greenish-yellow) ** Mustang Distr., Thakkhola, Purano Marpha, 3200 m, 17.III.1974: 1♂.

Measurements: **Wing**-L ♂ (2) 94 mm; ♀ (2) 89 and 91 mm. – **Tail**-L (graduation) ♂ (2) 102 (63) and 113 (67) mm; ♀ (2) 104 (63) and 107 (65) mm. – **Bill**-L ♂ (1) 12; ♀ (2) 11 and 12 mm. – **Tarsus**-L ♂ (2) 15 and 15.5 mm; ♀ (2) 15 and 17 mm. – **WTI** (4) 28.1-31.9%. – **TWI** (4) 108.5-120.2%.

Horizontal: My records extend from NW Dhaulagiri to the Darjeeling border. – Ringmo/Phoksumdo Lake (20.V.1979, 1♂♀ 15.VI.1973); Gompa/Tarakot (14.V.1970, 2.-6.VI.1973; see Material; both :Dolpo); – Gustung Khola (6.V.); Dhorpatan (23.IV., 8.-11.V.; see Material); Muri, Myagdi Khola (1.IV.; see Material; all :Myagdi); – Lete (1.V.); Thaksang above Tukche (8.-9.III.); ascent from Tukche to Thaksang (26.IV.); Purano Marpha (13.-17.III.; 23.IV.; see above; all :Mustang); – descent to Ghandrung (7.V. :Parbat); – above Dhumpus (27.IV., 9.V. :Kaski); – between Bagarchap and Thimang (14.IV.); Thimang (16.IV. both :Manang); – Kathmandu Valley, Phulchoki Mt. (19.-22.III. :Lalitpur); – Chordung Mt./Jiri (29.III. :Ramechap); – upper Simbua Khola (10.V. :Taplejung); – upper Gitang Khola near Dhorpar Kharka (29.-31.III. :Panchthar).

Vertical: My records from 20 localities are distributed like this (most of them from the presumed breeding season, IV-VI): 1550-2000 m: 2 loc.; 2010-2250 m: 2 loc.; 2260-2500 m: 3 loc.; 2510-2750 m: 5 loc.; 2760-3000 m: 4 loc.; 3010-3250 m: 3 loc.; 3260-3650 m: 2 loc. – Lowest records: 1550 and 1870 m above Dhumpus, 27.IV. and 10.V.; – the two highest records: 3300 m Gompa/Tarakot, V/VI; 3650 m Ringmo/Phoksumdo Lake, V/VI. – The al-

titudinal breeding range is not yet fixed, but it seems to be large; actual breeding records are scarce up to now. Most summer records (months?) range between 1200 and 2400 m (Inskipp & Inskipp 1991), but the species occurs regularly up to 3650 m (see also Diesselhorst 1968:214) and was observed up to 3965 m (Lowndes 1955; VIII). Except for several of Diesselhorst's (l.c.) records, most of the highest ones originate from arid areas N of the main range (3200-3965 m; Dolpo, Thakkhola, Manang; see Habitat).

Habitat: In accordance with its considerable altitudinal range, the Long-tailed Minivet occupies a broad array of vegetational types. They all have in common the open structure of light forests, forest edges and even small groves. Forest types differ with altitude. Records up to 2600 m originate from broad-leaved forests including pure *Quercus semecarpifolia* (Phulchoki Mt., 2650 m). At higher altitude, conifers are also present *(Abies spectabilis, Pinus wallichiana;* Thaksang, 3150 m), and along with a few *Betula utilis,* they prevail in the dry northern areas *(Picea smithiana;* Gompa/Tarakot, 3300 m – *Cupressus torulosa, Pinus;* Ringmo/Phoksumdo Lake, 3650 m; Purano Marpha, 3200 m). The dry northern areas definitely belong to the regular breeding areas as in three localities, Ringmo, Gompa and Purano Marpha, the species was met with in two different years.

Breeding: Testes of the III-♂ small, of the VI-♂ large (9 x 5 mm), ovary of the ♀ from 1.IV. small, that of ♀ from 23.IV. with strongly enlarged follicles close to oviposition. These data point to breeding activity in V, but there seems to be considerable variation (see Biswas 1961b, Diesselhorst 1968:215). As early as III, with heavy snow cover in shadowy forests and frost at night, *P. ethologus* is already present in the presumed breeding quarters (Thaksang 8.III., 3150 m; Purano Marpha from 13.III., 3200 m).

PYCNONOTIDAE

Pycnonotus

Five species occur in Nepal; all breed *(striatus, melanicterus, jocosus, leucogenys, cafer).* Except for *leucogenys,* the main area of which is situated west of India, the distributions of all other species are situated E of N India. Three have extensive Himalyan areas on the lower southern macroslope, continuous with the areas in India proper *(leucogenys* at least partly, *jocosus, cafer)* the others extended their areas into the Himalayas from SE Asia *(melanicterus, striatus).* In accordance with the tropical distribution of the genus in general, the main areas of the Nepal species are confined to the lowlands. Only *leucogenys* and *cafer* range locally above 2000 m, and the sparse *striatus* lives only above 1500 m. The common species *jocosus, leucogenys* and *cafer* have taken advantage of the destruction of the forest cover by human activity.

Pycnonotus leucogenys leucogenys (Gray)

Taxonomic note: Geographical variation is described in detail by Vaurie (1958:14-19; 1959:191) and Roselaar (in: Cramp 1988,5:478-479). Whether *P. leucogenys* forms a superspecies with SW Palaearctic and Afrotropical taxa is still open to question; *P. cafer* does not belong to it.

Material: 2 specimens: **D** Myagdi Distr., Muri, 2100 m, 25.III.1970: 1♂. **B** Kathmandu Valley, Lalitpur Distr., Godavari, 1600 m, 27.I.1970: 1 o.

Measurements: **Wing**-L ♂ 91. o 85 mm. – **Tail**-L ♂ 86.5, o 82 mm. – **Bill**-L ♂ and o 16 mm. – **Tarsus**-L ♂ 22.5, o 21 mm. – **WTI** (2) 12.9 and 13.2%. – **TWI** (2) 95.1 and 96.5%.

Horizontal: My records range from NW Dhaulagiri almost to the Darjeeling border. – Dunahi (8.VI. :Dolpo); – between Pelma and Emaka (21.V.); Muri (25.III.); near Dharbang (22.III., 29.V. all :Myagdi) – Ghasa (2.V. :Mustang); – Ghandrung (7.V. :Parbat); – Bahundanda (10.IV.); Jagat (11.IV.); Dharapangma (21.VI. all :Lamjung); – ascent to Khebang (25.IV. :Taplejung); – descent from Paniporua to Hinwa Valley (20.IV. :Panchthar); – Mai Khola Valley, ascent to Ilam (8.IV.); Siwaliks, ascent to Soktim (7.IV. both :Ilam).

Habitat: The White-cheeked Bulbul is predominantly a species of open landscape, heavily influenced by man. It inhabits bushy areas with single trees, forest edges and even gardens near human habitations. But association with man is apparently not as close as in *P. cafer.* As the species avoids closed forests, area extension and population size greatly benefited from the large-scale deforestation of the tropical/subtropical belt of the southern Himalayan macroslope.

Vocalizations: Often-displayed short verses, probably the territorial song (Fig.59f-h), are 0.3-0.5 s long and are composed of 4-5 notes – a combination of harsh and mellow components (for renderings see Fleming et al. 1976). The notes are heavily frequency-modulated, partly even click-like; bandwidth of the individual note and of the whole verse narrow, always less than 2 kHz. There is little individual variation of the male's repertoire; no more than 2 verse types have been encountered (Fig.59f-g).

Pycnonotus melanicterus

Horizontal: A few records from the SE hills near the Darjeeling border. – Mai Khola Valley, ascent to Ilam (8.IV.); Siwalik Mts., ascent to Soktim from Nodia Khola (7.IV.); N Sunichare, S border of Siwalik Mts. (4.IV. all :Ilam).

Vertical: Four records from 3 localities range from 250 to 630 m. Within this belt, the species is generally found in E Nepal, locally even higher (Inskipp & Inskipp 1991).

Habitat: Light subtropical forest, mostly in open places with bushes. All birds were in the lower bush storey, singles or two together (4.IV.).

Pycnonotus striatus

Horizontal, vertical: Two localities: between Mure and Hurure, 2150 m (13.-17.VI. :Sankhua Sabha); – Paniporua, 2300 m (17.-19.IV. :Panchthar).

Habitat: Open country with secondary growth, but edge of primary forest nearby. At both localities, single individuals or small flocks of up to 3 (Paniporua, before the breeding season ?) or groups of from 2 to 10 specimens (Mure/Hurure, after the breeding season ?) perched on tops of high isolated trees, always in the open, the forest edge at close range. I never came across the species within the dense primary forest nearby, but it may serve as the breeding ground proper. The species is known in Nepal from 1500-2650 m, but the monthly distribution is not differentiated (Inskipp & Inskipp 1991).

Pycnonotus cafer

Horizontal: My records stem from Kali Gandaki Valley to Kathmandu Valley. – Myagdi Khola, Dharbang (22.III. Myagdi); – Landrung (8.V. :Kaski); – Kathmandu, suburbs Chauni and Baneshwar (19.II., 18. and 31.III., 22.-26.VI.).

Vertical: The few records of my own range between 1000 m (Dharbang) and 1650 m (Landrung). In addition to many other villages and towns, the species is regularly met with in the Kathmandu Valley (1350 m). It rarely ascends to about 2100 m (Inskipp & Inskipp 1991).

Habitat: A species of open country with close affinities to human settlements, as long as there is some vegetation available: bushes and single trees in gardens, scrub close to settlements. As in *P. leucogenys,* the species avoids closed forests. Its population size has increased considerably since the deforestation of extended parts of the Nepal midlands.

Hypsipetes

The fauna of Nepal comprises three species; all breed *(mcclellandi, flavalus, leucocephalus).* These species reach their Himalayan areas from regions SE of the Himalayas proper along the southern macroslope of the main chain, which indicates their subtropical origin. *H. leucocephalus* is, as concerns ecological bandwidth, the most plastic species. In Nepal, it penetrates even into high altitudes and into areas beyond monsoon influence. It has disjunct areas in SW India and also in Ceylon.

Hypsipetes flavalus

Taxonomic notes: Often considered as *Hemixos flavala.*

Horizontal, vertical: My only record is from Arun Valley: 1 sp. below Karmarang (5.VI. :Sankhua Sabha) in secondary bush with single trees, semi-agricultural, at 1300 m. The species is sporadically distributed, and there are comparatively few records from the presumed breeding season (see Inskipp & Inskipp 1991).

Hypsipetes mcclellandi mcclellandi Horsfield

Taxonomic note: Perhaps conspecific with *H. virescens.*

Material: 1 specimen: **D** Myagdi Distr., Muri, 2300 m, 31.III.1970. 1♂.

Measurements: **Wing**-L 114 mm. – **Bill**-L 22 mm. – **Tarsus**-L 17 mm. – **WTI** 19.3%. – Testes slightly enlarged.

Horizontal, vertical: Besides the collected specimen, about 10 Mountain Boulbouls were seen pairwise on lower slopes of Sheopuri Mt. in the Kathmandu Valley at about 1800 m to 1950 m; 25.VI.1988. All stayed in low secondary bush. – A species of the subtropical cloud forest belt up to about 2150 m.

Hypsipetes leucocephalus psaroides Vigors

H. [madagascariensis], comp. Sibley & Monroe (1990:591). On coloration of the geographical forms of *H. leucocephalus* see Mayr (1941).

Material: 2 specimens: **D** Myagdi Distr., Muri, 2100 m, 25.-28.III.1970: 2♂.

Measurements: **Wing**-L 122 and 129 mm. – **Tail**-L 108 and 116.5 mm. – **Bill**-L 24 and 25 mm. – **Tarsus**-L 18.5 and 19 mm. – **WTI** 24.6 and 24.8%. – **TWI** 88.5 and 90.3%. – Testes enlarged.

Horizontal: My records from NW Dhaulagiri to the Darjeeling border. – Suli Gad Valley (7.VI.); between Tarakot and Dunahi (18.V., 10.VI.); Gompa/Tarakot (7.VI; all :Dolpo) – below Khibang (29.V.); Muri (25.-30.III. both :Myagdi: see Material); – below Ghasa (2.V. :Mustang): – below Ghandrung (8.V.); above Landrung (8.V.); between Landrung and Dhumpus (10.V. all :Kaski); – Boulboulé (10.IV. :Lamjung); – Tamur Valley, Lungthung (19.V.): Yamputhin (27.-29.IV.); confluence of Kabeli and Tada Khola (22.-24.IV.); ascent from Hinwa Khola to Yektin (20.IV. all :Taplejung).

Vertical: My records range from 850 m (Boulboulé, 10.IV.) to 2900 m (Gompa/Tarakot, 7.VI.), but the altitudinal belt of the breeding distribution is still not clear. – Presumed breeding season (M IV-VI): 15 localities cover 1350-2900 m; lowest is Khibang (29.V.), highest Gompa/Tarakot (7.VI.). Interval frequency as follows: 1650-2000 m: 6 loc.: 2010-2250 m: 2 loc.; 2260-2500 m: 0 loc.; 2510-2900 m: 3 loc. – Though Inskipp & Inskipp (1991) cite an alleged breeding record from Chitawan at about 300 m (original publication not seen by me), the regular breeding belt is situated much higher and may be quite limited. The lower margin may be near 1200 m with greatest population density up to 2500 m. My highest records are all from the comparatively dry southern parts of Dolpo NW of Dhaulagiri: In 1970 and 1973 (V, VI), the species was commonly seen in Barbung Khola Valley downriver from Tarakot to Dunahi and along the lower Suli Gad river between 2550 and 2900 m. – Outside breeding season (IV): 850 m Boulboulé (10.IV.); 1000 m Kabeli/Tada Khola (22.-24.IV.); 1250 m ascent to Yektin (20.IV.).

Habitat: The Black Bulbul prefers open forest, often secondary bush and riparian growth. Tree- and bush-rich semi-cultural land is often occupied and much of the present-day success and locally high population density of the species is due to the acceptance of habitats influenced by man. Originally, and still today, the Black Bulbul is a species of forest edges and accidentally opened parts of mature forests. For details see Diesselhorst's (1968:221) account.

Breeding: The 2 Muri ♂ (E III) had enlarged testes (up to 6 mm); Diesselhorst (1968:221) reports on specimens with maximum testes size and ♀ in oviposition state in M V, nest with fresh eggs E V (nesting record overlooked by Inskipp & Inskipp 1991).

Vocalizations: Among many others, prolonged "eeet" calls (Fig.59i-k) are commonly displayed by the Black Bulbul. These whistles are characterized by harmonics, some strong and some weak, which range from 2 to at least 8 kHz. The pattern of harmonics seems to be constant in the individual ♂ (Fig.59i versus k). In one of the 2 individuals illustrated, the strongest harmonic is in the center (Fig.59i), in the other the lowest and uppermost were strongest (Fig.59k). The frequency distances between the harmonics also seem to be subject to inter-individual variation (Fig.59i-k). Length of notes varies individually (0.65-0.95 in 1 ♂). See illustration of the similar "eeet" calls of related *Hypsipetes* species of the islands of the western Indian Ocean in Louette & Herremans (1985).

IRENIDAE

Aegithina tiphia tiphia (L.)

Material: 3 specimens: **N** Chitawan Distr., Rapti Valley, S Tekouli, Hatisar, banks of Rapti river, 300 m, 11.-14.II.1970: 1♂, 1♂ juv., 1♀.

Measurements: **Wing**-L ♂ 66; ♂ juv. 64; ♀ 61.5 mm. – **Tail**-L ♂ 49.5; ♂ juv. 49; ♀ 51 mm. – **Bill**-L ♂ 15; ♂ juv. 15; ♀ 15.5 mm. – **Tarsus**-L ♂ 20.5; ♂ juv. 18.5; ♀ 19 mm. – **WTI** (3) 9.8-12.1%. – **TWI** (3) 75.0-82.9%.

Horizontal, habitat: ascent to Soktim, 490 m (7.IV. :Ilam); see Material. – Among others, the specimens were caught in scrub and the forest edge on the banks of the Rapti River. The Common Iora breeds up to 1350 m (Kathmandu Valley, Fleming et al. 1976).

Chloropsis

Two species occur on the southern slopes of the mountain chain, *aurifrons* in the lower belt, *hardwickii* in the higher one. According to Fleming et al. (1976), there is considerable altitudinal overlap, but data in Inskipp & Inskipp (1991) suggest a clear separation between them.

Chloropsis aurifrons

Horizontal, vertical, habitat: Only one observation of a single specimen at the southern foothills of the Siwalik chain N of Sunichare in open Sal forest; 4.IV.1988.

Chloropsis hardwickii

Horizontal, vertical: Two observations E of the Arun Valley. – Lower Pahakhola Valley, above Karmarang, 1600 m (4.VI.1988 :Sankhua Sabha); – on the banks of Kabeli Khola near Yamputhin, 1650 m (30.IV.1988 :Taplejung).

Habitat: Both specimens were in open forest on steep slopes close to the river.

CINCLIDAE

Cinclus

Two species are breeding residents in Nepal, *cinclus* and *pallasii*. The vertical span of their breeding area belt extends from ca. 800 m to at least 4550 m, but there is no continuous distribution on the S flanks of the main chain, the zone above 3600 m being uninhabited by Dippers at least during the breeding season proper. *C. cinclus* is mainly confined to the dry areas N of the main range and is largely allopatric with *pallasii*. But W of Kanchenjunga the two species locally coexist in spring and both may breed there side by side. Their specific interrelations at sites where they live together are still to be worked out, as are the details of the post-breeding upstream vertical migrations of *pallasii*.

Cinclus cinclus cashmeriensis Gould

White-necked morph.

Material: 1 specimen: **D** Dolpo Distr., Tarap Khola Valley, Kangar, 4200 m, 17.VI.1973: ♂.

Measurements: **Wing**-L 104 mm. – **Tail**-L 55 mm. – **Bill**-L 19 mm. – **Tarsus**-L 29 mm. – **WTI** 25%. – **TWI** 52.9%.

Notes: Strongly enlarged testes, 8 mm; bill black; feet brownish; plumage clearly worn.

Horizontal: Our own records are concentrated in the NW and N flanks of Dhaulagiri (:Dolpo) and in the catchment area of upper Tamur and Arun (Lumbasumba massif :Taplejung). – Kangar, Tarap Khola: at least 1 pair present (17./18.VI.1973; see Material); Charka, upper Barbung Khola, at several times several specimens (20.-24.VI.1973); Yalung Khola in direction towards Dudje La, singles regularly seen at the side of the path along the stream banks (21.VI.1970); and an empty nest was found with adults present (26.VI.1973 all :Dolpo); – Ladza Khola W Walungchung Gola. breeding record (21./22.V.1988); from Kangla Khola to Thudam, 1 specimen, nearly simultaneously at this place 1 specimen of *C. pallasii* (25.V.1988); edge of Thudam village at several times single specimens, *C. pallasii* also being present there (25./26.V.1988); Gabri Khola above Thudam, ascent to Meropapa La several times singles in upper parts of the valley (28.V.1988; all :Taplejung).

The breeding areas within Nepal are situated in the arid zones N of the Himalayan main chain; consequently they are not continuous. They probably extend from the W Nepal border to Dolpo (:Dolpo) and N Mustang (:Mustang) and an additional breeding locality is now recorded for the first time in the NE of the country W of Kanchenjunga (this record has been already dealt with by Inskipp & Inskipp 1991).

Vertical, habitat: The two nesting sites are situated at 4150 m (Ladza Khola) and 4550 m (Dudje La); all other finds in V and VI between 3550 m (Thudam) and 4550 m (Dudje La). Because of its preference for arid areas (but see Kanchenjunga area), during the breeding time *cinclus* lives only above approximately 3500 m up to 4575 m (Fleming et al. 1976) or 4800 m (Inskipp & Inskipp 1991). Individual observations close to the upper limit have never been presented. The most important characters of breeding sites are apparently broad and shallow, not cascading streams and small rivers of the upper valleys; these are largely absent above 4500 m due to the steep and rugged landscape. The streams are partly situated in the forest zone (Thudam), but more often far beyond the tree limit in alpine steppes. During the breeding season, the vertical area belt probably only slightly exceeds 1000 m in width.

Breeding: The nest on the Ladza Khola (4150 m, Fig.60) contained 3 ca. 10-days-old pulli at 22.V., the other one at Dudje La (26.VI.) was (still ?) empty but fresh, the adults being present. Corresponding to the inhospitable high altitudes, which regularly produce sharp night frost E V at 4000 m, the breeding season takes place late (see *pallasii).* Ovipostion may start M IV at the earliest; correspondingly, fledged pulli are present by M VI (fide Fleming et al. 1976). – Nest sites in the two cases were vertical rock faces; one of them was situated below a bundle of last year's grass in the fissure of an isolated rock within the stream bed (Fig.60). – Syntopic occurrence of the two Dipper species *cinclus* and *pallasii* during the breeding season (E V) at altitudes between 3550 and 3930 m is here recorded for the first time for Nepal. A find in "summer" at 4270 m (:Dolpo) in the possible *cinclus* area is mentioned by Fleming et al. (1976) but *pallasii* is not a breeding bird there. Possible breeding of *pallasii* in the lower part of the *cinclus* area belt is substantiated by a *pallasii*-pullus on 27.V. close to Thudam (3550 m). However, considerable post-breeding

Fig.60: Nest site of *Cinclus cinclus* on the face of a large grass-crowned boulder amidst Ladza Khola W Walungchung Gola, 4100 m, Taplejung Distr., 22.V.1988 J. Martens.

(VII-IX) vertical migrations are known to occur in *pallasii* (Diesselhorst 1968:332, Fleming et al. 1976) and sympatric breeding of the two species has not yet been proven.

Cinclus pallasii tenuirostris Bonaparte

Cinclus [pallasii] incl. *mexicanus.*

Material: 3 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 13. and 18.IV.1970: 1♂, 1♀ * Upper Myagdi Khola Valley, N pasture Dobang, 2950 m, 23.V.1995: 1♀.

Measurements: **Wing**-L ♂ 99; ♀ 2x94 mm. – **Tail**-L ♂ 52; ♀ 49, 50 mm. – **Bill**-L ♂ 20; ♀ 2x20 mm. – **Tarsus**-L ♂ 28.5; ♀ 28, 29.5 mm. – **WTI** 23.4-24.2%. – **TWI** 52.5-53.2%.

Notes: ♂ gonads slightly active. – The small *C. p. tenuirostris,* striking by its reddish-brown colouration, has the lowest WTI (n=11, $\bar{x}$=25.1%, s_d=1.65; *souliei,* n=17, $\bar{x}$=27.3%, s_d=1.64; *pallasii,* n=18, $\bar{x}$=27.9%, s_d=1.02) and TWI congruent with *souliei (tenuirostris,* n=11, $\bar{x}$=54.4%, s_d=1.78; *souliei,* n=17, $\bar{x}$=54.1%, s_d=2.20); the northern nominate *pallasii* is relatively long-tailed: n=18, $\bar{x}$=59.3%, s_d=2.10. *C. p. dorjei* was not investigated.

Horizontal: Our own data originate from the NW flanks of Dhaulagiri to the piedmont levels of Kanchenjunga covering the whole expedition area. Inskipp & Inskipp (1991) also cite records from all mountainous parts of the country. In the appropriate vertical area band *pallasii* seems to be evenly distributed but Diesselhorst (1968:332) points out small local differences.

Vertical: Our finds extend from 750 m (20.III. near Kusma: Parbat) to 4100 m (31.V., S of Jungla Banjyang :Dolpo) most of them being concentrated between 200 and 3000 m. An independent young on 20.III. at 750 m is to be regarded as a strong indication for breeding. A nest was found in the Simbua Khola (:Taplejung) at 3350 m (V 1988) but there were no adults present. The two finds are close to the supposed upper and lower breeding area limits.

Not regarding seasons, *pallasii* has been found from 457 m (Fleming et al. 1976) to 4950 m (Diesselhorst 1968:332), an enormous vertical span, within which the actual breeding belt occupies a considerably narrower region. According to the present findings it extends from appr. 800 m (see above) to about 3600 m (Inskipp & Inskipp 1991), the actual vertical span being about 2800 m, remarkably broad for a Himalayan passerine bird.

Habitat: The Brown Dipper inhabits not only shallow and slowly flowing streams but also cascading large high mountain rivers, e.g. Tamur near Dumhan (:Taplejung, IX) (cf. *C. cinclus).* Post-breeding finds extend up to nearly 5000 m. Diesselhorst (1968:332) suggested that those altitudes are visited only after breeding activity is terminated (cf. Fleming et al. 1976) and that they are not situated within the breeding area. Even lack of competition in areas where *cinclus* is absent does not change the situation.

Breeding: Season is very early, already in I and II (Fleming et al. 1976); accordingly, an independent fledgling was seen on 20.III.1970 at 750 m (:Parbat, see above). Nesting site in a fissure of the eroded rocks in the bank ca. 80 cm above the foaming water line of Simbua Khola (:Taplejung, see above). – *Re* syntopic occurrence with *C. cinclus* see above.

TROGLODYTIDAE

Troglodytes troglodytes nipalensis Blyth

Material: 2 specimens: **D** Mustang Distr., Thakkhola, Thaksang above Tukche, 3150 m, 23.XI.1969: 1♀. **S** Solukhumbu Distr., Pheriche Valley, Phulung Karpo, 4350 m, 28.IX.1970: 1♀.

Measurements: **Wing**-L 47.5 and 52 mm. – **Tail**-L 29 and 34 mm. – **Bill**-L 10 and 11 mm. – **Tarsus**-L 17.5 and 19.5 mm. – **WTI** 10.5 and 11.5%. – **TWI** 61.1 and 65.4%.

Horizontal: Our records extend from NW Dhaulagiri to W Kanchenjunga. – Pass Jungla Banjyang (10.V.); Seng Khola (8.V.); Dhorpatan (12.-14.IV. all :Myagdi); – Titi Lake (25.II.); Thaksang above Tukche (23.XI. both :Mustang; see Material); – E Manaslu, Chyulwang Khola, Tabruk Karka (8.VIII. :Gorkha); – Phulung Karpo (28.IX. :Solukhumbu; see Material); – descent to Pahakhola from E (30.V.); descent from Pomri La westward (29.V.); Gabri Khola (28.V.); ascent to and descent from Merapapa La (28.V.); Kangla Khola above Thudam (24.V. all :Sankhua Sabha); – ascent to Tangje La (23.V.); Ladza Kharka W Walungchung Gola (22.V. both :Taplejung).

Vertical: Presumed breeding season or close to it (V-VIII): My own records range from 3800 to 4770 m and are distributed as follows: 3800-4000 m: 3 localities; 4010-4250 m: 6 loc.; 4260-4500 m: 5 loc.; 4510-4770 m: 3 loc. – Outside breeding season (II, IV, VIII, IX): Records include different stages of the pre- and post-breeding cycle: Winter quarters and/or

on the move to the breeding grounds: 25.II. at 2700 m, lake Titi; 23.XI. at 3150 m, Thaksang; 12.-14.IV. at 3150-3500 m, Dhorpatan. – Post-breeding close to or still within the breeding grounds: 8.VIII. at 4000 m E Manaslu; 28.IX. at 4350 m Valley of Pheriche (28.IX.). – Inskipp & Inskipp (1991) give the Wren's range as up to (rarely) 5300 m; Diesselhorst (1968:330) found it in Khumbu only from 3900 to 5000 m (VI-M IX), well above the timberline, and this seems to be largely the breeding range in the Himalayas in areas where no *Pnoepyga* species are present (see below).

Habitat: Within the presumed breeding period, all records of the Northern Wren, except the only one from the Seng Khola (3800 m, 8.V.), which originates from the upper open bush-rich forest zone, are from localities above the timberline in the zone of bushy (not dwarf) Rhododendrons up to 3 m high (above Pahakhola, down to 4050 m, V), also dwarf *Rhododendron* (Kangla Khola, 4250 m) on steep slopes, or in barren regions where horizontal areas adjoin steep and rocky slopes with extensive fields of piled-up boulders through which humans can move only with difficulty (upper Ladza Khola, 4250 m, 22.V.). Most extreme are the uppermost localities on the N slopes of Pomri La (4300-4770 m, V), where several ♂ sang exposed on the tops of rocks. These looked like black outcrops within a thick cover of snow, which was 1 m high in places. It is difficult to understand how the birds could find enough to eat among the few scattered rocks free of snow, and when their breeding season starts. This altitudinal range in the Lumbasumba Himal W of Kanchenjunga is known for heavy snow cover as late as June.

The Wren is apparently absent from the dry areas N of the Himalayan main range. I did not came across it during extended stays in Dolpo, Mustang and a shorter one in Manang. In the NW Dhaulagiri it stops on the N slopes of Jungla Banjyang (see Horizontal), and the one winter bird from Thaksang, though found within the monsoon-reduced area, originates from a part of the valley covered by heavy mesophilic forests.

At its lower altitudinal range, the Wren meets the ecologically similar *Pnoepyga albiventer* (e.g., between 3800 and 4000 m above Pahakhola, V). Both are said to avoid competition by occupying different altitudinal ranges (Diesselhorst 1968:331).

Migration: Only vertical. On the slopes of the Dhorpatan valley, a single bird (12.IV.1970) and a small population of several birds (14.IV.1970) were singing along open bush and small patches of *Rhododendron* and coniferous trees close to pastures. These observations may refer to late birds still in or on the way back to the breeding grounds. In V 1973, roughly in the same area, I could not find the Wren, and Morioka (1985) did not record it in the area from 5.-18.X.1981.

Vocalizations: The territorial song is, at least for the human ear, very similar to that of European populations. However, in the Kanchenjunga area it was not possible to provoke a territorial reaction by playback of a song from Germany. Possibly there are differences in note form which remain to be identified. See Kroodsma & Momose (1991) for comparison of songs of Japanese and N American populations.

Prunella

Six species occur in Nepal; 4 breed *(strophiata, fulvescens, rubeculoides, collaris),* 2 are winter guests *(himalayana, immaculata).* As is consistent with the Palaearctic/central Asian origin of the genus, the species in question breed only in areas above timberline and their altitudinal belts altogether range approximately from 3800 to 5400 m. *P. collaris* belongs to the small group of passerines with exceptionally high breeding localities in Nepal. *P. strophiata, fulvescens* and *rubeculoides* occupy largely the same altitudinal belt, below that of *collaris,* and they coexist in the dry Tibetan facies Dolpo N of the Himalayan main range. They segregate mainly by differing ecological requirements even at close range *(fulvescens, rubeculoides),* partly perhaps simply by competition *(strophiata).* See Schäfer (1938:286-294) for slight differences of the distributional ecology of the same set of species in Tibet.

Prunella strophiata strophiata (Blyth)

Material: 9 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3950 m, 4.VI.1970: 1♂ ** Mustang Distr., Thakkhola, Nabrikot, 2750 m, 10.XI.1969: 1♂ * Tukche, Kali Gandaki Valley, 2650 m, 19.X.1969: 1♂. **S** Solukhumbu Distr., Thame Teng, 3900 m, 6.X.1970: 1♂, 2♂ pull. * Tarnga, 4050 m, 12.X.1970: 1♂ * Pangpoche, 4000 m, 29.IX.1970: 1♀, 1 o.

Measurements: This section includes the extensive material of the Diesselhorst collection (ZSM). – **Wing**-L ♂ (16) 63-68, $\bar{x}$=65.6, s_d=1.66; ♀ (8) 62-65 mm, $\bar{x}$=63.2, s_d=1.00; o (1) 62.5 mm; ♂ pull. (6) 62-67.5, $\bar{x}$=64.1, s_d=1.96; ♀ pull. (2) 62 and 63 mm; o pull. (1) 62.5 mm. – **Tail**-L ♂ (15) 50-56 mm, $\bar{x}$=54.0, s_d=1.93; ♀ (8) 49-56 mm, $\bar{x}$=52.3, s_d=2.14; o (1) 56.5; ♂ pull. (5) 53-56 mm, $\bar{x}$=54.1, s_d=1.34; o pull. (1) 52.5 mm. – **Bill**-L ♂ (5) 10-11 mm, $\bar{x}$=10.3, s_d=0.45; ♀ (1) 10 mm; o (1) 10 mm; ♂ pull. (2) 9.5 and 10 mm. – **Tarsus**-L ♂ (15) 19.5-21.5 mm, $\bar{x}$=20.3, s_d=0.49; ♀ (8) 20-21 mm, $\bar{x}$=20.2, s_d=0.37; o (1) 19 mm; ♂ pull. (6) 18.5-21 mm, $\bar{x}$=20.1, s_d=0.97; ♀ pull. (3) 20-21 mm; o pull. (1) 20 mm. – Feet of a ♂ from X light orange. – For indices see Table. 3.

Tab.3: WTI, TWI and tarsus/wing index values of *Prunella strophiata* and *P. atrogularis huttoni.*

P. strophiata

	range	$\bar{x}$	s_d	n
WTI (%)	12.7–19.1	16.1	1.52	33
TWI (%)	78.1–86.7 (90.4)	83.1	2.54	30
Tarsus/wing index (%)	29.4–33.3	31.5	0.93	34

P. atrogularis huttoni

	range	$\bar{x}$	s_d	n
WTI (%)	18.9–26.7	22.3	1.70	41
TWI (%)	83.6–93.6	88.4	1.90	41
Tarsus/wing index (%)	25.9–29.7	27.8	1.05	24

Notes: Neither coloration nor proportions of wing and tail would justify treating *P. strophiata* and *P. atrogularis* as allospecies (cf. Haffer 1985: 1077). *P. atrogularis huttoni,* geographically neighbouring *P. strophiata,* has much longer wings but tarsi of the same length (♂: *atrogularis* x̄=20.6 mm, *strophiata* x̄=20.3 mm) and clearly higher TWI (possibly caused by allometric growth, but this is not likely because the WTI is also much higher).

The zoogeographic species of the genus *Prunella* are as follows: 1. *himalayana,* 2. *collaris,* 3. *rubeculoides,* 4. *strophiata* 5. *montanella,* 6. *[fulvescens]* incl. *ocularis, fagani,* 7. *[atrogularis]* incl. *koslowi,* 8. *[modularis]* incl. *rubida,* 9. *immaculata.*

Horizontal: My records range from Dhaulagiri to the Sikkim border. – Ringmo/Phoksumdo Lake (4.-15.VI., see Material); ascent to Bagar La (16.VI.); between Tukot and Parung La (19.VI.); Parung La (20.VI.); Jungla Banjyang, N slope (10.V. all :Dolpo); – resting place Phurbang (31.V.); Dhorpatan (17.IV.); Muri (25.-30.III. all :Myagdi); – Dudje La, W slope (27.VI.); ascent to Dapa Col from Tukche (18.VII.); Tukche (19.X., see Material); Nabrikot (10.XI., see Material; all :Mustang); – Chordung Mt. (1.IV. :Dolakha); – Thame Teng (6.X.; see Material); Tarnga (12.X.; see Material); Pangpoche (29.IX., see Material; all :Solukhumbu); – ascent to Pomri La (29.V.); Kangla Khola (24.V. both :Sankhua Sabha); – Ladza Kharka (22./23.V.); ascent to Anda Deorali S Gunsa (9.IX., 4200 m; both :Taplejung). – The species is widely distributed all over the Nepal part of the Himalayan main axis.

Vertical: Presumed breeding season (M V-M VII, extended to B IX): records range from 3800 m (ascent to Bagar La, 16.VI.) to 4650 m (Parung La, 20.VI.). 15 localities are distributed as follows: 3800-4000 m: 7 loc.; 4010-4250 m: 6 loc.; 4260-4500 m: 3 loc.; 4510-4650 m: 1 loc. Greatest density of records is from 3800-4300 m. Higher parts of the breeding range may be underrepresented because they have not been visited regularly. – Inskipp & Inskipp (1991) give the altitudinal belt during summer (months?) as 3500-4930 m, but Biswas (1961b) points out: "3655-5335 m in February-May" (see Habitat).

Outside breeding season (E IX-M IV): My records extend from 2100 m (Muri, 25.III.) to 4050 m (Tarnga, 12.X.) and include both individuals still on or close to the breeding grounds (3900-4050 m, 29.IX.-12.X.; see Material) and birds in the winter quarters considerably below the breeding range (2100-3000 m, 19.X.-17.IV.). An individual on 17.IV. was still far from the breeding grounds (Dhorpatan, 3000 m). – The winterquarters extend down to at least 1310 m (Ripley 1950); Inskipp & Inskipp (1991) report a "winter" area from 1600 to at least 3600 m (months not indicated).

Habitat: The Rufous-breasted Accentor is a typical and common bird of the alpine zone above timberline. Its lower limit is characterized by the zone of large *Rhododendron* bush *(Rh. anthopogon* and others), dwarf *Betula utilis, Berberis* and *Salix* which adjoin the timberline. The forest zone proper does not form part of its summer home. The upper limit is determined by the uppermost patches of dwarf *Juniperus* and *Rhododendron* scrub. At least same scattered patches of such a bush layer, low as it may be, are essential structures of the habitat of the species. This vegetation type reaches its highest outposts around 5000 m, locally slightly lower or higher. *P. strophiata* is also present in the appropriate habitat N of the main range, where I often met it in the high-altitude region of Dolpo. There *P. strophiata* lives at close quarters with *P. collaris* (which see) and *P. rubeculoides.* It remains to be determined which ecological requirements separate *strophiata* from the latter two. –

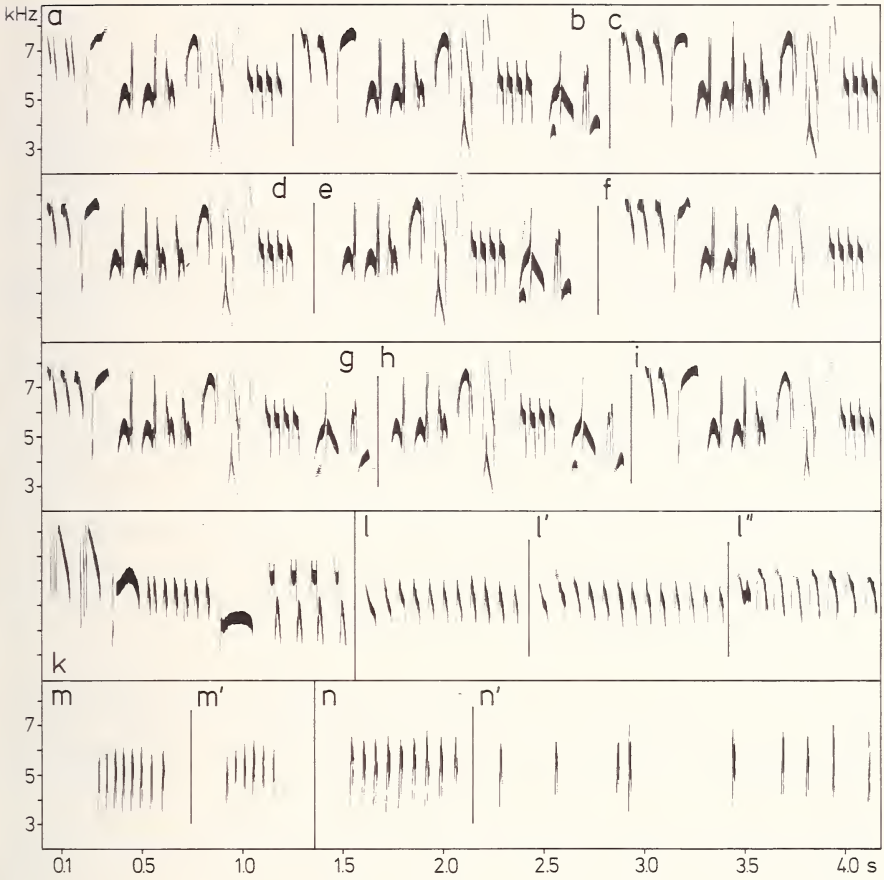


Fig.61: Vocalizations of *Prunella* species. – a-l) *P. fulvescens*. a-k: territorial song, a-i) 9 consecutively displayed verses (1 verse between 'b' and 'c' not shown, identical with h), Charka 21.VI.1973; k) 1 verse of another ♂, Charka 21.VI.1973; l-l'') series of warning calls of 1 ♂, Charka 24.VI.1973. m-n) *P. strophiata*. – Series of warning calls, m/m') Ringmo 13.VI.1973; n/n') Gabri Khola 28.V.1988.

For a detailed account of the species' ecology close to Mt. Everest see Diesselhorst (1968:338) and for one considering the whole range see v. Vietinghoff-Scheel (1977a).

Breeding: A fledgling still being fed was observed near Anda Deorali pass on 9.IX.1983, 4200 m. See Diesselhorst (1968:339) for newly fledged pulli as late as B IX in Khumbu.

Migration: Regular vertical movements after and before the breeding season. The bulk of the local population leaves the breeding grounds in the second half of X. M X individuals are still present higher than 4000 m (see Material), but others were already recorded on 19.X. at 2650 m in the winter quarters (see Material).

Vocalizations: Call series (Fig.61m/m', n/n') consist of broad-band (ca. 3.5 kHz wide) often narrowly spaced rows of angular notes (per rate 8-11 notes/0.5 s), which are always opened downwards.

Prunella fulvescens sushkini Collin & Hartert

Prunella [fulvescens] incl. *ocularis, fagani.*

Material: 4 specimens: **D** Dolpo Distr., between the passes Büko La and Mo La, 4600 m, 20.VI.1973: 1♂, 1♀ * upper Barbung Khola Valley, Charka, 4250-4350 m, 20.-23.VI.1973: 2♂.

Measurements: **Wing**-L ♂ (3) 76-78 mm; ♀ (1) 75 mm. – **Tail**-L ♂ (2) 62.5 and 66 mm; ♀ (1) 62 mm. – **Bill**-L (4) 12 mm each. – **Tarsus**-L ♂ (3) 20-21 mm; ♀ (1) 20 mm. – **WTI** (4) 19.6-20.5%; $\bar{x}$=20.0. – **TWI** (3) 81.7-84.6%.

Notes: For comparison, 16 *P. fulvescens* from the Tian Shan Mts. have WTI = 18.0-22.0%, $\bar{x}$=20.5, s_d=0.93 and TWI = 82.8-87.4%, $\bar{x}$=85.4, s_d=1.17.

P. montanella, an isolated species, has higher WTI values than *P. fulvescens,* despite a more rounded wing shape (WTI 22.5-25.0%, $\bar{x}$=24.0, s_d=0.78, n=8) and a relatively long tail (TWI 88.2-96.1%, $\bar{x}$=91.0, s_d=2.53, n=8).

The 4 *P. f. sushkini* have the bill black, the tarsi flesh-coloured, the toes grey. – Ovary hardly active after ovipisition, testes much enlarged, 9-14 x 6-8 mm.

Horizontal: Our records from the dry areas NW and N of Dhaulagiri. – Ringmo/Phoksumdo Lake (15.VI.); Mukut (17.VI.); Kangar in Tarap Valley (18.VI.); Zö La (19.VI.); near Charka and Charka village (20.-24.VI. all :Dolpo); – Jomosom (21., 26.III.); Purano Marpha (17.-19.III.); Choya (25.II. all :Mustang); – upper Manang village (19.IV. :Manang). – These records, summer as well as winter, coincide with the presently known species' Nepal range (Inskipp & Inskipp 1991), an southward extension of the Tibetan area. Even during winter, it is restricted to dry habitats.

Vertical: Within the presumed breeding season (VI): 7 localities in Dolpo range between 4000 m (Mukut, Ringmo) and 4700 m (Zö La); the remaining 4 were at 4200 m (Kangar), 4300-4350 m (in and near Charka), and 4600 m (Büko La). These data indicate a relatively small area belt of 700 m; Inskipp & Inskipp (1991) also present records not higher than 4880 m.

Outside the breeding season (II, III, IV, XI): Records in II and III concern vertical migrants still in their winter quarters below the breeding belt at 2400 m (Choya), 2750 m (Jomosom) and 3200 m (Purano Marpha). Likewise, the singing ♂ at 3700 m from above Manang (19.IV.) was not yet at the breeding place.

Habitat: During the breeding season, the Brown Accentor occupies the alpine zone in the dry rainshadow area N of Dhaulagiri and perhaps Annapurna. Preferred microhabitats seem to be rocky areas with sparse patches of low bushes, especially dwarf *Rhododendron, Caragana* and *Lonicera,* but flatter areas along high passes are also inhabited. The crucial character distinguishing it from the ecologically similar *P. rubeculoides* is the obvious presence of smaller or larger rocky outcrops and only sparse patchy, much reduced vegetation. These requirements of *fulvescens* are also satisfied in larger Tibetan villages of Dolpo. I found it common in Charka, a major settlement (about 20 houses) in the upper Barbung Khola Valley. Several ♂ were singing there from the tops of prayer-flag poles; I saw a copulating pair and fledglings still being fed (21.-26.VI.1973). The village and its close environs have no bushy vegetation left (Fig.36); very likely, these pairs breed in the dry scrub stacks which are normally piled on the edges of the flat Tibetan roofs, in close proximity to *Phoenicurus ochruros, Passer montanus* and *Columba rupestris* (which see). – For a ge-

neral account of the species' distribution and ecology see Portenko & v. Vietinghoff-Scheel (1977).

Breeding: Fledglings with parents on 21.VI. suggest beginning of oviposition in the first half of V, but strong song activity E VI and copulation (24.VI.) may indicate a 2nd brood. – First breeding record for Nepal.

Vocalizations: Territorial song (Fig.61a-k) is a short verse (1.2-1.8 s in the single ♂ checked) of remarkable frequency width (7 [2-9] kHz for the whole verse, up to 4.5 kHz for the individual note. Few notes are rich in harmonics. Most notes undergo rapid frequency shifts and parts of them are often nearly click-like. Angular notes always open downwards. The individual ♂ uses a limited repertoire of notes which are incorporated into a fixed syntax. Within 10 consecutively sung verses a central block of notes (several phrases) remains unchanged. In front and at the end of this block additional notes may be added with little variation. Of 10 verses 3 were identical (nos. 3, 6, 9). – Call series (Fig.61l-l''), apparently warning calls, are verse-like with slight variation from note to note. – Song display in exposed positions: rocks, low bushes or tops of prayer-flag poles in Tibetan villages (Fig.36).

Territorial song of *P. fulvescens* is similar to that of *P. ocularis* in overall appearance of note forms (sonagrams in Loskot 1988 and Cramp 1988). But frequency width seems to be much more reduced in *ocularis* (appr. 4-7.5 kHz according to sonagrams in Loskot 1988 and 2.7-5.5 [-7.2 in 1 note] of another specimen in Cramp 1988).

Prunella rubeculoides rubeculoides (Moore)

Material: 7 specimens: **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4250 m, 25.VI.1973: 1♂. **S** Solukhumbu Distr., Tarnga, 4050 m, 8-12.X.1970: 2♂, 2♀, 1 o * Lobuche, 4900 m, 22.IX.1970: 1♂.

Measurements: In this section Diesselhorst's material is included. – **Wing**-L ♂ (8) 76-84 mm, $\bar{x}$=80.4, s_d=2.49; ♀ (5) 73-76.5 mm, $\bar{x}$=75.2, s_d=1.61; o (1) 80.5 mm; pull. ♂ 82; ♀ 75, o 77 mm. – **Tail**-L ♂ (7) 62.5-70 mm, $\bar{x}$=66.0, s_d=2.69; ♀ (5) 58-62 mm, $\bar{x}$=61.1, s_d=1.75; o (1) 66 mm; pull. ♂ 68.5; ♀ 61; o 60.5 mm. – **Bill**-L ♂ (4) 11-13 mm, $\bar{x}$=12.1; ♀ (2) 11.5 and 12 mm; o (1) 12 mm. – **Tarsus**-L ♂ (8) 23.5-25.5 mm, $\bar{x}$=24.5, s_d=0.66; ♀ (5) 21.5-23.5 mm, $\bar{x}$=22.8, s_d=0.76; o (1) 24 mm; pull. (3) 23 mm each. – **WTI** (15) 13.0-19.9%, $\bar{x}$=16.5, s_d=2.01. – **TWI** (16) 78.4-84.9%, $\bar{x}$=81.6, s_d=1.96. – Tarsus/wing index (17) 28.1-31.5%, $\bar{x}$=30.3, s_d=1.06 (cf. *Prunella strophiata).*

Notes: Moult: IX-♂ (Lobuche) P7-9 growing (comp. Diesselhorst 1968:335).

Horizontal: My records are in dry areas N of Dhaulagiri and Annapurna and close to Mt. Everest. – Kangar (18.VI.); Büko La (19.VI.); between Büko La and Mo La (20.VI.); Charka (25.VI., see Material); ascent to Dudje La (21.VI., 26.VI. all :Dolpo); – above Muktinath (20.IV.); Muktinath (21.IV.); Serku (21.IV.); Tukche (26.IV. all :Mustang); – Tarnga (8.-12.X.); Lobuche (22.IX. both :Solukhumbu, see Material).

Vertical: During the presumed breeding season (VI): My records range between 4200 m (Kangar 18.VI.) and 4800 m (ascent to Dudje La (26.VI.); the other 7 sightings are evenly distributed between these data. This makes only a small altitudinal belt, and in view of the ecological requirements of the species (see Habitat), it may indeed extend only up to 5000 m (see Diesselhorst 1968:336). – Outside the breeding season (IX, X, IV): 22.IX. (Lobuche, see Material) still in the breeding grounds at 4900 m; 8.-12.X. (Tarnga, see Materi-

al) already below the lower breeding area limit at 4050 m; E IV still far from the breeding grounds at Tukche (2650 m, 26.IV.), Serku (3400 m, 21.IV.) and Muktinath (3600 m, 21.IV.).

Habitat: During the breeding season, the Robin Accentor lives in the alpine zone, mainly in the dry areas N of the main range. It prefers places where dwarf bushes provide cover, which is composed mainly of *Rhododendron, Caragana, Lonicera* and *Salix,* often close to running water. There *rubeculoides* often behaves quite secretive, and only rarely is it to be seen in the open. The song is also normally displayed hidden in this cover. The other Nepal breeding area, Khumbu, is exposed to monsoon precipitation, though it is moderate. Only in Dolpo does *P. rubeculoides* live in the same altitudinal belt with *P. strophiata* and *P. fulvescens.* However, *fulvescens* prefers the rocky open areas, *rubeculoides* and *strophiata* low and sparse bushy plant cover. Generally, *strophiata* seems to be confined to slightly moister microhabitats, but, as their altitudinal belts largely overlap, the situation is not very clear. – As concerns *strophiata* and *rubeculoides,* the situation in Charka allows a more general conclusion: in the vegetationless village and close to it, *fulvescens* has its strongholds, in the dwarf *Rhododendron* on the slopes below the village and near the river bank, *rubeculoides* is the only species. In the Everest area (Khumbu), where *fulvescens* is absent but *strophiata* present, the ecological situation differs (see Diesselhorst 1968:336). As would be expected from these habitat requirements, I did not come across the species in the extremely wet Kanchenjunga area. – Specimens in the winter quarters (or on the way back to the breeding grounds) were single or in small flocks (up to 5) in open agricultural land. – For a general account of the species' distribution and ecology see v. Vietinghoff-Scheel (1977b).

Prunella himalayana Blyth

Taxonomic note: This monotypic species forms a binary group with *P. collaris;* for wing and tail relations see *P. collaris.*

Material: 1 specimen: **J** Dolakha Distr., Thodung, 3200 m, 8.IV.1973: 1♀.

Measurements: **Wing**-L 93.5 mm. – **Tail**-L 54.5 mm. – **Bill**-L 12.5 mm. – **Tarsus**-L 22 mm. – **WTI** 29.9%. – **TWI** 58.3%.

Notes: Ovary inactive. Bill black, lower base yellowish; feet light flesh-coloured.

Horizontal, vertical: The collected specimen originates from a flock of about 25, which fed on clearings and close to the forest edge in the area of mixed coniferous/broad-leaved forests of Thodung. The Altai Accentor is a regular winter visitor to Nepal. Though late specimens stay up to (rarely) M V (Inskipp & Inskipp 1991), there is not the slightest evidence for breeding activities in Nepal and E of this country, and, probably likewise not at all in the Himalayas E of the Indus knee. However, all recent authors emphasize the Himalayas as part of the breeding range of *himalayana* (Marien 1951, Ali 1962, Ali & Ripley 1973b,9:148). Apart from two alleged breeding records in the Chumbi Valley, Himalayan S Tibet, there is no other hint and the two existing ones were never confirmed by recent records. Ali & Ripley's (1973b,9:149) and Portenko & v. Vietinghoff-Scheel's (1974) maps did not take this into account. Very probably, the Nepal wintering birds are long distance migrants, which may even cross large parts of Tibet to reach their winter quarters.

Prunella collaris nipalensis (Blyth)

Material: 5 specimens: **D** Dolpo Distr., above Kangar (descent from Namu La into Tarap Valley), 4900 m, 17.VI.1973: 1♀ ** Mustang Distr., Ghasa gorge, 1900 m, 24.II.1974: 1♂. **S** Solukhumbu Distr., Lunak near Cho Oyu glacier, 5070 m, 10.X.1970: 1 o (certainly ♂) * Gorak Shep, 5200 m, 26.IX.1970: 2♂.

Measurements: The plumage and tarsi values include the 17 specimens collected by Diesselhorst in Nepal. – **Wing**-L ♂ (16) (93) 97-105 mm, $\bar{x}$=99.8, s_d=2.85; ♀ (6) 87-95 mm, $\bar{x}$=92.0, s_d=2.95. – **Tail**-L ♂ (15) (61.6) 65.5-75.5 mm, $\bar{x}$=68.2, s_d=3.14. – **Bill**-L ♂ (4) 12-14 mm; ♀ (1) 12.5 mm. – **Tarsus**-L ♂ (15) 23-26 mm, $\bar{x}$=24.5, s_d=0.77.

The following indices (Tab.4) are based on 9 additional S Chinese specimens of *nipalensis* (Museum Dresden): they are compared with 33 European specimens (ssp. *collaris, subalpina)* as well as 29 *P. himalayana* (Mus. Berlin, Bonn, Dresden, New York).

Tab.4: WTI and TWI values of European and Asian subspecies of *P. collaris* and of *P. himalayana.*

	WTI (%)	$\bar{x}$	s_d	n	TWI (%)	$\bar{x}$	s_d	n
P. collaris (Europe)	25.5–29.9	27.7	1.13	33	60.6–65.6	63.3	1.51	33
P. c. nipalensis	20.2–26.8	23.0	1.97	29	64.1–71.9	67.3	1.92	28
P. himalayana	28.1–32.2	30.4	1.27	29	57.6–62.4	60.0	1.51	27

Notes: *P. c. nipalensis* and *P. himalayana* show very distinct proportional differences of the wing and tail feathers, which are "bridged" by the European *P. c. collaris* and *P. c. subalpina;* unfortunately, *P. himalayana* did not radiate into geographically differing forms.

Horizontal: My records are from the massifs of Dhaulagiri, Annapurna, Mt. Everest and Lumbasumba Himal W of Kanchenjunga. – Namu La (17.VI. :Dolpo); – ascent to Dapa Col (13.VII.); Ghasa (24.II., 28.III. :Mustang); – below Thorung La (20.IV.): Tal (12.IV. :Manang); – ascent to Pomri La (29.V.); Gabri Khola (28.V.); Tangje La, W slope (23.V. :Sankhua Sabha).

Vertical: During the presumed breeding season (V-VII): Our records range from 4350 m (Gabri Khola, 28.V.) to 5000 m (Dapa Col, 15.VII.); 4 additional localities are evenly distributed within this belt. The actual belt where breeding activities occur is difficult to determine and is still uncertain, at least the upper limit. It seems to depend on the local precipitation rate. Diesselhorst's (1968:334) detailed considerations admit breeding activity between 4750 and 5400 m in Khumbu (proven 4750-5100 m), but the belt extends down to at least 4400 m in the dry Thakkhola (see Breeding).

Outside breeding season (IX, X, II, III, IV): Records between 1600 m and 5200 m. In detail: In IX and X specimens still stay within the breeding belt (see Material). In II, III and at least to M IV, parts of the population reside in the foothills of the main range (down to 1600 m) but close to the breeding quarters (see Migration) and within IV are (all ?) on the way back to or have already reached them (4900 m and 5000 m Thorung La, 20.IV.).

Habitat: The Alpine Accentor occupies the highest altitudinal belt of all Nepal congeners and breeds well above the areas of Rufous-brested, Brown and Robin Accentor. As generally stated (Fleming et al. 1976, Diesselhorst 1968:333, Inskipp & Inskipp 1991), *collaris* occupies the alpine-arctic habitat of the Himalayan main chains, from the last patches of

the highest meadows to the inhospitable barren boulders and steep slopes with rocky outcrops and rock debris. It certainly belongs to the few Passeres with the highest outposts of small breeding populations in the High Himalayas, and together with *Phoenicurus erythrogaster, Ph. ochruros* and *Eremophila alpestris* it is member of the uppermost passeriform bird communities in the area. It is unproven whether the smaller species *strophiata, fulvescens* and *rubeculoides* penetrate to the lower part of the *collaris* belt and compete with the larger species or whether their upper and lower limits, respectively, are defined by ecological factors only. In the area of *collaris,* I never came across one of the other species.

Breeding: An adult carried food toward the nest/fledged young on 13.VII. (4400 m, ascent to Dapa Col). Diesselhorst (1968:334) saw fledglings still being fed on 21. and 24.VII.

Migration: Only strictly altitudinal within the main chains. Hitherto, the lowest winter records are within the dry areas N of the main range: 1900 m below Ghasa (24.II., 28.III.1974; :Mustang), 1600 above Tal (12.IV. :Manang). In all, 10 birds were concerned, which kept together in scattered pairs without acoustic and/or visual contacts. When disturbed, they flew off in pairs.

TURDIDAE

Brachypteryx

The Nepal list includes 3 species *(stellata, montana, leucophrys);* at least *stellata* and *montana* breed. *B. leucophrys* reaches its westernmost limit near the E Nepal border and its status there is unclear. The remaining species are local and rare and their biology poorly known. They replace each other altitudinally, *montana* staying in a lower, *stellata* in a higher belt.

Brachypteryx stellata

Horizontal, vertical: Descent from Pomri La to Pahakhola, 3670 m (30.V. :Sankhua Sabha).

Habitat: The only specimen observed was in a ravine in heavy *Abies-Rhododendron* forest beside the path leading down to Pahakhola; it was shy and could be viewed at for a few seconds only. Gould's Shortwing is a Himalayan endemic with few findings from Nepal including one (the only one recorded for the species) breeding record (fide Inskipp & Inskipp 1991). The vertical distribution in Nepal may concentrate in the upper *Abies-Rhododendron* zone (3500 m and above), but extends beyond the timberline further east (see Ali & Ripley 1973,8:204).

Brachypteryx montana

Horizontal, vertical: above Pahakhola, 2700 m (3.VI. :Sankhua Sabha); – between Pass Deorali and Hellok, 2700 m (17.V.); Omje Kharka NW Yamputhin, 2400 m (2.V. both :Taplejung). – Inskipp & Inskipp (1991) indicate a broad altitudinal span (2560-3660 m), but I found it to be very limited in the upper subtropical zone in forests dominated by *Quercus semecarpifolia* and other broad-leaved trees (Pahakhola, Omje) and by *Tsuga dumosa* (2400-2700 m).

Habitat: I noticed the White-browed Shortwing in dense wall-like riverside bush along larger streams within mature forest (Pahakhola; Omje) or in dense undergrowth of fallen trees and logs in mature *Arundinaria/Rhododendron/Tsuga* forest (Deorali/Hellok). It is extremely difficult to spot there unless by voice.

Vocalizations: According to my limited experience song, even of known territorial ♂, is rarely to be heard. I found it most often provoked by the observer's approach to the hidden bird: the nearby bird gives a sudden "unexpected" outburst of one, sometimes several, rarely a series of verses displayed from the hide. The verse is about 3 s long and combines whistles of different pitch with phylloscopine warbles. Judging from these acoustic characters, including the high pitch of the whistled parts (4.16-6.5 kHz) and the apparent affinity to running noisy water, Martens & Geduldig (1990, which see for sonagrams) classify the species as a "torrent bird".

Luscinia

The Nepal list comprises local breeding birds *(pectoralis, brunnea)* and winter guests from the N Palaearctic *(calliope, svecica, cyane). L. pectoralis* and *brunnea* differ greatly in ecology: The former lives in the dwarf bushy zone above timberline and its affinties are entirely Palaearctic, while the latter is confined to the transition zone between upper Indomalayan (Oriental) and lower Palaearctic belt, always in the understorey of forests and often close to water courses (see also general remarks on *Tarsiger).*

Luscinia svecica

Taxonomic note: An assignment to subspecies is not possible. According to the literature *L. s. saturatior* is small, maximal wing-L 72 mm and can hardly be considered for this specimen.

Material: 1 specimen: **N** Chitawan Distr., Tekouli, Hatisar, Rapti banks, 300 m, 12.II.1970: ♂.

Measurements: **Wing**-L 73.5 m. – **Tail**-L (52 mm). – **Bill**-L 11.5 mm. – **Tarsus**-L 26.5 mm. – **WTI** 21.8%. – **TWI** (70.7%).

Notes: Moult: The two T1 growing. According Glutz & Bauer (1988:214) moult in winter does not effect wings and tail.

Horizontal, vertical: J.M. came across only this specimen. A regular winter visitor at low altitudes (Inskipp & Inskipp 1991).

Luscinia pectoralis confusa Hartert

Luscinia [calliope] pectoralis

Taxonomic note: The two Rubythroat species form a superspecies (Haffer 1988 in Glutz & Bauer, 11/I: 100-101). The difference in coloration pattern of the tail is as in *Lanius [cristatus] cristatus* and *L. [cristatus] collurio.* The Chinese *Luscinia c. beicki* is more stump-winged than the northern *calliope* (WTI, $\bar{x}$=22, against 25%), the Chinese *L. p. tschebaiewi* is even more stump-winged (WTI $\bar{x}$=15%). TWI values increase in the same order.

Material: 1 specimen: **D** Dolpo Distr., descent from Jungla Banjyang to Tarakot, 4070 m, 1.VI.1973: ♂.

Measurements: **Wing**-L 77 mm. – **Tail**-L 63 mm. – **Bill**-L 12.4 mm. – **Tarsus**-L 30 mm. – **WTI** 14.3%. **TWI** 81.8%.

Notes: Testes strongly swollen; bill black, feet grey-black.

Horizontal: My records only from dry areas of the Dhaulagiri area. – Ringmo/Phoksumdo Lake (4.VI.1970, 15.VI.1973); Kangar, Tarap Valley (18.VI.); Mukut (18.VI. all :Dolpo); – descent to Kali Gandaki Valley from Dudje La, several singing ♂ (28.V.); ascent to Dapa Col (13.V., 13.VII. both :Mustang).

Vertical: Our observations in V-VII (breeding season) between 3900 m and 4350 m (both upper Kali Gandaki Valley). Diesselhorst's (1968) account on the species in Khumbu area is most detailed. He found it most common between 4700 and 4900 m, rarely and locally between 4250 and 4300 m. Lowndes (1955) noted breeding in Manang from 3960-4570 m.

Habitat: During the breeding season, the Himalayan Rubythroat is a species of open landscapes exclusively above the tree line. Steep slopes (below Jungla Banjyang) and gentle valley floors (Kangar) are settled as well. I found it within knee-deep *Rhododendron* scrub (Kangar), low *Rosa sericea* bushes (Mukut), scatterd dwarf *Juniperus* scrub (ascent to Dapa Col). At least a few bushes here and there are important requirements, often interspersed with large boulders. Very apparently, *pectoralis* is predominantly a species of the dry Inner Valleys and the N-facing slopes of the main range. However, well established populations exist in the Everest region, but at generally higher altitudes than for example in Dolpo and in Manang (Lowndes 1955). Though these localities are not situated in complete rainshadow, rainfall is reduced at the higher elevations of Khumbu close to Everest. In the extremely moist areas S and W of Kanchenjunga, I was not able to locate it at appropriate altitudes (V 1988). Concerning these ecological requirements, sighting of a breeding specimen at only 3300 m (Thare Pate, Ali & Ripley 1973,8:222), well within the forest zone, is not likely and needs confirmation.

Luscinia brunnea (Hodgson)

Luscinia [cyane] brunnea

Taxonomic note: Haffer (1988) introduced this superspecies (in Glutz v. Blotzheim & Bauer 11/2:100). The two allospecies are largely the same in their proportions of remiges and rectrices and their songs are similar (see sonagrams Fig.62a-g, h-m). *L. brunnea* resembles several *Tarsiger* species with respect to coloration, but their tail feathers are of different form and their tail is relatively long (> 70%).

Material: 5 specimens: **D** Myagdi Distr., Dhorpatan/Uttar Ganga plain, 2950 m, 8.-17.V.1973: 1♂, 2♂ juv., 1♀ * Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 30.VI.1970: 1♂.

Measurements: **Wing**-L ♂ (2) 75.5 and 79.5 mm; ♂ juv. (2) 72.5 and 75 mm; ♀ 75 mm. – **Tail**-L ♂ (2) 47 and 51.5 mm; ♂ juv. (2) 46 and 48 mm; ♀ 43.5 mm. – **Bill**-L ♂ (2) 12.4 and 13 mm; ♂ juv. (2) 12.2 and 13 mm; ♀ 11.7 mm. – **Tarsus**-L ♂ (2) 26 mm each; ♂ juv. (2) 25.5 and 26.5 mm; ♀ 26 mm. – **WTI** ♂ (4) 18.0-21.4%; ♀ 22.7%. – **TWI** ♂ (4) 62.3-64.8%; ♀ 58.0%.

Horizontal: My records stem from NW Dhaulagiri to near the Sikkim border. – Gompa/Tarakot (6.VI. :Dolpo); – Dhorpatan (8.-17.V.; see Material); pasture Thankur NW Dhorpatan (27.V.); below Bega Deorali (15.V.); upper Myagdi Khola, between Boghara and Dobang (21.V. all :Myagdi); – ascent from Choya to Lake Titi (2.V.); Chadziou Khola near

Ghasa (30.VI. see Material); above Ghasa (5.V. all :Mustang); – between Chitre and Ghandrung (30.IV., 7.V. :Parbat); – above Landrung and Tolka (8.V. :Kaski); – Trisuli Valley, near Dhunche (23.IV. :Rasuwa); – Kathmandu Valley, Phulchoki Mt. (25.IV., 14.V. :Lalitpur); – between Mure and Hurure (9.-16.VI.); below Pahakhola (4.VI. both :Sankhua Sabha); – Tamur Valley, below Walungchung Gola (19.V.); Omje Kharka and Omje Khola near Yamputhin (2.V.; 15.V.); confluence of Tada and Kabeli Khola (24.IV. all :Taplejung).

Vertical: During the breeding season (V-VII): Altitudes of 11 localities range between 1380 m (above Landrung, 8.V.) and 3400 m (Gompa/Tarakot, 6.VI.); among them 12 localities range from 2400 to 2650 m. The breeding belt is not easy to ascertain. Still in V, singing ♂ may disappear after a short display period (Omje Kharka, 2.V., 2400 m), others are far from the breeding grounds still E IV (Tada/Kabeli, 24.IV., 1000 m). Diesselhorst (1968:291) found it up to 3400 m at Ting Sang La, and according to Inskipp & Inskipp (1991), it breeds above 2135 m. "Numbers nest on Sheopuri at 8400 ft" (2600 m) (Proud 1955). – Outside breeding season (IV): The silent ♂ from 1000 m (Tada/Kabeli Khola, 24 IV) was caught in a mistnet in riverine bush.

Habitat: Generally, the Indian Blue Robin lives in closed forests with a dense understorey of bushes, herbs, fallen logs and even tangled vines. Quite often it is encountered close to running water, mostly streams or small rivers, within the dense bush layer (Dhorpatan; Omje Khola; Walungchung; Mure/Hurure) and maybe as a consequence, the territorial song shows at least tendencies of adaptation to the noise of torrents (see Vocalizations). On the other hand, comparatively dry habitats are also occupied (Omje Kharka; Gompa/Tarakot; ascent to Titi Lake). The types of forest vary widely. They range from rich subtropical broad-leaved near the lower limit to temperate forests at the upper limit, including *Pinus wallichiana* (close to Titi Lake), *Abies spectabilis* with *Betula* and *Rhododendron* (Thaksang) and *Picea smithiana* (Gompa). Only rarely are the dry forests N of the main range also inhabited (near Lake Titi, 2700 m; Gompa/Tarakot, 3400 m). Locally, this Robin is common. The specimens from Dhorpatan were all caught in permanently erected mistnets within a few meters of the river.

Vocalizations: Territorial song (Fig.62a-g) is subdivided into distinct verses, which are 1.5-2.4 s long; syntax clear and regular, 3 parts: (i) 1-3 introductory whistles at the same frequency, (ii) followed by 1 or several phrases: (a) simplest case is the repetition of 1 (complex) note (Fig.62c), sometimes trill-like, (b) repetition of a 2-note group; (iii) between (i) and (ii) a simple or complex part is often interspersed, e.g. a single note (Fig.62e), another phrase (Fig.62g), and additional notes giving the whole verse a complex structure (Fig.62b). – Frequency bandwidth is broad, up to nearly 7 kHz for the whole verse, lower limit near 2.5 kHz, the individual note up to 4.2 kHz (Fig.62c). – The verse repertoire of the individual ♂ is large. 7 consecutively produced verses (Fig.62a-g) are all different; except for the introductory whistles no note is part of any 2 verses of the 2 ♂ investigated. This syntax scheme also applies to the Kashmir population.

The song of the allospecies *T. cyane* (Fig.62h-m) shows similarities: verse with introductory notes (no whistles) followed by a long trill part consisting of repeated 2-note groups. The components are located in different frequency bands and are of different width; gene-

ral syntax simpler than in *brunnea*. Frequency range 2-3 kHz lower in *cyane*. In Nepal the *brunnea* song may be confused with that of *Tesia cyaniventer* (which see, Fig.79f-h), mainly due to the whistled introduction. Both have been found syntopically.

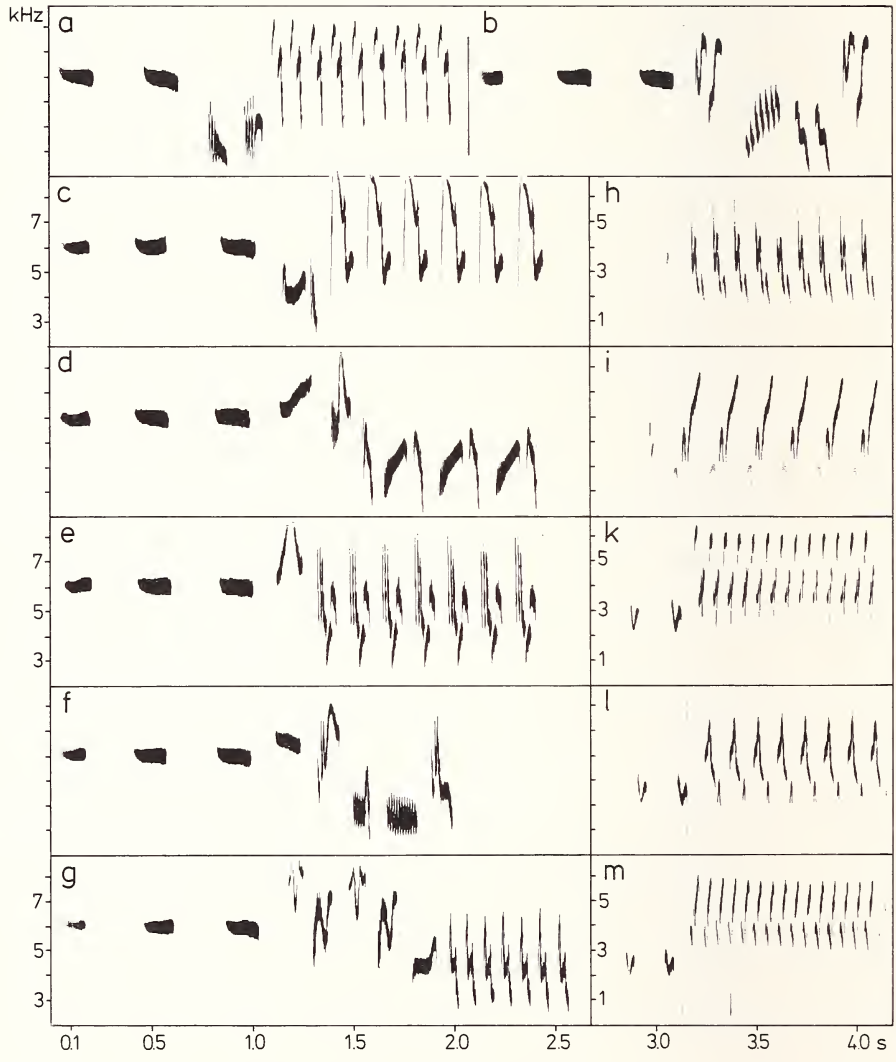


Fig.62: Territorial song of *Luscinia* species. – a-g) *L. brunnea*, 7 verses of 1 ♂, Dhorpatan 8.V.1973. h-m) *L. cyane*, 5 verses of 1 ♂, Russia, Ussuriland, NE Bikin 2.VI.1990. – Note different frequency scales.

Tarsiger

Four species are on the Nepal list, all breed *(cyanurus, chrysaeus, indicus, hyperythrus).* In terms of ecology, they are all quite similar, being forest dwellers of the Palaearctic zone not found below the fir *(Abies)* belt. They occupy the lowest bush stratum close to the ground or even the ground proper. Only *chrysaeus* penetrates into zones above timberline, even into the alpine belt devoid of bush vegetation. The ecological relations of these species have not yet been worked out. In this respect the *Luscinia* and some of the *Brachypteryx* species are also to be taken into account. All *Tarsiger* species apparently reached their Himalayan aréas from area parts adjacent to the E Himalayas, which are now much more extensive; only *hyperythrus* is confined to the eastern Himalayas, central Nepal being its westernmost outpost.

Tarsiger hyperythrus

Horizontal: My records are from the eastern tributary of the Arun to upper Simbua Khola, all 1988. – Upper Pahakhola below Pomri La (30.V. :Sankhua Sabha); – between Deorali and Hellok in Tamur Valley (17.V.); upper Simbua Khola (12./13.V. :Taplejung).

Vertical: The 3 records, all from V within the presumed breeding season, range from 3200 m Tamur Valley, 3350 m Simbua Khola to 3900 m Pahakhola. Inskipp & Inskipp (1991) give the vertical belt in "summer" as 3200-4200 m, but most records are from below 4000 m.

Habitat: Heavy mixed coniferous forest, mainly *Abies densa,* intermingled with tree *Rhododendron* (Tamur Valley) and open *Rhododendron* bush (3-4 m high) with individual *Betula utilis* trees above timberline (Pahakhola). 1 pair in the upper Simbua Khola stayed for 2 days in a small forest clearing (M V), a temporary yak pasture, where both sought shelter against heavy snowfall at higher altitudes (together with other high-altitude passerines). The ♂ being silent, they apparently were not at or near the breeding ground. The species is rare in Nepal and is met mainly in the eastern parts of the country (Inskipp & Inskipp 1991).

Vocalizations: Of territorial song (Fig.63o-o'') only 2 verse types of 1♂ are available. They show whistled and strongly frequency-modulated notes; two such parts may form combined notes (Fig.63o-o'). Auditory impression like "te rree treyre". – Warning call of the ♂ is a low "tak tak".

Tarsiger indicus indicus (Vieillot)

Material: 4 specimens: **D** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 2.XI.1969: 1♂ juv. **B** Rasuwa Distr., Syng Gyang, 3200 m, 23.IV.1973: 1♂ juv. **J** Dolakha Distr., Thodung, 3200 m, 8.IV.1973: 1♂ juv. (song specimen). **K** Sankhua Sabha Distr., Thudam, 3600 m, 26.V.1988: 1♂ (song specimen).

Measurements: Comparative material from the collections in Berlin, Dresden and Munich was included. As a result, juvenile ♂ are markedly smaller than adult ♂ and in addition relatively short-tailed: TWI ♂ juv. (5) 79.7-82.4%, $\bar{x}$=81.3; ♂ ad. (6) 82.9-90.9%, $\bar{x}$=88.1. – Interestingly, *T. i. formosanus* from Taiwan, which does not develop such bright colours as the continental form, according to the measurements presented by Hartert has wing/tail relations like those of juvenile *T. i. indicus.*

Wing-L ♂ 82, ♂ juv. (3) 76-79 mm. – **Tail**-L ♂ 68; ♂ juv. (3) 62-63 mm. – **Bill**-L (from the front edge of the nostril) ♂ 7; ♂ juv. (3) 6.5-8 mm. – **WTI** ♂ 20.7; ♂ juv. (3) 16.3-18.4%. – **TWI** ♂ 82.9, ♂ juv. (3) 79.7-82.4%.

Notes: Bill black, feet dark gray. Testes of ad. ♂ 8 mm, that of IV-♂ juv. only slightly smaller.

Horizontal: Records range from Thakkhola to near the Sikkim border. – Chadziou Khola W Ghasa (2.XI. :Mustang); – Gosainkund, Syng Gyang (23.-26.IV.; see Material; :Rasuwa); – Thodung (8.IV.; see Material; :Ramechap); – above Pahakhola (30.V. :Sankhua Sabha); – Thudam (26./27.V.; see Material); – Pass Deorali above Yamputhin (16./17.V. both :Taplejung).

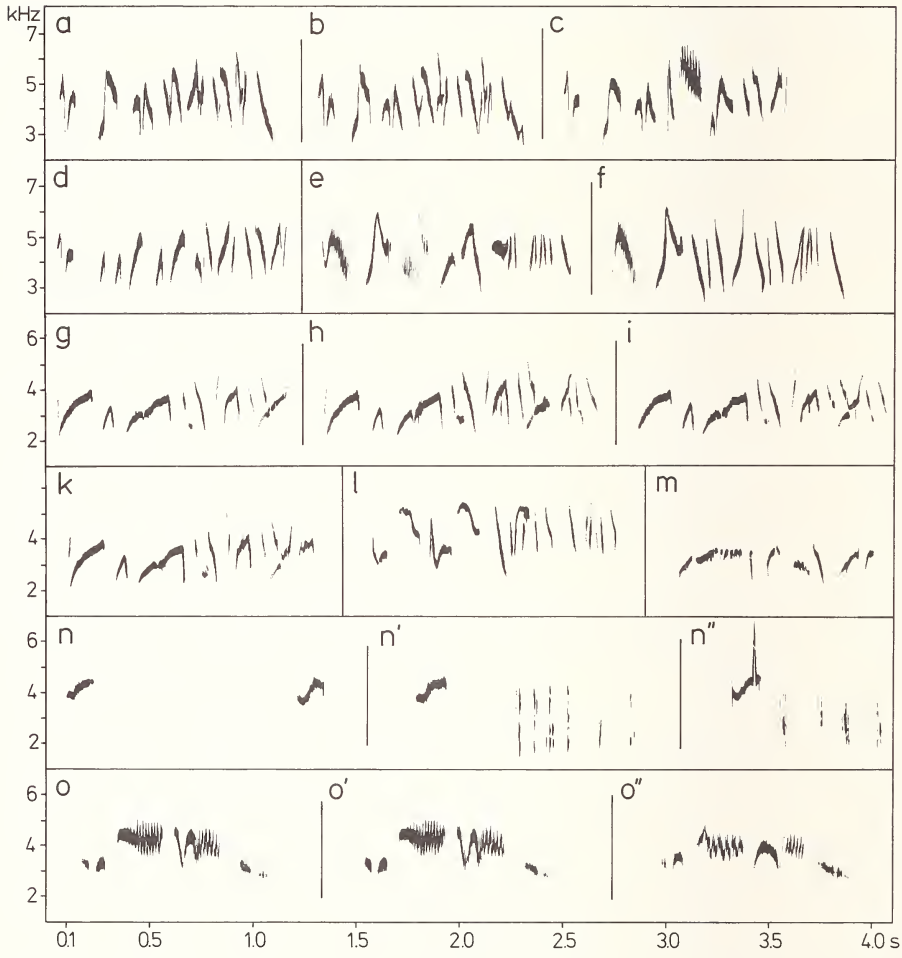


Fig.63: Vocalizations of *Tarsiger* species. – a-f) *T. chrysaeus,* territorial song, a-d) 4 verses of 1 ♂, Thudam 26.V.1988; e-f) 2 verses of another ♂.
g-n) *T. indicus,* g-m, territorial song, g-k) 4 verses of 1 ♂, Thodung 8.IV.1973; l) Syng Gyang 26.IV.1973; n-n": warning calls, 3 call series of 1 ♂, Thodung 8.IV.1973.
o-o") *T. hyperythrus,* territorial song, 3 verses of 1 ♂, above Pahakhola 30.V.1988.

Vertical: Presumed breeding season (IV, V): Lowest records: 3200 m: Syng Gyang (23./26.IV.), 3200 m Thodung (8.IV.); – highest ones: 3600 m above Pahakhola (30.V.), 3600 m Thudam (26.V.); 3700 m above Thudam (27.V.). Three more records fit into this series smoothly. – Outside breeding season (XI): 2600 m Chadziou Khola (2.XI.). – Inskipp & Inskipp (1991) give the "summer" records (months ?) from 3000 m to 4000 m without further comment. The vertical belt between 3200 m and 3700 m forms, at least in E Nepal, the centre of the distribution. The species is difficult to observe, but its voice once known is easy to recognize, even over quite large distances. Except the XI record, all others include not only the study skins but also records by ear. Thus, the relatively small belt given here seems to be quite realistic.

Habitat: The White-browed Bush-Robin occupies the lower bush storey of heavy mixed broad-leaved, mainly *Rhododendron,* and *Abies* forest. There it keeps close to the ground and may even display its song from the soil surface (Thodung, 8.IV.). ♂ defending a territory, appr. 150-200 m in diameter, apparently hasten along more or less fixed paths through the forest bush storey and display their sound verses every few seconds from a different place. Consequently, the observer may be on guard and may expect the ♂ at fixed places within its territory every 15 or 20 minutes (Thudam, 26.V.). The White-browed may visit forest edges, but in general, it is a bird of the dense understorey and difficult to observe without knowledge of its song.

Breeding: Juveniles without blue feathers had enlarged gonads (Thodung, 8.IV.; Syng Gyang; 23.IV.) and apparently were ready to breed; the Thodung specimen, in addition, was actively singing.

Vocalizations: Territorial song (Fig.63g-m) consists of short verses (0.95-1.35 s long). The verse is a combination of a few long notes at the beginning, which account for nearly half of the verse's length, and much shorter notes at the end, the latter mostly simple down-strokes (Fig.63g-k), rarely up-strokes (Fig.63m). Further syntax regularities of the material at hand are not discernible (4♂). Precise repetition of notes does not seem to occur. The unique syntax scheme gives the verse a remarkable audible impression: "Song a bubbling, double phrase combined to produce an unusual echo effect 'shri-de-de-de...de-de-dew'" or "wee-de wee-de trtrtr" (Fleming et al. 1979). – Warning (excitement) calls (Fig.63n-n") are whistled upstrokes, mostly starting with a short and slight downstroke (rising "heed") often combined with click-like "kr kr kr.." notes.

Tarsiger chrysaeus chrysaeus Hodgson

Material: 5 specimens: **G** Ghorka Distr., Rupina La, Manaslu massif, 4000 m, 8.VIII.1983: 1♂. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 24.IV.1973: 1♂ juv. **S** Solukhumbu Distr., confluence of Imja- und Phunki Drangka, 3250 m, 30.IX.-3.X.1970: 1♂ juv., 1♂ pull. (30.IX.), 1♀.

Measurements: **Wing**-L ♂ 68.5; ♂ juv. (2) 64 and 68.5 mm; ♂ pull. 65 mm; ♀ 64.5 mm. – **Tail**-L ♂ 54 mm; ♂ juv. (2) 52, 54 mm; ♂ pull. 52 mm. – **Bill**-L (from front edge of nostrils) ♂ 7; ♂ juv. (2) 8 mm; ♂ pull. 6.5 mm; ♀ 8 mm. – **WTI** ♂ 13.9; ♂ juv. (2) 12.5 and 13.1; ♂ pull. 13.9%. – **TWI** ♂ 78.8; ♂ juv. (2) 78.8 and 81.3; ♂ pull. 80.0%.

Notes: A comparison of 11 adult with 7 juvenile ♂ of *T. chrysaeus* revealed far less marked age differences in relative tail length than in *T. indicus.* – ♂ juv. bill horn-grey to bluish, feet dark flesh-coloured-grey. Testes of this ♂ (24.IV.) 7 x 4 mm.

Horizontal: Gosainkund, Syng Gyang (24.IV.; see Material; :Rasuwa); – Tabruk Kharka (8.VIII.; see Material; :Ghorka); – confluence of Imja and Phunki Drangka (30.IX.-3.X.; see Material; :Solukhumbu); – descent to Pahakhola (30.V. :Sankhua Sabha); – from Yamuthanga to Pomri La (29.V.); Gabri Khola above Thudam (28.V.); Thudam (27.V.); from upper Kangla Khola to Thudam (25.V. all :Taplejung).

Vertical: During the presumed breeding season (IV, V, [VIII]): The altitude of 9 localities ranges from 3200 m to 4450 m. Lowest ones: 3200 m Syng Gyang (24.IV.); 3550 m Thudam (27.V.); – highest ones: 4350 m Gabri Khola (28.V.); 4450 m below Pomri La (29.V.). Five more records fill the gap continuously. These data result in a belt slightly wider than 1200 m. Inskipp & Inskipp (1991) summarize Nepal summer data as "most frequent" between 3500 m and 4200 m, but their altitude bar indicates even higher records, which they do not specify. It is unlikely that the species exceeds 4500 m in Nepal during summer.

Habitat: The Golden Bush-Robin is, from the viewpoint of ecology, quite diverse. It lives within the whole fir-determined coniferous belt up to timberline, penetrates into the bushy and dwarf *Rhododendron* zone, *Salix* stands along water courses and even into the bush-free open alpine pastures, where it keeps to steep and rocky places (Lumbasumba Himal, 28./29.V.). However, even within the forest belt, the species is confined to open places, clearings, forest edges with dense bushes, where it is quite secretive and easily overlooked.

Vocalizations: Territorial song (Fig.63a-f) is short and trill-like. Notes are also short, mostly simple up- and down-strokes, but angular downward-opened notes frequently occur. For those with a strong frequency modulation superimposed see Fig.63c, e, f. All notes tend to have a rapid frequency shift, hence the trill-like auditory impression. – Syntax is irregular; repetitions of note groups are rare (Fig.63b, f central part). Every ♂ uses several verse types; in the 2♂ investigated 1 used 4 (Fig.63a-d), from the other one are illustrated (Fig.63e-f). – Frequency is very homogeneous; variation is minute, all notes being concentrated within a small frequency band of 3.5-4 kHz wide, the individual note only slightly narrower (bandwidth ranging from 2.5-6 kHz). – Song is secretively displayed from dense low bushes, rarely while the bird is exposed at the tops of twigs or stones (above the closed zone of bushes).

Tarsiger cyanurus rufilatus (Hodgson)

Taxonomic notes: Ali & Ripley (1973,8:233) write: "Blue plumage apparently not acquired before two years old." And Neufeldt (in Glutz v. Blotzheim & Bauer, 1988, 11/I: 270) found in *T. c. cyanurus* that ♂ in the 2nd year of life (in which they are thus not yet blue) are characterized by an absence of the dark band across the crop, little dorsal blue colour and a white stripe in front of the eye. An unobtrusive ♂ from 9.V. does not show the crop band, but still has very slender tail feathers. An unobtrusive ♂ from 16.IV. has the crop band, and lacks juvenile-like distally slender tail feathers.

Material: 15 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 22.V.-3.VI.1970: 1♂, 2♂ juv. * Gompa/Tarakot, 3300 m, 12.V.1970 and 5.VI.1973: 1♂ juv., 1♀ ** Myagdi Distr., Dhorpatan, 3000 m, 16.IV.1970: 1♂ juv. (tips of tail feathers relatively broad), 2♀ * Dhorpatan, Uttar Ganga plain, 2950 m, 9.V.1973: 1♂ juv. * Muri, 2100 m, 25.III.1970: 1♀ ** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 24.X.1969: 1♂ * Thaksang, above Tukche, 3150 m, 9.VII.1970, 4.VII.1973: 1♂ pull.,

1♀. **B** Kathmandu Valley, Godavari, 1600 m, 31.I.1970: 1 o ** Rasuwa Distr., Syng Gyang, 3200 m, 23.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (3) 83-87 mm; ♂ juv. (5) 78-81 mm, $\bar{x}$=79.4; ♂ pull. 81 mm; ♀ (5) 78-83 mm, $\bar{x}$=79.8; o 82 mm. – **Tail**-L ♂ (3) 62.5-67.5 mm; ♂ juv. (5) 58.5-62 mm, $\bar{x}$=60.2; ♂ pull. 60.5 mm; ♀ (4) 59-62 mm; o 63.5 mm. – **Bill**-L (from front edge of nostrils) ♂ (2) 7 mm; ♂ juv. (4) 6-6.5 mm; ♀ (4) 6-6.5 mm; o 7 mm. – **Tarsus**-L (3) 24-25 mm; ♂ juv. (5) 24-26 mm, $\bar{x}$=24.8; ♂ pull. 25.5 mm; ♀ (5) 24-25 mm, $\bar{x}$=24.4; o 24 mm. – **WTI** (15) 20.5-22.9%, $\bar{x}$=21.2, s_d=0.75. – **TWI** (14) 73.8-78.0, $\bar{x}$=76.0 s_d=1.50.

Notes: Testes ad. 23.IV. 5 x 3 mm, 3.VI. 5 x 4 mm; juv. 16.IV. 2 x 1 mm, 9.V. 8 x 4 mm, 12.V. 5 x 4 mm, 22./23.V. 3 x 3, 5 x 3 mm – ♂ bill black, feet black (ad.) or dark-grey (juv.).

With the addition of Chinese material, a total of 21 *rufilatus* skins (incl. *practicus, albocoeruleus; pallidior* not investigated) were compared with 46 *cyanurus* skins (incl. *ussuriensis*). The southern *rufilatus* is not only larger and (♂) more intensively coloured blue but shows also stumpier wings, lower WTI and tends to have a relatively long tail (Tab.5). The last character is less marked than indicated by Meise (1937:551), who had fewer skins at hand.

Tab.5: WTI and TWI ratios and relative length of P9 in *Tarsiger cyanurus cyanurus* and *T. c. rufilatus*.

	WTI (%)	$\bar{x}$	s_d	n	P9< or >P2(%)	P9≥P3(%)	P9≥P4(%)
T. c. cyanurus	23–28	25.7	1.10	46	–	72.3	27.7
T. c. rufilatus	20–23	21.3	0.91	20	74.1	28.6	–
	TWI (%)	x	s_d	n			
T. c. cyanurus	71.6–80.0	75.8	1.83	46			
T. c. rufilatus	73.8–83.3	77.0	2.41	19			

Horizontal: Ringmo/Phoksumdo Lake (22./23.V., 13.VI.; see Material); ascent to Bagar La (11.VI.); Gompa near Tarakot (12.V., 5.VI.; see Material); Suli Gad Valley (20.V.), resting place Dhule (7.V. all :Dolpo); – Thankur (5.V., 26.V.); Dhorpatan (16./17.IV., 15.V.; see Material); Muri (25.III.; see Material; all :Myagdi); – Purano Marpha (23./24.IV.); Thaksang above Tukche (27./29.IV., 4.VII., 7./8.VII.; see Material); Chadziou Khola (24.X.; see Material; all :Mustang) – Phulchoki Mt. (19.III.); Godavari (31.I.; see Material; both :Lalitpur); – Syng Gyang, Gosainkund (23.IV.; see Material; :Rasuwa); – Ting Sang La (13./14.IV. :Sindhu Palchok); – upper Simbua Khola (12.V.); above Yamputhin (17.V.); pasture Lassetham (7.V. all :Taplejung); – Paniporua (19.IV. :Panchthar).

Vertical: Presumed breeding season (from 3000 m upwards in M IV-VII): lowest records: 3000 m Dhorpatan (16./17.IV., 15.V.); uppermost record: 3800 m ascent to Bagar La (16.VI.). 17 localities are distributed as follows: 3000-3200 m: 6 loc.; 3200-3400 m: 6 loc.; 3400-3600 m: 5 loc.; 3600-3800 m: 1 loc. From these data, no clear-cut optimum zone can be discerned. Diesselhorst (1968:292), working for several months in upper Khumbu, found the species between 3500 m and 4200 m, thus at considerably higher altitudes than most

other authors, and there may be local differences depending on local (climatic) circumstances. Ali & Ripley (1973,8:232), referring to the whole Himalayan range, give 3000-4400 m with optimum zone 3500-4000 m. Inskipp & Inskipp (1991) indicate "mainly" 3000-4000 m in summer. The local vertical belts may vary somewhat but will not surpass 1000 m in width. – Outside breeding season (III, below 3000 m in IV, X): 2000 m Phulchoki Mt. (19.III.); 2100 m Muri (25.III.); 2300 m Paniporua (19.IV.); 2500 m Thimang (17.IV.); 2600 m Chadziou Khola (24.X.).

Habitat: The Orange-flanked Bush-Robin is an inhabitant of mixed, mainly coniferous forests with a well-developed bushlayer of various *Rhododendron* species in monsoon precipitation area or of deciduous bushes in areas with much less rainfall. In all parts of the moist facies, fir *(Abies)* is the predominant species: apparently, *cyanurus* does not penetrate into the adjacent pure oak *(Quercus)* zone to breed. The upper limit is determined by the timberline formed by *Abies, Betula utilis,* various bush *Rhododendron.* The species does not enter the pure upper bush zone. In dry Dolpo, it lives in *Picea smithiana* (Gompa/Tarakot) or in *Pinus wallichiana/Cupressus torulosa* forest (Phoksumdo Lake; also in Thakkhola: Purano Marpha).

Breeding: Nest with 4 eggs in the Dhorpatan Valley (3000 m; 15.V.), S valley bottom border, on small slope in fir forest along path in grass with little cover; – nest with 3 eggs in the Thankur Valley (3350 m, 26.V.), below wooden plank in dark fir forest, built predomi-

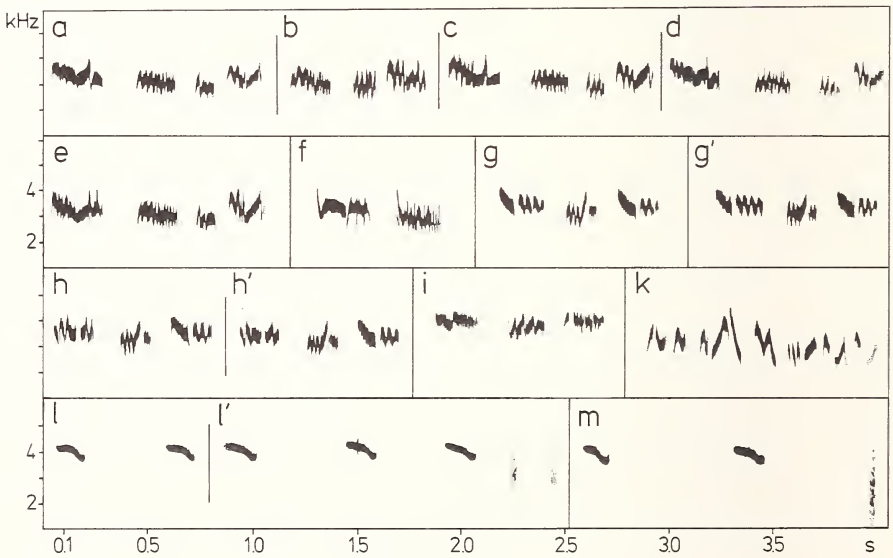


Fig.64: Vocalizations of *Tarsiger cyanurus rufilatus* (a-i, l-m) and *T. c. cyanurus* (k). – a-i: Territorial song of 4 ♂: a-e) Thaksang/Tukche 29.IV.1980; f) Thaksang/Tukche 27.IV.1980, 2nd ♂; g-h) 2 identical verses of 1 ♂, Ringmo/Phoksumdo Lake 13.VI.1973; i) Gompa/Tarakot 5.VI.1973; k) Mongolia, Tereldsh, M. Schubert 9.-11.VI.1979; – l-m) warning calls: l/l') sequences of ♀ at nest, Dhorpatan 15.V.1973; m) Thaksang/Tukche 22.IV.1980.

nantly of fern, lined with hair; – fledglings still being guided Thaksang/Tukche (3150 m, 7.VII.). – Within the lower part of the vertical area, oviposition starts at the latest by 10.V., perhaps as early as B V.

Migration: Only vertical. On 17. and 19.IV. singles still kept below the breeding belt (Thimang; Paniporua), at times when local populations are already at the breeding grounds.

Vocalizations: Territorial song (Fig.64a-i) is a short verse, 0.5-1.1 s long and comprises 3 to 6 notes, all within a narrow frequency band, bandwidth 2 kHz or even near 1 kHz (Fig.64i). The individual notes are frequency-modulated at an irregular but rapid rate, giving the verse a somewhat rasping auditory impression ("tree -trr-tretritt"). Whistled parts (notes) are nearly absent (Fig.64f). There is no regular syntax scheme and the notes of the verses of the individual ♂ are almost all different (Fig.64a-e), even more the verses of different ♂ (Fig.64a-i). Repetitions of notes rarely occur within the verse (Fig.64g/g'). In a series of 6 verses (5 in Fig.64a-e) all were different, some only slightly (Fig.64a and e). A series of 14 verses included 2 verse types (12+2 verses). Though the overall verse pattern is very similar, variability of the rapid frequency modulation produces the marked differences in fine structure of the notes. – Warning call (Fig.64l-m), once recorded at nest (Fig.64l-l'), is a soft descending "heed" whistle often uttered in long sequences, sometimes combined with a low "kr" note.

Vocalizations of the northern nominate *cyanurus* (Fig.64k) and the southern *rufilatus* differ considerably; they form regiolects (Martens 1996). Territorial song of the former is richer in number of notes and note types, notes are much less frequency modulated producing a softer turdine auditory impression and repetition of notes (note groups) often occurs. Frequency range is, at least in some cases, also wider (for sonagrams see Bezzel & Löhrl 1972, Bergman & Helb 1982, Cramp 1988, 5; Glutz von Blotzheim & Bauer 1988). Warning calls also seem to differ; they descend in *rufilatus* (Fig.64l-m) and ascend in *cyanurus* (for sonagrams see Glutz von Blotzheim & Bauer 1988).

Copsychus

Two quite different species as concerns morphology and ecology live in Nepal: *saularis* and *malabaricus*. Both are tropical in origin and are confined to low altitude in Nepal: *saularis* up to about 1500 m and often in close proximity to human settlements, the latter confined to the tropical lowlands and living only in undergrowth-rich forests.

Copsychus saularis saularis (L.)

Copsychus [saularis] incl. *niger, sechellarum, albospecularis*?, cf. Wolters (1980:424-425).

Material: 3 specimens: **B** Kathmandu, 1350 m, 24.IX.1969, 5.II. and 4.III.1970: 1♂, 2♀.

Measurements: **Wing**-L ♂ 100 mm; ♀ (2) 96.5 and 97 mm. – **Tail**-L ♂ 88 mm; ♀ (2) 83 and 86 mm. – **Bill**-L ♂ 17; ♀ (2) 16.5 and 18 mm. – **Tarsus**-L ♂ 31.5; ♀ (2) 29 and 30.5 mm. – **WTI** (3) 17.5-19%. – **TWI** (3) 86-88.7%.

Horizontal: Our observations from S Annapurna, from the Kathmandu Valley and from Arun Valley to the E border of the country. – Baglung (1.VI. :Baglung); – between Pokhara and Kharé (20./21.II., 27.IV. :Kaski); – Kathmandu, outskirts of the city (all year

round); Tumlingtar (21.VI.); Dharapangma (21.VI. both :Sankhua Sabha); – Uyam (22.IV.); Yektin (21.IV. both :Panchthar); – Mai Khola, ascent to Ilam (8.IV.); Siwaliks, Nodia Khola near Soktim (7.IV. both :Ilam).

Vertical: 260 m (Kharé, IV), 500 m (Tumlingtar, VI), 800 m (Pokhara, II), 1000-1200 m (Suiketh Valley W Pokhara, V), 1300 m (Uyam IV); 1350-1450 m (Kathmandu Valley), 1450-1570 m (Dharapangma, VI); 1550 m (Yektin, IV); 1700 m (Kharé, II). – The Asian Magpie-Robin lives in the Terai lowlands up to almost 2000 m, with only scattered distribution near the upper limit; it is confined to the subtropical belt.

Habitat: The Asian Magpie-Robin has successfully settled the human environment in rural villages and in garden-rich outskirts of cities like Kathmandu and Pokhara. Densely planted gardens with single larger trees, even small newly erected villages along the Siwalik chain, in an intermediate position between river valley and forest edge, have already been invaded by the Magpie-Robin. This suggests a primeval habitat: light forest of the subtropical belt. Large-scale deforestation of the midlands and forest replacement by open tree-rich agricultural vegetation supported the Robin, and only this vegetation change enabled it to extend its distribution up to the 2000 m mark.

Vocalizations: Territorial song (Fig.65a, b) consists of a continuous sequence of notes which is only indistinctly and irregularly subdivided into verse-like parts. Within defined sequences different notes may follow each other (2nd row 1st half) or distinct phrases consisting of repetitions of 2-note groups (5th row 1st half) up to 6-note groups (Fig.65b). Quality of notes is extremely diverse producing a partly coarse, partly melodious impression. Notes may vary between pure long-drawn-out whistles (2nd row) and highly complex notes including rapid frequency changes (1st row 2nd half), partly with harmonics (2nd row 1st half). Differences between individual ♂ are pronounced and also involve syntax structure (e.g. verse delimitation, see Fig.65a and b). – Warning calls (Fig.65c-c") are verse-like ("zee-tät-tät..") or slightly differing according to the number of "tät" notes, a very typical call.

Singing activity starts in II, possibly earlier (upon arrival on 17.II.1974 vivid song activity in Kathmandu); no song noticed on 21.VI. at the sites Dharapangma 1570 m and Tumlingtar 500 m, nor on 22.VI. upon return to Kathmandu 1350 m.

Copsychus malabaricus

Horizontal, vertical: Our observations stem only from the foothills of the Siwalik Mts. between 4. and 6.IV.1988, N Sunichare, 250 m (:Ilam). Individual ♂ sang in the understorey of the Sal timber forest. The Shama is already known from the SE Siwaliks (Inskipp & Inskipp 1991).

Phoenicurus

Seven species occur in the Nepal Himalayas; five are breeding birds *(caeruleocephalus, ochruros, frontalis, schisticeps, erythrogaster),* two are migrants from areas N of the Himalayas *(hodgsoni, erythronotus).* All breeding species of Nepal are typically Palaearctic in origin, with their main distributional areas NW, N and NE of the Himalayas. In accordance to this geographic origin, their altitudinal belt in Nepal is partly confined to the up-

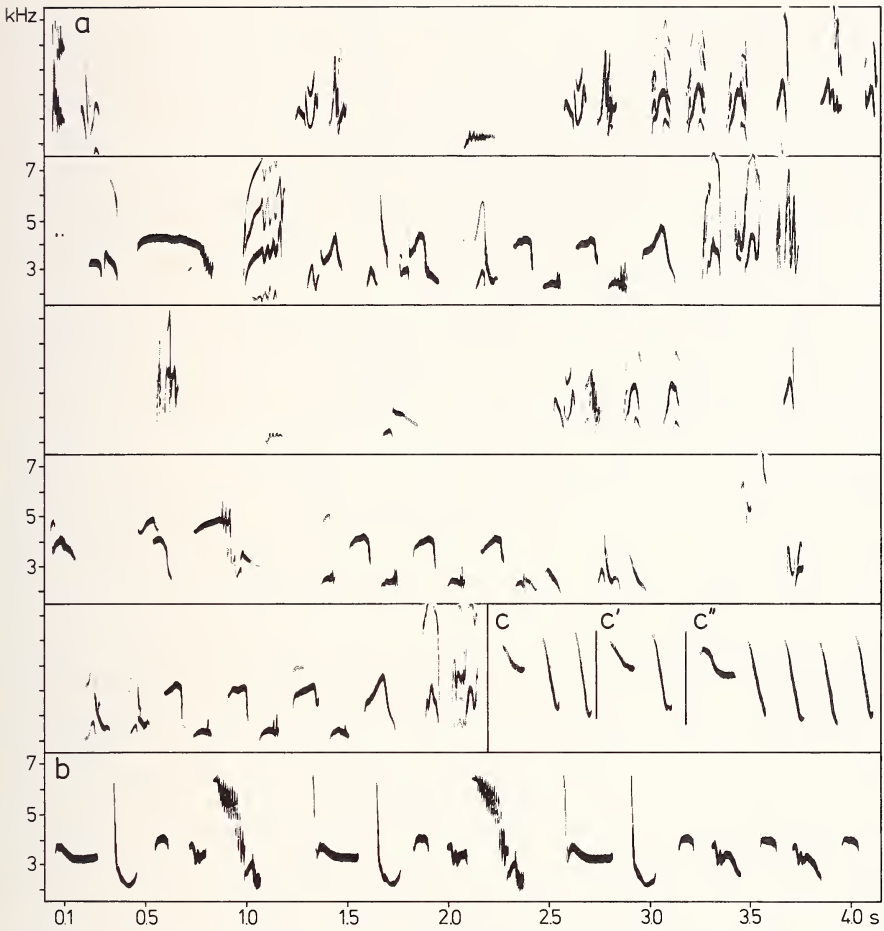


Fig.65: Vocalizations of *Copsychus saularis*. – a) Continuously given territorial song sequence, 18.6 s long, Kathmandu 23.III.1973; b) part of song sequence, Kathmandu 22.III.1973; – c-c": warning calls, Kathmandu; c-c') 23.VI.1988; c") 27.VI.1988.

per forest zone *(caeruleocephalus, schisticeps, ochruros* only partly), partly extends to the alpine zone and totals about 2000 m for the whole species set. Three of them are among those Passeres whose altitudinal outposts reach the highest parts of the alpine zone that are still inhabited by birds at all, roughly near 5000 m *(ochruros, frontalis, erythrogaster).* Whereas *frontalis* and *erythrogaster* prefer *(frontalis)* or at least tolerate *(erythrogaster)* monsoon-influenced climate, the remaining three species are confined to dry climates, thus to conditions which prevail N of the main range. For *ochruros,* the N slopes of the major massifs act as S border of otherwise extended Tibetan areas. In *schisticeps* and *caeruleocephalus* the Dhaulagiri/Annapurna region forms the western- and easternmost outposts of their main areas N/NE and W of the Tibetan plateau, respectively.

As a result of similar habitat preferences, there is considerable overlap of distributional ranges, but distinct differences exist, too, in order to avoid habitat competition. The species adapted to various forest types *(schisticeps, caeruleocephalus),* claim different vegetation structures, i.e. bushy-open as opposed to more closed and forest-like. *Ph. ochruros* and *frontalis* require very similar conditions, but they are dry- and wet-adapted, respectively. Consequently, *frontalis* is rare, mostly virtually absent in the *ochruros* area and vice versa. *Ph. erythrogaster* is the largest species and coincides in low population density with *ochruros* N of the main range, but with *frontalis* S of it. Because of their different sizes, they hardly interfere. (For ecological segregation of the slightly different set of *Phoenicurus* species in Tibet see Schäfer 1938:223-234).

Kleinschmidt (1908a) presented an impressive colour painting of the morphological characters of the montain-living Redstarts but he omitted the ♀. The 4 (or 5) species *Ph. erythronotus* with *alaschanicus, caeruleocephalus, schisticeps* and *frontalis,* the last 3 of which breed in Nepal, appear to have reciprocal relationships with each other on the basis of their morphological characters. The more extensively red tail of the ♂ *erythronotus* has dark tips in single individuals, most extended in T6. This dark region expands continuously in ♂ of *frontalis* and *schisticeps,* ultimately producing the black tail of *caeruleocephalus.* The *schisticeps* and *caeruleocephalus* ♀ still have reddish or red-brown outer webs of the tail but are clearly distinguished by the white throat patch and the large wing patch in *schisticeps.*

With respect to the wing/tail relations *schisticeps* and *caeruleocephalus* differ very markedly but in a way similar to vicariants: WTI in *caeruleocephalus* > *schisticeps,* TWI in *schisticeps* > *caeruleocephalus; caeruleocephalus* and *frontalis* show the same proportions and also have tarsi of equal length *(schisticeps* is more long-legged). Completely out of keeping with the rest is the northern *erythronotus,* the TWI of which corresponds to that of *schisticeps* while its WTI is the highest ($\bar{x}$=22.5%, cf. Eck 1983:15), that of *schisticeps* being lowest ($\bar{x}$=17.5%). An obvious explanation might be the extended migrations of *erythronotus,* but one should keep in mind that the non-migrating *Ph. [e.] alaschanicus,* which lives at the same latitude, shows the same high WTI values as does *erythronotus.*

Haffer (1988, in Glutz v. Blotzheim & Bauer 11:299) emphasizes regarding the redstart species that "deren phylogenetische Beziehungen noch weitgehend unbekannt sind". Consequently, one should not rashly separate these species by different generic names.

Phoenicurus caeruleocephalus (Vigors)

Material: 18 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 22.V.-2.VI.1970: 4♂, 4♀ * Gompa/Tarakot 3300 m, 13.-15.V.1970, 2.-3.VI.1973: 5♂, 1o ** Mustang Distr., Thakkhola, Tukche, Dambush Khola, 2900 m, 28.XI.1969: 1♀ * Thaksang above Tukche, 3150 m, 22.XI.1969: 1♂ juv., 8.III.1974: 1♂ * Purano Marpha, 3200 m, 6.VII.1973: 1♂.

Measurements: **Wing**-L ♂ (11) 80.5-87 mm, $\bar{x}$=83.7, s_d=1.77; ♂ juv. (1) 80.5 mm; ♀ (6) 80-83 mm, $\bar{x}$=81.1, s_d=1.50. – **Tail**-L ♂ (11) 61-68.5 mm, $\bar{x}$=64.6, s_d=2.34; ♂ juv. (1) 61 mm; ♀ (6) 61.5-65 mm, $\bar{x}$=63.6, s_d=1.36. – **Bill**-L ♂ (11) 11-13.5 mm, $\bar{x}$=11.6, s_d=0.74; ♂ juv. (1) 11.5 mm; ♀ (6) 10-12 mm, $\bar{x}$=11.1, s_d=0.71. – **Tarsus**-L ♂ (11) 21-23.5 mm, $\bar{x}$=22.0, s_d=0.78; ♂ juv. (1) 22.5 mm; ♀ (6) 20.5-23 mm, $\bar{x}$=21.8, s_d=0.88. – **WTI** (18) 18.1-22.5%, $\bar{x}$=20.2, s_d=1.18. – **TWI** (18) 74.4-81.3%, $\bar{x}$=77.5, s_d=1.72.

Notes: There seems to exist a tendency to relatively long tails in northern populations. Gonads in V distinctly enlarged.

Horizontal: Our records from northern parts of Dhaulagiri and Annapurna only. – Ringmo/Phoksumdo Lake (22.V.-2.VI., 14.VI., see Material); Gompa/Tarakot (13.-15.V., 2.-4.VI., see Material); upper Barbung Khola: near Kakkot, 1♂ (10.VI.); Pimring, 1♂ (12.VI. all :Dolpo); – Nilgiri forest near Jomosom (23.III.): Purano Marpha (13.-20.III., 23.IV., 9.-12.V., 6.-7.VII., see Material); Tukche (XI); below Nabrikot (XII); Taglung Khola E Lete (XII); Thaksang above Tukche (22.II.-8.III., 22.XI.; see Material; all :Mustang); – above Pisang (18.IV. :Manang).

Vertical: Breeding season or close to it (M IV-VII): 2900 m Kakkot (10.VI.), 3000-3100 m Pimring (12.VI.), 3100 m Pisang (18.IV.), 3200 m Purano Marpha (23.IV., 9.-12.V., 6.-7.VII.), 3300 Gompa/Tarakot (V/VI, see Material), 3600-3700 m Ringmo/Phoksumdo Lake (V/VI, see Material). According to these data, the altitudinal range within the breeding season is only about 800 m, but Inskipp & Inskipp (1991) indicate one record at 4250 m without precise data; this specimen was very likely not on the breeding grounds (see Habitat).

Outside breeding season (XI-III): 2400 m Taglung Khola (2.XII.); 2500 m below Nabrikot (1.XII.): 2650 m, 2900 m, 3150 m near Tukche (22., 26., 28.XI., 27.II.-8.III.); 3350 m Nilgiri forest near Jomosom (23.III.).

Habitat: In Nepal, the Blue-capped Redstart inhabits open forests, mainly with little undergrowth in the dry areas N of the Himalayan main range. In these areas coniferous forests prevail: e.g. on Phoksumdo Lake: *Pinus wallichiana/Cupressus torulosa;* Tarakot: *Picea smithiana, Betula utilis, Juniperus indica;* Purano Marpha: *Pinus, Cupressus.* Besides this vegetation type, it regularly stays in recently grown thickets, where it is especially difficult to locate (Phoksumdo Lake: *Pinus).* Scattered groups of *Betula* and adjacent *Salix* scrub (Phoksumdo Lake) do not suffice as summer habitat, and gorge-like valleys are also avoided (Suli Gad Valley; Martens 1972). Within the Thakkhola area, it is common in the dry forests of Purano Marpha, but is absent in the slightly moister and markedly denser/darker Thaksang forests *(Pinus, Abies, Picea,* except during pre-breeding season) a few kilometers (see Fig.30, 31) to the south. The conspicuous black and white appearance of the ♂ seems to be suitable for signalling in the shadowed understorey of forests to which the species mostly keeps. N Dhaulagiri and N Annapurna are the easternmost outposts of the species' area and its ecological niche seems to be quite limited there (see, in contrast, Bates & Lowther 1952, for Kashmir). Thus, the breeding range is rather restricted in Nepal as regards altitude and surface area. In the dry northern parts of the Dhaulagiri region, *caeruleocephalus* and *schisticeps* are sympatric, but their habitat preferences differ, the Blue-capped being confined mostly to the understorey of coniferous forests, the White-throated to more open tree formations, scattered trees and bushes on rocky slopes. Consequently, the two coexist only locally (Purano Marpha, 3200m; Phoksumdo Lake, 3600-3800 m). – For a general account of the species' distribution and ecology see Neufeldt & v. Vietinghoff-Scheel (1983).

Breeding: ♂ were already attacking each other and struggling for territories on 18.III.1974 Purano Marpha. For size of ovaries/testes see Martens (1972); testes slightly enlarged (2 mm) 8.III., reaching maximum size during VI and VII (8-9 mm); follicles still small in

first half of V, ♀ ovipositing 30.V. (Phoksumdo Lake); nest with 2 eggs 4.VI. (Gompa/Tarakot); fledglings together with adults 7.VII. (Purano Marpha). – The nest was in a fissure of a huge rock, with a broad bases of dry leaves and moss, lined with feathers. Eggs greyish-white, no distinct marks.

Migration: Only vertical. The above data (and Rand & Fleming 1957:151) from Thakkhola indicate that at least parts of the population stay close to the breeding grounds all year round; records in II up to 3150 m (Thaksang), in III up to 3350 m (Nilgiri forest; see Vertical).

Vocalizations: Territorial song (Fig.66a-c) consists of verses of different length (2-8 s) and irregular syntax: sequences of narrowly spaced, often differing note groups of equal frequency bandwidth and low overall frequency range follow each other at relatively long intervals (0.2-0.4 s). This regular series is disrupted by the insertion of single notes or small note groups in a higher frequency range. The two series' frequency bands are almost completely separated. Note groups of the lower series are uniform with regard to rapid frequency shift and overall frequency range, but show high variability in note fine structure. In the upper band whistle-like notes also appear. – Warning call series given at nest site (Fig.66d/d') are composed of "eet" calls and repeated double clicks "tk tk tk..". – Early onset of song display season: 7.III.1974 Thaksang; 13.III.1974 Purano Marpha. Though ♂ and ♀ largely keep hidden in the bush layer and in the canopies, ♂ regularly sing exposed from twigs or treetops.

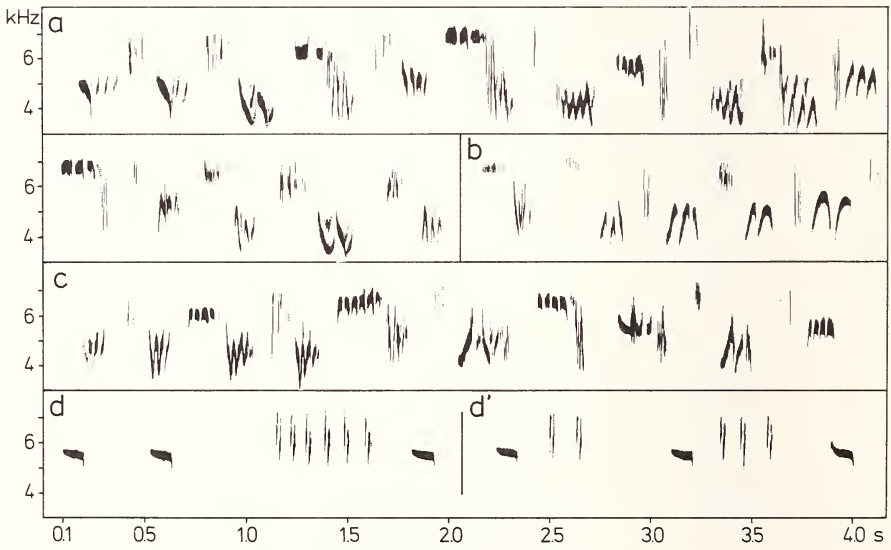


Fig.66: Vocalizations of *Phoenicurus caeruleocephalus*. – a-c) Territorial song; Purano Marpha; a) 20.III.1974; b-c) 19.III.1974, possibly 2 different ♂. – d/d') warning calls of ♂ near the nest, Gompa/Tarakot 4.VI.1973.

Phoenicurus ochruros rufiventris (Vieillot)

Material: 9 specimens: **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4350 m, 24.VI.1973: 1♂. **S** Solukhumbu Distr., Thame Teng, 3900 m, 6.X.1970: 1♂ juv. * Tarnga, 4050 m, 10.X.1970: 2♂, 2♂ juv., 1♀, 1 o (probably ♀) * Gorak Shep, 5150 m, 23.IX.1970: 1♂.

Measurements: **Wing**-L ♂ (4) 84-88.5 mm, $\bar{x}$=85.8; ♂ juv. (3) 86.5-89 mm; ♀ (2) 85 and 86 mm. – **Tail**-L (4) 60-64 mm, $\bar{x}$=62.3; ♂ juv. (3) 62-63 mm; ♀ (2) 62 and 63.5 mm. – **Bill**-L ♂ (4) 11-13 mm, $\bar{x}$=12.0; ♂ juv. (3) 12-13 mm; ♀ (2) 11.5 and 12 mm. – **Tarsus**-L ♂ (4) 24-25 mm, $\bar{x}$=24.3; ♂ juv. (3) 24-25 mm; ♀ (2) 24 and 26 mm. – **WTI** (9) 19.1-23.7%, $\bar{x}$=22.0, s_d=1.43. – **TWI** (9) 70.2-76.2%, $\bar{x}$=72.4, s_d=1.94.

Notes: ♂ from 24.VI. (Charka): bill black, feet grey-black, testes large, 7 x 5 mm. – An excellent survey of the Black Redstarts was presented by Kleinschmidt (1908b), who also included an illustration of *Phoenicurus hodgsoni.*

Horizontal: Our records from NW Dhaulagiri to Mt. Everest. – Ringmo/Phoksumdo Lake (15.VI.); ascent to Pass Bagar La from SW and N slope (17.VI.); Tarap Valley, Kangar (17./18.VI.); Barbung Khola: between Kakkot and Pimring (11./12.VI.), Pimring (12.VI.), Tarang (17.VI.), Charka (21./24.VI., see Material); ascent to Dudje La (25.VI.); Tajang Khola (21.VI. all :Dolpo); – Sangda (22.VI.), above Kagbeni (23.VI.), near Muktinath (20.IV.), between Jomosom und Tukche (30.VI.), near Choiro (19.VII. all :Mustang); – Braga (18.IV. :Manang); – Khumjung (18.IX., 4.X., 18.X.), Dughla and Lobuche (21.IX.), Gorak Shep (22.-27.IX., song heard also), Thame Teng (6.X.), Lunag (9.-11.X.), Tarnga (8.-12.X.), Pare (14.X.) (all in 1970, :Solukhumbu, for details see Martens 1971 and Material).

Vertical: Breeding season (IV-VII): Observations range between 2650 m and 4730 m, both altitudes being represented by breeding records. 2650-3000 m: 3 localities, 3010-3500 m: 3 loc., 3510-4000 m: 6 loc., 4010-4500 m: 5 loc., 4510-4730 m: 1 loc. – Lowest record: 2650 m Choiro, adults carrying food; highest record: 4730 m Tajang Khola, nest with eggs (see Breeding). Outside breeding season (IX-X): 3900-5150 m, all in High Khumbu close to Everest (see Horizontal); sightings possibly of locally breeding birds as well as passage migrants from Tibet.

Habitat: As a breeding bird *Ph. ochruros* is confined to the dry Trans-Himalayan Tibetan facies north of the main range, where it is locally common. My records are from :Dolpo, :Mustang and :Manang. Its small breeding area is continuous with the extended area in Central Asia, namely Tibet. In Nepal, the Black Redstart settles in open rocky valleys, on and close to rock faces, on flat valley bottoms, and even on grassy slopes in broader valleys, where nests may be built in old rodent holes (near Charka, 24.VI.) or in rock debris and pebbles close to the water course (Tajang Khola, see Breeding). The species is certainly not confined to pure rock habitats like rocky outcrops or river gorges. In addition, *ochruros* lives regularly in the Tibetan villages of Dolpo and upper Mustang and is even present in most of the smaller villages (observed in Kangar, Pimring, Tarang, Mukut, Sangdak, Muktinath). There it breeds in/on house walls and chortens (records from Kangar, Tarang, Charka; for the last village see Inskipp & Inskipp [1991]). Though the species is locally closely associated with man as in Europe, it also inhabits the open countryside far from human settlements. But it is obvious that Tibetan-style villages offer a rich variety of

nesting places. An additional factor may be an insect food supply, caused by the presence of cattle. In Charka (Fig.36) there were about 10-15 pairs in VI 1973.

The altitudinal range is closely linked with the local climatic conditions. At least within the Dhaulagiri/Annapurna area, the altitudinal belt of monsoon-reduced dry climate is fully used for breeding activity and ranges from about 2650 m (near Tukche) to near 5000 m, hence the low summer records from near Jomosom and Tukche. Only slightly further south, near Kalopani and Lete and closer to the "rain wall" formed near the Kali Gandaki gorge, where precipitation abruptly increases, *ochruros* is absent as a breeding bird.

Diesselhorst (1968:299) states that specimens in his collection (E VII and M VIII) from rain-rich High Khumbu probably belong to a small local breeding population. If so, this breeding area, in contrast to Dolpo and Mustang, must be confined to extreme altitudes close to 5000 m. Consequently, I did not come across *ochruros* in the Kanchenjunga area E of Arun (V 1988).

Breeding: In M VI 1970 and 1973 most fledglings had already left nests in the Dolpo population (fledglings seen: Pimring/Mukut 3400 m, 16.VI.; Tarang 3800 m 17.VI.; Charka 4300 m 24.VI., ascent to Dudje La 4300/500 m 25.VI.); latest date of an adult carrying food 19.VII. Choiro. – *Re* nesting sites see Habitat. I also discovered a nest in a pile of rock debris on plain ground close to the water of Tajang Khola at 4730 m, 4 eggs slightly incubated, 21.VI.1970 (Martens 1972). Referring to this record, Glutz v. Blotzheim & Bauer (1988,11:311) consider *ochruros* as surpassing all other W Palaearctic Oscines in respect to altitudinal range of the breeding area.

Migration: In Khumbu I noticed *ochruros* first 18.IX., and in subsequent days, the species became common and status did not change until 18.X., when I left the area (for details see Martens 1971). Most of the specimens, perhaps except those at Gorak Shep, where I heard several singing (22.-27.IX.), were migrants from the adjoining Tibetan population.

Vocalizations: Territorial song (Fig.67) does not differ in general pattern from that of European populations in being composed of 3 parts: (i) an introductory one rich in notes and phrases, (ii) a scratching or hissing one, and (iii) a final one immediately following (ii), also rich in different notes and phrases. Parts (i) and (iii) may be identical (Fig.67a), may differ slightly (Fig.67b, c) or strongly (Fig.67c [part i] and d; d', d''). The individual ♂ uses several song types; differences between them are caused merely by omitting notes of parts (i) or (iii). Verse lengths are between 3.3 s (Fig.67a) and 4.7 s (Fig.67c), and thus fall within the variation of European populations. A marked difference between European and Himalayan populations (including Ladakh/India) consists in the rapid delivery of the verses during display, which gives a hasty impression. However, in playback experiments, songs from Elburs (Iran; ssp. *phoenicuroides)* and Himalayan populations (Nepal; Ladakh) elicit full reactions of a population in Mainz, Germany (U. Weyand pers. comm.), indicating uniformity of basic song patterns within vast parts of the Black Redstart's area. – Song was heard 22.-27.IX. Gorak Shep (see Material).

Phoenicurus hodgsoni (Moore)

Systematic notes: *Ph. hodgsoni* and *phoenicurus* resemble each other in the ♂ sex to a certain extent; therefore Haffer (1988, in Glutz v. Blotzheim & Bauer 11:300) considers unit-

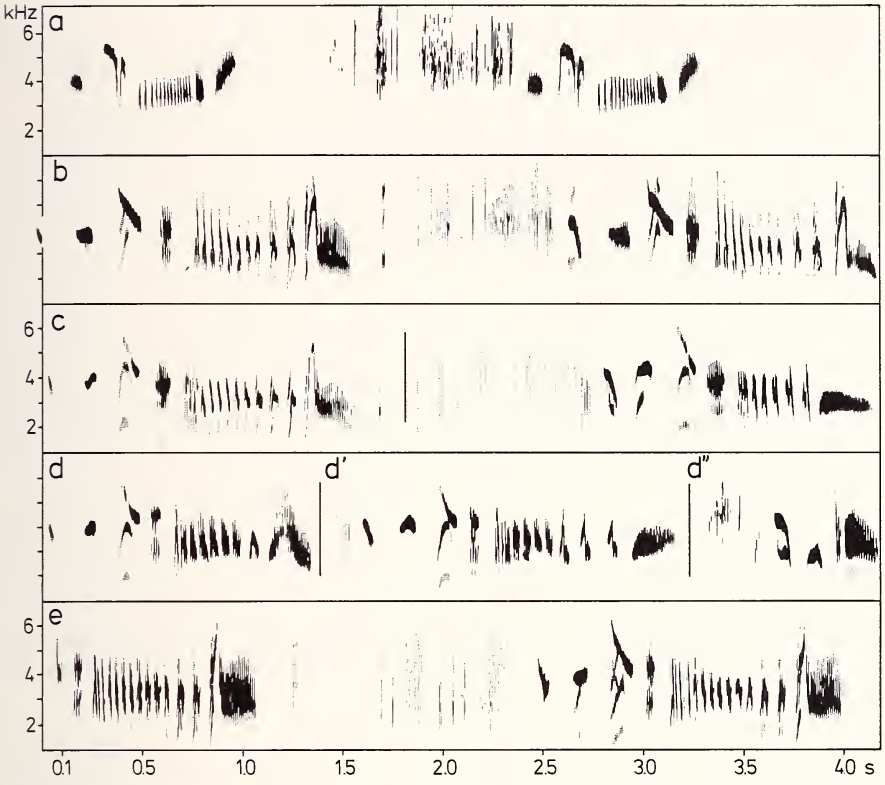


Fig.67: Territorial song of *Phoenicurus ochruros*. – a) Charka 21.VI.1973; b-e) Muktinath 21.IV.1980, b: 1st ♂, c-d: 2nd ♂, e: 3rd ♂. – Complete verses are shown in a, b, c (except for truncation of verse part [ii] by 0.6 s) and e. Incomplete verses are shown in d (only verse part [i]), in d' and d''(only verse part [iii]).

ing them into a superspecies. However, we have to take into account that the C Asian *ochruros rufiventris* does not possess the white wing patch, but it is present in more western Black Redstarts, even with white above the black forehead band! Besides, the ♂ juv. of *hodgsoni* has a "cairei", that of *phoenicurus* a "paradoxus" plumage state. As concerns the size of the black breast patch, *hodgsoni* takes a position between *ochruros rufiventris* and *phoenicurus*. *Ph. hodgsoni* is treated here as an independent monotypic species (isospecies).

Material: 4 specimens: **S** Solukhumbu Distr., Nangpa Tsangpo Valley, 3550 m, 14.-15.X.1970: 1♂, 2♂ juv., 1♀.

Measurements: **Wing**-L ♂ 87; ♂ juv. 83.5 and 85; ♀ 82 mm. – **Tail**-L ♂ 69; ♂ juv. 65 and 66.5; ♀ 65 mm. – **Bill**-L ♂ 11; ♂ juv. 12 and 12; ♀ 11 mm. – **Tarsus**-L ♂ 24; ♂ juv. 24 and 25; ♀ 24 mm. – **WTI** (4) 18.4-20.4%. – **TWI** (4) 77.8-79.3%.

Notes: For the proportions of 35 *Ph. hodgsoni* and other redstarts see Eck (1983:12-16).

Horizontal, vertical: Autumn and winter records from Thakkhola and Khumbu. – Choya, 2400 m (25.II., 1♂); Syang, 2700 m (21.III., 1♂, both :Mustang); – Chordung Mt./Jiri, 2300 m (3.IV., 1♀ :Ramechap); – Pare, 3350 m (14.-15.X. :Solukhumbu; see Material: Martens 1971:124).

Migration: *Ph. hodgsoni* is a winter visitor from Tibet north of the main range. Diesselhorst (1968:299) did not notice it until 21.IX. (1962) close to Everest when he left the area; however, migrations started about 3 weeks later in M X (1970) (see Material) in the same region, at which time the species was common as passage migrant.

Phoenicurus frontalis (Vigors)

Material: 20 specimens: **D** Myagdi Distr., Muri, 2100-2300 m, 25.III.-1.IV.1970: 2♂, 1♀ ** Mustang Distr., Nabrikot, 2750 m, 9.-10.XI.1969: 1♂, 1o * Tukche, 2650 m, 18.X.1969: 1♂ * Thaksang above Tukche, 3150 m, 23.XI.1969 1 (♀). **N** Makwanpur Distr., Mahabarat Mts., Daman, 2500 m, 22.II.1970: 1♀. **B** Sindhu Palchok Distr., Ting Sang La, 3250 m, 14.IV.1973: 1♂. **J** Dolakha Distr., Chordung Mt., Jiri, 2900 m, 29.III.-2.IV.1973: 2o * Thodung, 3200 m, 4.-8.IV.1973: 1♂, 1♀. **S** Solukhumbu Distr., Nangpa Tsangpo Valley, Pare, 3550 m, 14.X.1970: 1♂ * Khumjung, 3800 m, 19.IX.1970: 2♂, 1♀ pull./juv. * Pheriche Valley, Phulung Karpo, 4343-4350 m, 28.IX.1970: 2♂ pull./juv.

Measurements: **Wing**-L ♂ (8) 85-88 mm, $\bar{x}$=86.4, s_d=1.33; ♂ pull./juv. (3) 86.5-88 mm; ♀ (7) 80-86.5 mm, $\bar{x}$=82.4, s_d=2.56; ♀ pull./juv. (2) 80 and 81 mm. – **Tail**-L ♂ (7) 64-71 mm, $\bar{x}$=67.9, s_d=2.29; ♂ pull./juv. (3) 69-71.5 mm; ♀ (7) 62-69 mm, $\bar{x}$=64.6, s_d=2.62; ♀ pull./juv. (2) 62.5 mm each. – **Bill**-L ♂ (8) 11-13 mm, $\bar{x}$=11.6, s_d=0.68; ♂ pull./juv. (3) 10.5-11 mm; ♀ (7) 10-11.5 mm, $\bar{x}$=10.8, s_d=0.49; ♀ pull./juv. (2) 10-11 mm. – **Tarsus**-L ♂ (8) 21.5-25 mm, $\bar{x}$=23.4, s_d=1.05; ♂ pull./juv. (3) 23-24 mm, ♀ (7) 21.5-24 mm, $\bar{x}$=22.5, s_d=0.82; ♀ pull./juv. (2) each 22 mm. – **WTI** (17) 18.8-22.6%, $\bar{x}$=20.3, s_d=1.29. – **TWI** (19) 75.3-81.3%, $\bar{x}$=78.6, s_d=1.77.

Notes: Bill and feet black. – Testes of ♂ from 14.IV. (Ting Sang La) 6 x 4 mm.

2♂ from Khumjung, 19.IX., moult wings and tail and 5 juveniles, IX-X, moult body-feathers: pull./juv.

Horizontal: Thankur (5.V.); Dhorpatan (19.IV.); Muri (25.III./1.IV., see Material; all :Myagdi); – Phurbang (31.V.); Charka (23.VI.), Mukut (17.VI. all :Dolpo); – descent from Dudje La to Sangda (22.VI.); Dapa Col (18.VII.); Tukche (18.X., see Material); Thaksang above Tukche (23.XI., see Material); Nabrikot (9./10.XI., see Material); below Thorung La (20.IV. all :Mustang); – Ulleri (22.II. :Kaski); – above Manang (19.IV. :Manang); – Daman (22.II. :Makwanpur); – Ting Sang La (14.IV., see Material; :Sindhu Palchok); – Chordung Mt./Jiri (29.III., see Material); Thodung (4./7.IV., see Material; all :Dolakha); – Pare (14.X., see Material); Khumjung (19.IX., see Material); Phulung Karpo (28.IX.; see Material; all :Solukhumbu); – Kangla Khola (24.V.); Ladza Kharka (22./23.V.); upper Simbua Khola, 3350 m (15.V.), Lassetham (8./9.V. all :Taplejung); – Mai Pokhari (27.III. :Ilam).

Vertical: Breeding season (M V-VII, see Diesselhorst 1968:301): 8 localities provided records from 3800 m (Dapa Col, 18.VII.) up to 4400 m (Ladza Kharka, 23.V.). The lowest record coincides with data in Diesselhorst (1968:300), but the species' area extends at least up to 4900 m in Khumbu, where Diesselhorst discovered a nest. The vertical area comprises at least 1100 m. Early in the breeding season, heavy snowfall may urge the local population to return to the forest zone. This happened on 15.V.1988 in the upper Simbua Khola (3350 m), when dozens, mainly ♂, frequented small clearings on the valley floor. Summer records at low altitude (Inskipp & Inskipp 1991) may refer to such events, but certainly not to breeding birds.

Habitat: This is a species of the alpine zone above timberline. Consequently, it lives only in open places, which may be rocky with much debris on the valley floors or only gentle alpine meadows with a few *Juniperus* or dwarf *Rhododendron* bushes. In the upper zone of its breeding belt, even such bushy vegetation is absent and the otherwise closed cover of higher plants disappears more and more (see Diesselhorst [1968:300] for habitat preferences in the Khumbu area). The Blue-fronted Redstart is predominatly a species of the monsoon-rich southern slopes of the Himalayan main range, although it also penetrates into the much drier Inner Valleys (Thakkhola: Dapa Col) and even to the northern slopes (Mukut and near Sangdak 4000 m, Charka 4300 m). But its occurrence there seems to be irregular and I came across it only few times in Dolpo, though I stayed in the area for months. It occupies the same type of habitat as the Black Redstart, which is the common redstart in the northern Himalayan area as it is in nearby Tibet, and, though I saw both species side by side (Charka, VI), there may be competition between them. – For a general account of the species' distribution and ecology see v. Vietinghoff-Scheel (1982b).

Migration: Only slight vertical movements; stays in the understorey of forests and open landscape with bushes and groups of trees close to the breeding grounds during winter. – E IX still at 4350 m near the breeding grounds in Khumbu, in M X at 3800 m and 3350 m, near M XI at 2750 m, E II up to 2500 m (for details see Material). Movements from the nearby winter quarters back to the breeding grounds occur during IV: 2♂ 1♀ at 3850 m 19.IV.1980 near Manang; 1♂ at 4100 m 20.IV.1980 below Thorung La (W slope). But late specimens are present until M V in the forest zone: 1 sp. at 3500 m 5.V.1970 Thankur; at least 1 sp. 3350 m 8./9.V. Lassetham.

Phoenicurus schisticeps (Gray)

Material: 7 specimens: **D** Mustang Distr., northern Dhaulagiri area, Sangda, 3700 m, 28.VI.1973: 1♂ pull. * Kali Gandaki Valley, above Dangarjong, 3800 m, 29.VI.1973: 1♂ * Thaksang above Tukche, 3150 m, 22.XI.1969: 1♂, 2.VII.1973: 1♂ pull., 28.II.1974: 1♂, 1.III.1974: 1♀. * Purano Marpha, 3100 m, 16.III.1974: 1♂.

Measurements: **Wing**-L ♂ (4) 83-90 mm, $\bar{x}$=85.3; ♂ pull. (2) 81 and 82 mm; ♀ (1) 85 mm. – **Tail**-L ♂ (4) 66-77 mm, $\bar{x}$=71.1; ♂ pull. (2) 66.5 and 70 mm; ♀ (1) 73.5 mm. – **Bill**-L ♂ (4) 11-12.5 mm, $\bar{x}$=11.6; ♂ pull. (2) 10.5 and 11 mm, ♀ (1) 11.5 mm. – **Tarsus**-L ♂ (4) 23-26 mm, $\bar{x}$=24.6; ♂ pull. (2) 23.5 each; ♀ (1) 23.5. – **WTI** (7) 16.3-18.3%, $\bar{x}$=17.5, s_d=0.61. – **TWI** (7) 79.5-86.5%, $\bar{x}$=83.9, s_d=2.42.

Notes: Testes of ♂ from 29.VI. 8 x 5 mm. – ♂ pull.: Bill black, feet grey-black.

Horizontal: Records mainly from the northern parts of Dhaulagiri region. – Ringmo/Phoksumdo Lake (26.-28.V.); Barbung Khola, Tarang, 2♂1♀ (19.VI. all :Dolpo); – Sangda (28.VI.; see Material); Dangarjong (29.VI.; see Material); Purano Marpha (14.-18.III.; 10./11.V., pair; 6.VII.; see Material); Thaksang above Tukche (27.II.-9.III., 2.VII., 22.XI.; see Material; all :Mustang); – near Manang (19.IV. :Manang); – Mai Pokhari, 1 sp. (27.III. :Ilam).

Vertical: Breeding season (V-VII): 3150 m Thaksang (VI), 3200 m Purano Marpha (V, VII), 3600 m Ringmo (V), 3700 m Sangdak (VI), 3800 m Dangarjong (VI), 3800 m Tarang (VI). Inskipp & Inskipp (1991) give the summer distribution as between 3050 and 4200 m, but they had no actual signs of breeding activity at hand. Outside breeding season: 2200 m Mai

Pokhari (III), 3150-3350 m Thaksang/Tukche (II, III, XI), 3200-3400 m Purano Marpha (daily 14.-18.III.).

Habitat: During the breeding season the White-throated Redstart is confined to dry open habitats in the rain shadow north of the Himalayan main chain. Commonly inhabited vegetation types are edges and clearings of open forests (Ringmo; Purano Marpha: *Pinus wallichiana, Cupressus torulosa;* Thaksang: *Pinus,* locally *Picea smithiana, Betula utilis, Rhododendron arboreum),* where single trees and bushes are frequented. Barren and open slopes without forest cover are also occupied; single trees or small groups of bushes (Tarang, near Dangarjong: mainly *Juniperus indica)* and bushy dry vegetation on rocky slopes are fully sufficient (Dangarjong: *Caragana, Lonicera, Berberis, Rosa).* Such habitats are also often available close to terraces and fields and even near human habitation (Ringmo; Tarang). The zone above timberline is apparently unoccupied, and in Thakkhola there are no records during breeding season S of Tukche, which is close to relatively heavy though much reduced monsoon influence. During winter, the same habitats are used (see Migration), but *schisticeps* also penetrates into the interior of the then leaveless *(Betula)* forests. During all seasons, it perches on exposed twigs, tops of trees and bushes and hunts for insects, even during II and III, when not much insect life is present (see also *Ph. caeruleocephalus*). Habitat requirements in Nepal seem to match those in other parts of the breeding area (see Stresemann et al. 1937, Schäfer 1938, Ludlow 1944). – For a general account of the species' distribution and ecology see v. Vietinghoff-Scheel (1982a).

Breeding: Two pulli, collected 28.VI. and 6.VII. in the Kali Gandaki Valley and in one of the western tributaries, though fully independent had certainly been reared nearby (see Material). These specimens represent the first breeding records for Nepal and the westernmost outposts of the entire breeding area of this predominantly Tibetan/Chinese species. But it may reach further west within the Tibetan facies landscape in Nepal.

Migration: *Ph. schisticeps* spends the winter season close to the breeding grounds and withstands even severe frost during the winter season. I saw it nearly all year round in Thakkhola, where it breeds. During a stay from 27.II. to 12.III.1974 in the coniferous forests of Thaksang (3150 m), several specimens were present every day. There was still heavy snow cover on the shadowed forest ground but it had already melted in the clearings. The specimen from Mai Pokhari (III) was on its way back to the northern breeding grounds.

Phoenicurus erythrogaster

Horizontal: Observations during the breeding season only N of the Dhaulagiri main range. – Mukut, 2♂ (17.VI.); ascent to Parung La, 1 pullus (20.VI.); Dudje La, 1♀ in Coll. H.S. Nepali (27.VI. all :Dolpo); – Jomosom, 2♂ (21.-26.III. :Mustang).

Vertical: Breeding season (VI): 4000-4100 m Mukut; 4650 m Parung La; 5000 m Dudje La. Though there is no proof of breeding activity near Mukut, both ♂ were apparently close to their territories' borders. This record included, the vertical range is between 4000 and 5000 m. Diesselhorst (1968:304) insists that close to Everest the species' range is only between 4900 and 5200 m. Inskipp & Inskipp (1991) extend summer records up to 5600 m, but circumstances are not given. – Outside breeding season: 2750 m Jomosom (III).

Breeding: The pullus from Parung La was already independent; thus egg-laying must have started as early as about 10.V., possibly before then. This is even earlier than Diesselhorst (1968:305) suggests from his Khumbu data.

Habitat: Only the alpine zone with gentle slopes, flat parts of the high passes, also rocky areas, all above timberline, but sites are considerably lower in the dry areas north of the Himalayan main range than recorded from other parts of Nepal. However, many of the higher areas in the rain shadow are, at least today, treeless due to insufficient precipitation and due to human impact.

Rhyacornis fuliginosus fuliginosus (Vigors)

Taxonomic notes: Probably forms a superspecies with *R. bicolor* from Luzon (♀ coloured like ♂).

Material: 11 specimens: **D** Myagdi Distr., Dhorpatan including Uttar Ganga Valley and plain, 2950-3000 m, 11.-25.IV.1970 (9 sp.), 16.-20.V.1973 (2 sp.): – The series comprises 6 adult ♂, among them 1 probably erroneously identified as ♀ (no result of dissection given); also, its wing-L of 78 mm suggests a ♂. An additional ♂ from 14.IV. with slightly swollen testes has a ♀-like plumage (but ventrally blurred). Besides the 3 ♀ ad. a ♀ pull. is to be mentioned, the tail of which shows the typical white coloration with brown edges (cf. Ali & Ripley 1973,8:268 contra Hartert's wrong indication "Tail as in ♂ ad.").

Measurements: **Wing**-L ♂ (6) 76-79 mm, $\bar{x}$=77.4, s_d=1.11; ♂ juv. 71 mm; ♀ (3) 71-73.5 mm; ♀ pull. 71 mm. – **Tail**-L ♂ (6) 52-56 mm, $\bar{x}$=53.4, s_d=1.50; ♂ juv. 45.5 mm; ♀ (3) 46-49 mm. – **Bill**-L ♂ (6) 11-12 mm; ♂ juv. 11.5 mm; ♀ (2) 10, 11 mm; ♀ pull. 11.5 mm. – **Tarsus**-L ♂ (5) 21.5-23 mm; ♂ juv. 22 mm; ♀ (3) 21-22 mm; ♀ pull. 22 mm. – **WTI** ♂ (6) 23.1-27.2%, $\bar{x}$=25.1, s_d=1.52; ♂ juv. 23.9%; ♀ (3) 21.1-24.5%; ♀ pull. 23.2%. – **TWI** ♂ (6) 66.7-73.2%, $\bar{x}$=69.0, s_d=2.39; ♂ juv. 64.1%; ♀ (3) 64.8-66.7%.

Notes: ♂ bill black, feet "grey (flesh-coloured)" and "dark horn-coloured". Testes more or less swollen, in a ♂ from 16.V. large, 9 x 6 mm.

Horizontal: Suli Gad Valley (9.VI. :Dolpo); – Dhorpatan (8.-20.V.; see Material; :Myagdi); – Tatopani (4.V.); near Lete (30.IV.); near Ghasa (2.V. both :Mustang); – above Chitre (5.V.); above Ghandrung (7.V. both :Parbat); – Hyangja/Pokhara (11.V. :Kaski); – Boulboule (1300 m); N Tal (12.IV. both :Lamjung); – above Bagarchap (13./14.IV. :Manang); – Pahakhola (3.VI. :Sankhua Sabha); – below Walungchung Gola (20.V.); upper Simbua Khola (13.V.); confluence of Kabeli and Tada Khola (24.IV.); Kabeli Khola/Yamputhin (1.V. all :Taplejung); – below Dhorpar Kharka (13.IV. :Panchthar); – Gitang Khola (11./12.IV. :Ilam).

Vertical: During the presumed breeding season (M IV-VI): Our data cover a belt from 1000 m (Tada/Kabeli Khola, 24.IV.; Hyangja/Pokhara, 11.V.) to 3350 m (Simbua Khola, 13.V.). – The species' vertical belt is not yet fully known and may be wider than currently believed. The above-mentioned data at 1000 m are the lowest hitherto known from the breeding season (Inskipp & Inskipp 1991), but a recent breeding record at 600 m (perhaps even lower) NW Kathmandu (Likhu Khola, Tyler & Ormerod 1993:64) is still considerably lower. It is open to question whether data from the lower and upper vertical limits include permanent parts of the breeding belt or represent only irregular outposts. Given the locally high population density (see Habitat), the latter assumption may be correct.

Habitat: The Plumbeous Water-Redstart belongs to a specialized group of torrent birds living on stones in the torrent bed proper or on the banks in immediate proximity to the waterline. It lives constantly in the open and is always freely to be seen. During the breeding season, a multitude of different types of water courses is inhabited, ranging from small streams 3-5 m in width with low gradients (above Ghandrung, 2700m, 7.V.), through broad rivers also with low gradient (Tada Khola, 1000 m, 24.IV.) to the broad, extremely noisy and turbulent mountain torrents close to the S macroslope of the main chain with high gradients (Kali Gandaki; Tatopani, 1200 m, 4.V.; Kabeli Khola/Yamputhin, 1650m, 1.V.; upper Simbua Khola, 3350 m, 13.V.). All transitional types are also inhabited. Water courses may be within forests with trees approaching the water line or they may be situated completely in the open and fully insolated. See also Diesselhorst (1968:306), who presents a largely consistent characterisation.

Population density is locally high. 7 specimens (5♂, 2♀) of the series from the Dhorpatan Valley (see Material) were mist-netted from 11.-18.IV. with nets constantly placed across a stream. Apparently, the free territory was re-occupied immediately by ♂ without a territory that were wandering around in search of free ones. Diesselhorst (1968:306) reports thin populations in his Khumbu study area. However, one has to take into account that free access to long stretches of watercourses for the observer is not usual in Nepal, so that underestimation of local populations may be the rule.

Breeding: An independent juvenile (20.V.) is among the Dhorpatan (2950 m) series (see Material). At the same locality a nest-building ♀ was observed on 10.V., nest ready 12.V. still without eggs, ♀ brooding 4 eggs 20.V. – The species is double-brooded (Ali & Ripley 1973,8:268) and the laying season starts early, E II at low altitudes (pulli still being fed 27.III., Likhu Khola NW Kathmandu, about 600 m, Tyler & Ormerod 1993). For ovary development in the Kathmandu Valley see Diesselhorst (1968:305), pulli well on the wing on 28.V. (Kathmandu Valley, 1400 m, Proud 1949) correspond to the Dhorpatan record, but altitude there considerably higher. – [Breeding records in the Jiri Valley (Diesselhorst 1968:306) overlooked by Inskipp & Inskipp (1991).]

Vocalizations: Territorial song (Fig.68a-d) is an unobtrusive continuous jingle of rising amplitude (but not pitch). The verse is subdivided into short phrases of 6 to 10 individual notes, which regularly fuse within the 1st third of the verse into a complex strongly frequency-modulated compound note. Its modulation rate varies within the verse up to threefold. The rate is lowest at the beginning, highest at the end of the verse and intermediate inbetween. These 3 classes of note types, which form 3 phrases within the verse are distinct, no continuous transition. Inter-phrase (-note) pauses cannot be recognized by the human ear. The frequency range, 5 kHz and higher, and to a lesser extent the note form qualify this song as "torrent-adapted" (Martens & Geduldig 1990). But, at least on the raging, broad, steep-gradient mountain rivers, this voice penetrates the noise only at close range, a consequence of the lack of drawn-out whistles, which are characteristic of many "torrent birds". Calls (Fig.68e-f) are a clearly whistled ascending "see" often combined with several broad-range "tk tk" clicks and fit well into the torrent voice scheme. For vocalizations of fighting ♂ cf. Martens & Geduldig (1990).

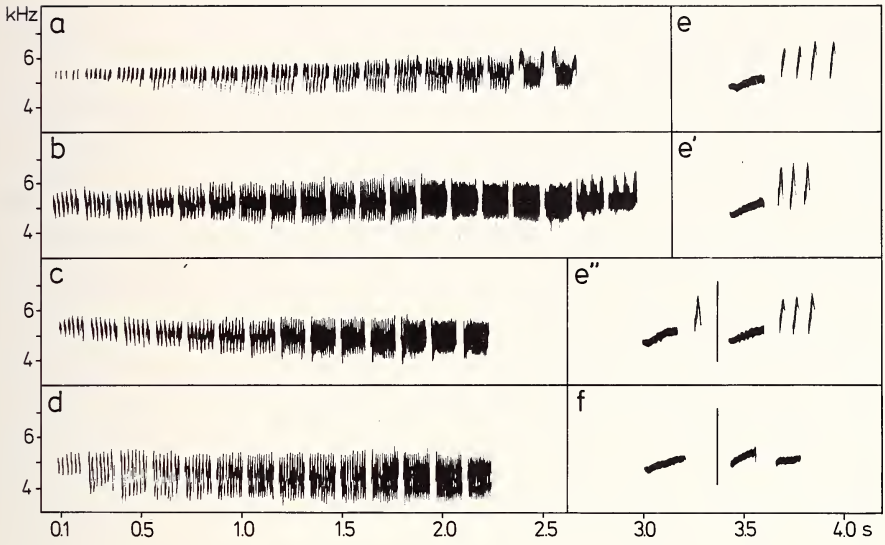


Fig.68: Vocalizations of *Rhyacornis fuliginosus,* territorial song (a-d) and warning calls (e-f). – a-d) 4 verses of 1 ♂, Potana 7.V.1980; e-f) warning calls; e-e") Dhorpatan 8.V.1973; f) ♂, Potana 7.V.1980.

Hodgsonius phaenicuroides phaenicuroides (Gray)

Material: 5 specimens: **D** Dolpo Distr., Suli Gad Valley, 3200 m, 10.VI.1973: ♂ juv. (with strongly developed testes, 9 x 5 mm) * Ringmo/Phoksumdo Lake, 3650-4000 m, 25.V.-3.VI.1970: 1♂, 1♂ juv., 1♀ ** Mustang Distr., Thaksang above Tukche, 3150 m, 8.VII.1970: 1♂.

Measurements: **Wing**-L ♂ 70, 71.5; ♂ juv. 68.5, 71; ♀ 71.5 mm. – **Tail**-L ♂ 75, 81.5; ♂ juv. 76, 76; ♀ 78.5 mm. – **Bill**-L ♂ 13.5, 14.5; ♂ juv. 13, 14.9; ♀ 12 mm. – **Tarsus**-L ♂ 28, 28.5; ♂ juv. 29, 29.5; ♀ 29 mm. – **WTI** (6, another ♂ juv. included) 13.9-17.1%, $\bar{x}$=15.4, s_d=1.25. – **TWI** (6) 107-114%, $\bar{x}$=109.8, s_d=2.63.

Notes: Testes ♂ 3.VI. 6 x 4 mm; 8.VII. 9 x 8 mm; ♂ juv. 25.V. 5 x 4 mm, 10.VI. see Material.

Horizontal: Our data are concentrated around the Dhaulagiri massif, mainly the N macroslope. – Ringmo/Phoksumdo Lake (25.V.-3.VI., 13.-15.VI.; see Material); Tarang, upper Barbung Khola (15.VI.); Mukut (16.VI.); Suli Gad Valley (10.VI; see Material; all :Dolpo); – Thankur NW Dhorpatan (27.V. :Myagdi); – Dudje La, E slope (27.VI.); Kali Gandaki Valley, between Sangda and Kagbeni (23.VI.); Thaksang above Tukche (2.-4.VII., 7./8.VII.; see Material; all :Mustang).

Vertical: Presumed breeding season (E V-VII): 10 localities range between 3150 m (Thaksang, B VII) and 4200 m (Dudje La, 27.VI.), and they are evenly scattered over this vertical belt of slightly more than 1000 m. – Inskipp & Inskipp (1991) give the distribution of the "summer visitor" population (months ?) as between 2900 m and 4270 m, but there seem to exist considerable local differences. Lowndes (1955) reports on an "isolated" pair at 8000 ft. (2450 m), but the closed population above 10,000 ft. (3050 m). This considerably broad belt is occupied also in Thakkhola (3150 m - 4200 m), but the limits Diesselhorst (1968:306)

gives for the area in upper Khumbu are from 3500 m to 4200 m only. Presumably, local climatic conditions play a major role in such marked differences, which are also obvious in other predominantly dry-adapted species (see Habitat).

Habitat: Within the forest zone, the White-bellied Redstart occupies the transition zone between open bush-rich facies and closed forests of varying composition. In the uppermost parts of its area, however, beyond timberline, only bushy formations are available, here and there intermingled with single trees, mainly *Betula utilis* or *Juniperus* (cf. Diesselhorst 1968:307). Man-made clearings with luxuriant hedges *(Berberis, Rosa, Viburnum)* bordering fields near forest edges are occupied at Thaksang (3150 m, B VII; Fig.31) and at the pasture Thankur (3350 m, 27.V.). Human influence may also apply to many breeding sites within the forest zone of the southern macroslope of the main chain. Larger stretches of open bushy country do not occur there under natural conditions and the species may have been favoured by human activities. I found the species' strongholds, however, to be situated in the dry parts of the Inner Valleys and of the N macroslope of Dhaulagiri (Dolpo) and Annapurna (Thakkhola). Open vegetation even within the forest zone is often to be found in many places, and the species seems to be distributed quite regularly there, not only locally as in monsoon-influenced areas. Accordingly, Lowndes (1955) found the species to be "common" in the Manang area (N of Annapurna). The upper Khumbu, where the species was studied by Diesselhorst (1968:306) is also slightly monsoon-reduced. In the extremely wet Kanchenjunga area I did not come across it in appropriate season (V, VI) and altitude.

Breeding: Families guiding fledglings were commonly seen at Thaksang (3200 m, 7.VII.); Diesselhorst (1968:309) did not notice pulli during VII in higher parts of Khumbu, indicating even later onset of breeding activity there.

Vocalizations: A quite homogeneous general pattern of the short (0.8-1.0 s) territorial song (Fig.69a-k, a'-k'): (i) one-note descending whistle introduction, often with a frequency modulation overlaid (Fig.69a-k) or broken into small (nearly) independent pieces (Fig.69a'-k'); (ii) heavily frequency modulated note and/or 1 or 2 angular notes (opened downwards); (iii) final part is a short whistle, sometimes extremely frequency modulated, and a low trill. This verse scheme, though comprising only 5-7 units (partly composed of several subunits), is subject to strong variation of nearly all notes; the general scheme, however, remains unaltered. In the Thaksang ♂ (Fig.69a'-k') variation is pronounced, in the Ringmo ♂ less marked (Fig.69a-k). In 14 spontaneously given verses of the former 9 differ (sequence A-B-C-D-E-E-F-G-H-I-E-E-E-A, Fig.69a-k). In the latter ♂, out of a series of 10 verses all were different except for the 1st and last, which differed only in the frequency modulation of the introductory whistle note. – The song can be rendered a rapid "tsee-tsits-rewe" or "tsee-tsri-tse-tik" and is displayed from the layer of dense bushes and scrub near forest edges; and only rarely is a singing individual to be seen sitting exposed.

Cinclidium leucurum leucurum (Hodgson)

Material: 1 specimen: **D** Myagdi Distr., Bobang, S Dhorpatan, 2450 m, 1.V.1970: 1♂ juv.

Measurements: **Wing**-L 97.5 mm. – **Tail**-L 70 mm. – **Bill**-L from front edge of nostril 9.5 mm. – **Tarsus**-L 28.5 mm. – **WTI** 18.5%. – **TWI** 71.8%.

Notes: Testes slightly enlarged.

Horizontal: Our scattered records range from SW Dhaulagiri to the Arun Valley. – Bobang S Dhorpatan (1.V. :Myagdi; see Material); – Kathmandu Valley, Sheopuri Mt. (25.VI. :Kathmandu); – Phulchoki Mt. (25.IV. :Lalitpur); – between Mure and Hurure (9.-16.VI.); Chichila (20.VI. both :Sankhua Sabha). The record from Bobang is the westernmost within the species' area.

Vertical: During the presumed breeding season (end of IV, V, VI): I found it only from about 1850 m (Phulchoki Mt.), 1950 m (Chichila), 2100 m (Mure/Hurure) to 2300 m (Sheopuri Mt.) and 2450 m (Bobang). – Fleming et al. (1976) mention the upper limit as 2750 m, as do Inskipp & Inskipp (1991), but none presents data. Obviously, the altitudinal range of the species is quite limited, certainly less than 1000 m wide.

Habitat: The White-tailed Robin is a shy and unobtrusive inhabitant of the bushy understorey of broad-leaved forests in the lower cloud-zone. It favours bushes along streams (Sheopuri; Bobang; Chichila), but its voice shows only slight adaptations to overcome the noise of running water. It may also be met far from water, e.g. in bushes at the edge of steep slopes (Mure/Hurure forest, Phulchoki Mt.). The species seems to be sparsely distributed in scattered minute populations, which are easily overlooked.

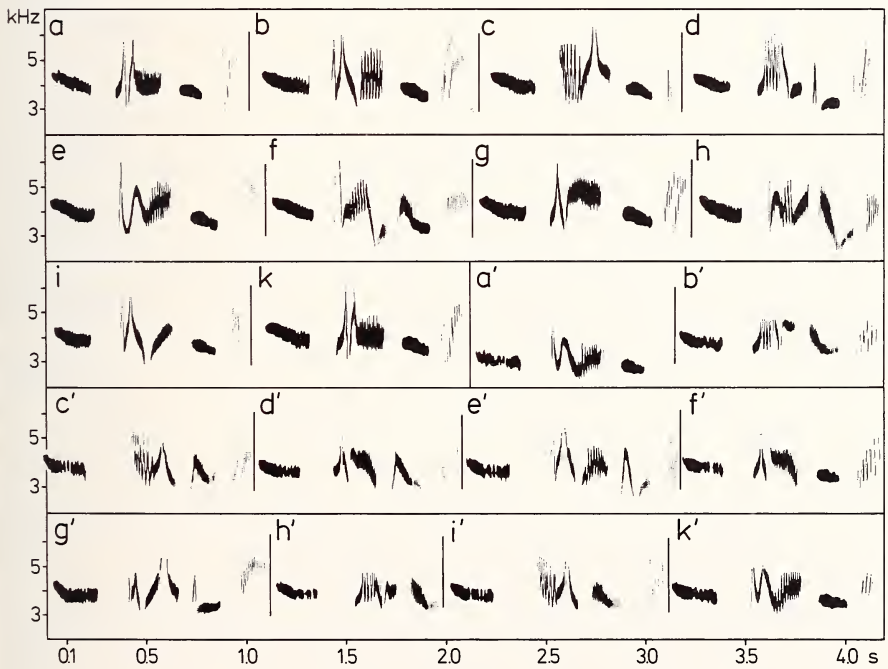


Fig.69: Territorial song of *Hodgsonius phaenicuroides*. – a-k) sequence of 10 consecutively given verses, Ringmo 13.VI.1973; a'-k') sequence of 10 verses in order from a series of 16 verses (see text), omitted are 6th (identical with e'), 11th (=e') and 12th (=e'), 13th is identical with a'; Thaksang/Tukche 2.VII.1973.

Vocalizations: Territorial song (Fig.70a-l, a'-g', a''-c'') consists of short verses 0.55-1.4 s long comprising sequences of whistled and slightly frequency-modulated notes. Notes are arranged in 3-4 clearly separated frequency bands; notes or small note groups of the individual bands follow each other. This simple syntax scheme still allows much variation as to verse types. Consequently, the repertoire of the individual ♂ is large. Of a sequence of 12 verses 11 were different (Fig.70a-l), as were 7 verses of another ♂ shown in Fig.70a'-g'. The temporal pattern of consecutive notes is complicated: many notes that follow each other overlap slightly, indicating that the 2 syrinx tympana produce different notes simultaneously. Frequency bandwidth is extremely narrow, sometimes reduced to slightly more than 1 kHz (Fig.70c, i), maximum near 2.3 kHz (Fig.70a'). Intervals between the different frequency bands are between 400 and 500 Hz wide. The whistles qualify this song as torrent-adapted but not the upper frequency range, which is not high enough (Martens & Geduldig 1990). Aural impression is that of a silvery clear but somewhat compressed verse. The birds sing while hidden in the lower bush layer within closed forests, and are rarely to be seen.

Grandala coelicolor Hodgson

Material: 2 specimens: **D** Myagdi Distr., ascent to Jungla Banjyang from S (Dhorpatan), resting place Phurbang, 4150 m, 1.VI.1973: 2♂.

Measurements: **Wing**-L 145.5 and 146 mm. – **Tail**-L 87 and 88.5 mm. – **Bill**-L 13.8 and 14.3 mm. – **Tarsus**-L 28.5 and 29 mm. – **WTI** 41.1 and 41.9% – **TWI** 59.8 and 60.6%.

Notes: Bill and feet black; gonads maximally developed, 10 and 11 mm.

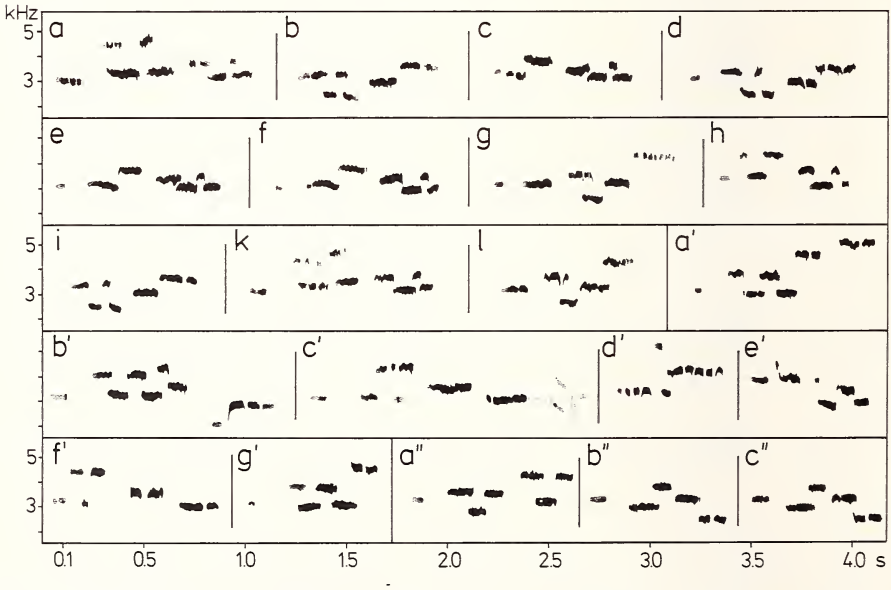


Fig.70: Territorial song of *Cinclidium leucurum*. – a-l) 1st ♂, Mure/Hurue 11.VI.1988; a'-g') 2nd ♂, Kathmandu Valley, Sheopuri Mt. 25.VI.1988; a''-c'') 3rd ♂, Chichila 20.VI.1988.

Horizontal, vertical: Only few finds of my own in the NW and N Dhaulagiri and along the E tributaries of the upper Arun. – Dhaulagiri: S Jungla Banjyang, flock of ♂, 4150 m (1.VI., see Material; :Myagdi); – Tarap Khola, Kangar, 4300 m (18.VI., 1♀ in Coll. H.S. Nepali; :Dolpo); – upper Arun area: Ladza Khola, 4460 m, 3 specimens (23.V.), upper Gabri Khola, 5 specimens including several ♀, 4550 m (28.V.): Meropapa La, several gliding, 4690 m, 4300 m 3 specimens on meadow searching for food (28.V.); descent from Pomri La, 4550 m and slightly below, singles (29.V. all :Sankhua Sabha).

Altogether my finds, all from or close to the breeding season, comprise a vertical belt only 500 m wide. But this refers only to a part of the area during the breeding season (cf. Diesselhorst 1968 and Inskipp & Inskipp 1991); the altitudes of the nest sites in Nepal are still open to question. Diesselhorst (1968:310) noticed adults carrying food and fledged independent juveniles slightly above 5000 m.

Habitat: Breeding season or close to it (V, VI): within the Himalayan main axis area rugged and barren high-altitude facies far beyond timberline; in searching for food prefers walking on meadows with short grass and herbs. The two specimens were collected from a flock of 8 birds, which descended downvalley after heavy snowfall. Obviously they had left the ♀ breeding on their nests. – Flight very elegant, the long and narrow wings making a swallow-like impression (for colour drawing of birds on the wing see Vaurie 1972, pl. C).

Saxicola

The Nepal list comprises 6 species *(torquata, leucura, insignis, caprata, jerdoni, ferrea). S. insignis* and *jerdoni* are rare winter visitors, the 4 others breed. *Leucura* is a lowland species and overlaps altitudinally with *caprata; ferrea* overlaps with *caprata* in its lower distributional belt and fully with *torquata.* The latter reaches the highest altitudes at its breeding places in Tibetan plateau regions. Though the breeding species prefer largely the same kind of habitat, open places with sparse bush or tree vegetation often within agricultural land, they do not seem to breed at close range. There are two subspecies each of *caprata* and *torquata,* which replace each other altitudinally. They merge *(caprata)* or are separated by a slight altitudinal gap caused by different ecological requirements *(torquata).*

Saxicola torquata

S. [torquata] incl. *tectes, dacotiae, leucura.*

Saxicola torquata indica (Blyth)

Material: 2 specimens: **D** Myagdi Distr., Muri, 2100 m, 31.III.1970: 1♂ ** Mustang Distr., Thakkhola, S Katang, appr. 2550 m, 8.VII.1973: 1♀.

Measurements: **Wing**-L ♂ 69.5; ♀ appr. 65 mm. – **Tail**-L ♂ 49.5; ♀ 45.5 mm. – **Bill**-L ♂ 11.5; ♀ 12 mm. – **Tarsus**-L ♂ and ♀ 22 mm. – **WTI** (2) 20.0-21.6%. – **TWI** (2) 70-71.2%.

Horizontal: To ensure reliability of the subspecies assignment, only observations from the presumed breeding season are listed here. – Upriver from Dunahi (8.VI.); Gompa/Tarakot (12.V.); Tarakot (7.VI.); Pelma (6.V., 29.V. all :Dolpo); – Dhorpatan (19.V., in collection H.S. Nepali); Beni, in addition common in the lower Myagdi Khola up to Muri (21.-23.III.,

see Material); Dara (5.IV. all :Myagdi); – N of Lete, Kali Gandaki Valley (8.V., 8.VII., see Material); near Lete on the way to Titi (2.V.); Titi Lake (1.V. all :Mustang); – between Tatopani and Ghara (3.V.); upper Ghara (3.V.); Sikha (3.V.); Ghandrung (8.V. all :Parbat); – Landrung (8.V.); between Dhumpus and Suiketh (10.V. both :Kaski); – between Mai Pokhari and Ilam (1.IV.); Mai Pokhari (31.III. both :Ilam); – Uyam (22.IV. :Panchthar); – ascent to Sablako Pass (21.IV., singing; :Taplejung)

Vertical: My own data cover an altitude from 900 m (Beni, 21.III.) to 3300 m (Gompa/Tarakot, 12.V.). The localities are distributed as follows: 900-1250 m: 3 localities; 1260-1500 m: 3 loc.; 1510-1750 m: 6 loc.; 1760-2000 m: 3 loc.; 2010-2250 m: 4 loc.; 2260-2500 m: 3 loc.; 2510-2750 m: 3 loc.; 2760-3000 m: 1 loc.; for highest record see above and Habitat. – Inskipp & Inskipp (1991) give the range as between 365 m and 2895 m in summer but no details.

Habitat: The ssp. *indica* of the Common Stonechat lives in close proximity to man, especially on or near agricultural land, terraced fields with bushes or small trees nearby. Besides this, any open bushy places or slopes are appropriate as breeding habitat, including broad riverbeds with sparse vegetation on pebble fields (near Lete :Mustang). On 1.V., a ♂ perched on herbs and bushes in the reeds of Titi Lake (:Mustang; Fig.32). Despite the availability of appropriate habitats over extensive parts of the cultivated midlands, this Stonechat is not common in most places. It is predominantly sparsely distributed, the population being apparently, at least in many places, dispersed into isolated pairs in large parts of the area (see also Diesselhorst 1968:315). Ssp. *indica* penetrates as a breeding bird to the northern relatively dry macroslope of Dhaulagiri, and the highest records of all for Nepal are from lower Dolpo but still within the forest zone.

Breeding: Season starts early. The ♂ from Muri (31.III., see Material) had strongly enlarged testes (7.5 x 4 mm). Similar circumstances had been noticed in M III by Diesselhorst (1968:314). A pair fed fledglings on 8.VII. (N of Lete, :Mustang); this date may indicate a second brood per year.

Saxicola torquata przewalskii (Pleske)

Material: 8 specimens: **D** Dolpo Distr., between the passes Büko La and Mo La, 4500 m, 20.VI.1973: 1♂ * upper Barbung Khola Valley, near Charka, 4350 m, 20.VI.1973: 1♀ * sources of Barbung Khola, confluence of Yulung und Lo Khola, ascent to Dudje La, 4400 m, 25.VI.1973: 1♂ ** Mustang Distr., Cha Lungpa Valley near Sangdak, 4050 m, 28.VI.1973: 1♂. **B** Kathmandu, suburb Chauni, 1350 m, 26.II.-8.III.1970: 2♂. **S** Solukhumbu Distr., Tarnga, 4050 m, 9.X.1970: 1♀ juv. (long-winged) * Pheriche Valley, Phulung Karpo, 28.IX.1970: 1♂ juv.

Measurements: **Wing**-L ♂ (5) 73-76 mm, $\bar{x}$=74.1; ♂ juv. 71.5; ♀ 72; ♀ juv. 73 mm. – **Tail**-L ♂ (5) 50-54 mm, $\bar{x}$=52.3; ♂ juv. 50; ♀ 51.5; ♀ juv. 55 mm. – **Bill**-L ♂ (5) 10.5-12 mm, $\bar{x}$=11.4; ♂ juv. 10; ♀ 11; ♀ juv. 11 mm. – **Tarsus**-L ♂ (5) 22.5-25 mm, $\bar{x}$=23.7. – **WTI** (8) 17.1-21.1%, $\bar{x}$=19.1, s_d=1.37. – **TWI** (8) 68.5-75.3%, $\bar{x}$=71.2, s_d=2.32.

Notes: For more about wing/tail indices in *Saxicola* see Eck (1983:16-17).

Horizontal: My records from N Dhaulagiri and N Annapurna (breeding population), Kathmandu and Khumbu (winter visitors). – Kangar, upper Tarap valley (18.VI.); between Passes Büko La and Mo La (20.VI.; see Material); Charka, upper Barbung Khola (22.VI.; see

Material); Mukut (16.-17.VI.); ascent to Dudje La (25.VI.; see Material; all :Dolpo); – above Sangdak (28.VI.; see Material), above Dangarjong, Kali Gandaki Valley (29.VI. both :Mustang); – between Manang and ascent to Thorung La (19.IV. :Manang); – Kathmandu Valley (26.II.-28.III., see Material); – Tarnga (9.X.); Phulung Karpo (28.IX. both :Solukhumbu; see Material).

Vertical: Records cover an area belt from 3300 m (Dangarjong, presumed *przewalskii)* to 4800 m (Büko La/Mo La area). There is an uniform vertical distribution from 3900 m (near Manang) to 4800 m (Büko La/Mo La) without noticeable concentration of the population within this 900-m-wide belt. However, the gap from the lowest locality Dangarjong (3300 m, no specimen secured) to the next higher one near Manang (3900 m) is considerable. For ecological reasons, the low Dangarjong record is assigned to *przewalskii* (see Habitat). – Fleming et al. (1976) give as lower limit for *przewalskii* 2745 m (no locality), as upper limit 4575 m (breeding record).

Habitat: As in its area in Tibet, ssp. *przewalskii* is an inhabitant of monsoon-protected high altitude areas N of the main range. It settles on stony barren grounds or on alpine meadows with scattered bushes of dwarf *Rhododendron, Cotoneaster, Salix* at moist places, *Caragana, Rosa sericea* and *Juniperus* bushes. Like ssp. *indica,* it does not avoid agricultural regions, but these are rare in Tibetan Dolpo and thus are occupied only occasionally (Mukut, 4000 m; Martens 1972). This Stonechat is locally not rare, with scattered but continuous populations near watercourses as well as dry slopes. It also breeds considerably above the upper limit of low bushes and apparently is not confined to them. The exceptionally low site at Dangarjong was on an arid, steep, stony slope with scattered *Rosa* bushes.

Breeding: In mid to end VI the young fledge: 17.VI. (Mukut 4000 m, newly fledged in snow); fledglings being fed: 28.VI. (Sangdak 4050 m), 29.VI. (Dangarjong 3300 m). There are no signs of two broods per year and I did not notice any independent juveniles at high altitude in V/VI. Oviposition may start at mid V, considerably later than in ssp. *indica.* Fleming et al. (1976) report on a nest with 4 eggs as late as 20.VI., 4575 m.

Distributional relations: In the Himalayan region, the two very different subspecies *indica* and *przewalskii* occur at close range, the former being (nearly) confined to the southern macroslope of the main chain, the latter to the Tibetan plateau facies. Apparently, they do not meet (see sketch map in Ali & Ripley 1973,9:26). In fact, their ecological requirements seem to be so different that areas of intermediate (climatic) conditions remain unoccupied.

Details from the Dhaulagiri area (Fig.43): Kali Gandaki Valley: Ssp. *indica* penetrates northward to the point where the bulk of monsoon precipitation abruptly stops. In the Kali Gandaki Valley, a pair with fledglings at Katang N of Lete, 8.VII.1973, 2550 m (see Material) provides the northernmost breeding record. The southernmost record for *przewalskii,* a pair feeding young, is situated about 25 km northward near Dangarjong, 29.VI.1973, 3300 m, in typical trans-Himalayan semi-desert habitat, on a steep slope above the valley floor (no specimen was secured). During extended stays also in other parts of Thakkhola during the breeding seasons in 1970, 1973, 1980 and 1995, I never came across a Stonechat in this critical part of the valley; the species is obvious absent there.

Barbung Khola Valley (Fig.43): The ssp. *indica* was met with from near Dunahi, 8.VI.1970, 2300 m (Martens 1972) up to Tarakot (2900 m) and Gompa near Tarakot (3300 m; see also Horizontal; no specimens secured). These localities, situated at least partly N of the main range and within a low-precipitation area, are still far away from Tibetan facies landscape. Ssp. *przewalskii* in the same river system, including its tributaries, lives no lower than 4000 m (see Vertical). The two subspecies are separated by a vertical gap of 700 m and by a horizontal one of about 30 km.

The conditions that so strictly separate *indica* and *przewalskii* are not yet fully understood. *S. t. przewalskii* does not descend, as many other dry-adapted species do, to whatever low altitudes are available in monsoon-protected areas like upper Barbung Khola and Kali Gandaki Valley (c.f. *Monticola solitarius, Motacilla alba, Serinus pusillus, Emberiza cia, Parus rufonuchalis).* Very obviously, it can tolerate only extremely slight precipitation (up to about 200 mm). Ssp. *indica,* however, even leaves the monsoon area to a certain extent (Dunahi; near Lete), but avoids high altitudes on the southern and northern macroslopes of the main chain, Tibetan plateau facies included. Although the highest and lowest outposts of *indica* and *przewalskii,* respectively, meet and suggest parapatric distribution, they are not parapatric in a narrow sense. Depending on local conditions, the two subspecies are segregated by an altitudinal and horizontal gap.

Saxicola caprata

Taxonomic notes: The 3 specimens from Kathmandu belong to *S. c. bicolor* Sykes, the 2 from Rapti Dun according to coloration to *S. c. burmanica* Baker. The latter were collected in II, the season of nest construction in Chitawan (Inskipp & Inskipp 1991:249).

Saxicola caprata bicolor Sykes

Material: 3 specimens: **B** Kathmandu, 1350 m, 3.II.-5.III.1970: 2♂, 1♀.

Measurements: **Wing**-L ♂ (2) 68, 70; ♀ 71 mm. – **Tail**-L ♂ (2) 47, 49; ♀ 50.5 mm. – **Bill**-L ♂ (2) 10.5; ♀ 11 mm. – **Tarsus**-L ♂ (2) 20, 21; ♀ 21 mm. – **WTI** (3) 15.4-16.9%. – **TWI** (3) 69.1-71.1%.

Horizontal: Our records extend from NW Dhaulagiri to Kathmandu Valley. – Tarakot (7.VI. :Dolpo); – N Kusma (20.III.); Beni (20.III., 31.V.); Myagdi Valley near Dharbang (22.III. all :Myagdi); – Pokhara (20.II.); Mahandra Gupa near Pokhara (11.V. both :Kaski); – between Turture and Syuribar (8.IV.), near Phalesangu (9.IV. both :Lamjung); – Kathmandu Valley, suburb Chauni (19.II., 23.III.: see Material).

Vertical: All observations except those from Chitawan are assigned to *bicolor* here. The transition zone between ssp. *burmanica* and ssp. *bicolor* is not known. – Lowest record at 530 m (Turture, 8.IV.), then a regular series of 8 localities up to 1500 m (Myagdi Valley, 22.III.). This belt covers the main vertical distribution, which is extended by scattered records up to 2500 m and exceptionally up to 2650 m (Marpha; Inskipp & Inskipp 1991). This is even exceeded by a specimen at 2850 m (Tarakot, 7.VI.). Marpha and Tarakot are situated in the Inner Valleys north of the main chain.

Habitat: Like other *Saxicola* species, the Pied Bushchat prefers open habitat: slopes with few bushes, abandoned pastures and terraces, riverbeds with scarce vegetation. It does not avoid neighbouring human habitation (near Pokhara airport, II 1974).

Vocalizations *(bicolor* and *burmanica):* Territorial song (Fig.71l-q) consists of short verses 1.1-1.7 s long. Syntax is simply structured: 1-5 introductory whistled notes which are slightly frequency modulated and always descending in pitch stand at the beginning; 2nd part comprises coarse rapidly modulated notes including marked frequency jumps from note(group) to note(group). This twofold subdivision is not always realized; whistled notes may also be included in the 2nd part (Fig.71q). Repertoires of the individual ♂ may be quite rich: 15 consecutive verses were all different in note form and note arrangement except for 1 which was repeated 3 times (see Fig.71l-p). – Warning calls are of different quality: whistled "seeye" (stress on 1st syllable) and complex click-like notes ("tk tk tk..") are both produced by 1 individual bird in the same situation, in mixed series (Fig.71r-s). – Song period starts early in the year: In Chitawan (300 m), the local *(burmanica)* population was actively singing M II (already breeding period !). The same holds true for Pokhara (800 m, *bicolor*) at 20.II., but in the Kathmandu Valley (1350 m) singing activity apparently starts later.

Saxicola caprata burmanica Baker

Material: 2 specimens: **N** Chitawan Distr., Tekouli, Hatisar, banks of Rapti river, 300 m, 12.-13.II.1970: 1♂, 1♀.

Measurements: **Wing**-L ♂ 68; ♀ 69 mm. – **Tail**-L ♂ 51.5; ♀ 50.5 mm. – **Bill**-L ♂ and ♀ 11 mm. – **Tarsus**-L ♂ 20; ♀ 22 mm. – **WTI** (2) 15.9-16.2%. – **TWI** (2) 73.2-75.7%.

Horizontal, vertical, habitat: The only records refer to the specimens mentioned in the Material section. The local population was found in the broad river valley near the grass-covered banks and clumps of bushes, also close to human habitations. Though the Pied Bushchat has long been known from lowland Nepal, this population is assigned here for the first time to ssp. *burmanica,* which is widespread in India.

Vocalizations: see ssp. *bicolor.*

Saxicola ferrea ferrea Gray

Material: 3 specimens: **D** Myagdi Distr., Dhorpatan and Uttar Ganga Valley, 2950-3000 m, 12.IV.1970, 23.V.1973: 1♂, 1♀. **B** Sindhu Palchok Distr., ascent to Ting Sang La starting from Bhote Kosi Valley, 2180 m, 12.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (2) 68, 69; ♀ 66 mm. – **Tail**-L ♂ (2) 60 and 61.5; ♀ 58 mm. – **Bill**-L ♂ (2) 10, 11; ♀ 11 mm. – **Tarsus**-L ♂ (2) 21, 22; ♀ 21.5 mm. – **WTI** (3) 15.9-18.2%. – **TWI** (3) 87.9-89.1%.

Notes: Bill (♂, ♀) black, feet dark grey (♂) or black (♀). Ovary inactive (23.V.), testes minute or markedly swollen, 5 x 3 mm (12.IV.).

Horizontal: Our records range from NW Dhaulagiri to the Sikkim/Darjeeling border. – Tarakot (7.VI.); Gompa near Tarakot (3.VI. both :Dolpo); – Dhorpatan (22.V. :Myagdi); – Jomosom (21.III.); Purano Marpha (7.VII.); Tukche (30.IV.); Lete (27.III., 1.V.); Dana (9.VII.); near Titi (2.V. all :Mustang); – Ghandrung (7.V. :Parbat); – Landrung (8.V.); Potana (28./29.IV. both :Kaski); – Tal/Marsyandi Valley (11.IV.); Dharapani (12.V. both :Lamjung); – Syng Gyang, Gosainkund (26.IV. :Rasuwa); – Kathmandu Valley (22.III. :Lalitpur); – ascent to Ting Sang La (12.IV.); Thodung (10./11.V.; both :Dolakha); – between Mure and Hurure (14.VI.); Pahakhola (31.V. both :Sankhua Sabha); – ascent to Walungchung Go-

la (19.V.); Yamputhin (29.IV., 16.V.); between Khebang and Yamputhin (26.IV. all :Taplejung); – Paniporua (19.IV. :Panchthar), – Mai Pokhari (27.-31.III.; 10.IV.); descent to Ilam (1.IV. both :Ilam).

Vertical: Presumed breeding season (E III-VII): 35 localities range between 1600 m (Tal, 11.IV.) and 3300 m (Gompa/Tarakot, 7.VI.), which makes an altitudinal belt of 1700 m. The distribution of the records is as follows: 1600-1750 m: 3 localities; 1760-2000m: 6 loc.; 2010-2250 m: 9 loc.; 2260-2500 m: 5 loc.; 2510-2750 m: 5 loc.; 2760-3000 m: 5 loc.; 3010-3300 m: 3 loc. The distribution is more or less even, including 5 localities at or above 3000 m. These data are in accordance with those presented by Inskipp & Inskipp (1991): "summers between 1500 and 3355 m".

Habitat: Like other *Saxicola* species, the Grey Bushchat prefers open places with clumps of bushes, in most cases localities which are the result of human activities. In vast stretches of nearly treeless terraced agricultural land, *ferrea* shows highest population densities with pairs every few hundred meters (between Kuinekani and Marangpa, :Myagdi, 2000-2300 m, V). Otherwise, the affinity of *ferrea* to forest vegetation is closer than in the other Nepal Bushchats. It lives not in the forest interior but at forest edges and near clumps of trees and groups of bushes in the neighbourhood of forests. Forest clearings are also inhabited if they are large enough (above Bikuti, 2180 m, 12.IV.; Potana, 2000 m, 29.IV.). It often perches on treetops. The Grey Bushchat also penetrates into the Inner Valley and onto the northern macroslope of Dhaulagiri. Among these regions are the upper Kali Gandaki Valley (several localities between Lete and Jomosom; III-VII) and lower Dolpo (Tarakot and nearby; VI). Close affinity to forest vegetation is also obvious there. Localities in monsoon-protected areas are among the highest (3200 m Purano Marpha 7.VII.; 3300 m Gompa/Tarakot, 7.VI.).

Breeding: Starts early in E III/B IV and covers a long period to VII. My data are as follows: 30.IV.: 2 nests with 3 newly hatched juveniles and 1/2 egg(s) ready to hatch (Ghandrung, 2100 m; Lete, 2400 m); – 22.V.: nest with 4 juveniles nearly ready to fledge (Dhorpatan, 3000 m); – 31.V.: adults warning near the nest or fledglings (Pahakhola, 2530 m); – 14.VI.: adult feeding fledgling (Mure/Hurure, 2100 m); – 9.VII.: adults with food warning near nest or fledglings (Dana, 1700 m). This last date may indicate a second brood per year. For early beginning of the season see also Proud (1955), who found fledglings at E V, in accordance with the above data, in the Kathmandu Valley.

Vocalizations: Territorial song (Fig.71a-f) is a short (1.0-1.3 s) warbling verse of characteristic syntax: (i) a short introductory note, low and differing from all others; (ii) main part comprising broad frequency band width notes, often phrase-like (repetition of note groups); (iii) final trill part of angular notes opened downwards, the series slightly descending in pitch. – Warning calls (Fig.71g-k) given near the nest or when fledged young are present differ: (i) a soft whistled "tyoup" note (0.17-0.18 s) gently descending in pitch, at the end slightly rising (Fig.71g-h); (ii) a soft trill (0.45-0.53 s) consists of an ascending note, with an extreme frequency modulation superimposed, the modulation increasing towards the end of the note (Fig.71i-k). The single modulations may be isolated in the individual ♂, cutting the note into numerous click-like components. The single ♂ uses several different trill

notes (Fig.71i). Warning call types (i) and (ii) are apparently used by ♂ and ♀ for the same purpose. 1 ♂ displayed both in alternation within a long call sequence.

Oenanthe deserti oreophila (Oberholser)

Material: 1 specimen: **D** Dolpo Distr., between Passes Büko La and Mo La, 4550 m, 20.VI.1973: ♂.

Measurements: **Wing**-L 102 mm. – **Tail**-L 69 mm. – **Bill**-L 15.3 mm. – **Tarsus**-L 27 mm. – **WTI** 28.4%. – **TWI** 67.6%.

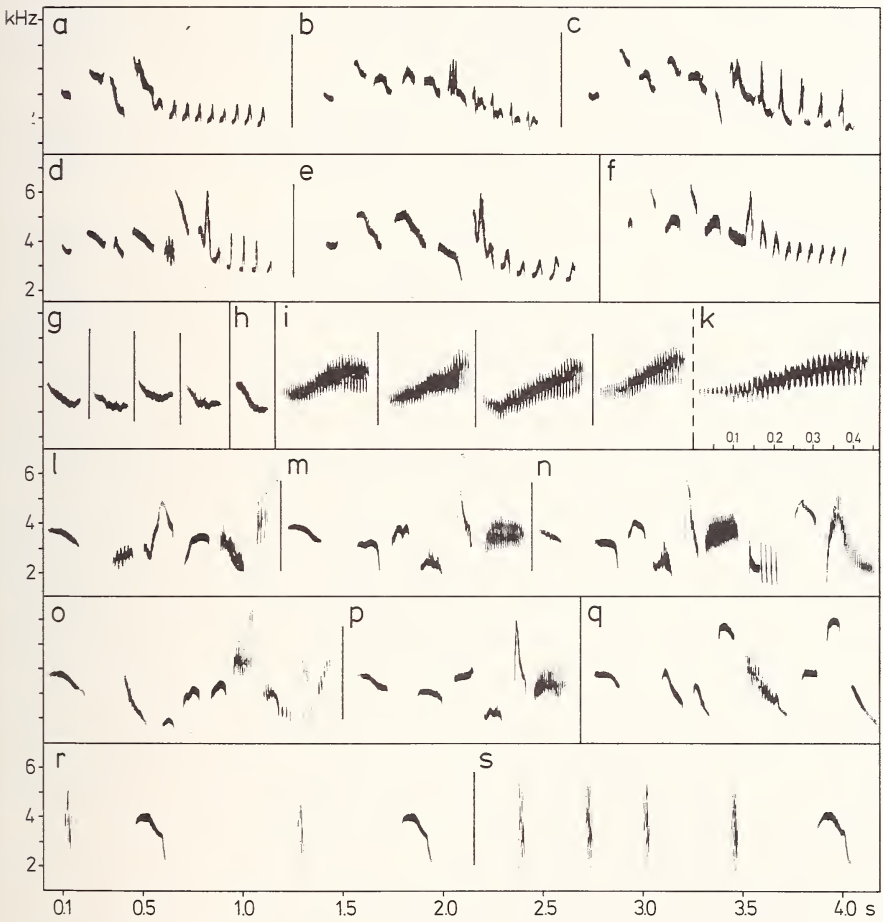


Fig.71: Vocalizations of *Saxicola* species. – a-k) *S. ferrea;* territorial song (a-f) and warning calls (g-k; g-h: "tjoup" type; i-k: trill type); – a-e) 5 consecutively given verses of 1 ♂, Gompa/Tarakot 5.VI.1973; f) 1 verse, Dhorpatan 10.V.1973; g) Pahakhola 31.V.1988; h) Mure/Hurure 14.VI.1988; i) 4 calls of 1 ♂, Pahakhola 31.V.1988; k) time scale of last note in i) doubled to show details of frequency modulation.
l-s) *S. caprata;* territorial song (l-q) and warning calls (r-s); – l-p) 5 verses of 1 ♂, Rapti Valley S Tekouli II.1970; q) 1 verse, Kathmanmdu 23.III.1973; r-s) 2 sequences of warning calls, Kathmandu 19.II.1974.

Notes: Testes much enlarged, 7 mm. Bill and feet black.

Horizontal, vertical: The specimen represents the only observation; ♂ foraging in moist meadow in the broad tree- and bush-less river valley. Because of rain no detailed observation was possible. The Desert Wheatear is confined in Nepal to the arid areas of the NW in continuation of its Tibetan area.

Chaimarrornis leucocephalus (Vigors)

Material: 3 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 18.IV.1970: 1♀. **S** Solukhumbu Distr., Pheriche Valley, Phulung Karpo, 4350 m, 28.IX.1970: 1♂. **M** Taplejung Distr., pasture Lassetham NW Yamputhin, 3450 m, 7.V.1988: 1♀ (at nest).

Measurements: **Wing**-L ♂ 102; ♀ 90, 92 mm. – **Tail**-L ♂ 82.5; ♀ 66, 73 mm. – **Bill**-L ♂ 14.5; ♀ 13.5, 14.5 mm. – **Tarsus**-L ♂ 31; ♀ 28, 29.5 mm. – **WTI** (3) 21.1-24.5%. – **TWI** (3) 73.3-80.9%.

Notes: For extension of variation see Eck (1983:16), with a discussion of colouration patterns in *Chaimarrornis* and *Phoenicurus*.

Horizontal: Our records extend from Phoksumdo Lake to the Sikkim/Darjeeling border. – Above Phoksumdo Lake (4.VI.); Suli Gad Valley (9.VI.); ascent to Pass Bagar La (19.VI.); near Tarang, upper Barbung Khola (16.VI.); between Tarakot and Dunahi (18.V.); Pass Jungla Banjyang (9.V.) and N slope (10.V.); Phurbang (31.V.); resting place Dhule and Cheng Khola (8.V. all :Dolpo); – ascent to Thankur and pasture Thankur (4.V.); Dhorpatan (7.IV., 18.IV., see Material); Bobang (28.IV. all :Myagdi); – between Marpha and Tukche (25.IV. :Mustang); – above Chitre, Bantanti (7.V.; 30.IV. both :Parbat); – Boulbule (10.IV. :Lamjung); – above Bagarchap (13.IV. :Manang); – Pheriche Valley, Phulung Karpo (28.IX. :Solukhumbu; see Material); – above Pahakhola (30.V.); ascent to Pomri La from E (29.V.); ascent to Meropapa La (28.V.); Gabri Khola (27./28.V.); Thudam (25./26.V.); from upper Kangla Khola to Thudam (25.V.); Kangla Khola (24./25.V. all :Sankhua Sabha); – Ladza Khola (21./23.V.); above Walungchung Gola to Ladza Khola (21.V.); Tamur Valley N Lungthung (19./20.V.); upper Simbua Khola (10./15.V.); pasture Lassetham (8.V.: see Material); Omje Kharka (2./5.V.); confluence of Kabeli and Tada Khola (24.IV. all :Taplejung); – between Mai Pokhari and Gitang Khola (11.IV.); Mai Pokhari (10.IV. both :Ilam).

Vertical: Presumed breeding season (V-VII): My records range from 2400 m (3 localities; Marsyandi Valley and Kanchenjunga area) to 4600 m (2 loc.; Kanchenjunga area). – Details as follows: 2400-2500 m: 4 loc.; 2510-3000 m: 4 loc.; 3010-3500 m: 6 loc.; 3510-4000 m: 9 loc.; 4010-4500 m: 15 loc.; 4510-4600 m: 3 loc. The strong preponderance of high-altitude data may be due to the greater visibility of watercourses in areas without accompanying tree vegetation; thus these data may be overrepresented. But at the piedmonts of Kanchenjunga, where most of the observations were made, the species is common indeed. Accordingly, the vertical belt spans about 2200 m during the breeding season, but there are slightly higher records from Khumbu up to 4800 m (Diesselhorst 1968:317); however, still higher records up to 5100 m seem not to be substantiated (Fleming et al. 1976).

Outside breeding season (IV, IX): 850 m (10.IV., Boulboulé); 1000 m (24.IV., confluence of Kabeli/Tada Khola); 1800 m (11.IV., N Mai Pokhari); 2150 m (10.IV., Mai Pokhari); 2750-2650 m (25.IV., Marpha/Tukche); 3000 m (7.IV., 18.IV., Dhorpatan); 4350 m (28.IX., Pheriche).

Habitat: The White-capped Redstart very constantly accompanies watercourses of variable width and gradient throughout its vertical belt. It rarely goes beyond the rocks and pebbles of the river bed and the river banks, and it never penetrates into the bush or tree vegetation growing along the banks. However, obviously in areas of high population density, single pairs or even good parts of the population may leave the immediate vicinity of running water and may settle far, even kilometers, from the nearest brook or river. This holds true especially for alpine facies areas, i.e. far above the tree line, but rarely also occurs within the forest belt (pasture Lassetham, 3350 m, 8.V.1988, at least 2 pairs, nest under construction). More commonly inhabited are waterless habitats within the alpine meadow belt, even in rocky areas (ascent to Pomri La, 4500-4600 m, 29.V.1988, several pairs). In any such cases, broad open places without tree or bush vegetation are needed.

Occasionally, population density along watercourses is remarkably high. Hitherto, such densities have mostly been recorded at alpine facies altitude, where population structure is easily checked (see Diesselhorst 1968:318), but can also be observed within the forest zone (upper Simbua Khola, 3250-3400 m, 10.-15.V., birds in pairs every 100-200 m; Kangla Khola; 4000-4200 m, 24.-25.V., pairwise every 200 m).

Breeding: 1 specimen carried nesting material on 8.V. (Lassetham, 3350 m). The ♀ of this pair was accidentally caught in a mousetrap. Within the same day, the ♂ was paired with another ♀, again in his old territory. This case indicates that population pressure may be high even in habitats far from torrents within the forest zone.

Migration: Altitudinal. Movements to the breeding grounds from below the breeding belt continue at least to E IV. According to Diesselhorst (1968:318), only birds observed from V onwards are considered to be breeding. This is substantiated by the developmental state of gonads of specimens from IV (see above). But even in the breeding belt proper, movements certainly continue to E V/B VI, when in the upper parts of the vertical belt the snow cover finally melts. Individual birds can often be seen in a riverbed with snow- and ice-covered banks (Jungla Banjyang, 10.V., 4450 m).

Vocalizations: Besides the well-known long-drawn-out call "tsee", which presumably also functions in the territorial context, there is a highly complicated and variable display song. This is given by the ♂ during courtship in the presence of the ♀ and can be heard only at close range (Geduldig 1991). There is no marked territorial song in this species. The "tsee" call differs in quality according to altitude. From 3900 m upwards, this call has a clinking sound. See Martens & Geduldig (1990) for details and sonagrams.

Monticola

Three species occur in Nepal; all breed *(cinclorhyncha, rufiventris, solitarius).* They differ ecologically: *cinclorhyncha* and *rufiventris* inhabit the monsoon-exposed southern macroslope of the main chain, but they largely occupy different vertical belts and different vegetation types. *M. rufiventris* lives in heavy forest, *cinclorhyncha* near bushy forest edges, also in treerich agricultural land. *M. solitarius* is confined to the dry northern slope exposed to Tibet and lives at various altitudes.

Monticola cinclorhyncha

Horizontal, vertical: Muri, 2100 m, 1♂ (4.IV.); Thulo Khola, 1850 m, ♂♀ carrying food (18.V. both :Myagdi); – Dhunche, 2000 m, 1♂ (22.IV. :Rasuwa); – descent from Paniporua to Hinwa Valley, 1♂ singing, 1360 m (20.IV.); ascent to Worebung Pass 1900 m, 1♂ (21.IV. both :Panchthar). – All observations in open area with single scattered trees and bushes, all places markedly transformed by man.

Monticola rufiventris

Horizontal, vertical: Dhorpatan, 3000-3200 m (12./13.IV.1970, 18.V.1973 :Myagdi); – Kathmandu Valley, Phulchoki Mt., 2050 m (19.III.1980 :Lalitpur); – lower slopes of Dadar Danda, 2750 m (23.IV.1995 :Sindhu Palchok); – Gitang Khola, above Dorpar Kharka, 2550 m (29.III.1980 :Taplejung).

Habitat: Spaced forest formations, also forest edges with adjacent clumps of bushes; in the climatically severe Dhorpatan Valley *Abies-Juniperus* forest close to the edge, on Mt. Phulchoki within the degraded *Quercus* zone, in the Gitang Khola Valley in *Lithocarpus pachyphylla* and tree *Rhododendron* forest.

Breeding: Breeding records in the Dhorpatan Valley: fledged nearly independent juveniles together with adults, 13.IV.1970, at the same locality an additional pair but nest/juveniles not found, 3100-3200 m. At the same locality but 3 years later, a ♀ carrying food; one more pair nearby giving warning calls during a hailstorm, 18.V.1973. Consequently, incubation may start B-M III, a very early date, for the Dhorpatan Valley climate is very harsh and severe during spring. 2nd breeding locality for Nepal (Inskipp & Inskipp 1991).

Vocalizations: Territorial song (Fig.72a-n), according to the only ♂ available, is divided into short verses 0.95-1.9 s long. The verse repertoire of this ♂ was large: in 49 verses there were 24 verse types, 13 of which are illustrated here. Several of them differ only slightly (Fig.72a/d, c/f, i/k), others are extremely divergent (Fig.72a/l). Various verses may be produced only once, the following ones being different, but such a sequence may be interrupted by the repetition of one verse up to 6 times. Verse syntax is quite homogeneous despite strong note variation at the beginning. Verses start with a short introductory note (or a group of short notes) followed by a long (0.2-0.34 s) (slightly) descending whistle, which is present in all 49 sonagrams available. The following notes are angular, opened downwards, or simple up- und downstrokes, several strongly frequency modulated and sometimes cut into click-like pulses. Except for the introductory notes and the whistle no clear syntax scheme is recognizable. Frequency band is only 2-3 kHz wide, made broader only by single notes (Fig.72n). Frequency is generally low, many notes descending to 2 kHz. Verses may be rendered as "te djüü teeje re".

Monticola solitarius pandoo (Sykes)

Material: 2 specimens: **D** Mustang Distr., Kali Gandaki Valley, Tukche, 2650 m, 30.VI.1973: 1♀ pull./juv.: Marpha, 2700 m, 5.VII.1973: 1♂.

Measurements: **Wing**-L ♂ 125; ♀ 122 mm. – **Tail**-L ♂ 82; ♀ 85 mm. – **Bill**-L/**Height** ♂ 22.5/5.4 mm; ♀ 20/5.5 mm. – **Tarsus**-L ♂ 28.5; ♀ 29 mm. – **WTI** ♂ 28.8; ♀ 32% – **TWI** ♂ 65.6; ♀ 69.7%.

Notes: Testes very large, ovary inactive. ♀ with remnants of the pullus feathers on the upper parts.

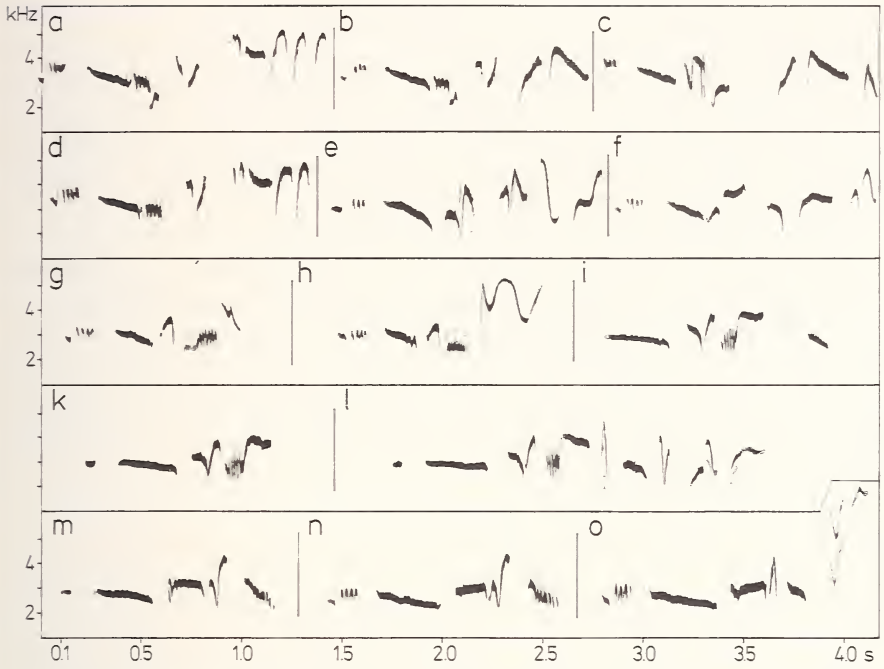


Fig.72: Territorial song of *Monticola rufiventris*. – 13 selected verses from a continuous sequence of 1 ♂. upper Gitang Khola 29.III.1980.

Horizontal: Our records are limited to the arid areas N of Dhaulagiri and Annapurna. – Dhaulagiri: near Tarakot (7.VI.). Gompa/Tarakot (12.V.): upper Barbung Khola Valley: Pimring (13.VI.), Charka (22.VI. all :Dolpo); – Thakkhola: Dangarjong (29.VI.), Jomosom (30.VI.). Marpha (5.VII.). Purano Marpha (5.V., 9.V., 6.VII.). Tukche (25./26.IV., 28.VI., 1.VII.), Gobang (27.VI. all :Mustang); – S: Dharbang (22.III. :Myagdi).

During the breeding season the Blue Rock-Thrush is known only from the monsoon-protected areas in the NW of the country, the easternmost being located in the Marsyandi Valley (:Manang) (Lowndes 1955; VI, VIII).

Vertical: My observations range between 2550 m (Gobang :Mustang) and 4300 m (Charka :Dolpo); most of them between 2550 m and 3300 m (Gompa/Tarakot), beyond this only Pimring (3900 m) and Charka (4300 m). The vertical area belt spans appr. 1750 m and is very likely used for breeding activity. – The vertical distribution comprises the middle part of the forest zone upwards to the alpine dwarf-bush heather. Apparently, there is no close adaptation to certain plant communities but areas of low precipitation are clearly preferred. In the Dhaulagiri/Annapurna region these conditions are fulfilled down to about 2500 m. and *solitarius* is present at that altitude. There seems to be an upper border where the cushion-plant zone comes to an end, but the delimiting factors have not yet been determined. The Nepal Blue Rock-Thrush's distribution type is concordant with that of *Emberiza*

cia and *Serinus pusillus* (which see). – Inskipp & Inskipp (1991) present uncommented finds up to 4800 m in summer.

Habitat: In Nepal as elsewhere, the Blue Rock-Thrush is an inhabitant of various open landscapes and avoids forests. In Thakkhola, the area of highest population density, it lives on dry slopes sparsely covered with bushes, but does not avoid proximity to forest edges. In Thakkhola it regularly breeds in villages; this was demonstrated in Tukche, where I found 3 nests E VI/B VII 1973, in the masonry of collapsed houses and in a chorten. Also in Dolpo I often saw it close to villages (Tarakot, Charka).

Breeding: Juveniles being fed E VI/B VII (see Habitat) in Thakkhola (Tukche, Marpha, Choyro); according to these data oviposition may be expected M V to 2nd third V.

Migration: Even the low-altitude breeding sites in Thakkhola are left during winter. E II to 23.III.1974 none were encountered in Thakkhola, nor in X/XI 1969. Between 25. and 30.IV.1980 the local population was present (since when?) between Tukche and Lete. 1 specimen near Dharbang (:Myagdi, 1000 m) on 22.III.1970 was still in the winter quarters or migrating to the breeding grounds.

Myiophonus caeruleus temminckii Gray

Myiophonus [caeruleus] incl. *flavirostris,* cf. Eck (1974).

Material: 2 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 17.IV.1970: 1♀. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 1.X.1970: 1 o (presumably ♂).

Measurements: **Wing**-L o 132; ♀ 123 mm. – **Tail**-L o 178; ♀ 166+x mm. – **Bill**-L o 26.5; ♀ 28 mm. – **Tarsus**-L o 53; ♀ 51 mm. – **WTI** ♀ 17.5%. – **TWI** 74.1 and 74.2%.

Notes: Moult of the specimen from X: P1-P5 old, P6-P10 growing, also S and T moulting (wing-L measurements possible via P5 because of very roundish wing).

Horizontal: Though distinctly specialized, the Blue Whistling Thrush is widely distributed in the Nepal Himalayas. Within the main large massifs our own records extend all over the expedition area from NW Dhaulagiri to S Kanchenjunga. While the species is continuously distributed, it is important to recognize the small gaps and their causes. In general, the Whistling Thrush breeds only in the monsoon-influenced parts of the country S of the main range; however, its area does not end abruptly at places where monsoon rains diminish. In the Thakkhola (Kali Gandaki Valley :Mustang) it penetrates northward in small numbers as far as Tukche (breeding record VII 1970), sometimes on the valley bottom even N to Choya (15.IV.1980). Monsoon precipitation is slight there but still supports luxuriant coniferous forests on the upper slopes where the Whistling Thrush lives. In Purano Marpha, a distinctly drier place 5 km to the N and exposed to the NW, the species is absent. – In the Barbung Khola Valley, shadowed by the N flanks of Dhaulagiri, *caeruleus* is a common bird on the dry valley bottom between Dunahi and Tarakot (VI 1973), but no observations upriver from Tarakot, on the relatively moist upper slopes (e.g. Gompa/Tarakot) or even the drier valley bottom. One sighting at Phoksumdo Lake, but it is not a breeding bird there (13.VI.1973). In the Marsyandi Valley as well, *caeruleus* penetrates into arid areas, though only sparsely (Lowndes 1955).

Vertical: Records during the breeding months (IV-VII) extend between 470 m (Mai Khola, 7./.8.IV.1988, singing) and 4300 m (Jungla Banjyang, 2 specimens 9.V.1970) – one of the

broadest altitudinal belts of all the Nepal birds! According to our own data continuous populations exist within this belt, though their density in the lower and upper parts seems to be less. About 90% of the data originates from altitudes between 1700 and 3600 m.

Habitat: An exclusively arboreal species; mostly in varying woodland types from thick forest to open bush with single larger trees, rarely outside forests. However, forests are not inhabited continuously; with remarkable constancy, the species is found only in the vegetation strip closest to a watercourse. The wide altitudinal belt in itself indicates a preference not for certain forest or climatic types but for running water. Within the large array of watercourses available, no type seems to be preferred. Banks of large and noisy rivers (e.g. Kali Gandaki and lower reaches of its tributaries; Marsyandi, Buri Gandaki, Tamur, Arun) as well as small forest streams are among the regularly frequented habitats. Along the river courses the population is distributed linearly and largely within hearing ranges of the rivers. However, there are exceptions: brood Thaksang (VII 1970) in closed forest (mainly coniferous) apart from every watercourse. – Several sightings above the timberline during the breeding months: 4000 m, Cheng Khola (:Dolpo), 8.V.1970 1 specimen in low *Rhododendron* shrub; – 4300 m, ascent to Jungla Banjyang (:Dolpo), 9.V.1970 2 specimens in alpine cushion vegetation with many boulders; – 4250 m, Ladza Kharka above Walungchung (:Taplejung), 23.V.1988 1 specimen on nearly vegetationless boulder slope, shy, only little song activity.

Population density is locally high: in riverine *Alnus* vegetation of the Gitang Khola (:Ilam) one pair took the place of the next one every 250-300 m, 1750 m, IV 1988.

Breeding: Season quite extended, possibly differing according to altitude. – Regular approaches to (?) feed juveniles at unaccessible nest 22.-24.IV.1988, Kabeli/Tada Khola confluence, 1000 m (:Taplejung); – carrying nesting material 8.V.1988, Lassetham, 3350 m (:Taplejung); – the same 14.V.1988, Simbua Khola, 3350 m (:Taplejung); – juveniles just fledged together with adults 7.VII.1970, Thaksang/Tukche, 3200 m (:Mustang).

Vocalizations: The far-carrying territorial song is strong, consists nearly exclusively of clear flute-like elements changing in pitch from note to note. This song penetrates the loudest torrent noise (see Martens & Geduldig 1990 for sonagrams; Fig.40).

Zoothera

Seven species occur in Nepal; probably all breed *(mollissima, dixoni, dauma, monticola, marginata, wardii, citrina).* The species set occupies a large variety of habitats and altitudes and covers nearly all forest types from the Dun valleys *(citrina)* up to the timberline *(mollissima)* and even beyond *(dixoni),* encompassing about 4000 m. Dense and tangled forests, often with heavy moss cover on the ground, are preferred. *Z. monticola* and *marginata* are very local and secretive with few records hitherto. Despite considerable overlap in altitudinal distribution, species do not live in close proximity except for the winter quarters.

Zoothera mollissima mollissima (Blyth)

Cf. Vaurie (1955) and Rand & Fleming (1957:159-160).

Material: 1 specimen: **B** Kathmandu Valley, Lalitpur Distr., Phulchoki Mt., 2700 m, 28.I.1970: 1 o.

Measurements: **Wing**-L 145 mm. – **Tail**-L 100 mm. – **Bill**-L 22 mm. – **Tarsus**-L 39 mm. – **WTI** 31%. – **TWI** 69%.

Horizontal, vertical: The specimen was among other turdines on a treeless shoulder below the top of Phulchoki. This winter record is the highest known from Nepal; Inskipp & Inskipp (1991) present records up to 2400 m.

Zoothera dixoni (Seebohm)

Cf. Vaurie (1955).

Material: 2 specimens: **B** Kathmandu Valley, Lalitpur Distr. Phulchoki Mt., 2700, 28.I.1970: 2 o, collected together with *Z. mollissima* at the same time and the same locality.

Measurements: **Wing**-L 132 and 140 mm. – **Tail**-L 104 and 114 mm. – **Bill**-L 21 and 23 mm. – **Tarsus**-L 36 and 37 mm. – **WTI** 28 and 31.4%. – **TWI** 78.8 and 81.4%, thus exceeding the maximum value of 78% (n=24) given by Vaurie!

Horizontal, vertical: Both specimens were on a clearing below the top of Phulchoki Mt. in *Quercus semecarpifolia* forest. *Z. mollissima* (which see) was present at the same time.

Zoothera dauma dauma (Latham)

Zoothera [dauma], cf. Sibley & Monroe (1990).

Material: 4 specimens: **D** Myagdi Distr., Bobang, 2450 m, 30.IV.1970: 1♂, 1♀. **B** Sindhu Palchok Distr., Ting Sang La, 3200 m, 16.IV.1973: 1♀. **J** Ramechap Distr., pass N Jiri, 2550, 10.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (2) 148 and 148 mm; ♀ (2) 137 and 142 mm. – **Tail**-L ♂ (2) 97 and 101 mm; ♀ (2) 91 and 99 mm. – **Bill**-L ♂ (2) 23 and 23.3 mm; ♀ (2) 23.3 and 24 mm. – **Tarsus**-L ♂ (2) 33 and 35.5 mm; ♀ (2) 32 and 34 mm. – **WTI** (4) 29.9-33.1%, $\bar{x}$=31.5. – **TWI** (4) 65.5-69.7%, $\bar{x}$=67.5.

Notes: Gonads slightly enlarged, in the ♂ from 10.IV. 8 x 4 mm. Bill horn-coloured, darker above; feet flesh-coloured. – 12 tail feathers (cf. Mees 1977:258). Northern Scaly Thrushes (ssp. *aurea, toratugumi)* are distinctly larger; they have 14 and 12 or 14 tail feathers, respectively, and a higher WTI (32.5-37.5%, $\bar{x}$=35.4, s_d=1.31, n=20).

Horizontal: Our records extend from SW Dhaulagiri to the Jiri area (:Ramechap). – Dhorpatan (11.-13.V.); Bobang S Dhorpatan (28.IV., see Material :Myagdi); – Pokhara (19.XII. :Kaski); – Pass Ting Sang La (16.IV.; see Material); Dadar Danda, Kalinchok area (22.IV. :Sindhu Palchok); – upper part of the Jiri Valley (10.IV.; see Material; :Ramechap).

Vertical: Within the presumed breeding season (IV-V): 2500 m Bobang; 2550 N Jiri; 3000-3200 Dhorpatan; 3100 m Dadar Danda; 3200 m Ting Sang La. "Summer" distribution is 2320 to 3540 m according to Inskipp & Inskipp (1991), but months are not detailed. Their altitude bar indicates only scanty records above 3000 m. Generally, the distributional belt during the breeding season seems to be quite limited and may only slightly exceed 1000 m.

Habitat: The Scaly Thrush is a forest dweller, which prefers mature forest with dense bushy understorey and apparently deep moist soil. According to altitude however, the forests belong to quite different types. The lower distributional belt belongs to species-rich broad-

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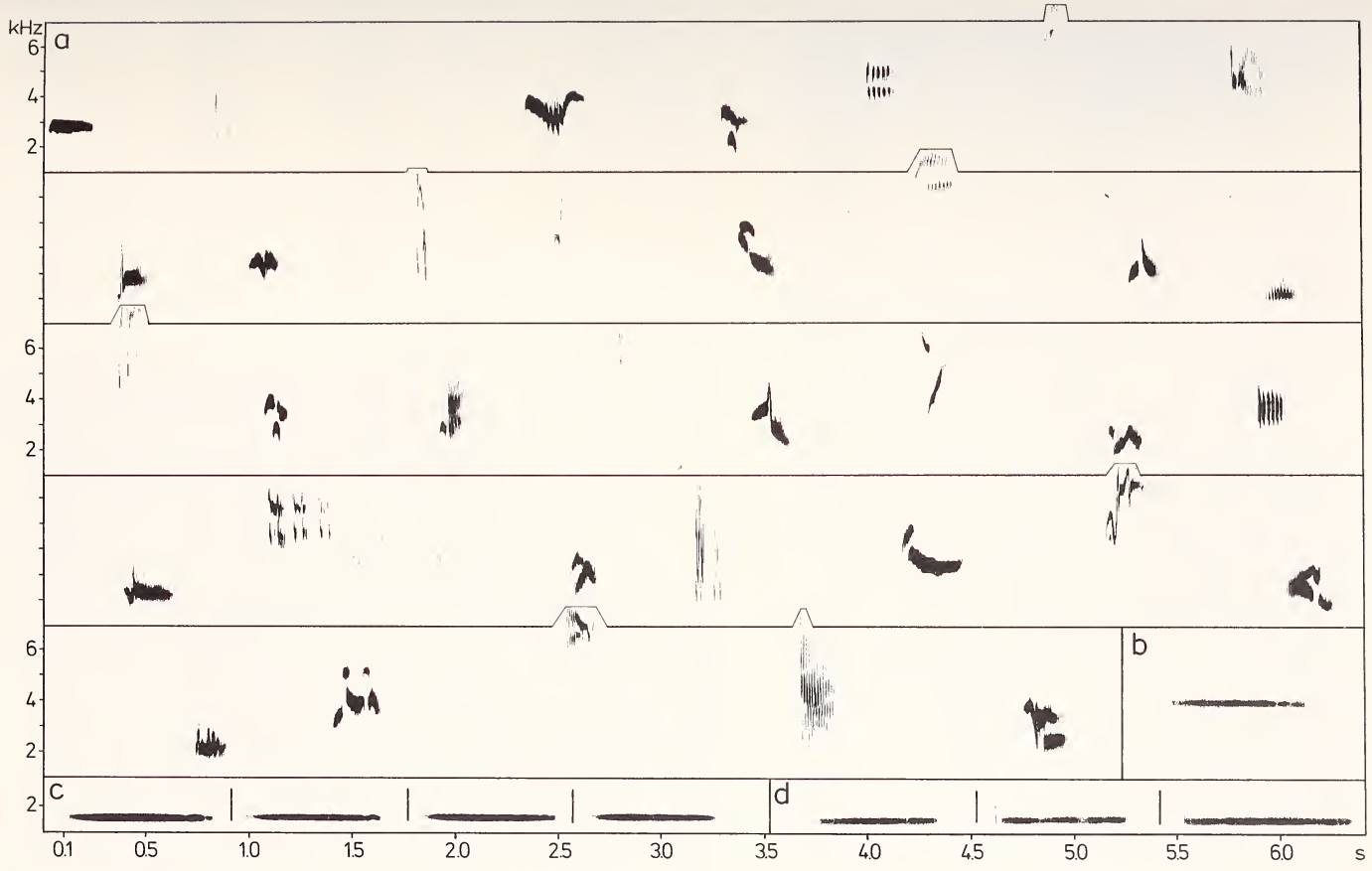
Fig.73: Territorial song of *Zoothera dauma.* – a) *Z. d. dauma;* part of continuous song sequence, Dhorpatan 11.V.1973. – b-d) *Z. d. toratugumi;* high-frequency song note; c) 4 low-frequency song notes of 1 ♂; d) 3 low-frequency song notes of another ♂; all from Russia, Khekhzir Reservation S Khabarovsk 9.VI.1990.



leaved forests of the cloud zone (e.g. *Aesculus indica),* no coniferous trees being present there (2500 m, Bobang). Slightly higher, closed stands of *Tsuga dumosa* may prevail (2550 m, N Jiri). In the upper part of the belt, *Quercus semecarpifolia,* tree-like *Rhododendron* and coniferous species dominate *(Abies spectabilis, Pinus wallichiana,* 3000-3200 m; Dhorpatan, Ting Sang La).

Vocalizations: Territorial song (Fig.73a), typical turdine in character, consists of a continuous sequence of spaced notes or small note groups (about 0.15 to 0.36 s); 3 sequences were 2, 4 and 4.5 minutes long. Individual notes are whistled, slightly or so strongly frequency-modulated that a series of closely-spaced click-like notes results (Fig.73a, 1st and 2nd row). Frequency bandwidth of a song sequence is high (up to 5.5 kHz), but there are marked differences. Whistled notes are generally low-pitched though exceptions do occur (individual notes situated in a frequency band of 2-5 kHz); click-like notes often have a broader range and are higher-pitched, exceeding 7 kHz. Within a song sequence appr. 33.5 s long all notes were different; no repetition or recombination of notes to form different note groups. Distances between notes (note groups) vary from 0.5-0.7 s, giving the aural impression of a slow song.

Song of northern ssp. *varia* and *toratugumi* (Cramp 1988,5:917) are nearly ideal spaced whistles with hardly any frequency modulation discernible (Fig.73b-d). Note frequency of the individual ♂ is very constant (1600 Hz in one, 1540 Hz in another ♂). High-frequency whistles are near 4000 Hz (4000 and 4080 Hz in 2 verses of 1 individual), but are much rarer (3 such notes sung by a ♂ among dozens of low-pitched notes of several individuals). High- and low-frequency whistles may be heard simultaneously but apparently originate from different individuals; their sex is unknown. This song type is uniform all over Siberia and even Japan, though minor differences occur. In conjuction with slight but distinct differences in morphology (see above), voice may indicate species status of northern and southern Scaly Thrushes (comp. Beaman 1994). For the recent splitting of *Z. dauma* into several allospecies, also for vocal reasons, see Sibley & Monroe (1990).

Zoothera monticola monticola Vigors

Material: 2 specimens: **G** Parbat Distr., Bantanti, NW Ghandrung, 2650 m, 1.V.1995: 1♀. **M** Taplejung Distr., Kanchenjunga massif, upper Simbua Khola Valley, 3250 m, 11.V.1988: ♀.

Measurements: **Wing**-L 137 and 143 mm. – **Tail**-L 81 and 82 mm. In the original description of *Z. m. atrata* Delacour & Greenway 1939, the **Tail**-L of the type is erroneously given as 48 mm. – **Bill**-L 38 and 37,5 mm; – **Height** (above front edge of nostril) 8.6 mm, greatest height 9 mm. – **Tarsus**-L 33 and 34 mm. – **WTI** 24.1 and 24.5%. – **TWI** 59.1 and 57.3%.

Notes: ♀ from 1.V. 115 g, T1 right growing, largest oocytes 3-4 mm.

Horizontal: Records from the Dhaulagiri/Annapurna and Kanchenjunga massifs. – Upper Myagdi Khola, Dobang (27.V. :Myagdi); – E slope of Ghorapani Pass (11.VII.); Bantanti (1.V.); between Deorali and Chitre (2./3.V. all :Parbat); – upper Simbua Khola (10.V. :Taplejung).

Vertical: I observed the species at 2400 m (Dobang), 2500 m (Ghorapani), 2650 m (Banthanti), 2700 m (Deorali/Chitre) and 3350 m (Simbua Khola). According to Inskipp & Inskipp (1991), the species ranges in "summer" between 2285 m and 3850 m, but details are not given.

Fig.74: *Zoothera monticola,* specimen from the upper Simbua Khola; 11.V.1988. W. Schawaller

Habitat: According to altitude, the Long-billed Thrush lives during the breeding season in broad-leaved or coniferous/*Rhododendron* forests. Besides a heavy understorey of bushes, ferns and herbs, it seems to require places with moist earth, muddy sites, soft riparian banks or thick layer of mosses, where the species is able to probe with its extremely long bill for soil-dwelling invertebrates (Fig.74a, b). The pair in the Simbua Khola, e.g., lived in mature *Abies densa* forest, bushy species-rich *Rhododendron* storey, all boulders were covered with an extensive thick moss layer and much decaying wood was present. The netted specimen carried an earthworm. – Under present-day conditions only largely undisturbed forests may meet its habitat requirements; forests opened by heavy grazing, with a more or less cleared forest floor, are apparently avoided. All above observations stem from sites as characterized. However, even at suitable places it seems to be rare and local. At Bantanti 2 were present, probably a pair, as well as in the Simbua Khola Valley. At my camp site between Deorali and Chitre, 2 ♂ were singing simultaneously at dusk as happened at Dobang.

There is very little information on this species in Nepal; it seems to be rare everywhere, at least very secretive. Fleming et al. (1976) discovered a nest at 2287 m (the lowest record during the breeding season at all), but no locality was indicated. Inskipp and Inskipp (1991) present only 3 records from the presumed breeding season (V-VII), all from C Nepal, among them a breeding record from the Langtang Valley (height?).

Although not many suitable forests remain for the species, it nevertheless may be locally underrepresented by the present data. The species is extremely shy and secretive, but may be most readily spotted by its voice (see Vocalizations).

Vocalizations: Territorial song (Fig.75a-s), not turdine-like at all, consists of prolonged whistles (0.3-0.6 s), which are all produced within a narrow and low frequency band less than 2 kHz wide, very uniformly situated between 2 and 4 kHz. The individual verse comprises 3-6 notes; they fall into 3 groups. (i) pure whistles, always slightly frequency-modulated, irregularly ascending or descending; (ii) whistle notes beginning or ending with a frequency modulation of the carrier frequency; (iii) short notes (up to 0.2 s) entirely frequency-modulated. – There are verses consisting only of whistle notes (Fig.75a, f, p), others comprise 2 (Fig.75h, k, m, q) or all 3 note types (Fig.75c, e). Amplitude modulation within the verse, even within the individual note, may be marked. The individual repertoire may be quite large. 12 verses of 1 ♂ could be assigned to 7 verse types (Fig.75a-h). Nearly identical notes may occur in different verse types (Fig.75b, d, f). Verses belonging to the same verse type were used in different populations (Fig.75k: Chitre, 75m: Dobang, about 40 km apart).

The song, the only reliable information on the species' presence, is produced only for a few, mostly less then 10 minutes, at dusk and dawn. The combination of elongated pure low-frequency whistles with modulated rasping notes cause a mournful auditory impression ("rrraee ti tü", "trrray tya tyee"; see Fleming et al. 1976 for other renderings).

Zoothera wardii

Horizontal, vertical: Dhunche, 1900 m, 2200 m (22. and 23.IV. :Rasuwa). The Trisuli Val-

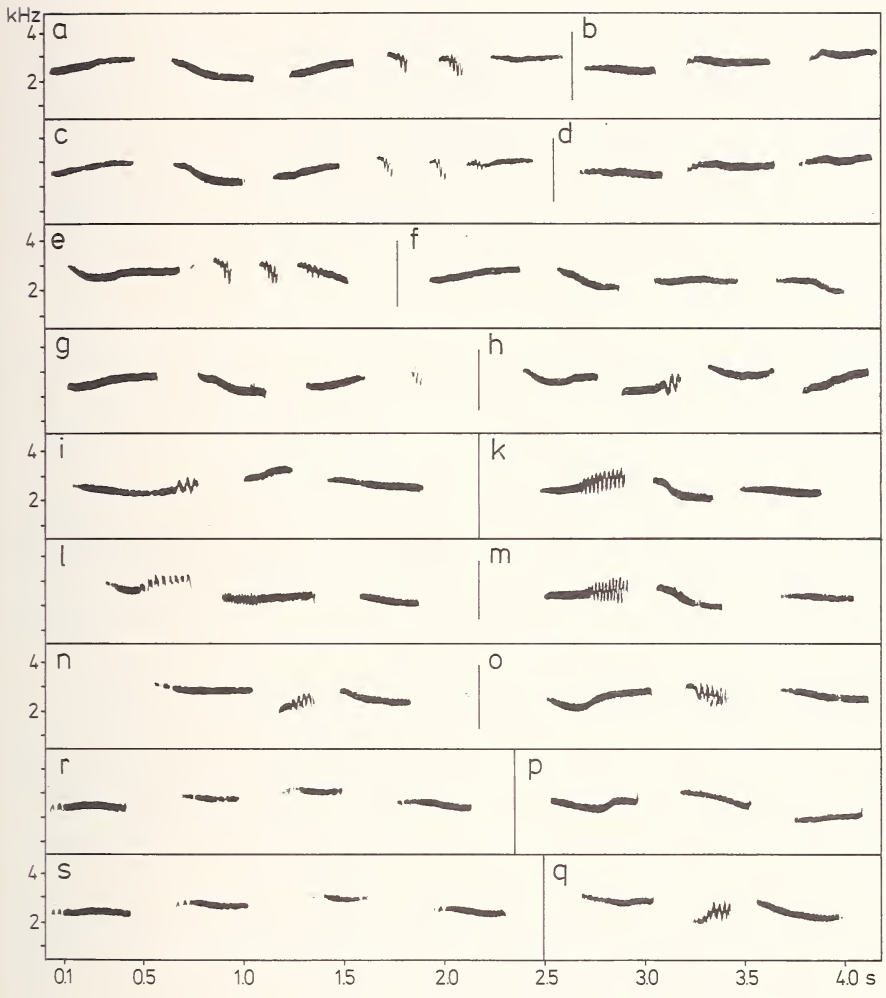


Fig.75: Territorial song of *Zoothera monticola*. – a-k) 10 verses of 3 ♂ (a-h: 2.V. at dusk; i: 3.V. at dawn, k: 2.V. at dusk), between Deorali and Chitre 2./3.V.1995; l-o) 4 verses of 1st ♂, at dawn, Dobang 27.V.1995; p-q) 2 verses of 2nd ♂, at dawn, Dobang 27.V.1995; r-s) at dawn, Bantanti 1.V.1995.

ley near Dhunche represents one of the strongholds of this species in Nepal (Inskipp & Inskipp 1991).

Habitat: Broad-leaved forest with moist underground; both localities were close to rivers. For a general account of the distribution and ecology of this Himalayan endemic see Wunderlich (1988d).

Turdus

Ten species are on the Nepal list; five breed *(unicolor, albocinctus, boulboul, viscivorus,* possibly *rubrocanus),* five are winter visitors, one of them represented by 2 very different subspecies *(merula, kessleri, obscurus, naumanni, ruficollis* with ssp. *ruficollis* and ssp. *atrogularis).* The 4 (5) breeding species occupy an altitudinal belt appr. 2000 m wide (1500-3500 m) nearly exclusively on the southern macroslope; all are arboreal. *T. viscivorus* is confined to W Nepal, *rubrocanus* to E Nepal. The vertical belts of the remaining species slightly overlap, but they prefer different altitudes and habitat. No interactions have been described yet.

Turdus unicolor Tickell

Taxonomic notes: According to Sibley & Monroe (1990) *T. unicolor, hortulorum* and *dissimilis* are allospecies of the same superspecies. With respect to coloration, pattern of the ♀, nest construction and distribution, for consistency *philomelos* should be added to *hortulorum.* We prefer to continue to treat *unicolor* as an isolated species. The remnant of red below the wing and the grey upperside of the ♂ are not in themselves sufficient to combine *unicolor* with *hortulorum* and, in addition, the ♀ of the two differ greatly. On the other hand, the ♂ of *dissimilis* and *hortulorum* are also distinctly differentiated whereas their ♀ are alike, as in the case of *T. chrysolaus* and *celaenops.*

Material: 2 specimens: **D** Myagdi Distr., Muri, 2300 m, 2.IV.1970: 1♂. **G** Kaski Distr., southwestern Annapurna area, Khare, 1650 m, 14.VII.1973: 1♂.

Measurements: **Wing**-L 124 and 129 mm. – **Tail**-L 81 and 88 mm. – **Bill**-L 21 and 23.5 mm. – **Tarsus**-L 30.5 and 32 mm. – **WTI** 26.6 and 27.9%. – **TWI** 65.3 and 68.2%.

Notes: ♂ from 14.VII. large testes, 11 x 7 mm. Under the wings red nearly absent.

Horizontal: Only a few records of our own: Muri (2.IV; see Material :Myagdi); – Potana (27.V.), Kharé (14.VII; see Material; both :Kaski); – Mai Pokhari (10.IV. :Ilam).

Vertical: The 4 records extend from 1650 m (Kharé) to 2000 (Potana), 2150 m (Mai Pokhari) and 2300 m (Muri).

Habitat: Two types can be recognized: The ♂ from Kharé belonged to a (small) population (one more specimen was collected by H.S. Nepali), living in cultivated/semi-cultivated land on the Naudara Ridge close to Pokhara: terraced fields, trees and scattered bushes on slopes and along the roadside. Song was heard and the birds were apparently on their breeding grounds. The specimens from Muri and Potana were trapped in rich broad-leaved forest, and at Mai Pokhari I came across a flock of 3 birds in a small relict forest near the lake, probably not at their breeding place. There is not much known about habitat requirements of the Tikell's Thrush in Nepal. It is certainly not as common as Inskipp & Inskipp (1991) indicate, only 2 breeding records existing up to now. – For a general account of the species' distribution and ecology see Wunderlich (1988c).

Turdus albocinctus (Royle)

Turdus [albocinctus] incl. *rufitorques*

Taxonomic note: The smaller *T. rufitorques* (C America) and the larger *albocinctus* correspond so closely with respect to wing/tail proportions (Tab.6, Fig.76), sexual dimorphism

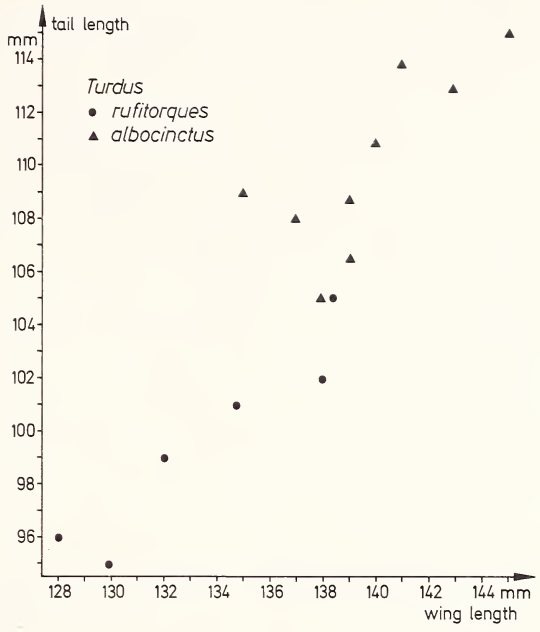


Fig.76: Scatter diagram of tail and wing length measurements of *Turdus albocinctus* and *T. rufitorques* to show differences in size but identical proportions.

and colour pattern (not with respect to egg characteristics) as to justify combining them in a common superspecies. The distributional "gap" does not contradict this, as is demonstrated by *Sitta [carolinensis]* incl. *leucopsis*. *Turdus migratorius* was believed to form a superspecies with *rufitorques* on the grounds of adjoining distributional areas. This does not seem to be correct.

Material: 2 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 11.IV.1970: 1♀ and Dhorpatan/Uttar Ganga Valley, 2950 m, 19.V.1973: 1♂.

Measurements: **Wing**-L ♂ 139, ♀ 137 mm. – **Tail**-L ♂ 106.5, ♀ 108 mm. – **Bill**-L ♂ 24.5, ♀ 26 mm. – **Tarsus**-L ♂ 38, ♀ 33 mm. – **WTI** ♂ 25.2, ♀ 24.1%. – **TWI** ♂ 76.6, ♀ 78.8%.

Notes: ♂ bill golden yellow, feet grey-yellow. Testes strongly developed, 10 x 6 mm.

Tab.6: WTI and TWI values of *T. albocinctus* and *T. rufitorques*.

	WTI (%)	$\bar{x}$	s_d	n	TWI (%)	$\bar{x}$	s_d	n
albocinctus	24.1–27.7	26.0	1.16	24	74.3–83.2	78.3	2.12	22
rufitorques	25.4–29.6	27.5	1.07	66	68.4–77.9	73.8	1.90	66

Horizontal: My records are from NW Dhaulagiri (:Dolpo) to the Kanchenjunga area. – Gompa/Tarakot (11.V./4.VI. :Dolpo); – Dhorpatan (11.-18.IV., 19.V., see Material), Muri (2.IV. both :Myagdi); – Trisuli Valley, Syng Gyang (26.IV. :Rasuwa); – Ting Sang La (16.IV.); Dadar Danda, Kalinchok Mt. (19.-23.IV., both :Sindhu Palchok); – Chordung Mt./Jiri (29.III./1.IV.), Thodung/Those (5.IV. both :Dolakha); – Pahakhola (31.V./4.VI.), Wa-

lungchung Gola (20./21.V.), pass Deorali above Yamputhin (16.V.), descent from pasture Lassetham to Simbua Khola; adults carrying food (19.V. all :Taplejung); – Dhorpar Kharka (14./15.IV. :Panchthar).

Vertical: These records range between 2300 m (Muri) and 3400 m (Yamputhin). All except the lowest one (Muri) refer to proved or at least potential nesting sites (E III-M VI; for breeding period see below). Those 13 localities encompass 3 at altitudes between 2700-2900 m, 10 between 3000-3400 m (7 at 3200 m). Highest record is W Yamputhin (3400 m). Inskipp & Inskipp (1991) give summer distribution down to 2400 m, but there is no documentation of breeding at this altitude yet.

Habitat: The White-collared Blackbird is predominantly an inhabitant of the lower parts of the coniferous tree zone, where it is widespread and locally common, but not generally distributed. Large stretches of primary forest, e.g. S and W of Kanchenjunga, host only thin, perhaps scarce populations. Only locally does the species also penetrate into the zone of broad-leaved trees to breed, down to 2700 according to my observations (Pahakhola; Dhorpar Kharka). Forests consist of *Abies spectabilis* and *A. densa* (E of Arun), various tree *Rhododendron* species, or, only at the lower margin of the breeding belt, almost entirely broad-leaved trees: mainly *Quercus semecarpifolia* and scattered *Magnolia campbelli* (Pahakhola), or *Lithocarpus pachyphylla* with *Magnolia* and large *Rhododendron,* locally also the conifer *Tsuga dumosa* (Dhorpar Kharka). Besides these habitats, fully exposed to the heavy precipitation of the monsoon period, *albocinctus* also penetrates into drier forests N of the main chain, but only locally. I found it (1970, 1973) in the *Picea smithiana/Betula utilis* forests near Tarakot (:Dolpo), but not further north (Suli Gad Valley, Phoksumdo Lake). The drier parts of Thakkhola (:Mustang; from Kalopani northwards) are also uninhabited. Clearings and forest edges seem to be an important prerequisite for suitable habitat structure. Often *albocinctus* can be seen searching for food while hopping on the ground in bush- and treeless meadows, even far from forest edges, where it pokes for earthworms (which were seen being carried to the nest). – For a generel review of the species' distribution and ecology see Wunderlich (1988b).

Breeding: Season starts early in the year. 1♀ was seen carrying nesting material under an old treetrunk on 30.III. (Chordung Mt, 2900 m); 1 pair carrying food to the nest (which could not be searched for) on 9.V. (descent to Simbua Khola, 3200 m), fledglings still being fed by the parents 31.V. (Pahakhola, 2700 m). Diesselhorst (1968:327) found 2 nests with eggs B and E V at Ting Sang La and Thodung (not referred to by Inskipp & Inskipp 1991).

Vocalizations: Territorial song (Fig.77a) consists of long continuous sequences, no distinct verses being discernible. Many of the note types are whistle-like with slight frequency modulation and low bandwidth of the individual note group (up to 2 kHz, rarely up to 3 kHz). More or less closely spaced click-like note groups occur; they range up to 8 kHz. Notes are mainly combined into 2-note groups, which are often repeated several times, followed by a switch to another note-group type. The individual note group repertoire seems to be large; except for the repetitions of given note groups, only different note groups were used in the illustrated sequence appr. 36 s long. This very turdine-like song sounds very similar to that of the European *Turdus philomelos.* Warning calls (Fig.77b, c) are click-like with complicated microstructure; they can be rendered as "chack chak..." (spacing of notes dif-

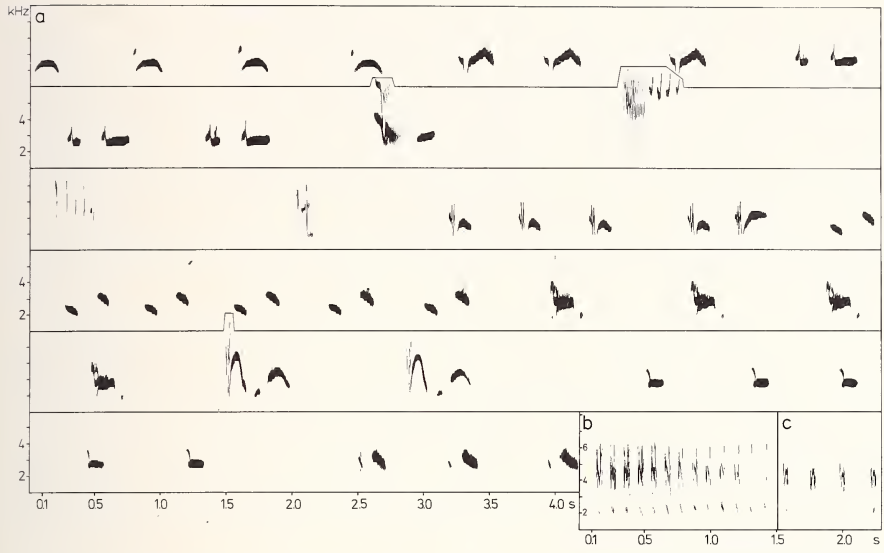


Fig.77: Territorial song of *Turdus albocinctus*. – a) part of continuous sequence, Thodung, 5.IV.1973; b) warning call series which was displayed when song sequence (a) was terminated; c) part of warning call series, given at dusk, Chordung Mt. 31.III.1973.

fers according to situation) and are consistent with calls of many other *Turdus* species. – Song is displayed early in the morning, even before dawn, from the tops of tall trees, then again in the evening. Singing first heard E III (Chordung Mt.), last 4.VI. Pahakhola (then left the area).

Turdus boulboul (Latham)

Taxonomic notes: *T. boulboul* matches *T. torquatus* in wing/tail relations, but shows much lower WTI and differing sexual dimorphism of colour characters. Both are remarkable in the light edges of the wing feathers.

Material: 3 specimens: **D** Myagdi Distr., Bobang, 2450 m, 27.IV.1970: 2♂, 1♀.

Measurements: **Wing**-L ♂ (2) 147 and 148 mm; ♀ 142 mm. – **Tail**-L ♂ (2) 112.5 and 116 mm; ♀ 112 mm. – **Bill**-L ♂ (2) 24 and 25 mm; ♀ 25 mm. – **Tarsus**-L ♂ (2) 33 and 34 mm; ♀ 33 mm. – **WTI** (3) 26.4-27.2%. – **TWI** (3) 76.5-78.9%.

Notes: The 2 T6 are much shortened in 1 ♂, apparently later re-grown. Gonads of all 3 specimens much enlarged.

Horizontal: My records are from SW Dhaulagiri to the Sikkim/Darjeeling border. – Bobang (27.IV.; see Material), Muri (2.IV. both :Myagdi); – between Landrung and Dhumpus (9.V.), below Dhumpus (10.V. both :Kaski); – Kathmandu Valley: Phulchoki Mt. (14.V. :Lalitpur), Sheopuri Mt. (25.VI. :Kathmandu); – Chichila (19.VI.), between Mure and Hurure (17.VI. both :Sankhua Sabha); – Omje Kharka (2.V.), Yamputhin (27.IV. both :Taplejung); – Mai Pokhari (10.IV. :Ilam).

Vertical: All altitudinal records are from within the presumed breeding season (IV-VI; see Breeding). Lowest records: 1850 m Dhumpus (10.V.), 1950 m Chichila (19.VI.). 8 locality records cover 2000 m (Yamputhin, 27.IV.) to 2500 m (Bobang, 27.IV.); highest record 2660-2700 m Phulchoki Mt. (14.V.). My observations are largely but not completely consistent with the statement of Inskipp & Inskipp (1991): "Chiefly summers between 2100 m and 2745 m". Very exceptional is the sight record at 3300 m (Bigu, 16.V.) by Diesselhorst (1968:328), which was never confirmed. Except for this report the altitudinal belt for breeding activities is less than 1000 m wide in Nepal.

Habitat: The Grey-winged Blackbird during the breeding season is restricted to the temperate-subtropical moist broad-leaved forest S of the main range, which is extremely rich in tree species of various genera and families *(Quercus, Castanopsis, Ulmus, Magnolia, Alnus, Rhododendron, Aesculus, Populus, Sorbus,* to mention only few of them). The upper limit of the breeding area coincides with the upper limit of pure stands of *Quercus semecarpifolia* (Phulchoki Mt.); *boulboul* does not inhabit coniferous stands. The ground of the forests is moist being covered by a dense understorey of bushes and herbs. As favoured feeding areas forest clearings are often visited, and this otherwise shy species can frequently be seen here, mostly at dawn and dusk. – For a general account of the species' ecology and distribution see Wunderlich (1989).

Breeding: The above-mentioned specimens (27.IV.) had fully developed sexual organs, the ♀ was in ovipositing state.

Vocalizations: Territorial song (Fig.78) is divided into distinct verses 1.7-2.6 s long, pauses between verses are appr. 2-4 s long. Notes are predominantly whistles with low-rate frequency modulation. At the end of the individual verse a click-like section is nearly al-

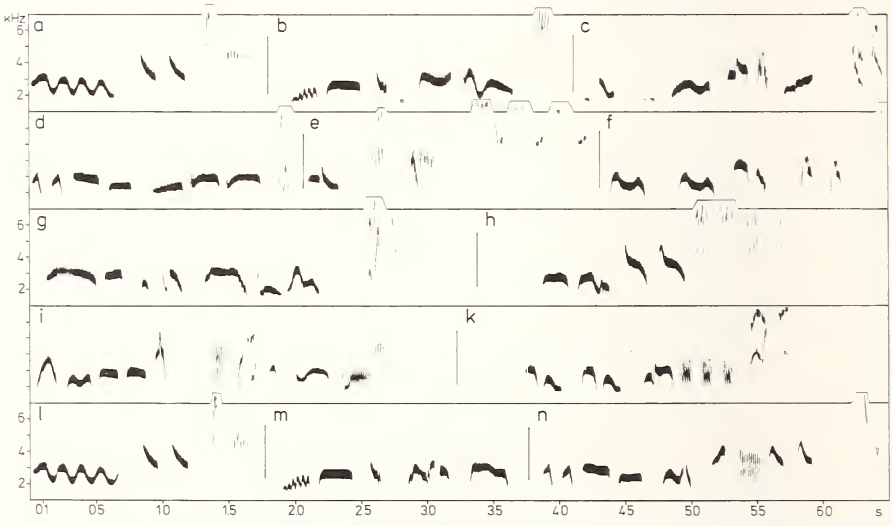


Fig.78: Territorial song of *Turdus boulbul.* – a-n) 13 continuously given verses of 1 ♂, Omje Kharka 2.V.1988.

ways present (about 5 kHz bandwidth, ranging up to 7 kHz). Mid frequency of whistled notes is near 3 kHz, ranging from appr. 2 to nearly 4 kHz. The repertoire size of the individual ♂ seems to be considerable. Almost all 13 verses illustrated are different as are all notes (except for few repetitions within a verse); only the 1st and the 11th verse are identical. This suggests a repertoire of invariable verses which are repeated within long song sequences. – Song is displayed from treetops, also from single isolated trees in clearings. The song is typically turdine with respect to the speed and richness of motifs and notes. Single ♂, however, use very simplified songs; the reason for this is unknown (Mure/Hurure, 17.VI.). Song heard last on 25.VI. (Sheopuri Mt.) and activity may well extend into VII.

Turdus ruficollis

Turdus ruficollis ruficollis Pallas

Material: 1 specimen: **D** Mustang Distr., Titi Lake, 2700 m, 26.II.1974: 1♀.

Measurements: **Wing**-L 136 mm. – **Tail**-L 98 mm. – **Bill**-L 18.6 mm. – **Tarsus**-L 33 mm. – **WTI** 30.9%. – **TWI** 72.1%. – **Weight** 86 g.

Horizontal, vertical: Three records: Titi Lake (see Material, 26.II.); Jomosom, 2 specimens 21.III. (both :Mustang, 2750 m); Thodung/Those, 4.IV., 1 sp. Coll. H.S. Nepali (:Ramechap, 3200 m).

Habitat: The Mustang records are from N of the main range, a preferred winter resort of this subspecies according to Fleming et al. (1979). All observations refer to one or two specimens each, which strayed by themselves and were not associated with *T. r. atrogularis*. This latter subspecies (which see) was common in the area. Generally, nominate *ruficollis* seems to be considerably sparser than *atrogularis* in Nepal. 19 specimens collected randomly in the Kathmandu Valley, from XI to III, were all nominate *atrogularis* (Dieselhorst 1968:328).

Turdus ruficollis atrogularis Jarocki

Material: 5 specimens: **J** Dolakha Distr., Chordung Mt./Jiri, 2900 m, 1.-2.IV.1973: 1♂, 1♂ juv., 1♀ * Thodung, 3200 m, 4.-5.IV.1973: 1♂, 1♀.

Measurements: **Wing**-L ♂ (2) 132 and 134 mm; ♂ juv. (1) 139 mm; ♀ (2) 133 and 137 mm. – **Tail**-L ♂ (2) 91 and 91.5 mm; ♂ juv. (1) about 97 mm; ♀ (2) 92.5 and 95 mm. – **Bill**-L ♂ (1) 19.2 mm; ♂ juv. (1) 17.9 mm; ♀ (2) 18.1 and 18.2 mm – **Tarsus**-L ♂ (2) 33 mm each; ♂ juv. (1) 33.5 mm: ♀ (2) 32 and 32.5 mm. – **WTI** (5) 32.8-34.9%, $\bar{x}$=33.8, s_d=0.92 . – **TWI** (5) 67.9-69.5%, $\bar{x}$=69.0, s_d=0.67.

Notes: Necklace of the Chordung-♀ (1.IV.) conspicuously black. ♀: bill above dark brown or dark grey, below yellowish or yelow-orange, feet grey-flesh-coloured. – ♂: bill above black, below yellowish to orange-yellow, feet yellowish horn-coloured and grey-flesh-coloured. Gonads inactive.

Horizontal, vertical: Thaksang above Tukche, 3150 m (3.-6.III.), Purano Marpha, 3200 m (19.III.), Jomosom, 2750 m (25.III. all :Mustang); – Chordung Mt./Jiri, 2900 m (30.III.-2.IV.; see Material), Thodung/Those, 3200 m (5.-8.IV. both :Ramechap; see Material).

Habitat: Forests (:Ramechap) and open landscape with fields and bushes, forest edges (:Mustang). Flocks were common with up to 20 specimens in the Thodung and Chordung area, smaller flocks in Thakkhola. These guests from the N Palearctic feed extensively on the nectar of flowering *Rhododendron* trees as a food source (Chordung, 1.IV.).

Migration: No specimens were seen in Khumbu up to 24.X.1970 nor in Thakkhola up to 8.XII.1969, indicating that the influx of the wintering populations starts only late in the year. Diesselhorst (1968:330) also noticed none up to M IX in Khumbu; Rand & Fleming (1957), however, record 1 skin from Thakkhola in "December". According to Inskipp & Inskipp (1991) the species reaches its Himalayan winter quarters by M X, but no details are presented concerning localities/altitudes and subspecies.

Enicurus

Four species occur in Nepal; all breed *(scouleri, immaculatus, schistaceus, maculatus).* They are, as applies to the whole genus, specialized to fast-running water courses (Fig.40), which mainly flow in ravines and which are shaded by densely forested slopes. They occupy niches similar or even identical to those of the *Motacilla* species of Nepal *(madaraspatensis, cinerea,* locally also *alba).* During the breeding season the four Nepal species cover the whole forest belt of the S Himalayan macroslope from about 300 m to at least 4000 m. The lowest belt is occupied by *immaculatus* (300-1300m), followed by *schistaceus* (900-1600m), *maculatus* (1350-3100m) and *scouleri* (1100-4200m). There is considerable overlap between *immaculatus* and *schistaceus,* as betwen *maculatus* and *scouleri.* However, the latter are quite distinct in size and general morphology and probably do not compete. In general, *Enicurus* populations are sparsely distributed during summer and there may be only rarely (if at all, at least in Nepal) competition between congeners living in the same river system at comparable altitudes. Syntopic *Motacilla* species are roughly of the *scouleri* size, but are smaller than the remaining *Enicurus* species. Nothing is known about interactions during the breeding season, but for winter see Tyler & Ormerod (1993). – The *Enicurus* species in question occupy larger areas in SE Asia (Indochinese-Himalayan distribution type; Martens 1984), from which they invaded the Himalayan arch westwards to differing extents (including *E. leschenaulti,* which does not reach Nepal).

Enicurus scouleri scouleri Vigors

Taxonomic note: *E. scouleri* stands opposite all other species of the genus, which show striking dichotomies: *schistaceus/immaculatus, ruficapillus/velatus, leschenaulti/maculatus.*

Material: 3 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 12.-13.IV.1970: 2♂ ** Dolpo Distr., S of Jungla Banjyang, Phurbang, appr. 4200 m, 31.V.1973: 1♂.

Measurements: ♂: **Wing**-L (3) 78-80 mm. – **Tail**-L (3) 48-50 mm. – **Bill**-L (3) 11-12 mm. – **Tarsus**-L (3) 16-20 mm. – **WTI** (3) 20.5-25%. – **TWI** (3) 61.5-64.1%.

Horizontal: Our records extend from W Dhaulagiri to close to the Sikkim border. – Resting place Phurbang S Jungla Banjyang (31.V.; see Material; :Dolpo); – Dhorpatan (12.-13.IV.; see Material); – Rukshesara (24.II. :Mustang); – between Gara and Sikha (3.V. :Parbat); – above Bagarchap (13.IV. :Manang); – Lungtung (19.V.); above and below Walungchung Gola (20./21.V.); upper Simbua Khola (10.V. all :Taplejung); – below Dhorpar Kharka (13.IV. :Panchthar).

Vertical: During the presumed breeding season (IV-V): Our records cover a belt from 1150 m (Bim, Myagdi Khola, 29./30.V.) to 4200 m (Phurbang, 31.V.). The latter record is unusual in being separated from the next lower one by 700 m. 5 localities (from 12) are

situated between 2050 m and 2700 m. Records above 3000 m are rare, above 4000 m exceptional. Inskipp & Inskipp (1991) indicate for the summer "chiefly between 1830 m and 4000 m". The width of this area belt, now about 3000 m, is remarkable and exceeds those of all Nepal congeners.

Habitat: The Little Forktail stays constantly and all year along watercourses, but their width and gradient differ considerably, even within the breeding season. They vary from minute streams hardly 3 m wide (Dhorpatan Valley, 3000 m, 12./13.IV.) with low gradient to the most rugged, wild and much broader torrents about 30-40 m across (Simbua Khola, 3250 m, 10.V.) or even broader (Tamur below Walungchung, 2400 m, 20.V.). The species seems to prefer small and medium-sized streams and it can frequently be seen close to small waterfalls (see Ali & Ripley 1973,9:7), often along the lower (or lowest) parts of small tributaries of larger rivers nearby. Most of its stream and river habitats are accompanied by at least bushy vegetation, mostly forests. But more open riverbeds with largely unsheltered banks, at least devoid of higher vegetation, are also occupied (Tamur below and above Walungchung, 3500 m, 21.V.). Only one record is from a brook in alpine meadows (Phurbang, 4200 m, 31.V.), certainly an exception. In general, as already indicated by its broad altitudinal belt occupied, this is the most euryecious of the Central Himalayan *Enicurus* species set. – For behaviour in the winter quarters see Tyler & Ormerod (1993, Nepal) and Mauersberger (1988, Tadzhikistan).

Vocalizations: Several times I heard a piercing "tsee"; this is consistent with the species' noisy environment and, though recordings are not yet available, may be regarded as a "torrent adaptation".

Enicurus immaculatus (Hodgson)

Material: 1 specimen: **N** Chitawan Distr., Rapti Valley, N foothills of Siwalik Mts. S Tekouli, 300 m, 16.II.1970: ♂.

Measurements: **Wing**-L 88 mm. – **Tail**-L (graduation) 107.5 (25) mm. – **Bill**-L 16.5 mm. – **Tarsus**-L 25 mm. – **WTI** 23.9%. – **TWI** 122.2%.

Horizontal, vertical: Rapti Valley S Tekouli, 300 m (16.II.; see Material; :Chitawan); – S feet of Siwalik Mts. N Sunichare, 250 m (4.IV. :Ilam). – This is a lowland species, not even reaching Kathmandu Valley.

Habitat: Both observations made at narrow streams in tropical forest.

Enicurus schistaceus

Horizontal, vertical, habitat: Arun Valley between Hedagna and Num, 950 m (6.VI. :Sankhua Sabha). – 1 adult together with 2 fledglings already well on the wing were seen along the lower course of a side stream close to its confluence with the Arun; heavy subtropical forest on steep slopes along the watercourse. The birds were absent the following day. First breeding record for Nepal. – Strongholds of *schistaceus* are in the eastern parts of Nepal between 900 and 1675 m (Inskipp & Inskipp 1991).

Enicurus maculatus maculatus Vigors

Material: 3 specimens: **D** Myagdi Distr., Bobang, 2450 m, 1.V.1970: 1♂ * Dhorpatan, 3000 m, 14.IV.1970: 1♀. **N** Makwanpur Distr., Mahabarat Mts., Daman, 2500 m, 24.II.1970: 1♀.

Measurements: **Wing**-L ♂ 111; ♀ 101, 104 mm. – **Tail**-L ♂ 147; ♀ 134, 142 mm. – **Bill**-L ♂ 19; ♀ 18.5, 20 mm. – **Tarsus**-L ♂ 29.5; ♀ 28.5, 30 mm. – **WTI** (3) 24.8-27.9%. – **TWI** (3) 132.4-136.5%.

Notes: The ♂ and the ♀ of 14.II. show a pale reddish trace on the white underside. Testes (1.V.) slightly swollen.

Horizontal: My records are from the Dhaulagiri massif and from the central Mahabarat Mts. – Bobang S Dhorpatan (1.V., see Material); Dhorpatan (14.V., see Material); below Khibang (20.V.); upper Myagdi Khola, Boghara (21.V. all :Myagdi); – Kali Gandaki Valley, Rukshesara N Tatopani (4.V. :Mustang); – Mahabarat Mts., Daman (24.II. :Makwanpur).

Vertical: The records, all except for Daman, from the presumed breeding season, cover an area belt 1600 m wide: 1400 m (Khibang), 1600 m (Rukshesara), 1800 m (Boghara), 2100 m (Lumsum), 2450 m (Bobang), 2500 m (Daman), 3000 m (Dhorpatan). Inskipp & Inskipp (1991) indicate: "...mainly summering between 1370 m and 3100 m". – The "juv.♂" specimen of *maculatus* collected at Hitaura (close to the Dun lowlands, 20.V.; Biswas 1961c), referred to as a breeding record by Inskipp & Inskipp (1991), is more appropriately considered *immaculatus* ("...unspotted with brown primaries"). This is also in accordance with the altitude concerned.

Habitat: All specimens were observed at narrow streams shadowed by dense forest and bushes which at places cover the watercourse like a narrow tunnel.

SYLVIIDAE

Tesia

Three species are recorded for Nepal *(castaneocoronata, cyaniventer, olivea),* at least two breed. *T. castaneocoronata* and *cyaniventer* are widely distributed, but despite slight altitudinal overlap, they are separated from each other by different vertical distribution. No syntopic occurrence of both has yet been recorded. The east Himalayan *olivea* was collected in the upper Arun Valley. Its ecological relations to the very similar *cyaniventer* from the same area are open to question.

Tesia castaneocoronata castaneocoronata (Burton)

Material: 3 specimens: **D** Myagdi Distr., from Dhorpatan to Tarakot, Gustung Khola Valley, 2800 m, 28.V.1973: 2♂, 1♀.

Measurements: **Wing**-L ♂ (2) 48.5 and 49.5; ♀ 48 mm. – **Tail**-L ♂ (2) 26 mm each; ♀ 23 mm. – **Bill**-L ♂ (1) 10 mm. – **Tarsus**-L ♂ (2) 22 and 23; ♀ 22 mm. – **WTI** (3) 9.3-11.1%. – **TWI** (3) 47.9-53.6%.

Notes: Bill black-grey or brown-black, lower part light flesh-coloured; feet flesh-coloured. – Ovary undeveloped (after oviposition); testes 5 x 4 mm.

Horizontal: Our records from W Dhaulagiri eastwards to the Sikkim/Darjeeling border. – N of Thankur in Gustung Khola Valley (28.V.); upper Myagdi Khola, Dobang (22.V. both :Myagdi); – Gorapani Pass (11.VII. :Kaski); – Phulchoki Mt. (25.IV., 14.V. :Lalitpur); – Pahakhola (31.V.-4.VI. :Sankhua Sabha); – Tamur Valley below Walungchung Gola (20.V.); below Pass Doerali W Yamputhin (17.V.); ascent to pasture Lassetham (6.V. all :Taplejung); – Paniporua (16.-19.IV.); below Dhorpar Kharka (13.IV.); upper Gitang Khola Valley (31.III.); lower Gitang Khola Valley (11.IV. all :Ilam).

Vertical: Presumed breeding season (M IV-M VII): Lowest record within this period is at 1730 m (Gitang Khola, 11.IV.), but the singing ♂ may not have been at its breeding ground; the next one higher up: 2100 m below Dhorpar Kharka (13.IV., singing ♂); highest record: 3450 m E Yamputhin (17.V.). 19 localities are distributed as follows: 2100-2250 m: 2 loc.; 2260-2500 m: 8 loc.; 2510-2750: 4 loc.; 2760-3000: 3 loc.; 3010-3500 m: 2 loc. These data coincide well with those presented by Inskipp & Inskipp (1991): "Most frequently between 2440 m to 3300 m". Polunin (1955) mentions one record at 13,000 ft. (appr. 4000 m) "among bamboo thicket in fir forest". Also according to his list, there is no fir forest at this altitude, and his statement seems to be erroneous.

Habitat: The Chestnut-headed Tesia is entirely a forest species, which prefers the dark ground storey covered by low bushes. But in most cases there is no dense and tangled cover of grasses, herbs and ferns as in the habitat of the Grey-bellied Tesia. If the observer "dives" into this vegetational stratum, there are good chances to detect it, particularly as it also enters and even crosses open places, like small clearings and paths. It sometimes leaves the soil layer for a brief excursion onto higher bushes, rarely small trees. Nevertheless, in more open places without higher vegetation, such as bare ravines with only a few bushes, the Tesia is an excellent skulker, the presence of which may be detected only by its voice.

According to the altitudinal belt, *castaneocoronata* inhabits species-rich evergreen broadleaved forests of the cloud zone, even pure *Quercus semecarpifolia* forest (Phulchoki Mt., 2600 m; Fig.17) up to the temperate lower part of the *Rhododendron*-conifer zone. But this forest type is situated at the upper distributional limit and is only sparsely inhabited. At this altitude, it meets the ecologically similar *Pnoepyga albiventer* (3450 m, Deorali Pass W Yamputhin; *Abies densa, Rhododendron hodgsoni, Arundinaria* bamboo; 17.V.1988).

Vocalizations: The territorial song (Fig.79a-e) is a short warble (0.6-0.9 s); its frequency ranges between 2.7 and 7.5 kHz, the single verse consists of 3-6 different notes, most of them showing rapid frequency ascent or descent (individual note up to 2.5 kHz frequency span). The average frequency mainly descends within the verse from the first note to the last one resulting in a broad frequency span (up to 4.5 kHz, Fig.79c/c'), but range may be quite limited in others (2.7 kHz, Fig.79e). The single ♂ uses only one verse type, which is repeated with great accuracy within long verse sequences (Fig.79a/a", b/b', c/c'); only once was a second type recorded from an individual ♂. Along territorial borders song may be displayed at close quarters by rivalling ♂ (Pholchoki Mt., 14.V.).

Tesia cyaniventer Hodgson

Material: 2 specimens: **K** Sankhua Sabha Distr., between Mure and Hurure, 2100 m, 12.IV.1988: 2♂, one preserved in spirit.

Measurements: **Wing**-L 55 mm. – **Tail**-L 20 mm. – **Bill**-L 12 mm. – **Tarsus**-L 23.5 mm. – **WTI** 12.7%. – **TWI** 36.4%; **Weight** 11 g.

Notes: Testes 7 mm, some subcutaneous fat.

Horizontal: Our own patchily distributed records are from the Kali Gandaki, Myagdi, Marsyandi, Kathmandu and Arun Valleys and near the Sikkim border. Upper Myagdi Khola, Dobang (22., 26./27.V.); above Khibang (19.V.); Thulo Khola, right tributary to Kuinekani (18.V.); between Bega and Bega Deorali (16.V. all :Myagdi); – above Ghasa (5.V.); Thak-

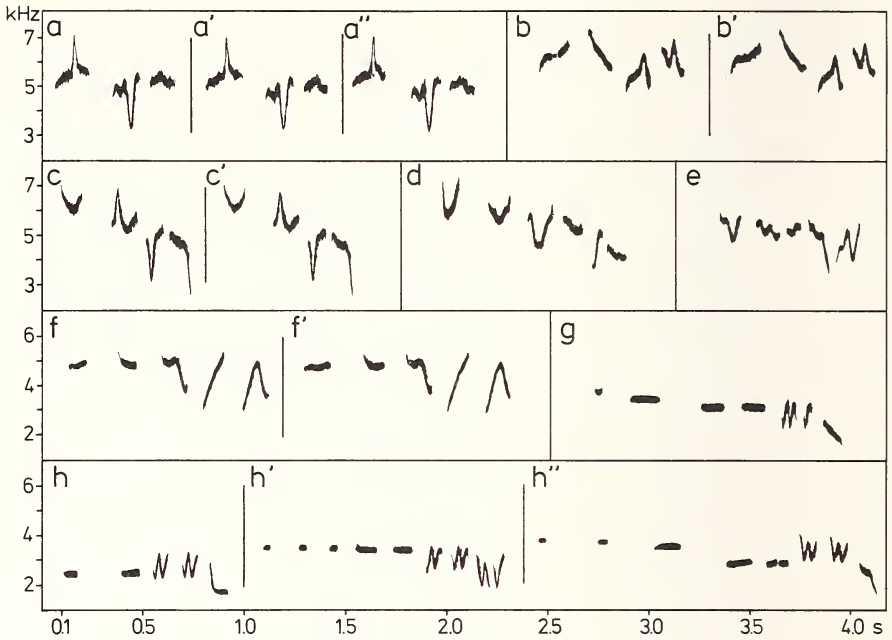


Fig.79: Vocalizations of *Tesia* species. – a-e) *Tesia castaneocoronata,* territorial song; a-a'') 3 verses of 1 ♂, Pahakhola 1.VI.1988; b-b') two verses of 1 ♂, Pahakhola 3.VI.1988; c-c') two verses of 1 ♂, Pahakhola 2.VI.1988; d) Omje Kharka 2.V.1988; e) ascent to Dhorpar Kharka 13.IV.1988. f-h) *Tesia cyaniventer,* territorial song; f-f') 2 verses of 1 ♂, Thaksang/Tukche 7.VII.1970; g) Yamputhin 28.IV.1988; h-h'') 3 verses of 1 ♂, Mure/Hururе 11.VI.1988.

sang above Tukche (7.VII. both :Mustang); – above Landrung and Tolka (29.IV. :Kaski); – near Bagarchap (13.IV. :Manang); – Kathmandu Valley, Sheopuri Mt. (25.VI. :Kathmandu); – Arun Valley, between Mure and Hururе (9.-17.VI.); Chichila (20.VI. both :Sankhua Sabha); – Yamputhin (28.IV. :Taplejung).

Vertical: The altitudinal belt is quite narrow: 1650 and 1900 m Yamputhin; 2000 m Chichila and Tolka; 2100 m Mure/Hururе; 2200 m Tulo Khola and Ghasa; 2300 m near Bagarchap and again on Sheopuri Mt and above Bega; 2400 m Dobang and Khibang. Exceptionally a singing ♂ was found at 3400 m above Tukche (Fig.30,31), an area certainly not belonging to the regular distribution area as concerns altitude and habitat. Inskipp & Inskipp (1991) indicate as altitudinal belt during "summer" 1525-2440 m, but without details. It is obvious that in Nepal the vertical range of the species is quite limited, at least at present, and hardly exceeds 1000 m.

Habitat: The Grey-bellied Tesia inhabits the lower zone of the cloud forests, where it prefers dense mature stands of various oak *(Quercus)* species with closed canopy. The forest ground must be covered by a dense and tangled layer of grasses and herbs, and most preferred seems to be an understorey of ferns up to 70-80 cm high. Such conditions prevailed at the only locality where I discovered a remarkably dense population, the oak forests

between Mure and Hururе in Arun Valley. Here up to 3 (once perhaps 4) specimens could be heard from one spot, and there were singing ♂ every 200-300 m for about 2 km along the main path traversing the forest. Though a stream flowed through this forest, the singing ♂ apparently were not concentrated along its course. But the 2 ♂ near Bagarchap and on Sheopuri Mt. defended areas close to a little, but noisy rivulet. The ♂ at Thaksang/Tukche, an Inner-Valley locality, certainly a stray, sang extensively on a clearing in heavy mixed *Abies/Rhododendron/Betula* forest (compare the unexpected occurrence of *Cettia acanthizoides,* which see, at this place 3 years later). According to the present data, *cyaniventer* is not closely confined or even adapted to the neighbourhood of running water. In the Mure/Hururе forest, the single specimen mainly kept completely hidden among the dense herbaceous understorey and often sang a few meters from the observer's feet. Only rarely was one seen for a few seconds in the open on a path or 1-2 m up in a bush. Even playback of its own song may not lure it out of hiding.

The area of *T. cyaniventer* may have been considerably shrunken in recent decades. Biswas (1962b: 407) found it to be common within the Kathmandu Valley and its environs in 1947, and so did Proud (1955) largely within the same period. Forests in the region of the Kathmandu Valley have much diminished since then as has the understorey of those that remain, and *cyaniventer* apparently disappeared. This has happened at a sensitive altitude for the species and concerns nearly all Nepal.

For records of the Slaty-bellied Tesia *(T. olivea)* in lower parts of the Mure/Hururе forest and further south near Khandbari at 1000-1700 m (:Sankhua Sabha) see Inskipp & Inskipp (1991). Details of the allopatric/sympatric distributional pattern of the two species have not been worked out and are urgently needed.

Vocalizations: The territorial song (Fig.79f-h) is loud and explosive and can be heard over relatively long distances, even close to running water. The verse is short, 0.8-1.8 s, rhythmically structured into 2 parts: (i) 2-6 introductory short whistles (0.03-0.15 s) arranged in one or several groups of notes of different length and frequency, pitch from one note group to the following one always descending, (ii) final group of 3-4 strongly modulated notes. The single note ranges from 1.3-2 kHz, and the note group is about 0.5-1 s long. The individual ♂ uses several verse types (Fig.79h-h"), the repertoire size has yet to be determined. The combination of whistles/pauses of different length and the closely attached final warble result in a typical rhythm and sound.

The Indian Blue Robin *(Luscinia brunnea)* has quite a similar song (q.v., Fig.62a-g), as it also starts with several short whistling introductory notes followed by an explosive main part, but it is less markedly divided into 2 sections. The two species' songs are easily confused, the more as both may occasionally live in close proximity (observed near Potana, IV; in upper Myagdi Khola, V; above Khibang, V; in the Mure/Hururе forest, VI). *Pnoepyga pusilla,* another ground dweller, was also present there. – Sings at least to E VI (25.VI., Sheopuri Mt.).

Cettia

The Nepal list encompasses six species *(pallidipes, fortipes, major, flavolivacea, acanthizoides, brunnifrons).* All breed in the area, though breeding records are still largely lacking. The vertical and ecological segregation of the species set is distinct, but 2 species may coincide locally *(brunnifrons/acanthizoides;* Thaksang, VII; – *brunnifrons/flavolivacea:* Syng Gyang, IV). Except *brunnifrons,* all have quite narrow vertical ranges in Nepal. The only low-altitude species is *pallidipes. C. brunnifrons* and *flavolivacea* reach, at least locally, the alpine zone beyond timberline. The vertical belt of all species during breeding season is about 3500 m, perhaps even more. Highly specialized is *acanthizoides,* which prefers bamboo clumps. *C. fortipes* has marked E-W distributional limits, a large gap within nearly all Nepal (except Arun Valley to the E border) separating the W and E Himalayan subspecies. More biological and acoustic information is needed for the rare species *pallidipes* and *major.*

Cettia fortipes fortipes (Hodgson)

Cettia [fortipes], incl. *vulcania,* see Wells (1982), and *carolinae.*

Material: 1 specimen: **M** Ilam Distr., Paniporua, 2300 m, 18.IV.1988: 1♂.

Measurements: **Wing**-L 58.5 mm. – **Tail**-L 56 mm. – **Bill**-L 11 mm. – **Tarsus**-L 23 mm. – **WTI** 11.1%. – **TWI** 95.7%. – Testes 4 mm.

Horizontal (Fig.80): Our records only east of the Arun; mostly by voice (except Paniporua) – Num (8.V.); Pahakhola (31.V. both :Sankhua Sabha); – Lungthung (19.V.); Omje Kharka (5.V.); Yamputhin (27.IV. all :Taplejung); – Paniporua (18.-20.IV.); Mai Pokhari (26.III., 9.-11.IV.); between Ilam and Mai Pokhari (9.IV. all :Ilam). – Undoubtedly, nominate *fortipes* is absent from nearly all Nepal west of the Arun Valley as a breeding species, but the western Himalayan ssp. *pallidus* may reach into far W Nepal (see Fleming & Traylor 1968:178).

Vertical: Our own records range between 1700 m (near Ilam, IV) and 2600 m (Pahakhola, V) as follows: 1700-2000 m: 2 localities; 2050-2250 m: 7 loc.; 2260-2500 m: 2 loc.; 2510-2600 m: 1 loc. Obviously, in E Nepal the altitudinal distribution covers a small belt of less than 1000 m, the main population being concentrated in an even much narrower range. The data presented by Inskipp & Inskipp (1991) are also concentrated around 2000 m, with only one above 3000 m (method of record not given).

Habitat: Generally, the Brown-flanked Bush Warbler prefers open landscape with small groups of trees, bushes, forest edges, small ravines with narrow forest belts. Such vegetational structures must be located close to clearings with low vegetation interspersed, most often low bushes and dense layers of herbs. In E Nepal, such habitats are often situated in agricultural land, where small patches of forest-like vegetation remain close to abandoned and even overgrown terraces (Yamputhin, IV) and pastures (below Paniporua, IV), often with *Rubus* hedges and dense secondary growth of the introduced weed *Eupatorium.* Mostly, dense and closed virgin forests are avoided, but in a suitable habitat, even small clearings in such forests may be occupied (Omje Kharka NW Yamputhin, V). *Alnus* growth in ravines is used, even Cardamon plantations which are often cultivated in native and somewhat opened *Alnus* groves close to watercourses (below Mai Pokhari, IV). In general,

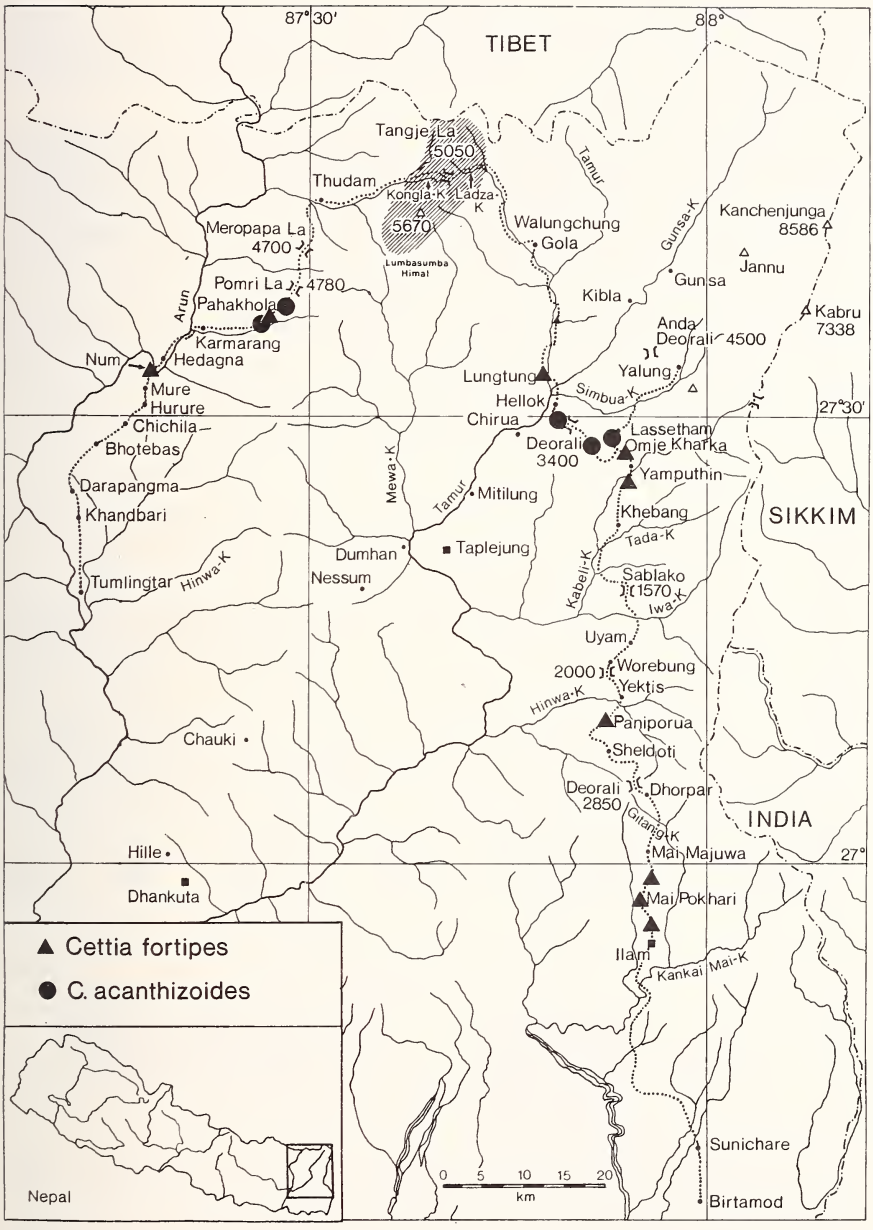


Fig.80: Distribution of *Cettia acanthizoides* and *C. fortipes* S and SW of the Kanchenjunga massif to show largely vertically allopatric distribution of the two species, i.e. *acanthizoides* at higher, *fortipes* at lower altitudes. The only sympatric locality (Pahakhola) differs in microhabitat: edge of cultivation *(fortipes)* versus bamboo clumps in oak forest *(acanthizoides)*. – Data from IV-VI 1988.

the presence of *C. fortipes* in Nepal indicates an artificial state of the vegetation, and the species has taken great advantage of the large-scale forest reduction in respect to population density and size of the area settled. Why it did not penetrate into areas west of the Arun Valley, remains unanswered.

Vocalizations: Territorial song (Fig.81a-d) is a striking short verse (1.7-2.1 s in 3 ♂), which is presented from the dense understorey of bushes along forest edges, small vegetation patches where the bird is constantly submerged near the ground. The song is subdivided into 2 parts; part (i) is always a long-drawn-out whistle, which is followed after a short pause (0.1 s or even less) by (ii) a short (0.45-0.7 s) but strikingly loud and "explosive" phrase. It consists of 2 or 3 notes of broad frequency range (individual note: 2-2.5 kHz, bandwidth of all notes within 1 verse up to 4.5 kHz). At least two types are used by the individual ♂. Parts (i) and (ii) are subject to variation: the single ♂ uses at least 2 whistles, which differ in frequency (Fig.81c/c'; in Fig.81d/d': 1880 Hz and 2400 Hz), and two different parts (ii). One type (i) and one type (ii) are tightly combined (Fig.81c/c', d/d'). Both com-

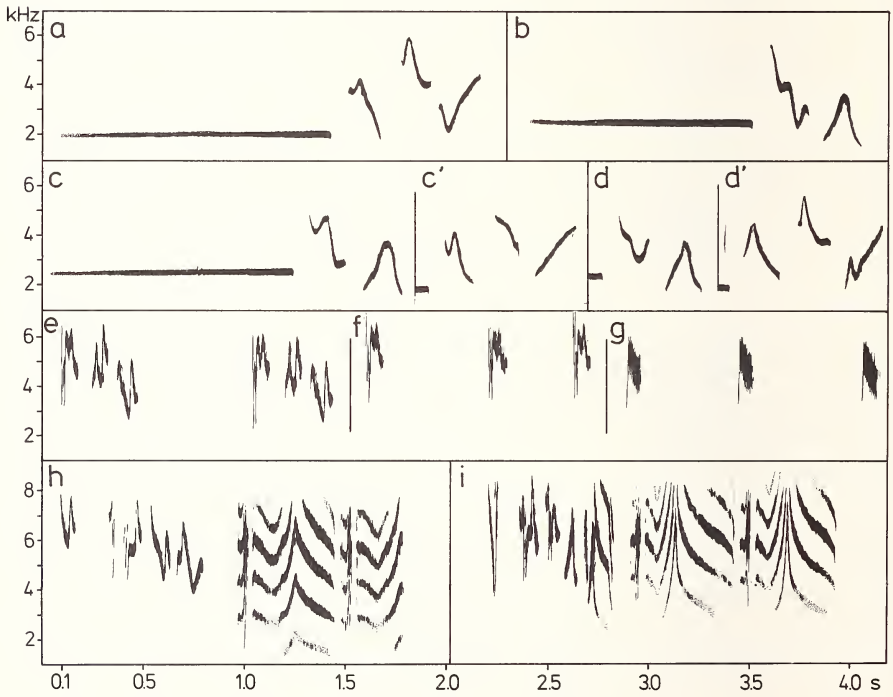


Fig.81: Vocalizations of *Cettia* species. – a-d') *Cettia fortipes,* territorial song, a-b) verses of 2 different ♂, Mai Pokhari 26.III.1980; c-c') 2 verses of 1 ♂, in c') only end of verse illustrated, Paniporua 20.IV.1988; d-d') only end of 2 verses of 1 ♂, ascent to Mai Pokhari 7.IV.1988.
e-i) *Cettia brunnifrons,* warning calls (e-g) and territorial song (h-i); e) verse-like series of warning calls; f-g) 2 parts of a series of different warning calls (f: "tsik", g: "tsip" or "tsit"), e-g: Deorali Pass W Yamputhin 17.V.1988; h-i) 1 verse each of 2 ♂; h) Gosainkund 26.IV.1973, i) Dhorpatan 10.V.1973.

binations do not vary even in minor details. Onset of singing activity is early in III (26.III.1980, Mai Pokhari). For various paraphrases of this easily remembered song see Ali & Ripley (1973,8:11).

Cettia flavolivacea flavolivacea (Blyth)

Material: 6 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3950 m, 4.VI.1970: 2♂ ** Mustang Distr., Thakkhola, Chadziou Khola Valley, 2600 m, 23.X.1969: 1♀. **B** Kathmandu Valley, Lalitpur Distr., Godavari, 1600 m, 26.I.1970: 1 (♀), sides of bill slightly deformed ** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 25.IV.1973: 1♂. **K** Sankhua Sabha Distr., Pahakhola, 2700 m, 3.VI.1988: 1♀.

Measurements: **Wing**-L ♂ (3) 57-60 mm; ♀ (3) 49.5-54 mm. – **Tail**-L ♂ (3) 54-61 mm; ♀ (3) 45-54 mm. – **Bill**-L ♂ (3) 10-11 mm; ♀ (3) 21-23 mm. – **WTI** (5) 13.7-15%, $\bar{x}$=14.3, s_d=0.55. **TWI** (6) 90.9-101.7%, $\bar{x}$=98.3, s_d=4.50.

Notes: ♂ bill brownish, at the base lighter; feet light grey. Testes at 25.IV. and 4.VI. small, 3 x 2 mm. – ♀ at 23.X. has nearly finished moult of wing and tail feathers.

Horizontal: All records refer to the above-mentioned specimens. They were collected between NW Dhaulagiri and one of the eastern tributaries of the Arun.

Vertical: During the presumed breeding season (E IV, VI): The 3 localities were at the altitudes 2650 m (3.VI.), 3200 m (24.IV.) and 3950 m (4.VI.) and thus encompass a vertical belt of 1300 m. Inskipp & Inskipp (1991) summarize altitudinal records during summer as 2440-3600 m, but details, especially months, are not given. – Outside breeding season (X, I): 1600 m (26.I.), 2600 m (23.X.).

Habitat: No general statements can be made yet, the three possible breeding places being quite different in habitat structure and altitude: small clearing with thick and high bushes and *Arundinaria* thickets near a stream in mature *Quercus semecarpifolia* forest (2650, Pahakhola); bushes (including *Piptanthus nepalensis)* along the edge of *Abies spectabilis/Quercus semecarpifolia* forest (3200, Syng Gyang); clumps of up to 4 m high thickets of *Salix* bushes above timberline in the dry zone NW of Dhaulagiri Range (3950 m, Phoksumdo Lake). It is unknown whether any of these records represent breeding specimens, and breeding records are still lacking for Nepal.

Vocalizations: Renderings of the voice are contradictory (see Fleming et al. 1976, Ali & Ripley 1973,8:14-15); very likely the song is not as striking as in other *Cettia* species.

Cettia acanthizoides brunnescens (Hume)

Taxonomic note: The colour difference from ssp. *acanthizoides* is clearly visible.

Material: 2 specimens: **D** Mustang Distr., Thaksang above Tukche, 3150 m, 2.-4.VII.1973: 2♂.

Measurements: **Wing**-L (2) 52, 54 mm. – **Tail**-L (2) 45, 51 mm. – **Bill**-L (2) 9, 10.5 mm. – **Tarsus**-L (2) 21, 22 mm. – **WTI** (2) 11.5, 13%. – **TWI** (2) 86.5, 94.4%. – Testes 7 x 5 mm in both ♂.

Horizontal: Records from very limited areas: Thakkhola and near the Sikkim/Darjeeling border. – Thaksang above Tukche (2.-4.VII. :Mustang); – Pahakhola (31.V.); descent to Pahakhola (30.V. both :Sankhua Sabha); – ascent to Deorali Pass from Yamputhin (16.V.); ascent to pasture Lassetham from Yamputhin (15.V.); Tamur Valley, above Tellok (17.V. all :Taplejung).

Vertical: Our 10 records, all from the presumed breeding season (V, VII), range from 2600 m to 3300 m and are distributed as follows: 2600-2700 m: 4 localities; 2710-3000 m: 3 loc.; 3010-3300 m: 4 loc. Highest records are from 3200 m Lassetham and 3300 m Thaksang. The otherwise scarce Nepal records, according to Inskipp & Inskipp (1991), lie between 2000 and 3600 m, but several of them may not refer to locally breeding birds. According to the new material presented here, the vertical range of the species seems to be very limited.

Habitat: All localities W of the Arun include ringal *(Arundinaria)* bamboo clumps, but the forest types concerned are quite different and range from broad-leaved to *Rhododendron*/coniferous. Habitats were dense uniform bamboo patches with only a few trees interspersed, but sometimes there were only a few bamboo plants with bushes and vines (ascent to Deorali W Yamputhin, V) at forest edges or small clearings (ascent to Lassetham, V). The locality on the forest clearing Thaksang above Tukche (Fig.31) is exceptional, for it is located N of the main range in an area of strongly reduced monsoon influence. The two territorially very active ♂ hid in dense hedges and bushes *(Berberis, Spiraea, Rosa, Ribes, Viburnum)* along the forest edge *(Abies, Pinus, Picea, Betula),* but bamboo is not present there (for details of this unique record see Martens 1975).

Breeding: No records for Nepal. At Thaksang 2 ♂ were active singers and highly territorial, especially on playback of their own song, as late as 4.VII. I was still unable to discover a ♀.

Vocalizations: The Yellow-bellied Bush-warbler can readily be distinguished by its remarkable song, which was previously described in precise detail by Ludlow & Kinnear (1944:202). Most astonishing are 4 long-drawn-out whistles (nearly 2 s each), followed by a series of double notes. Verbal renderings (Ali & Ripley 1973,8:16) and sonagrams of 2 ♂ verses (Martens l.c.) indicate only minor variation at least in the Himalayan area of the species.

Cettia brunnifrons brunnifrons (Hodgson)

Taxonomic notes: The 3 subspecies *whistleri, brunnifrons* and *umbraticus* have recently been accepted (Peters XI: 16), *umbraticus* however is hardly separable by size; Ali & Ripley (1973, 8:18) consider *muroides* Koelz a valid subspecies for reasons of more intense colouration.

Material: 4 specimens: **D** Myagdi Distr., Dhorpatan, Uttar Ganga Valley, 2950 m, 18.V.1973: 1♂. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 25.-27.IV.1973: 2♂. **S** Solukhumbu Distr., confluence of Imja and Phunki Dangka, 3250 m, 3.X.1970: 1♀.

Measurements: **Wing**-L ♂ (3) 45-49.5 mm; ♀ 47.5 mm. – **Tail**-L ♂ (2) 43-44 mm. – **Bill**-L ♂ (3) 9-9.5 mm; ♀ 9 mm. – **Tarsus**-L ♂ (3) 18-19 mm, ♀ 18.5 mm. – **WTI** (4) 6.7-9.5%, x̄=8.5. – **TWI** (1) 91.5%.

Notes: ♂ bill dark brown to brown-black, lower base lighter; feet grey flesh-coloured to orange-grey. Testes IV 4-5 x 3-5 mm, V 6 x 4 mm.

Horizontal: Our records range from SW Dhaulagiri to the Sikkim/Darjeeling border. – Dhorpatan (18.V. :Myagdi; see Material); – above Tukche, right bank (13.V.); Thaksang above Tukche (3.VII. both :Mustang); – Marsyandi Valley, between Syuribar and Phalesangu (9.IV.

:Tanhu); – Buri Gandaki Valley, Chyul-wang Valley W Nyak (6.VIII. :Ghorka); – Trisuli Valley, Syng Gyang (25.-27.IV. :Rasuwa; see Material); – confluence of Imja- and Phunki Drangka (3.X. :Solukhumbu, see Material); – Pomri La, descent to Pahakhola (30.V.); Kangla Khola, descent to Thudam (25.V. both :Sankhua Sabha); – Ladza Khola W Walungchung (21.V.); Deorali Pass W Yamputhin (17.V.); upper Simbua Khola (12.V.); pasture Lassetham (7.V. all :Taplejung).

Vertical: Breeding season (E IV-VIII): My records range between 3000 m (Dhorpatan, V) and 4000 m (below Pomri La, V), and the 16 localities cover this belt as follows: 3000-3250 m: 4 loc.; 3260-3500 m: 6 loc.; 3510-3750 m: 2 rec.; 3760-4000 m: 3 loc. These records are in full accordance with those of Diesselhorst (1968:263; V-VIII), but Inskipp & Inskipp (1991) give the lower limit as 2750 m in "summer", without indicating the months. However, though the habitat preferences of the species are not very limited, its vertical distributional belt is quite narrow and does not exceed 1000 m as regards my own observations. – Outside the breeding season: 9.IV. at 630 m in the Marsyandi Valley, a specimen still far away from the breeding grounds; 3.X. at 3200 m probably still at or close to them.

Habitat: During the presumed breeding season (E IV-VII), the Grey-sided Bush Warbler occupies the transition zone between closed forests and park-like or even more open vegetational types. In its habitat, two structural components are always present: dense bush, hedges, sometimes ringal bamboo *(Arundinaria;* Lassetham), always close, rarely more distant than 100-200 m, to the next forest edge. This kind of habitat is still present at the upper limit of its area near the timberline around 4000 m, where low bushy *Rhododendron* species prevail. Two observations, left and right banks of the Kali Gandaki near Tukche, refer to Inner-Valley facies, where monsoon influence is strongly reduced. But the species is only scantily distributed in such a habitat. *C. brunnifrons* frequents the dense understorey, mostly close to the ground. But it is a curious bird, and when its attention has been attracted, it often leaves the shadowy cover. – The Grey-sided Bush Warbler was seen feeding on the contents of *Piptanthus nepalensis* flowers (Leguminosae; Syng Gyang, see Vogel et al. 1984).

Breeding: A nest with 3 eggs was found on 6.VIII. (Chyul-wang Khola, 3350 m) in a bunch of grass about 30 cm above the ground, indicating that the breeding season may be prolonged considerably.

Vocalizations: The territorial song (Fig.81h-i) is conspicuously divided into two parts: (i) a short warble with 7-10 notes of extremely quick frequency changes and wide ranges, up to 4 kHz, of the single note (length appr. 0.6-0.8 s). Frequency range of the warble varies between different ♂ (4.5 and 7 kHz in 2 ♂, Fig.81h and i) and it is always falling in pitch; part (ii), 0.8-1.0 s long, immediately follows (i) and is divided into four subparts, (a) a trill of about 0.05 s, (b) a chevron-like structure with a steeper (beginning) and a flatter (ending) slope with 4-5 harmonics. The final two subparts are repetitions of these with slight variations of the harmonic-rich subpart (b). This part of the full verse is much lower in amplitude than the preceding one, but is conspicuous by its thin, metallic-sharp sound: "tee-te-wé", the é being markedly pronounced. Frequency width of (ii) is about 6 kHz. The verse is often given without part (ii). Both parts (i, ii) are constant in the individual ♂. Frequency range of the whole verse is wide, often exceeding 8 kHz. – Various warning

calls are frequently uttered and are diverse: (i) Series of identical "tsik" calls with broad frequency range, similar to notes of the song (Fig.81f-g); (ii) series of closely packed clicks, which are combined to coherent "tsit" notes and which are repeated in a long, irregular spaced sequence (Fig.81e); (iii) stereotyped verse-like combinations are often presented (Fig.81h-i).

Bradypterus thoracicus thoracicus (Blyth)

Material: 1 specimen: **G** Ghorka Distr., Chyul-wang Valley, western tributary of the Buri Gandaki, 3400 m, 3.VIII.1983: 1 o pull.

Measurements: Remices and rectrices still growing, on the crown remnants of the natal down still present (pull. I). – **Tarsus**-L 19 mm.

Horizontal, vertical, habitat: The fledgling, still unable to escape on the wing, was caught by hand, the adults being present. Habitat was open landscape with small patches of mature fir forest *(Abies spectabilis)* within extended meadows with a luxuriant growth of grasses and herbs, and a multitude of flowers interspersed. The family crawled through this dense plant layer, and I could catch only a glimpse of the individual birds. Such biotopes, though all man-made at this altitude, are rare in Nepal, where most open unterraced places are heavily grazed, often even overgrazed, by cattle. In the valley in question, unsettled by man, only a few shepherds with goats and sheep are present temporarily.

This is the third breeding record of the Spotted Bush Warbler for Nepal. The others originate from further west in Lamjung Himal and in the Machapuchare area (Inskipp & Inskipp 1991), but have never been published in the necessary detail as regards the importance of the records. The altitudes indicated are 3850 m (but 4850 m in Inskipp & Inskipp 1985) and 3350 m and coincide well with the above one. Thus, *thoracicus* may be restricted to a (very) small altitudinal belt in the upper oak and conifer/*Rhododendron* zone.

Contrary to the statement of Ali & Ripley (1973a,8:22), the species is not at all common in the Central Himalayas and deserves special attention in order to detect more of the obviously scattered and small local populations.

Prinia

There are nine, possibly *(rufescens)* ten, species as breeding residents in Nepal *(gracilis, inornata, socialis, cinereocapilla, hodgsoni, flaviventris, criniger, sylvatica, atrogularis);* five of them are confined to the subtropical lowlands below 1000 m *(gracilis, inornata, socialis, flaviventris, sylvatica),* two do not exceed 2000 m *(cinereocapilla, hodgsoni),* and only one Nepal species is confined to the mountainous zone up to about 3000 m *(criniger).* Most species reach their S Nepal area from tropical India (except *cinereocapilla, criniger).* For none of the sympatric lowland species have the ecological interrelationships been worked out up to now.

Prinia hodgsoni rufula Godwin-Austen

Material: 1 specimen: **N** Chitawan Distr., S Tekouli, banks of Rapti River, 300 m, 13.II.1970: ♀.

Measurements: **Wing**-L 43 mm. – **Tail**-L (graduation) 50 (28) mm. – **Bill**-L 10 mm. – **Tarsus**-L 17 mm. – **WTI** 9.3%. – **TWI** 116.3%.

Horizontal: Our own summer records are only from the East: Tumlingtar (22.VI.); below Khandbari (21.VI. both :Sankhua Sabha); – Mai Khola Valley near Soktim (7.IV.); ascent to Ilam from Mai Khola Valley (8.IV. both :Ilam). – Winter: see Material.

Vertical: The 7 records of our own range from 500 m to 1050 m and are evenly scattered over this altitudinal belt (twice 500, once 600, 750, 860, 920, 1050 m). *Hodgsoni* has its strongholds in the low subtropical southern part of the country up to 400 m, but locally reaches 1600 m (Diesselhorst 1968:265) or even 1750 m (Inskipp & Inskipp 1991).

Habitat: All my records are from open cultivated landscapes with bushes and single big trees, even close to human settlements and villages.

Vocalizations: Territorial song (Fig.82c-f) is a short verse 1.5-2 s long. It is subdivided into 3 or sometimes only 2 parts: (i) a few extremely short click-like notes, sometimes lacking (Fig.82c); (ii) 2-6 slightly frequency-modulated whistling notes in a descending or ascending sequence, sometimes combining both qualities (Fig.82d); (iii) a rattling trill consisting of broad-band click-like notes which are combined to note-groups. The individual note group may stay isolated or may be repeated up to 8 times by the individual ♂. Frequency bandwidth in all 5 ♂ checked was near 5 kHz. The individual ♂ uses only one verse type.

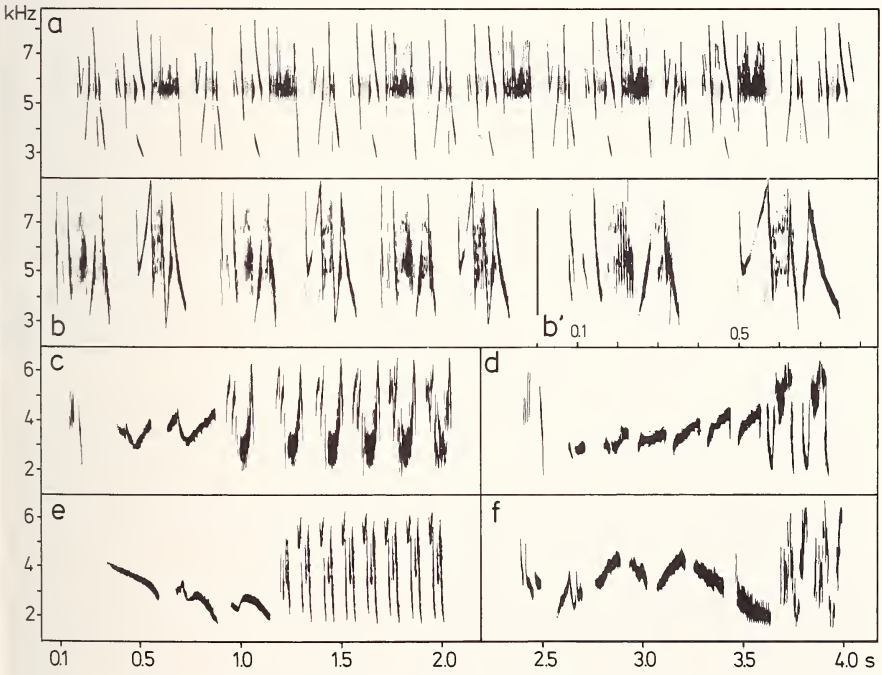


Fig.82: Vocalizations of *Prinia* species. – a-b) *Prinia criniger,* territorial song; a) Ulleri 13.VII.1973; b) Yektin 21.IV.1988; b') song of individual as in b) but different time scale to show note fine structure.
c-f) *Prinia hodgsoni,* territorial song; c) Mai Khola, ascent to Ilam 8.IV.1988; d) Khandbari 21.VI.1988; e) Khandbari, 21.VI.1988, different ♂; f) above Soktim 7.IV.1988.

This, however, may be altered with respect to the number of note groups combined to form part (iii). – The verse can be rendered like "ts dyü dyü dshr dshr .." (Fig.82c). Song given mostly exposed from the top of bushes or from the lower canopy of medium-sized trees. First territorial song heard 7.IV., song period extends at least to E VI (last heard several ♂ singing when leaving the area: 22. VI.).

Prinia socialis stewarti Blyth

Material: 1 specimen: **N** Chitawan Distr., S Tekouli, bank of Rapti River, 300 m, 12.II.1970: ♀.

Measurements: **Wing**-L 46 mm. – **Tail**-L (graduation) 59.5 (35) mm. – **Bill**-L 11.5 mm. – **Tarsus**-L 21 mm. – **WTI** 9.8%. – **TWI** 129.3%.

Habitat: The specimen was caught in bushes near the bank of the Rapti River.

Prinia criniger criniger Hodgson

P. [criniger] incl. *polychroa*

Material: 3 specimens: **D** Dolpo Distr., Suli Gad Valley near Rohagaon, 3000 m, 8.VI.1973: 1♀ (oviposition). **G** Parbat Distr., Ulleri, 2000 m, 13.VII.1973: 1♂. **B** Rasuwa Distr., Trisuli Valley below Ramche, 1500 m, 28.IV.1973: 1♂.

Measurements: Seven additional specimens from Nepal (2♂ from ZSM and 5♀ from Field Museum, Chicago) have been included. Both ♂ (Thamba Khola, Ting Sang La) are markedly lighter, the 5♀ (Hetora, Birethanti) from lower altitudes decidedly more rusty brownish then the 3 specimens mentioned above. – **Wing**-L ♂ (4) 57.5-59 mm, $\bar{x}$=58.4; ♀ (6) 47-51 mm, $\bar{x}$=48.5, s_d=1.34. – **Tail**-L see TWI – **Bill**-L ♂ (4) 11.5-12 mm, $\bar{x}$=11.9. – **Tarsus**-L ♂ (4) 22-24 mm, $\bar{x}$=22.8; ♀ (1) 18 mm. – **WTI** (8) 8.3-13.6%, $\bar{x}$=11.5, s_d=2.14. – **TWI:** The Prinias have a relatively long tail in "winter", a relatively short one in "summer", but the periods of moult are not known in the necessary detail. According to Biswas (1962b: 427) V-♂ still have a "winter tail", and this is the case even for the Ulleri-♂ from 13.VII. (TWI 174%). The ♀ from 8.VI. is moulting tail feathers (T1 new, TWI 146%), the ♀ from 11.IV. (Hetora) presents new feathers (TWI 131%), but another one from the same locality (22.V.) old ones (TWI 156%). The extreme TWI values of the present specimens are 131 and 176%.

Notes: According to the skins mentioned here and in addition to Biswas (l.c.) and Colston (pers. comm. VII 1992) wing length of 20 ♂ *P. c. criniger* is 55-61 mm, of 16♀ 47-52 mm. ♀ exhibit a narrow half ring of whitish feathers around the upper part of the eye.

Gonads of all 4 ♂ very large, ♀ ovipositing. – ♂: Bill black, feet orange, iris light brown.

Horizontal: I found the Striated Prinia within an isolated area NW of Dhaulagiri, in Thakkhola, in the S and E Annapurna, in the Trisuli, Bothe Kosi and Arun Valleys and in the tributary Pahakhola, southern Kanchenjunga massif: upper Tamur Valley, upper Kabeli Khola, S to Mai Khola. – In detail: Dhaulagiri: between Parila and Rohagaon in Suli Gad Valley (8.VI.); Tarakot (17.V.); between Tarakot and Dunahi (18.V. all :Dolpo); – Thakkhola: Choya and near Titi Lake (1.-2.V. :Mustang); – Annapurna: Gara (3.V. :Parbat); – Landrung (8.V.); Ulleri (12.-14.V.. see Material; both :Kaski); – Marsyandi Valley, Phalesangu and Boulboulé (9.-10.IV; both :Tanhu), – Trisuli Valley between Ramche and Dhunche (28.IV. :Rasuwa and :Nuwakot); – Bothe Kosi Valley (12.IV. :Dolakha); – Arun Valley, Chichila and Hurure (19.VI.); Pahakhola (31.V.-4.VI. both :Sankhua Sabha); – upper Tamur Valley below Walungchung (19.V.); ascent to Khebang (25.IV. both :Taplejung); – Yektin (21.IV.), between Paniporua and Hinwa Valley (20.IV. both :Panchthar); – Mai Khola below Ilam (8.IV. :Ilam).

Vertical: My records range between 650 m (see below) and 3000 m (Suli Gad Valley, 8.VI.); approximately 20 of the data/sites are evenly distributed between 1200 m (below Ulleri, 14.VII.) and 2000 m (Gara, 3.V.). The observations from lower sites may refer to passage migrants (IV) on their route to breeding areas higher up in the mountains, but all specimens sang, sometimes several at one place: 650 m Mai Khola 8.IV.; 700 m Phalesangu 9.IV. (several); 850 m Boulboulé 10.IV. (several). Sites beyond 2000 m are situated far to the East (Pahakhola) or in arid areas outside monsoon influence: 2400 m Choya, 2500 m between Choya and Titi (both :Mustang, 1.V.); 2400 m and 2550 m Pahakhola (:Sankhua Sabha, E V/B VI); 2900 m Tarakot (M V); 2550 m Barbung Khola Valley (M V); 2650-3000 m Suli Gad Valley (records by voice and skin, see Material; 8.VI. :Dolpo).

These data alone indicate a vertical breeding area 1800 m wide, which possibly is even broader if IV-data are included. Inskipp & Inskipp (1991) give occurrence during summer (months?) only between 1220 and 2300 m (a few higher up indicate the altitude bar), Ali & Ripley (1973,8:70) without reference, "exceptionally 3100 m" for Nepal.

Habitat: *P. criniger* lives in open landscape with scattered low bushes, also single isolated trees, often on steep slopes which may be extremely dry and hot outside the monsoon season (e.g. rock faces on the trail ascending Khebang, E IV). Those preferences are a prerequisite for life in agricultural land, which is occupied in many places. Fallow fields and bushy wasteland, mainly man-made, interspersed between fields and terraces, are important. It rarely lives in vegetation of tilled soil, e.g. maize fields (Ulleri, VII). The present large areas of the Striated Prinia in the Nepal midlands have only been made available by large-scale forest destruction; its range was much more restricted in former times. This Prinia is the only one in the Central Himalayas to locally also inhabit the dry areas N of the main range; in Thakkhola near Choya and Titi (:Mustang), in addition NW of the Dhaulagiri massif (upper Barbung Khola, Suli Gad Valley :Dolpo). But these are exceptions, and its occurrence in the Suli Gad Valley seemed to be quite isolated in 1973.

Breeding: Territorial song regularly heard from 8.IV. onwards, gonads already strongly enlarged E IV (see Material), ♀ on 8.VI. ovipositing (at 3000 m, see above), M VII still vivacious courtship display between 2000 and 2100 m (Ulleri). Consequently, the breeding period seems to be quite prolonged and may comprise several broods.

Vocalizations: Territorial song (Fig.82a-b) is a rhythmic, "endlessly" and continuously produced warble sounding like the noise of a machine. It is often tirelessly displayed from low bushes and the sound is typical of dry bushy hills and valley slopes in the cultivated midlands. The song consists (in the 2♂ investigated) of 2 to 3 similar note groups which are repeated precisely within sequences of different length, often up to one minute. The note groups are characterized by extremely rapid, sometimes click-like frequency modulations. The bandwidth of the individual note is up to 5.5 kHz, that of the whole verse 6.5 kHz; the frequency extends up to 10 kHz. Broad bandwidth and strong frequency modulation are responsible for the song's harsh sound.

Prinia atrogularis

Horizontal, habitat: 1 specimen was seen in dense secondary growth of *Eupatorium* with bushes and burnt remnants of a former forest, about 200 m from the edge of the forest patch

between Mure and Hurure, left bank of Arun Valley (:Sankhua Sabha, 2100 m), 13.VI.1988. The bird was visible for a short while on a twig, uttering long series of "tse-tse-tse..." calls, then diving into the dense herb and bush layer. This is one of the westernmost records of the species (already dealt with in Inskipp & Inskipp 1991; see also Tymstra 1993).

Orthotomus sutorius patia Hodgson

Material: 9 specimens: **N** Chitawan Distr., S Tekouli, Hatisar, banks of Rapti River, 300 m, 10.-15.II.1970: 1♂, 3♀, 1 o. **B** Kathmandu Distr., Kathmandu, Chauni, 1350 m, 2.III.1970, 20.IV.1973; Lalitpur Distr., Godavari, 1600m, 27.I.1970: 2♂, 2 o.

Measurements: **Wing**-L ♂ (3) 46.5-50 mm; ♀ (3) 44.5-49 mm; o (3) 48-49.5 mm. – **Tail**-L ♂ (2) 43 mm; ♀ (3) 39-50 mm; o (2) 44 and 48 mm. Though the measurements refer to the relative short "winter tails", they seem to be quite low and the shapes of T1 differ. Tail length and tail graduation have yet to be determined for summer and winter set. – **Bill**-L ♂ (3) 13-14 mm; ♀ (3) 12.5-13.3 mm; o (3) 13-13.5 mm. – **Tarsus**-L ♂ (3) 20-21 mm; ♀ (3) 19-19.5 mm; o (3) 20-21 mm. – **WTI** (9) 6.3-11.2%, $\bar{x}$=9.3, s_d=1.72. – **TWI** (7) 86.7-102.0%, $\bar{x}$=92.7, s_d=5.32.

Notes: 1 o (2.III., Kathmandu) has T1 growing. – 1♂ (28.IV., Kathmandu) with bill dark brown, feet grey flesh-coloured.

Horizontal: Our records from the Myagdi Valley eastwards close to the Darjeeling border. – Near Beni (21.III.); Bim, common down to Dharbang (30./31.V. both :Myagdi); – Suikibagar (3.V. :Mustang); – Dumre and Turture (7.IV. :Tanhu); – trail to Phalesangu (9.IV.), near Boulboulé (10.IV.); near Senghe (10.IV. all :Lamjung); – Kathmandu, outskirts of the city (III, VI, VII, :Kathmandu); – Hedagna (5.VI.); Bhotebas (20.VI.); Khandbari (22.VI., all :Sankhua Sabha); – confluence of Tada and Kabeli Khola (24.IV.); ascent to Sablako Pass (22.IV. both :Panchthar); – ascent to Ilam from Mai Khola (8.IV. :Ilam).

Vertical: Breeding season or close to it (E III-VI): Our own records range from 400 m to 1850 m and are distributed as follows: 400-1000 m: 8 localities; 1050-1500 m: 4 loc. (with many observations in the Kathmandu Valley); 1550-1850 m: 3 loc. The lowest records are from the Marsyandi Valley (400-850 m) and from below Ilam (660 m, 700 m), the highest from lower Thakkhola (Suikibagar, 1430 m) and from the Arun Valley (Bhotebas, 1850 m). The data presented here are in accordance with those given by Inskipp & Inskipp (1991): 75-1830 m. Obviously, there are no seasonal restrictions.

Habitat: In large parts of Nepal, the Tailorbird prefers open country with scattered vegetation of both bushes and single trees, most often in cultivated land, even in gardens and fields bordered by bushes and trees on the outskirts of Kathmandu City. The degradation of the natural plant cover in much of Nepal, which consisted mainly of forests, into an open landscape of (sometimes) bush- and tree-rich agricultural land has certainly increased the population density to a large extent. Originally, the Tailorbird lived in open subtropical forest, also along rivers, at the edges and in natural clearings, where it is still present nowadays (Tada Khola, 1000 m, IV).

Vocalizations: Territorial song (Fig.83a-d) is a monotonous, often nearly "endless" repetition of a single note or note groups consisting of 2 notes always given at identical intervals. In the latter case, one of the notes is of small bandwidth (appr. 0.5 kHz) and low frequency (near 2-3 kHz), the other is always broad-band (2-3 kHz) ranging up to 5.5 kHz. A simple rapid downstroke is sometimes combined with an upstroke of variable bandwidth.

Songs of 2-note groups have been recorded only in the Kathmandu Valley (3 ♂; Fig.83a-b). As the notes of individual ♂ are invariable, the single note (or note group) may serve as a distinct marker for an individual ♂.

Acrocephalus dumetorum Blyth

Material: 3 specimens: **G** Kaski Distr., Potana, SW Dhumpus, 2000 m, 28.IV.1995: 1♀. **N** Chitawan Distr., S Tekouli, Hatisar, banks of Rapti river, 300 m, 11.II.1970: 1♂. **B** Kathmandu Distr., Kathmandu, Chauni, 1350 m, 30.IV.1973: 1♂.

Measurements: Included are 10 specimens collected in Nepal by Diesselhorst. – **Wing**-L ♂ (6) 58.5-

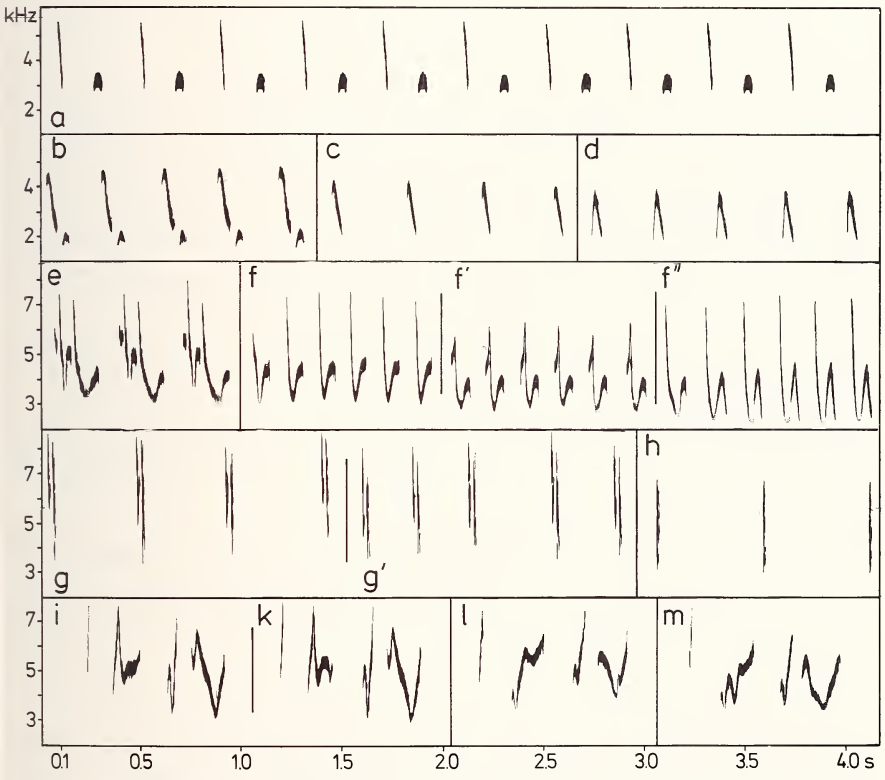


Fig.83: Vocalizations of *Orthotomus* and *Phylloscopus* species. – a-d) *Orthotomus sutorius,* parts of long sequences of territorial song; a) Kathmandu 20.VII.1973; b) Kathmandu 2.IV.1988; c) Hedagna 5.VI.1988; d) N slope of Sablako Pass 22.IV.1988.

e, g) *Phylloscopus fuligiventer,* territorial song (e) and warning calls (g); e) verse, g-g') call series of 2 ♂, Yamuthanga 29.V.1988.

f, h) *Phylloscopus fuscatus,* territorial song (f-f'') and warning call series (h); f-f'') 3 verses of 1 ♂, selected for similarity with *Ph. fuligiventer* song (e); h) warning call series; all from Siberia, lower Amur, Slavianka 18.VI.1990.

i-m) *Ph. reguloides,* "call verses"; i-k) 2 verses of 1♂, Dhorpatan 24.IV.1970; l) Thaksang/Tukche 4.VII.1973; m) Lete 8.V.1995.

64.5 mm, $\bar{x}$=62.8, s_d=2.30; ♀ (4) 59-63 mm; o (3) 62-65.5 mm. – **Tail**-L ♂ (6) 50-54.5 mm, $\bar{x}$=52.3, s_d=1.54; ♀ (4) 50-53 mm; o (2) 55 and 56.5 mm. – **Bill**-L ♂ (2) 13 mm; ♀ (1) 14 mm. – **Tarsus**-L ♂ (6) 21-23 mm, $\bar{x}$=22.4, s_d=0.80; ♀ (4) 22-23 mm; o (3) 22.5-23.5 mm. – **WTI** (13) 18.3-22.9%, $\bar{x}$=20.6, s_d=1.23. – **TWI** (11) 82.5-85.5 (89.7)%, $\bar{x}$ (n=11 without the extremely high value) = 83.9, s_d=1.34.

Notes: The IV-specimen from Kathmandu is markedly lighter than that from II.

Horizontal, vertical, habitat: The three specimens were caught in bushes of the Chitawan lowlands close to the Rapti River banks, in bushes near forest edge and in a bushy garden in the outskirts of Kathmandu. As a passage migrant and winter visitor till V, the species is well known from Nepal (Inskipp & Inskipp 1991).

Seicercus

There are four species in Nepal: *burkii, poliogenys, castaniceps* and *xanthoschistos.* All, perhaps except *poliogenys,* breed. Their affinities are close to the subtropical climatic belt, mainly the broad-leaved forests of the cloud zone. Only *burkii* is a very euryoecious species inhabiting a broad vertical span exceeding that of all insectivorous passerines of Nepal; it is followed by *xanthoschistos. S. burkii* and *xanthoschistos,* the most common species, differ in habitat requirements, but may occur at close range along forest edges. Both other species are rare and their ecology remains undescribed at least within the borders of Nepal.

Seicercus castaniceps castaniceps (Hodgson)

Material: 2 specimens: **D** Myagdi Distr., Muri, 2100 m, 28.III.1970: 1♂. **M** Ilam Distr., Paniporua, 2300 m, 17.IV.1988: 1♀.

Measurements: **Wing**-L ♂ 52, ♀ 49 mm. – **Tail**-L in ♂ all feathers growing, ♀ 37 mm. – **Bill**-L (-Width) ♂ 8 (3.7), ♀ 7.5 (3,9) mm. – **Tarsus**-L ♂ 16, ♀ 16 mm. – **WTI** 13,5 and 14.3%. – **TWI** 75.5%.

Notes: ♀: follicle 0.5-1.5 mm, ♂: testes: 2 mm.

Horizontal, vertical, habitat: The Muri specimen was caught at the edge of *Rhododendron* forest, that from Paniporua in thick bushes on overgrown terraces close to a forested ravine. Both altitudes are within the known summer range in Nepal: 1800-2750 m (Inskipp & Inskipp 1991).

Seicercus burkii burkii (Burton)

Taxonomic note: Jordans & Niethammer (1940) and Stresemann (1940) dealt simultaneously with the clarification of the systematics of the sibling species *burkii* and *affinis. S. affinis* has markedly more limited distribution, which is disjunct in China.

Material: 10 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 30.V.-2.VI.1970: 1♂, 1♀. ** Myagdi Distr., Dhorpatan, Uttar Ganga Valley, 2950 m, 17.V.1973: 1♀ ** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 30.X.1969: 1♂. **N** Chitawan Distr., Rapti Valley, foothills of Siwalik Mts., S Tekouli, 300 m, 15.II.1970: 1♀. **B** Lalitpur Distr., Kathmandu Valley, Godavari, 1600 m, 31.I.1970: 2 o ** Sindhu Palchok Distr., Ting Sang La, 3250, 14.IV.1973: 1♂. * Dadar Danda, 3150 m. 22.IV.1995: 1♂. **J** Dolakha Distr., Chordung Mt./Jiri, 2900 m, 1.IV.1973: 1♂ (song specimen).

Measurements: **Wing**-L ♂ (5) 54.5-62 mm, $\bar{x}$=57.6; ♀ (3) 53.5-54 mm; o (2) 53.5-54 mm. – **Tail**-L ♂

(5) 44-55 mm, x̄=47.4; ♀ (3) 44-46 mm, o (2) 45-46.5 mm. – **Bill**-L ♂ (5) 9.5-11 mm, x̄=10.4; ♀ (3) 9-11 mm; o (2) 10-11 mm. – **Tarsus**-L ♂ (5) 17.5-19 mm, x̄=18,2; ♀ (3) 18-19 mm; o (2) 2x19 mm. – **WTI** (10) 12.9-15.0%, x̄=14.0, s_d=0.81. – **TWI** (10) 80.0-86.9%, x̄=83.2, s_d=2.01.

Notes: Testes slightly swollen. Colour of bill above dark horn-brown to black, below orange-yellow. – Legs light, grey brown or flesh-coloured.

Horizontal: My own records cover all major massifs of the main range and the adjacent midlands from the NW Dhaulagiri to near the eastern frontier to Sikkim and Darjeeling. Of the nearly 45 localities, only a few can be mentioned here: Dhaulagiri: Ringmo/Phoksumdo Lake (30.V.-2.VI., see Material); Suli Gad Valley (20.V.); Gompa/Tarakot (4.VI. all :Dolpo); – descent from Thankur (5.V.); Dhorpatan (20.-23.IV., 9.-23.V.); Bobang S Dhorpatan (27.-30.IV., see Material; all :Myagdi); – Thakkhola, Chadziou Khola (1.VII., 30.X., see Material); between Tukche and Ghasa (2.VII.); Thaksang/Tukche (26./27.IV., 2.-6.VII. all :Mustang); – Marsyandi Valley: between Senghe and Tal (11.IV.); Thimang above Bagarchap (14.IV. both :Manang); – S: descent to Ghandrung (7.V.); Chitre (5.V. both :Parbat); – Rapti Valley S Tekouli (15.II., see Material; :Chitawan); – Kathmandu Valley: Godavari (31.I., see Material); Mt. Phulchoki (22.III., 14.V. both :Lalitpur); – Pass Ting Sang La (14.IV., see Material; :Sindhu Palchok); – Chordung Mt./Jiri (28.III., 1.IV., see Material); Thodung (7.IV. both :Ramechap); – Arun Valley: between Mure and Hurure (9./10.VI.); Pahakhola (31.V.-6.VI. both :Sankhua Sabha); – Kanchenjunga massif: Thudam (26.V.); Pass Deorali between Yamputhin and Hellok (17.V.); upper Simbua Khola Valley (10./11.V.); pasture Lassetham and pasture Omje Kharka (1.-8.V.); Yamputhin (27.IV. all :Taplejung); – Paniporua (17.-19.IV.); Dhorpar Kharka (15.IV. both :Panchthar); – Mai Pokhari (10.IV. :Ilam).

Vertical: During the presumed breeding season (E IV - B VII): 60 records in about 45 localities, several of them repeatedly in different years, extend from 1550 m (Marsyandi Valley, Tal and Samche, 11.IV.) to 3650 m (Phoksumdo Lake, V/VI., see Material). Thus the vertical distribution covers at least 2100 m, but not a single nest has been found in Nepal yet. This is a vast belt for an insectivorous passerine and includes a multitude of vegetational and climatic conditions (see below). The records mentioned, all of singing ♂, spread over the inhabited forest belt as follows: 1500-2000 m: 4 records (between Tal and Samche, 1500-1550 m, 11.IV.; Yamputhin 1650 and 1900 m, 27.IV., S Yamputhin, 2000 m, 26.IV.) – 2010-2500 m: 10 rec., – 2510-3000 m: 13 rec., – 3010-3500 m: 13 rec., – above 3500 m: 2 rec. (Thudam 3600 26.V.; Phoksumdo Lake 3650, see Material). – Highest summer record reported by Diesselhorst (1968:284) is 3700 (Khumbu, V); Inskipp & Inskipp (1991) state 3800 m for the upper limit (without details), but their lower limit at 2400 m is certainly too high. – Outside the breeding season: For winter quarters see Migration. As early as III close to or even present at the breeding grounds (see Breeding and Vocalizations).

Habitat: During the breeding season forests, which, in accordance with the extended altitudinal belt, encompass a great variety of tree species and climatic conditions. All forest-like tree formations at the various altitudes seem to be inhabited, including pure coniferous stands, but with differing population density. *S. burkii* does not avoid the monsoon-protected northern mountain slopes, but is apparently rarer there: lower Dolpo (Gompa/Tarakot; Phoksumdo Lake) and upper Thakkhola (above Tukche). Population density may be

highest in mixed deciduous forests between 2300 and 2800 m. Near Lete/Thakkhola (V), I heard up to 3 singing ♂ from one spot. I never found *burkii* close to the timber-line, nor in shrubs beyond. *S. burkii* is a true forest dweller and prefers the storey just below the canopy, often sitting quite freely when singing. It forages close to the ground in bushes, but never sings there. A few examples of habitat composition: stream-side trees and bushes with *Alnus nepalensis* (Yamputhin, 1650 m), *Quercus* forest of various species (Mure/Hurure, 2150 m; Phulchoki Mt., 2700 m), rich mixed deciduous forests (Bobang, 2450 m; Lete, 2470 m; Chitre/S Annapurna, 2550-2850 m), mixed *Quercus, Magnolia, Rhododendron* forest (Dhorpar Kharka, 2700 m), dense mixed forests of *Pinus wallichiana* and *Abies spectabilis* with sparse *Betula* and *Rhododendron* in zone of reduced monsoon (Thaksang/Tukche, 3100-3300 m), *Abies densa* and extended stands of *Rhododendron hodgsoni* (pasture Lassetham, 3350-3450 m), same combination, but with *Betula utilis* (Thudam, 3600 m), dry *Pinus wallichiana/Cupressus torulosa* forest (Phoksumdo Lake, 3650 m).

Breeding: ♂ from 1. and 14.IV with slightly enlarged testes (3 and 2 mm, respectively; 2900 and 3250 m). Diesselhorst's (1968:285) observations of late arrival at the breeding grounds, not until V, does not correspond to my own records in the same (Ting Sang La, see above, nearly 3 weeks earlier) and other areas in E Nepal (Chordung Mt. 2900-3000 m, 28.III.; Gitang Khola 2550 m, 28.III.; Thodung 3200 m, 7.IV.; singing ♂ in all localities). In view of the heavy singing activity as early as E III, nest building may start within IV, at least in the lower part of the altitudinal belt. Contrary to Inskipp & Inskipp (1991), Diesselhorst (1968:285 "...auch fand ich nie ein Nest") did not confirm breeding at Mt. Phulchoki (but see *S. xanthoschistos),* however noticed a still dependent fledgling in Khumbu.

Migration: Altitudinally; in winter down to the Terai lowlands (Rapti Dun, II, see Material), but regularly within the Kathmandu Valley (1600 m, Godavari, I, see Material); Inskipp & Inskipp (1991): up to 2135 m (no details given).

Vocalizations: Territorial song (Fig.84a-m) consists of short verses of mostly simple syntax: a repetition of note groups of 2 (rarely 3) notes each, rarely only 1 note. Verses often start with 1 or 2 introductory notes (or note groups) different from the other notes of the verse; rarely a phrase is added of (often simple ascending) notes at the end of a verse, but extent of such appendices differs between individual ♂. Maximum frequency bandwidth within a verse high, up to 5 kHz, but large differences between the individual notes within a verse: about 1.0 to 4.5 kHz. Frequency of all verses measured ranges from 2.5 to 8 kHz but is more limited in individual verses. The frequency bands of the 2 notes of the individual note groups are mostly quite different, often completely separated from each other. Note forms often angular, opened up- or downwards. Length of verse 0.6-1.0 s, pauses between verses 3.7-5.5 s when undisturbed (example from 1 ♂, Fig.84a-m). Verse repertoires of individual ♂ are high: Fig.84a-m and 84a'-l' present 12 and 11 verses of 2 ♂. All are different as is every single note of these 23 verses. The actual repertoire of individual ♂ is certainly even higher but open to question. – Calls of unknown meaning ("klik") shown in Fig.84m'.

There is early onset of the singing period (earliest observations at 22.III. Phulchoki Mt. 2600 m; 28.III. Gitang Khola 2550 m; 28.III. Chordung Mt. 2900 m); extends into VII (22.VII. near Ghasa 2350 m).

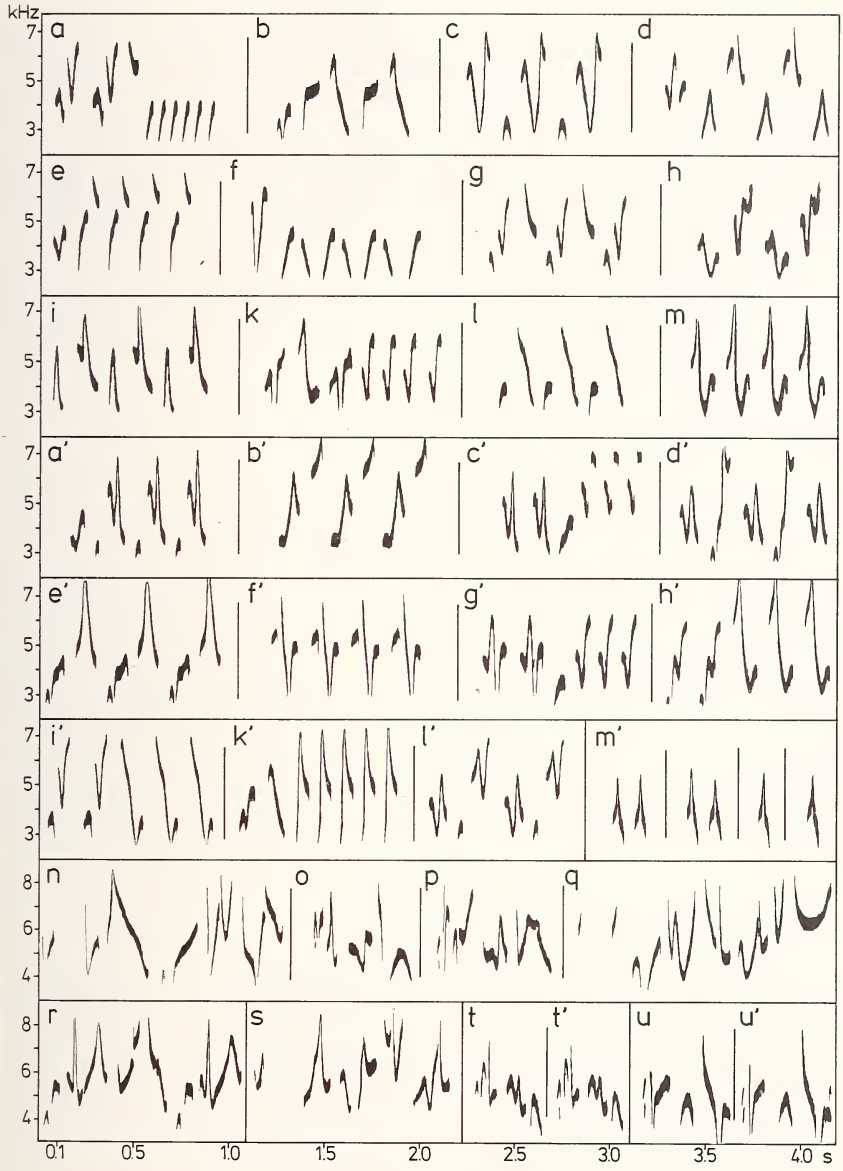


Fig.84: Vocalizations of *Seicercus* species. – a-m) *S. burkii,* territorial song (a-m, a'-l') and calls (m'); continuous sequence of 12 verses of 1 ♂, below Lete 1.V.1980; a'-l') continuous sequence of 11 verses of 1 ♂, Bobang S Dhorpatan 1.IV.1970; m') calls of unknown function, probably warning calls, Suli Gad Valley 8.VI.1970.
n-u) *S. xanthoschistos,* territorial song (n-s) and warning calls (t-u); n-r) 5 verses of 1 ♂, ascent to Mai Pokhari 9.IV.1988; s) Yektin 21.IV.1988; t/t') and u/u') 2 call series of both sexes at the nest, above Yamputhin 16.V.1988.

Seicercus xanthoschistos xanthoschistos (Gray & Gray)

Material: 9 specimens: **D** Myagdi Distr., Muri, 2100-2300 m, 25.III.-1.IV.1970: 3♂, 2♀. **G** Parbat Distr., Ulleri, 2000 m, 12.VII.1973: 1♂ pull. **B** Dolakha Distr., ascent to pass Ting Sang La (E slope), 2350 m, 13.IV.1973: 1♂ (song specimen). **N** Makwanpur Distr., Mahabarat Mts., Daman, 2500 m, 23.-25.II.1970: 1♀, 1 o.

Measurements: In this section, Diesselhorst's collection from the Kathmandu Valley, Pass Ting Sang La, Jiri, Bigu and Bikuti is incorporated (ZSM). Not included are 1♀ and 1 o from the Mahabarat Mts. (see above), for the ♀ has very long wings (59 mm), and both specimens are remarkable for high WTI: ♀ 16.1%, o 17.5%; their TWI is 77.1% (♀) and 80.7% (o).

Wing-L ♂ (17) 54-58 mm, $\bar{x}$=56.0, s_d=1.65; ♀ (11) 51-56 mm, $\bar{x}$=52.7, s_d=1.60. – **Tail**-L ♂ (17) 40.5-46 mm, $\bar{x}$=42.8, s_d=1.68; ♀ (11) 39.5-43.5 mm, $\bar{x}$=40.9, s_d=1.34. – **Bill**-L ♂ (2) 9.5 and 10 mm; ♀ (2) 9.5 and 10 mm. – **Tarsus**-L ♂ (3) 18-19 mm; ♀ (2) 18.5 and 19 mm. – **WTI** (28) 10.9-16,2%, $\bar{x}$=13.9, s_d=1.19. – **TWI** (28) 74.5-80.6%, $\bar{x}$=76.9, s_d=1.54.

Notes: ♂ pullus is brownish on the back, below faded pale yellow. ♂ bill (13.IV.) dark brown, below yellowish, feet yellow-grey.

Horizontal: The records of J.M. extend from the NW Dhaulagiri to localities close to the Sikkim/Darjeeling border. Only a few of the ca. 25 localities can be cited here. – Parila in Suli Gad Valley and several additional localities (19./20.V., 18.VI.); upper Barbung Khola, upstream Tarakot (10.VI. both :Dolpo); – S: ascent to pass Jalja La (5.IV.); Myagdi Khola, Muri (25.III.-1.IV., see Material; both :Myagdi), – E: Thakkhola, between Lete and Ghasa (2.V. :Mustang); – Ghandrung (8.V. :Parbat); – between Landrung and Dhumpus (9.V.); Ulleri (12.VII., see Material; both :Kaski); – E: between Senge and Tal (11.IV.); near Bagarchap (12.IV.); above Darapani (12.IV. all :Lamjung); – Mahabarat Mts., Daman (23.-25.II., see Material; :Makwanpur); – Kathamandu Valley, Mt. Phulchoki (19.-24.III. :Lalitpur); – ascent to pass Ting Sang La, E slope (13.IV., see Material; :Ramechap); – Arun Valley, Chichila (19.VI.); between Mure and Hurure (12.VI.); ascent to Num (8.VI. all :Sankua Sabha); – Tamur Valley, N Lungtung (19.V.); Kabeli Khola, above Yamputhin (16.V. both :Taplejung); – Paniporua (20.IV. :Panchthar); between Ilam and Mai Pokhari (9.IV. :Ilam).

Vertical: Within or close to the breeding season (IV-VI), 29 records range between 1150 and 3050 m, in detail: 1150-1500 m: 5 records; 1510-2000 m: 12 rec.; 2010-2500 m: 10 rec.; above 2500 m: 3 rec. 18 out of the 29 records extend from 1800-2400 m and indicate the preferred altitudinal belt. Lowest record: 1150 m, S Tatopani (:Mustang, 15.V.); highest records: 2700 m Parila, 2750 m upstream Tarakot, 3050 m Suli Gad Valley (see Horizontal, all :Dolpo, V, VI). Including the data of Inskipp & Inskipp (1991; 1000-2700 m), the altitudinal belt for *xanthoschistos* during the breeding season is about 2000 m wide, but above 2500 m the species is only patchily distributed. – My only winter record is at 2500 m (Daman, II, see Material).

Habitat: The Grey-hooded Warbler inhabits the subtropical hilly and mountainous zone, but avoids the Terai lowlands. It does not penetrate into dense closed forests but prefers forest edges, open forest remnants, relictual arboreal vegetation along streams and even hill pastures overgrown with low bushy vegetation *(Rubus, Artemisia,* high grasses; above Yamputhin, 16.V.), where it even breeds (see Breeding). Much of the midland forest, at the preferred altitude of *xanthoschistos,* is nowadays largely fragmented into or even reduced

to scattered islands; the Grey-hooded Warbler has greatly benefited from this situation and is, at least in its altitudinal strongholds (1900-2400 m), a common species. On Phulchoki Mt. (:Lalitpur), I found it common up to 2050 m, the lower limit of the *Quercus semecarpifolia* zone (19.III.). Locally, *xanthoschistos* also inhabits drier habitats in the rain-shadow of the main range (lower Dolpo, NW Dhaulagiri). In the localities in the Suli Gad Valley and near Tarakot, all in the same region, such conditions prevail. These are also the highest sites recorded for the species in Nepal. In the drier parts of Thakkhola (upper Kali Gandaki Valley), I could not spot it; the northernmost records coincide with the border of heavy monsoon precipitations (between Lete and Ghasa, 2250 m, V).

Breeding: Testes were already enlarged, in some cases to maximum size, between 25.III. and 1.IV. (Muri) and 13.IV. (Ting Sang La). A nest contained 4 young ready to fledge within 3 or 4 days on 16.V. (above Yamputhin, 2350 m). Proud (1949), Biswas (1962b) and Diesselhorst (1968:286) provide corresponding data. Thus, egg-laying already starts at B IV. The Yamputhin nest, domed, built of moss and covered by some leaves and grass blades, on the inside lined with hairs, was built on the ground below a *Rubus* bush on an overgrown pasture, with no tree-like vegetation nearby (see Ali & Ripley 1973,8:185). Low "stairs" of broad leaves of grass in front of the nest may guide the adults to the entrance hole.

Vocalizations: Territorial song (Fig.84n-s) consists of short twittering verses 0.5-1.4 s long and of high pitch. Frequency span of the verse is as broad as 5 kHz, individual notes comprising a span of 4.5 kHz and exceeding even 8.5 kHz. The individual ♂ uses at least 5 verse types, which differ in length and note composition. All notes of different verse types differ (Fig.84n-r) and repetition of notes within a verse is rare (Fig.84r). High frequency, irregular syntax and extremely rapid frequency changes make the *xanthoschistos* song sharp and piercing. Warning calls (Fig.84t-u) of adults at the nest are verse-like, composed of 4-5 notes and about 1 kHz lower in frequency than song. Rapid frequency shifts apply to them, too. ♂ and ♀ seem to use different verses; they did not vary in the only 2 individual adult specimens investigated.

Phylloscopus

Sixteen species are found in the Himalayas (and bordering regions), the greatest species density of this genus within its Palaearctic range, and 9 species breed in Nepal *(reguloides, trochiloides, magnirostris, pulcher, maculipennis, proregulus, inornatus, fuligiventer, affinis),* 8 in Kashmir. As many as 10 species can occur sympatrically (Martens 1980, Fig.1). In Kashmir all 8 breeding species live in close conjunction (Price & Jamdar 1989, 1991b), while in Nepal only 6 are known so far (see Table 7). There is moderate variation in species spectrum along the Himalayan Range. Most notable are the two endemic species *tytleri* and *occipitalis,* which are restricted to the dry western end of the Himalayas and the adjacent regions. Other widespread species adapted to dry conditions are *neglectus, subviridis, griseolus, sindianus* and *inornatus;* apart from *sindianus* and *griseolus,* these should be regarded as marginal Himalayan species. The only one in this group that ranges into the dry regions of western Nepal is *inornatus.* The largest areas occupied by many species are in the wooded Chinese mountains bounding the Himalayas to the east, from which they

have evidently migrated westward into the Himalayan range, colonizing it as far as Kashmir in some cases: *reguloides, maculipennis, pulcher, magnirostris, proregulus, trochiloides, cantator.* Evidence for this immigration from the east includes not only the size and position of the whole area but also the subspecific composition of individual populations (see below) and the high ecological requirement for species-rich wet deciduous and coniferous forests. The central and western Himalayas were also invaded from the east by the alpine species *fuligiventer* and *affinis,* which are therefore also represented in large numbers in S Tibet. Only a few species reach the limit of their distribution in the central Himalayas (in Nepal): *inornatus* at the W Dhaulagiri (from the west) and *fuligiventer* in the Annapurna massif (from the east); *cantator* does not reach E Nepal.

The vertical distribution in Nepal extends from about 2000 m *(reguloides)* to about 4500 m *(fuligiventer)* or even higher *(affinis).* Lower and upper breeding limits have not yet been documented by nest finds, but it is certain that the entire lower belt of forest below 2000 m is not inhabited by any *Phylloscopus* species, and hence no species in the central Himalayas has penetrated into the Oriental (Indomalayan) region. The greatest number of species is found in the vertical band between 3000 and 4000 m, and the density of individuals is also greatest here.

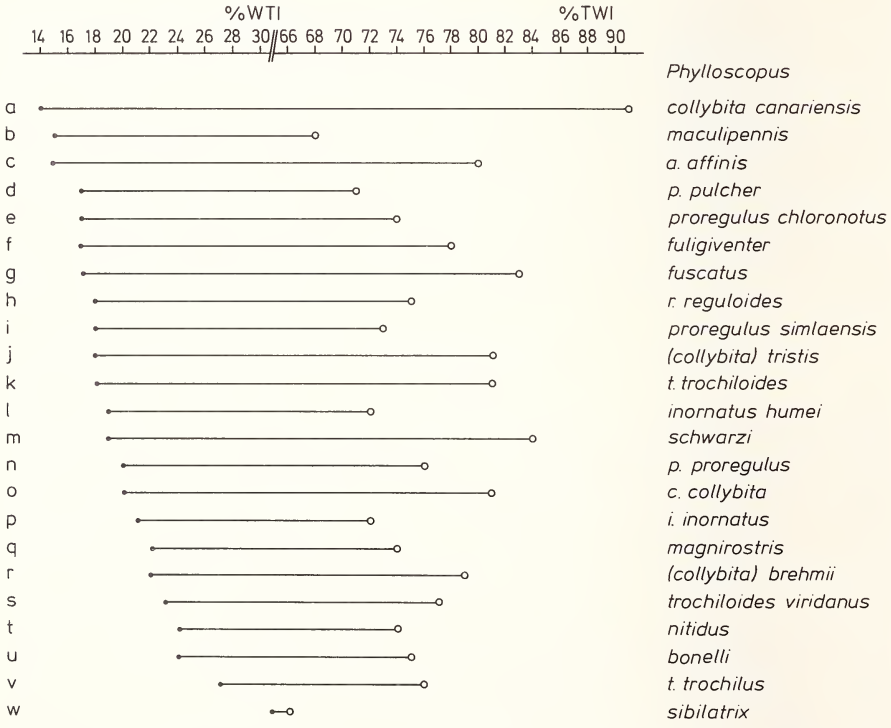


Fig.85: Diagram to show differences of statistical values of wing/tip index (WTI) and tail/wing index (TWI) within the genus *Phylloscopus.* Bars combine lowest WTI and highest TWI values within a given species or subspecies (see text: *Phylloscopus).*

In a number of species from the Chinese region, subspecies have differentiated in the Himalayas, which indicates that these populations are old or at least do not represent simple postglacial immigration. Seven species are in this category; of these, 3 have each formed one subspecies *(pulcher, trochiloides, cantator),* 2 have each formed two *(fuligiventer, proregulus)* and 2 have each formed three *(maculipennis, reguloides),* all of which are restricted to the Himalayas. In their main areas east of the Himalayas, these species also require a predominantly monsoon-wet climate (cf. Ali & Ripley 1973, 8).

Comparison of the flight-feather proportions of many taxa of the genus *Phylloscopus* reveals considerable differences in wing/tip index (WTI). The mean WTI of 23 taxa (see Fig.85) ranges from 14% to 31%! The figure also shows a disproportionately large increase in WTI in the upper part of the range, so that when arranged in ascending order they form a concave curve.

There are also some interesting details. For instance, *sibilatrix* (Fig.85w) is not so much the representative of an "incipient genus" (Gaston 1974:446) but rather an extreme of the genus. *Ph. [collybita] tristis* and *t. trochiloides* are identical in WTI (and in tail/wing index, TWI), even though they migrate over very different distances. The range of high wing/tip indices also includes short-distance migrants such as *[c]. brehmii* and *magnirostris;* in the range of low values there is a long-distance migrant *(f. fuscatus,* $\bar{x}$=17%) next to a nonmigratory species *(proregulus simlaensis,* $\bar{x}$=18%), and so on. The extremes, however, are as would be expected, with non-migrants *([collybita] canariensis, maculipennis)* at the low end and long-distance migrants *(t. trochilus, sibilatrix)* at the other. Within species/superspecies, the long-distance-migratory forms have higher WTI (exception *[collybita] brehmii*): compare *proregulus chloronotus* with *p. proregulus, t. trochiloides* with *t. viridanus* or *i. inornatus* with *i. humei.*

The situation soon becomes obscure, however, when one turns to the TWI (see Fig.85). *Ph. maculipennis* (WTI, $\bar{x}$=15%) has a TWI of $\bar{x}$=68%, while *sibilatrix* (WTI, $\bar{x}$=31%) has a TWI of $\bar{x}$=66%. Only within species/superspecies does this variation in proportion seem to follow a rule, in that the relative tail length decreases with rising WTI (see also Gaston 1974, Fig.4). This could practically be called a "compensation rule". Although the load-bearing area of the tail and its function in steering and balance have been considered at length, the reasons for these differences in proportion are not yet really clear.

Tab.7: *Phylloscopus* species communities of some well-studied habitats in Nepal with the species *maculipennis, reguloides, pulcher, proregulus, magnirostris, trochiloides, affinis, fuligiventer, inornatus.*

Dhorpatan 3000 m	Thaksang 3200 m	Thodung 3200 m	Ringmo 3600 m	Khumjung 3800 m	Meme Kharka 4100 m
maculip	–	*maculip*	–	–	–
reguloid	*reguloid*	*reguloid*	–	–	–
proregul	*proregul*	*proregul*	*proregul*	*proregul*	–
magniros	*magniros*	–	–	–	–
?	*pulcher*	*pulcher*	–	*pulcher*	–
–	*trochil*	–	*trochil*	*trochil*	–
–	*affinis*	–	*affinis*	*affinis*	–
–	–	–	*inornat*	–	–
–	–	–	–	–	*fuligiv*

Phylloscopus reguloides reguloides (Blyth)

Taxonomic note: In view of the facts that an exclave of *Ph. coronatus* lives in the midst of *reguloides claudiae* and that *occipitalis* is sympatric with *r. kashmiriensis,* it seems more cautious not to include *reguloides* in the same superspecies with *occipitalis* and *coronatus* (and *ijimae*). Indeed, according to genetic findings *occipitalis* itself should not belong to the species group *coronatus/ijimae/cebuensis* (Richman & Price 1992, Fig.3).

Material: 12 specimens: **D** Dolpo Distr., Gompa/Tarakot, 3250 m, 5.VI.1973: 1♂ ** Myagdi Distr., Dhorpatan, 2950-3000 m, 11. and 25.IV.1970: 2♂ * Bobang, 2450 m, 30.IV.1970: 1♂ * Muri, 2100 m, 25.-30.III.1970: 2♂, 1♀. **G** Parbat Distr., Ghorapani, 2800 m, 27.VII.1970: 1♂, 1♀. **J** Ramechap Distr., Mt. Chordung/Jiri, 2900 m, 28.-29. III.1973: 2♂ (song specimens) * Thodung, 3200 m, 8.IV.1973: 1♂ (song specimen).

Measurements: In few cases, the Diesselhorst collection was included. **Wing**-L ♂ (17) 56.5-62.5 mm, $\bar{x}$=59.7, s_d=1.38; ♀ (9) 55-59.5 mm, $\bar{x}$=56.9, s_d=1.57; 2 o 57.5 and 60.5 mm. – **Tail**-L ♂ (17) 42-47 mm, $\bar{x}$=44.4, s_d=1.33. – **Bill**-L ♂ (10) 9.5-10 mm, $\bar{x}$=9.9, s_d=0.21; ♀ (1) 9.5 mm; o (1) 9.5 mm. – **Tarsus**-L ♂ (17) 16-19 mm, $\bar{x}$=17.8, s_d=0.71; ♀ (9) 15-18.5 mm, $\bar{x}$=17.3, s_d=1.00; o (2) 17.5 and 18 mm. – **WTI** (28) 14.3-21.3%, $\bar{x}$=17.7, s_d=1.57. – **TWI** (28) 71.3-77.4%, $\bar{x}$=74.5, s_d=1.63.

Notes: beak (♂) dark gray, reddish underneath, feet (♂) gray. Gonads of individual ♂ well developed in IV and VI.

Horizontal: My records in the region of the foothills and the main range in all areas covered by the expeditions derive from 44 different observation sites, most with multiple sightings from the NW Dhaulagiri to the Sikkim/Darjeeling border. – In detail: Suli Gad Valley (9.VI.); Gompa/Tarakot (5.VI.); Cheng Khola (8.V. all :Dolpo); – many localities in Thakkhola from Ghasa up to Thaksang/Tukche (24./26.IV, 1.-8.V., 2./4.VII. :Mustang); – Marsyandi Valley, up to Pisang (17.IV. :Manang); – Chitre (4.V. :Parbat); – Trisuli Valley, Syng Gyang (26.IV. :Rasuwa); – Phulchoki Mt. (14.V. :Lalitpur); – Ting Sang La (14.IV. :Sindhu Palchok); – the vicinity of Jiri (28.III.) and Thodung (4./8.IV. :Ramechap); – Arun Valley (9.VI., Mure/Hurure) with side valleys (Pahakhola, 3.VI. both :Sankhua Sabha); – Tamur Valley, Walungchung Gola (20.V.); Kabeli Khola (27.IV. Yamputhin; both :Taplejung); – Paniporua (16./20.IV. :Panchthar); – Gitang Khola (27.III., 11./13.IV.); Mai Pokhari (1., 9./10.IV. :Ilam).

Vertical: Near breeding (from E III) and breeding season (to E VIII): sightings from 44 sites between 1750 m (IV) and 3660 m (V). Nearly uniformly distributed between 2100 and 3200 m, fewer sightings above and below these limits. – Records up to 2100 m: 1750 and 1850 m Gitang Khola 11./13.IV. (:Ilam); 1800 m Yamputhin E IV (:Taplejung), 1830 m above Landrung 8.V. (:Kaski). – Finds above 3200 m: 3300 m Gompa/Tarakot 5.VI. (:Dolpo); 3400 m Thaksang/Tukche 27.IV. (:Mustang); 3630 m Cheng Khola 8.V. (:Dolpo); 3660 m descent to Thankur 5.V. (:Myagdi). Inskipp & Inskipp (1991) report 1980-3800 m as summer quarters. Whether all singing (!) ♂ in the extremes of the data are actually breeding there remains to be determined.

Habitat: The vertical belt about 2000 m wide during the breeding season encompasses different climate levels and hence different forest formations. The lower limit, at 1750 m, is

still in the region of subtropical deciduous forest (E and C Nepal; all the low-altitude finds come from there), and between 2000 and 3000 m species-rich forests are occupied, dominated by *Quercus* and *Rhodondron* and, further west, by *Pinus* and *Picea.* The upper limit, at 3600 m, is characterized by subalpine woodland with *Abies, Rhododendron* and *Betula.* The birds prefer more or less open formations and even isolated groups of trees, though the biospectrum also includes dark, dense coniferous forests (Thaksang; Gompa/Tarakot). *Alnus* forests along the courses of brooks are regularly occupied. This ecological plasticity even permits *reguloides* to colonize the (not too extreme) dry regions north of the main chains, where mesophilic forest is localy present: Thaksang/Tukche (Thakkola :Mustang) and Gompa/Tarakot (:Dolpo) are still in this region.

Ph. reguloides is probably the most common *Phylloscopus* species in Nepal: a broad vertical area and ecological versatility are combined with high local population densities. At favorable locations 3 or even 4 ♂ can be heard singing from a single site; such locations were found at the southern edge of the Dhorpatan Valley and the Kali Gandaki Valley near Lake Titi, and in the mesophilic forests of Thaksang. Here a territorial ♂ was encountered every 40-50 m.

Breeding: Occupation of the breeding areas begins as early as E III, when the ♂ are singing and giving territorial responses: 26.III. Mai Pokhari 2200 m (:Ilam); 27.-30.III. Gitang Khola 2500 m (:Ilam); 25. and 30.III. net captures, song from 2.IV. Muri 2100 m (:Myagdi); 28.III. Chordung Mt./Jiri 2900 m. At E III/B IV overwinterers still remain at lower altitudes in the Terai (cf. Diesselhorst 1968:283). Gonads of the ♂ at potential breeding sites in III and the first half of IV are usually undeveloped or at most slightly enlarged, reaching maximal size only in V and VI (up to ca. 7 mm). Building activity at a nearly completed nest on 14.V., on a horizontal branch of a fir *(Abies),* spherical nest with side entrance about 3-4 m above ground.

Vocalizations: Territorial song similar to that of the Coal Tit *(Parus ater aemodius)* and the Crested Black Tit *(P. ater melanolophus),* but some notes in the verse rise more sharply and over a greater range of frequencies. Both of these are found together with *reguloides* in the upper third of its area. Sonagrams in Martens (1980). *Ph. reguloides* uses "call verses" ("zeetedät") when somewhat aroused, probably in different contexts, and single verses are sometimes interspersed into sequences of normal song (Fig.83i-m). There seems to be little inter- and intraindividual variation in note form and syntax of this complex call, which always consists of 4 single notes. (i) a single steep upstroke (at least 3 kHz wide), (ii) a long note with several up- and downstrokes, slopes less steep, (iii) a short note with a long final upstroke, note with broadest frequency span, up to 4.5 kHz, (iv) longest note (up to 0.2 s), mainly "v"-shaped. Frequency range (3 to nearly 8 kHz in 1♂, less in others) is lower than in normal song (cf. Martens 1980).

Phylloscopus trochiloides

Taxonomic notes: The taxonomic rank of the individual components of this zoogeographic species (1. *viridanus,* 2. *plumbeitarsus,* 3. *trochiloides* + *ludlowi,* 4. *nitidus*) is greatly in need of clarification. According to Stepanyan (1990) and Glutz v. Blotzheim & Bauer (1991,12/II:1045-1046), 1 and 2 are certainly conspecific. That 1 and 3 are also conside-

red to be so is difficult to justify, given that Martens (1980:34) writes, "Nevertheless, the syntax of their territorial songs is different in principle ..." and that despite the great similarity between 1 and 4, at least in syntax, 4 *(nitidus)* is usually regarded as a separate species. In summary, Martens (l.c.:35) states, "The differences between *nitidus* on the one hand and the two *trochiloides* forms *trochiloides* and *viridanus* on the other appear profound." However, as this is said in the context of description rather than evaluation, the taxonomic question is still unresolved. A comparative glance at the flight-feather proportions shows that *nitidus* and *trochiloides* are extremely different, but in the sense of the typical variation in proportions among closely related bird forms. With respect to these characters, then, *Ph. t. viridanus* is fairly close to *nitidus,* and so is *plumbeitarsus* (n=4: WTI $\bar{x}$=22.1%, TWI $\bar{x}$=74.5%). Genetic differentiation within the *trochiloides* complex is not much pronounced as well (Helbig et al. 1995).

Tab.8: Flight-feather proportions of the taxa *trochiloides, nitidus* and *viridanus.*

	WTI (%)	$\bar{x}$	s_d	n	TWI (%)	$\bar{x}$	s_d	n
trochiloides	14.9–20.0	18.2	1.28	21	76.7–82.4	80.7	1.38	21
nitidus	22.2–25.4	23.5	1.22	5	70.1–77.0	74.1	1.56	42
viridanus	21.1–25.4	22.7	1.26	11	74.6–79.0	76.6	1.54	14

Phylloscopus trochiloides* ssp. (incl. *viridanus)

Material (cf. Tab.9): 4 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 24. and 28.V.1970: 2♂ (ssp. ?). ** Mustang Distr., lower Lete Khola opposite Lete, 2400 m, 5.V.1995: 1♂ *(viridanus).* **N** Chitawan Distr., Rapti Valley, S Tekouli, Hatisar, 300 m, 9.II.1970: 1 o *(viridanus).*

Tab.9: Measurements and flight-feather proportions of 4 specimens of *Phylloscopus trochiloides* ssp. (cf. Material).

	Wing-L	Tail-L	Bill-L	Tarsus-L	WTI	TWI	H9
Lete, 5.V.	63.5	49	10.5	18.5	19.7	77.2	<4
Ringmo, 24.V.	64	47.5	9.5	21	21.9	74.2	<4
Ringmo, 28.V.	62.5	47	10	20	22.4	75.2	<4
Hatisar, 9.II.	60.5	46	10	19	21.5	76.0	>4

Notes: These two birds from Ringmo (gonads small, 2 mm) have a delicate buff coloration on the underside that is not present in the 12 other specimens from the same site. The high WTI and low TWI (cf. below) do not fit *trochiloides* in the strict sense, nor do the flight-feather relationships; conversely, the coloration does not fit the subspecies *viridanus.* The bird from Hatisar, however, undoubtedly belongs to *viridanus.*

Horizontal, vertical: The *viridanus* specimen was occupying its winter quarters during II, in riverbank shrubbery in the Rapti Valley (300 m); two others were living E V in the local *trochiloides* breeding population, to which they obviously did not belong as breeding birds (3650 m). The two and the Lete specimens are also evidence of extremely late passage of a population that is presumably breeding a considerable distance away.

Phylloscopus trochiloides trochiloides (Sundevall)

Material: 24 specimens: **D** Myagdi Distr., Dhorpatan, 2950 m, 12.V.1973: 1♂ * upper Myagdi Khola, pasture Dobang, 2400 m, 25.V.1995: 1♂ ** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650-3950 m, 22.V.-4.VI.1970, 12.VI.1973: 7♂, 5♀ ** Mustang Distr., Thakkhola, Thaksang, 3150 m, 7.-10.VII.1970, 2.-5.VII.1973: 1♂, 4♀, 1 o, 1 pull. (with conspicuously intensive-coloured wing bar). **N** Chitawan Distr., Rapti Valley S Tekouli, Hatisar, 300 m, 10.II.1970: 2♂. **S** Solukhumbu Distr., Thame Teng, 3900 m, 6.X.1970: 1♂.

Measurements: **Wing**-L ♂ (11) 62-68 mm, $\bar{x}$=64.7, s_d=1.78; 2♂ from Chitawan Distr. with 58 and 59 mm fall in the range of ♀ (no remark on the label); ♀ (9) 58-60.5 mm, $\bar{x}$=59.3, s_d=1.10; o 59.5 mm. – **Tail**-L ♂ (11) 49-54 mm, $\bar{x}$=52.5, s_d=1.45; ♀ (9) 46-49 mm, $\bar{x}$=47.4, s_d=1.33; o 48 mm. – **Bill**-L ♂ (10) 10-11 mm, $\bar{x}$=10.2, s_d=0.42; ♀ (8) 10-11 mm, $\bar{x}$=10.3, s_d=0.38; o 10 mm. – **Tarsus**-L ♂ (11) 18.5-21 mm, $\bar{x}$=20.2, s_d=0.64; o 19 mm. – **WTI** (22) 14.9-20.0%, $\bar{x}$=18.2, s_d=1.25. – **TWI** (22) (76.7) 79.0-82.4%, $\bar{x}$=81.1, s_d=1.39.

Notes: A ♂ from the upper Terai, Chitawan, 10.II.1970 (ZFMK 71.853) having a WTI of 13.8% and a TWI of 85.3% was not included here, as these values lie outside (below and above, respectively) the range of variation of the others.

V- and VI-♂ from Dhorpatan and Ringmo have slightly to distinctly (5x3 mm) enlarged gonads. – 1 ♂ (V): beak dark brown, light flesh-coloured underneath. Feet ash-gray.

Horizontal: Our data (passage and breeding localities) from NW Dhaulagiri to the Sikkim border. – Ringmo/Phoksumdo Lake (22.V.-4.VI.; 11.-15.VI. 1970, 1973, see Material); ascent to Bagar La (16.VI.); Barbung Khola near Kakkot (12.VI. all :Dolpo); – Dhorpatan (12., 21.V., see Material :Myagdi); – Thaksang/Tukche (27.IV.1980, 2.-5.VII.1973, 7.-10.VII.1970); Purano Marpha (7.VII. both :Mustang); – between Pisang and Manang (18.IV. :Manang); – foot of Mt. Everest, Thame Teng (6.X. :Solukhumbu); – Lumbasumba Himal, Thudam; E Thudam (26.V.), S Kanchenjunga, upper Simbua Khola, 10.V. both :Taplejung); – Chitawan (10.II., c.f. Material, :Chitawan).

Vertical: Breeding season (V-VII; X): because of the late migratory activity, which continues into V, individuals (populations) were considered as inhabiting the breeding-area belt only if they were found singing for several days in a row. – In detail: 3000-3100m Kakkot, Barbung Khola (V; :Dolpo); 3150 m Thaksang (IV, VII); 3200 m Purano Marpha (VII; both :Mustang); 3550m Thudam (V; :Taplejung); 3600-4100m Phoksumdo Lake (V, VI; :Dolpo); 3700 m ascent to Bagar La from Ringmo (VI; :Dolpo); 3820-3950m descent to Thudam from Tangje La (V; :Taplejung). – 3900 m Thame Teng (X; :Khumbu), this specimen evidently belongs to the local breeding population (cf. Diesselhorst 1968:279). – Outside the breeding season: 300 m, Rapti Valley, Tekouli (II :Chitawan: see Material).

These data imply a vertical belt about 1100 m wide, though it may well not be occupied throughout its extent in all regions. Diesselhorst (1968:280) found a range of only 3450-4200 m in the Khumbu, and Inskipp & Inskipp (1991) report 2440-4270 m for the status as summer visitor. The much lower limit evidently applies to late birds on passage and by no means to locally breeding birds. The upper limit is reached not everywhere and only by thin populations.

Habitat: *Ph. trochiloides* inhabits forest of varying structure but never closed, extensive timber forest; the species is always found in sparsely wooded to open areas, the marginal parts of timber forests (e.g., clearing Thaksang/Tukche) of various composition, mainly

comprising *Pinus, Abies, Cupressus, Juniperus, Betula,* and even bushes near the forest such as *Rosa, Berberis, Clematis* with occasional small *Rhododendron* (Thudam). This habit enables it to penetrate as far as the tree line, where it can still colonize open shrub formations of tall *Salix* (Phoksumdo Lake) but does not enter the dwarf-shrub zone. All the breeding regions known so far are located in Nepal in the immediate vicinity of the main chain, not in the adjacent foothills (cf. Diesselhorst 1968:281). The dry north side of the mountains is included in the area to the extent that forest bordered by shrub formations is available (Phoksumdo Lake, upper Barbung Khola, Thakkhola; Manang: Lowndes 1955).

Breeding: Arrival in the breeding areas is not documented; during a sojourn beginning 26.IV.1980 in Thaksang, a confirmed breeding place, the first specimen was heard on 27.IV. and only occasional singing in the following days. Gonads are slightly enlarged in V-♂ from Phoksumdo Lake and distinctly enlarged in those of B VI. 14 specimens caught there (25.V.-4.VI.1970) were found in a few groups of bushes where they did not occupy fixed territories; and even this late 2 were not local (see Migration); hence even B VI fixed territories could not be established everywhere. 1 fledged chick was found on 10.VII. (Thaksang). Late onset of breeding from M V on, corroborated by Diesselhorst (1968:281) for the Khumbu (with chicks from M VII), is consistent with this, but not the extremely early dates of Biswas (1962b), also from the Khumbu. Another indicator of late breeding onset is that on 12.VI.: 1 specimen still remained in Dhorpatan (:Maygdi), outside the breeding area.

Migration: Vertical migrant; reaches the breeding regions M (?) to E IV and stays there at least until B X (3900 m :Solukhumbu, see Material). In II found in the Terai lowland (see Material). Arrival at breeding grounds extends over at least 1 month; sightings outside breeding regions on 12.V. (see Breeding) and 5., 16. and 23.V. (Diesselhorst 1968:279).

Vocalizations: For discussion see above. It has since been shown that the Far Eastern *plumbeitarsus* cannot be distinguished acoustically from *viridanus* (Schubert 1982); it follows that two forms that are distinctly different in coloration and reportedly locally sympatric can do without this important distinguishing character.

Phylloscopus magnirostris Blyth

Material: 5 specimens: **D** Myagdi Distr., Dhorpatan, 2950 m, 9.-17.V.1973: 2♂, 1♀ * upper Myagdi Khola, Boghara, 1800 m, 26.V.1995: 1o (wing and leg) ** Mustang Distr., Thakkhola, Thaksang, 3150 m, 5.VII.1973: 1♂.

Measurements: The following data include two specimens from Khumjung (leg. Diesselhorst). – **Wing**-L ♂ (5) 69-71 mm, $\bar{x}$=69.9; ♀ 65 mm, o 69 mm. – **Tail**-L ♂ (5) 49.5-55 mm, $\bar{x}$=51.7; ♀ 49 mm. – **Bill**-L ♂ (3) 11-11.5 mm, ♀ 11 mm. – **Tarsus**-L ♂ (3) 19-20 mm, ♀ 19 mm. – **WTI** (7) 20.7-23.2%, $\bar{x}$=21.9, s_d=0.98. – **TWI** (6) 71.2-78.6%, $\bar{x}$=74.2, S_d=2.54.

Notes: Gonads of the ♂ somewhat swollen, ovary undeveloped. Beak (♂) gray-brown to black-brown, light orange underneath. Feet (♂) ashy blue-gray or gray horn-colored.

Horizontal: Auditory evidence (IV-VII) obtained by J.M. in most parts of the expedition region at suitable places, some quite densely populated. – Dhorpatan (8.-17.V., see Material; :Myagdi); – Gompa/Tarakot (4.VI.); Suli Gad Valley (20.V., 6.VI.); Barbung Khola Valley at Tarap Khola confluence (10.VI. all :Dolpo); – Thakkhola, many encounters be-

tween Ghasa and Tukche (27.IV.-9.VII.; see Material; all :Mustang); – Chitre (4.-6.V.); Ghandrung (7.V.); Ghorapani Pass and path down to Ulleri (11.VII., 29.VII. all: Parbat); – Trisuli Valley, Dhunche (27.IV. :Rasuwa); – Junbesi (IX; :Solukhumbu); – Lumbasumba Himal, Thudam (26.V.); Tamur Valley, Walungchung Gola (21.V.); Simbua Khola Valley with pasture Lassetham (7., 9.V.); Kabeli Khola Valley near Yamputhin with pasture Omje Kharka (28.IV.-3.V. all :Taplejung); – Dhorpar Kharka N Ilam (16.IV. :Ilam).

Vertical: Documented by ourselves in the prebreeding (IV) and potential breeding period (V-VII) between 1650 m (Yamputhin, IV) and 3700 m (:Dolpo, below Bagar La, VI). The breeding zone does not cover the entire altitude belt: the specimen in Yamputhin disappeared after singing for 2 days. ♂ at 2000 m (Dhunche :Rasuwa, E IV; Ghasa :Mustang, VII) mark the lower limit of the continuous vertical record. Of 48 auditory finds, 44 are distributed between 2400 and 3550 m; below this range: 1650 m (see above), 1800 m (see Material), 2000 m (see above), 2100 m (above Ulleri :Parbat, VII); above it: 3650 m Ringmo (:Dolpo, only on 30.V., no breeding place); 3700 m, ascent to Bagar La (:Dolpo, singing 16.VI., whether breeding place unknown).

Habitat: *Ph. magnirostris* is the only *Phylloscopus* species in the Himalayas that is closely associated with and even acoustically adapted to fast-flowing, noisy mountain brooks and rivers and, consequently, to linear (one-dimensional) territories (cf. *Ph. borealoides* in Japan/Sakhalin, Martens 1988). It stays mainly in the forest vegetation along the streams (Fig.40) and more rarely in open shrubbery, also near the water (upper Tamur below Walungchung :Taplejung, V). This association is so regular and constant that occasional departures are conspicuous: in the *Abies-Pinus* forests around Thaksang (:Mustang) a few individuals could be heard during all summer visits (1970, 1973, 1980; IV, VII), in locations where there is no flowing water for kilometers. The species was also heard singing at other places away from water, only as we were passing through, but these were not necessarily breeding sites.

The north flank of the mountains is regularly occupied, wherever forest or bushy vegetation accompanies rivers. In the Suli Gad Valley it is common, sometimes with a row of singing ♂ at intervals of 300-500 m (:Dolpo, 2850-3100 m, VI). In the upper Barbung Khola singing was heard above the junction with the Tarap Khola (2500 m, VI) and there were several ♂ at the bridge before Kakkot (:Dolpo, 3200 m, VI) where forest vegetation is fading out. The sites where it is routinely found in Thakkhola (:Mustang, IV, V, VII) are also in the region of distinctly reduced monsoon influence. Hence the species is not bound to a particular type of vegetation, and does not even have a general preference for deciduous forest; although this is usually the vegetation along rivers on the S flank, it is only locally so on the N side of the main flank. It is only subtropical climate, in the strict sense, that *magnirostris* seems to avoid, and also the upper subalpine level (cf. v. Vietinghoff-Scheel 1988).

Because the territories extend along rivers ("one-dimensional territories"), the birds are easy to observe. Between Ghorapani Pass and Ulleri (:Kaski, 2750-2100 m, 29.VII.) at least 10 ♂ were singing (see above), and I found it likewise common in the upper Myagdi Khola (2000-3200 m).

Breeding: First song on 16.IV. (Dhorpar Kharka :Taplejung). ♂ gonads slightly enlarged in the first half of V. Breeding possible from second half of V on, perhaps not until VI; no accurate data are as yet available for Nepal (cf. Bates & Lowther 1952 for Kashmir). So far there is no documentation of breeding in Nepal.

Vocalizations: Territorial song a very characteristic whistle sequence of 5 notes, arranged in 3 groups of 1-2-2 notes each, decreasing in pitch. These bright, silvery, sharp whistles easily penetrate the noise of the brook (Martens 1980, Martens & Geduldig 1990). This kind of verse seems to exist throughout the area with no discernible dialects (personal observations, also in Kashmir; tape recordings of A. Gebauer in Qinghai, China), although certain authors have described the verse as comprising only 4 notes (Weigold in Stresemann 1923, China; Schäfer 1938, Tibet), sometimes 6 notes (Diesselhorst 1968:279; Nepal). Singing from about M IV on (see above) after return from the wintering regions until at least VII (29.VII. many between Ghorapani and Ulleri :Parbat), then again IX (Junbesi :Solukhumbu).

Phylloscopus pulcher pulcher Blyth

Material: 14 specimens: **D** Myagdi Distr., Thankur, N Dhorpatan, 3350 m, 26.V.1973: 1♂ (song specimen) * upper Myagdi Khola, N pasture Dobang, 2950 m, 24.V.1995: 1♂, 1♀. ** Mustang Distr., Chadziou Khola, 2600 m, 23.X. and 3.XI.1969: 1♀, 1 o. **N** Makwanpur Distr., Mahabarat Mts., Daman, 2500 m, 23.II.1970: 2♂. **B** Kathmandu Valley, Mt. Pulchoki, 2700 m, 28.I.1970: 1 o. **J** Ramechap Distr., Mt. Chordung/Jiri, 2900 m, 28.-30.III.1973: 2♂, 1♀ * Thodung, 3200 m, 6.IV.1973: 1♀. **S** Solukhumbu, confluence of Imja- and Phunki Drangka, 3250 m, 30.IX.1970: 1♀ * Lughla, 2950 m, 22.X.1970: 1 o.

Measurements: **Wing**-L ♂ (6) 53.5-62 mm, $\bar{x}$=58 (both ♂ from the Mahabarat Mts. are notably small, 53.5 and 55 mm); ♀ (5) 54-54.5 mm, $\bar{x}$=54.3; o (3) 55-57 mm. – **Tail**-L ♂ (6) 37.5-44 mm, $\bar{x}$=41.5; ♀ (5) 37-40 mm, $\bar{x}$=38.2; o (3) 39-41 mm. – **Bill**-L ♂ (6) 9.5-10.5 mm, $\bar{x}$=10, s_d=0.48; ♀ (5) 9-10.5 mm, $\bar{x}$=9.9; o (3) 10-10.5 mm. – **Tarsus**-L ♂ (6) 18.5-20.5 mm, $\bar{x}$=19.4, s_d=0.74; ♀ (5) 18-19.5 mm, $\bar{x}$=18.7; o (3) 18.5-19.5 mm. – **WTI** (14) 14.0-19.3%, $\bar{x}$=17.4, s_d=1.41. – **TWI** (14) 67.9-72.7%, $\bar{x}$=70.7, s_d=1.51.

Notes: Gonads of the ♂ from Thankur (26.V., song specimen) are very large (9 x 6 mm). The ♀ from the Chadziou Khola, 23.X., is moulting the body-feathers. Beak black with yellowish or reddish base. Feet dark gray or dark olive.

Horizontal: We found it in the entire region investigated, from Dhaualgiri to the eastern border of the country, but during winter not in the lowlands. – Thankur (26./27.V. :Myagdi); – Cheng Khola (8.V.); ascent to Bagar La (16.VI. :Dolpo); – Purano Marpha (24.IV.); Thaksang/Tukche (29.IV., 1.-7.VII.); Chadziou Khola (23.X., 3.XI., see Material; all :Mustang); – Thimang (14.IV. :Manang); – Trisuli Valley, Syng Gyang (24.IV. :Rasuwa); – Daman (23.II., see Material; :Makwanpur); – Pass Ting Sang La (14.IV. :Sindhu Palchok); – Kathmandu Valley, Balaju (17.III.); Phulchoki Mt. (22.III. :Lalitpur); – Chordung Mt. (28.III.-1.IV.); Thodung (4.-7.IV. :Ramechap); – Lughla (22.X.), confluence of Imja and Phunki Drangka (30.IX. :Solukhumbu); – Gabri Khola, Pomri La, descent to Pahakhola (26.-30.V.); Thudam (26.V.); Kangla Khola, descent to Thudam (25.V. all :Sankhua Sabha); – Ladza Khola W Walungchung Gola (21.V.); upper Simbua Khola (10.-13.V.); pasture Lassetham E upper Simbua Khola (7.-9.V. all :Taplejung); – Paniporua (:Panchthar, E IV); Dhorpar Kharka (14.-15.IV. :Ilam).

Vertical: Because in winter *pulcher* departs only slightly from the vertical belt in which it breeds, unless breeding is actually documented the vertical limits and time of breeding cannot be specified precisely. The breeding period and hence the time when the birds occur only at the breeding sites is here considered to be minimally from V to VII.

Our own sightings throughout the year: 1400 m (III, Kathmandu) to 4100 m (E V, Gabri Khola). – Breeding season (V-VII): finds at 24 sites between 3250 m (10.V., upper Simbua Khola :Taplejung) and 4100 m (E V; Thudam, Gabri Khola :Sankhua Sabha); uniformly distributed over this altitude range. This corresponds to a vertical belt 850 m wide. Diesselhorst (1968:274) reported a breeding belt with the limits 3600-4300 m, while Inskipp & Inskipp (1991) gathered data from predominantly 3500 to 4000 (4265) m. Taken together, the data imply a breeding zone of about 1000 m.

Outside the breeding season (IX-IV): finds at 12 sites between 1400 m (M III, Kathmandu) and 3250 m (E IX, Phunki :Solukhumbu; M IV, Ting Sang La :Sindhu Palchok); closely grouped sightings only above 2550 m (M II, Daman :Makwanpur; M IV, Thimang :Manang). This series also includes data near the potential breeding grounds (above ca. 3200 m) beginning E III (Chordung, 2900 m; B IV, Thodung, both :Ramechap, 3200 m), demonstrating that these regions are occupied long before breeding actually begins and can easily be reached from the nearby winter quarters.

Habitat: At breeding time *pulcher* inhabits the subalpine coniferous forest; its altitude range seems to coincide largely with, but not be strictly limited by, that of the *Abies* species *spectabilis* (W) and *densa* (E Nepal). The lowest-altitude territories are always to be expected where the first firs appear in the zone of evergreen oaks, chiefly *Quercus semecarpifolia,* hence from ca. 2900 m upward (but it is just in this region, up to ca. 3200 m, that there are no known VI finds; cf. Breeding). Above the *Abies* zone it occurs in the adjacent *Betula utilis* belt, up to the last large trees or even bushes: *Juniperus, Betula,* large *Berberis* and *Rhododendron.* The dwarf-shrub zone with small rhododendrons is not colonized. Probably this *Abies* zone is occupied only in the region of the main mountain range and not where it extends S into the foothills, far away from the main range. Consequently there were no sightings in the *Abies* zone around Dhorpatan in IV and V, nor at Jiri and Thodung in V/VI (Diesselhorst 1968:274), although the species was present there E III/B IV (and hence only passing through?). In the dry regions N of the main range scattered *pulcher* are sighted (ascent to Bagar La :Dolpo, 3700 m, VI, *Abies;* regularly at Thaksang :Mustang, IV, VII), but the too-dry Dolpo forests are avoided, e.g. at Ringmo (:Dolpo, V, VI; *Pinus, Cupressus).*

Within this clearly delimited vegetation zone, closed stands seem to be preferred, even including uniformly tall *Abies* forest, though open stands are occupied to a lesser extent, occasionally even the edges of clearings. At the treeline only open formations are available (cf. Vocalizations). Diesselhorst (1968:274) reports similar structures on Mt. Everest.

Breeding: Begins late, in accordance with the high altitude of the breeding regions. Gonads still undeveloped E III/A IV (testes up to 1 mm, Chordung, Thodung), E V very large (9x6 mm, Thankur). Egg-laying not until VI (3600-4300 m, :Solukhumbu, Diesselhorst 1968:274). Data for similarly late breeding in VI and VII in Whymper (1907) (W Himalaya), Weigold (1923) (China), Whistler (1926) (W Himalaya).

Migration: Only slightly vertical. Even the higher parts of the area are not vacated until late in the year: E IX at 3250 m (see above), according to Diesselhorst (1968:273) M IX, according to Fleming et al. (1975) as late as E X at 4000 m. Even I and II at altitudes near the boundary of the breeding regions, but then (always?) away from the main range: E I (2700 m, Phulchoki Mt., see above), E II (2500 m, Daman, see above); according to Inskipp & Inskipp (1991) even higher, without data. Arrival of *pulcher* in the breeding zone is correspondingly early, but at this time (E III/B IV) the altitude at which breeding actually begins cannot be determined.

Vocalizations: Long, two-part verses comprising a typical purring sound, with various rattling parts and intermediate calls combining the two (Martens 1980); usually sung at medium height in the firs, never in the treetops. *Ph. pulcher* begins to sing while still in its winter quarters: 17.III. Kathmandu 1400 m, 22.III. Phulchoki Mt. 2700 m. No singing in autumn.

Phylloscopus maculipennis (Blyth)

Taxonomic notes: According to Ticehurst (1938:121) *m. maculipennis* has a wing length of 48-51 mm in ♂ and 45.5-50 mm in ♀ (♂/♀ n=136), and in *virens* (breeding region unknown) it reaches 55.5 mm. Because the form *centralis* Ripley of W and C Nepal is regarded as part of a cline, the measurements reported here (see below) must be evaluated accordingly: 50.5-54.5 mm in 9 ♂. Therefore no subspecific assignment is undertaken, and the sample is simply termed a *maculipennis* population group.

Material: 5 specimens: **D** Myagdi Distr., Dhorpatan, 2950 m, 23.V.1973: 1♂. **G** Parbat Distr., Ghorapani, 2800 m, 27.VII.1970: 1♂; between Ghorapani and Ulleri, 2500 m, 11.VII.1973: 1♂ pull. **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 31.III.1973: 1♂ * Thodung, 3200 m, 6.IV.1973: 1♂.

Measurements: Partly also material of the Diesselhort collection is included. – **Wing**-L ♂ (9) 50.5-54.5 mm, $\bar{x}$=51.3, s_d=1.41; ♂ pull. 51.5 mm. – **Tail**-L ♂ (8) 33-38 mm, $\bar{x}$=35.2, s_d=1.60; ♂ pull. 33 mm. – **Bill**-L ♂ (3) 8-9 mm; ♂ pull. 7 mm. – **Tarsus**-L ♂ (4) 17-17.5 mm; ♂ pull. 17 mm. – **WTI** (11) 12.1-17.7%, $\bar{x}$=15.3, s_d=1.56; pull. 14.6%. – **TWI** (10) 66.0-70.5%, $\bar{x}$=68.2, s_d=1.47; pull. 64.1%.

Notes: Gonads very small on 27.VII., swollen on 31.III. and very large on 6.IV. and 23.V.; see also Diesselhorst (1968:277).

Horizontal: Only scattered sightings at Dhaulagiri and Annapurna, becoming more common from the Ting Sang La Pass (about 86°E) to the E border of the country. – In detail: Dhorpatan (16.IV., 23.V. :Myagdi); – Pass Ghorapani (27.VII.; see Material; :Kaski), – Pass Ting Sang La (14.IV. :Sindhu Palchok), – Mt. Chordung/Jiri (31.III., 2.IV.; see Material); Thodung (4.-5.IV., see Material; both :Ramechap); – Pahakhola and below Pahakhola (31.V. to 6.VI. both :Sankhua Sabha); – ascent to pass Deorali from Yamputhin (17.V.), Omje Kharka (5.V.); Yamputhin (27.IV. all :Taplejung); – Paniporua (17.IV. :Panchthar); – Dhorpar Kharka (14.IV.); Mai Pokhari (10.IV. both :Ilam).

Vertical: In and near breeding season (IV-VII): sightings at 14 sites between 1800 m (E IV, Yamputhin) and 3200 m (B and E IV, Thodung; Ting Sang La); apart from the two extreme altitudes, narrower range between 2100 and 3200 m, greatest density (at 10 sites) between 2300 and 3000 m. Because breeding evidently begins early (see Breeding), these data can indicate a belt at most 1850 m wide, or 1250 m if the IV data are excluded. Inskipp & Inskipp (1991) report summer visitors more narrowly restricted, 2440-3500 m.

Habitat: Distribution is concentrated in the moderate subtropical deciduous-forest zone; our records from stands of *Castanopsis, Quercus, Alnus, Lithocarpus, Magnolia,* tree *Rhododendron* upwards into the lower part of the subalpine level, characterized by extensive stands of *Quercus semecarpifolia* and *Abies.* The types of formation are as diverse as the plant communities themselves: open stands (of *Quercus* [Dhorpar Kharka, Pahakhola] and *Castanopsis* [Mai Pokhari]) are colonized as well as dark, uniform *Abies* forest (Thodung) or mixed stands including *Quercus semecarpifolia* and/or large *Rhododendron* (Thodung, Chordung Mt.). There are no discernible preferences, in any case euryoecious. Usually found in the upper stratum of closed or open forests; only rarely caught in nets near the ground, and therefore difficult to document unless the vocalizations are recognized. More common in E Nepal, from about 86°E to the Sikkim/Darjeeling border.

Breeding: Evidently early onset. Beginning indicated by singing ♂ E III and B IV at the potential breeding altitude (see above), associated with conspicuous vocal altercations at territorial boundaries (countersinging, 5.IV. Thodung), and early enlargement of gonads (3 mm and 6 mm on 31.III. and 6.IV., respectively). Adults with food in beak and warning, evidently near nest, on 17.V. (above Yamputhin toward the Deorali pass, 2700 m) suggest egg-laying from E IV on. One chick sighted on 11.VII. had been fledged for some time (see Material). Diesselhorst (1968:278) found correspondingly early onset of breeding: nest-building on 6.V., egg-laying even before 8.V.

Vocalizations: Short twittering verse, ca. 1 s long, often sounds tit-like, especially because of comparable two-element-group structure; single notes with marked, rapid frequency change ("steep"), for details see Martens (1980:47).

Phylloscopus proregulus

Taxonomic notes: Regarding morphology and taxonomy of the *proregulus* complex: Alström & Olsson (1990), Alström, Colston & Olsson (1990, 1992) summarize the characters, especially the vocal ones, and the taxonomic conclusions from their studies. According to them, (i) *proregulus* and *chloronotus* (incl. *simlaensis)* should be considered allospecies*, and (ii) there are evidently two sympatric species in China: *Ph. chloronotus* and *Ph. sichuanensis.* The two species do not differ in their measurements or the flight-feather relationships. In the coloration of head and wings, however, *sichuanensis* exhibits characters noted by La Touche (1922) in describing *Ph. proregulus yunnanensis.*

In 1926 (:245) La Touche declared the *proregulus yunnanensis* described from Mengtz in S Yunnan to be a separate species. Paler and less distinct head markings and the absence

* Cheng (1987:809) mentions an intergradation between *chloronotus* and *proregulus* in E Qinghai, which Alström & Olsson (1990:38) regard as unfounded. The *proregulus* symbols on Cheng's map 630 are clearly not migration symbols, and Ticehurst (1938:116) had earlier emphasized, on morphological grounds, the intermediate character of *kansuensis* Meise between *chloronotus* and *proregulus.* Therefore the distinct allopatry between *proregulus* and *chloronotus* remains to be specifically confirmed. All 7 *Ph. proregulus kansuensis* available (including the type specimen) dispose of the dark wing shadow which is characteristic for *Ph. proregulus.* Wing/tail indices of this series cf. Tab. 11. Lenght of P10 corresponds with *chloronotus,* also TWI; WTI is between *chloronotus* and *proregulus.* All values are in agreement with Ticehurst's view (l.c.).

of a black spot or "shadow" on the secondaries below the wing bar characterize both *yunnanensis* and *sichuanensis*. 31 *chloronotus* in the American Museum of Natural History (New York) have the "wing shadow", but a "cotype" of *yunnanensis* (AMNH 450 048), ♂, Mengtsz, 16.X.1920, was immediately noticeable due to its weakly developed head stripe and the absence of a "wing shadow". Ticehurst (1938:119) declared, "The presence or absence of the dusky spot on the wing below the lower bar is purely an individual variation". He studied 170 skins of *chloronotus*. Eck examined 113 skins of the forms *proregulus, chloronotus* (incl. *forresti, newtoni)* and *simlaensis,* and found only two from Nepal that clearly lacked this "shadow" below the wing bar! Both birds must for the time being be regarded as belonging to *simlaensis:* ♂, Gompa, V, well developed testes; ♂, Dhorpatan, V, well developed testes (see Material). However, they differ in their wing/tip indices (WTI), that of the former being 17.6% and of the latter, 11.3%! The latter WTI is well below all the other WTI's. Furthermore, the ♂ from Gompa (higher WTI) has a wing length of a good 56 mm, while the one from Dhorpatan, with WTI of only 11.3%, has wings only 48.5 mm long (Fig.86a). Ticehurst noted for ♂ of *chloronotus* and *simlaensis* a minimum of 52.5 mm (evidently with no specimen from Nepal), whereas Biswas (1962b: 416) reports 48-58 mm for 6 ♂ from central Nepal (i.e. ssp. *chloronotus).* It seems clear that a 10-mm range of variation for these small warblers is out of the question. La Touche (1922) reported 52-54 mm for 5 *yunnanensis.* 8 *chloronotus* ♂ from Nepal have wing lengths of 50-57 mm, while those of 7 *simlaensis* ♂ from Nepal are 53-56 mm and of 3 additional *simlaensis* (?) ♂, 48, 48.5 and 48.5 mm (giving an overall range of 48-56 mm); the last 3 ♂ had WTI's of 16.7%, 18.6% and 11.3% (!) and were collected in Muri (III), at the Chadziou Khola (X) and near Dhorpatan (V); see Material.

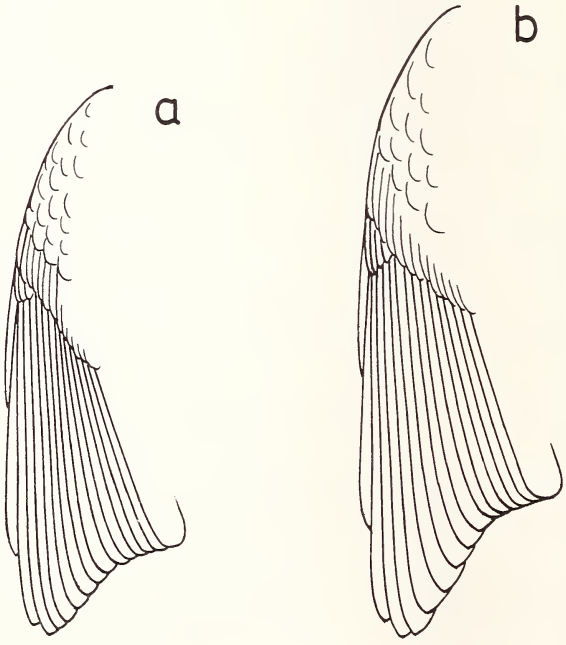


Fig.86: Wings of *Phylloscopus proregulus* specimens to show differences in size and proportions of P10 (see text); a) ♂, Dhorpatan 9.V.1973 (Coll. Martens 816), b) ♂, Dhorpatan 16.V.1973 (Coll. Martens 815). Drawings to scale.

The absence of the "shadow" on the secondaries is therefore very rare (2 instances in 82 skins) and is associated with both short and long wings. Conspicuous shortness of the wings in turn is associated with extremely low or relatively high WTI. The flight-feather relationships (TWI) for the birds collected in Nepal are unremarkable (cf. Tab.10).

Tab.10: Primary-feather relationships of the *Phylloscopus proregulus* collected in Nepal, mostly during the breeding season (see above). The asterisk indicates that the bird with the extremely low WTI is one of the 3 specimens in this category. The table shows that when P8=P5, P9 is not <P1, and when P8=P5, P9 is not >P3. *Ph. p. proregulus* has more pointed wings: see numbers in brackets.

	P9<P1	P9=P1	P9>P1	P9=P2	P9>P2	P9=P3	P9>P3
P8=P6	–	–	–	–	–	–	(2)
P8>P5	–	1	3*(1)	1	1(2)	3(2)	(17)
P8=P5	–	2	1	1	1	–	–
P8<P5	2	1	4	2	1	–	–

Tab.11: A comparison of *simlaensis* (or *chloronotus)* with northern *proregulus* reveals the following differences in wing proportions (cf. Fig.87).

	WTI (%)	$\bar{x}$	s_d	n	TWI (%)	$\bar{x}$	s_d	n
simlaensis	14.6–20.0	18.2	1.48	16	69.3–75.7	72.7	1.48	15
chloronotus	15.4–19.0	17.4	1.24	12	71.8–76.6	73.6	1.60	11
proregulus	18.3–22.9	20.3	1.26	27	72.3–79.2	76.0	1.65	22
kansuensis	17.3–21.6	18.9	1.73	7	73.3–78.2	75.7	1.63	7

Notes: The birds with the extremely low WTI are not included in the table; cf. Fig.86a.

The unusual aspect of this WTI/TWI comparison is that the northern *p. proregulus* with higher WTI (and accordingly more pointed wings with shorter P10) does not have the lower TWI but rather a higher TWI than the breeding birds of Nepal (Fig.87).

On the basis of the available material it is impossible to separate from *simlaensis* another taxon with smaller body size. However, it would be desirable to compare *sichuanensis* once again in detail with *yunnanensis*. It is conceivable that this species might also exist in Nepal, in a different local form. It is, in conclusion, not to be excluded that *sichuanensis* is a junior synonym of *yunnanensis*.

Phylloscopus proregulus simlaensis Ticehurst

Material: 17 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 22.V.-3.VI.1970: 1♂, 2♀ * Gompa/Tarakot, 3300 m, 12.-15.V.1970: 2♂, 1♀ ** Myagdi Distr., Dhorpatan, 3000 m, 12.-16.IV.1970: 3♀ * Dhorpatan, Uttar Ganga Plain and Uttar Ganga Valley, 2950 m, 20.-22.IV.1970 and 16.-19.V.1973: 4♂ * Myagdi Khola, Muri, 2100 m, 25.-30.III.1970: 2♂ ** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 24.-30.X.1969: 1♂, 1 o.

Measurements: The data of the 3♂ with wing length 48 mm and 48.5 mm are mentioned below in a separate chapter. – **Wing**-L ♂ (7) 53-56 mm, $\bar{x}$=55, s_d=1.19; ♀ (6) 48-53 mm, $\bar{x}$=50.6, s_d=1.74; o 50 mm. – **Tail**-L ♂ (7) 38.5-42 mm, $\bar{x}$=40.2, s_d=1.08; ♀ (6) 33.5-38.5 mm, $\bar{x}$=35.9, s_d=1.99; o 36.5 mm. – **Bill**-L ♂ (7) 7-8 mm; ♀ (6) 7-8 mm; o 7.5 mm. – **Tarsus**-L ♂ (7) 16-17.5 mm; ♀ (6) 16-18 mm; o 17 mm.

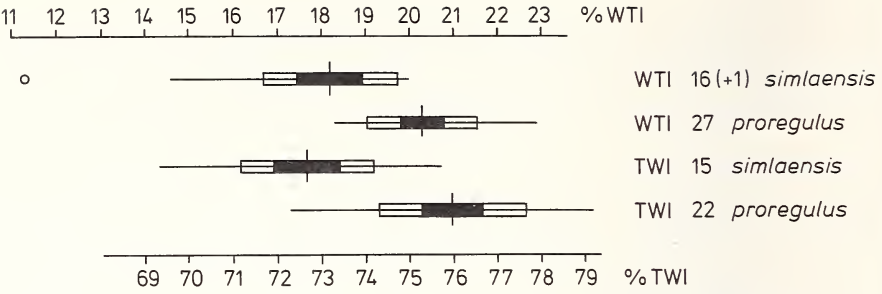


Fig.87: Diagram to show differences of statistic values of wing/tip index (WTI) and tail/wing index (TWI) of *Phylloscopus proregulus simlaensis* and *Ph. p. proregulus.*

3 short-winged ♂ (see above): **Wing**-L ♂ (3) 48/48.5/48.5 mm. – **Tail**-L ♂ (2) -/35/36 mm. – **Bill**-L ♂ (3) 7/8/7.5 mm. – **Tarsus**-L ♂ (3) 16.5/17/16 mm.

Horizontal: Our data cover the Dhaulagiri area (see Material). – Ringmo/Phoksumdo Lake (21.V.-6.VI.; see Material); ascent to Bagar La (16.VI.); Gompa/Tarakot (12.-16.V., 1.-7.VI.; see Material; all :Dolpo); – Dhorpatan (12.-22.IV., 16.-24.V.; see Material); Muri (25.-30.III., see Material; both :Myagdi); – Chadziou Khola (24.-30.X.; see Material); Purano Marpha (24.IV., 10.-12.V. both :Mustang).

Phylloscopus proregulus chloronotus (Gray & Gray)

Loc. typ. restr. Central Valley of Kathmandu (Ripley 1950:401).

Material: 5 specimens: **D** Myagdi Distr., upper Myagdi Khola Valley, N pasture Dobang, 2950 m, 24.V.1995: 1♂. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 24.IV.1973: 1♂. ** Sindhu Palchok Distr., Dadar Danda SW Kalinchok Mt., NW Charikot, 3150 m, 20.IV.1995: 1♂. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 29.IX.-2.X.1970: 1♂, 1♀. – The 8 specimens from the Diesselhorst collection (1968:276) gathered between Kathmandu and Khumjung also belong to this subspecies. The ♂ from the Myagdi Khola is slightly more yellowish on the belly, but otherwise not distinguishable from *chloronotus;* it probably represents *chloronotus x simlaensis.*

Measurements: They include the Diesselhorst material. – **Wing**-L ♂ (9) 50-57 mm, $\bar{x}$=53.6, s_d=2.33; ♀ 50 mm; o (2) 50.5. and 53 mm. – **Tail**-L ♂ (8) 36.5-43 mm, $\bar{x}$=39.9, s_d=2.30; ♀ 36 mm; o (2) 37 and 38.5 mm. – **Bill**-L ♂ (3) 7.5-8.5 mm; ♀ 7.5 mm. – **Tarsus**-L ♂ (3) 17 and 2 x 18 mm; ♀ 17.5 mm. – ♂ (24.V.1995, Myagdi Distr.) **Wing**-L 51 mm (P8=5, 9<2, P10 10 mm > primary coverts). – **Tail**-L 37.5 mm. – **Bill**-L 8.5 mm. – **Tarsus**-L 17 mm. – **WTI** 13.7%. – **TWI** 73.5%.

Horizontal: Our observation range from the Myagdi Valley to near the E border (see Material). – Upper Myagdi Khola (24.V., see Material; :Myagdi); Trisuli Valley, Gosainkund, Syng Gyang (24./25.IV.; see Material; :Rasuwa); – Ting Sang La (16.IV. :Sindhu Palchok); – Thodung/Those (7.IV. :Ramechap); – Thudam (25.V., warn calls, apparently close to the nest); – Walungchung Gola (20.V. :Taplejung).

Vertical *(simlaensis* and *chloronotus):* In and near the breeding season (IV-VI): sightings from 2950 m (Myagdi Khola, VI) and 3000 m (Dhorpatan, nest find) to 3800 m, with most (6 out of 11) of the records at sites at 3200 and 3300 m; higher sites at Thudam 3650 m, ascent to Bagar La 3800 m, Ringmo 3600-3800 m. – Outside breeding season (III): Muri,

2100 m. According to these data, the width of the vertical belt during the breeding season is 800 m. Inskipp & Inskipp (1991) report a broader summer visiting area, 2750-4000 m, with no detailed months' documentation.

Habitat *(simlaensis* and *chloronotus):* All forest formations at the altitudes 3000-3800 m: *Abies* (Thodung, Dhorpatan, Ting Sang La) and *Tsuga* (Walungchung, Myagdi Khola) on the rainy south flanks, in the lowest zone scattered *Quercus semecarpifolia* (Ting Sang La), where the oaks are always intermingled with tree *Rhododendron.* At Thudam the birds also live (and perhaps breed) in open terrain with shrubbery and *Betula,* in the dry zones north of the main range in forests of *Picea* (Tarakot), *Pinus* (Purano Marpha, Ringmo) and *Cupressus* (Ringmo, Purano Marpha). At present, no preference for any of these forest formations is detectable. However, *proregulus* appears to be more abundant in the less rainy regions and wherever the scant precipitation is sufficient for forests to grow (Tarakot; Ringmo), Pallas's Leaf Warbler is present.

The species not only spends much time in the crowns of the trees, as usually emphasized (cf. Diesselhorst 1968:276), but is also often found in the bottom stratum, among the low shrubbery at the edge of the forest. The nest find corroborates this. Most of the specimens were caught in nets near the ground.

Breeding: The gonadal development of the specimens documents the time course of breeding: E III undeveloped (2100 m, vertical migrants); similarly until M IV (Dhorpatan); enlarged to as much as 4 mm E IV (there and Syng Gyang); 5-6 mm M-E V, nest without eggs until 24.V. (Dhorpatan); 12.V. ♀ laying eggs (Gompa); B VI gonads up to 7 mm (Gompa). Hence V/VI should be regarded as the main breeding months. Diesselhorst's (1968:276) VII specimens showed already regressive gonadal development. – The nest (Dhorpatan) was wedged in a vertical fork among the lowest branches of a fir, at 2.5 m; on 24.V. there were still no eggs but the adults were warning intensely. First documentation of breeding for Nepal.

Vocalizations: For territorial song and calls of *p. simlaensis* see Martens (1980:48-52). Considerable frequency differences from nominate *p. proregulus* were noted then and later corroborated by Schubert (1982), who also reported that the note repertoire of *p. proregulus* is larger and its voice louder. These differences cause diminished responses in playback experiments. For instance, *p. chloronotus* does not respond to *p. proregulus* and conversely (Alström & Olsson 1990). J.M. confirmed that at Amur and Ussuri *p. simlaensis* song was not "understood" by nominate *proregulus,* which did not approach the loudspeaker at all upon playback experiments (only a few examples so far).

Phylloscopus inornatus humei (Brooks)

Taxonomic notes: The distribution and the reciprocal relationships of the forms *inornatus, humei* and *mandellii* have been discussed in terms of the latest information by Chrabryj et al. (1989) and Glutz v. Blotzheim & Bauer (1991, 12/II), but not revised. In order not to preempt a revision, we continue here to treat them as conspecific.

Out of the total of 26 skins available from Nepal in the Diesselhorst and Martens collections (Munich and Bonn), only one is definitely an *inornatus* winter visitor (Munich

62.972); it was collected in Kathmandu Valley on 31.X.1962. A ♂ collected there on 17.III.1962 is very similar to *mandellii* (det. Diesselhorst), and the 24 others are *humei.*

Birds of II and III are conspicuous by their gray, worn-out plumage (colouration approximately as in Fig.4 of Tab.4 in Inskipp & Inskipp 1991). In IV and V, after the body-feathers have moulted, they are distinctly more colourful.

Material: 19 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 22.V.-3.VI.1970: 4♂, 4♀ * Gompa/Tarakot 3300 m, 14.V.1970: 1♀ ** Myagdi Distr., Dhorpatan, 3000 m, 16.IV.1970: 1♀ (moulting) * Muri, 2100 m, 25.-29.III.1970: 2♂, 1♀, 2 o ** Mustang Distr., Thakkhola, Tukche, 2650 m, 4.X.1969: 1♂ * Lete Khola oposite Lete, 2400 m, 6.V.1995: 1♀. **B** Kathmandu, 1350 m, 4.II. and 3.III.1970: 1♂ (III), 1 o. – In the following, the specimens for which no sex is indicated are counted as ♂ because of their large size.

Measurements: **Wing**-L ♂ (11) 55-60.5 mm, $\bar{x}$=58.2, s_d=1.89; ♀ (8) 53.5-56.5 mm, $\bar{x}$=55.6, s_d=0.95. – **Tail**-L ♂ (11) 38.5-45 mm, $\bar{x}$=42.1, s_d=1.77; ♀ (8) 37-41 mm, $\bar{x}$=39.5, s_d=1.44. – **Bill**-L ♂ (11) 8-9.5 mm, $\bar{x}$=8.5, s_d=0.59; ♀ (8) 8-9 mm, $\bar{x}$=8.5, s_d=0.36. – **Tarsus**-L ♂ (11) 17.5-19 mm, $\bar{x}$=18.3, s_d=0.64; ♀ (8) 16.5-19 mm, $\bar{x}$=17.9, s_d=0.83. – **WTI** (24) 16.8-20.7%, $\bar{x}$=18.8, s_d=1.07 (nominate *inornatus* from the breeding grounds, n=28, 18.9-23.1%, $\bar{x}$=20.9, s_d=1.35). – **TWI** (24) (67.3) 69.6-75.9%, $\bar{x}$=72.2, s_d=1.99 (nominate *inornatus* from the breeding grounds, n=26, (67.0) 69.4-75.2%, $\bar{x}$=71.6, s_d=1.72).

Notes: The primary-feather relationships for *humei* in Nepal: P9=2: 2x, P9<3: 6x, P9=3: 3x, P9<4: 13x, H9=4: 1x. P10 5-9 mm > coverts (for *inornatus* P10 4-7 mm > coverts).

Horizontal: Close to breeding sesason and breeding season (IV-VI): records only in Dhaulagiri and Annapurna area: Gompa/Tarakot (14.V., 15.VI.; see Material); Ringmo/Phoksumdo Lake (21.V. to 6.VI.; see Material; both :Dolpo), – Lete (6.V.; see Material); Thaksang/Tukche (28.IV. both :Mustang). – Beside breeding season: Dhorpatan (16.IV.); Muri (25.-29.III. both :Myagdi); – Tukche (4.X.; see Material; :Mustang); – Kathmandu Valley (4.II., 3.III. :Kathmandu).

It is unclear whether the two specimens from Thakkhola – singing ♂ heard near Tukche (28.V., record unconfirmed in VII 1970 and 1973) and the netted ♀ from Lete (6.V.) – were breeding birds. Gompa/Tarakot, Phoksumdo Lake and the Thakkhola localities are NW and E outposts of the Dhaulagiri massif and are all in the rain shadow of the main chain. If Thakkhola is a breeding area at all, the local population is certainly extremely local and thinned out. In any respect, the easternmost *humei* populations of the Himalayan arc are within the Dhaulagiri massif.

Vertical: Breeding season (as above): Thaksang 3250 m, Gompa/Tarakot 3300 m, Ringmo 3600-3700 m. That is, the finds are limited to a narrow range of altitudes, about 400 m. Inskipp & Inskipp (1991) report 2800-3660 m for summer finds, but no details given. – Winter visitors have been sighted at 1350 m (Kathmandu Valley, B II, B III); documented altitudes for birds of passage in spring are 2100 m (Muri, E III) and 2950 m (Dhorpatan, M IV), in fall 2650 m (Tukche, B X).

Habitat: In breeding season at Gompa/Tarakot in tall, sparse *Picea-Betula* forest, similarly at Phoksumdo Lake in open stands of *Pinus wallichiana* and *Juniperus indica* fringed by *Berberis* and *Caragana* bushes, but not in *Betula* and *Salix* formations at higher altitudes. The population density in the Ringmo forest is high (details in Martens 1972:108-109).

Breeding: All of 4♀ specimens (M-E V, 1 Gompa, 3 Ringmo) are either in the process of egg-laying or nearly ready to begin, the testes are enlarged but still relatively small: 2 x 3 to 4 x 4 mm. Hence the breeding season of this Dhaulagiri population begins more or less synchronously, in the second half of V. Cf. data for Kashmir in Bates & Lowther (1952:134) and Price & Jamdar (1991a).

Migration: *Ph. i. humei* is regarded as a particularly common winter visitor in Nepal (Biswas 1962b), which according to Inskipp & Inskipp (1991) is found throughout the W-E extent of the country. Most of this documentation presumably refers to the Central Asian rather than the small Himalayan *humei* populations; documented in Nepal from B X (see above, cf. also Biswas 1962b, where older sources are cited, and Diesselhorst 1968:275). Visitors remain until M IV (see above) and E IV (Biswas 1962b). Perhaps even the Thaksang (28.IV.) and the Lete (6.V., see Material) specimens refer to late passage migrants.

Vocalizations: The verse of *humei* song is hardly identifiable as such because of its simple structure; including the characteristic long-drawn-out "clinking sound" it is better termed a "call" song. There are only slight individual degrees of variation in its form, and each ♂ probably sings in an invariant way typical of the individual (Martens 1980, Schubert 1982). Apart from the individual differences, the repertoire in the region of the SW limit of the area (Nepal, Kashmir) cannot be distinguished from that of C Asian (Kirghizia; pers.obs.) populations and that near the NE limit (Mongolia), even with respect to details of the clinking sound (Schubert 1982), so that there seems to be no tendency at all for dialects to develop. The nominate form *Ph. i. inornatus* lacks the clinking sound and has an only slightly larger differing note repertoire. In the breeding season the two forms are sympatric W of Lake Baikal and in the Sajan Mts. (summarized in Chabryj et al. 1989, Glutz v. Blotzheim & Bauer 1991, 12/II: 1120), correspondingly there appear to be conspicuous acoustic differences between them. The isolating mechanisms, if such exist, remain to be discovered.

Phylloscopus fuscatus fuscatus (Blyth)

Phylloscopus [fuscatus] incl. *fuligiventer*

Taxonomic note: The two other subspecies, the distinctly larger *robustus* Stresemann and the differently coloured *weigoldi* Stresemann, are certainly not concerned.

Material: 1 specimen: **N** Chitawan Distr., Rapti Valley S Tekouli, Hatisar, 300 m, 10.II.1970: 1♂.

Measurements: **Wing**-L 56 mm. – **Tail**-L 45.5 mm. – **Bill** defect – **Tarsus**-L 20 mm. – **WTI** 16.1% (H9 < 3), – **TWI** 81.3%.

Horizontal, vertical: This specimen was the only individual encountered during the winter field studies 1969/70 and II/III 1974. A regular winter visitor, sparsely documented, during the sedentary phase found at altitudes up to 1600 m (Inskipp & Inskipp 1991).

Phylloscopus fuligiventer fuligiventer (Hodgson)

Phylloscopus [fuscatus] fuligiventer

Taxonomic note: For the relationship between *fuligiventer* and *fuscatus* see Vaurie (1954:9-16) and Ripley (1961).

Material: 1 specimen: **G** Ghorka Distr., NW slope of Rupina La, Manaslu range, 4000 m, 8.VIII.1983: 1♂.

Measurements: **Wing**-L 59,5 mm. – **Tail**-L 46.5 mm. – **Bill**-L 10 mm. – **Tarsus**-L 22 mm. – **WTI** 16.8% (P10 12.5 mm > primary coverts, P9 < 3, P7 longest, outer web of P5-8 notched). – **TWI** 78.2%. – **Testes** 1 mm.

Horizontal: Found by me at 2 sites: in the Manaslu massif NW of Rupina La several pairs were guiding fledged chicks (7.-9. VIII., see Material; :Gorkha); – left-side tributaries of the Arun (Lumbasumba Himal): Gabri Khola above Thudam (29.V.); pasture at Yamuthanga, below Pomri La (30.V. both :Sankhua Sabha). – The W limit of the *fuligiventer* area extends into Nepal; the westernmost breeding site so far discovered is in the Annapurna massif (Thiollay 1980).

Vertical: Only in the alpine zone far above the treeline. The small population at Rupina La lived between 3900 and 4000 m, and that at the Arun tributaries (Lumbasumba Himal) was about uniformly distributed between 4250 and 4450 m.

Habitat: In V and VIII, in both months at the breeding site, in alpine dwarf-shrub vegetation with knee- to at most hip-high dwarf *Rhododendron* and scattered larger *Salix* bushes (Rupina La), at the dwarf-shrub level just below 4000 m, in places degraded by use as pasture, or in ankle- to calf-high *Rhododendron* carpets, also completely open sites with bush vegetation as well as rocky cliffs. The birds creep inconspicuously through the low bushes and are noticeable at most by their calls.

Breeding: On 29.V. copulation observed (Lumbasumba Himal); on 7./8.VIII. the population at Manaslu (Rupina La) still included a few almost independent chicks. The specimen ♂ already has severely regressed gonads. Second documentation of breeding in Nepal.

Vocalizations: E V, evidently in the approach to breeding, surprisingly silent; only a few times a song verse at long intervals was heard. Ludlow & Kinnear (1944:199) also noted for the ssp. *tibetanus* in SE Tibet that "We heard no song" (in V, VI, VIII). At the Yamuthanga J.M. noted a brief, hard, slurred call in long series ("tsr", contact or warning call?), which is composed of a double click (Fig.83f/f') of the 2 ♂ recorded. Calls of *fuscatus* (E Siberia, lower Amur) are harder and still less voiced ("tk") and consist of only 1 click (Fig.83h). In the only recorded verse, *fuligiventer* produces note-groups of 4 notes each (Fig.83e). Verses of *fuscatus* (Fig.83g-g") are distinctly simpler in structure, usually consisting of only one, often quite simple note repeated several times.

Phylloscopus affinis (Tickell)

Taxonomic note: See Alström & Olsson (1992) for characters and distribution of *Ph. affinis* and *Ph. subaffinis*.

Material: 19 specimens: **D** Myagdi Distr., Dhorpatan, 2950 m, 9.-14.V.1973: 3♂, 1♀ ** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650-3950 m, 29.V.-4.VI.1970: 2♂, 3♀ * Tarang, 3600 m, 14.VI.1970: 1♂, 1♀ ** Mustang Distr., Thakkhola, Tukche, 2650 m, 3.X.1969: 1 o. **N** Chitawan Distr., upper Terai, S Tekouli, Rapti Valley, 300 m, 13.II.1970: 1♀. **S** Solukhumbu Distr., Thame Teng, 3900 m, 6.X.1970: 1 o * Tarnga, 4050 m, 13.X.1970: 1♀ * Pangpoche, 4000 m, 29.IX.1970: 1♂ * Valley of Pheriche, Phulung Karpo, 4350 m, 28.IX.1970: 1♂, 2♀.

Measurements: **Wing**-L ♂ (8) 58-62.5 mm, $\bar{x}$=59.7, s_d=1.77; ♀ (9) 54-58 mm, $\bar{x}$=55.2, s_d=1.25; o (2) 53 and 59.5 mm. – **Tail**-L ♂ (8) 43-48 mm, $\bar{x}$=45.2, s_d=1.89; ♀ (9) 39-44 mm, $\bar{x}$=41.9, s_d=1.96; o (2) 41 and 46.5 mm. – **Bill**-L ♂ (8) 9-11 mm, $\bar{x}$=10, s_d=0.60; ♀ (8) 8.8-10 mm, $\bar{x}$=9.7, s_d=0.44; o (2) 9

and 9.5 mm. – **Tarsus**-L ♂ (8) 18-20 mm, $\bar{x}$=19.1, s_d=0.73; ♀ (9) 18.5-20 mm, $\bar{x}$=18.9, s_d=0.57; o (2) 18.5 and 20 mm. – **WTI** (19) 12.1-17.9%, $\bar{x}$=15.0, s_d=1.71. – **TWI** (19) 72.2-78.2 (80.4)%, $\bar{x}$=76.0, s_d=1.88.

Notes: Gonads distinctly active only in the ♂ from Ringmo (E V-B VI). Beak (V) black-brown or dark gray, lower base yellowish, orange or flesh-colored. Feet gray.

Horizontal: Our records are from Dhaulagiri-Annapurna (N parts from Phoksumdo Lake to Thakkhola and in the upper Marsyandi Valley; S Dhaulagiri) and Everest area, in addition Chitawan. – In detail: Dhaulagiri: from Ringmo (23.-28.V., 10.-14.VI.) across the passes Zö La (19.VI.), Büko La and Mo La (20.VI.), upper Barbung Khola, Terang (14.VI.); Tukot (20.VI.) and tributaries (Mukut, 16./17.VI.); Parung La (20.VI. all :Dolpo); – Dudje La (17.VI.); Thakkhola: descent from Dudje La (28.VI.); between Muktinath and Jomosom (singing 21.IV.), Purano Marpha (23.IV., A VII), Thaksang (27.IV., 6.VII.), Tukche (singing 26.IV., common A X) and below Nabrikot (singing 30.IV.), Larjung/Gobang (13.V. all :Mustang); – Marsyandi Valley: from Manang to ascent of Thorung La (singing 19.IV. :Manang); – S Dhaulagiri: Dhorpatan (9.-14.V., see Material; :Myagdi); – Chitawan (13.II., see Material; :Chitawan); – Everest (28.IX. to 13.X.; various localities; see Material; :Solukhumbu).

Vertical: Near and during breeding season (V-VII): our data indicating breeding according to time of year and biotope were obtained between 2550 m (IV/V, Thakkhola) and 4900 m (VI, Dolpo). The lowest were in the dry zone of Thakkhola (Kali Gandaki Valley): 2550 m below Nabrikot (E IV) and near Larjung/Gobang several singing (13.V.), 2570-2650 m at bottom of valley near Tukche (E IV, 8.V., 13.V.), 3100 m (nest find), 3300 m Purano Marpha (E IV, VII), 3150 m Thaksang (E IV, VII), 3500 m between Jomosom and Muktinath (E IV). From Thakkhola the breeding area continues into the high-altitude region N of Dhaulagiri and Annapurna. Data above 4500 m all in Dolpo: 4650 m from Tukot to the Parung La, 4600-4800 m between Büko La and Mo La, 4600-4900 m between Zö La and Büko La (all VI). For specimens from Dhorpatan, 2950 m, in V see under Breeding. – Outside the breeding season (II, IX, X): 300 m Chitawan (II), 2650 m Tukche (X), 3900-4350 m Everest region (E IX, X).

The vertical breeding zone at Dhaulagiri is at least between 3100 m (nest find) and about 4800 m, if the highest VI finds are taken as evidence of breeding. Probably it extends to still lower altitudes down to 2550 m where the species was regularly met in IV, V and VII (see above). The breeding zone in the wet Khumbu is between 3500 and 4350 m, and thus is considerably more restricted (Diesselhorst 1968:270).

Habitat: In Nepal *affinis* must be regarded as an inhabitant of open biotopes where bushes grow, with widely varying extremes. They range from thickets more than head-high, comprising young *Pinus, Berberis, Rosa, Rhododendron, Juniperus* and *Cupressus* bushes near or far from the edges of forests or even in large clearings in the forest zone (Thakkhola, lower limit of area), through scattered, low bushes near the treeline, to *Salix, Lonicera* and *Caragana* in the Tibetan region and up to the highest limits of the dwarf-shrub zone, where only a few minute rhododendrons grow (Dolpo, Khumbu). Dry zones are preferred for breeding (Thakkhola, Dolpo, Manang), and there altitude evidently is not an important limiting factor: down to 2550 m in Thakkhola (singing, IV, V, VII), which there also marks the

southern limit of the massive monsoon influence. In the distinctly wetter high regions at the foot of Everest (Khumbu) the breeding zone begins considerably higher (see below), and in the extremely monsoon-wet Kanchenjunga massif to the west as far as Arun I did not find the species at all (V, VI).

Breeding: Time course cannot yet be precisely specified, especially since the homeward migration can continue to M V (see Migration). Gonads of those ♂ are undeveloped (up to 3 mm). Only those of the ♂ from Ringmo appear distinctly active (5-6 mm, E V-B VI). Nest with almost fledged chicks on 6.VII. (Purano Marpha, 3100 m) should be considered normal in this context, not as a delayed or second brood. This is consistent with the data of Diesselhorst (1968:270) with fledged chicks from E VI/B VII. Nest-building as late as E VII in the Khumbu (Diesselhorst 1968:271). The extremely early evidence of breeding in Biswas (1962b) is hard to reconcile with this. E III 1974 I saw none in the lower-altitude breeding regions in Thakkhola.

Migration: In the breeding regions of the Khumbu the first birds passing through from Tibet appear B IX (Diesselhorst 1968). B X *affinis* was the most common small bird in the Kali Gandaki Valley at Tukche, a large proportion of them probably on the way from Tibet (Martens 1971b). Overwintering birds stay in the Terai (see above). – The homeward migration can be documented outside the breeding regions as late as M V (Dhorpatan, 2950 m, clearly between 9. and 17.V.1973), with occasional singing there at the end of this period. On the other hand, I observed singing birds in the potential breeding region from 19. and 21.IV. on (Manang, from 3650 m; Thakkhola, from 2550 m). III data for the Khumbu area have yet to be confirmed (Biswas 1962b).

Vocalizations: Characterized by short trill verses with a hard metallic sound, having a clearly separate initial note (sonagrams in Martens 1980). May be confused with the song of *Certhia himalayana,* which sounds softer. The two can be nearby neighbours in Thakkhola. Autumn song was recorded by Diesselhorst (1968:272) in the Khumbu.

Phylloscopus tristis Blyth (taxonomic status uncertain)

Phylloscopus [collybita], incl. *collybita, brehmii, tristis, sindianus* (incl. *lorenzii), canariensis.*

Taxonomic notes: Mainly from the publications of Martens (Martens & Meincke 1989, with literature survey), Salomon (1989, 1990) and Helbig et al. (1993, 1995) more isolating mechanisms between the taxa of the chiffchaff group became known than were previously suspected. If Martens' predictions about the nature of the contact between *Ph. c. abietinus* and *tristis "fulvescens"* are correct, partly already corroborated by Marova & Leonovitch (1993), the following grouping within the superspecies *Ph. [collybita]* presents itself: *[coll.] canariensis* (incl. *exsul); [coll.] brehmii, [coll.] collybita* (incl. *abietinus, caucasicus/menzbieri, brevirostris), [coll.] tristis* (incl. *"fulvescens"*), *[coll.] sindianus* (incl. *lorenzii*). See detailed discussion in Helbig et al. (1996).

A comprehensive biometric comparison of all chiffchaff forms would be rewarding, since the Iberian *brehmii* with respect to voice, relatively short tail and (as opposed to *collybita* in the strict sense) clear tendency toward pointed wings (Ticehurst 1938:46; Niethammer 1963:404; Erard & Salomon 1989:32, in Tab.I under "Drp 10" and "Drp 1") does not seem

to be a bridge between *collybita* and *canariensis*. The taxa *Ph. collybita brevirostris, Ph. s. lorenzii* et *Ph. s. sindianus* and, in particular, *Ph. can. exsul* and *Ph. can. canariensis*, all of which are "southern" forms, are extremely long-tailed (see Tab.12). Aspects of interest are not only the WTI difference – compared with the length of the migratory routes – between *brehmii* and *tristis* but all the differences in proportion throughout the whole superspecies. For instance, there is a tendency toward decreasing WTI and increasing TWI from *brehmii* through *collybita* and *tristis, lorenzii* and *sindianus* to *canariensis*. In this "evolutionary radiation" the tiny *neglectus* has no place (WTI as in *sindianus* or *canariensis*, TWI very low, less than in *brehmii*). The entire group of species thus consists of three geospecies: (1) superspecies *Ph. [collybita]*, (2) monotypic isospecies *Ph. neglectus*, and (3) isospecies *Ph. trochilus*, a clinally varying population group.

Tab.12: Flight-feather proportions (WTI, TWI) in *Ph. [collybita]* and *Ph. neglectus*.

	WTI (%)	$\bar{x}$	s_d	2m	n
brehmii	18.3–25.0	20.5	1.88	0.97	15
c. collybita/abietinus	16.7–23.4	20.2	1.50	0.42	51
c. brevirostris	17.9–20.2	19.0	0.85	0.76	5
tristis	14.1–20.2	17.7	1.38	0.36	60
lorenzii	17.3–19.7	18.4	0.83	0.63	7
sindianus	14.4–17.1	15.4	0.81	0.41	16
can. canariensis	10.7–17.3	13.9	1.50	0.46	43
can. exsul	9.9–14.7	13.0	1.65	1.25	7
neglectus	12.5–16.4	14.7	1.19	0.49	24
	TWI (%)	$\bar{x}$	s_d	2m	n
brehmii	75.0-82.1	78.7	1.90	0.98	15
c. collybita/abietinus	77.4-86.0	81.3	1.96	0.58	46
c. brevirostris	80.2-85.0	82.8	2.04	1.82	5
tristis	77.6-85.5	81.2	2.13	0.56	57
lorenzii	82.1-87.4	84.6	1.79	1.35	7
sindianus	80.0-85.7	83.3	1.74	0.87	16
can. canariensis	87.5-96.3	90.8	2.04	0.62	43
can. exsul	90.2-95.1	93.0	2.13	1.61	7
neglectus	70.6-78.4	75.8	2.02	0.86	22

Material: 8 specimens: **N** Chitawan Distr., S Tekouli, Hatisar, banks of Rapti, 300 m, 12.-14.II.1970: 3♀ (ZFMK 71.835, **Wing**-L 64 mm, is probably a ♂). **B** Kathmandu, 1350 m, 2.II.-11.III.1970: 4♂, 1 o (presumably ♀).

Measurements: **Wing**-L ♂ (5) 62-64 mm, $\bar{x}$=63.2; ♀ (3) 56-58.5 mm. – **Tail**-L ♂ (4) 49-52.5 mm, $\bar{x}$=50.8; ♀ (3) 46.5-47.5 mm. – **Bill**-L ♂ (5) 8.8-9mm; ♀ (3) 9-9.8 mm. – **Tarsus**-L ♂ (5) 20-21 mm; ♀ (3) 19-19.5 mm. – **WTI** (8) 15.9-19.6%, $\bar{x}$=18.3, s_d=1.33. – **TWI** (7) 79.0-84.8%, $\bar{x}$=81.1, s_d=2.19. P10 4.5-7.5 mm > primary coverts, P9 <, = or > P3.

Notes: Testes inactive. – 2♂ from Kathmandu (ZFMK 71.833: 3.II.; 71.832: 11.III.) are especially worth mentioning. The II bird is conspicuously gray, the underwings are only a delicate yellow and

the flanks are a rather brownish shade, reminiscent of *sindianus*. However, the wing structure (P9 > 3 and P10 only 5.5 mm > the hand coverts) is that of *tristis*. – The III bird is in the greatest imaginable contrast. It has buff-coulored fresh plumage. This is proved by the presence of some still unfinished feathers (cf. Diesselhorst 1968:269).

Horizontal, vertical: The Siberian Chiffchaff is a winter visitor in Nepal; during the sedentary winter period it does not range beyond the altitude of the Kathmandu Valley, about 1400 m (Inskipp & Inskipp 1991). There I regularly found it at the edge of the city, where there are many gardens, in II and III as well as in the lowland of the Rapti Valley N of the Siwalik Range in II. The birds were not very shy; no vocalizations.

Regulus regulus ssp.

Taxonomic notes: The only specimens in very good plumage (Tukche, Purano Marpha) are indistinguishable from 2 ♂ from Gilgit and Sining *(r. himalayensis),* hence is in any case not indubitably *r. sikkimensis*.

Material: 5 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3800 m, 13.VI.1973: 2♂ * Gompa/Tarakot, Barbung Khola, 3250 m, 6.VI.1973: 1♂ ** Mustang Distr., Thakkhola, Tukche, Dambush Khola, 2900 m, 28.XI.1969: 1 o (presumably ♂) * Purano Marpha, 3200 m, 10.V.1995: ♂.

Measurements: **Wing**-L ♂ (5) 55-57 mm. – **Tail**-L ♂ (5) 38-40 mm. – **Bill**-L ♂ (5) 9-10 mm. – **Tarsus**-L ♂ (5) 16.5-18 mm. – **WTI** (5) 19.8-21.8%. – **TWI** (5) 68.5-72.1%.

Horizontal: Our records are mainly from the drier parts of Dhaulagiri and Annapurna regions. – Ringmo/Phoksumdo Lake (25.V./ 11.-14.VI.; see Material); Gompa/Tarakot (3.-6.VI.; see Material; both :Dolpo); – Thankur (27.V. :Myagdi); – Thaksang above Tukche (27.II. to 11.III.); Dambush Khola near Tukche (28.XI.; see Material); Purano Marpha (16./17.III., 24.IV.; 10.V., see Material); Thini near Jomosom (23.III. all :Mustang); – near Pisang (18.IV. :Manang); – Trisuli Valley, Syng Gyang (23.IV. :Rasuwa; 1 sp. in Coll. H.S. Nepali).

Vertical: Presumed breeding season and close to it (IV-VI): 3000 m Pisang (IV), 3200 m Syng Gyang (IV), Purano Marpha (V), 3300 m Gompa/Tarakot (VI), 3350 m Thankur (V), up to 3800 m Ringmo (V, VI). – Outside the breeding season: 2800 near Tukche (II, III, IX), 3000 m Thini (III), 3200 m Purano Marpha (III). For details see Habitat.

Habitat: Coniferous forests the year round. *R. regulus* seems to be quite common in the monsoon reduced forests N of the main range of Dhaulagiri (near Tarakot; Phoksumdo Lake) and Annapurna (Manang area) and in the Inner Valleys (Thakkhola), where in certain areas several singing ♂ can be regularly heard within short distances. In all S exposed wet regions, *regulus* is, – in accordance with Diesselhorst (1968:287) – much more sparse, and I found none in the Kanchenjunga area E of Arun in appropriate altitude and habitat during IV-VI, VIII and IX. Preferred forest types consist of *Pinus smithiana* (Tarakot), mixed *Pinus wallichiana/Cupressus torulosa* (Phoksumdo Lake; Purano Marpha), mixed *Abies spectabilis/P. wallichiana,* mixed *A. spectabilis/Quercus semecarpifolia* (Syng Gyang). There exist considerable differences in the altitudinal range with respect to local precipitations. In dry areas the whole coniferous tree belt seems to be occupied (appr. 3000-4000 m), whereas in wet regions the thin populations are confined to the upper (subalpine) forest belt (see Diesselhorst 1968:287).

Breeding: Small flocks still on 14.IV., probably close to the breeding season (Purano Marpha, 3200 m). Adults were near a nest which was situated on a horizontal branch of a *P. wallichiana* tree, at Phoksumdo Lake (3700m, 16.VI.).

Migration: Apparently only slightly altitudinally. Observations in III and XI (both near Tukche, see above) at only 2800 m, but both within the coniferous tree zone, may indicate such migrants. Inskipp & Inskipp (1991) note records down to 2000 m.

Vocalizations: Starts singing as early as III; 9. and 11.III.1974 (Thaksang, 3150 m), 17.III.1974 (Purano Marpha, 3200 m), but frequently still heard M VI (Phoksumdo Lake, then left area of observation). Territorial song similar to European populations; the single verse with a stereotyped main part which consists of a repetition of a simple note. To the main part different final parts are attached. The single ♂ uses several final parts, up to 9 in one ♂. Sonagrams in Becker (1978) according to recordings from Ringmo and Gompa/Tarakot by J.M.

Leptopoecile sophiae obscura Prshewalskij

Material: 2 specimens: **D** Mustang Distr., Thakkhola, Purano Marpha, 3150 m, 19.III.1974: 1♂, 1♀.

Measurements: **Wing**-L ♂ 52, ♀ 52.5 mm. – **Tail**-L ♂ 50, ♀ 52 mm. – **Bill**-L both 9.5 mm. – **Tarsus**-L ♂ 18.5, ♀ 20 mm. – **WTI** 10.6 (♂) and 10.5% (♀). – **TWI** 96.2 (♂) and 99% (♀), respectively.

Notes: Gonads of both specimens slightly swollen. – ♀ very fat.

Horizontal: Our records are confined to the northern macroslope of Dhaulagiri and Annapurna and the Inner Valley of Thakkhola. – Below Phoksumdo Lake, 1 sp. (6.VI.); upper Barbung Khola, Tarang, several obs. at different altitudes (14./15.VI. both :Dolpo); – Dudje La, E slope (27.VI.); between Sangdak and Dangarjong, several obs. (28.VI.); above Jomosom (29.VI.); Purano Marpha (16.-19.III.; see Material; all :Mustang); – Marsyandi Valley, above Manang, ascent to Thorung La, 1 sp. (19.IV. :Manang).

Vertical: Our data extend from 2850 m (above Jomosom, 29.VI.) to 4340 m (below Thorung Pass, 19.IV.). The strongholds are certainly above 3500 m, where most of my observations originate. Inskipp & Inskipp (1991) generalize the occurrence of this "resident" in Nepal as between 2700 m and 4575 m.

Habitat: Stoliczka's Tit-Warbler is an endemic species of C Asia which lives exclusively in dry mountainous areas. Its southern area limit is on the northern macroslope of the Himalayan arc, and the records from Nepal range among the most southern ones. The habitat in Nepal is very much like that described from other area parts: open bush with scattered *Caragana* and *Berberis* bush, often interspersed with small *Juniperus* bushes or trees. This holds true for all my Nepal data, and the species seems to be most common on dry S-exposed slopes (Thakkhola between Jomosom, Dangarjong and Sangda, E VI 1973). Within the monsoon-protected dry areas, nearly every altitude is occupied as long as at least a few, even low bushes are still present at the upper limit. There were several (pairs) down to 2850 m (above Jomosom, 29.VI.) on extremely dry slopes, and I found a pair (♂ singing together with ♀, in both gonads enlarged) considerably further south near the "monsoon frontier" above Marpha on old terraces with *Pinus wallichiana* bush and giant peach trees close to the forest edge (I found them all cut down in 1995 and apple-trees recently plan-

ted). However, the species is absent on the floor of the Kali Gandaki Valley, an originally forested area *(Pinus, Juniperus, Cupressus),* but now largely deforested. The Bush-Warbler was never found outside its presumed Nepal breeding range and it obviously tolerates severe weather conditions (up to which altitude?) (for winter records in Thakkhola see Fleming & Traylor 1957, Fleming 1969).

MUSCICAPIDAE

Niltava

Nine species occur in Nepal (*grandis, macgrigoriae, sundara, poliogenys, unicolor, rubeculoides, banyumas, tickelliae, hodgsoni;* species assignment according to Peters XI, 1986); all are believed to breed, but breeding records are not available for all of them *(unicolor, banyumas, tickelliae, hodgsoni).* The whole species set is tropical to subtropical as regards its vertical distribution and only slightly exceeds 3000 m (*sundara,* a species occupying a belt 1000 m wide). *N. poliogenys, unicolor* and *tickelliae* are restricted to the lowlands, the remainder of the species live in intermediate belts. All inhabit dense vegetation, keep mainly well hidden and are not easy to observe. Though there is much vertical distributional overlap, ecological preferences or competition between congeners have not been described.

Niltava macgrigoriae macgrigoriae (Burton)

Material: 2 specimens: **B** Kathmandu Valley, Lalitpur Distr., Godavari, 1600 m, 26.I.1970: 1♂ (gonadal state not mentioned on the label). **D** Myagdi Distr., upper Myagdi Khola Valley, S Boghara, 1450 m, 28.V.1995: 1♂.

Measurements: **Wing**-L 67.5 and 67 mm. – **Tail**-L 54 and 52 mm. – **Bill**-L 10 and 10.5 mm. – **Tarsus**-L 18.5 and 17.5 mm. – **WTI** 17.8% and 19.4%. – **TWI** 80% and 77.6%. – (Not compared with *N. m. signata*).

Horizontal, vertical: Boghara, 1450 m (28.V. :Myagdi); Godavari (data see above; :Lalitpur); – Chichila, 1950 m (19.VI. :Sankhua Sabha); – Yamputhin, 1650 m (1.V. :Taplejung). – The breeding belt is still not well defined and the lower limit open to question. The Boghara record, also an independent fledgling was observed there, ranges among the lowest during the breeding season. Uppermost records during the breeding season are at 2200 m (Inskipp & Inskipp 1991).

Habitat: Near Chichila, a pair was seen several times on bush tops near forest edge; the Yamputhin ♀ was mist-netted in Cardamom thickets and *Alnus* bushes along a stream; the Boghara ♂ in riparian vegetation along the Myagdi Khola; the Godavari specimen, on its wintering grounds, also in bushes. The only breeding records from Nepal are from the latter area.

Niltava sundara sundara Hodgson

Material: 8 specimens: **D** Myagdi Distr., Bobang S Dhorpatan, 2450 m, 29.IV.-1.V.1970: 2♀ * upper Myagdi Khola, Boghara, 1800 m, 26.V.1995: 1♂ * upper Myandi Khola, pasture Dobang N Boghara, 2400 m, 26.V.1995: 1♀ ** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 28.VI.1970: 1♀. 1 o (presumably ♀) * Thakkhola, lower Lete Khola near Lete, 2400 m, 6.-7.V.1995: 1♂, 1♀.

Measurements: **Wing**-L ♂ (2) 2x83.5 mm, ♀ (6) 78-81 mm, $\bar{x}$=79.7, s_d=1.17. – **Tail**-L ♂ (2) 68 and 71.5 mm, ♀ (5) 60.5-65.5, $\bar{x}$=63.7, s_d=2.14. – **Bill**-L ♂ (2) 12.5 and 13 mm, ♀ (6) 11-13 mm, $\bar{x}$=12, s_d=0.71. – **Tarsus-L** ♂ (2) 20.5 and 21 mm, ♀ (6) 20-21.5 mm, $\bar{x}$=20.8, s_d=0.52. – **WTI** (8) 17.7-22.2%, $\bar{x}$=19.5, s_d=1.29. – **TWI** (7) 77.6-85.6%, $\bar{x}$=80.9, s_d=2.57.

Horizontal: Bobang S Dhorpatan (29.IV.-1.V.; see Material); N Boghara (26.V.; see Material; both :Myagdi); – Chadziou Khola (28.VI.; see Material); Lete (6./7.V. see Material; both :Mustang); – above Bagarchap; Thimang (13., 16.IV. :Manang); – Paniporua (17.IV. :Panchthar); – Mai Pokhari (10.IV. :Ilam).

Vertical: Presumed breeding season (M IV-VI): 1800 m Boghara; 2300 m Paniporua; 2400 m Bagarchap, Dobang and Lete; 2450 m Bobang; 2550 m Thimang; 2600 m Chadziou Khola; – close to breeding season: 2150 m Mai Pokhari, 2♂ in *Berberis* bushes outside the forest, certainly migrants. – Lower limit of the vertical belt is at 2135 according to Inskipp & Inskipp (1991), highest records are mentioned by Diesselhorst (1968:258), 2900-3200 m, which have not yet been repeated elsewhere, up to now, perhaps a local speciality of the Khumbu area?

Habitat: Dense undergrowth in deciduous forest during the breeding season, where the species behaves quite secretively and it is not easy to observe.

Breeding: One ♀ from Bobang (1.V.) was ovipositing, the other one (with small follicles only) had possibly already finished. Diesselhorst (1968:259) judged from fledged young on 3.VI. start of oviposition in (early) V. These observations are consistent.

Niltava rubeculoides rubeculoides (Vigors)

Material: 1 specimen: **M** Taplejung Distr., confluence of Tada Khola and Kabeli Khola, 1000 m, 24.IV.1988: 1♂.

Measurements: **Wing**-L 72 mm. – **Tail**-L 53 mm. – **Bill**-L 12 mm. – **Tarsus**-L 16 mm. – **WTI** 23.6%. – **TWI** 73.6%. – **Testes** enlarged: 8 x 5 mm.

Horizontal, vertical: see Material for the only record.

Habitat: The above specimen sang in shrubbery about 2 m high along the Tada Khola banks close to the confluence of Kabeli Khola. *Luscinia brunnea* und *Orthotomus sutorius* were also present there. In India and Nepal, the Blue-throated Flycatcher lives only along the S macroslope of the Himalayan axis but is confined to the lower subtropical parts only up to 1500 m (Inskipp & Inskipp 1991). There is only one exceptional record far beyond, at 2100 m near Bigu (19.V.; Diesselhorst 1968:259).

Niltava poliogenys poliogenys (Brooks)

Material: 2 specimens: **N** Chitawan Distr., Rapti Valley, S Tekouli, Hatisar, 300 m, 9.II.1970: 1 o. **M** Ilam Distr., Siwalik Mts. N Sunichare, 250 m, 5.IV.1988: 1♂ (preserved in spirit).

Measurements: **Wing**-L 72 mm. – **Tail**-L 57 mm. – **Bill**-L 12.5 mm. – **Tarsus**-L 18.5 mm. – **WTI** 19.4%. – **TWI** 79.2%.

Horizontal, vertical: see Material.

Habitat: The Sunichare ♂ sang in the understorey of Sal *(Shorea robusta)* forest and was certainly on its breeding ground; the Chitawan specimen was mist-netted at the edge of a

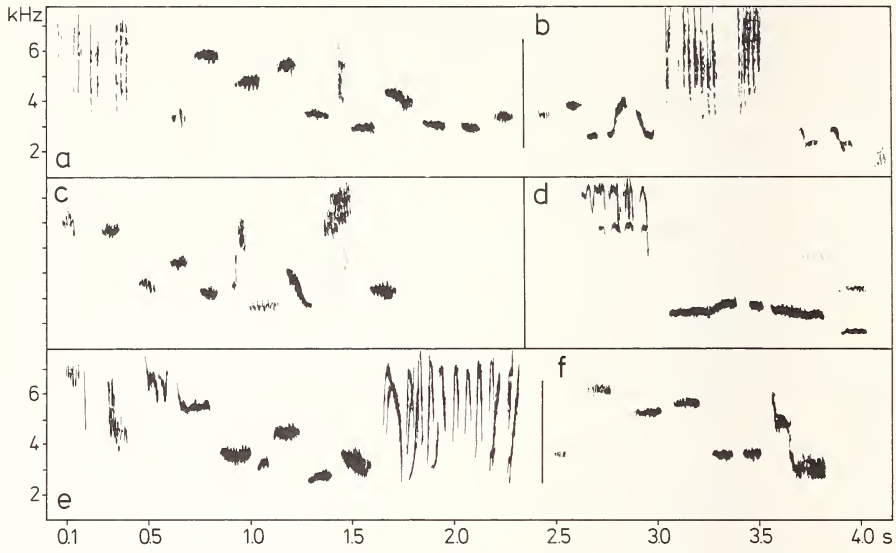


Fig.88: *Niltava poliogenys*, territorial song: a-c) 1st ♂, 3 verses; d-f) 2nd ♂, 3 verses; N Sunichare 4.IV.1988.

forest patch on the Rapti river in its winter quarters. – The species has already been recorded from the above localities, which are close to its western range limit (Inskipp & Inskipp 1991).

Vocalizations: Territorial song (Fig.88) consists of complex verses up to 3 s long, which comprise flute-like unmodulated, strongly frequency-modulated and even click-like note groups with broad frequency band in varying combinations. The repertoire of the individual ♂ must be extremely large; in the 2 ♂ recorded there were no repetitions of notes nor of note groupings. The auditory impression is similar to song of the European Robin *(Erithacus rubecula)* but harsher. The ♂ sang well hidden in dense bush layer in Sal *(Shorea robusta)* forest and were difficult to observe.

Muscicapa

Six species are to be found in Nepal *(thalassina, ferruginea, sibirica, ruficauda, muttui, dauurica);* all are breeding birds except *muttui* which is a vagrant. These species show close affinities to Palaearctic climatic conditions and regularly live at altitudes up to 3000 m and beyond (except *dauurica,* up to 1550 m). The belt of *thalassina* is at least 2200 m wide and in this respect marks the most successful of all Central Himalayan flycatcher species. *Muscicapa* species keep more to the open, sitting on exposed branches and tree tops to look for prey. *M. thalassina* and *sibirica* coexist in the Dhorpatan Valley (together with *Ficedula tricolor,* all near 3000 m), but their interrelations have not been analysed.

Muscicapa thalassina thalassina Swainson

M. [thalassina] incl. *panayensis*

Material: 2 specimens: **D** Myagdi Distr., Bobang, 2450 m, 28.IV.1970: 1♀ (breeding patch). **J** Ramechap Distr., Chordung Mt. near Jiri, 2800 m, 3.IV.1973: 1♂.

Measurements: **Wing**-L ♂ 86; ♀ 80 mm. – **Tail**-L ♂ 73; ♀ 64.5 mm. – **Bill**-L ♂ 11; ♀ 8.3 mm. – **Tarsus**-L ♂ 16; ♀ 15 mm. – **WTI** 20.9% (♂); 23.8% (♀). – **TWI** 84.9% (♂); 80.6% (♀). – **Testes** 4 x 3 mm, ♀ see above.

Notes: ♂ bill and feet black.

Horizontal: Bobang S Dhorpatan (28.IV.: see Material); Dhorpatan (24.IV., 20.-23.V.); Muri (24.III. all :Myagdi); – between Lete and Ghasa (2.V. :Mustang); – Potana (27.IV.); descent from Dhumpus to Suiketh Valley (10.V. both :Kaski); – near Jagat (11.IV.); Dharapani, near bridge (12.IV. both :Lamjung); – Phulchoki Mt. (19.III., 22.III., 11.V. :Lalitpur); – Chordung Mt. near Jiri (3.IV.; see Material); Thodung (6.IV. both :Ramechap); – ascent to Omje Kharka and Omje Kharka (1., 3.V.); Yamputhin (29.IV.); confluence of Kabeli and Tada Khola (23.IV. all :Taplejung); – Paniporua (20.IV.); descent from Paniporua to Hinwa Khola (20.IV.); ascent to Paniporua (16.IV. all :Panchthar); – Dhorpar Kharka (13.IV.); upper Gitang Khola (27./28.III.); Mai Pokhari (26.III., 1.IV.); between Ilam and Mai Pokhari (25.III., 9.IV. all :Ilam).

Vertical: The species' vertical range is extraordinarily wide; our records, exceeding all previous ones, extend during the presumed breeding season (IV-VI) from 1000 m (Kabeli/Tada Khola, 23.IV., singing) to 3200 m (Thodung, 6.IV., singing), resulting in a 2200 m vertical belt. – Records from 33 localities distribute as follows: lowest records: 1000 m Kabeli/Tada Khola (23.IV.); 1300 m between Senge and Tal (11.IV.); 1400 m below Paniporua (20.IV.); – highest records: 2700 m near Paniporua (16.IV.) and Chordung Mt. (3.IV.); 3000 m Dhorpatan (24.IV., 20.-23.V.); 3200 m Thodung (6.IV.). – Distribution in 500 m steps: 1000-1500 m: 3 records; 1500-2000 m: 8 rec.; 2000-2500 m: 15 rec.; 2500-3000 M: 6 rec.; 3000-3200 m: 1 rec.

Outside breeding season (III): At least E III, the population (all members ?) has already reached the breeding belt, but perhaps not yet the individual breeding grounds: 2650 m Phulchoki Mt. (22.III.); 2450 m, 2550 m upper Gitang Khola (27./28.III.); 2150 m Mai Pokhari (26.III.); 2050 m Phulchoki Mt. (19.III.).

Habitat: The Verditer Flycatcher settles along forest edges, on clearings, in open parkland with scattered tree vegetation, even in minute patches of remaining forest. In general, it can live in tree-rich agricultural land, but it is not common there. In these regions the trees usually do not occur in groups, which are apparently indispensable. The species has evidently taken advantage of the large-scale deforestation of the Nepal midlands, which made available a good array of habitats. Nevertheless, the species is not common, rather patchily distributed at most sites, and the relatively many records available may largely be due to its habit of perching on exposed tree tops and singing there. Thus, it is easily encountered. The multitude of climatic conditions which the Verditer tolerates is impressive: from subtropic environment near 1000 m up to the Palaearctic *Rhododendron/Quercus/Abies* belt above 3000 m, where it is present at least as early as B IV (Thodung).

Breeding: The Verditer sings early in the season at (presumed) breeding sites: 26.III. Mai Pokhari (2150 m); 27.III. upper Gitang Khola (2450 m); 3.IV. Chordung Mt. (2700 m); 6.IV. Thodung (3200 m). The Bobang specimen (28.IV., 2500 m) was in the oviposition stage. Diesselhorst (1968:254) reports on a nest with eggs discovered on 11.V., the ♀ still being ready to continue ovipositing.

Vocalizations: Territorial song (Fig.89a-g), often displayed in an exposed position on a bush or low tree, is a twittering verse about 3-4.5 s long, similar to the song of the European *Prunella modularis*. The verses illustrated here range between 2960 and 5850 Hz with little variation from one verse to another. The frequency band of the individual verse is about 2700 Hz wide and quite constant within the individual note. The note repertoire of single ♂ is high, consequently verse syntax complicated. All but 3 of the 46 notes in the verses in Fig.89a and 89b are different. Verses 89b and 89c have a closed block of 13 notes in common; 89c and 89d are identical for the 15 notes after the 1st 3 or 4 notes, then the 2 last ones (except minor differences); 89d and 89e are identical except for additional notes in the longer verse 89d; verse 89f is unique compared with all preceding ones; 89g and 89f share an identical note block in the 1st half of the verse, and among the remaining notes several are similar but not identical.

Muscicapa sibirica cacabata Penard

Taxonomic notes: The 4 Nepal specimens in addition to 5 *M. s. cacabata* from Sichuan compared with the northern ssp. *sibirica* display the following plumage proportions (Tab.13):

Tab.13: WTI and TWI values of *Muscicapa s. sibirica* and *M. s. cacabata*.

	WTI (%)	$\bar{x}$	s_d	n	TWI (%)	$\bar{x}$	s_d	n
sibirica	34.8–36.3	35.5	0.70	4	63.7–67.1	64.9	1.58	4
cacabata	29.2–33.8	31.9	1.50	9	62.2–67.7	64.3	1.78	9

The areas of *s. sibirica* and of the southern *s. cacabata* are disjunct by a large gap. The northern form is a migrant, the southern one also but more limited ("Peters" XI: 318). Supposedly the WTI difference between the two is connected with this. If the Far Eastern *griseisticta* is considered an allospecies of *striata (M. [striata]* and *sibirica* then forming a binary group), it is remarkable that *griseisticta* and *striata* differ so greatly in WTI although they use migratory routes of nearly equal length (Tab.14):

Tab.14: WTI values of *M. griseisticta* and *M. striata striata*.

	WTI (%)	$\bar{x}$	s_d	n
M. griseisticta	35.0–38.4	37.1	1.29	9
M. striata striata	29.7–33.7	32.0	0.97	30

In this context we once again would like to stimulate a complete examination of closely related groups of birds with respect to their differences of wing construction. Meise

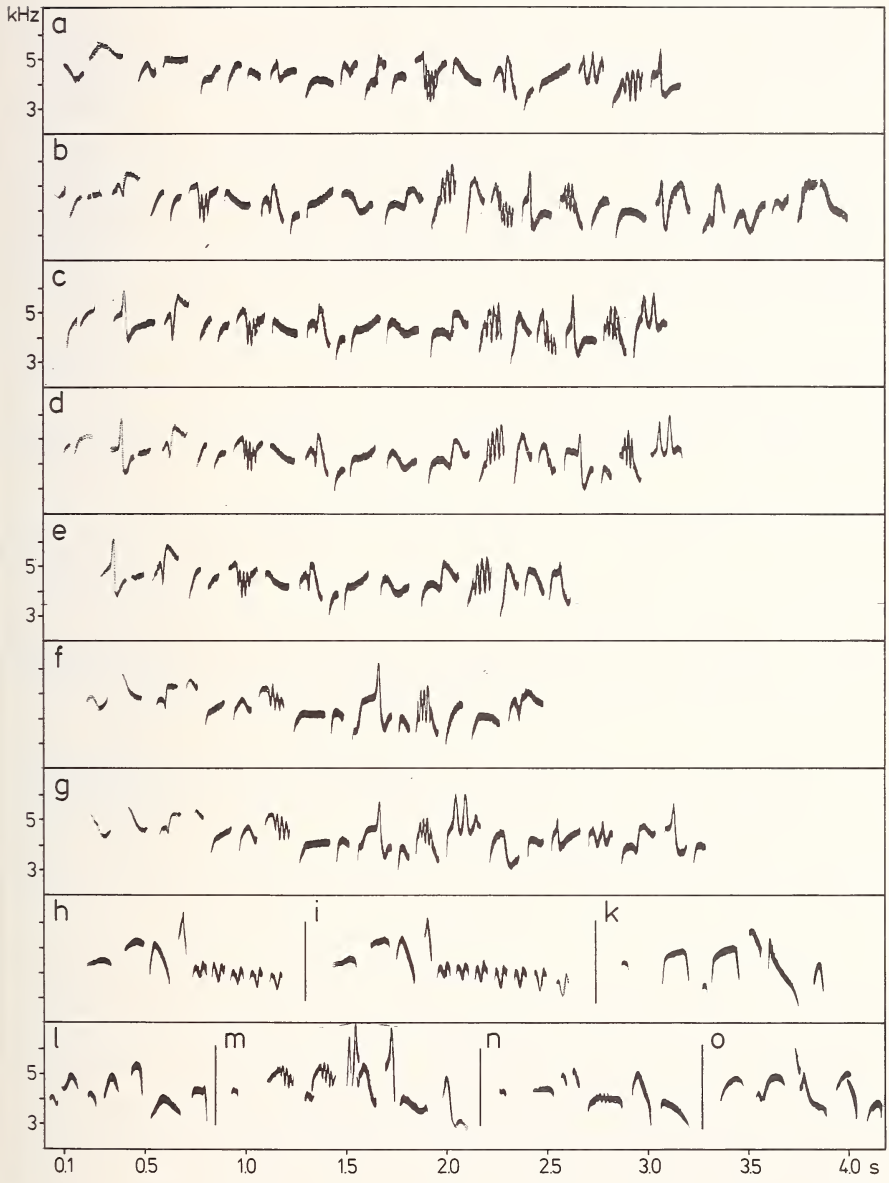


Fig.89: Territorial song of Muscicapidae. – a-g) *Muscicapa thalassina;* 7 consecutive verses, Mai Pokhari 26.III.1980.
h-o) *Ficedula westermanni;* 7 consecutive verses, Yamputhin 27.IV.1988.

(1938:61) mentioned five flycatcher species, "in which the more distantly migrating subspecies have more prominently pointed wings", among them *Ficedula hypoleuca* and *F. narcissina*. According to studies by S. Eck *h. hypoleuca* and *h. speculigera* have WTI values of 28.4-33.9%, $\bar{x}$=31.1, s_d=1.08 (n=143) and 28.3-32.7%, $\bar{x}$=30.6, s_d=1.35 (n=19), respectively, with H 9 < 6 in both. *F. n. narcissina* and *n. elisae* have migratory routes of nearly equal length but WTI values of 26.6-30.4%, $\bar{x}$=28.0, s_d=1.33 (n=11), H 9 > 5 and 23.6-26.4%, $\bar{x}$=24.6, s_d=1.15 (n=7), H 9 < 5, respectively. The WTI of *F. zanthopygia* using the same migratory route is between those of *narcissina* and *elisae:* 24.3-29.3%, $\bar{x}$=27.0, s_d=1.20 (n=19), H 9 < or > 5. The TWI, accordingly, shows a "reverse" trend: *elisae* $\bar{x}$=69.9%, s_d=1.36 (n=7), *zanthopygia* $\bar{x}$=66.1%, s_d=1.38 (n=19), *narcissina* $\bar{x}$=64.7%, s_d=1.63 (n=10).

Material: 4 specimens: **D** Dolpo Distr., Gompa near Tarakot, 3300 m, 15.V.1970: 1♂ ** Myagdi Distr., Dhorpatan, Uttar Ganga plain, 2950 m, 9. and 24.V.1973: 3♂.

Measurements: ♂: **Wing**-L (4) 72-76 mm, $\bar{x}$=73.8. – **Tail**-L (4) 45-49.5 mm, $\bar{x}$=46.9. – **Bill**-L (2) 8.5-10 mm. – **Tarsus**-L (3) 11.5-12.5 mm. – **WTI** (4) 29.2-32.2%, $\bar{x}$=30.7. – **TWI** (4) 62.2-65.1%, $\bar{x}$=63.6. – **Testes** 6-7 x 4 mm.

Notes: Bill black and brownish black. Feet dark grey to brownish black.

Horizontal: Our records stem only from the Dhaulagiri/Annapurna region. – Gompa near Tarakot (15.V.; see Material: :Dolpo); – Dhorpatan (9., 24.V.; see Material; :Myagdi); – above Ghandrung (7.5. :Parbat).

Vertical: The records cover only the upper part of the species' range: 2750 m Ghandrung; 2950 m Dhorpatan; 3300 m Tarakot. – Inskipp & Inskipp (1991) indicate 2000 to 3300 m during summer, but records between 2800 and 3300 m are apparently sparse.

Habitat: Edges of mature forest, bushes and single trees nearby; the species keeps mainly to the bush layer. In its altitudinal range, coniferous forests prevail: *Abies spectabilis/Pinus wallichiana* (Dhorpatan), *Picea smithiana* (Tarakot). In the Dhorpatan Valley, the Asian Sooty Flycatcher is quite common.

Breeding: In the Dhorpatan Valley (2950 m), first egg in a nest on 14.V., about 2 m above ground. For testes size see Measurements. Third breeding record for Nepal.

Ficedula

The 11 species of the Nepal list *(sapphira, tricolor, superciliaris, westermanni, hodgsoni, hyperythra, monileger, strophiata, hodgsoni, subrubra, parva;* species assignment as to genus according to Peters XI, 1986) make a quite heterogeneous assemblage with respect to morphology and ecology. All species breed except for *subrubra* and *parva* which are visitors. All species are distributed along the S flanks of the Himalayan macroslope from E to W, several with distributional limits within Nepal *(sapphira, westermanni, monileger).* Very divergent altitudinal distributions and widely differing ecological adaptations – from understorey species *(strophiata, hyperythra)* to species living mainly exposed on branches and tree tops – make the genus extremely diverse. The most extensive vertical areas are those of *westermanni* (1800 m), *superciliaris* (1500 m) and *strophiata* (1550 m). Only *strophiata* penetrates up to timberline, *superciliaris* and *tricolor* coexist locally and also occur on the dry northern slopes of the main chain.

Ficedula hyperythra hyperythra Blyth

Material: 1 specimen: **M** Ilam Distr., upper Gitang Khola, NE Mai Pokhari, 2500 m, 28.III.1980: ♂.

Measurements: **Wing**-L 62 mm. – **Tail**-L 43 mm. – **Bill**-L 10 mm. – **Tarsus**-L 18.5 mm. – **WTI** 20.2%. – **TWI** 69.4%.

Horizontal: Descent to Ghandrung (7.V. :Parbat); – upper Gitang Khola (28./29.III.; see Material); – Paniporua (17.-19.IV. both :Panchtar).

Vertical: 2300 m Paniporua; 2550 m Gitang Khola; 2730 m Ghandrung. – The vertical range in Nepal is not well documented. Inskipp & Inskipp (1991) indicate "between 2000 m and 2440 m, and sometimes up to 3000 m". Two of the above records are situated within this upper thinly settled area part, but it is open to question how regularly *hyperythra* leaves the subtropical belt proper.

Habitat: I found the Snowy-browed Flycatcher in deep-cut ravines in the bushy understorey of dense broad-leaved forests, mainly *Quercus* (Paniporua) and *Lithocarpus* (Gitang Khola). There it is very secretive and is discovered mainly by its bright coloration and contrasting eyebrow.

Breeding: At Paniporua and Gitang Khola, I saw them pairwise and apparently on the breeding grounds, already displaying on 28.III.

Ficedula sapphira

Horizontal, vertical, habitat: Confluence of Kabeli and Tada Khola, 1000 m (24.IV.1988; :Taplejung). The only ♂ was seen close to a forest edge near the river bank. – The Sapphire Flycatcher has its western limit in far E Nepal where it is considered scarce.

Ficedula tricolor tricolor (Hodgson)

Material: 15 specimens: Dolpo Distr., Gompa/Tarakot, 3300 m, 14.-16.V.1970: 1♂, 2♂ juv. ** Myagdi Distr., Dhorpatan, Uttar Ganga plain, 2950 m, 8.-11.V.1973: 1♂, 1♀ ** Mustang Distr., Chadziou Khola, 2600 m, 20.-24.X.1969: 1♂, 1♂ juv. * Thaksang above Tukche, 3150 m, 7.VII.1970, 2.-4.VII.1973: 2♂, 2♀, 2 pull. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 24.-25.IV.1973: 1♂, 1♀.

Measurements: **Wing**-L ♂ (6) 61.5-64 mm, $\bar{x}$=62.8, s_d=0.93; ♂ juv. (3) 59-61 mm; ♀ (4) 56-58 mm, $\bar{x}$=57.1; pull. (2) 56-57 mm. – **Tail**-L ♂ (6) 53-57.5 mm, $\bar{x}$=54.5, s_d=1.84; ♂ juv. (3) 50-53 mm; ♀ (4) 46.5-50.5 mm, $\bar{x}$=48.4; pull. (1) 47 mm. – **Bill**-L ♂ (6) 9-11 mm, $\bar{x}$=9.8, s_d=0.82; ♂ juv. (3) 9-11 mm; ♀ (4) 8-10 mm, $\bar{x}$=8.9; pull. (2) 9-10 mm. – **Tarsus**-L ♂ (6) 18.5-20 mm, $\bar{x}$=19.3, s_d=0.52; ♂ juv. (3) 19-20 mm, ♀ (4) 18-19 mm, $\bar{x}$=18.8; pull. (2) 17.5-19.5 mm. – **WTI** (15) 14.2-18.3%, $\bar{x}$=16.1, s_d=1.11. – **TWI** (14) 82.8-89.8%, $\bar{x}$=85.6, s_d=2.10. – **Testes** ♂ 24.IV. and 8.V. 6 x 3, 14.V. 2 x 2, 4. and 7.VII. 4-5 x 3-4 mm, ♂ juv. 14.V. 3 x 3 mm. – **Ovaries** not or slightly developed (after oviposition?).

Notes: Bill black. Feet dark grey to blackish dark brown (♂) and grey flesh-coloured to grey brown (♀), respectively. – The reduction of the ventral ochre coloration toward spring is very striking.

Horizontal: Gompa/Tarakot (14.-16.V.; see Material; :Dolpo); – Dhorpatan (16.-19.IV., 8.-11.V.; see Material; :Myagdi); – Chadziou Khola (20.-24.X.; see Material); Thaksang above Tukche (27.IV., 2.-4.,7.VII.; see Material; both :Mustang); – Trisuli Valley, Gosainkund, Syng Gyang (24./25.IV.; see Material; :Rasuwa).

Vertical: Our data from the presumed breeding season (IV-VII) form only a narrow 300-m-belt: 2950 m Dhorpatan (V); 3150-3300 m Thaksang (IV, VII); 3200 m Syng Gyang (IV);

3300 m Gompa/Tarakot (V). The vertical distribution of *tricolor* in the Central Himalayas is not well understood. There seem to be only a few records from the breeding season; Inskipp & Inskipp (1991) indicate 3050 m to 4000 m, but the latter record stems from Diesselhorst (1968:257) and is unique (specimens collected 3800-4000 m in high Khumbu). This seems to be a special situation not representative of other localites. Records from other parts of the country do not exceed 3400 m. Ali & Ripley (1972,9:172) generalize for Nepal, including Diesselhorst's data, "2700-4000 m". According to our experience, the species' continuously area belt is extremely small in Nepal, with only patchily distributed populations near 3000 m and beyond. – Outside breeding season (X): 2600 m Chadziou Khola (see Material).

Habitat: Forested areas of various mainly Palaearctic composition with a rich understorey of bushes and hedges, often also in open stands, forest edges and clearings. In any case, a good coverage of low bushes, mainly joining the lower parts of the tree canopy, must be present. Individuals at the observation sites mainly stayed in the bush stratum and lower part of the tree canopy. Nests are situated at the height of the bush layer and, consequently, fledged young keep to the low bush stratum. Besides localities of the S macroslope of the main chain, which is fully exposed to monsoon precipitation (Syng Gyang; Dhorpatan), *tricolor* also settles in monsoon-reduced areas of the Inner Valleys (Thakkhola: Thaksang) and N of the main range (Dolpo: Gompa/Tarakot). However, I did not find it in the extremely dry areas on Phoksumdo Lake. – For syntopic occurrence with *F. superciliaris* see this species.

Breeding: Nest construction by the ♀, accompanied by the ♂, on 18.V. (Dhorpatan, 2950 m), nest about 3 m high on a remnant tree stem. For gonadal development see Measurements.

Vocalizations: Warning calls (Fig.90o-r; e.g. when guiding fledged young) are short "teet" notes or series of rapidly ascending clicks ("tk tk tk.."given at varying distances) of remarkably broad frequency span near or exceeding 5 kHz. A more complicated note ("ft") may precede such call series (Fig.90o).

Ficedula superciliaris

Taxonomic notes: The ♂ shows the marked characteristics of *F. s. superciliaris* Jerdon, but the area of intergradation between the subspecies *superciliaris* and *aestigma* is said to comprise large parts of Nepal and Sikkim.

Material: 3 specimens: **D** Dolpo Distr., Gompa near Tarakot, 3300 m, 12.-14.V.1970: 1♂, 2♀.

Measurements: **Wing**-L ♂ 63; ♀ (2) 61.5, 62 mm. – **Tail**-L ♂ 43; ♀ (2) 44, 44 mm. – **Bill**-L ♂ 10.5; ♀ (2) 9, 10.5 mm. – **Tarsus**-L ♂ 16; ♀ (2) 14.5, 15.5 mm. – **WTI** (3) 23.6-25.8%. – **TWI** (3) 68.3-71.6%.

Horizontal: Gompa/Tarakot (12.-14.V., 6.VI.; see Material; :Dolpo); – Lete (1.V. :Mustang); – above Landrung (8.V.); above Dhumpus (9.V. both :Kaski); – Thimang near Bagarchap (15.IV. :Manang).

Vertical: The above localities are quite remarkably distributed: 4 of them form a small belt from 1830 m Landrung; 2100 m Dhumpus; 2480 m Lete to 2550 m Thimang, in total 720 m. The last one, in Gompa, is situated at 3300 m, resulting in a large gap in between. – Ins-

kipp & Inskipp (1991) indicate for the breeding season 1800-3200 m, a belt largely substantiated by the few records of Diesselhorst (1968:256). Though a broad belt of about 1500 m is apparently inhabited, the vertical distribution is not continuous at all and there seem to exist big distributional gaps and local differences.

Habitat: Open parts and edges but mostly with a good understorey of bushes in mixed, mainly broad-leaved forests. The Ultramarine Flycatcher keeps to the canopy stratum during the breeding season; it is rarely to be seen in the bush layer. Despite the assumption of Diesselhorst (1968:257), followed by Ali & Ripley (1972,7:172), *superciliaris* and *tricolor* may occur together within a limited forest patch *(Picea/Betula* stands above Gompa/Tarakot, *superciliaris* present in 1970 and 1973, *tricolor* at least in 1970; see Material section of respective species). Their ecological interactions remain to be analysed.

Vocalizations: Territorial song (Fig.90l-n) is a short trill (0.2-0.6 s long) of rapidly descending, nearly click-like, clearly and somewhat irregularly spaced notes with a large frequency span (up to 3.5 kHz for an individual note). The trill part is often preceded by a whistle-like note of much more limited frequency range, at high frequency near the beginning of the first note of the trill part (1 case Nepal) or at low frequency near its end (1 case Kashmir). – The song type as presented in Fig.90m/m' closely resembles the warning-call series of *Culicicapa ceylonensis* (which see, Fig.91d-e) and the song of *Certhia nipalensis* (which see), but the latter is more piercing.

Ficedula westermanni

Horizontal, vertical: Below Ghandrung, 1450 m (8.V. :Parbat); – above Ilam, 1800 m (1.IV. :Ilam); – Yamputhin, 1800 m (27.IV. :Taplejung). – The species is said to occur from 1200 to 3000 m during the breeding season (Inskipp & Inskipp 1991), an unusually broad vertical span, but records so far are scanty and much of the species' spatial distribution remains to be analysed.

Habitat: The specimens from the presumed breeding season, both singing ♂, were in tree-rich cultivated land (Ghandrung) and in *Alnus* riverine vegetation close to agricultural clearings (Yamputhin).

Vocalizations: Territorial song (Fig.89h-o), displayed from a tree top or an exposed branch, consists of short verses 0.8-1.2 s long. The repertoire of the individual ♂ comprises several verse types which are repeated with remarkable accuracy (Fig.89h/i) before the switch to another type. The only ♂ recorded sang 6 verse types. These differ considerably and only single notes were repeated in different verse types (Fig.89i/n). Most notes are more or less angular and opened downwards.

Ficedula strophiata strophiata (Hodgson)

Material: 14 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 16.IV.1970: 1o * Dhorpatan, Uttar Ganga Valley, 2950 m, 18.-21.V.1973: 2♂, ♂ from 21.V. song specimen) ** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 29.VI.-1.VII.1970: 1♂, 1♂ pull. **G** Parbat Distr., Ghorapani Pass, 2800 m, 26.VII.1970: 1♂. **B** Sindhu Palchok Distr., Ting Sang La, 3250 m, 14.IV.1973: 2♀. **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 28.III.-1.IV.1973: 1♂, 2♀ * Thodung, 3200 m, 4.-8.IV.1973: 2♂, 1♀.

Measurements: **Wing**-L ♂ (7) 73.5-78 mm, $\bar{x}$=75.9, s_d=1.57; ♀ (6) 67-73 mm, $\bar{x}$=69.7, s_d=2.34. – **Tail**-L ♂ (7) 57-62 mm, $\bar{x}$=59.4, s_d=1.82; ♀ (6) 50-57 mm, $\bar{x}$=53.3, s_d=2.52. – **Bill**-L ♂ (7) 9-11.5 mm, $\bar{x}$=10.1, s_d=0.84; ♂ pull. 8.5 mm; ♀ (6) 9-11 mm, $\bar{x}$=9.7, s_d=0.75. – **Tarsus**-L ♂ (7) 19-21.5 mm, $\bar{x}$=19.9, s_d=0.95; ♂ pull. 18 mm; ♀ (6) 18-19,5 mm, $\bar{x}$=18.8, s_d=0.52. – **WTI** (13) 18.7-23.7%, $\bar{x}$=21.6, s_d=1.24. – **TWI** (13) 74.6-80.3%, $\bar{x}$=77.4, s_d=1.50. – **Testes** from IV to V increasingly larger, from VI onwards shrinking: 28.III. 6 x 5; 7./8.IV. 6 x 4-5 mm; 18.-21.V. 7 x 4; 29.VI. 5 x 4; 26.VII. 3 x 2 mm. **Ovary** developing in IV.

Notes: Bill black. Feet dark grey to brownish black (♂), grey brown to dark grey (♀).

Horizontal: Suli Gad Valley (6.VI. :Dolpo); – upper Myagdi Khola, Dobang (26.V.); Dhorpatan (16.IV., 18.-21.V.; see Material; both :Myagdi); – Thaksang above Tukche (28./29.IV.); Chadziou Khola (29.VI.-1.VII.; see Material; both :Mustang); – above Chitre (5.V.); Ghorapani Pass (11.VII., 26.VII.; see Material; both :Parbat); Dadar Danda, Kalin-

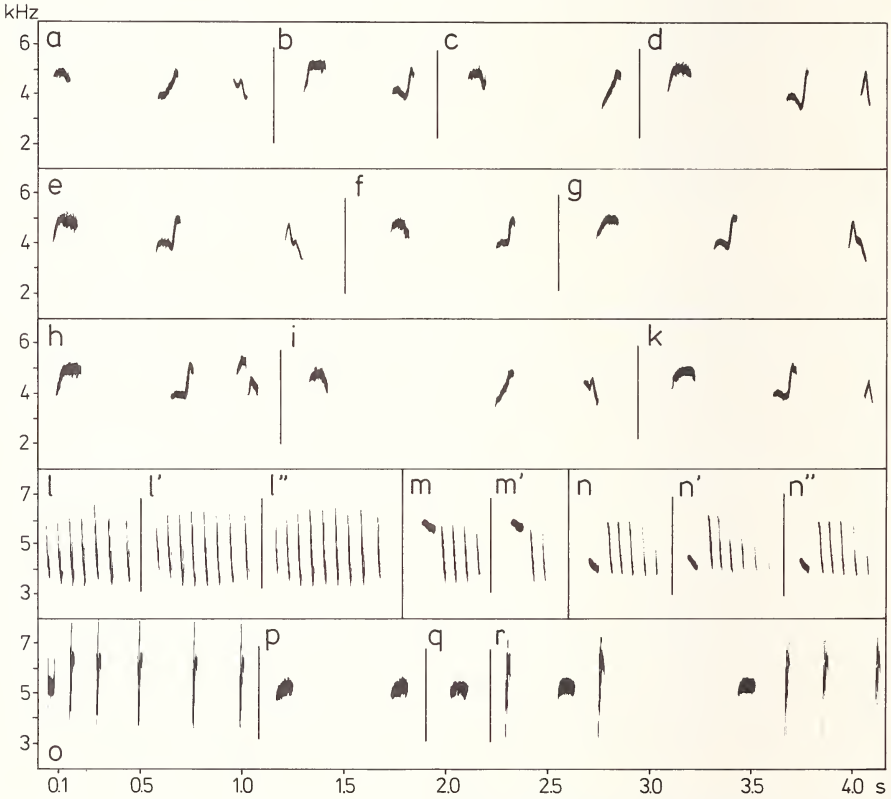


Fig.90: Vocalizations of Muscicapidae. – a-k) *Ficedula strophiata;* 10 consecutively given verses of territorial song of 1 ♂, Dhorpar Kharka 15.IV.1988.
l-n) *Ficedula superciliaris,* territorial song; l-l'') 3 verses of 1 ♂, Gompa/Tarakot 4.VI.1973; m-m') 2 verses of 1 ♂, Thimang/Bagarchap, 15.IV.1980; n-n'') 3 verses of 1 ♂, India, Kashmir, Pahalgam 14.V.1976.
o-r) *Ficedula tricolor;* warning calls near fledged juveniles; o) 1st ♀; p-r) 2nd ♀; Thaksang/Tukche 3.VII.1973.

chok area (19.-23.IV.); Ting Sang La (14.IV.; see Material; both :Sindhu Palchok); – Chordung Mt./Jiri (28./29.III.; see Material); Thodung (4.-8.IV.; see Material; both :Ramechap); – Pahakhola and descent thereto (30.V., 1.-4.VI. :Sankhua Sabha); – upper Simbua Khola (10.-15.V.); pasture Lassetham (6.-7.V. both :Taplejung); – Dhorpar Kharka (14.-16.IV.); upper Gitang Khola Valley (29.III. both :Panchthar).

Vertical: During the presumed breeding season (IV-VII), our records range from 2400 m to 3600 m. – Details: lowest records: 2400 m Dobang (26.V.); 2600 m Chadziou Khola (29.VI.); 2700 m Dhorpar Kharka (14.-16.IV.) and Ghorapani (11.VII.); – highest ones: 3450 m Lassetham (7.V.); 3600 m descent to Pahakhola (30.V.). 11 localities out of 20 are concentrated between 2800 and 3200 m. These records represent only a part of the total vertical span. Inskipp & Inskipp 1991) generalize "summers between 2440 m and 4000 m", but above 3600 m, *strophiata* is already rare and certainly only patchily distributed, a fact already stressed by Diesselhorst (1968:255), and a nest was never discovered that high. In any case, the *strophiata* area comprises more than 1000 m, perhaps close to 1500 m in Nepal.

Habitat: The Orange-gorgetted Flycatcher lives predominantly in the undergrowth of various forests, mainly the bush layer including the light parts, but on rare occasions, sometimes to display territorial song, perches on side branches or treetops. Obviously it does not prefer a certain forest composition. In search for food, it does not pursue flying insects, but collects them within the undergrowth from branches or from the soil cover (see Diesselhorst 1968:256, Löhrl 1992). In general, it is a locally common species, especially in *Rhododendron-Quercus-Abies* forests at and above 3000 m.

Breeding: On 1.VI. a nest contained 3 pulli nearly ready to fledge (Pahakhola, 2750 m); thus, oviposition may have started E IV/B V. According to other data available, this is an early date and populations in the higher part of the area may begin later (see Diesselhorst 1968:256). Testes are already slightly enlarged E III (see Measurements) and shrink by E VI. – The nest (see above) was nearly totally built of moss, lined with hairs, outer surface covered with some pieces of *Rhododendron* bark, inserted in the moss cover of a tree trunk, 5 m high, thus excellently camouflaged.

Vocalizations: The territorial song (Fig.90a-k) is remarkably simply-structured and resembles a sequence of call notes rather than a song: a loose combination of 3, rarely 4 or 2 notes which are presented at quite long intervals (0.21-0.81 s, pauses unequal in length, 1st or 2nd pause being the longer one). Consecutive verses differ, though individual verse types may be repeated within a series of verses. But even within verses of the same verse type, there are minor differences in the fine structure of notes and the duration of the pause between notes (comp. Fig.90a/i and 90d/k). The song is displayed from side branches of medium-sized trees where the birds keep hidden, rarely while exposed from treetops (Dhorpar Kharka, IV).

Ficedula parva albicilla (Pallas)

F. [parva] incl. *subrubra*

Material: 1 specimen: **N** Chitawan Distr., upper Terai, Rapti Valley, foothills of Siwalik range S Tekouli, 300 m, 18.II.1970: 1♂ juv.

Measurements: From the same area (Rapti Valley, Hitora, 22.III.1962) a ♂ from the Diesselhorst collection was included. – **Wing**-L 69 (juv.), 70 mm. – **Tail**-L 2 x 52.5 mm. – **Bill**-L 9 (juv.), 10 mm. – **Tarsus**-L 2 x 17 mm. – **WTI** 24.6 and 24.3%. – **TWI** 76.1 and 75.8%.

Horizontal, vertical, habitat: The only specimen was mist-netted in Sal forest *(Shorea robusta)* on the N foothills of the Siwalik range. – A common winter visitor in lowland Nepal.

Culicicapa ceylonensis calochrysea Oberholser

Culicicapa [ceylonensis] incl. *helianthea*

Material: 1 specimen: **D** Myagdi Distr., Bobang S Dhorpatan 2450 m, 27.IV.1970: ♂.

Measurements: **Wing**-L 64 mm. – **Tail**-L 55 mm. – **Bill**-L 10.5 mm. – **Tarsus**-L 13.5 mm. – **WTI** 20.3%. – **TWI** 85.9%.

Notes: Testes slightly swollen.

Horizontal: Bega (16.V.); Bobang S Dhorpatan (27.IV.; see Material; both :Myagdi); – Kathmandu Valley, Sheopuri Mt.; 25.VI. :Kathmandu); – Chichila (19.VI.); between Mure and Hurure (9.-16.VI.); Karmarang (5.VI.); Pahakhola (1.-.4.VI. all :Sankhua Sabha); – Omje Kharka (3.V.); Yamputhin (27.IV., 1.V.); confluence of Kabeli and Tada Khola (24.IV. all :Taplejung); – Paniporua (17.IV. :Panchthar); – Mai Pokhari (10.IV.); Siwalik Mts. near Soktim (7.IV.); Siwalik Mts. near Sunichare (4.IV. all :Ilam).

Vertical: Presumed breeding season (M IV-VI): Records range from 1200 m (Kabeli/Tada Khola, 24.IV.) to 2700 m (Pahakhola, 1.-4.VI.). Localities are evenly distributed over this belt with a slight concentration at 2100-2300 m. Highest records from Nepal, up to 3100 m, were presented by Diesselhorst (1968:260); they have remained exceptional until now. – Outside breeding season: singing ♂ at 250 m (N Sunichare, 4.IV.) and another at 400 m (Siwaliks Mts. near Soktim, 7.IV.) are believed to be still migrating back to the breeding grounds.

Habitat: The Grey-headed Flycatcher is a forest dweller which settles in closed tall-tree mature forest (Omje Kharka 2400 m), but also in more open park-like stands (Pahakhola 2600-2700 m), forest edges (Sheopuri 2150 m) and even in clumps of *Alnus* riparian forest (Karmarang 1350 m; Bega 1650 m), also close to or, rarely, within agricultural land (Yamputhin 1650 m), but seldom close to human settlements. In general, the species needs tall trees and prefers, as a species predominantly confined to forests, the lower canopy storey, foraging only rarely on high bushes.

Vocalizations: The verses of territorial song (Fig.91a-c) very regularly are composed of 4 notes in an overall slightly ascending pitch. All individual notes show ascending frequency or at least the main slope (Fig.91a) ascends. These clear notes produce a strong rhythmical impression, like "titeritit". In the 3 ♂ checked, only one verse type was used and repeated with remarkable accuracy. Warning-call series (Fig.91d-e), e.g. at the appearance of a *Tupaia* or an owl, are verse-like series of click-like notes with a broad frequency span of even more than 5 kHz, up to 7.4 kHz. The individual call series is up to 4-5 s long. – In sonagram and auditory impression, the call series are very similar to certain song forms of *Ficedula superciliaris* (which see, Fig.90m).

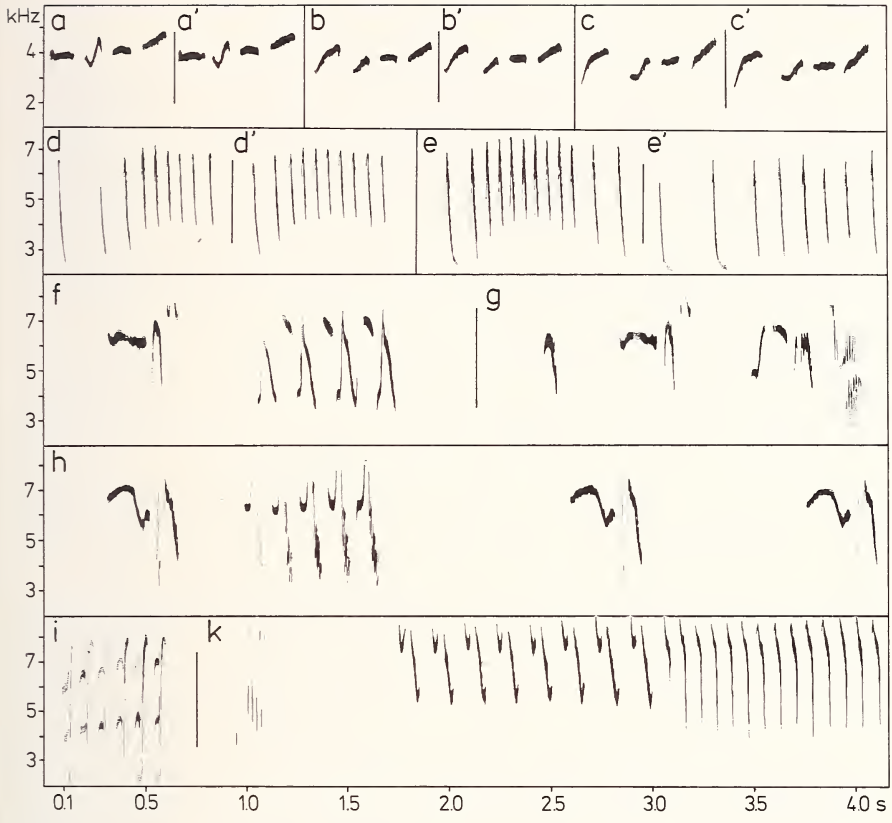


Fig.91: Vocalizations of Muscicapidae and Rhipiduridae. – a-e) *Culicicapa ceylonensis,* territorial song (a-c) and warning calls (d-e). – a-a') 2 verses of 1 ♂, Mai Pokhari 10.IV.1988; b-b') 2 verses of 1 ♂, Yamputhin 1.V.1988; c-c') 2 verses of 1 ♂, Karmarang 5.VI.1988; – d-e) 2 warning call series of 2 ♂ each, d-d') Tada/Kabeli Khola 24.IV.1988; e-e') Mure/Hurure 9.VI.1988.
f-k) *Rhipidura hypoxantha,* parts of territorial song of 1 ♂, Gompa/Tarakot 3.VI.1973.

RHIPIDURIDAE

Rhipidura

Three species occur in Nepal *(hypoxantha, albicollis, aureola);* all breed though there are no records for *aureola.* Their ecological requirements are highly diverse. *Rh. aureola* is a tropical species extending its all-Indian area into lowland Nepal, *albicollis* inhabits the midlands no higher than 2400 m, and *hypoxantha* penetrates into the Palaearctic vegetation belt near timberline, certainly the most euryoecious species within Nepal. It coexists locally with *albicollis.* The latter is a secretive bush and thicket species, *hypoxantha* stays mainly in the lower canopy and high bushes and is conspicuous by its permanent "hyperactivity".

Rhipidura hypoxantha Blyth

Systematic notes: Species perhaps to be separated as a monotypic genus *Chelidorhynx.*

Material: 5 specimens: **D** Dolpo Distr., Gompa near Tarakot, 3300 m, 13.V.1970: 1♂. ** Myagdi Distr.. Dhorpatan, 3000 m, 16.IV.1970: 2♂. **B** Kathmandu Valley, Lalitpur Distr., Godavari, 1500 m, 26.I.1970: 1 o. **J** Ramechap Distr., Thodung, 3200 m, 6.IV.1973: 1♀.

Measurements: **Wing**-L ♂ (3) 56-57 mm, ♀ 55.5; o 55.5 mm. – **Tail**-L ♂ (3) 55.5-59 mm; ♀ 57; o 55.5 mm. – **Bill**-L ♂ (3) 7-7.5 mm; o 6.5 mm. – **Tarsus**-L ♂ (3) 14-14.5 mm; ♀ 14.4; o 15 mm. – **WTI** (5) 16.1-18.0%, $\bar{x}$=17.1, s_d=0.86. – **TWI** (5) 99.1-103.5%, $\bar{x}$=101.1, s_d=1.92.

Notes: ♀ bill above black, below orange-yellowish, feet dark-grey. Ovary inactive.

Horizontal: Gompa/Tarakot (13.V., 2.-3.VI.; see Material; :Dolpo); – Dhorpatan (15./16.IV.; see Material; :Myagdi); – Thaksang above Tukche (26./27.IV., 4.VII., 6. VII.); Purano Marpha (23.IV. both :Mustang); – above Chitre (4./5.V.); descent to Ghandrung (7.V. both :Parbat); – above Bagarchap (13.IV. :Manang); – Kathmandu Valley: Godavari (26.I.; see Material); Phulchoki Mt. (14.V. both :Lalitpur); – Ting Sang La (14.IV. :Sindhu Palchok); – Chordung Mt. (1.IV., 28.III.); Thodung (6.IV., see Material; both :Ramechap); – descent to Pahakhola (30.V.); Thudam (26.V. both :Sankhua Sabha); – Ladza Khola above Walungchung Gola (21.V.); upper Simbua Khola (11.V. both :Taplejung); – Paniporua (18.IV. :Panchthar); – upper Gitang Khola (29./30.III. :Ilam).

Vertical: 10 records during the presumed breeding season (V-VII) extend from 2700 m (Chitre, 5.V.) to (3 uppermost findings) 3440 m (descent to Pahakhola, 30.V.); 3600 m (Thudam, 26.V.); 3670 m (Ladza Khola, 21.V.). – Close to the breeding season (III-IV): 10 records between (3 lowest records) 2300 m (Paniporua, 18.IV.); 2400 m (Bagarchap, 13.IV.); 2550 m (Gitang Khola, 29./30.III.) and (2 uppermost) 3200 m (Parano Marpha, 23.IV.); 3400 m (Thaksang, 27.IV.).

The breeding belt is not easy to ascertain. At least E III, the Yellow-billed Fantail is already present within the presumed breeding belt and actively singing. But in IV small flocks are still roving through forest vegetation (18.IV., Paniporua, 2300 m), and this was reported even in V by Diesselhorst (1968:261), possibly non-breeding birds. There is only one breeding record, altitude unreported. According to dates from V onwards presented here, the breeding belt is roughly 1000 m wide. Inskipp & Inskipp (1991) summarize "summer" dates from 2440-4000 m, no months given.

Habitat: In general, the Fantail is confined to forests, staying mainly in the lower canopy but occasionally coming down to the bush stratum. Its limitation to forests is quite strict,

so that it is rarely observed near or on clearings or at forest edges. Giving the broad belt occupied during summer, the climatic conditions to be sustained are very diverse. Habitats comprise the upper subtropical belt within the oak *(Quercus, Lithocarpus)* zone and extend to the *Rhododendron/Abies* belt, even to its upper section with bushy *Rhododendron* prevailing and *Betula* stands close to (artificial?) timberline. Even areas of reduced monsoon influence in the Inner Valleys and N of the main chain are inhabited (Thakkhola: Thaksang, Purano Marpha; Dolpo: near Tarakot), where almost exclusively coniferous forests occur *(Pinus, Abies, Cupressus, Picea).*

Vocalizations: Territorial song (Fig.91f-k) consists of nearly constantly displayed und irregularly spaced sequences of single notes, note groups or even long trills (up to 2.5 s); the trills may be composed of phrases (Fig.91f). Frequency span of individual notes is generally remarkably wide, often reaching 5.5 kHz; maximum frequency is near 9 kHz. The auditory impression is somewhat like that made by *Phylloscopus proregulus* (especially the northern subspecies of the taiga belt), but the song is more vigorously produced.

Rhipidura albicollis albicollis (Vieillot)

Material: 1 specimen: **D** Myagdi Distr., below Khibang, 1400 m, 20.V.1955: 1♂.

Measurements: **Wing**-L 84 mm. – **Tail**-L 104.5 mm. – **Bill**-L 11 mm. – **Tarsus**-L 20.5 mm. – **WTI** 17.9%. – **TWI** 124.4%.

Horizontal: below Khibang (20.V., see Material :Myagdi); – Mai Pokhari (1.IV., 9.IV. :Ilam); – Paniporua (18.IV. :Panchthar).

Vertical: 1400 m (20.V.); 1800 m (1.IV.); 2150 m (9.IV.); 2300 m (18.IV.). – These observations fall in the upper half of the species' vertical range, which extends (rarely) up to 2440 m (Inskipp & Inskipp 1991).

Habitat: The White-throated Fantail is said to live in the lower canopy and especially in the bushy understorey of forests. It is well able even to fly quite skilfully within the narrow space between bushes (Paniporua).

MONARCHIDAE

Hypothymis azurea

Horizontal, vertical, habitat: S Siwalik Mts., N Sunischare, 250 m (4.IV. :Ilam). The only specimen encountered was in *Shorea robusta* forest near a spring.

TIMALIIDAE

Pellorneum ruficeps

Horizontal, vertical: Both our records originate from the lower Arun valley: Darapangma (20./21.VI., 1430 m); N Khandbari (21.VI., 1150 m; both :Sankhua Sabha). According to Inskipp & Inskipp (1991) they are near the upper distributional limit of the species, where it is said to be rare and local (but see below).

Habitat: On the eastern slopes of Arun Valley, I found the Puff-throated Babbler only in degraded scrub and in tree-rich agricultural land, always close to human settlement, mostly more or less scattered buildings. 3♂ were singing between Darapangma and Khandbari along the roadside in dense bushes and low trees, always hidden in the foliage and to be seen in the open only after play-back of their own vocalizations. In the area under consideration, the species was not common, the few ♂ registered being widely spaced with no close neighbours.

Vocalizations (Fig.92a-h): A quite often encountered double-whistle, the second element slightly descending in pitch ("dee-tüeh", Fig.92d-h), seems to be used in territorial context. It was given by 3 ♂ in the early morning and later up to about 11 a.m., always from dense foliage. At dusk, a specimen displayed turdine-like song (Fig.92a) from the upper canopy of a huge *Eucalyptus* tree on the Darapangma ridge. This consists of whistling notes of slightly descending pitch with slight and irregular frequency modulation. Upon play-back of the double-whistle (see above), a specimen came close to the speaker, always hidden in bushes, then answered by a loud and conspicuous warbling song (Fig.92b-c) of clear, mostly long drawn-out whistling notes, all except a few introductory notes within a narrow frequency range of less than 2 kHz.

Pomatorhinus

The genus comprises 4 species in Nepal *(erythrogenys, schisticeps, ruficollis, ferruginosus).* Except for *ferruginosus,* for which only a few sightings in the Arun are known, there

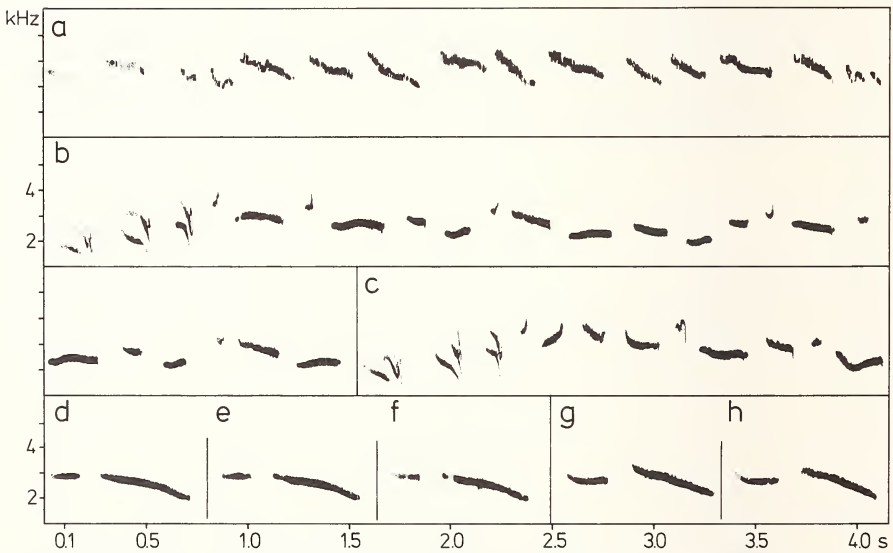


Fig.92: Vocalizations of Timaliidae. – a-h) *Pellorneum ruficeps,* territorial song (a-c) and call-like vocalizations (d-h); a) song at dawn from treetop, Darapangma 20.VI.1988; b-c) flute-like song after playback of double call, Darapangma 21.VI.1988; d-f) 3 double calls of 1 ♂, Darapangma 21.VI.1988; g-h) 2 double calls of 1 ♂, above Khandbari 21.VI.1988.

are breeding records. The first three species are graduated vertically, *schisticeps* in the lowest, *ruficollis* in the uppermost belt, but there is considerable overlap. Though the 3 species are commonly distributed and their preference for open and secondary vegetation is obvious, their exact niches remain to be determined. Despite their medium-sized bodies, the voices of at least *erythrogenys* and *ruficollis* are unexpectedly low – an adaptation to staying mainly close to the ground?

Pomatorhinus erythrogenys

Horizontal: Ghandrung (30.IV. :Parbat); Kathmandu Valley, Sheopuri (25. VI. :Kathmandu); – Bhotebas (20. VI.); Chichila (18/19.VI. both :Sankhua Sabha); – Yamputhin (16.V. :Taplejung).

Vertical: All data from the presumed breeding season (V/VI): 1700 m Sheopuri; 1850 m Bothebas; 1950 m Chichila; 2100 m Ghandrung, Yamputhin. This makes only a narrow span of 400 m, but records gathered by Inskipp & Inskipp (1991) range down to 305 m ("sedentary resident"), though detailed data on summer and winter distribution are still largely unavailable.

Habitat: The Rusty-cheeked Scimitar-babbler is an inhabitant of open country with sparse bush and/or tree vegetation, sometimes on grassy hillsides with few bushes (Yamputhin), but also in thick bushes close to (mature) forest edges (Chichila). Consequently, large scale deforestation of vast parts of the Nepal midlands has been advantageous to the species and it is often classified as "common".

Vocalizations: The territorial song (Fig.93a-c) is an antiphonal duetting. One partner, apparently the ♂ (cf. Ali & Ripley 1971,6:142; Fleming et al. 1976) gives a (complex) double note, the ♀ adds a short but prominent "kik". Pauses between end of the ♂ part and beginning of ♀ part vary considerably, not only between different ♀ but also within individual ♀. The ♀ may even start before the ♂ part finishes (Fig.93c-c'). Often the ♀ part is completely lacking, but this may be dependent on the season. All recordings presented here originate from M VI, when pair bonds have been stable for long time and the breeding cycle may have been in progress. ♂ notes differ greatly in various ♂ but are very constant in the individual ♂. The ♀ "kik" however is very similar in all ♀ recorded, even in pitch and fine structure. In *erythrogenys* as in *ruficollis,* pitch of the whole duet is remarkably low: lower range of the ♂ part often below 0.85 kHz, upper below 2 kHz. The upper range of the ♀ "kik" is nearly 1 kHz higher than the highest ♂ parts. – Duetting display is combined with a conspicuous movement of head and bill, which are vertically bent down and up, rhythmically and alternately according to ♂ and ♀ vocal parts.

Pomatorhinus ruficollis ruficollis Hodgson

Material: 1 specimen: **D** Mustang Distr., Thakkhola, Chadziou Khola Valley; 2600 m, 27.X.1969: 1♂.

Measurements: **Wing**-L 77 mm. – **Tail**-L 82 mm. – **Bill**-L (by compasses) 20.5 mm. – **Tarsus**-L 29 mm. – **WTI** 7.8%. – **TWI** 106.5%.

Horizontal: Our records extend fom S Dhaulagiri to near the eastern border: Upper Myagdi Khola, Boghara (20., 26.V. :Myagdi); Chadziou Khola (27.X.; see Material; :Mustang);

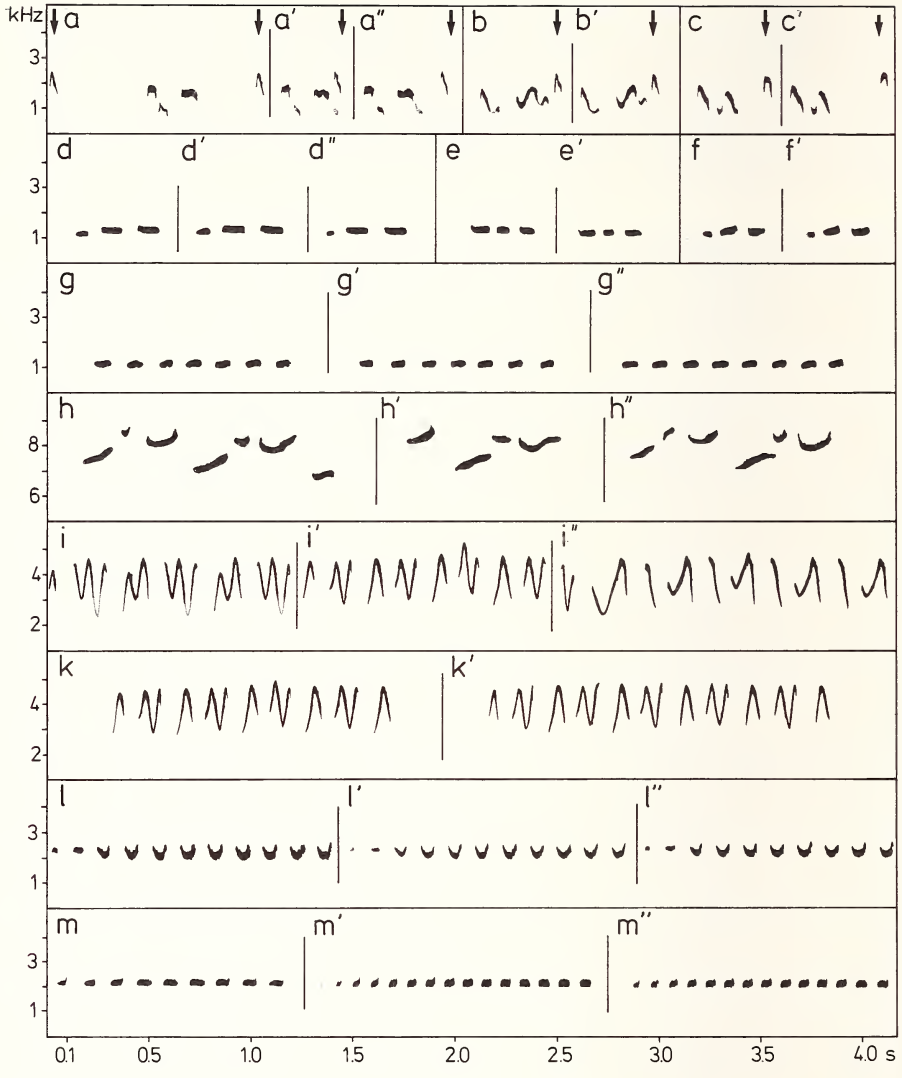


Fig.93: Vocalizations of Timaliidae. – a-c) *Pomatorhinus erythrogenys,* duetting pairs; a-a") 3 duet verses of 1 pair, Chichila 18.VI.1988; b-b') 2 duet verses of another pair, Chichila 18.VI.1988; c-c') 2 duet verses of another pair, Chichila 20.VI.1988. – Arrows: ♀ part.
d-f) *Pomatorhinus ruficollis,* territorial song; d-d") 3 verses of 1 ♂, between Chichila and Bhotebas 20.VI.1988; e-e') 2 verses of 1 ♂, Mai Pokhari 10.IV.1988; f-f') 2 verses of 1 ♂, near Mure 8.VI.1988.
g) *Xiphirhynchus superciliaris,* territorial song; g-g") 3 consecutive verses of 1 ♂, Lassetham 9.V.1988.
h) *Stachyris ruficeps,* territorial song; h-h") 3 consecutive verses of 1 ♂, Omje Kharka 2.V.1988.
i-k) *Spelaeornis caudatus,* territorial song; i-i", k-k') verses of 1 ♂, Paniporua 18.IV.1988.
l-m) *Stachyris pyrrhops,* territorial song; l-l") 3 verses of 1 ♂, above Bega 16.V.1955; m-m") 3 verses of another ♂, Boghara 27.V.1995.

– Lughla (23.X. :Solukhumbu); – near Mure (8.VI.); Chichila (19.VI); between Chichila and Bhotebas (20.VI. all :Sankhua Sabha); – Mai Pokhari (10.IV. :Ilam).

Vertical: Presumed breeding season and close to it (IV, V, VI): 1800 m Boghara; 1850 m Bhotebas; 1950 Chichila; 2150 m Mai Pokhari; – outside breeding season (X): 2600 m Chadziou Khola; 2850 m Lughla. – The Streak-breasted Scimitar-babbler is said not to migrate altitudinally (Inskipp & Inskipp 1991), thus the X records may also indicate parts of the vertical belt inhabited constantly. Chadziou Khola and Lughla records are at and even above the presently known vertical range of the species.

Habitat: *P. ruficollis* hunts predominantly in the understorey of secondary growth in diverse bushes and single trees where it is mostly difficult to see and certainly often overlooked.

Breeding: At least 1 adult specimen guided fledged young in dense bushes close to the forest edge at 19.VI. (Chichila, 1950 m). Diesselhorst (1968:223) reports the same situation in E V (Jiri, 2100 m).

Vocalizations: Commonly heard is a three-note call (Fig.93d-f; territorial song?) to be rendered as "hoo-doo-dood", the first syllable shortest but with stress and slightly lower in pitch (to be recognized only on the sonagram). All notes are clearly whistled with only minor modulations and are quite low: All notes of 2 ♂ ranged below 1.3 kHz.

Xiphirhynchus superciliaris

Horizontal, vertical: Only one observation: Pasture Lassetham NW Yamputhin (9.V., 3350 m; :Taplejung). This specimen, apparently a ♂, was for few minutes at the edge of the small pasture clearing in low *Berberis* and *Rhododendron* bush, close to mature *Abies densa/Rhododendron hodgsoni* forest. The site being fogbound, my attention was attracted by the peculiar voice (see below). – The species is said to be a "scarce resident" in Nepal, its western distributional limit is in the Dhaulagiri area (Inskipp & Inskipp 1991); there are additional records from the Apsuwa River, western Arun catchment area in III and IV (Tymstra 1993). The record presented here is the highest in Nepal, exceeding all others by 300 m.

Vocalizations (Fig.93g): The specimen displayed uniform verses of 7 or 8 short identical "oop-oop-oop..." notes, ascending slightly in pitch by about 50 Hz. The mid-frequency of all notes was conspicuously low: 1.16 kHz.

Pnoepyga

The discovery of a wren-babbler species new to science (Martens & Eck 1991), the third of the genus, is to be regarded as a major event in Himalayan and even Indian ornithology in recent years. Most remarkably and embarassingly, *immaculata,* a sibling of *albiventer,* lives in close sympatry and even syntopy with both hitherto known species, *albiventer* and *pusilla.* However, the voice of all three species differs considerably, and a tape recording of an individual that later became the *immaculata* type specimen was the key for its discovery. *P. immaculata* must have been overlooked owing to its apparent scarcity and overall similarity to both other species of the genus. The three species inhabit different altitudinal belts, but there is considerable overlap, *pusilla* occupying the lower, *albiventer* the upper belt, *immaculata* mostly in between. *P. albiventer* and *immaculata* have been found at close range on their presumed breeding grounds (Lete :Mustang) as have *albiventer* and

pusilla (Omje Kharka :Taplejung). Though all species are ecologically very similar in that they are confined to the ground layer of dense forests, they have slight ecological peculiarities as well as differing altitudinal preferences. *P. pusilla* lives close to rivers and streams and shows vocal adaptations to the noisy environment. The two others are difficult to tell apart, but *immaculata* apparently prefers extremely dense forests with luxurient undergrowth. *P. albiventer* is the most euryoecious species of the three and inhabits the broadest vertical belt.

While the distribution of *pusilla* and to a lesser extent of *albiventer* is Chinese SE Asian (map in Harrap 1989), *immaculata* is confined to Nepal up to now, and none of the larger collections which we checked revealed any misidentified *immaculata* specimen collected beyond the Nepal borders.

Pnoepyga albiventer albiventer (Hodgson)

Material: 5 specimens: **D** Mustang Distr., Lete Khola opposite Lete, 2400 m, 7.V.1995. 1♀ (song specimen). **B** Sindhu Palchok Distr., Ting Sang La, 3200 m, 15.IV.1973: 2♂ (song specimens). **M** Taplejung Distr., upper Simbua Khola, 3250 m, 3570 m; 11. and 13.V.1988: 2♂ (preserved in spirit).

Measurements: For this section additional material from Nepal and all other parts of the area of ssp. *albiventer* was included (collections in Berlin, Chicago, Dresden, Munich, New York, Tring and Washington). – **Wing**-L of ssp. *albiventer* from all area parts (without specimens from Mt. Victoria, which represent a geographic form of their own): ♂ (25) 58.5-67.5 mm, $\bar{x}$=61.8, s_d=2.13; ♀ (22) 56-62 mm, $\bar{x}$=59.9, s_d=1.47. – **Wing**-L Nepal: ♂ (15) 58.5-65 mm, $\bar{x}$=61.5, s_d=2.03; ♀ (14) 56-62 mm, $\bar{x}$=59.5, s_d=1.59; – Mt. Victoria: ♂ (8) 59-64 mm, $\bar{x}$=61.4, s_d=2.20; ♀ (4) 60-62.5 mm, $\bar{x}$=61.8.

Nepal: **Tail**-L ♂ (9) 16.5-19 mm, $\bar{x}$=17.7, s_d=0.97; ♀ (9) 13-20 mm, $\bar{x}$=17.4, s_d=2.10. – **Bill**-L ♂ (11) 10-12 mm, $\bar{x}$=11, s_d=0.55; ♀ (14) 10-12 mm, $\bar{x}$=11.1, s_d=0.49. – **Tarsus**-L ♂ (11) 23.5-25 mm; $\bar{x}$=24.2, s_d=0.56; ♀ (12) 22.5-24.5 mm, $\bar{x}$=23.3, s_d=0.62. – **WTI** (27) 4.8-9.0%, $\bar{x}$=6.7, s_d=1.25. – **TWI** (20) 26.7-33.9%, $\bar{x}$=29.1, s_d=1.86.

Bill/wing-Index: ssp. *albiventer* (without Mt. Victoria population) (50) 16.0-20.3%, $\bar{x}$=18.3, s_d=1.05; pulli (11) 16.0-18.5%, $\bar{x}$=17.4, s_d=0.79; adults separated by sex: ♂ (21) 16.1-19.7%, $\bar{x}$=18.1, s_d=0.97; ♀ (21) 16.5-20.3%, $\bar{x}$=18.5, s_d=0.95. – Mt. Victoria (12) 19.2-21.5%, $\bar{x}$=20.4, s_d=0.78. – *P. immaculata* (8) 20.0-22.3%, $\bar{x}$=21.3, s_d=0.81. – *P. pusilla* (Nepal, China, Mt. Victoria) (16) 19.8-24.3%, $\bar{x}$=22.3, s_d=1.43.

Notes: *Re* variability in colouration of old birds see Martens & Eck (1991). The nest (juvenal) plumage takes two forms (Plate 1): (i) underside blackish grey, giving a monotone impression (a-b), (ii) underside with brown feathers, which in the throat region are edged with yellow at the end; on the belly the yellow is more extensive and transected by a narrow brown cross-band (c-e). The moult from the two forms of juvenal plumage into the "scaly" adult plumage is documented by skins. Type (i) moults into the dark phase, type (ii) into the light phase.

Horizontal (see map in Martens & Eck 1991): Our records from SW Dhaulagiri to the Darjeeling/Sikkim border. – Dhorpatan (8.V.); N Boghara (21./22.V. both :Myagdi); – S Lete (1.V.; 8.V.); ascent to Lake Titi (2.V. both :Mustang); – Bantanti (1.V.); above Chitre (4./5.V. :Parbat); – Trisuli Valley, Syng Gyang (25.IV. :Rasuwa); – Ting Sang La (16.IV.; see Material, :Sindhu Palchok); – descent to Phahakhola (29.V./30.V.); Thudam (25./27.V.); Kangla Khola above Thudam (25.V. all :Sankua Sabha); – Ladza Khola above Walungchung Gola (21.V.); ascent to Walungchung Gola (20.V.); upper Simbua Khola (10.-13.V.; see Ma-

terial); pasture Lassetham (8.V., 15.V.); Omje Kharka (4.V. all :Taplejung); – Dhorpar Kharka (14./15.IV. :Panchthar).

Vertical: The above records, all falling in the presumed breeding season or being close to it (M IV-E V), range between 2370 m (N Boghara), 2400 m (Omje Kharka, Lete) and 4000 m (above Pahakhola) covering a vertical belt of about 1600 m. This agrees well with the statement of Inskipp & Inskipp (1991): "summers" (no months given) from 2440 to 4000 m. Only Harrap (1989) mentions a record at 2000 m in the Trisuli Valley, but this is in error for *P. immaculata* (Martens & Eck 1989; N. Redman pers. comm.). Strongholds of the species may be between 2900 and 3400 m (11 out of 20 records of our own).

Habitat: The Greater Scaly-breasted Wren-babbler occupies a mainly two-dimensional habitat, the floor of a great variety of forest types, depending on level within the broad altitudinal belt. All inhabited forests show a closed canopy and quite often a well developed layer of ferns, herbs and mosses, and in addition decaying wood, rocks and rock debris are often interspersed. But dense ground vegetation is not a prerequisite, forests with a more open floor and only sparse vegetation also being inhabited. In any case, opportunities to shelter in crevices, under rocks and logs are always nearby. The species does not perch, as do all three congeners, on even low bushes; it is totally confined to the soil layer, mounting only low rocks and logs. In general, it lives less hidden than at least *P. pusilla.*

Inhabited forest communities are as follows: mixed *Quercus/Acer* (Omje Kharka, 2400 m); mixed broad-leaved forest (Lete, 2530 m), dense *Tsuga dumosa* (Walungchung Gola, 2950 m; Simbua Khola, 2900 m), *Abies spectabilis, Pinus wallichiana* (Dhorpatan, 3000 m), *Abies/Quercus/Rhododendron* (Syng Gyang, 3200 m), *Abies densa, Rhododendron hodgsoni* (Lassetham, 3400 m), *Abies densa, Betula utilis* (Kangla Khola, 3850 m), low *Rhododendron* bush, *Betula* near timber line (descent to Pahakhola, 4000 m).

Vocalizations: Territorial song is a short trill (1.2-1.7 s) with a rigid syntax, so that the verses are quite uniform even in ♂ separated by hundreds of kilometers. Single notes are strongly frequency modulated, with steep sides, angular opened up- or downwards, and broad frequency range. The acoustic impression resembles somewhat that given by the Central European song type of *Certhia familiaris* (for details see Harrap 1989, Martens & Eck 1991).

Pnoepyga immaculata Martens & Eck

Material: 5 specimens: **D** Mustang Distr., Thakkhola, opposite Lete, 2530 m, 1.V.1980: 1♂ (**holotype;** song specimen) * Lete Khola opposite Lete, 2400 m, 5.-7.V.1995: 2♂ (song specimens; yellow morph; specimen from 7.V. in Museum Dresden no. C 52955). * Chadziou Khola Valley, 2600 m, 30.VI.1970: 1♀ (ovipositing; **paratype**) ** Myagdi Distr., upper Myagdi Khola between pasture Dobang and Boghara, 2100 m, 26.V.1995: 1♂ (song specimen; white morph).

In addition to the four type specimens mentioned in the original description (Martens & Eck 1991) an orginally misidentified fifth skin is to be added: ♂ (white morph) from Chisapani, 950', Kailali Distr., Karnali Valley/W Nepal, 19.XII.1948 (Smithsonian Institution Washington 408846, see S. D. Ripley 1950:391, *albiventer):* bill blackish brown, lower base whitish, legs pale brown, **Wing**-L 58 mm (Ripley noted 60). – **Tail**-L 17 (Ripley noted 14). – **Bill**-L at least 12.5 mm (basis damaged). – **Tarsus**-L 23 mm.

Measurements of the known specimens: (6♂, 2♀): **Wing**-L ♂ (6) 56-61 mm; ♀ (2) 55.5-56.6 mm. – **Tail**-L ♂ (6) 16-20 mm; ♀ (2) 16.5-17 mm. – **Bill**-L ♂ (6) 12-13 mm; ♀ (2) 11.3-12 mm. – **Tarsus**-L ♂ (6) 22-24 mm; ♀ (2) 23-23.5 mm. – **WTI** (8) 5.2-7.4%, $\bar{x}$=6.1, s_d=0.98. – **TWI** (8) 27.1-32.8%, $\bar{x}$=29.3, s_d=1.80. – Bill/wing index see *Pnoepyga albiventer.*

Horizontal: Our records are as follows: upper Myagdi Khola, Boghara and between Boghara and pasture Dobang (21./22.V., 26.V.1995, see Material); above Kuinekani (18.V.1995, both :Myagdi); – right banks of lower Lete Khola opposite Lete (1.V.1980, **holotype,** 5.-7.V.1995, see Material); between upper village Ghasa and Lete (14.V.1995); Chadziou Khola Valley (30.VI.1970, **paratype,** see Material; all :Mustang); – upper Gitang Khola Valley (13.IV.1988, record through sonagram :Panchthar).

At present *immaculata* is to be considered an endemic species of Nepal, which is known from 10 localities, 8 in the presumed breeding grounds (upper Myagdi Khola; Kuinekani; Lete; Ghasa; Chadziou Khola Valley; Langtang Valley; between Ting Sang La and Bigu; upper Gitang Khola), 2 in the winter quarters in the lowlands (Chisapani/Karnali Valley; Amlekhganj). Most of these records can be attributed to 3 major populations: (i) Upper Myagdi Khola between Boghara and pasture Dobang. Without playback stimulation 3 singing ♂ were heard on 21./22.5.1995, 4 at other localities in the same valley section on 26.5.1995. According to the suitable habitat conditions on both river banks dozens of pairs may be expected to live there. The terrain, however, is extremely steep and difficult to explore. (ii) Thakkhola between Ghasa and Lete including the left banks of lower Chadziou Khola Valley and right banks of the lower Lete Khola. The holotype and 1 paratype originate from this area (see Material). A not very detailed investigation which covered only the right banks of lower Lete Khola and the right banks of Kali Gandaki between Lete and Ghasa in V 1995 revealed a well established population there. At least 20 ♂ were spotted by playback experiments in this area, including forests along the path leading northward from the upper village Ghasa to Lete. According to the habitat requirements (see below), the population might surpass, perhaps considerably, 100 pairs. (iii) N. Redman (pers. comm.) localized 14 singing ♂ in the Langtang gorge between Syabru and Lama Hotel in V 1993, all by playback experiments with the voice of the holotype. The records near Kuinekani (2 singing ♂, 18.V.1995), Bigu (:Sindhu Palchok) and near Dhorpar Kharka (N Ilam :Ilam) refer to single observations and the local population size remains unknown.

While most of Nepal is covered now by scattered observations and several study skins, even close to the Darjeeling border, records from Sikkim and Darjeeling are to be expected. However, dozens of study skins of *albiventer* from these areas and from Bhutan did not reveal any additional record for *immaculata.*

Vertical: Well documented records are located at 1800 m (Boghara); 2000 m, 1800-2500 m (Langtang Valley; Harrap 1989, N. Redman pers. comm.); 2100 m (upper Gitang Khola); 2150-2300 m (N of Boghara several singing ♂); 2200-2570 m (from Ghasa to lower Lete Khola, many singing ♂); 2650 m (Chadziou Khola); 3100 m (Ting Sang La/Bigu). Local distributions seem to be quite limited and to differ: Myagdi Khola: 1800-2350 m; Thakkhola 2200-2650 m (for Langtang Valley see above). Thus the *immaculata* distribution falls within the upper vertical belt of *pusilla* and the lower one of *albiventer,* but close vicinity at the presumed breeding grounds was hitherto observed only for *immaculata/albiventer* and *albiventer/pusilla* (Martens & Eck 1991).

Further records of syntopy for *immaculata/albiventer:* Lete Khola opposite Lete: 2♂ *albiventer* singing within the *immaculata* population at 2400 and 2450 m, 7. and 8.V.1995, respectively (see *albiventer* Material); upper Myagdi Khola, N of Boghara, 2370 m 1 ♂ singing at the upper edge of the local *immaculata* population, 21.V.1995.

Habitat: The 3 large populations in the upper Myagdi Khola, in Thakkhola and in the Langtang gorge (N. Redman pers. comm.) are confined to unusual and identical vegetational structures: heavy mixed deciduous forest (in Thakkhola locally with few *Pinus wallichiana* and *Tsuga dumosa*) and a dense understorey of bushes, bamboo, ferns and tangled vines (e.g. *Aristolochia,* Myagdi Khola). Altitudinally, this plant community is largely restricted to parts of valleys along massifs of the main chain, usually deeply recessed, where precipitation falls all year round, though it is particularly heavy during the monsoon. Owing to this constellation of orography, location of the distribution points with respect to the main chain, and altitude within the monsoon convection zone, the vegetation is extremely dense and luxuriant, so that these relatively small regions of the valleys (usually extending over only a few kilometers) appear tropical. These regions are the preferred habitat of *immaculata.* Although *P. albiventer* is also capable of taking up residence under these conditions, it prefers altitudes where the climate is more Palaearctic and the forest floor is less densely overgrown with herbs and shrubs, often being covered only with deadwood and scattered bushes; more rarely, it is found among dense vegetation that covers the ground completely.

Conversely, *immaculata* also accepts simpler vegetational structures. Above Kuinekani, 2 ♂ sang in bushes accompanying a stream passing through agricultural land (potato fields, overgrown pastures, 2500 m, 2400 m; 18.V.1995). Degraded forest, however, was in the vicinity. I saw it once in the open at a forest edge (below Dhorpar Kharka, IV), as did Diesselhorst (1968: 224, skin no. 385, *albiventer*).

In the optimum zone of *immaculata,* population density may by high. Along the path between Ghasa and Lete at several places every 100-150 m a ♂ could be provoked by playback of a local tape recording, and even 2♂ were heard at one site at several localities.

At present, the *inmaculata* populations in the upper Myagdi Khola and in Thakkhola seem not to be endangered because human pressure on forests, at least for now, is low in both areas. However, the understorey of a piece of good habitat N of Ghasa has been cleared and pines have been felled; this patch is not longer suitable for the Nepal Wren-babbler. Due to its minute area splinters, the species is vulnerable and further development is to be observed carefully. Only one of the local areas are situated in a fully protected region (Langtang National Park).

Vocalizations: The territorial song is a silvery strophe of nearly regularly spaced whistled notes, the whole verse slightly descending in pitch. The single note is only slightly frequency modulated. Consequently, the frequency range is considerably more limited than in *albiventer,* covering only about half of that of *albiventer* (see Martens & Eck 1991 for details). As in *albiventer,* the verse type of the individual ♂ is rigidly fixed and seems not to be subject to variations.

Pnoepyga pusilla

Horizontal: Records only from SW Dhaulagiri and the Arun Valley eastwards. – Side-valley of Thulo Khola, towards Kuinekani (18.V.1995, one singing ♂ :Myagdi); – above Tolka (29.IV.1995, one singing ♂ :Kaski); – Chichila (19./20.VI.); between Mure and Hurure (8./16.VI. both :Sankhua Sabha); – from Pass Deorali to the Kabeli Khola Valley (17.V.); Omje Kharka NW Yamputhin (2./6.V., together with *albiventer;* both :Taplejung); – Paniporua (18./20.IV. :Panchthar).

Vertical: The above records, all by the peculiar voice, range from 1960 m Tolka, 2000 m Chichila to 2640 m Deorali Pass, thus covering a quite narrow vertical belt of just 700 m. Inskipp & Inskipp (1991) summarize "summer" records (months?) from 1500-2590 m. All congeners are difficult to identify in the field by morphological characters, and obviously the literature is burdened by misidentifications.

Habitat: The Lesser Scaly-breasted Wren-babbler lives obscure and well hidden in the dense herb, fern and grass layer, mainly of primeval forests. Only rarely can it be found in the open at forest edges or even along scanty vegetation at road sides (Paniporua). But the bird is almost always hidden in dense foliage, even during playback experiments, which may attract the bird near or even to the immediate vicinity of the observer's feet. Moreover, the species shows a distinct preference for the vegetation along the banks of rivers and streams, and only a few of my observations refer to (singing) specimens a few hundred meters away from running and noisy water (see Vocalizations). Population density may be locally high: between Chichila and Bhotebas (:Sankhua Sabha), 7 were heard along a distance of about 2 km, the birds always perching on the ground along small streams and rivulets, which cut across the horizontal path. As the species is difficult to observe and the voice unobtrusive, it may be largely underrepresented. However, in W and W central Nepal, I came across it only twice and it seems to be absent in vast areas.

Vocalizations: In Nepal, territorial song consists of two unobtrusive whistles, with a slight and short modulation at the beginning. High pitch (4.8-7.4 kHz) indicates adaptation to noisy water courses (see Habitat; for details, also geographical variation, see Harrap 1989, Martens & Geduldig 1990, Martens & Eck 1991).

Spelaeornis

Two species are recorded for Nepal, *caudatus* and *formosus.* Both are scarce inhabitants of the herb layer of dense deciduous subtropical forests, difficult to observe and hence probably largely underrecorded. In Nepal they have not been found W of the Arun watershed, apparently the western border of their range. Their biology is virtually unknown, and at least in Nepal, their existence is greatly endangered due to loss of forest habitat.

Spelaeornis caudatus

Horizontal, vertical: Paniporua, 2300 m (18.IV.1988 :Panchthar).

Habitat: Upon playback of an unknown song, a ♂ approached the speaker and displayed continuous song while sitting exposed in the herb layer at the edge of a small forest clearing in a deeply cut river gorge. A second specimen, silent, apparently the ♀, was close by. The next morning playback was repeated, but the birds did not show up again.

The observation was made in a very impressive, though not untouched forest community: species-rich mixed deciduous forest in a ravine with oak *(Quercus)* prevailing, locally *Lithocarpus pachyphylla* interspersed, many epiphytes, among them numerous orchids. This locality is the margin of a still large patch of more or less untouched subtropical forest extending northward on a ridge entering Hinwa Valley. Surprisingly, this area suffers little human pressure though a few kilometers to the S and E, the oak forests of an adjoining ridge are badly damaged by the population of recently established settlements. The forested area seems to be highly interesting and should be investigated in more detail (stay of J.M. from 16.-20.IV.1988). – The above observation is mentioned in Inskipp & Inskipp (1991).

Vocalizations (Fig.93i-k): Territorial song is a loud monotonous strophe of a "pitchee-pitchee..." sequence, which is rendered, even upon playback, mostly in good shelter from the herb layer. The sonagram reveals a rigid syntax: constant alternation of 2 notes separated by about equal distances, only the introductory note of the verse differing from the others. The only ♂ recorded displayed 3 different verse types comprising 6 different notes.

Stachyris

Four species are on the Nepal list *(ruficeps, pyrrhops, chrysaea, nigriceps).* They are unevenly distributed in Nepal: *pyrrhops* is a locally common Himalayan endemic with the eastern border in E Nepal, *nigriceps* and *ruficps* enter Nepal from extended SE subtropical areas westward to C and far E Nepal, respectively, *chrysaea* is extremely local with few recent records. None of the species exceeds 2800 m vertically; *nigriceps* lives in the close neighbourhood of noisy rivers and streams and displays corresponding vocal adaptations.

Stachyris ruficeps ruficeps Blyth

Material: 1 specimen: **M** Taplejung Distr., Omje Kharka, NW Yamputhin, 2400 m, 3.V.1988: 1♂.

Measurements: **Wing**-L 52.5 mm. – **Tail**-L 47 mm. – **Bill**-L 12.5 mm. – **Tarsus**-L 18.5 mm. – **WTI** 9.5%. – **TWI** 89.5%.

Notes: Testes undeveloped.

Horizontal, vertical: Records only in the far East of the country: Pahakhola, 2650 m, 2 sp. mist-netted (1.VI. :Sankhua Sabha); – Omje Kharka, 2400 m (2.-5.V., see Material; :Taplejung).

In Nepal, the species is restricted to areas along the Arun Valley and further east. The present records fall within this scheme. For the area under study, the vertical area is only poorly documented, especially during the breeding season. According to the graph in Inskipp & Inskipp (1991), the present upper limit is at about 2800 m, the lower, however, at least during the breeding season, not yet defined. Ali & Ripley (1971,6:170) give 1000-2700 m (optimum 1500-2400 m), but refer to the whole Indian territory.

Habitat: Mixed broad-leaved forest. At Omje Kharka, small flocks of up to 3 (or even more?) in company of other species roamed in the canopy of medium-sized trees, preferably at forest edges. The Pahakhola specimens were caught in dense bushes intermingled with bamboo close to a stream in mature *Quercus semecarpifolia* forest.

Vocalizations (Fig.93h): The territorial song is an irregular combination of extremely high-pitched whistles, the individual note up to 8 kHz, others slightly below, showing remarkable amplitude modulations. Despite this high-pitched whistled song, there is no hint of close ties to noisy habitats along torrents.

Stachyris pyrrhops Blyth

Material: 1 specimen: **B** Kathmandu Valley, Lalitpur Distr., Godavari, 1600 m, 27.I.1970: 1 o.

Measurements: **Wing**-L 54 mm. – **Tail**-L 51 mm. – **Bill**-L 12.5 mm. – **Tarsus**-L 18.5 mm. – **WTI** 5.6%. – **TWI** 94.4%.

Horizontal: Few records from S Dhaulagiri to the Kathmandu Valley. – Upper Myagdi Khola, Boghara (27.V.); below and above Bega (16.V., both :Myagdi); – Kathmandu Valley, Godavari (27.I., see Material, :Lalitpur).

Vertical: 1550 m, 1900 m (Bega), 2100 m (Boghara). These records from the presumed breeding season are situated within the known vertical area as is the winter specimen (see Material).

Habitat: The specimen from Godavari was one out of a flock of 7 mist-netted in secondary scrub near the Godavari fish farm. The Black-chinned Babbler was found there previously by Fleming (Rand & Fleming 1957:124) and Diesselhorst (1968:227) in III and X, respectively. For habitat during breeding season see Vocalizations.

Vocalizations: Territorial song (Fig.93l-m) is a mellow low-pitched trill ("jüjüjüjü..") – a single note, which is repeated up to 15 times with little variation. Bandwidth of notes increases slightly within the first 3 notes of the verse. Note form differs between ♂ but is very constant within individual ♂; it hardly changes even upon playback experiments: angular and opened upwards (frequency bandwidth below 1 kHz, Fig.93l-l") or short whistle-like notes with a short upstroke at the beginning and at the end (about 500 Hz bandwidth only; Fig.93m-m"). Mid-frequency of the notes is slightly above 2 kHz. Song is displayed in the understorey of dense scrub and bushes mixed with bamboo thickets, also at the edge of agricultural land. The species is difficult to see there and can hardly be lured out even by playback experiments.

Stachyris nigriceps

Horizontal: Records only from the Arun Valley eastward to the Sikkim/Darjeeling border. – Chichila (20.VI.); Arun Valley bottom between Hedagna and Num (6.VI. both :Sankhua Sabha); – Yamputhin (28./30.IV.); confluence of Tada and Kabeli Khola (24./25.IV. both :Taplejung); – Iwa Khola Valley S of Sablako Pass (22.IV.); – Yektin (21.IV. both :Panchthar).

Vertical: All observations from the presumed breeding season (IV-VI) between 950 m (Arun Valley bottom) and 1950 m (Chichila). The other individual records are 1000 m Tada Khola, 1100 m Iwa Khola, 1500 m Yektin, 1650 Yamputhin. These data enlarge the vertical belt given as 1220-2000 m during "summer" by Inskipp & Inskipp (1991) considerably. It is now slightly above 1000 m in width.

Habitat: The Grey-throated Babbler seems to be a highly specialized species which I encountered only in dense and bushy vegetation along watercourses, both fast-running and

noisy torrents and rivers (near Yamputhin) and small streams running smoothly without much noise (Tada Khola, near Yektin, Arun), at least during the pre-monsoon period. There it lives very secretively, always hidden and hardly to be seen in the open, at least during the breeding season. Thus, all observations presented here are by the peculiar voice (see below). Among the few observations, no preference for any kind of watercourse could be decerned.

Vocalizations: The territorial song is always an uniform long-drawn-out trill consisting of 2-4 whistling introductory and 12-15 shorter notes mostly of nearly equal length. The frequency range of the songs of several ♂ is roughly between 4.1-5.9 kHz and even narrower in the individual ♂. This range alone indicates a good adaptation for river noise (Martens & Geduldig 1990). The species is highly territorial, but the displaying behaviour seems to be unusual. As I noticed, the song is not given at any hour of the day, but only during a very limited period, and in individual ♂ it may last only a few minutes. At the recording places, only 1 ♂ was present, and this may be a reason for limited activity and reduced territorial behaviour:

- Tada Khola, 1000 m, 24./25.IV.: song only between 0500 and 0600 hours, even briefer activity in the evening, no singing at any other time of day
- Yamputhin, 1650 m, 28.IV./1.V.: intense display of song on 28.IV. only between 0450 and 0515 hours, similarly limited during the other days, very few verses in the afternoon were be heard
- Arun Valley, 950 m, 6.VI.: song activity shortly before 0700 hours during a few minutes only, not noticed all day long.

All other observations of the species were recorded en route, and no detailed data on singing behaviour are available.

Conostoma aemodium Hodgson

Material: 1 specimen: **D** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 23.X.1969; ♂.

Measurements: **Wing**-L 128 mm. – **Tail**-L (graduation) 127 (22) mm. – **Bill**-L 23.5 mm (height in front of forehead feathers 11.8 mm). – **Tarsus**-L 39 mm. – **WTI** 10.2%. – **TWI** 99.2%.

Horizontal: Between Baldebas and Dhule (30.V. :Myagdi); – between Deorali and Chitre (3.V. :Parbat); – Chadziou Khola above Ghasa (23.X.; see Material; :Mustang); – above Omje Kharka (15.V.); ascent to pass Deorali from Yamputhin (16.V. both :Taplejung).

Vertical: 2600 m Chadziou Khola; 2800 m Baldebas/Dhule and Deorali/Chitre; 2930 m Deorali; 3100 m Omje Kharka. According to Inskipp & Inskipp (1991), these records, all from the presumed breeding season except the one from Chadziou Khola, are within the lower half of the vertical distributional belt so far known for Nepal (2700-3600 m).

Habitat: The Great Parrotbill inhabits forests of the cloud-forest zone, which consist, depending on altitude, of various tree communities, in general *Quercus/Rhododendron* in the lower, *Abies/Rhododendron* in the upper part of the vertical belt. A crucial factor seems to be the presence of bamboo *(Arundinaria)* stands, with which the species is most often associated. Regarding the above records, referring only to single specimens, only one (Baldebas/Dhule) originates from a forest type without bamboo nearby. In search of food, the Parrotbill tears leaves off bamboo stems (Deorali) or long pieces of bark from branches of

living bushes (Chadziou Khola, undetermined species). It is still unclear whether vegetable material itself is consumed, but this was thought to be the case by Ali & Ripley (1971,6:197).

Paradoxornis nipalensis

Paradoxornis nipalensis nipalensis (Hodgson)

Material: 3 specimens: **D** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 23.X.1969, 30.VI.1970: 1♂, 2♀.

Measurements: **Wing**-L ♂ 49; ♀ (2) 47.5 and 51 mm. – **Tail**-L ♂ 52; ♀ (2) 52.5 and 55 mm. – **Bill**-L ♂ 7; ♀ (2) 6.5 and 7 mm. – **Tarsus**-L ♂ 18.5; ♀ (2) 17.5 and 19 mm. – **WTI** (3) 13.3-15.7%. – **TWI** (3) 106.1-110.5%.

Notes: Testes slightly swollen, ovary (♀ from 30.VI.) active, close to ovipositing.

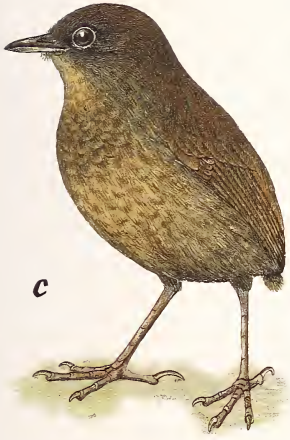
Horizontal, vertical: Records only from S Annapurna massif, Kali Gandaki and Kathmandu Valleys. – Chadziou Khola, 2600 m (see Material; :Mustang); – Potana, 2000 m (28.IV. :Kaski); – Phulchoki Mt., 2650 m (31.III. :Lalitpur). – This subspecies is confined to C Nepal, "eastern and western limits to be determined" (Ali & Ripley 1971,6:202); no contact zones to the neighbouring subspecies have been detected yet. – The altitudinal band seems to be very restricted, between 2000 and 3000 m according to Inskipp & Inskipp (1991); however, they did not indicate months, and according to the present data for the ssp. *nipalensis* and *humii,* the belt during the breeding season may be even narrower.

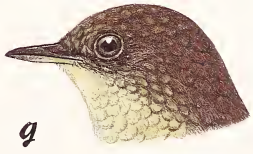
Habitat: The affinities of the Black-throated Parrotbill to bamboo stands (in Nepal mainly small to medium-sized *Arundinaria*) seem to be quite close, even if only small clumps intermingled with bushes in or at the edge of forests are concerned (Phulchoki Mt.; Chadziou Khola); all observations refer to this habitat except for a small flock passing a forset clearing near Potana. Outside the breeding season, at least between X (Chadziou Khola) and B VI (Pahakhola, see *P. n. humii),* (parts of) the local population assemble in flocks of up to 20 or even more specimens (Martens 1972).

Breeding: Period apparently starts late in early summer. The ♀ from 30.VI., accompanied by the ♂, was close to ovipositing. Correspondingly, the local population at Pahakhola *(P. n. humii,* see below) was still roaming in flocks of up to at least eight specimens in E V and B VI, and testes of a ♂ were only slightly enlarged, indicating that the population was not close to the breeding period proper. The species seems to be territorial during the breeding season.

Plate 1: *Pnoepyga albiventer.* a-e) moult from pullus stage ("Nestkleid") to juvenile stage (a-b: dark morph, c-e: light morph); f-g) comparison of size and coloration of head/throat of *P. albiventer* ssp. (f) and *P. a. albiventer* (g). – Drawn from skins as follows: a) Tring NHM 1935.4.5-816, ♂; Dib La, Trashiyangsi, E Bhutan, 19.IX.1934. – b) Tring NHM 1935.4.5-800, sex?; Me La, Shingbe, E Bhutan, 24.VIII.1934. – c) Tring NHM 1935.4.5-821, sex?; Dib La, Trashiyangsi, E Bhutan, 10.IX.1934. – d) Tring NHM 1935.4.5-818, ♀; Dib La, Trashiyangsi, E Bhutan, 24.IX.1934. – e) Tring NHM 1935.4.5-808, ♂; Dib La, Trashiyangsi, E Bhutan, 16.IX.1934. – f) Tring NHM 1905.9.10-550, ♀; S Chin Hills, Mt. Victoria, 30.III.1904. – g) Tring NHM 1935.4.5-809, ♀; Dib La, Trashiyangsi, E Bhutan, 16.IX.1934.

Original by K. Rehbinder.





KR

Paradoxornis nipalensis humii (Sharpe)

Material: 2 specimens: **K** Sankhua Sabha Distr., Pahakhola, 2700 m, 31.V.1988: 1♂, 1♀.

Measurements: **Wing**-L ♂ 51; ♀ 47.5 mm. – **Tail**-L ♂ 57.5; ♀ 52 mm. – **Bill**-L ♂ 8; ♀ 7 mm. – **Tarsus**-L ♂ and ♀ 18 mm. – **WTI** (2) 11.8-14.7%. – **TWI** (2) 109.5-112.8%.

Notes: Testes slighty enlarged, ovary inactive.

Horizontal, vertical: Pahakhola, 2700 m (31.V.-3.VI., see Material; :Sankhua Sabha).

Habitat: In the Pahakhola area, during E V and B VI, small flocks of from two to eight specimens were regularly caught in dense thickets near a stream with tall *Arundinaria* bamboo intermingled. This bushy vegetation was located in a small clearing within mature *Quercus semecarpifolia* forest.

Breeding: see *P. n. nipalensis.*

Garrulax

15 species are on the Nepal list *(albogularis, leucolophus, monileger, pectoralis, striatus, variegatus, rufogularis, ocellatus, caerulatus, ruficollis, lineatus, squamatus, subunicolor, affinis, erythrocephalus);* all breed. With respect to breeding status, this is the most species-rich bird genus within the Central Himalayas. The whole forest belt of the southern macroslope of the main chain is inhabited by Laughing-Thrushes, and one species *(affinis)* even penetrates into open and sparse bush beyond timberline, giving a total of more than 4000 m altitudinally. The vertical belt of the individual species, however, is limited, rarely exceding 2000m *(affinis),* but being much more narrower in most species. Though the vertical areas of several species overlap, only a few species occur syntopically during the breeding season (Dhorpatan, 3000 m: *affinis, variegatus, lineatus).* But ecological niches, competition and causes of vertical segregation within *Garrulax* have not been studied so far. – All Nepal species are distributed along the Himalayan axis from E to W, and several western limits are situated within Nepal, mostly in the Dhaulagiri area *(monileger, pectoralis, caerulatus, ruficollis, squamatus, subunicolor, affinis).* Only one species is a Himalayan endemic confined to the western part of the mountain chain *(variegatus)* extending to E Nepal. See Meinertzhagen (1928) and Cheng (1982) for distributional analysis of the genus.

Garrulax albogularis albogularis (Gould)

Material: 1 specimen: **D** Myagdi Distr., Bobang, S Dhorpatan, 2500 m, 27.IV.1970: o.

Measurements: **Wing**-L 136 mm. – **Tail**-L 139 mm. – **Bill**-L 24 mm. – **Tarsus**-L 51 mm. – **WTI** 5.9%. – **TWI** 102.2%.

Horizontal: Bobang S Dhorpatan (27.IV; see Material); Myagdi Khola, Muri, flock of about 10 sp. (1.IV. both: Myagdi); – Chitre and above Chitre, flock 5-6 sp. (4.-6.V.); above Ghandrung; flock (7.V.); Ghorapani Pass, flocks up to 15 sp. (11.VII., 24.VII. all :Parbat); – above Dhumpus, flocks up to 7 sp. (9.V.); Potana (30.IV., flock of about 4 sp., both :Kaski); – Chichila, flock 10 sp. (19.VI.); between Mure and Hurure, flocks up to 10 sp. (11.-16.VI. both :Sankhua Sabha); – between Deorali pass and Hellok, flock 10 sp. (17.V. :Taplejung).

Vertical: Our records (10 localities), all from the presumed breeding season (V-VII) or close to it (IV), range from 2100 m (above Dhumpus, 9.V.) to 2800 m (Ghorapani Pass, 24.VII.) and are evenly distributed within this belt. – Locally, and very likely as an exception, the

species' area extends up to 3300 m well within Palaearctic vegetation and climatic conditions (Diesselhorst 1968:231). "Summers chiefly between 1800 m and 2440 m, occasionally up to 3500 m" (Inskipp & Inskipp 1991).

Habitat: The White-throated Laughing-Thrush settles within a great variety of deciduous forests of the upper subtropical belt. It does not reach, at least not permanently, the upper *Quercus semecarpifolia* limit. Inhabited forests are mostly closed and have a dense canopy, but the species sometimes leaves the forest to penetrate into secondary growth or to single trees (Mure/Hurure, M VI; Chichila, 19.VI.). – The social organisation of *albogularis* still poses questions. Flocks of up to 10 specimens, often even more, continue to congregate during the whole breeding season, and most specimens observed between B IV to M VII flocked together (see Horizontal). In most cases these birds were not just still non-territorial birds in IV/V and mixed flocks with pulli in V/VII, but any flock which could be screened in some detail consisted of adult birds. Nevertheless, a family with at least one grown-up pullus kept separate and did not join larger flocks which were present nearby. Perhaps not the whole local population breeds in a given year? (see Ali & Ripley 1972,7:4; Diesselhorst 1968:231).

Breeding: 1 fledgling, already well on the wing, was being fed by the parents (Chichila, 19.VI.).

Vocalizations: Call, obviously given in various situations, but mainly as an alarm, is a long-drawn-out "tseee"; every call with a small introductory upstroke and a similar downstroke at the end (for sonagrams see Martens & Geduldig 1990).

Garrulax leucolophus

Horizontal: Below Dhumpus, 3 flocks, between 3 and 5 sp. (10.V.); Potana, flock of about 10 sp. (29.IV., both :Kaski); – Phulchoki Mt., flock of about 5 sp. (25.IV. :Lalitpur); – confluence of Tada and Kabeli Khola, flock of appr. 5 sp. (24.IV. :Taplejung); – between Yektin and ascent to Worebung Pass, flock of 3 sp. (21.IV. :Panchthar).

Vertical: Data from the presumed breeding season or close to it (E IV, V): 1100 m (Tada/Kabeli); 1650 m (Worebung); 1900 m (Dhumpus); 2000 m Potana. – Inskipp & Inskipp (1991) indicate residence "mainly between 800 m and 1980 m"; but do seasonal differences exist?

Habitat: Apparently, the species settles a considerable array of mature and slightly altered forests (above Dhumpus, Potana), light forests neighbouring agricultural land (Tada/Kabeli) and even cultivated land with assemblages of trees only close to villages and single houses (below Worebung). Also in the White-crested Laughing-Thrush, one may suspect that not the whole local population breeds and the actual breeding quarters are not yet described for Nepal (only one breeding record within Nepal so far).

Garrulax striatus

Horizontal: Our records extend from S Dhaulagiri to the Sikkim border. – upper Myagdi Khola, Boghara and Dobang (21.-27.V. :Myagdi); – Chitre (7.V. :Parbat); – Ulleri (12./13.VII.); above Dhumpus (2.V., 9.V. :Kaski); – Phulchoki Mt. (25.IV. :Lalitpur); – between Mure and Hurure (13./17.VI.); Arun Valley bottom between Hedagna and Num

(17.VI. :Sankhua Sabha); – ascent to Omje Kharka from Yamputhin (1.V.); Yamputhin (26.-30.IV., 3.-5.IX. all :Taplejung). – All records of this not easily to be observed species are substantiated by tape recordings.

Vertical: All data from the presumed breeding season (E IV-VII): 950 m (Arun river, Hedagna/Num); 1650-1900 m (Yamputhin); 1800 m (Boghara); 1900 m (ascent to Omje Kharka); 2000 m (Ulleri); 2100 m (Mure/Hurure; above Dhumpus); 2700 m (Deorali/Chitre); 2850 m (Chitre). – These data enlarge the vertical belt as described by Ali & Ripley (1972,7:11; 1200-2700 m, no geographical limitation given) and Inskipp & Inskipp (1991; 1200-2850 m for Nepal). It may comprise in Nepal roughly 2000 m, but certainly not in every part of the country.

Habitat: The Striated Laughing-Thrush is predominantly a forest dweller and prefers dense broad-leaved forests with a closed canopy of the upper tropical and the subtropical zone, as stated by Ali & Ripley (1972,7:11). At least in Nepal, the upper limit is defined by the *Quercus semecarpifolia* belt wherever conifers are absent. As concerns closed forest, exceptions are diverse. I found it in riparian *Alnus* stands (Yamputhin, 1650 m), in patches of bush on largely treeless slopes (between Yamputhin and Omje Kharka, 1900 m), in tree-rich agricultural land (Ulleri, 2000 m). Even in such more open habitats, the species keeps hidden in dense foliage of bushes and trees and is difficult to observe.

Vocalizations: The verse of the territorial song (Fig.94a-g) is a combination of whistling and hoarse notes causing an unmistakable vocal impression, "resembling those of a domestic fowl that has laid an egg" (Ali & Ripley 1972, 7; 11), but notably shorter. The verses can be heard over quite long distances. Commonly, the verse consists of 4-7 ascending or descending, sometimes horizontal notes of narrow frequency range (appr. 2.5 kHz, upper frequency up to 3.6 kHz), the last note combining up- and downstroke. The characteristic hoarse sound is caused by strong secondary frequency modulation which may completely dissect part of the note into single short atonal click-like notes (Fig.94a-b). In rare cases this frequency modulation is absent. Only one precisely repeated verse type was recorded from individual ♂.

Garrulax variegatus variegatus (Vigors)

Material: 7 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3600 m, 10.VI.1973: 1♀ ** Myagdi Distr., Dhorpatan, Uttar Ganga Valley, 25.IV.1970 and Uttar-Ganga plain, 13.V.1973, 2950 m: 2♂. ** Mustang Distr., Thakkhola, Chadziou Khola Valley, 2600 m, 27.X.1969: 1♂ juv. * Thaksang above Tukche, 3150 m, 9.VII.1970: 1 pull. * Purano Marpha, 3200 m, 17.III.1974: 1♀. **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 29.III.1973: 1♀ juv.

Measurements: **Wing**-L ♂ (3) 103-105 mm; ♀ (2) 102, 103 mm. – **Tail**-L ♂ (3) 118-125 mm; ♀ (2) 116. 120 mm. – **Bill**-L ♂ (3) 18-20 mm; ♀ (3) 17-20 mm; pull. 16 mm. – **Tarsus**-L ♂ (3) 37-39 mm, ♀ (3) 37-38 mm; pull. 36 mm. – **WTI** (5) 8.3-10.5%, $\bar{x}$=9.4, s_d=0.89. – **TWI** (5) 112.4-121.4%, $\bar{x}$=115.7, s_d=3.51. – **Testes** in IV 3 x 3, in V 5 x 4 mm.

Notes: The feathers of the ♀ from Ringmo (10.VI.) are so worn out that they are not measurable. The yellow of the primaries' webs has nearly completely disappeared, being now grey as in *G. v. similis*. – Bill black (♀) or grey-black (♂). Feet orange-flesh-coloured (♀) or flesh-coloured (♂), iris blue-grey (♀) or grey-green (♂).

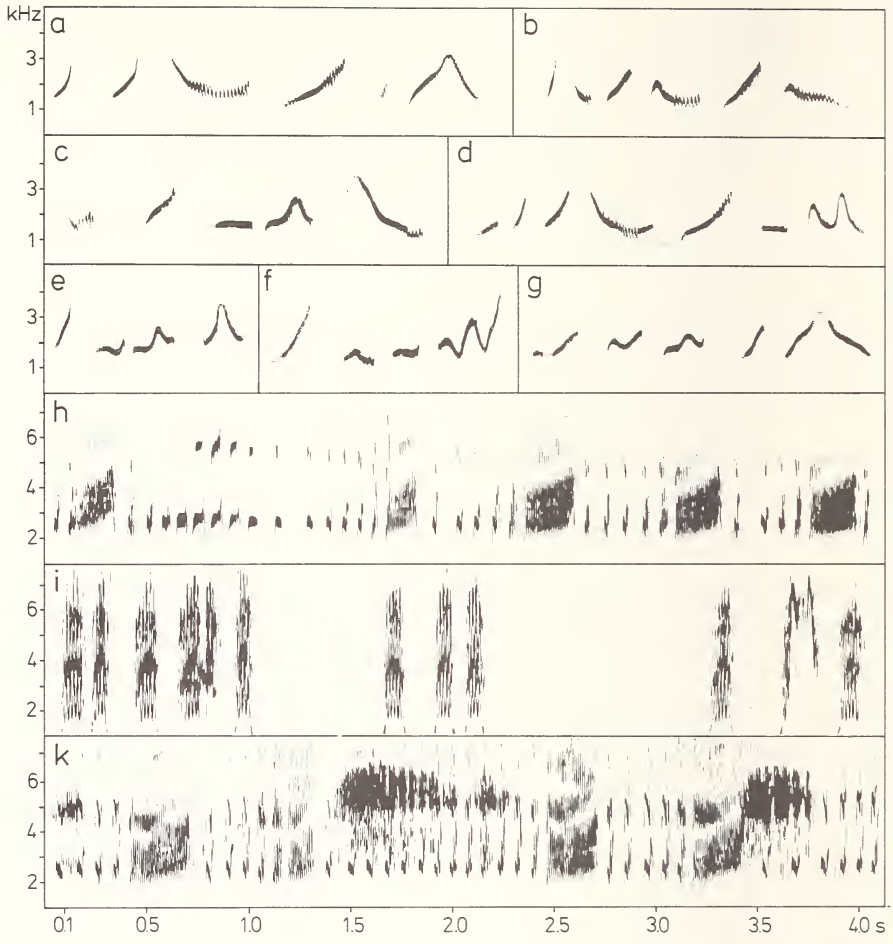


Fig.94: Vocalizations of *Garrulax* species. – a-g) *G. striatus,* territorial song of 7 ♂, 1 verse each; a) Chitre 6.V.1980; b) between Landrung and Dhumpus 9.V.1980; c) ascent to Omje Kharka 1.V.1988; d) Yamputhin 26.IV.1988; e) Yamputhin 27.IV.1988; f) Yamputhin 30.IV.1988; g) between Hedagna and Num 6.VI.1988.
h) *G. affinis,* part of a long call sequence near the nest, both adults present; Simbua Khola 13.V.1988.
i) *G. lineatus,* part of a long call sequence, Mure/Hururе 16.VI.1988.
k) *G. subunicolor,* part of a long call sequence, Simbua Khola 13.V.1988.

Horizontal: Ringmo/Phoksumdo Lake (10.-15.VI.; see Material); Gompa/Tarakot (3.VI. both :Dolpo): – Dhorpatan (25.IV., 9.-13.V.; see Material; :Myagdi); – Thaksang above Tukche (28.II.-2.III., 9.VII.; see Material); Purano Marpha (17.-19.III.; see Material); Chadziou Khola (27.X.; see Material; all :Mustang). – Chordung Mt. near Jiri (29.III.; see Material; :Ramechap). – *G. variegatus* is a W Himalayan endemic species, eastern border being

situated in E Nepal. The Jiri record is the easternmost hitherto, only about 20 km SE of Ting Sang La where Diesselhorst (1968:234) secured specimens.

Vertical: Breeding season or close to it (E IV-VII): Records extend from 3000 m (Dhorpatan, IV, V) to 4000 m (on Phoksumdo Lake, VI); other altitudes are: 3150 m (Thaksang/Tukche, VII); 3300 m (Gompa/Tarakot, VI); 3650 m (Phoksumdo Lake). – Outside breeding season (II, III, X): 2600 m (Chadziou Khola, X); 2900 m (Chordung Mt., III); 3150 m (Thaksang/Tukche, II, III); 3200 m Purano Marpha (III). – About the seasonality of the species little is known; all data presented here for the year round fall within the (as to months) undifferentiated total vertical range presented by Inskipp & Inskipp (1991): 2100-4100 m. The breeding belt is not defined yet and may be more limited. The only breeding records from Nepal (Dhorpatan Valley, Inskipp & Inskipp 1991) may be at 3000 m or slightly above.

Habitat: (E IV-VII) mostly coniferous forests *(Abies, Pinus wallichiana:* Dhorpatan, Thaksang/Tukche; – *Picea/Betula:* Gompa/Tarakot; – *Pinus wallichiana, Cupressus, Juniperus, Betula:* Phoksumdo Lake). But within forested areas the Variegated Laughing-Thrush keeps more to open places, forest edges, clearings, or even low bushes *(Salix, Berberis, Caragana,* small *Juniperus)* near the upper distributional limit close to timberline. – Habitats outside the breeding season are the same, but broad-leaved forests are occupied, too (Chadziou Khola, X), also *Quercus/Abies* (Chordung Mt., III). – Most of the records presented here originate from the dry parts of the Inner Valleys and from N of the main range (except Dhorpatan, Chadziou Khola and Chordung Mt.). There it seems to outnumber *G. affinis,* a similarly common species with which it occurs locally together. In the E Nepal area near its distributional limit the species seems to be rare or even scarce.

Breeding: At B VII there were numerous recently fledged pulli at the forest edge and in the hedges of the Thaksang clearing (see Material; Fig.30, 31).

Vocalizations: Territorial song (Fig.96g-m) commonly consists of 2, rarely only of one note; the notes are very different in length (less than 0.1 s/0.35-0.45 s), the 2nd being longest. If only one note is present, the 1st seems to be incorporated into the 2nd. The scheme of frequency modulation is regular: 3 angular note parts opened downwards, their turning points being located at various frequencies in different ♂, in addition 3 inflection points at lower frequencies, angles opened upwards. The introductory note, if given separately, is a short downward-bent angle. The *variegatus* song is similar to that of *affinis* (Fig.95d-g). The main difference consists in the last note: The *affinis* note comprises a long-drawn-out slope, which causes the peculiar vocal impression and the note is nearly twice as long as in *variegatus.*

Garrulax ocellatus

Material: 1 specimen: **D** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 27.X.1969: 1♀.

Measurements: **Wing**-L 129 mm. – **Tail**-L 154 mm. – **Bill**-L 25 mm. – **Tarsus**-L 44 mm. – **WTI** 7%. – **TWI** 119.4%.

Notes: Moult: body-feathers and P7-P10 growing.

This specimen is closer to *G. o. ocellatus* (Vigors) but colour of the tail has a tendency to *G. o. griseicauda* Koelz. See Fleming & Traylor (1964:534-535) and Eck (1987b).

Horizontal: Chadziou Khola (27.X. :Mustang); – Trisuli Valley, Syng Gyang (26.IV. :Rasuwa); – Dadar Danda, Kalinchok Mt. (19.-23.IV. :Sindhu Palchok); – Chordung Mt. near Jiri (29./30.III. :Ramechap); – above Pahakhola and descent to Pahakhola (30.V., 4.VI. :Sankhua Sabha); – pasture Lassetham (8.V. :Taplejung).

Vertical: 2750 m Pahakhola; 2900 m Chordung Mt.; 3150 m Dadar Danda; 3300 m Syng Gyang; 3350 m Lassetham; 3400 m descent to Pahakhola. – These data largely coincide with the 2 breeding records from Nepal at 2850 m and 3100 m (Diesselhorst 1968:236). Inskipp & Inskipp (1991) enlarge the vertical belt from 2135 m to 3660 m, but data are not specified as to seasons. According to present data, the breeding belt may be extremely restricted in Nepal, ranging from 2700 m to 3500 m including the Diesselhorst (1968:235) records SW of Everest.

Habitat: Mature forest in the upper oak *(Quercus semecarpifolia)* and the lower fir *(Abies)* zone. The species always stays within the closed forests; I rarely saw it at forest edges or in clearings (Dadar Danda). However, it freely visits the forest floor in search of food. Also during the breeding season (nests discovered by Diesselhorst in E V/B VI contained eggs and pulli, respectively; see Vertical), the Spotted Laughing-Thrush may congregate into flocks of up to 5 sp. (Pahakhola, 6.VI.). Probably, not the whole local population is in breeding condition simultaneously? – For ecological and distributional relationships with the Chinese *G. maximus* see Eck (1987).

Vocalizations: There exist two types of calls during the breeding season, both presumably territorial song (Fig.95a-c): (i) 3-note verses (Fig.95b, c-c') with relatively strong frequency modulation (note length 0.26-0.45 s, bandwidth up to 3.6 kHz). Several of the individual notes are similar to those of *G. erythrocephalus* (Fig.95b' 1st note versus Fig.96b/b'), *G. affinis* (Fig.95b' last note versus Fig.95d/d' last note) and *G. variegatus* (Fig.95b' last note versus Fig.96h/h') song notes. The 3-note combination of nearly equal note length is distinctive, resulting in a verse length of appr. 1.3-1.5 s. (ii) Verses composed of 4 longer notes (0.43-0.55 s in the only example), with longer distances between notes and strongly reduced frequency modulation (bandwidth 1.64 kHz for the whole verse) and low maximum frequency (2.6 kHz in the only available verse sequence; Fig.95a). Both song types are quite different for the human ear.

Garrulax subunicolor subunicolor (Blyth)

Material: 2 specimens: **M** Taplejung Distr., Kanchenjunga massif, valley of upper Simbua Khola, 3350 m, 13.V.1988: 1♂ ** Ilam Distr., upper Gitang Khola Valley NE Mai Pokhari, 2500 m, 30.III.1980: 1♀.

Measurements: **Wing**-L ♂ 96; ♀ 92 mm. – **Tail**-L (graduation) ♂ 110 (35); ♀ 101 (29) mm. – **Bill**-L ♂ 16; ♀ 16.5 mm. – **Tarsus**-L ♂/♀ 36 mm. – **WTI** 5.2 and 5.4%. – **TWI** 114.6 and 109.8%. – ♂ very fat, **testes** 5 mm. ♀ 55 g.

Notes: Iris ivory white.

Horizontal; vertical: Data as in the Material section; no additional observations.

Habitat: The Gitang Khola ♀ was in heavy broad-leaved forest, namely *Lithocarpus pachyphylla,* the Simbua Khola ♂ in mature *Rhododendron/Abies* forest. This ♂ with only slightly enlarged testes seemed not to be in breeding condition yet; as was the case for 2♂ from

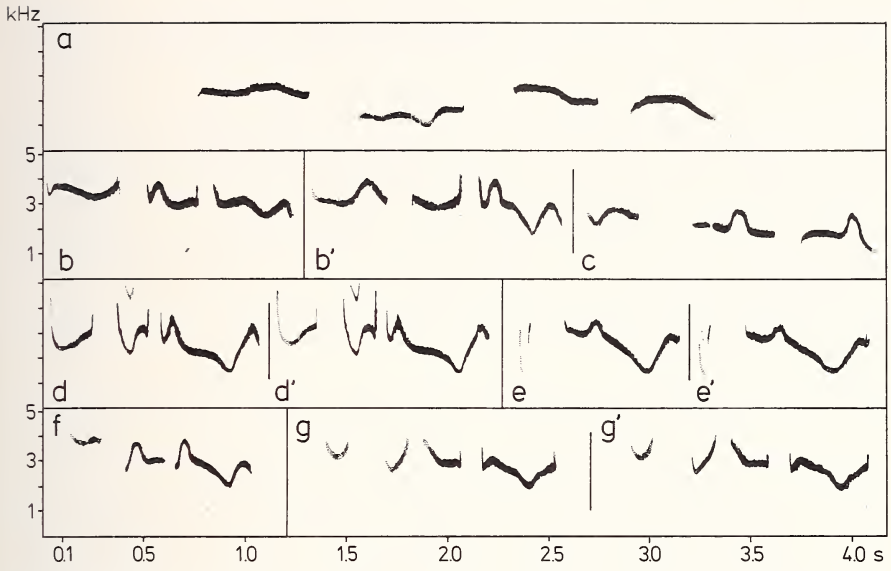


Fig.95: Territorial song of *Garrulax* species. – a-c) *G. ocellatus;* a) low frequency song, Pahakhola 4.VI.1988; b-b') high frequency song, Gosainkund 26.IV.1973; c) high frequency song, Pahakhola 4.VI.1988.
d-g) *G. affinis;* d-d') 2 verses of 1 ♂, from Yamputhin to Deorali 17.V.1988; e-e') 2 verses of 1 ♂, upper Pahakhola 30.V.1988; f) Lassetham 7.V.1988; g-g') 2 verses of 1 ♂, Kangla Khola 25.V.1988.

the Ting Sang La from similar altitude collected in B V (Diesselhorst 1968:238). – The Simbua Khola ♂ had a thick layer of *Rhododendron* pollen sticking to its bill and gluing its forehead feathers together.

Vocalizations: Warning calls (Fig.94k) are long series of 2 components: (i) groups of variable numbers of similar strongly frequency-modulated calls with a click-like ending and (ii) long notes composed of narrowly spaced clicks, the whole series sounding like "keke-ke....rä.kekeke....rä..".

Garrulax affinis

Garrulax affinis affinis Blyth

Material: 2 specimens: **D** Myagdi Distr., Dhorpatan, 16.IV.1970: 1♀ juv. ** Mustang Distr., Thaksang above Tukche, 3150 m, 6.III.1974: 1 o juv.

Measurements: **Wing**-L 102+x (♀ juv.) 107 (o juv.) mm. – **Tail**-L 119 (♀ juv.), 127 (o juv.) mm. – **Bill**-L 19 (♀ juv.), 18.5 (o juv.) mm. – **Tarsus**-L 36 (♀ juv.), 37 (o juv.) mm. – **WTI** 7.8 and 4.7%. – **TWI** 116.7 and 118.7%.

Garrulax affinis bethelae Rand & Fleming

Material: 1 specimen: **D** Mustang Distr., Chadziou Khola, 2600 m, 27.X.1969: 1♀. This specimen from the distributional area of *G. a. affinis* definitely shows the characters of the eastern subspecies. This

is more readily characterized by the colouration of the back than by the colouration of the edges of the underside feathers. – 4 specimens: **J** Ramechap Distr., Thodung, 3200 m, 6.-7.IV.1973: 1♂ juv., 2♀ juv. and ad. **S** Solukhumbu Distr., confluence of Imja- and Phunki Drangka, 3250 m, 1.X.1970: 1 pull.

Measurements: Material of the Diesselhorst collection of this subspecies (n=14) is included. – Measurements not separated as to juv. and ad.: **Wing**-L ♂ (9) 98-111 mm, $\bar{x}$=106.4, s_d=3.81; ♀ (8) 94-114 mm, $\bar{x}$=104.4, s_d=6.02; pull. (2) 100, 101 mm. – **Tail**-L ♂ (6) 114-127 mm, $\bar{x}$=122.7, s_d=4.68; ♀ (6) 109-133 mm, $\bar{x}$=118.8, s_d=7.89. – **Bill**-L ♂ (8) 19.5-22 mm, $\bar{x}$=20.2, s_d=0.75; ♀ (7) 18.5-22.5 mm, $\bar{x}$=20.1, s_d=1.34; pull. (2) 17, 18 mm. – **Tarsus**-L ♂ (9) 37.5-40 mm, $\bar{x}$=38.3, s_d=0.83; pull. 2x37 mm. – **WTI** (18) 4.6-8.2%, $\bar{x}$=6.5, s_d=1.07. – **TWI** (11) 112.6-119%, $\bar{x}$=115.3, s_d=1.99. – **Testes** of ♂ juv. (Thodung, 3200 m, 6.IV.) slightly enlarged, 4 x 3 mm.

Notes: The back feathers of pulli do not show light spots, those of the underparts no light edges. – Bill black, feet orange fleshy-coloured.

Horizontal (both subspecies): Our own records range from the Dhorpatan Valley (S Dhaulagiri) to the Sikkim/Darjeeling border. – Dhorpatan (14.-16.IV., 8.V.; see Material; :Myagdi); – Chadziou Khola Valley (27.X.; see Material); Thaksang above Tukche (6.III. both :Mustang); – Trisuli Valley, Syng Gyang (26.IV. :Rasuwa); – Thodung/Those (6./7.IV.; see Material; :Ramechap); – Pahakhola and descent to Pahakhola (30./31.V.); Thudam (25.-27.V.); Kangla Khola E Thudam (24.V. all :Sankhua Sabha); – ascent to Walungchung Gola (20.V.); Deorali Pass W Yamputhin (17.V.); upper Simbua Khola (10.-15.V.); pasture Lassetham (8.V. all :Taplejung); – Paniporua (17.IV.); Dhorpar Kharka (14.IV. both :Panchthar). – The records in the Dhorpatan Valley (from 1970 and 1973) mark the westernmost localities of the closed area of the species. An additional one refers to a locality considerably further W in the Jumla district (Inskipp & Inskipp 1991) and may indicate the occurrence of permanent but thinned out populations W of Dhaulagiri.

Vertical: Presumed breeding season and close to it (M IV-V): Our lowest record is at 2300 m (Paniporua, 17.IV.), followed by 2650 m (Pahakhola, 30.V.) and 2700 m (Dhorpar Kharka, 14.IV.); the highest one at 4150 m (Kangla Khola, 24.V.). Most observations are from 3000 m and above: 10 range from 3000 m to 3870 m, only 1 above 4000 m. – Inskipp & Inskipp (1991) summarize the Nepal summer records (months?) as "mainly between 2750 m and 4000 m, and locally as high as 4600 m". The latter altitude marks alpine pastures without any bushes, certainly not a permanent summer habitat for a Laughing-Thrush of whatever species.

Habitat: The Black-faced Laughing-Thrush is predominantly a forest dweller which lives, according to the wide belt settled, in quite a lot of forest types: mainly mixed broad-leaved in the lower part to mixed *Rhododendron*/coniferous, mainly *Abies,* in the upper part. Dense growth with a heavy bush storey which provides good hiding places are always preferred. In rare cases single birds or small parties may be seen in more open places, bushy clearings, forest edges. This is particularly true above timberline beyond 4000 m where only dwarf *Rhododendron* and a few *Juniperus* and *Salix* bushes prevail (Kangla Khola, 24./25.V.), to which altitudes the Black-faced regularly penetrates (see Vertical). However, it is open to question if the species breeds there (see Diesselhorst 1968:239 for an ecological account in the Khumbu area). – Locally, the Black-faced is common. Around Thudam, at 3550m, the loud whistling calls were to be heard in many places, often

simultaneously from various spots. All that could be seen at close range were together pairwise (25./27.V.). However, in the upper Simbua Khola (13.V.), there were still flocks of up to 3 specimens.

Vocalizations: Territorial song (Fig.95d-g) is a loud group of whistles (up to 1.2 s long) consisting of 2 or 3 mostly slowly frequency-modulated notes, all opened upwards. Last note is longest (0.5-0.7 s) consisting of 2 angular subdivisions. The individual ♂ repeats its song verses without noticeable variation and seems to use only one song type. Frequency range of the last note hardly exceeds 3.6 kHz starting near 1.4 kHz. This voice is very penetrating and can be heard over long distances along the valley slopes. – Warning calls (Fig.94h), an "endless" chattering which the adults may utter near the nest for minutes, represent an irregular combination of blocks of clicks (up to 0.24-0.28 s, "rääd") and series of melodious and coarse notes.

Garrulax erythrocephalus kali Vaurie

Taxonomic note: Vaurie (1953) reviewed the geographic variation of the species.

Material: 1 specimen: **G** Kaski Distr., between Landrung and Dhumpus, 2100 m, 9.V.1980: ♂.

Measurements: **Wing**-L 106 mm. – **Tail**-L (graduation) 120 (33) mm. – **Bill**-L 22 mm. – **Tarsus**-L 38 mm. – **WTI** 3.8%. – **TWI** 113.2%. – **Testes** slightly enlarged, 6x4 mm.

Horizontal: Bobang S Dhorpatan (29.IV.); Bega Deorali (16.V. :Myagdi); – Potana (28.IV.); between Landrung and Dhumpus, single sp. (9.V. both :Kaski); – Kathmandu Valley, Phulchoki Mt., flock of 4-6 sp. (25.IV., 14.V. :Lalitpur); – ssp. *nigrimentus:* upper Pahakhola (20.V.); between Mure and Hurure, flocks of about 5 sp.; pair with pulli (9.-15.VI. both :Sankhua Sabha); – Tamur Valley between Hellok and Lungtung (19.V. :Taplejung); – Dhorpar Kharka, 2 sp. identified by sonagram, Fig.96f-f' (14.IV.); upper Gitang Khola (29.III. both :Ilam); – Paniporua (17.IV. :Panchthar).

Vertical: During the presumed breeding season or close to it (E III-M VI): our records range from 2000 m (Potana), 2100 m (near Dhumpus; Mure/Hurure) to 2660 m (Mt. Phulchoki) and 2700 m (Dhorpar Kharka), and, unexpectedly high, 3540 m (upper Pahakhola) – apart from the last record, a quite limited belt. – According to Inskipp & Inskipp (1991) the vertical area during summer is actually considerably wider (1800-3000 m; months?); they derived the upper limit from data provided by Diesselhorst (1968:240) from the area W of Everest.

Habitat: The Chestnut-crowned Laughing-Thrush is a strict forest dweller, which I found only rarely close to clearings or near forest edges. It mostly hides in the canopy and I very rarely observed it on or near the ground (contra Diesselhorst 1968:241). At its altitude the forests are broad-leaved, and only at the upper limit, where I encountered it only once, it may reach the lower *Abies* zone. Forests here are dense, with mostly heavy bush layer, and often rich in tangled vines creeping up to the canopy. – *G. erythrocephalus* also stays in flocks even during the breeding season (see *albogularis, ocellatus)* and most of the encounters were with flocks (possibly because they are noisy and thus easier to identify than silent breeding pairs). Perhaps not the entire local population splits into breeding pairs?

Breeding: 2 adults accompany 2 pulli already well on the wing in the Mure/Hurure forest, 16.V.

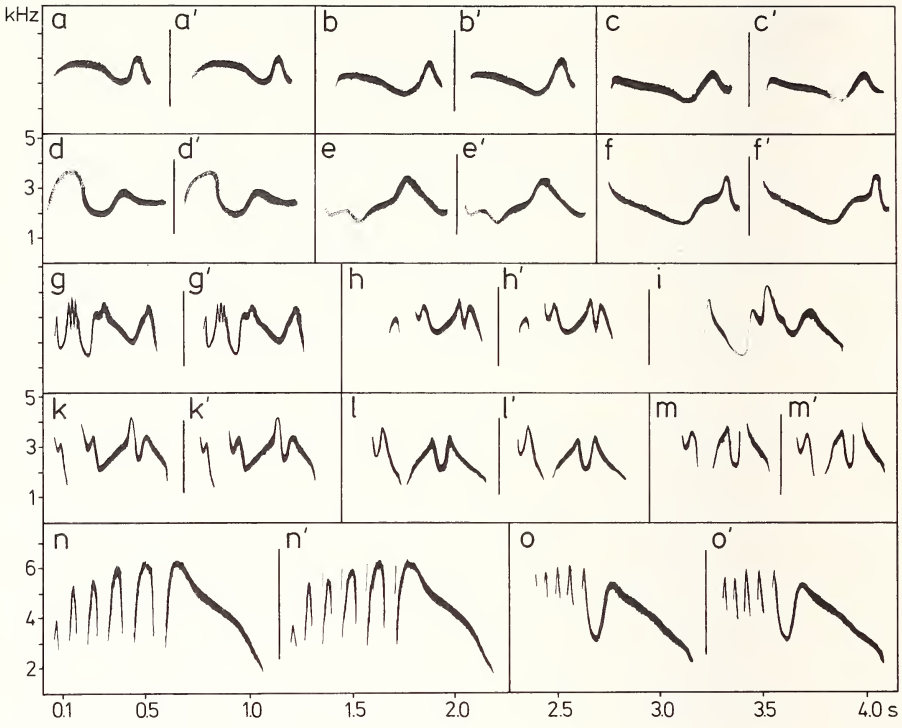


Fig.96: Territorial song of *Garrulax* species. – a-f) *G. erythrocephalus;* 2 1-note-verses each of individual ♂; a-a') upper Pahakhola 20.V.1988; b-b') Paniporua 17.IV.1988; c-c') Phulchoki Mt. 14.V.1980; d-d') Dhumpus 9.V.1980; e-e') 2nd ♂ from Phulchoki Mt. 14.V.1980; f-f') Dhorpar Kharka 14.IV.1988.
g-m) *G. variegatus;* 2 verses each of individual ♂; g-g') Dhorpatan 19.IV.1970; h-h') 2nd ♂ from Dhorpatan 8.V.1973; i) 1 verse, Lete 1.V.1980; k-k') Thaksang 27.IV.1980; l-l') 2nd ♂ from Thaksang 8.VI.1970; m-m') 3rd ♂ from Thaksang 8.VI.1970.
n-o) *G. lineatus;* 2 verses each of individual ♂; n-n') ascent to Dhorpar Kharka 13.IV.1988; o-o') Omje Kharka 5.V.1988.

Vocalizations: Territorial song (Fig.96a-f) consists of a loud carrying one-note whistle, given at 5- to 7-s intervals. It is characterized by being composed of two parts, both angular-like and opened downwards. The gradient of the slopes of the two angles is different – in many types one slope is drawn out followed by the narrower 2nd angle (Fig.96a-c). Other types have steeper slopes but all notes are approximately of equal length (between 0.5 and 0.6 s; lower frequency 1.3-2 kHz, upper 2.5-3.6 kHz). All recorded ♂ produced only one note type, which was precisely repeated.

Garrulax lineatus setafer (Hodgson)

Material: 5 specimens: **D** Dolpo Distr., Gompa near Tarakot, 3300 m, 5.VI.1973: 1♂ ** Myagdi Distr., Dhorpatan, 3000 m, 19.IV.1970: 1♂ ** Mustang Distr., Thakkhola, Chadziou Khola Valley, 2600 m,

1.XI.1969: 1♂. **K** Sankhua Sabha Distr., between Mure and Hurure, 2100 m, 16.VI.1988: 1♂ (song specimen). **M** Taplejung Distr., Omje Kharka, NW Yamputhin, 2400 m, 5.V.1988: 1♂ (song specimen).

Measurements: ♂: **Wing**-L (5) 77-82 mm, $\bar{x}$=79.1, s_d=1.95. – **Tail**-L (3) 87-96 mm. – **Bill**-L (5) 15-16 mm, $\bar{x}$=15.4, s_d=0.55. – **Tarsus**-L (5) 26.5-29 mm, $\bar{x}$=27.9, s_d=0.89. – **WTI** (4) 2.6-8.9%, $\bar{x}$=6.3. – **TWI** (3) 110.8-120%, $\bar{x}$=114.5. – **Testes** 19.IV. 3 x 2 mm; 16.VI. 7 mm; 5.V. 7 x 4 mm; 5.VI. 10 x 6 mm (the latter specimen belonged to a nest with eggs, see Breeding).

Notes: The Chadziou Khola ♂ still moulting body-feathers.

Horizontal: Our records extend from NW Dhaulagiri to the Sikkim/Darjeeling border. – Gompa/Tarakot (3.-5.VI.; see Material; :Dolpo); – Dhorpatan (19.IV.; see Material); Bega Deorali (16.V. both :Myagdi); – Ghandrung (8.V. :Parbat); – below Ghasa and opposite Lete (4.V. :Mustang); – Potana (28.IV. :Kaski); – Kathmandu Valley, Phulchoki Mt. (14.V. :Lalitpur); – between Mure and Hurure (16.VI.; see Material; :Sankhua Sabha); – Omje Kharka NW Yamputhin (5.VI.; see Material; :Taplejung); – ascent to Dhorpar Kharka (13.IV. :Panchthar).

Vertical: Data during the presumed breeding season and close to it (M IV-VI). – 2000 m Phulchoki Mt. and Potana; 2100 m Ghandrung; 2100 m below Dhorpar Kharka; 2150 m Mure/Hurure; 2400 m Omje Kharka; 3000 m Dhorpatan; 3300 m Gompa/Tarakot. – The vertical span of the species is wide; Inskipp & Inskipp (1991) give 2400-3950 m; the lower limit, however, has to be reduced even more (see above); it is documented by an actual breeding record. The highest one is that from Tarakot (see Breeding). The entire belt may be less than 2000 m wide, but it certainly differs locally.

Habitat: The Streaked Laughing-Thrush is to be grouped among the two most euryoecious *Garrulax* species in the central Himalayas (besides *G. affinis).* It settles a broad array of virgin forest types, secondary forests, bushes, even patchily distributed ones, and penetrates quite regularly into open country, often in cultivated fields close to villages (Ghandrung, 2100m). Examples: bushes near forest clearing (Potana, 2000 m), partly deciduous species-rich broad-leaved forest (Mure/Hurure, 2150m; Omje Kharka, 2400m), low *Juniperus/Pinus* forest/bushes (Dhorpatan, 3000m), mature *Picea smithiana* forest (Tarakot, 3300m). – *G. lineatus* also occurs in the drier areas N of the main axis, but I noticed it no further N than the Tarakot forest near Gompa. This is in accordance with the species' area in the dry Indian NW Himalayas and beyond.

Breeding: Nest in a small cavity on a steep slope in mature *Picea* forest with 2 light blue eggs being incubated (also) by the ♂ (Gompa/Tarakot, 3.VI.). Another nest on the ground in a meadow, hedges and forest edge nearby; two pulli about one week old (Potana 28.IV.). Third and fourth proven breeding locality in Nepal.

Vocalizations: Territorial song (Fig.96n-o) is subdivided into two phrases, (i) a series of several (4 in both verses figured here) angle-shaped short notes opened downwards, (ii) a much longer note (between 0.4 and 0.6 s) with a steep ascent and a long and gentle whistling descent. A short note (see i) may be added to the beginning of the whistle. – Warning calls (Fig.94i) form irregular series of blocks of strongly frequency-modulated click-like closely-packed units, which cover a broad frequency span of 6.6 kHz (1.5-8.1 kHz). The auditory impression is somewhat like calls of the European Fieldfare *(Turdus pilaris).*

Leiothrix lutea calipyga Hodgson

Material: 1 specimen: **D** Myagdi Distr., upper Myagdi Khola. Boghara. 1800 m. 27.V.1955: 1♂.

Measurements: **Wing**-L 71 mm. – **Tail**-L 56 mm (graduation 12 mm). – **Bill**-L 13.3 mm. – **Tarsus**-L 26 mm. – **WTI** 12.7%. – **TWI** 78.9%.

Horizontal: Records from the Myagdi Khola Valley eastward to Arun Valley: – Boghara (27.V., see Material); Thulo Khola above Chimkhola, side valley (18.V. both :Myagdi): – Ghasa (4.V., 14.V. :Mustang); – above Chitre (3.V. :Parbat); – Kathmandu Valley, Phulchoki Mt. (25.IV. :Lalitpur); – Chichila (20.VI.); between Mure and Hurure (11.-17.VI. both :Sankhua Sabha): – Worebung Pass (21.IV. :Panchthar); – below Mai Pokhari (9.IV. :Ilam).

Vertical: The records, all from the presumed breeding season (V, VI) or close to it (IV) span a narrow belt: 1800 m Boghara: 1900 m Worebung: 1950 m Chichila and Ghasa: 2100 m Mure/Hurure and Thulo Khola: 2180 m Phulchoki Mt.; 2340 m Chitre. The specimen in open bush at 1700 m below Mai Pokhari was not yet on its breeding grounds. Lower and upper limit of the breeding belt during the (very long [see Diesselhorst 1968:242]) breeding season is not well known, but may extend up to about 2500 m, at least locally (Inskipp & Inskipp 1991).

Habitat: I met the Red-billed Leiothrix within both primeval oak *(Quercus)* forest (Mure/Hurure) and secondary bush (Chitre, Thulo Khola, Chichila, Mure/Hurure, Worebung), locally common in riverside *Arundinaria* bamboo thickets (Boghara). Even in primeval forests, the species keeps close to the ground and is normally well hidden in dense understorey; it is rarely, mainly in secondary bush, to be seen in the open. Most often, the typical song reveals its presence. In this respect, it behaves much like Old World warbler *(Sylvia)* species. See similar habitat description in Ali & Ripley (1972b,7:68) and Diesselhorst (1968:242).

Vocalizations: The territorial song (Fig.99h-i) is best compared with that of *Sylvia atricapilla* from Central Europe: A melodious verse of flutelike and/or whistling notes in a compact series, each note separated from the preceding one by mostly minor frequency jumps. The individual note is only slightly frequency-modulated (see Thielcke & Thielcke 1970 for sonagrams of two functionally different song types). The species keeps well hidden in dense vegetation and even by playback of local song I was not able to lure it into the open.

Pteruthius

Four species are on the Nepal list: *rufiventer, flaviscapis, xanthochlorus* and *melanotis;* all breed. *P. rufiventer* and *melanotis* are local and reach their western limits in WC Nepal. *P. xanthochlorus* occupies the highest altitudinal belt of all local congeners and enters Palaearctic conditions well above 3000 m, where it stays even in winter. There is considerable altitudinal overlap of all species around 2000 m, but they are too different in size and habits as to compete seriously.

Pteruthius flaviscapis

Horizontal: My records from S Annapurna to the Sikkim/Darjeeling border. – Above Khibang (19.V. :Myagdi); – above Ghandrung (30.IV. :Parbat); – above Tolka (29.IV. :Kaski):

– above Bagarchap (14.IV. :Manang); – ascent to Ting Sang La from Bikuti (13.IV. :Dolakha); – above Pahakhola (3.VI. :Sankhua Sabha); – Omje Kharka NW Yamputhin (2./3.V. :Taplejung); – Paniporua (18.IV. :Panchthar).

Vertical: The above records, all within or close to the presumed breeding season (IV-VI), range within a narrow belt from 1760 m, 1900 m (Tolka), 2300 m (Paniporua, Ghandrung) to 2700 m (Pahakhola). These altitudes largely coincide with those presented by Inskipp & Inskipp (1991): "1800-2200 m in 'summer'". All data considered, the vertical belt known at present still comprises less than 1000 m in Nepal and locally is certainly even narrower.

Habitat: All data fall into the cloud forest zone, which, in the section inhabited by the White-browed Shrike-babbler, is dominated by broad-leaved forests, mainly oak *(Quercus),* maple *(Acer), Magnolia campbelli,* also an array of *Rhododendron* species. At least during the breeding season, *P. flaviscapis* seems to stay exclusively in the canopy of tall trees, well hidden and rarely to be seen. Only by its distinctive voice and sometimes by the striking white belly can it be located. But even when singing, it is rarely exposed at the treetops.

Vocalizations (Fig.97i-n): Territorial song is a rhythmical three-note "yip yip yip" or "yip dip dip", stress on the first or the last note, sometimes extended to up to six notes. The individual ♂ may use at least two song types, which are reproduced with high constancy. For variations of these renderings see Ali & Ripley (1972b,7:75).

Pteruthius xanthochlorus xanthochlorus Gray

Material: 3 specimens: **G** Parbat Distr., between Deorali and Chitre, 2800 m, 2.V.1995: 1♂. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 1.X.1970: 2♂.

Measurements: **Wing**-L 61, 62.5 and 63 mm. – **Tail**-L 45.5, 46 and 46.5 mm. – **Bill**-L 9, 10 and 10 mm. – **Tarsus**-L 19.5, 20 and 20 mm. – **TWI** 73, 74.4 and 74.6%.

Notes: In both ♂ from the end the outer primaries still growing. 1 ♂ with olive-brownish trace on the head (juv.?). The 3rd ♂ (V) with enlarged testes (8x4 mm).

Horizontal: Seven records, all except the above mentioned by voice, from the S Annapurna to the Sikkim/Darjeeling border. – Between Deorali and Chitre (2.V., see Material :Parbat); – Marsyandi Valley, pasture Thimang (14.IV. :Manang); – Ting Sang La (16.IV.); Dadar Danda (21.IV. both :Sindhu Palchok); – Chordung Mt. near Jiri (2.IV. :Ramechap); confluence of Imja and Phunki Drangka (1.X., see Material :Solukhumbu); – upper Gitang Khola (30.III. :Panchthar).

Vertical: Thimang 2250 m (14.IV.); Gitang Khola 2500 m (30.III.); Deorali/Chitre (2.V.); Chordung Mt. 2900 m (2.IV.); Dadar Danda 3150 m (21.IV.); Ting Sang La 3200 m (16.IV.); Imja/Phunki Drangka 3250 m (1.X.). The two latter records extend the upper limit of the vertical area in Nepal for 200 m; including the data presented by Inskipp & Inskipp (1991) the belt now comprises slightly more than 1000 m. Altitudinal differences between winter and breeding season are still largely unknown.

Habitat: The singing ♂ near Thimang and in the upper Gitang Khola were in mixed broad-leaved forest, mainly *Quercus, Acer* (two species) with small stands of *Pinus wallichiana* interspersed and of *Lithocarpus pachyphylla,* the specimens from Ting Sang La and Chordung Mt., also singing ♂, in mixed *Quercus semecarpifolia/Abies/Rhododendron* forest, the

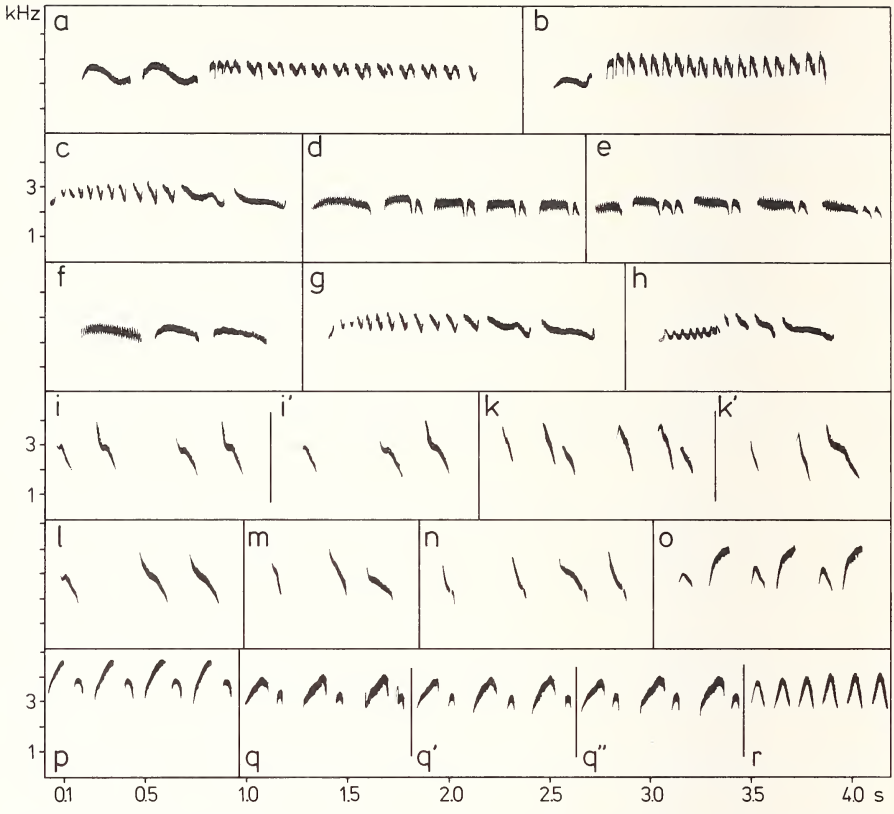


Fig.97: Vocalizations of Timaliidae. – a-h) *Actinodura nipalensis;* territorial song; a, b, d, f) Pahakhola 1.VI.1988; c, g) Omje Kharka 2.VI.1988; e) Phulchoki Mt. 14.V.1980; h) Gitang Khola 29.III.1980. i-n) *Pteruthius flaviscapis;* territorial song; i-i') 2 verses of 1 ♂, Pahakhola 3.VI.1988; k-k') 2 verses of 2nd ♂, Pahakhola 4.VI.1988; l) Omje Kharka 1.V.1988; m) 2nd ♂, Omje Kharka 1.V.1988; n) 3rd ♂, Omje Kharka 2.V.1988.
o-r) *Pteruthius xanthochlorus;* territorial song; o) Chordung Mt. 2.IV.1973; p) upper Gitang Khola 30.III.1980; q-r) Ting Sang La 16.IV.1973; q'', r: verse types after playback.

♂ from Dadar Danda in *Abies/Rhododendron* forest, in all cases high in the canopy stratum. The Khumbu specimens were mist-netted in a *Salix/Betula* stand close to the ground near the river.

Vocalizations: The territorial song (Fig.97o-r) is a uniform very rhythmical verse like "we-kee, we-kee..." or "te-wik, te-wik..." with stress on the first or second syllable. Even over great distances (Ting Sang La to Gitang Khola: appr. 340 km) syntax and note structure are remarkably uniform: upstroke note with large frequency range (about 2 kHz) and angle-like note with narrow range (about 0.5-1 kHz) follow each other. This double-note group is repeated with great accuracy 3 to 4 times, even after playback experiments, but then sometimes reduced to homogeneous angle-like notes (Fig.97r).

Pteruthius melanotis

Horizontal, vertical: Arun Valley, between Mure and Hurure, 2150 m (16.VI. :Sankhua Sabha); – Mai Pokhari, 2100 m (10.IV. :Ilam). – There are only a few records in Nepal, where the species reaches its western distributional limit. Its vertical area belt during "summer" is strikingly limited, 1800-2440 m according to Inskipp & Inskipp (1991).

Habitat: Sites were a patch of remnant *Castanopsis* forest (near Mai Pokhari) and dense primary *Quercus/Rhododendron* forest (Mure/Hurure). In both cases the birds kept to the lower canopy of tall trees.

Actinodura

Two species are on the Nepal list, *nipalensis* and *egertoni*. The former breeds, probably also the latter with few sightings around 2000 m; *nipalensis* is wide-spread in the cloud forest zone.

Actinodura nipalensis vinctura Ripley

A. [nipalensis] incl. *waldeni*

Material: 1 specimen: **K** Sankhua Sabha Distr., Pahakhola, 2700 m, 1.VI.1988: ♂

Measurements: **Wing**-L 94 mm. – **Tail**-L 85 mm. – **Bill**-L 17 mm. – **Tarsus**-L 31 mm. – **WTI** 13.8%. – **TWI** 90.4%. – **Testes** 6 mm.

Horizontal: Kathmandu Valley, Phulchoki Mt. (14.V. :Lalitpur); – Pahakhola (1.-3.VI.; see Material; :Sankhua Sabha); – upper Gitang Khola (29.III. :Panchthar); – Omje Kharka NW Yamputhin (2.V. :Taplejung).

Vertical: Records from the presumed breeding season or/and close to it (III-VI, mostly by song records): 2400 m Omje Kharka; 2550 m upper Gitang Khola; 2650 m Phulchoki Mt.; 2700 m Pahakhola. These data range within the optimum zone in Nepal (about 2000-3000 m), but Inskipp & Inskipp (1991) extend the area up to 3500 m (no months and localities given).

Habitat: Mainly oak *(Quercus)* forests, often mixed stands, within the cloud forest zone, most regularly in *Qu. semecarpifolia* zone (Mt. Phulchoki, Pahakhola), also in mature *Lithocarpus pachyphylla* forest (upper Gitang Khola). Clearings and forest edges of mature stands are apparently preferred. The Hoary Barwing keeps mostly hidden in the canopy of tall oaks, but commonly perches on treetops or dead branches for song display.

Vocalizations: Territorial song (Fig.97a-h): 2 types are recognizable. Type (i) starts with 1 or 2 whistling notes, followed by a soft trill, to be rendered like "liou liou pre re re re..." (Fig.97a-b). Whistles may also be added at the end of the verse (Fig.97c, g-h). The trill notes show at least one distinct down stroke and vary slightly in fine structure (range, frequency modulation and distance between notes). Type (ii) song consists of a series of long whistling notes (Fig.97d-f), several or all being heavily frequency-modulated (vibrato). Shorter angular notes, opened downwards, may be interspersed (Fig.97d-e).

Minla

Three species are residents in Nepal *(cyanouroptera, strigula, ignotincta).* They are all inhabitants of the cloud forest zone, *strigula* and to smaller extent also *cyanouroptera* penetrate to altitudes characterized by Palaearctic climatic and vegetational affinities. Their area belts largely overlap, but the individual species stress different zones, *cyanouroptera* occupying the lowest, *strigula* the highest. The Himalayan areas are parts of larger ones E of this mountain arch, *ignotincta* reaching its W distributional limit in Central Nepal.

Minla cyanouroptera cyanouroptera (Hodgson)

Material: 1 specimen: **M** Pachthar Distr., Paniporua, 2300 mm, 17.IV.1988: ♂.

Measurements: **Wing**-L 66.5 mm. – **Tail**-L 66 mm. – **Bill**-L 12 mm. – **Tarsus**-L 21 mm. – **WTI** 10.5%. – **TWI** 99.3%. – **Testes** 5 mm.

Horizontal: Records only from Arun Valley to the Sikkim/Darjeeling border. – Between Mure and Hurure (14.-17.VI. :Sankua Sabha); – Omje Kharka (5.V. :Taplejung); – Paniporua (17.-20.IV.; see Material; :Panchthar); – Gitang Khola (11./12.IV.); Mai Pokhari (10. IV. both :Ilam).

Vertical: Seven localities range between 1730 m (Gitang Khola Valley) and 2400 m (Omje Kharka), four between 2100 and 2300 m. The lower vertical limit of the species is little known, and the Gitang Khola record of a singing ♂ may be close to it. The vertical belt may be less than 1000 m in width.

Habitat: The Blue-winged Minla is an arboreal species but settles a large variety of habitats: primeval forests preferably in the open and light parts (Paniporua, Omje Kharka) as well as open agricultural land with small patches of trees or rows of bushes (near Paniporua, roadside), even *Alnus* riverine forest (Gitang Khola). Despite this array of habitats, I met the species only locally, the singing ♂ being well spaced.

Vocalizations: Territorial song (of the only ♂ recorded) is a short verse (1.1 s) of three whistled notes, partly slightly angle-shaped, opened downwards (0.2-0.3 s), at progressively decreasing frequency; there are slight modifications of the fine structure from verse to verse (Fig.98c-c''). For modifications of this song scheme see Ali & Ripley (1972b,7:96).

Minla ignotincta ignotincta Hodgson

Material: 1 specimen: **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 28.III.1973: ♂ (song specimen).

Measurements: **Wing**-L 66.5 mm. – **Tail**-L 57 mm. – **Bill**-L 10 mm. – **Tarsus**-L 20 mm. – **WTI** 15.8%. – **TWI** 85.7%. – **Testes** large, 6 x 4 mm.

Notes: Bill black-brown, grey below. Feet orange-grey, iris creamy white.

Horizontal: Dadar Danda, Kalinchok area (23.IV. :Sindhu Palchok); – Chordung Mt. near Jiri (28.III.-2.IV.; see Material; :Ramechap); – N Ilam (1.IV. :Ilam); – Paniporua (17.-20.IV. :Panchthar).

Vertical: 1200 m N Ilam; 2300 m Paniporua; 2900-3000 m Chordung Mt.; 3150 m Dadar Danda. The Ilam specimen was still below the breeding belt, several at Paniporua wandered around in flocks together with *M. cyanuoroptera* feeding at *Rhododendron* flowers. The

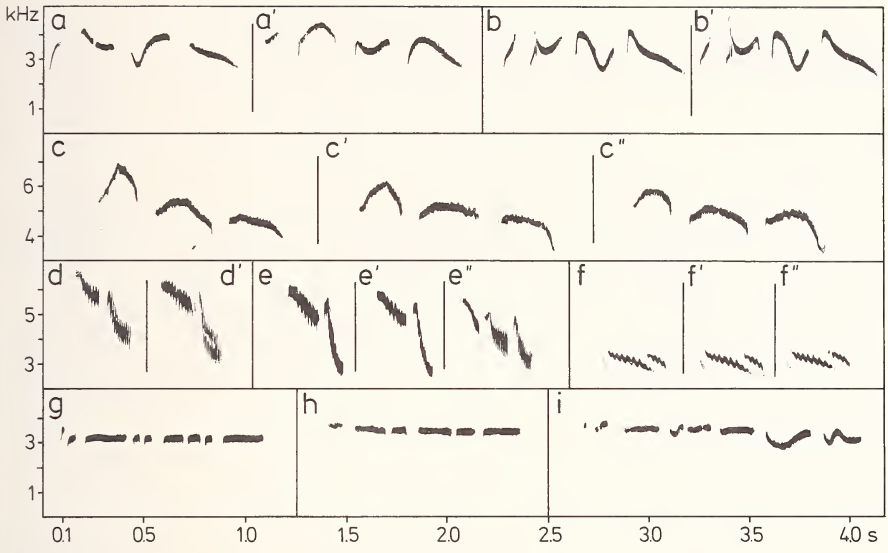


Fig.98: Vocalizations of Timaliidae. – a-b) *Minla ignotincta;* territorial song; a-a') 2 verse types of 1 ♂, Paniporua 20.IV.1988; b-b') 2 verses of 1 ♂, Chordung Mt. 28.III.1973.
c) *Minla cyanouroptera;* territorial song; c-c") 3 consecutive verses, Gitang Khola 12.IV.1988.
d-e) *Yuhina flavicollis;* calls; d-d') 2 calls of 1 ♂, ascent to Lassetham 6.V.1988; e-e") 3 calls of 1 ♂, Mai Pokhari 1.IV.1980.
f) *Yuhina gularis;* calls; f-f") 3 calls of 1 ♂, Pahakhola 2.VI.1988.
g-i) *Heterophasia capistrata;* territorial song; g) Pahakhola 1.VI.1988; h) Mure/Hurure 17.VI.1988; i) Sheopuri Mt. 25.VI.1988.

Chordung population was territorial, the ♂ actively singing. The summer range is, according to Inskipp & Inskipp (1991) between 1830 and 3400 m, but breeding records are still scanty and the respective altitudinal belt unsufficiently defined.

Habitat: The Red-tailed Minla is an arboreal species of the cloud forest zone and settles broad-leaved forests in the lower part of its vertical area belt as well as coniferous forest in the upper part, mainly *Abies* mixed with tree *Rhododendron* and few *Quercus* (Chordung Mt.). See Diesselhorst (1968:244).

Vocalizations: Territorial song (Fig.98a-b) is a short whistled verse about 1 s in length consisting of 4 notes of increasing duration. In both ♂, recorded at localities about 170 km apart, syntax and even structure of notes are surprisingly similar (Fig.98a-a'/b-b'). The Paniporua ♂ performed 2 verse types (Fig.98b-b'). The Red-tailed Minla song is remarkably similar to that of the Common Rosefinch *(Carpodacus erythrinus,* which see; Fig.120), in length as well as in rhythm, note form and frequency range, and the two are difficult to tell apart in the field. The Minla song, however, is less rhythmical, somewhat softer, less harsh. The differences are also evident in the sonagram: *erythrinus* notes show sharp frequency changes from up to down and vice versa, but exceptions occur (Fig.120), while in *ignotincta* frequency change is less abrupt. In addition, slight frequency modulations with-

in the individual up- and downstrokes occur. The two species inhabit different altitudes and habitats, however, and are strictly allotopic at least during the breeding season. – Song display season starts at the latest in E III.

Minla strigula strigula (Hodgson)

Material: 8 specimens: **D** Myagdi Distr., Dhorpatan including Uttar Ganga plain. 2950-3000 m, 12.-22.IV.1970: 3♂, 1♀. **G** Parbat Distr., Ghorapani Pass, 2800 m, 26.-27.VII.1970: 1♂, 1♀. **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 28.-29.III.1973: 2♂.

Measurements: **Wing**-L ♂ (6) 68.5-70 mm, $\bar{x}$=69.1, s_d=0.59; ♀ (2) 65-67 mm. – **Tail**-L ♂ (6) 65-69 mm, $\bar{x}$=67.7, s_d=1.54; ♀ (2) 63-66 mm. – **Bill**-L ♂ (6) 11.5-13 mm, $\bar{x}$=11.9, s_d=0.59; ♀ (2) 12 mm. – **Tarsus**-L ♂ (6) 24-25.5 mm, $\bar{x}$=24.8, s_d=0.69; ♀ (2) 24 mm. – **WTI** (8) 9.7-13.8%, $\bar{x}$=11.7, s_d=1.46. – **TWI** (8) 94.9-100%, $\bar{x}$=97.9, s_d=1.60. – **Testes** of 3 ♂ (IV, Dhorpatan) small: 2-3 mm, of 2 ♂ (III, Chordung) large: 5-8 mm.

Notes: Bill and feet dark grey in a ♂ (III). Judged by the condition of the feathers, moult was just terminated.

Horizontal: Our records from SW Dhaulagiri to SW Kanchenjunga massif. – Dhorpatan (12.-23.IV.; see Material; :Myagdi); – above Chitre (4./5.V.); descent to Ghandrung (7.V.); Ghorapani Pass (26/27.VII.; see Material; all :Parbat); – Phulchoki Mt.(22.III. :Lalitpur); – Dadar Danda (21.IV.); Ting Sang La (14.IV. both :Sindhu Phalchok); – Chordung Mt. (28.-29.III.; see Material); – Thodung (5.IV. both :Ramechap); – Pahakhola (1.VI. :Sankhua Sabha); – upper Simbua Khola (12.V.); Omje Kharka (6.V. both :Taplejung); – Dhorpar Kharka (14.IV. :Panchthar).

Vertical: Data representing 15 localities (III-VII, only 2 in III) extend from 2650 m (Chitre, 4.V.) to 3350 m (upper Simbua Khola, 12. V.), the remainder are spread evenly over this belt. Inskipp & Inskipp (1991) even extend the area belt during summer from 2440 to 3750 m, but no months are indicated. The vertical belt during breeding season may cover roughly 1000 m.

Habitat: The Chestnut-tailed Minla is an entirely arboreal species, and according to its vertical distribution, quite different forest types are occupied: both the upper part of the oak zone *(Quercus,* mainly *semecarpifolia)* and the lower part of the coniferous zone, consisting mainly of *Tsuga* and *Abies* and, at least in E Nepal, a great variety of tree *Rhododendron* species and *Magnolia campbelli.* Within its forest habitat, the species prefers the bush strata often only two meters above ground or the lower canopy of trees. Locally, the species is common, and during the flowering time of *Rhododendron,* it can be seen exploiting the *Rhododendron* flowers for perhaps both insects and nectar. Bill and throat feathers may stick together then, partly covered with pollen.

Vocalizations: Territorial song (Fig.99b-e) consists of 3-4 loud melodious whistles of increasing length, mainly 1.0-1.5 s long, the single note slightly frequency modulated. In this series, also for the human ear, the first and the last notes are the lowest, though only in their more or less prolonged final parts. Agitated ♂ display much more complicated song including extremely frequency modulated notes, resulting in a combination of different harsh notes rich in harmonics (Fig.99b-b').

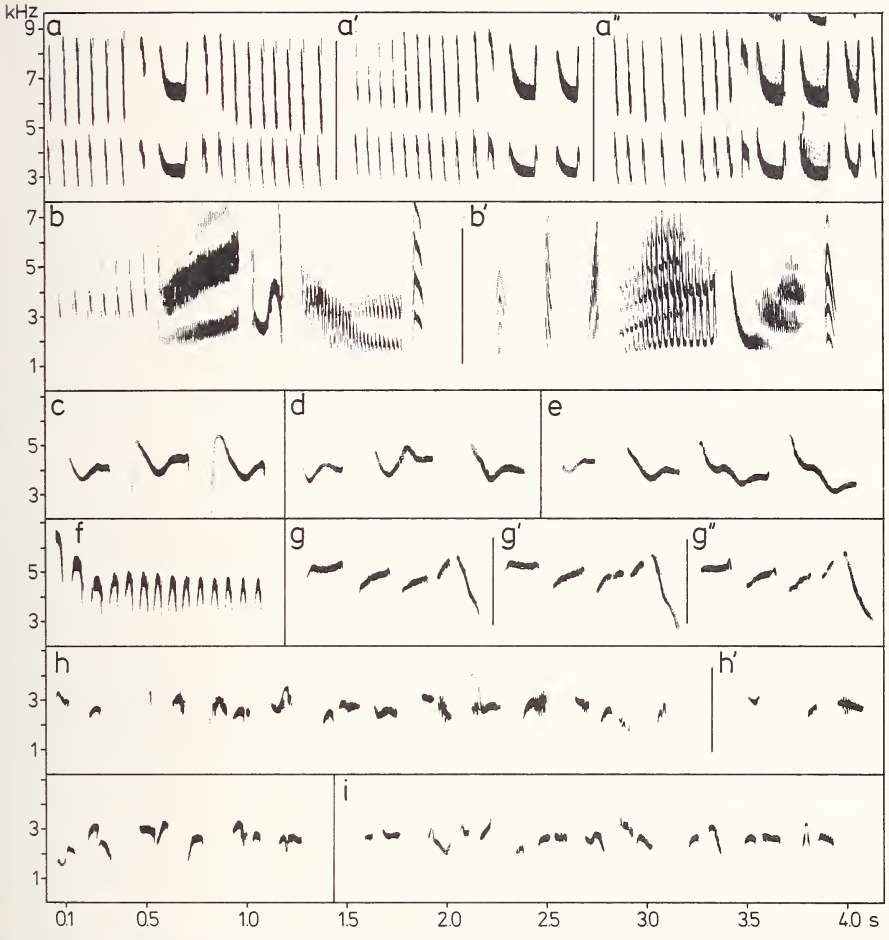


Fig.99: Vocalizations of Timaliidae. – a, f) *Alcippe vinipectus;* calls (a-a") and territorial song (f); a-a") Chordung Mt. 30.III.1973; f) Phulchoki Mt. 22.III.1980.
b-e) *Minla strigula;* excitement song (b-b') and territorial song (c-e); b-b') Chordung Mt. 28.III.1973; c) Phulchoki Mt. 22.III.1980; d) Chordung Mt. 29.III.1973; e) Ting Sang La 4.IV.1973.
g) *Alcippe castaneceps;* territorial song; g-g") 3 verses of 1 ♂, Mure/Hurure 16.VI.1988.
h-i) *Leiothrix lutea;* territorial song; h-h') 2 verses of 1 ♂, Worebung Pass 21.IV.1988; i) 1 verse of 2nd ♂, Worebung Pass 21.IV.1988.

Alcippe

The Nepal list comprises four species *(chrysotis, castaneceps, vinipectus, nipalensis);* all breed, but proofs are still lacking for the scarce and local *chrysotis.* Within the Central Himalayas, all species settle warm temperate subtropical to Palaearctic climatic belts with different strongholds. Lowest is *nipalensis,* followed by *castaneceps, chrysotis* and *vinipectus.*

All species have their main areas east of the Himalayas (Indochinese-Himalayan), from where they penetrated into the mountain system. Only *vinipectus* extends into Nepal westward.

Alcippe chrysotis chrysotis (Blyth)

Material: 1 specimen: **K** Sankhua Sabha Distr., Pahakhola, 2700 m, 1.VI.1988: 1♂.

Measurements: **Wing**-L 53.5 mm. – **Tail**-L appr. 47 mm. – **Bill**-L 8 mm, height 3.8 mm. – **Tarsus**-L 21 mm. – **WTI** 10.3%. – **TWI** 88%. – **Testes** 4 mm.

Horizontal, vertical, habitat: The above specimen was mist-netted in a small clearing near a stream, densely covered with thick vegetation of *Arundinaria* bamboo and a variety of different bushes, all amidst heavy *Quercus semecarpifolia* forest (record already mentioned by Inskipp & Inskipp 1991).

The species is local in Nepal, known only from the central parts and from the extreme NE, ranging roughly from 2500 m to 3000 m (see Inskipp & Inskipp 1991).

Alcippe nipalensis nipalensis (Hodgson)

Material: 1 specimen: **B** Kathmandu Valley, Lalitpur Distr., Godavari, 1600 m, 27.I.1970: 1 o. – A ♀ from the same locality (leg. Diesselhorst, 25.X.1962) was measured in addition.

Measurements: **Wing**-L o 60, ♀ 61 mm. – **Tail**-L o 62, ♀ 60 mm. – **Bill**-L o 10.8, ♀ 11.8 mm. – **Tarsus**-L 2 x 20 mm. – **WTI** 9.2 and 10.7%. – **TWI** 103.3 and 98.4%.

Habitat: The above specimen was mist-netted in secondary bush near the Godavari fish farm. Diesselhorst (1968:250) considered it a common winter visitor between X and III in this area of the Kathmandu Valley, and the only Nepal breeding records are from the surrounding hills.

Alcippe castaneceps castaneceps (Hodgson)

Material: 3 specimens: **G** Parbat Distr., between Ghorapani Pass and Ulleri, 2500 m, 11.VII.1973: 1♂. **B** Kathmandu Valley, Lalitpur Distr., Phulchoki Mt., 2700 m, 28.I.1970: 2o.

Measurements: **Wing**-L (3) 56-58.5 mm. – **Tail**-L (2) 42.5 and 43 mm. – **Bill**-L (3) 8-11.8 mm. – **Tarsus**-L (3) 19.5-20.5 mm. – **WTI** (3) 10.5-12.5%. – **TWI** (2) 74.6 and 76.8%.

Horizontal: Upper Myagdi Khola, between pasture Dobang and Boghara (26.V.); Boghara (27.V. both :Myagdi); – between Pass Ghorapani and Ulleri (11.VII., see Material; :Parbat); – Phulchoki Mt., (28.I.; see Material; :Lalitpur); – between Mure and Hurure (12./14.VI.); above Pahakhola (31.V./3.VI. both :Sankhua Sabha); – Omje Kharka NW Yamputhin (2.V. :Taplejung); – Paniporua (17.IV. :Panchthar); – Mai Pokhari (10./11.IV. :Ilam).

Vertical: Our records range between 1800 m (Boghara, V). 2100 m (Mure/Hurure, VI), 2500 m (Ghorapani/Ulleri) and 2700 m (Pahakhola, V/VI). These data exactly coincide with those presented by Inskipp & Inskipp (1991): "Summers between 1825 m and 2745 m", only exceptionally higher. This makes a small vertical area belt of about 1000 m. Within Nepal limits, there is no definite breeding record yet. The record from Phulchoki Mt. in I is as high as the regular uppermost locality within the breeding season. – The upper Myagdi Khola represents the westernmost locality of the species' range where it seems not to be

rare. 2 specimens were mist-netted in riparian bamboo thickets, 2 others seen in heavy bush understory of mature forest (see Habitat).

Habitat: The Rufous-winged Fulvetta is an inhabitant of the cloud-forest zone. It settles dark, shady and thickly moss-covered forests, mostly in the lower strata up to 4 m high, rarely in the canopy belt. This Fulvetta, having remarkably strong legs, is able to walk on the vertical bark of tree trunks, partly nuthatch-, partly treecreeper-like, to exploit bark crevices, mosses and other epiphytes for food. At least in the lower part of its area in Nepal, it covers the niche of *Certhia* species, the area of which does not extend below 2000 m, and partly the niche of *Sitta* species. However, the *Certhia* and *Sitta* species living within the vertical range of *castaneceps* avoid dark, closed moss-covered forests, and there seems to be no ecological overlap. The Fulvetta normally stays sheltered in vegetation and is difficult to observe, and even by playback experiments it is not easy to lure out.

Breeding: The season is not yet defined. On 17.IV. (Paniporua), a flock of 3 were netted in bushes on overgrown terraces; two together, apparently pairs, were seen and caught several times, on 26. and 27.V. (Myagdi Khola), on 31.V. and 3.VI. (Pahakhola).

Vocalizations: Territorial song (Fig.99g-g") is a loud warbling verse, about 0.8-1.2 s long, a combination of moderately to strongly frequency-modulated notes, the latter mostly angular-shaped, bent up- or downwards. Notes with greatest frequency range are always at the end of the verse. The individual ♂ may use up to 4 different verse types or even more (Fig.99).

Alcippe vinipectus

Alcippe vinipectus vinipectus (Hodgson)

Material: 4 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 13.IV.1970: 1♂, 1♀ ** Mustang Distr., Chadziou Khola, 2600 m, 27.X.1969: 1♂ (with top of the skull preserved). **B** Kathmandu Valley, Lalitpur Distr., Phulchoki Mt., 2700 m, 28.I.1970: 1o (presumably ♂).

Measurements: **Wing**-L ♂ (3) 57-58.5 mm; ♀ (1) 54 mm. – **Tail**-L ♂ (3) 51.5-53 mm. – **Bill**-L ♂ (3) 9-10 mm; ♀ (1) 9 mm. – **Tarsus**-L ♂ (3) 22-23 mm; ♀ 22.5 mm. – **WTI** (4) 10.3-12.3%, $\bar{x}$=11.0. – **TWI** (3) 90.4-90.6%.

Horizontal: Dhorpatan (13.IV., 12.V., see Material; :Myagdi); – Chadziou Khola Valley (27.X., see Material), Thaksang above Tukche (28.II.-5.III; both :Mustang); – Marsyandi Valley, Thanjok (17.IV. :Manang); – Kathmandu Valley, Phulchoki Mt. (28.I, 19.III, 14.V., see Material; :Lalitpur).

Alcippe vinipectus chumbiensis (Kinnear)

Material: 4 specimens: **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 24.IV.1973: 1♂. **J** Ramechap Distr., Thodung, 3200 m, 5.IV.1973: 1♂. **S** Solukhumbu Distr., Lughla, 2950 m, 21.X.1970: 1♀. * Confluence of Imja and Phunki Drangka, 3250 m, 2.X.1970: 1♂. – 1♀ from Jiri (leg. Dieselhorst, 24.V.) also belongs to this subspecies.

Measurements: **Wing**-L ♂ (3) 56-61.5 mm; ♀ (1) 58.5 mm. – **Tail**-L ♂ (3) 50-54 mm; ♀ (1) 55 mm. – **Bill**-L ♂ (3) 9-9.5 mm; ♀ (1) 9.5 mm. – **Tarsus**-L ♂ (3) 21-24 mm; ♀ (1) 23 mm. – **WTI** (4) 10.2-11.4%, $\bar{x}$=10.9. – **TWI** (4) 87.8-94.0%, $\bar{x}$=90.2. – **Testes** of a IV-♂ (ssp. *vinipectus)* and of 2 IV-♂ (ssp. *chumbiensis)* slightly swollen.

Notes: ♂ bill dark brown or black, lower base lighter. Feet dark grey. Iris creamy white; according to Ali & Ripley (1972,7:116) iris colour is very variable in both subspecies.

Horizontal: Trisuli Valley, Gosainkund, Syng Gyang (23/24.IV.; see Material, :Rasuwa); – Chordung Mt., Jiri (30.III.); Thodung near Those (5/7.IV. see Material, both :Ramechap); – above Pahakhola (30.V./1.VI, :Sankhua Sabha); – Dhorpar Kharka (15.IV. :Panchthar).

Vertical (both subspecies): Records from 10 localities, all from the breeding season or close to it, range from 2500 m (Thanjok, 17.IV.) to 3670 m (above Pahakhola, 30.V.). This is a slightly narrower belt that given by Inskipp & Inskipp (1991), but summering up to 4200 m is recorded by Diesselhorst (1968:249), close to timberline or even beyond. Several winter records from 18.II.-5.III. with mild night frost still in beginning of III at 3200 m (Thaksang), even N of the main range, are remarkably high and indicate frost resistance.

Habitat (both subspecies): According to the vertical area, its strongholds are in the zone of *Quercus semecarpifolia* and *Abies* forest, intermixed with various tree *Rhododendron* species and *Juniperus* near the treeline. North of the main range, in the Tukche area, it occurred in the belt of *Pinus wallichiana, Betula utilus* and *Abies* forest, but records are only from winter with heavy snow cover persisting in shade of coniferous forest, none from the breeding season. The species prefers mainly light forests, even edges and clearings, but is typically arboreal with apparent affinities to severe Palaearctic climate even during winter.

Vocalizations: Territorial song (Fig.99f) is a high pitched trill of sharp angle-like notes, always opened downwards. The first notes fall continuously in pitch, the rest of the series consists of largely identical notes. For calls see Fig.99a-a".

Yuhina

Six species are on the Nepal list *(bakeri, flavicollis, gularis, occipitalis, nigrimenta, zantholeuca);* all breed, but this has yet to be confirmed for the very local *bakeri.* Vertical areas of all congeners during the breeding season cover a belt approximately 2800 m wide (1000-3800 m); the areas of the individual species, however, are graduated but there is considerable overlap, even between common species: the main belts of *flavicollis, gularis* and *occipitalis* are between 2000 and 3000 m, and they may occur at close range (see *gularis* and *occipitalis,* below). Ecological interactions have not yet been studied. No species penetrates into the monsoon-reduced dry Inner Valleys between the massifs or even N of the main range.

Yuhina flavicollis

Horizontal: Our records are from S Dhaulagiri to near the Darjeeling border. – Upper Myagdi Khola, S Boghara (28.V. :Myagdi); – Lete (1.V.); between Lete and Ghasa (2.V. :Mustang); – between Landrung and Dhumpus (9.V. :Kaski); – between Tal and Bagarchap (12.IV. :Lamjung); – Chichila (19 VI); between Mure and Hurure (10.IV. :Sankhua Sabha); – Omje Kharka (2.V. :Taplejung); descent from Paniporua to Hinwa Khola (20.IV.); Paniporua (20.IV. :Panchthar); – Mai Pokhari (1.IV., 12.IV. :Ilam).

Vertical: Our records from the breeding season or close to it (M IV to VI) range from 1400 m (Paniporua/Hinwa Khola, 20.IV.), 1450 m (S Boghara, 28.V.) to 2400 m (Omje Kharka, 2.V.; Lete, 1.V.). Five localities (out of 13) are concentrated between 1950 m (Chi-

chila) and 2150 m (Mai Pokhari). These data make a vertical breeding-season area 1000 m wide, as indicated by Inskipp & Inskipp (1991), but they fix the summer range (months ?) from 1830 m to 2745 m.

Habitat: The Whiskered Yuhina is well confined to the upper part of the Oriental (Indomalayan) Region; consequently, the forest types settled are entirely broad-leaved and cover the whole array of mixed forests of the area. As in the congeners of the region, the species is not confined to forests in a strict sense but works through forest edges and secondary growth, both bushes and clumps of trees. Observations during the breeding season proper (V, VI), however, indicate that the species is forest-bound. As late as IV (19.IV. leaving the area, Paniporua), *flavicollis* hunted in flocks of up to 10 specimens in bushes on overgrown terraces close to the forest edge.

Vocalizations: The most commonly heard call given by single birds or in flocks is a nasal "zi grä" (Fig.98d-e). It consists of 2 or 3 notes with a pronounced fall in pitch on which is superimposed a more rapid frequency modulation. Frequency range is high and may extend from 3.6 to 6.5 kHz in an individual call, sometimes from 2.5 to 6.5 kHz.

Yuhina gularis gularis Hodgson

Material: 4 specimens: **D** Myagdi Distr., upper Myagdi Khola, pasture Dobang N Boghara, 2400 m, 25.V.1995: 1 wing and foot. Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 27.X.1969: 1o. **G** Parbat Distr., Ghorapani Pass, 2800 m, 26.VII.1970: 1♂, 1♀. **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 1.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (2) 72, 76 mm; o (2) 74, 76.5 mm. – **Tail**-L ♂ (2) 53 and 57.5 mm; ♀ 59; o 57 mm. **Bill**-L ♂ (2) 15; ♀ and o 14 mm. – **Tarsus**-L ♂ (2) 20-23 mm; ♀ 20.5; o (2) 21, 22 mm. – **WTI** (5) 15.8-18.8%, $\bar{x}$=17.1. – **TWI** (5 including 1♂ from Ting Sang La) 73.6-77.6%; $\bar{x}$=75.6. – **Testes** slightly enlarged.

Notes: ♂ (1.IV.) bill above black, lower basis red-brown, feet light flesh-coloured.

Horizontal: Records from Thakkhola to close to the Darjeeling border. – Chadziou Khola (27.X.; see Material; :Mustang); – between Ulleri and Gorapani (23.II., 11.VII.); Ghorapani Pass (26.VII.; see Material; both :Parbat); – Dadar Danda, Kalinchok (22.IV. :Sankua Sabha); – Chordung Mt./Jiri (1.IV.; see Material; :Ramechap); – Pahakhola (3.VI. :Rasuwa Garhi); – upper Simbua Khola (10.-12.V. :Taplejung); – Dhorpar Kharka (15.IV. :Panchthar).

Vertical: Breeding season or close to it (IV-VII): Our records extend between 2400 m (between Ulleri and Ghorapani Pass; 11.VII.) and 3350 m (upper Simbua Khola, 12.V.), a vertical area nearly 1000 m wide. There is a remarkable concentration of 5 localities (out of 10) between 2600 m and 2750 m. Our data coincide with Diesselhorst's (1968:246) as concerns the upper limit; local differences are to be taken into account: "Absent in the subalpine forests of higher sites [above 3600 m] in Khumbu". Inskipp & Inskipp (1991) note "summers mainly between 2435 and 3700 m" (no months given).

Habitat: The Stripe-throated Yuhina occupies largely a vertical belt similar to that of the Rufous-vented, i. e. the cloud-forest zone which forms a transition area between the upper parts of Oriental (Indomalayan) and the lower parts of the Palaearctic Realm. Inhabited forest types are as described for the Rufous-vented, but the Stripe-throated is more strictly confined to closed forests and forest edges (cf. Diesselhorst 1968:246). Syntopic occur-

rence of both *gularis* and *occipitalis* was noted at Pahakhola (2600 m, 3.VI.) and in the upper Simbua Khola (3250 m, 10.V.) and on the Dadar Danda (3150 m, 20.-22.IV.).

Vocalizations: Call note is a nasal descending "queee" with a remarkable structure (Fig.98f-f''): mostly the call consists of 3 parts, the upper and the lower of which may be harmonics of the central one but are considerably shorter, the lower starting, the upper finishing the call. There is strong frequency modulation in all parts.

Yuhina occipitalis occipitalis Hodgson

Material: 3 specimens: **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 25.IV.1973: 1♀. **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 30.III.1973: 1♂ * Thodung, 3200 m, 8.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (2) 65, 66; ♀ 63 mm. – **Tail**-L ♂ (2) 51.5 and 52; ♀ 50.5 mm. – **Bill**-L ♂ (2) 14 and 14.5; ♀ 13.5 mm. – **Tarsus**-L ♂ (2) 18, 19; ♀ 18 mm. – **WTI** (3) 15.4-17.5%. – **TWI** (3) 78.8-80.2%. – **Ovary** activated, **testes** (8.IV.) slightly swollen (5 x 3 mm).

Notes: Bill reddish or grey reddish (♂) or dark orange brown (♀); feet orange.

Horizontal: Trisuli Valley, Syng Gyang (25.IV., see Material; :Rasuwa); – Dadar Danda, Kalinchok (19.-23.IV. :Sindhu Palchok); – Chordung Mt. (30.III., see Material); Thodung (8.IV., see Material; both :Ramechap); – above Pahakhola (1./4.VI. :Sankhua Sabha); – upper Simbua Khola (10. and 12.V.); ascent to pasture Lassetham (6.V. both :Taplejung).

Vertical: Records from V and VI, within the presumed breeding season, range from 2600 m (Pahakhola) to 3250 m (Simbua Khola). But also earlier, in III and IV, records are just as high (2900 m 30.III., Chordung; – 3200 m 8.IV., Thodung; – 3200 m 25.IV., Syng Gyang). These observations coincide with those compiled by Inskipp & Inskipp (1991), but summer range (months?) reaches up to 3600 m.

Habitat: The Rufous-vented Yuhina inhabits the uppermost zone of all congeners and penetrates well into the Palaearctic climatic and vegetational belt. Forest types in the lower zone are mixed oak (mainly *Quercus semecarpifolia), Rhododendron/Magnolia* communities (Pahakhola), mixed *Quercus/Rhododendron*/conifer (mainly *Abies* sp.) (Thodung; Syng Gyang) to nearly pure *Abies* with scattered *Rhododendron, Sorbus* and *Juniperus* (upper Simbua Khola). Near the upper limit of the species' range (near 3600 m), only *Abies* and *Rhododendron* are present. The species hunts in bushes and the lower canopy, especially while exploiting flowers during the *Rhododendron* blooming season.

Heterophasia capistrata nigriceps (Hodgson)

H. [capistrata] incl. *gracilis*

Material: 10 specimens: **D** Myagdi Distr., Bobang, 2450 m, 28.IV.-1.V.1970: 1♂, 1♀ * Dhorpatan including Uttar Ganga Valley, 2950-3000 m, 13.-23.IV.1970, 18.V.1973: 2♂, 2♀ ** Mustang Distr., Chadziou Khola, 2600-2650 m, 26.X.1969, 1.-2.VII.1970: 2♂, 1♀.**J** Dolakha Distr., Thodung, 3200 m, 5.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (6) 92.5-102 mm, $\bar{x}$=97.4, s_d=3.58; ♀ (4) 90-96 mm, $\bar{x}$=93.4. – **Tail**-L ♂ (6) 98-107 mm, $\bar{x}$=102.2, s_d=3.37; ♀ (4) 95-100, $\bar{x}$=96.8. – **Bill**-L ♂ (6) 17.5-21 mm, $\bar{x}$=19.2, s_d=1.25; ♀ (4) 18-20 mm, $\bar{x}$=19. – **Tarsus**-L ♂ (6) 29-30.5 mm, $\bar{x}$=29.6, s_d=0.67; ♀ (4) 28-30 mm, $\bar{x}$=28.9. – **WTI** (10) 14.9-19.6%, $\bar{x}$=16.6, s_d=1.73. – **TWI** (10) 101.6-108.1%, $\bar{x}$=104.4, s_d=2.27. – **Testes** at 5.IV. 4 x 2 mm, 20.IV. 6 x 4 mm, 28.IV. 7 x 6 mm, 2.VII. 7 x 3 mm. **Ovary** activated at 1.V.

Notes: IV ♂ bill black, feet grey flesh-coloured. The ♂ from Thodung has a more greyish back, thus tending to *H. c. bayleyi* (Kinnear).

Horizontal: Our records extend from SW Dhaulagiri to the Sikkim/Darjeeling border. – Dhorpatan (13.-23.IV., 13.-18.V., see Material); Bobang S Dhorpatan (28.IV.-1.5., see Material); upper Myagdi Khola, Boghara and Dobang (25.-27.V.); Muri (31.III.-2.IV. all :Myagdi); – Chadziou Khola (26.X., 1.-2.VII, see Material); Lete (30.IV-1.V. both :Mustang); – above Chitre (5.5.), above Ghandrung (7.V. both :Parbat); – above Landrung (8.V.); above Dhumpus (9.V.); above Ulleri (27.IX. all :Kaski); – Marsyandi Valley, Dharapani (12.IV.); near clearing Thimang (13.IV. both :Manang); – Sheopuri Mt. (25.VI. :Kathmandu); – Phulchoki Mt. (19.III., 23.III, 14.V. :Lalitpur); – Ting Sang La (14.IV. :Sindhu Palchok); – Chordung Mt. N Jiri (27.III.-3.IV.); Thodung near Those (5.IV., see Material, both :Ramechap); – Pahakhola (1.-4.VI.); between Mure and Hurure (8.-17.VI. both :Sankhua Sabha); – between Hellok und Lungthung (19.V.); Omje Kharka (1.-6.V.); Yamputhin (29.IV.); Gitang Khola (28.III.); Dhorpar Kharka and ascent to Dhorpar Kharka (13.-14.IV. all: Taplejung); – Mai Pokhari (26.III., 1.IV., 10.-11.IV. :Ilam).

Vertical: Within or close to the breeding season (IV-VI): 1800 m (Boghara, 26.V.), 1830 m (forest edge above Landrung, 8.V.), 1900 m (Dharapani, 12.IV.; Yamputhin, 29.IV.) to 3200 m (Thodung, 5.IV.; Ting Sang La, 14.IV.). There seems to be even distribution all over this belt, but the species is most common between 2100 and 2800 m (observations at 21 localities, out of 33).

Habitat: The Black-capped Sibia is a most characteristic and locally common inhabitant of the cloud-forest zone, which is dominated by various species of oaks, especially *Quercus semecarpifolia* in the upper parts of its range. Its populations fade out at about 3000 m where oaks are reduced in favour of conifers, mainly *Abies* species. However, locally, in the uppermost parts of its range, it may occur in pure conifer stands (Dhorpatan, 3000 m: *Abies, Pinus wallichiana, Juniperus).* At Thodung and Ting Sang La, both localities at 3200 m, single oaks are still present here and there amidst the conifers. No populations could be traced in the rain shadow north of the main range, even at low altitudes. Consequently, the species is absent from upper Thakkhola (northernmost records are from the lower Chadziou Khola Valley above Ghasa [see Material] and from Lete, still within the monsoon influence area but isolated pockets of broad-leaved forest are inhabited even N of Kalopani), upper Marsyandi Valley and from the forested parts of Dolpo.

Vocalizations: Territorial song (Fig.98g-i) is a series of clear whistles, all notes at one frequency only or interrupted by frequency jumps between single notes (Martens & Geduldig 1990) or a marked freqency modulation (Fig.98i). Every individual ♂ seems to use only one (rarely a few) song types by which it is easily recognizable by sonagram, sometimes even by the human ear. Though this whistle song seems to penetrate well the noise of mountain torrents (noted already by Diesselhorst 1968:251), its frequency range is too low to fulfill the requirements of a "torrent-adapted voice" (Martens & Geduldig l.c.). However, the song can be heard over long distances in the oak forest, often several ♂ from one locality. This mellow and warm whistle concert is, given a high population density, very characteristic and typical for the oak forest zone.

AEGITHALIDAE

Aegithalos

Three species occur in Nepal, all breed *(iouschistos, niveogularis, concinnus).* They are separated by altitudinal preferences and by their distributional limits along the Himalayan main axis which are apparently caused by differing ecological requirements. *Ae. concinnus* ranges all over the country and inhabits the lowest belt. *Ae. iouschistos* lives in a higher belt and its western limit is situated on the southern slopes of Dhaulagiri. Finally, *niveogularis* is confined to dry areas; its easternmost outposts reach NW Dhaulagiri. At least during the breeding season, none of the species have been found in close proximity to one another (for distribution of *iouschistos* and *niveogularis* in the Himalayan region cf. Fig.100).

Aegithalos niveogularis niveogularis (Gould)

Taxonomic notes: The relationships of the small *Aegithalos* tits have often been treated but never clarified in detail. The short-tailed *Ae. iouschistos* s.str. seems to be even more isolated than the grey-faced *Ae. fuliginosus* from Central China. The latter apparently sometimes hybridizes with *Ae. n. bonvaloti* (Kleinschmidt & Weigold 1922; Birckhead 1937:13-14). Most surprising is the great similarity between *niveogularis* (W Himalaya) and *sharpei* (Mt. Victoria), which was already pointed out by Vaurie (1957:18). Only in

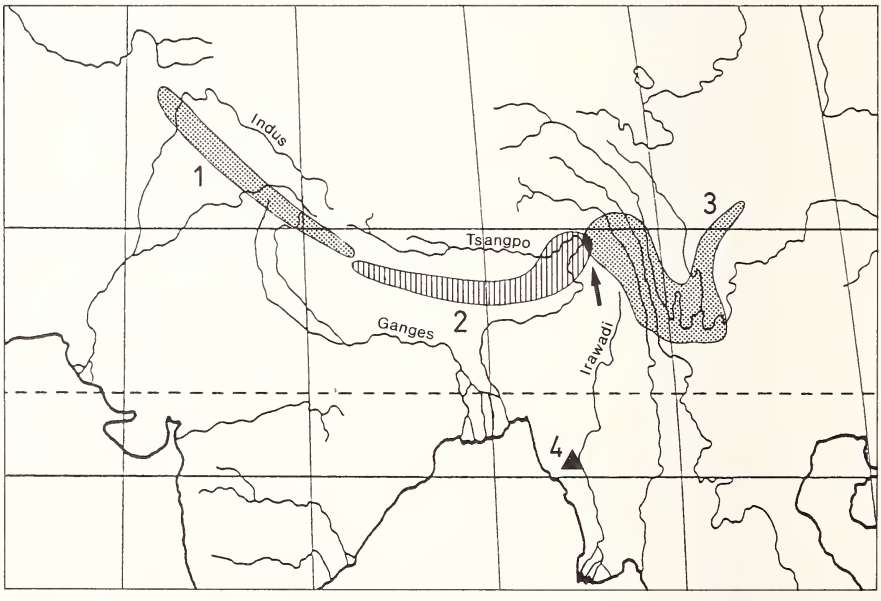


Fig.100: Distribution of two *Aegithalos* species in the Himalayan region. – *Ae. niveogularis* (1: *Ae. n. niveogularis;* 3: *Ae. n. bonvaloti* and *Ae. n. obscuratus* [spur to the N]; 4: *Ae. n. sharpei); Ae. iouschistos* (2). – Maps drawn from data in Wunderlich (1989a, 1991).

the pullus plumage is the throat reddish in *niveogularis* (according to Hartert), but in *sharpei* (and *bonvaloti*) with an ochre tinge. We propose to treat the two geographic isolates in the W *(niveogularis)* and S *(sharpei)* with *bonvaloti* and *obscuratus* as conspecific (Fig.100).

Material: 3 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 24.V.1970: 1♂ * Gompa/Tarakot, 3300 m, 13.V.1970: 1♂, 1♀.

Measurements: **Wing**-L ♂ (2) 64 and 64, ♀ 60 mm. – **Tail**-L ♂ (2) 56 and 57, ♀ 53 mm. – **Tarsus**-L ♂ (2) 18 and 18, ♀ 17.5 mm. – **WTI** (3) 16.7-17.5%. – **TWI** (3) 88.3-89.1%. **Gonads** of both ♂ 3 x 3 mm, ♀ undevelóped.

Notes: A II-♀ from Kashmir (ZSM 09.5422) is much lighter in colour.

Horizontal: Our records only in the dry regions of NW Dhaulagiri. Except an observation on 22.V. on the banks of Phoksumdo Lake (:Dolpo), all others are identical with those mentioned in the Material section. There are no verified records (skins) from the breeding season east of NW Dhaulagiri (easternmost record near Tarakot, see Material). Scattered breeding populations may exist in Thakkhola (:Mustang) and even further east in the upper Marsyandi Valley (:Manang). Inskipp & Inskipp (1991) also enumerate field observations (not from the breeding season) in monsoon-influenced area.

Vertical: The localities are situated at 3300 m (Gompa) and 3650 m (Phoksumdo Lake). Inskipp & Inskipp (1991) indicate Nepal records from 2750 to 3550 m, Fleming et al. (1975) up to 3965 m, but without seasonal differentiation.

Habitat: Bushes *(Rosa, Berberis)* and scattered trees on abandoned terraces close to forest edge above Gompa/Tarakot; the local forests are mixed stands of *Picea smithiana* and *Betula utilis.* On Phoksumdo Lake, specimens made their way through dense clumps of young *Pinus wallichiana, Berberis* and *Rosa* bushes, close to somewhat open forest *(Pinus, Cupressus, Juniperus).* Both localities are situated N of the main range in a monsoon-reduced area, where the species is the only representative of the genus. The White-throated Tit is a west Himalayan species adapted to dry climate.

Aegithalos concinnus iredalei (Baker)

Taxonomic note: According to colour pattern of juvenile and adult plumage and bill shape *Ae. concinnus* forms a binary group with *leucogenys.* – Relying on Ticehurst's description (1926), *Ae. c. rubricapillus* (joining *iredalei* eastward) is darker and smaller (**Wing**-L maximally 52 mm versus 57 mm in *iredalei),* see also Rand & Fleming (1957:117).

Material: 3 specimens: **D** Myagdi Distr., Myagdi Khola, Muri, 2100-2300 m, 25.III.-2.IV.1970: 2♂, 1♀ (in oviposition state).

Measurements: **Wing**-L ♂ (2) 53.5 and 54 mm, ♀ 51 mm. – **Tail**-L (graduation) ♂ (2) 53 (13) and 54 (13.5) mm, ♀ 47 (12) mm. – **Tarsus**-L ♂ (2) 16 and 16.5 mm. – **WTI** (3) 13.0-16.8%. – **TWI** (3) 92.2-100.0%.

Notes: Greatly enlarged gonads, ♀ near oviposition.

Horizontal: Records from S Dhaulagiri to the Sikkim/Darjeeling border. – Muri (25.II.-2.IV. :Myagdi); – Choya (25.II.); Titi Lake (25.II.); between Lete and Ghasa (2.V. all :Mustang); – Paniporua (17.IV. :Panchthar); – Omje Kharka (3.V. :Taplejung); – below Mai Pokhari (9.IV.); Mai Pokhari (26.III., 10.IV. :Ilam).

Vertical: During the breeding season or close to it (III-V): Observations range between 1700 m (below Mai Pokhari, 9.IV.) and 2400 m (Omje Kharka, 3 V); 4 of the 7 records are concentrated between 2100 and 2250 m. Fleming et al. (1975) indicate as upper limit near 2600 m, Inskipp & Inskipp (1991) even up to (rarely) 3000 m. The lower breeding limit remains to be defined. Diesselhorst (1968:350) collected a specimen with enlarged testes at 1450 m (Godavari, 17.III.), probably at the beginning of the breeding season. Evidently, the population density is highest within a quite narrow belt from below 2000 m to 2600 m.

Habitat: Open scrub, bushes and open forest with clearings, preferably forest edges within the lower part of the cloud zone. Preferences are not recognizable as yet. The Black-throated Tit stays singly, pairwise or in small flocks in the bush storey, never high up in trees. The Titi Lake, Lete and Choya localities are already within the monsoon-reduced dry areas N of the main range, but evidently the species does not penetrate further N within the Kali Gandaki Valley.

Breeding: Early season; the Muri ♀ (25.III.) was in the ovipositing state. Biswas (1963a) found it breeding in III and IV, Diesselhorst (1968:350) reported strongly enlarged testes on 17.III. (see above). Even during the breeding season, the species may remain in small flocks of up to 5 (Mai Pokhari, 10.IV., 2150 m; Omje Kharka, 3.V., 2400 m) and even 15 specimens (Lete, 5.V., 2400 m). Already regressive testes on 11.V. point to an early end of the season (Diesselhorst 1968:350).

Vocalizations: Two types of calls are used by birds gathered into flocks roaming through the bush layer, (i) series of short clicks of conspicuously broad frequency span, some at least 9 kHz, others only 6 kHz, the initial clicks being broadest (Fig.101c, beginning of Fig.101d); (ii) verse-like call series of angular, downward-opened notes in a mainly descending but parially ascending series, the ascending slope always the shortest. Notes of highest frequency (at the beginning) exceeding 9 kHz (Fig.101e).

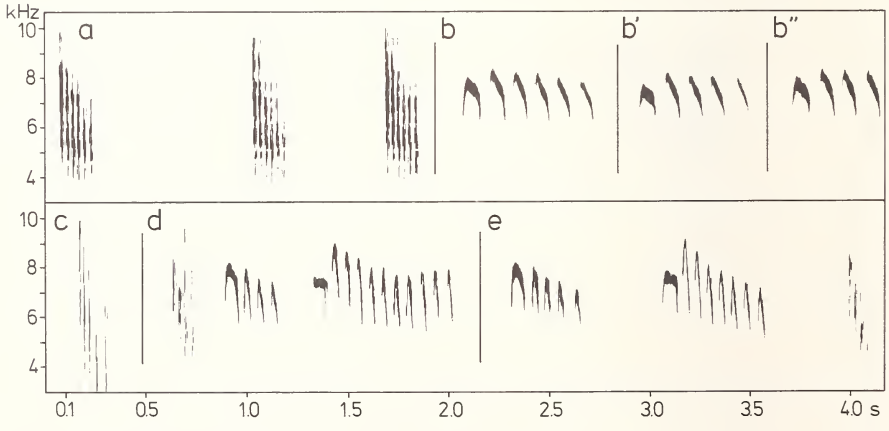


Fig.101: Vocalizations of *Aegithalos* species. – a, b) *A. iouschistos;* 2 types of contact calls of 1 specimen; Chordung Mt. 30.III.1973.
c-e) *A. concinnus;* 2 types of contact calls from specimens of a flock; Mai Pokhari 10.IV.1988.

Aegithalos iouschistos (Hodgson)

Taxonomic note: With respect to the differing ventral colour patterns of young and adults and also to the sympatry with *Ae. n. bonvaloti* (Tsangpo bend, cf. Atlas Verbr. pal. Vögel, part 17, 1991) it seems advisable to regard *iouschistos* as a monotypic isolated species. Wunderlich's map depicts a disjunct distributional area for *Ae. iouschistos*. He erroneously treated *Ae. niveogularis obscuratus* (slightly darker than ssp. *bonvaloti)* as a form of *iouschistos* (see Fig.100).

Material: 2 specimens: **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 25.IV.1973: 1 ♀ (in oviposition state). **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 30.III.1973: 1 o.

Measurements: In this section 3 ♂ (Jiri, Bigu) and the ♂ pullus (Thodung) of the Diesselhorst collection are included (altogether 6 specimens). – **Wing**-L ♂ (3) 55-58; ♂ pull. (1) 54.5; ♀ 56.5; o (1) 55 mm. – **Tail**-L ♂ (2) 50.5 and 51; ♂ pull. (1) 49.5; ♀ (T1 missing); o (1) 49 mm. – **Tarsus**-L ♂ (3) 17-18; ♂ pull. (1) 17; ♀ 17; o (1) 16.5 mm. – **WTI** (6) 14.7-16.8%, x̄=16.0. – **TWI** (4) 87.1-90.8%, x̄=89.1. (n=4 in Vaurie [1957]: 18, x̄=85%).

Notes: Iris creamy white and light yellow, respectively, feet flesh-coloured.

Horizontal: Scattered records from SW Dhaulagiri to near the Sikkim/Darjeeling border. – Dhorpatan (22./23.IV. :Myagdi); – Trisuli Valley, Syng Gyang (25.IV. :Rasuwa); – Pahakhola (1.VI. :Sankua Sabha); – Dhorpar Kharka (14.IV.); Deorali Pass near Dhorpar Kharka (16.IV. both :Ilam). – The species has its western limit in the Dhaulagiri area. The Dhorpatan record is the westernmost locality at present.

Vertical: During breeding season (E III-A VI), our records in a narrow belt from 2600-3200 m; 4 localities: 2600-2900 m, 2 loc.: 3000-3200 m (Dhorpatan, Syng Gyang). Diesselhorst's (1968:350; V-VI) records are between 2900 and 3400 m; Inskipp & Inskipp's (1991) highest record (month ?) is at 3700 m. The altitudinal breeding belt does not exceed 1000 m and may be considerably narrower locally.

Habitat: Clearings in open forests, forest edges and bushy places nearby, but also in forests with dense lower storey (Pahakhola, 1.VI.). Though the general appearance of the habitat is similar within the occupied belt, the forest composition differs according to altitude: *Quercus semecarpifolia/Magnolia campbelli/Arundinaria* (Pahakhola, 2600 m); *Rhododendron/Lithocarpus pachyphylla/Tsuga dumosa* (Dhorpar Kharka, 2700-2800 m); *Pinus wallichiana, Abies spectabilis* (Dhorpatan, 3000 m); *Quercus semecarpifolia/Abies spectabilis* (Syng Gyang, 3200 m).

Breeding: The ♀ from Syng Gyang (25.IV.) was in the oviposition state. Breeding records are from V (Fleming et al. 1976; Inskipp & Inskipp 1991); a pullus was collected on 3.VI. (Diesselhorst 1968:350). Season seems to be limited to a short period, mainly IV/V.

Vocalizations: Two types of contact calls (Fig.101a-b) are used by single birds or flocks, (i) groups of closely spaced short clicks given at different intervals. Frequency bandwidth is very broad and encompasses at least 8 kHz (app. 3-11 kHz, 1-9 kHz, repectively), the first clicks of a group being broadest (Fig.101a); (ii) verse-like call series of angular, downward-opened notes, the ascending slope of which is in some cases strongly reduced, the individual notes exceeding 8 kHz (Fig.101b). – Both types of contact calls are very similar to those of *Ae. leucogenys* in Afghanistan and (less) to *Ae. caudatus* in Europe (for sonagrams see Löhrl & Thielcke 1969), indicating constancy of inherited ethological characters over long periods of time.

***Sylviparus modestus* ssp.**

Taxonomic notes: Of three subspecies, the westernmost *(simlaensis)* and easternmost *(klossi)* are said to be very light in colour and hardly distinguishable from one another; they are separated taxonomically because their ranges of distribution are so far apart. Between them, and hence also in Nepal, the darker *modestus* has been reported. However, the two ♂ from Nepal with worn (III) and renewed (VII) plumage have a much lighter coloration than a small series from Sichuan *("occultus" = modestus).* In view of the fact that additional subtle forms have been described for Mt. Victoria *(saturatior),* Fukien *(ricketti)* and Tonkin *(tonkinensis),* it seems more appropriate merely to call attention to the differences that can exist, rather than finding a new subspecies name for each of them (cf. Vaurie 1950:49-51; 1957a:35; Snow 1957:36). Regarding the systematic position of *Sylviparus modestus,* see Löhrl (1982, 1988b).

Material: 2 specimens: **G** Parbat Distr., Ghorapani Pass, 2800 m, 27.VII.1970: 1♂ (feathers fresh, tail feathers clearly pointed). **J** Ramechap Distr., Chordung Mt., 2900 m, 30.III.1973: 1♂ (song specimen).

Measurements: **Wing**-L 2 x 59 mm. – **Tail**-L 37 mm, in the III specimen tail damaged. – **Bill**-L 7 and 7.5 mm. – **Tarsus**-L 15.5 and 17 mm. – **WTI** 18.6 and 19.5%. – **TWI** 62.7%.

Notes: In respect to colouring, Yellow-browed Tits (WTI 16.4-21.3%, $\bar{x}$=19.3, s_d=1.38, n=16 from China, Sikkim, Nepal and Mt. Victoria) resemble *Phylloscopus* warblers but are remarkably short-tailed, more than *Phylloscopus* warblers: TWI 61.5-66.9%, $\bar{x}$=63.9, s_d=1.61, n=15. But regarding this character, they are even undercut by the Chinese Yellow-bellied Tit *Parus [elegans] venustulus* (53-58%). – Bill blackish, feet lead grey.

Horizontal: Our records are from Lete (6.V. :Mustang); Ghorapani Pass (27.VII.; see Material); between Deorali and Chitre (3.V. both :Parbat); – Kathmandu Valley, Sheopuri Mt. (26.VI; :Kathmandu); – Chordung Mt. (30.III.; see Material; :Ramechap).

Vertical: The 5 records fall into a narrow range: 2300 m (Sheopuri), 2450 m (Deorali/Chitre; Lete), 2800 m (Ghorapani), 2900 m (Chordung). Inskipp & Inskipp (1991) indicate a similarly narrow vertical belt: usually 2135-2800 m "during summer" (months?), rarely up to 3250 m; Diesselhorst (1968:349) collected specimens at 3200 m in V.

Habitat: Because of its narrow vertical range, during the breeding season the Yellow-browed Tit is largely restricted to the high-altitude and cloud-forest zone where a large array of broad-leaved trees exist including walnut *(Juglans regia),* maple (*Acer;* Lete), many oak species *(Quercus)* which locally intermingle with a large proportion of tree *Rhododendron* or, at the upper limit, of *Abies.* Downward migration during the winter is also uncommon, as shown by the E III finding of a wandering flock at 2900 m (see above).

Breeding: It is only recently that nests of Yellow-browed Tits have been observed; they are built in tree holes like those of the other Paridae (Fleming 1973, Löhrl 1981, Redman et al. 1984). Of several ♂ collected M V most had active gonads (Diesselhorst 1968:349), one nest contained eggs E IV (Fleming 1973) and two others already had pulli B V (Fleming 1973, Löhrl 1981), fledged pulli as early as M V (Inskipp & Inskipp 1991), family group with evidently independent pulli on 25.VI at Sheopuri (see Horizontal).

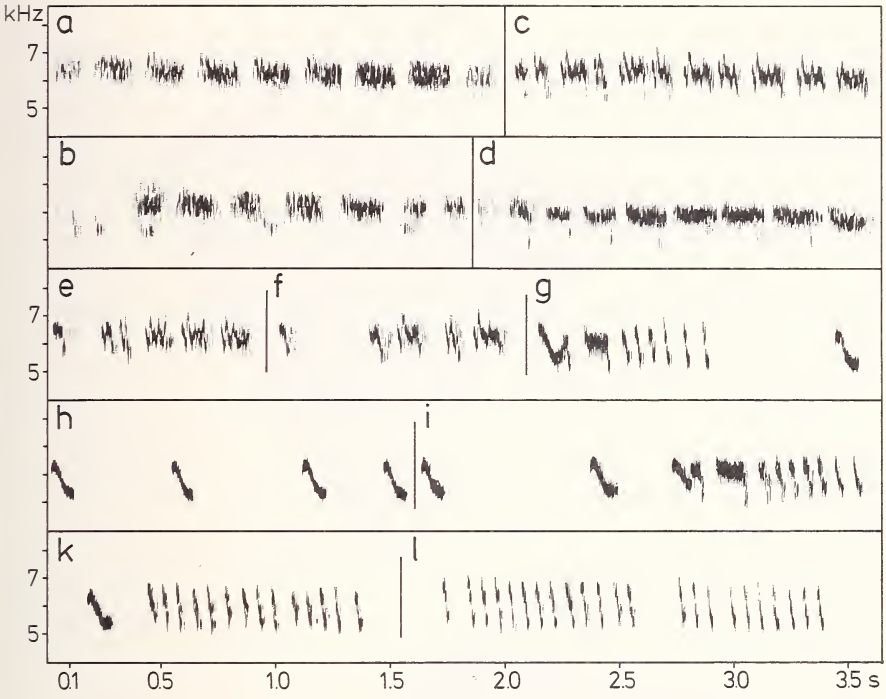


Fig.102: Vocalizations of *Sylviparus modestus*. – a-b) calls of 1 (2?) specimens of a flock, Chordung Mt. 30.III.1973. c-l) song (c-g) and (?) warning call series (h-l) all given in territorial context upon playback of a-b), Lete 6.V.1995.

Vocalizations: Irregular high-pitched twittering verses (Fig.102a-b; quickly "sre sre.."), continuously displayed by several specimens in pre-breeding-time flock (III); very similar twitter verses (Fig.102c-f) given upon playback of the recording Fig.102a-b), all in territorial context during the presumed breeding season (B V). The single notes are high-pitched (5.5 up to nearly 7 kHz), heavily and irregularly frequency-modulated; all seem to differ from each other. Sharp "ceet" calls are given in pure series (Fig.102h) or are added at the beginning and to the end of presumed song verses (Fig.102m, i-k). Also on playback of verses Fig.102a-b trills (rapid and sharp "zitetetet") of single notes with rapid downstrokes (Fig.102k, l) are given, sometimes in combination with other notes. – The meaning of the different vocalizations is not yet clear, because very similar note/verse types may be produced spontaneously during the pre-breeding season (Fig.102a-b) and during the presumed breeding season (Fig.102c-f). Fig.102a/b-verses were "understoood" by 2 territorial ♂ and elicited strong responses. The marked frequency modulation in *Sylviparus* differs strictly from any other parid song known so far.

Parus

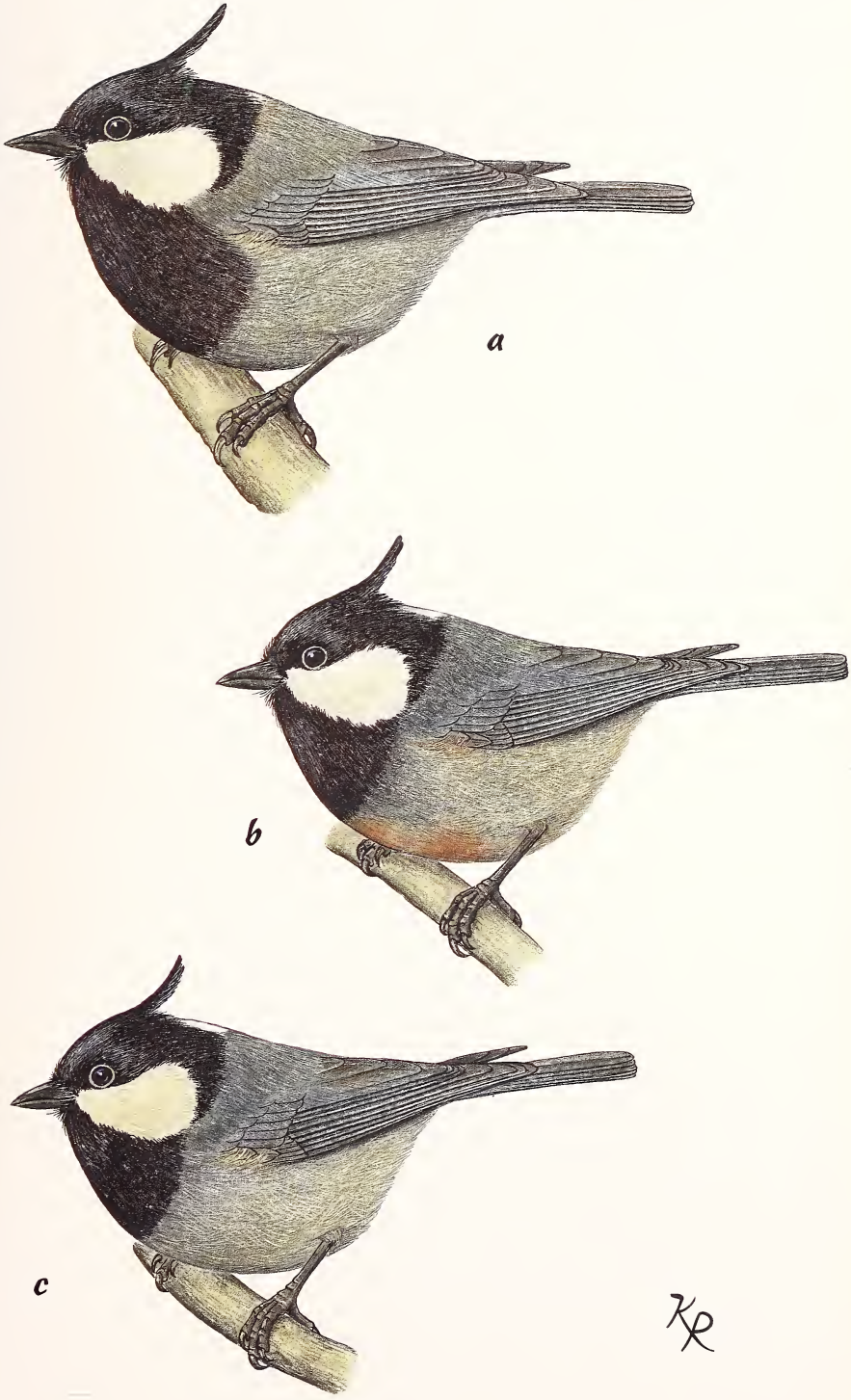
The Nepal list comprises 8-10 species depending on how certain species are defined. We lump *melanolophus* with *ater* (contra current opinion of most authors including Martens 1975) and retain nominate *rubidiventris* with *r. beavani* (agreeing with most authors), both on biological grounds (see the respective species). The species' list then is as follows: *dichrous, rufonuchalis, rubidiventris, ater, major, monticolus, xanthogenys, spilonotus.*

In the Himalayas the whole forest belt, which in Nepal is locally wider than 4000 m, is inhabited by tits. Particularly rich in species is the upper part from about 1500 m onwards to timberline at 4000 m or beyond. All species are concentrated there except *major.* But also within this 2500-m-belt, there is a noticeable vertical graduation of species sets. Most species occur exclusively in the Palaearctic belt beyond 3000 up to timberline; there *dichrous, rubidiventris, ater/melanolophus, rufonuchalis* occupy nearly the same vertical belt, and all may occur in one forest patch (see Tab. 15) while only *monticolus* is a member of both realms, Palaearctic and Indomalayan. Only *major, xanthogenys* and *spilonotus* inhabit the latter, partly also *monticolus.* Up to 1200 m *major* is the only species, stressing the fact that most of the Himalayan tits are largely Palaearctic in origin, only two Chinese Himalayan *(monticolus, dichrous),* one Indochinese Himalayan *(spilonotus).*

In the Central Himalayas there is contact between the distributional areas of several *Parus* taxa which are currently being placed in the transitional field of well advanced subspecies and incipient (or even recently established) species: (i) Superspecies or species group (?) *rufonuchalis.* In Kumaon and considerable parts of W Nepal *rufonuchalis* and *r. rubidiventris* occur sympatrically during the breeding season without hybridisation (see below). – (ii) *r. rubidiventris* and *r. beavani,* very distinct in colouration (Plate 2), are separated only by a deep-cut river valley but may merge in S Tibet. They are considered by a few authors as different species despite identical song (see below). – (iii) *ater aemodius* and *a. melanolophus,* generally considered as different species, meet in the Dhaulagiri area, forming a narrow zone of hybridisation. This gives rise to peculiar colour effects (see below); their vocalizations are very similar, probably identical. – (iv) *xanthogenys* and *spilonotus,* very similar in external appearance, meet in far E Nepal. Their interactions in the zone of contact are virtually unknown.

Plate 2: Himalayan representatives of a) *Parus rufonuchalis,* b) *Parus rubidiventris rubidiventris* and c) *P. rubidiventris beavani.*
Drawn from skins as follows: a) Bonn ZFMK 71.1055; Nepal, Dolpo Distr., Ringmo/Phoksumdo Lake, 24.V.1970. – b) Bonn ZFMK 71.1064; Nepal, Myagdi Distr., Dhorpatan, 24.IV.1970. – c) Bonn ZFMK 71.61; Nepal, Solukhumbu Distr., Pare, 15.X.1970.

Original by K. Rehbinder.



Tab.15: *Parus* species communities of some well-studied localities in Nepal harbouring the species/subspecies *dichrous, monticolus, ater aemodius, a. melanolophus, rufonuchalis, r. rubidiventris, r. beavani, xanthogenys, major.*

Kathmandu 1400 m	Dhorpatan 3000 m	Thaksang 3150 m	Thodung 3200 m	Tarakot 3300 m	Ringmo 3600 m
major	–	–	–	–	–
xanthogen	–	–	–	–	–
–	*monticol*	*monticol*	–	*monticol*	–
–	*dichrous*	*dichrous*	*dichrous*	*dichrous*	–
–	*melanol*	–	–	*melanolo*	*melanol*
–	–	*aemodius*	*aemodius*	–	–
–	*rubidiv*	*rubidiv*	–	*rubidiv*	*rubidiv*
–	–	–	*beavani*	–	–
–	–	*rufonuch*	–	–	*rufonuch*

Parus dichrous

Parus [cristatus] dichrous

Taxonomic notes: Although the European *P. cristatus* and the Central Asian *P. dichrous* are widely separated geographically, in the scatter diagram of wing and tail dimensions they are remarkably close to one another. In this regard the Crested Tits *sensu lato* appear the same as most Grey Tits (subgenus *Poecile)* in that they exhibit no significant differences in WTI but have undergone considerable shifts in the TWI (Tab.16). It should be noted that the TWI difference between the subspecies *dichrous* and *izzardi* (cf. below) seems to result from the difference in body size, whereas that between *dichrous/izzardi* and the *wellsi – dichroides – P. cristatus* group is apparently independent of size; *wellsi* and the rest are "offset" in the diagram, being disposed at right angles to the line representing simple enlargement.

Tab.16: TWI of various populations of *Parus dichrous* and of *P. cristatus mitratus.*

	TWI (%)	$\bar{x}$	s_d
dichrous (C Nepal) ♂/♀ (4/2)	63.8–67.6	65.7	1.05
izzardi (E Nepal) ♀ (4)	64.9–68.2	66.1	1.57
izzardi (E Nepal) ♂ (9)	66.7–72.2	68.8	1.68
wellsi (Washan) (4)	68.4–72.2	69.5	1.81
dichroides (7)	70.7–73.9	72.6	1.10
P. cristatus mitratus (17)	75.4–81.5	79.0	1.88

Biswas (1963a) restricted the **locus typicus** of *dichrous* Blyth to northern Central Nepal and described the ssp. *izzardi* on the basis of only one specimen from Thammu, Bhote Kosi Valley, E Nepal in 1955. Snow (1957:39-40) lumps *izzardi* with nominate *dichrous;* the **type** (♂) had a wing length of 74 mm. According to Snow, *P. d. dichrous* (♂) has wing length 68.5-75 mm, but unfortunately he did not disclose the origin of his material. In the material available for the present study, it is obvious that the birds from E Nepal are distinctly larger (material of Diesselhorst: E Nepal: Ting Sang La, Khumjung, i.e. to the east

of 86°E longitude; Martens: Dhorpatan to Ghorapani, i.e. between 83°E and 84°E, also Chordung and Nangpa-Tsangpo Valley in E Nepal, which again lie east of 86°E). Central Nepal, ♂ (4) wing length 65.6-69 mm; Eastern Nepal, ♂ (9) wing length 71-75 mm (cf. wing length of the *izzardi* type).

A range of variation of 65.5-75 mm in the ♂ would be too large for these small birds. The crucial point here is not whether the nomenclatural distinction is justified, but whether a difference actually exists. In this connection, however, it is practical to make use of the name *izzardi*.

Parus dichrous dichrous Blyth

Material: 6 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 18.IV.1970: 1♂, 1♀ * Dhorpatan, Uttar Ganga Plain, 2950 m, 16.V.1973: 1♂ ** Mustang Distr., Thakkhola, Lete, 2600 m, 3.XII.1969: 1♂ * Chadziou Khola, 2600 m, 27.X.1969: 1♂. **G** Parbat Distr., Ghorapani Pass, 2800 m, 27.VII.1970: 1♀ juv.

Measurements: **Wing**-L ♂ (4) 65.6-69 mm, $\bar{x}$=67.1; ♀ incl. juv. (2) 65-65.6 mm. – **Tail**-L ♂ (4) 43-44 mm, $\bar{x}$=43.9; ♀ (2) 43-43.5 mm. – **Tarsus**-L ♂ (4) 19-20 mm, $\bar{x}$=19.4; ♀ (2) 19 mm. – **WTI** (6) 15.3-17.9%, $\bar{x}$=16.7, s_d=0.91. – **TWI** see above.

Horizontal: Gompa/Tarakot (11.V., 16.VI. :Dolpo); – between Dhule and upper Cheng Khola (8.V.); Thankur (27.V.); Dhorpatan (15.-18.IV.,16.-21.V.; see Material; all :Myagdi); Titi Lake (26.II); Chadziou Khola (27.X.; see Material); Lete (7.V., 3.XII.; see Material); Thaksang above Tukche (27.IV;); Purano Marpha (17./19.III, 24./25.IV. all :Mustang); – descent to Ghandrung (7.V.); Ghorapani Pass (27.VII. both :Parbat); – Marsyandi Valley, near Pisang (17.IV. :Manang).

Parus dichrous izzardi Biswas

Material: 2 specimens: **J** Ramechap Distr., Chordung Mt. near Jiri, 2900 m, 31.III.1973: 1♂. **S** Solukhumbu Distr., Nangpa Tsangpo Valley, Pare, 3550 m, 14.X.1970: 1(♂) juv.

Measurements: The data below include material of the Diesselhorst collection. – **Wing**-L ♂ incl. juv. (9) 71-75 mm, $\bar{x}$=72.4, s_d=1.57; ♀ (4) 66-70 mm, $\bar{x}$=67.5. – **Tail**-L ♂ (9) 48-52 mm, $\bar{x}$=49.8, s_d=1.54; ♀ (4) 43.5-45 mm, $\bar{x}$=44.6. – **Tarsus**-L ♂ (2) 19-20 mm. – **WTI** (9) 14.9-19.3%, $\bar{x}$=17.4, s_d=1.40. – **TWI** see above. – **Testes** 31.III. 8 x 6, 18.IV. 6 x 5, 16.V. 9 x 5 mm. – **Ovary** 18.IV. inactive (after oviposition ?). – **WTI** of 17 *P. cristatus mitratus:* 16.9-20.9%, $\bar{x}$=18.3, s_d=1.31.

Notes: ♂ bill blackish or dark grey, feet lead grey, iris "pinkish bright" or "bright read".

Horizontal: Dadar Danda, Kalinchok (19.-22.IV.); Ting Sang La (14.IV. both :Sindhu Palchok); – Chordung Mt./Jiri (29.III., 2.IV.; see Material); Thodung (8.IV., 4.IX. :Ramechap); – between Khumjung and Milinggo (19.IX.); Pare (14.X.; see Material; both :Solukhumbu); – upper Simbua Khola (14./14.V. :Taplejung).

Vertical (both subspecies): Breeding season and close to it (M IV-VII): Records from 15 localities range from 2450 to 3630 m and are not evenly distributed over this belt. Lowest records are: 2450 m opposite Lete (7.V.); 2720 m descent to Ghandrung (7.V.); 2800 m Ghorapani Pass (27.VII., see Material); 2900 m Pisang (17.IV.); – highest records: 3350 m upper Simbua Khola (12./14.V.); 3550 m Purano Marpha (24.IV.); 3630 m Dhule (8.V.). In the Khumbu area (Mt. Everest region), Diesselhorst (1968:346) found the Grey-crested Tit up to 4200 m, apparently the only data close to and above 4000 m for that species in Nepal.

Biswas (1963a) noted *dichrous,* again in the Khumbu area, up to nearly 4000 m. This considerable vertical extent may be a special situation in the monsoon-rich though somewhat precipitation-protected upper Everest region. I met the species only rarely in the extremely wet Kanchenjunga area and not above 3350 m although a wide array of appropriate habitats was available. The breeding belt of *dichrous* comprises roughly 1500 m, but certainly not continuously all over its Nepal area.

Outside breeding season (X-III): Records from 7 localities extend from 2600 m (Lete, 3.XII; Chadziou Khola, 27.X.) to 3550 m (Pare, 14.X.) and cover nearly the same belt as in the breeding months. There seem to be no considerable seasonal altitudinal movements at all. Highest records are again from Khumbu according to Inskipp & Inskipp (1991).

Habitat: The Grey-crested Tit occupies, though the vertical range is locally quite limited, widely diverse forests, both open stands and dense dark coniferous forests. They comprise broad-leaved in the lower to purely coniferous with *Rhododendron* in the upper part of the range. There seems to be no preference for either type and the lower limit may be defined only by climatic circumstances. Examples from the breeding season: Broad-leaved forest mainly *Juglans regia* and *Acer* sp., few *Pinus wallichiana* and *Tsuga* (2450 m, 7.V., Lete); *Rhododendron arboreum* forest (2700 m, 7.V., descent to Ghandrung; – 2800 m, 27.VII., this year's pullus, Ghorapani Pass); *Pinus wallichiana* forest (2900 m, 17.IV., Pisang); mixed mainly *Abies spectabilis, Pinus wallichiana* (3000 m, 16.V., Dhorpatan); open *Quercus semecarpifolia* (3050 m, 28.V., Pelma); dense *Abies spectabilis* with *Pinus wallichiana* nearby (3200 m, 27.IV., Thaksang); *Picea smithiana, Betula utilis* (3300 m, 6.VI., Gompa/Tarakot); *Cupressus torulosa, Pinus wallichiana* (3550 m, 24.IV., Purano Marpha). See Diesselhorst (1968:346) for further details. – Besides its area of the southern macroslope of the main range, *P. dichrous* also penetrates into areas of reduced monsoon influence (lower Dolpo: near Tarakot; – Thakkhola: near Tukche and Marpha; – Marsyandi Valley: Pisang; – NW Manaslu: Dudh Khola [Lowndes 1955]), but it is absent from the extremely dry *Pinus/Cupressus* forests on Lake Phoksumdo, NW Dhaulagiri.

During the flowering season of the various tree *Rhododendron* species, *P. dichrous* visits the flowers (in search of insects ?). In the Jiri specimen, bill, throat and forehead feathers are glued with pollen.

Breeding: Testes 8 mm (31.III.: Chordung, 18.IV.: Dhorpatan), 9 mm (16.V.: Dhorpatan). – Carrying and search for nesting material 18.IV and 14.V., respectively (Dhorpatan, 3050 m; Simbua Khola, 3350 m); feeding young in a woodpecker hole, 3 m above ground, 27.V. (Thankur, 3350 m); independent pulli 27.VII. (Ghorapani Pass, 2800 m). See largely coinciding data in Diesselhorst (1968:347).

Vocalizations: Territorial song (Fig.103d-i) is a combination (recorded on playback of call series) of different note types, some of which are used separately, namely as calls. (i) Call derivates are the narrow angular-like notes opened downwards, always several combined to short trills (Fig.103a-c). The other notes fall into two types: (ii) Short descending notes with broad frequency span (up to 5 kHz), (iii) longer (0.1-0.25 s) notes with a short abrupt click-like onset, a more or less horizontal to slightly falling part, some of them ending likewise with a broad click. This song does not fit into the widely distributed *Parus* song scheme (e.g. Thielcke 1968), the regular repetition of note groups (but compare *P. ru-*

fonuchalis and *P. xanthogenys).* In both ♂ recorded (Tukche, Dhorpatan, 80 km apart), note forms, especially the trill parts, are similar, the other notes show overall similarity but differ in details.

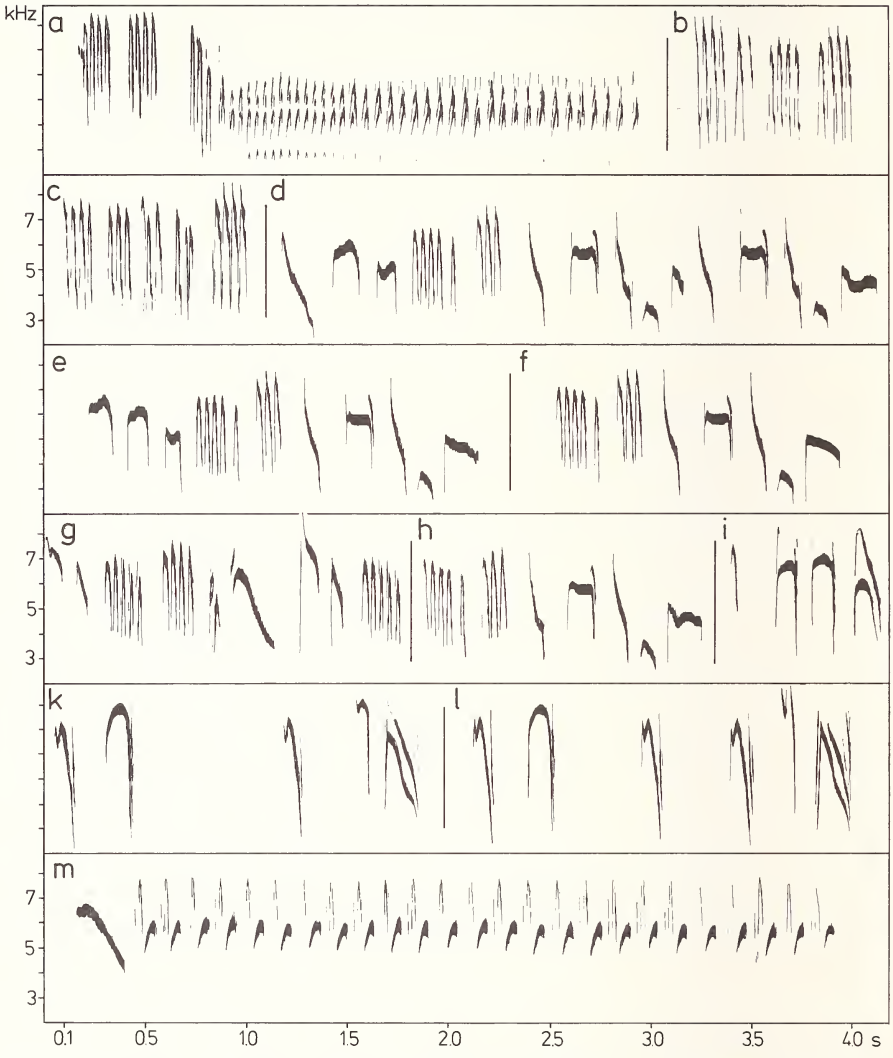


Fig.103: Vocalizations of *Parus* species and *Cephalopyrus flammiceps.* – a-i) *P. dichrous;* calls (a-c) and territorial song (d-i); a) calls from specimens within a flock, Thodung 8.IV.1973; b-c) spontaneously given call series, Thaksang/Tukche 27.IV.1980; d-f, h-i) verses from 1 ♂, Thaksang/Tukche 27.IV.1980; g) Dhorpatan 21.V.1973.
k-l) *P. ater melanolophus;* warning calls of food-carrying adult near nest upon presentation of a stuffed Long-eared Owl *(Asio otus),* Dhorpatan 23.V.1973.
m) *Cephalopyrus flammiceps,* verse of territorial song, Thimang 15.IV.1980.

Calls: Those produced upon slight irritation, especially after playback of calls, are very similar to, perhaps identical with those elements integrated into the song (Fig.103a-c). Others differ in having a narrower frequency range, well developed harmonics and combination to long trills, up to 38 notes counted (Fig.103a).

Similarity to note forms (elements) of the closely related European *P. cristatus* is obvious (comp. Bergmann & Helb 1982, Tretzel in Glutz von Blotzheim & Bauer 1993). Narrow angular-like notes, used in series as calls or combined with other elements to form song verses, are common in both. Longer notes with steep onset and end are also used by both species, though details of note forms differ. Rapid frequency modulations, which are commonly used by *cristatus,* are not represented in the *dichrous* recordings available. In general, *dichrous* notes cover a broader frequency span, most conspicuous in the angular-like calls, than those of *cristatus* and the upper limit, in general, seems to be higher (up to 9 kHz). The auditory impression, however, is quite different in the two species.

Parus rufonuchalis Blyth

Material: 15 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 22.-25.V.1970, 14.-15.VI.1973: 5♂, 4♀ ** Mustang Distr., Thakkhola, Thaksang above Tukche, 3150 m, 21.XI.1969, 3.-4.VII.1973, 1.III.1974: 1♂, 1♂ pull., 3♀ * Purano Marpha, 3200 m, 10.V.1995: 1♂.

Measurements: **Wing**-L ♂ (7) 76-79 mm, $\bar{x}$=77.6, s_d=0.94; ♂ pull. 72 mm; ♀ (7) 72.5-75 mm, $\bar{x}$=74.1, s_d=0.84. – **Tail**-L ♂ (7) 52-56.5 mm, $\bar{x}$=54.6, s_d=1.46; ♂ pull. 51 mm; ♀ (7) 50-54 mm, $\bar{x}$=52.8, s_d=1.35 – **Bill**-L ♂ (7) 11-13 mm, $\bar{x}$=12.4, s_d=0.75; ♂ pull. 12 mm; ♀ (7) 12-13 mm, $\bar{x}$=12.3, s_d=0.39. – **Tarsus**-L ♂ (7) 19-20.5 mm, $\bar{x}$=19.6, s_d=0.56; ♂ pull. 19.5 mm; ♀ (7) 18-20 mm, $\bar{x}$=19.1, s_d=0.85. – **WTI** (15) 15.2-20.5%, $\bar{x}$=17.9, s_d=1.65. – **TWI** (15) 66.7-73.4%, $\bar{x}$=70.8, s_d=1.67. – **Bill/wing index** (14) 14.3-17.9%, $\bar{x}$=16.3, s_d=0.84. Comp. all indices with *Parus rubidiventris.* – **Testes** 1 x 1.5 mm (22.V.), 3 x 4 mm (24.V.; 25.V. weight of this ♂ 12 g), 6 x 6.5, 5.5 x 7 mm (14.VI.) and 8 x 5 mm (10.V.).

Horizontal: Our records cover only a small area within the Dhaulagiri/Annapurna massiv. – Ringmo/Phoksumdo Lake (20.-26.V., 13.-15.VI.; see Material); ascent to Bagar La from Manduwa (16.VI. both :Dolpo); – Thakkhola: between Kalopani and Lete (8.VII.); Thaksang above Tukche (27.II.-11.III, 26./27.IV, 2.-4.VII.; 21.XI.; see Material); Purano Marpha (23./24.IV.; 10.-12.V.; 7.VII.); Dhumpu near Jomosom (22./23.III. all :Mustang). – The records from the upper Kali Gandaki Valley (:Mustang) represent the eastern-most localities of the breeding range.

Vertical: Breeding season and close to it (IV-VII): our records range from 2600 to 4000 m, in detail: 2600 m Kalopani/Lete (8.VII.); 2700 m ascent to Thaksang (26.IV.); 3150 m Thaksang (see data above); 3200-3600 m Purano Marpha (see above); 3550 m ascent to Bagar La (16.VI.); 3600-4000 m Phoksumdo Lake (see above). – Outside breeding season: 3000 m Dhumpu (22./23.III.); Thaksang (data in II, III and XI above). There seem to be no marked altitudinal movements, and up to now the species was found in Nepal only within its presumed breeding range, both vertically and horizontally (see Habitat).

Habitat: In Nepal, the Rufous-naped Tit is restricted to dry areas located in the rain shadow of the Inner Valleys (Thakkhola in the upper Kali Gandaki Valley) or far N of the main range (Dolpo and further W). Due to the rainy areas S of the main range, which are avoided, and to the insurmountable high unforested passes, its distribution is patchy. In dry areas, where it is locally common both in Dolpo and Thakkhola, the whole forest belt seems

to be occupied up to timberline and within the valley downwards to the border of heavy monsoon influence (near Lete in the Kali Gandaki Valley). Consequently, the forest types it inhabits are dry-adapted, too. They are nearly exclusively coniferous, but comprise the high altitude *Betula utilis*. In Thakkhola, various stands of *Pinus wallichiana, Abies spectabilis, Picea smithiana* (Thaksang), in addition *Juniperus* and *Cupressus torulosa* (Purano Marpha) are occupied, mixed with *Betula* beyond 3000 m. In Dolpo, habitat selection seems to be even more restricted: *Pinus* and *Cupressus* forest on Phoksumdo Lake, along the path leading to Bagar La also *Abies*. In the upper Barbung Khola, Gompa/Tarakot, I did not observe it in slightly more mesophilic forests *(Picea smithiana, Betula)* in 1970 and 1973. In general, light and open forests are preferred; it often visits groups of bushes and forest edges near clearings.

Breeding: Season starts at different times according to altitude. – Thakkhola: 2600-3200 m: Display of territorial song first heard E II/A III, but playback experiments still largely unsuccessful, still in flocks with other tit species 23.III. (Dhumpu 3000 m); – mainly pairwise together, apparently not yet breeding 9.-12.V. (Purano Marpha 3100-3200 m); – family with fledglings still being fed 7.VII. Purano Marpha; – pulli E VI at Thaksang in mixed flock with *P. ater* 8.VII. near Lete. – Dolpo: start substantially later; up to 6.VI. (1970) no sign of breeding activity, no territorial song, testes only slightly developed (see above); from 10.-15.VI. (1973) pairs on territory, song display, most pairs still together thus not yet breeding, testes now well developed (see above). In Thakkhola, there was no more song display in E VI/A VII (1970, 1973). – See Löhrl & Thielcke (1969) for breeding behaviour in Afghanistan and Roberts (1992) for Pakistan with older references cited.

Vocalizations: *P. rufonuchalis* is one of the few (Eurasian) *Parus* species the songs of which do not fit into the general syntax scheme of *Parus* songs, a repetition of note groups (syllables) (Thielcke 1968). On the contrary, its songs are irregular in this respect and fall into 2 categories. (i) Trill song: Its striking part is a long (0.3-0.5 s) trill note which is strongly frequency modulated at a rate of 4-5 modulations/0.1s (Purano Marpha population, 1995). In addition mostly extremely short click-like notes are incorporated into the verse. (ii) Whistle song: without trills, many notes are whistles, besides modulated notes as in many other parids (for sonagrams see Thielcke 1968, *rubidiventris;* Martens 1971, 1975). Both types of song are also found in the Afghanistan (Thielcke 1968) and the Tian Shan populations, the northern-most part of the *rufonuchalis* area (recordings by J. Martens).

Parus rubidiventris

Taxonomic notes: The taxonomic relationship of the three closely related *Periparus* tits *rufonuchalis, rubidiventris* and *beavani* to one another was clarified by Martens (1971, 1975) as follows: *rubidiventris* and *beavani* are conspecific and separated at the species level from *rufonuchalis* (Plate 2). *P. rufonuchalis* and *P. rubidiventris* definitely form a "binary group" but do not necessarily constitute a superspecies.

So far *P. r. rubidiventris* and *r. beavani* are considered allopatric in Nepal, being separated by the Bhote Kosi. Although occasional individuals of each form have been recorded in the area of the other, as yet no specimens have been documented (Martens 1971:454;

1975:394; 1985:365-366; Inskipp & Inskipp 1991:325) and consequently no hybrids are known. For this reason Haffer (1989:494; 1993:373) regards them as belonging to different species, as Wolters (1980:384) had done before him. In the recent presentation of evidence favouring this classification, however, Haffer does not take into account that in S Tibet, where it originates, the Bhote Kosi does not separate the two forms by a deeply incised, climatically unfavourable valley as it does in Nepal. Sightings of *beavani* north of the main Himalayan chain are known (Cheng 1987, map 701). Before *rubidiventris* and *beavani* can be elevated to the rank of species, more information about their interactions in that contact region is needed.

The two forms *rubidiventris* and *beavani* are distinguishable from one another by their plumage when still in the nest; the former has an extensive reddish colouration ventrally and the latter does not, though they are of about the same size. *P. rufonuchalis* is distinctly larger. With respect to WTI and TWI the three forms do not differ appreciably, but the large *P. rufonuchalis* is relatively short-legged (tarsus-wing index: *rufonuchalis* (14) 24.0-27.1%, $\bar{x}$=25.7, s_d=1.07; *beavani* (26) 25.6-29.4%, $\bar{x}$=27.2, s_d=0.92; *rubidiventris* (15) 26.1-29.2%, $\bar{x}$=27.8, s_d=1.06). The differences in relative bill length are just as clear; here the large *P. rufonuchalis* has the highest score, but the two others also differ from one another: *rufonuchalis* (14) 14.3-17.9%, $\bar{x}$=16.3, s_d=0.84; *rubidiventris* (15) 13.4-16.9%, $\bar{x}$=15.2, s_d=1.11; *beavani* (25) 12.3-15.4%, $\bar{x}$=13.8, s_d=0.94.

Parus rubidiventris rubidiventris Blyth

Material: 17 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 25.V. and 4.VI.1970: 2♂ * Dhule, path from Dhorpatan to Tarakot, 3000 m, 30.V.1973: 1 pull. ** Myagdi Distr., Gustung Khola Valley, near Pelma, 3050 m, 28.V.1973: 1♀ * Dhorpatan, Uttar Ganga Valley and Uttar Ganga plain, 2950 m, 20.IV.1970, 8.-24.V.1973: 5♂, 1♀ ** Mustang Distr., Thakkhola, Thaksang above Tukche, 3150 m, 21.XI.1969, 5.VII.1973: 1♀, 1o, 1 pull. * Purano Marpha, 3200 m, 16.III.1974: 1♀. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 25.-26.IV.1973: 2♂, 1♀.

Measurements: **Wing**-L ♂ (9) 65-74 mm, $\bar{x}$=69.3, s_d=2.56 (!); 2 pull. 65.5 and 71 mm; o (4) 66-68.5 mm, $\bar{x}$=67.3, s_d=1.44. – **Tail**-L ♂ (8) 45-49.5 (52) mm, $\bar{x}$=48.1, s_d=2.10; 2 pull. 46 and 49 mm; ♀ (5) 43.5-49 mm, $\bar{x}$=46.6, s_d=2.22. – **Bill**-L ♂ (9) 10-11.5 mm, $\bar{x}$=10.6, s_d=0.59; 1 o 11 mm; 2 pull. 9 and 9.5 mm; ♀ (5) 10-11.5 mm, $\bar{x}$=10.7, s_d=0.60. – **Tarsus**-L ♂ (9) 18.5-20.5 mm, $\bar{x}$=19.1, s_d=0.82; 1 ♀ 19 mm; 2 pull. 18 and 19 mm; ♀ (5) 19-20 mm, $\bar{x}$=19.2, s_d=0.45. – **WTI** (15) 15.8-19.7%, $\bar{x}$=17.6, s_d=1.33. – **TWI** (14) 65.9-71.5%, $\bar{x}$=69.4, s_d=1.34. – **Bill/wing** index (15) 13.4-16.9%, $\bar{x}$=15.2, s_d=1.11. – **Testes** 2 x 2 mm (25.V.: 3650 m), 3 x 3.5 mm (4.VI.: 3950 m), 3.5 x 5 mm (20.IV.: 2950 m), 5-6 x 8-10mm (25.IV.-19.V.: 2950 m).

Notes: ♂ and ♀ bill black, feet lead grey. 1 o (5.VII.) moults wing and tail, old feathers very worn.

Horizontal: Ringmo/Phoksumdo Lake (23.-25.V., 11.VI.; see Material); Gompa/Tarakot (3.-6.VI.); Cheng Khola (8.V., 30.V.); Dhule (30.V., see Material; all :Dolpo); – Thankur N Dhorpatan (26.V.); near Pelma (28.V.); between Dhorpatan and Thankur (26.V.); Dhorpatan (8.-21.IV., 8.-19.V.; see Material); upper Myagdi Khola N Dobang (23./24.V.); ascent to Jaljala (6.IV. all :Myagdi); – near Lete (25.II.); Thaksang above Tukche (27.II.-10.III., 5.-9.VII., 21.XI., see Material); Purano Marpha (16.-17.III., 23.-24.IV.; see Material); Dhumpu near Jomosom (23.III. all :Mustang); – near Chitre (7.V. :Parbat); – between Thimang and Pisang (17.IV.); above Pisang (18.IV. both :Manang); – Gosainkund, Syng Gyang (25./26.IV.; see Material; :Rasuwa).

Vertical: Presumed breeding season and close to it (IV-VII): Our records extend from 2550 m to 4000 m, thus comprise a vertical range of 1450 m. In detail: lowest records: 2550 m near Thimang (17.IV.); 2850 m near Chitre (7.V.); 3000 m ascent to Jaljala (6.IV.), in addition Dhule (30.V.), Dhorpatan (IV./V.); – uppermost records: 3900 m between Dhorpatan and Thankur (25.V.): 4000 m Ringmo (23./25.V.). There is a strong concentration of localities between 3100 and 3700 m: 13 of the 21 localities are located within this belt. – Except for the hints in Ali & Ripley (1973,9:182: "Breeds between 3000 and 4100 m"), no detailed data have been published. Inskipp & Inskipp (1991) do not differentiate ssp. *rubidiventris* and *beavani* in this respect. – Outside breeding season (II, III, IX): 3 specimens at 2400 m below Lete, 25.II., is the lowest record, all others fall within the breeding belt.

Habitat: The Rufous-bellied Crested Tit inhabits, according to its considerable altitudinal belt, a large number of forest types. Lowest localities fall well into the mixed broad-leaved zone (near Thimang, 2550 m, 17.IV.) and in the oak *(Quercus)* zone (Chitre, 2850 m, 7.V.), which is occupied throughout. Higher up, it enters coniferous forest types which at many sites are intermixed with tree *Rhododendron.* Coniferous stands comprise *Abies spectabilis* (Dhorpatan, 3000 m, IV/V), mixed *Pinus wallichiana/Abies* (Thaksang, 3150 m, IV), *Picea smithiana* (Gompa/Tarakot, 3300 m, V/VI), *Pinus wallichiana/Cupressus torulosa* (Purano Marpha, 3200 m, IV; Ringmo, 3600 m, V/VI). At higher altitudes, *Betula utilis* is regularly present. *P. rubidiventris* enters freely the dry forests of the Inner Valleys and N of the main chain (Thakkhola, upper Marsyandi Valley); in Dolpo it is present wherever forests remain.

Open stands and forest edges are preferred and it apparently avoids thick and dark growth, as is sometimes characteristic of *Abies spectabilis.* The scrub zone is penetrated, too, even during the breeding season (above Thankur, 3900 m, 25.V.), but breeding there has yet to be substantiated. Two more close relatives (subgenus *Periparus*) may live in close proximity in the same habitat without signs of competition and may even breed in holes of the same tree: *P. rufonuchalis* which is larger (throughout Thakkhola; Ringmo/Phoksumdo Lake) and *P. ater aemodius* or *P. a. melanolophus,* respectively, which are smaller (in all the Nepal area) (for details see Martens 1971, 1975:376-379). This subspecies is locally common, especially in its optimum zone above 3000 m and in the dry zone.

Breeding: Development of testes, see Measurements. – Still in flocks in company of other tit species 16./17.III. (Purano Marpha 3200 m); territorial song starting by M III, in low intensity even earlier: 28.II. (Thaksang 3150 m), carrying nesting material 18.IV. (Pisang 3100 m); ♀ with breeding patch 25.IV. (Gosainkund 3200 m); young about 10 days old in 3 nests 12.V. (Dhorpatan 3000 m); fledglings still being fed 15.V. (Dhorpatan 3000 m); adults carrying food 30.V. (Cheng Khola 3550 m); adults still breeding 3.VI. (Gompa/Tarakot 3300 m); fledged independent pulli 5.VII. (Thaksang 3150 m). – According to the above data, oviposition may start in the first third of IV at about 3000 m, lower down even earlier, later in the upper part of the range. – Nesting sites: in tree hole appr. 0.5 m above ground; behind bark of *Abies* tree 1.5 m; in burnt *Quercus* tree close to forest edge, 3 m (Martens 1975:379). – Low numbers of young found in nests: once 2 pulli, 1 egg; once 3 pulli. A nest (Dhorpatan), the first described, was built entirely of animal hairs; no moss was used either at the basis or in the walls.

Vocalizations: Territorial song of nominate *rubidiventris* is a loud trill- to whistle-like, somewhat lilting verse. The individual verse is constructed of notes or groups of 2 notes, which are repeated 3-9 times. All note types have in common 2-3 rapid frequency changes between 2 and 5.5 kHz. 1 or 2 introductory notes are rarely added. There exists a great variety of note types within the *rubidiventris* area, and the individual ♂ uses at least 3-4 types. In playback experiments, *rubidiventris* reacts fully to song of the allopatric *beavani* (for details and sonagrams, also of calls, see Martens 1971, 1975:384-393).

Parus rubidiventris beavani (Jerdon)

Material: 11 specimens: **B** Sindhu Palchok Distr., Ting Sang La, 3200 m (3400? m), 14.IV.1973: 1♂ (song specimen) 1♀. * Dadar Danda, 3150 m, 22.IV.1995: 1♂. **J** Ramechap Distr., Jiri, 2900 m, 2.IV.1973: 1♂ * Thodung, 3200 m, 7. (song specimen)-8.IV.1973: 2♂. **S** Solukhumbu Distr., Nangpa-Tsangpo Valley, Pare, 3550 m, 14.-15.X.1970: 2♂, 1 o * Lughla, 2850 m, 21.X.1970: 1♂, 1o.

Measurements: They include the material of the Diesselhorst collection. **Wing**-L ♂ (15) 68-73.5 mm, $\bar{x}$=70.6, s_d=1.67; ♀ (5) 68.5-70 mm, $\bar{x}$=69.1, s_d=0.65; 1♀ pull. 67.5 mm; ♀ (6) 68-73 mm, $\bar{x}$=70.5, s_d=2.14. – **Tail**-L ♂ (14) 47.5-51.5 mm, $\bar{x}$=49.3, s_d=1.31; ♀ (5) 48-49.5 mm, $\bar{x}$=48.4, s_d=0.65; 1♀ pull. 48 mm; o (5) 48-51 mm, $\bar{x}$=49.3, s_d=1.21. – **Bill**-L ♂ (15) 8.5-11 mm, $\bar{x}$=9.8, s_d=0.75; ♀ (5) 9-10.5 mm, $\bar{x}$=9.6, s_d=0.55; ♀ pull. 8.5 mm; o (5) 9-10 mm, $\bar{x}$=9.6, s_d=0.55. – **Tarsus**-L ♂ (15) 18-20 mm, $\bar{x}$=19.2, s_d=0.49; ♀ (5) 17.5-19 mm, $\bar{x}$=18.4, s_d=0.65; 1♀ pull. 18.5 mm; o (6) 19-20 mm, $\bar{x}$=19.3, s_d=0.41. – **WTI** (24) 15.1-20.8%, $\bar{x}$=17.2, s_d=1.29. – **TWI** (26) 68.1-72.5%, $\bar{x}$=70.1, s_d=1.08. – **Bill/wing index:** (26) 12.3-15.4%, $\bar{x}$=13.8, s_d=0.95.

Notes: Ovary at 14.IV. well developed. Testes 2.-14.IV. fully enlarged (up to 7 x 10 mm). ♂ and ♀ bill black, feet dark blue grey to blackish grey.

Horizontal: Ting Sang La (14./15.IV.; see Material): Dadar Danda W Kalinchock Mt. (21.-23.IV. both :Sindhu Palchok); – Chordung Mt./Jiri (28./31.III., 1.IX.); Thodung near Those (4.-8.IV., 4.IX.; see Material; both :Ramechap); – below Lamjura Pass (10.IX); Pare (14./15.X.; see Material); Khumjung (18.IX.); between Khumjung and Milinggo (19.IX.); Lughla (21.X.; see Material; all :Solukhumbu); – upper Simbua Khola (15.V.); Deorali pass W Yamputhin (17.V.); pasture Lassetham (8.V.); Gunsa (11.IX. all :Taplejung); – Dhorpar Kharka (15.IV. :Panchthar).

Vertical: Our data from the breeding season (E III-V) range from 2700 to 3950 m. – Details: lowest records: 2700 m Dhorpar Kharka (15.IV.); 2900 m Chordung Mt. (31.III.); uppermost records: 3600 m Thudam (25.V.); 3950 m upper Kangla Khola (25.V.). 7 of 11 localities range between 3200 and 3480 m; they are evenly distributed and this belt may mark at least a major part of the optimum zone of *beavani*. Diesselhorst (1968:344) gives 4100 m for this subspecies as upper limit in the Everest region.

Habitat: It was correctly described by Diesselhorst (1968:345), who states among other things: The Sikkim Black Tit is a "forest tit", similar in its ecology to the European *P. a. ater* but not that closely confined to conifers. It also lives in pure *Rhododendron* forest and likewise in pure *Abies spectabilis* stands, as well as in different types of mixed forest and, at the upper distributional limit, in the *Betula utilis* zone. Forest edges are frequently visited, also single trees in secondary bush. It forages in the canopy of tall trees and in the bush layer as well. But the niche occupied seems to be even broader than defined by Diesselhorst (l.c.): It breeds down to at least 2700 m (Dhorpar Kharka 15.IV., carrying nesting

material) in the oak zone *(Lithocarpus pachyphylla, Magnolia campbelli, Tsuga dumosa, Rhododendron).* On the other hand, I met it even above timberline in *Salix* and *Rhododendron* bush up to 4 m high (3950 m Kangla Khola, 25.V.). In general, *beavani* is, at least in its optimum zone, a common species, commoner than the syntopic *P. ater.* In the moist eastern Himalayas, the latter is sparsely distributed and only very locally a more common bird (g.e. *P. ater).* The situation is just the reverse in the area of nominate *rubidiventris,* where at least in its drier monsoon-protected parts, *P. ater aemodius* and more westward *a. melanolophus* outnumber *rubidiventris* by far.

Breeding: Early start of the season: Carrying nesting material 31.III. (Chordung Mt. 2900 m); 4.IV. (Thodung 3200 m); 15.IV. (Dhorpaṙ Kharka 2700 m); and 15.V. (Simbua Khola 3350 m). Diesselhorst (1968:345) noticed fledged young still being fed on 30.V. (3000 m), a date largely consistent with the above observations.

Vocalizations: Territorial song is identical with that of nominate *rubidiventris* (sonagrams in Martens 1975:384). There seems to be less variability of note types in *beavani* than in *rubidiventris.* One-note groups have been found only in *rubidiventris* as yet. In playback experiments, *beavani* reacts to (allopatric) *rufonuchalis* whistle song and it indeed employs vocalizations very similar to *rufonuchalis* song though these do not function in the territorial context. In nominate *rubidiventris,* which is sympatric with *rufonuchalis,* no such coincidence has been found yet (see details in Martens 1975:390-392). A call note, possibly contact call ("see wü"), is used quite often by *beavani.* This vocalization apparently lacks in nominate *rubidiventris* (sonagram in Martens 1975:389, Fig.12 last row).

Parus ater

Taxonomic notes: Surprisingly, both Sibley & Monroe (1990) and Cramp & Perrins (1993) not only do not regard *P. melanolophus* and *P. ater* as conspecific but do not even combine them as a superspecies (Plate 3). In extremely detailed studies, Diesselhorst & Martens (1972) and Martens (1975) had demonstrated that in W Nepal, where between the two there is a distance of merely ca 80 km not documented with verifiable material, both species exhibit striking morphological developments. These were interpreted as the result of hybridization, one strong indication for which was the geographical proximity of the species. The authors acknowledged that the aberrant types of colouration observed around Dhorpatan (SW Dhaulagiri, *melanolophus* area) and in the Thakkhola *(aemodius* area) are in each case not found in the neighbouring species, but suggested conceivable genetic effects in hybridization. To be sure, it was always emphasized that nowhere *P. melanolophus* and *P. a. aemodius* have been known to occur together during the breeding season.

The following quotation from Martens (1975:405) gives a further illustration of how problematic it is to interpret disparities in colouration: "Unlike the colour characters, length of bill conforms to a **continuous** trend from short-billed *aemodius* through intermediate types to long-billed *melanolophus.* These measures are a still more impressive indicator of the influence of the genes of the initial forms" (cit. transl.).

All this earlier material (cf. Martens 1975:404-405, and see below) has now been examined once again. It should be emphatically pointed out that no new information could be obtained about the origin of the "cinnamon-breasts" of Dhorpatan, and that of the five pos-

sibilites considered by Diesselhorst & Martens (1972:381), their preferred hypothesis of an extremely narrow hybridization zone, with extremely different phenotypes on the west and the east, cannot for the present be falsified. Nonetheless, it would also be possible to prefer another version (mentioned by Diesselhorst & Martens), in which the aberrant colourations are interpreted as peripheral population effects and not as signs of hybridization.

Regarding the specific features: Among the *P. a. melanolophus* around Dhorpatan, more or less grey-breasted birds are found together with so-called "cinnamon-breasts" (which are not present in *P. ater aemodius).* Almost a century ago Hellmayr (1903) had reported: "The black of the throat gradually gives way to a dark ash-grey on the front of the breast, **within which colour** individual **small, rust-red feathers** are sprinkled" (emphasis added, cit. transl.). Two skins bearing plumage with such traces of red are in German collections: the Senckenberg Museum (from Nepal, but where exactly?) and the Museum Koenig (NW India). What is the significance of red in the grey breast feathers of *melanolophus* (already incipient in the pullus plumage), far away from *P. a. aemodius*? It is conceivable that the "cinnamon-breasts" coexisting with grey-breasted birds in the Dhorpatan Valley belong to *P. melanolophus* in the broad sense, perhaps as remnants of a red-breasted peripheral form.

An analogous example is provided by the sympatric Rufous-vented Tit *(P. rubidiventris),* the red-bellied subspecies of which, *rubidiventris* (in which the red is likewise concentrated on the middle of the underparts!), occupies a relatively tiny marginal area in comparison to the distribution of the grey-bellied subspecies *beavani* (and *saramatii).* Might there perhaps be a not yet spotted red-breasted *melanolophus* population to the east of Dhorpatan?

The "beige-grey" colouration on the underside of some *melanolophus* is evidently within the normal range of variation. Hellmayr (1903) wrote (cit. transl.): "Underbody ash-grey, with more or less olive tinge on the middle of the abdomen." In his time, *P. melanolophus* had not yet been reported from Nepal.

The "*aemodius*-like hybrids" from the Thakkhola have a striking reddish-yellow or reddish-ochre colouration on the ventral surface, coupled with intensification of the grey shade on the flanks; the flank grey was described by Hartert (1905:359) as characteristic of *aemodius.* Neither the reddened breast nor the grey flanks are found in *melanolophus.* At most the red component, greatly enhanced and concentrated in the middle of the undersurface, might be identified in the "cinnamon-breasts" of Dhorpatan. The Thakkhola population inhabits a minute area closed off toward the north like a blind alley. It may be, however, that such birds also live further to the west and come into contact with *melanolophus;* that is, the "cinnamon-breasts" around Dhorpatan could also (see above) be hybrids between *melanolophus* and the Thakkhola form, especially in view of the fact that ventral reddening also occurs in hybrids between *melanolophus* and German *ater* (Löhrl 1994). The series of plumage specimens from Thakkhola (n=18) is remarkably uniform in colour and gives the impression of a constant geographical form more than of hybrids. Additional material could show that these birds are also larger, on average, than the eastern *aemodius.*

Note added in the proof: The small series collected west of Thakkhola in 1995 (n=7, see under *Parus ater* ssp. [Thakkhola], material II) confirms interbreeding with *P. a. melano-*

lophus sensu lato (Fig.104). The Thakkhola form ranges as far south as the western part of the Parbat District (see Material I); the eastern extent of its distribution is unknown.

From east to west, then, Nepal is occupied by several remarkable geographical forms of *Parus ater:* in the east *P. a. aemodius* and in the western central region the Thakkhola form, similar in coloration but strikingly distinct; at the upper Myagdi Khola the Thakkhola form adjoins the very different *P. a. melanolophus.* It is only in western central Nepal (Dhorpatan Valley) that the latter in turn exhibits the well-known cinnamon colourations (Plate 3) reminiscent of polymorphism. *Parus ater* is thus one ot the few bird species in Nepal with a conspicuous geographic subdivision into marked different forms (cf. also *Paradoxornis nipalensis,* Martens 1972:107, text and map).

The bill length of the males of *aemodius* is 7-8.5 mm (n=11), of specimens in the Thakkhola 7.5-9 mm (n=9), and of *melanolophus* in W Nepal 8-9.5 mm (n=23, including Dhorpatan birds). With respect to relative bill length, 13 specimens from the Thakkhola do not differ from 15 of the more eastern *aemodius.* In *P. melanolophus* the relative bill length is somewhat greater on average. Only seven "cinnamon-breasts" are available, too few to justify any conclusion. Their measurements are within the range of variation of *aemodius* as well as those of the other *melanolophus* of Dhorpatan, Thankur, Gompa and Ringmo. The geographical variation within *melanolophus* needs to be investigated more thoroughly (Paynter 1962).

Given that Löhrl's experiment (1972, J. Orn. 113:465; 1994) confirms fertility between *P. a. ater* (!) and *P. melanolophus,* the same can surely be inferred for the Himalayan forms *melanolophus* and *aemodius* in view of their biological and vocal similarities. It follows that *P. melanolophus* should be classified as a subspecies of *P. ater.*

The f_1 and f_2 hybrids bred by Löhrl (Museum Dresden C 52892-C 52903, n=12) are coloured "reddish" on the underside but intensity varies. This colour is not present in the parental forms, analogous to the "cinnamon-bellied" specimens from Dhorpatan if one regards those as hybrids. Unlike the latter, the aviary hybrids show a broad "swamping" variation of lower-side colouration evenly scattered throughout. The grey-bellied and cinnamon-bellied specimens from Dhorpatan, however, appear more polymorphic and are also consistent in their dimensions. This does not apply to Löhrl's hybrids.

Parus ater melanolophus Vigors (Plate 3e-f)

Material: 43 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650-3700 m, 25.V.1970, 14.VI.1973: 2♂ * Suli Gad Valley, 3050 m, 8.VI.1973: 2♂ * Gompa/Tarakot, 3300 m, 3.-6.VI.1973: 7♂, 2♀, 1 o ** Myagdi Distr., Thankur (NW Dhorpatan), 3350 m, 26.-27.V.1973: 3♂, 2♀ * Dhorpatan Valley (incl. Uttar Ganga Plain and Uttar Ganga Valley), 18.IV.-24.IV.1970, 10.V.-25.V.1973: 11♂, 9♀, 3 pulli (1♂, 2♀).

Song specimens: Gompa, 2♂, 3. and 6.VI.1973; – Dhorpatan, ♂ from 13.V. (cinnamon belly), Mus. Koenig 74.442, this ♂ was paired with ♀ Mus. Koenig 74.409 (cinnamon patches on the breast); additional 5♂ grey-breasted, one among them shows beige tone on the underside. – **Testes** without exception strongly developed.

Measurements:

1) Ringmo and Suli Gad Valley: 4♂
Wing-L (4) 60-64.5 mm, x̄=61.9. – **Tail**-L (4) 40.5-44 mm, x̄=42.5. – **Bill**-L (4) 8.5-9.2 mm, x̄=8.9. – **Tarsus**-L (4) 16.5-17.5 mm, x̄=17.0. – **WTI** (4) 16.4-21.7%, x̄=18.8. – **TWI** (4) 67.5-71.0%, x̄=68.7.
2) Gompa/Tarakot: 7♂, 2♀, 1o
Wing-L ♂ (7) 62-63.5 mm, x̄=62.6, s_d=0.63; ♀ (2) 59-61 mm; o 63 mm. – **Tail**-L ♂ (7) 42-45.5 mm, x̄=43.9, s_d=1.38; ♀ (2) 41-43 mm; o 43 mm. – **Bill**-L ♂ (6) 8.8-9.5 mm, x̄=9.1, s_d=0.25; ♀ (2) 9-10 mm; o 9.2 mm. – **Tarsus**-L ♂ (7) 16-17 mm, x̄=16.4, s_d=0.45; ♀ (2) 16-17 mm; o 17 mm. – **WTI** (10) 16.9-21.8%, x̄=19.1, s_d=1.59. – **TWI** (10) 67.7-72.2%, x̄=69.8, s_d=1.44.
3) Thankur: 3♂, 2♀
Wing-L ♂ (3) 61-62 mm; ♀ (2) 60-61 mm. – **Tail**-L ♂ (2) 42.5-43 mm; o (2) 41-42 mm. – **Bill**-L ♂ (3) 8.5-9 mm, ♀ (2) 9-9.2 mm. – **Tarsus**-L ♂ (3) 16.5-17 mm; ♀ (2) 16-16.5 mm. – **WTI** (5) 16.9-20.0%, x̄=18.5, s_d=1.24. – **TWI** (4) 68.3-69.4%, x̄=68.8, s_d=0.49.
4) Dhorpatan
   a) Cinnamon-bellied specimens: 2♂, 4♀. 1♀ with cinnamon patches (see b). **Wing**-L ♂ (2) 61-63.5 mm; ♀ (4) 61-63.5 mm, x̄=62.1. – **Tail**-L ♂ (2) 41.5-44.5 mm; ♀ (4) 43-44.5 mm, x̄=43.6. – **Bill**-L ♂ (2) 8.8-9 mm; ♀ (4) 8.2-9 mm, x̄=8.6. – **Tarsus**-L ♂ (2) 17-18 mm; ♀ (4) 16-17 mm, x̄=16.4. – **WTI** (6) 18.0-20.5%, x̄=19, s_d=1.23. – **TWI** (6) 68.0-71.3%, x̄=69.8, s_d=1.30.
   b) Grey-bellied specimens: 9♂, 5♀ (incl. 1 sp. with cinnamon spots, Mus. Koenig 74.409), 1 o. **Wing**-L ♂ (9) 59-66 mm, x̄=62.3, s_d=2.14; ♀ (5) 60-63 mm, x̄=61.1, s_d=1.25; o 60.5 mm. – **Tail**-L ♂ (5) 41.5-48 mm, x̄=44.1, s_d=2.61; ♀ (5) 41-44 mm, x̄=41.8, s_d=1.30; o 43 mm. – **Bill**-L ♂ (8) 8-9 mm, x̄=8.6, s_d=0.33; ♀ (5) 8-10 mm, x̄=9.3, s_d=0.83; o 9 mm. – **Tarsus**-L ♂ (9) 16-17 mm, x̄=16.7, s_d=0.36; ♀ (5) 16-16.5 mm, x̄=16.2, s_d=0.27; o 16 mm. – **WTI** (15) 15.3-21.0%, x̄=18.9, s_d=1.50. – **TWI** (12) 66.7-72.7%, x̄=69.7, s_d=1.67.
   c) Grey- and cinnamon-bellied specimens combined: 11♂, 9♀. **Wing**-L ♂ (11) 59-66 mm, x̄=62.3, s_d=1.99; ♀ (9) 60-63.5 mm, x̄=61.6, s_d=1.31. – **Tail**-L ♂ (8) 41.5-48 mm, x̄=43.9, s_d=2.23; ♀ (9) 41-44.5 mm, x̄=42.6, s_d=1.39. – **Bill**-L ♂ (10) 8-9 mm, x̄=8.7, s_d=0.32; ♀ (9) 8-10 mm, x̄=8.9, s_d=0.73. – **Tarsus**-L ♂ (11) 16-18 mm, x̄=16.9, s_d=0.51; ♀ (9) 16-17 mm, x̄=16.3, s_d=0.36. – **WTI** (21) 15.3-21%, x̄=19.0, s_d=1.40. – **TWI** (18) 66.7-72.7%, x̄=69.7, s_d=1.52.

All specimens of localities 1-4 combined: 25♂, 13♀.
Wing-L ♂ (25) 59-66 mm, x̄=62.2, s_d=1.54; ♀ (13) 59-63.5 mm, x̄= 61.2, s_d=1.33. – **Tail**-L ♂ (21) 40.5-48 mm, x̄=43.5, s_d=1.78; ♀ (13) 41-44 mm, x̄=42.4, s_d=1.30.

Notes: Bill black, feet lead-grey.

Horizontal: Our own records extend from NW to SW Dhaulagiri area, the cinnamon-bellied specimens included (Dhorpatan). – Phoksumdo Lake (23.-27.V., 14.VI., see Material); ascent to Bagar La (16.VI.); Suli Gad Valley (9.VI.; see Material); Gompa/Tarakot (3.-6.VI.; see Material); above Dhule to Cheng Khola (8.V.); above Baldebas N Emaka (29.V.); ridge close to Pelma (28.V. all :Dolpo); – Gustung Khola Valley N Thankur (6.V.); Thankur NW Dhorpatan (26./27.V.; see Material); Dhorpatan (18.-24.IV.; 10-25.V.; see Material; all :Myagdi).

Vertical: Breeding season (IV-VI): Lowest record is at 2800 m near Baldebas (29.V.), highest at 4000 m on Phoksumdo Lake (23.V.), but the optimum zone is approximately between 3000 m and 3700 m. 11 of 13 localities fall within this reduced belt. Lowest in this group: 3000 m Gustung Khola (6.V.); Dhorpatan (many records in IV and V, see above); – highest: 3600 m Phoksumdo Lake (V/VI, see above); 3660 m descent to Thankur from SW (5.V.): 3700 m ascent to Bagar La (16.VI.); 4 localities between 3300 and 3400 m. –

Inskipp & Inskipp (1991) give 2200-3700 m as summer residence without details; this lower limit, however, encompasses considerable parts of the subtropical belt not likely to hold breeding populations of *melanolophus.*

Habitat: *P. a. melanolophus* is predominantly a coniferous forest dweller, but in the lower part of its vertical belt is content also with oak *(Quercus)* forest (Baldebas 2800 m, near Pelma 3050 m). The varieties of coniferous stands inhabited are numerous: *Abies spectabilis* (Dhorpatan 3000 m; Thankur 3350 m), *Picea smithiana* (Gompa/Tarakot 3400 m), *Pinus wallichiana, Cupressus torulosa* (Phoksumdo Lake 3600-4000 m). Tree *Rhododendron* is present throughout in the Nepal area visited except the extremely dry parts of Dolpo (Tarakot, Phoksumdo Lake), and near its upper limit, the tit penetrates into the *Betula utilis* zone (Phoksumdo Lake).

In its Dhaulagiri range, *melanolophus* is a very prosperous form outnumbering all other *Parus* species, especially the other syntopic con-subgeners *rub. rubidiventris* and *rufonuchalis;* all three coincide in the Phoksumdo forest (Martens 1971, 1975). Only at the latter place, *melanolophus* was less common in 1970 and 1973. I encountered highest density in the Gompa *Picea/Betula* forests, where it proved to be the commonest small passerine. Three nests were close by, and in B VI adults were regularly seen carrying food.

Breeding: Available basic data: Dhorpatan (3000 m): 23.V. pulli in nest about 12 days old; 22.V. pulli fledging from another nest. – Thankur (3350 m): 26.V. 6 pulli in nest about 10 days old. – Gompa/Tarakot (3300 m): 4.VI. parents feed small unfeathered pulli; 3.VI. pulli fledge from 2 nests. Around 6.VI. parents are actively feeding pulli mostly still hidden in the nests. – Phoksumdo Lake (3600 m): 27./28.V. partners of a pair feeding each other, 30.V. carrying nesting material. – According to the above data, oviposition is graduated altitudinally and may start at 3000 m (Dhorpatan) about M IV, at 3300 m (Thankur, Gompa/Tarakot) E IV and at 3600 m (Phoksumdo Lake) even considerably later, though the single observation there may not be representative (but see the equally late season's onset in *P. rufonuchalis* at the same locality). – Nest sites: in tree holes 1.5-4 m (4: Dhorpatan, Thankur, Gompa), under/between stones (2: Gompa, 30 m apart).

Vocalizations: Territorial song in *melanolophus/aemodius* is very much alike and there are only minor differences of insignificant details. In the Nepal *melanolophus* area there seem to be local differences of note forms resulting in small-range dialects, especially between populations living S and N of the main axis. In the *aemodius* area, this phenomenon apparently does not exist. Playback experiments with Central European *ater* song in both *melanolophus* and *aemodius* area, respectively, elicited only a slight territorial response (see details in Martens 1975:411-421). However, Thielcke (1969) found SW German *a. ater* highly responsive to Afghan *melanolophus* song and demonstrated that the two have many note forms in common. A rough survey of *ater* song in major parts of the Palaerctic revealed high similarity in syntax and note forms from S France to Japan, but less in frequency range. This vocal uniformity contrasts with the marked morphological radiation of the Coal Tit complex (Martens 1993), indicating that cultural tradition results in characters considerably more persistent than inherited ones. – Warning calls at nest upon presentation of a stuffed Long-eared Owl *(Asio otus)* see Fig.103k-l.

Parus ater **ssp.** (from the upper Kali Gandaki Valley: Thakkhola, Plate 3d)

Material (I): 18 specimens: **D** Mustang Distr., Thakkhola, below Nabrikot, close to Nabrikot Khola, 2580 m, 8.VII.1973: 1 pull. * Chadziou Khola, 2600 m, 30.X.1969: 1♂ * Thaksang above Tukche, 3150 m, 23.XI.1969, 2.VII.1973 (pullus), 7.-11.III.1974: 5♂, 1♀, 2 o, 1 o pull. * Purano Marpha, 3200 m, 15.-19.III.1974, 10.V.1995: 3♂, 2♀ * above Dhumpu, near Jomosom, 3300 m, 23.III.1974: 1♂. **G** Parbat Distr., between Deorali and Chitre, 2850 m, 2.V.1995: 1♂.

Measurements: **Wing**-L ♂ (10) 59-65 mm, $\bar{x}$=61.8, s_d=1.75; ♀ (3) 60-61 mm; o (2) 62-62.5 mm; pull. (2) 58-60 mm. – **Tail**-L ♂ (10) 42.5-47 mm, $\bar{x}$=44.3, s_d=1.32; ♀ (3) 42.5-45 mm; o (1) 45 mm; pull. (2) je 42.5 mm. – **Bill**-L ♂ (11) 7.5-9 mm, $\bar{x}$=8.2, s_d=0.41; ♀ (3) 8-9 mm; o (2) je 8 mm; pull. (2) 7.5-8.5 mm. – **Tarsus**-L ♂ (10) 15.5-17.5 mm, $\bar{x}$=17.0, s_d=0.60; ♀ (3) 17 mm each; o (2) 17.5-18 mm; pull. (2) 17 mm each. – **WTI** (17) 16.7-22.0%, $\bar{x}$=19.5, s_d=1.50. – **TWI** (16) 69.3-75.0%, $\bar{x}$=71.7, s_d=1.50.

Material (II): 7 specimens: **D** Myagdi Distr., upper Myagdi Khola, N of pasture Dobang, 3200 m, 23.-24.V.1995: 7♂.

Measurements: **Wing**-L (7) 58.5-63.5 mm, $\bar{x}$=61.1, s_d=2.08. – **Tail**-L (7) 40-46 mm, $\bar{x}$=43.4, s_d=2.50. – **Bill**-L (7) 8.1-9 mm, $\bar{x}$=8.4, s_d=0.29. – **Tarsus**-L (7) 15.5-17 mm, $\bar{x}$=16.2, s_d=0.57. – **WTI** (7) 17.8-21.3%, $\bar{x}$=19.0, s_d=1.10. – **TWI** (7) 68.4-74.2%, $\bar{x}$=70.9, s_d=2.01.

Notes: Testes extremely active. – In colouration, 4 ♂ very similar to those from Thakkhola (see under I), in 1 ♂ the reddish-beige breast colour is intensified to a cinnamon red, and 2 ♂ have extensive (olive-)green colour on the belly. The variability suggests that these birds come from a mixed population comprising the (eastern) Thakkhola form and the (western) *melanolophus*.

Horizontal: Lake Titi (25.II.); below Nabrikot (8.VII., see Material); Chadziou Khola (30.X., see Material); Thaksang above Tukche (27.II.-12.III., 2.VII., 23.XI., see Material); Purano Marpha (15.-19.III., 24./25.IV., 10.-12.V., see Material); above Dhumpu (23.III., see Material; all :Mustang); – between Deorali Pass and Chitre (1.-3.V., 8.V., see Material :Parbat).

Vertical: Breeding season and close to it (IV-VII): All records but one (Chitre) are from the rain shadow areas of the upper Kali Gandaki. – Lowest records: 2600 m below Nabrikot (8.VII., fledglings); 2800 m above Chitre (5.V.); – uppermost ones: 3350 m, 3600 m Purano Marpha (24.IV.). The remaining localities are concentrated slightly above 3000 m and reflect the commonly visited areas (Thaksang, Purano Marpha, forests above Jomosom). – Outside breeding season: They all fall within the breeding belt: 2700 m Lake Titi (25.II.); 2800 m ascent to Thaksang (28.II.); 3150 m Thaksang (23.XI.), 3200 m Purano Marpha (15.-19.III.).

Habitat: The local Thakkhola subspecies is entirely a coniferous forest dweller, even in the lowest parts of its area, but may penetrate into the *Betula utilis* zone at the upper limit, although this has not yet been documented. The area is locally still nicely covered with various coniferous stands, namely *Pinus wallichiana* (lower parts, around Lake Titi, above Nabrikot), *Juniperus* sp. (valley bottom, insolated slopes), *Abies spectabilis* (Thaksang, above Jomosom), *Cupressus torulosa, Pinus* (Purano Marpha). There is little doubt that at least the upper forest belt up to timberline is fully occupied by this local subspecies. The lower limit seems to coincide with the rain shadow limit below Lete and the lowest *Pinus wallichiana* stands nearby. This low limit (appr. 2600 m) is unusual for *Parus ater* in Nepal and should be compared with the local climatic and vegetational conditions.

Breeding: Onset certainly later than in *aemodius* proper. Enlargement of testes starts only about M III (Thaksang 3150 m) or even later (Purano Marpha, 3200 m); rare spontaneous

song first heard 27.II. (Thaksang), song remains rare in M III (Purano Marpha), when large parts of the local population still occur in flocks; upon playback of songs, a few approach the speaker curiously up to 23.III., but do not display territorial behaviour. 1 ♂ singing near nesthole 27.IV. (3200 m), pulli in mixed flock with *P. rufonuchalis* 8.VII. (2600 m). – Oviposition may take place in second half of IV at 3000 m and above.

Vocalizations: See *melanolophus* (above).

Parus ater aemodius Blyth (Plate 3c)

Material: 17 specimens: **B** Rasuwa Distr., Syng Gyang, 3200 m, 24.-26.IV.1973: 4♂, 2♀ ** Sindhu Palchok Distr., Ting Sang La, 3250 m, 14.-15.IV.1973: 3♂ (2 song specimens) * Dadar Danda, 3150 m, 22.IV.1995: 1♂ ** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 29.III.-2.IV.1973: 4♂ (1 song specimen) * Thodung, 3200 m, 6.IV.1973: 1♂. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 1.-2.X.1970: 1 o, 1 o (juv. = 1st generation of contour feathers).

Measurements: **Wing**-L ♂ (13) 57.5-64 mm, $\bar{x}$=60.9, s_d=2.14; ♀ (3) 58-59.5 mm. – **Tail**-L ♂ (12) 41-47 mm, $\bar{x}$=43.6, s_d=2.18; ♀ (3) 40.5-42 mm. – **Bill**-L ♂ (11) 7-8.5 mm, $\bar{x}$=7.9, s_d=0.40; ♀ (2) 8-8.5 mm. – **Tarsus**-L ♂ (11) 16-18.5 mm, $\bar{x}$=17.3, s_d=0.70. – **WTI** (17) 17.6-23.4%, $\bar{x}$=19.5, s_d=1.76. – **TWI** (15) 68.9-74.6%, $\bar{x}$=71.4, s_d=1.75.

Notes: Bill black, feet dark lead-grey to black. – Testes of all spring ♂ well swollen, ovaries of the two spring ♀ clearly active.

Horizontal: Records from Marsyandi Valley close to the Sikkim/Darjeeling border. – Thimang above Bagarchap (16.IV. :Manang); – Trisuli Valley, Syng Gyang (24.-26.IV.; see Material; :Rasuwa); – Dadar Danda, Kalinchok (20.-23.IV.); Ting Sang La (13.-15.IV.; see Material; both :Sindhu Palchok); – pass N Jiri (10.IV.); Chordung Mt./Jiri (28.III.-3.IV.; see Material); Thodung (3.-8.IV.; see Material; :Ramechap); – confluence of Imja and Phunki Drangka (1./2.X.; see Material; :Solukhumbu); – upper Gitang Khola (27.III. :Ilam); – upper Simbua Khola (10.-14.V.); pasture Lassetham (8./9.V.); Deorali Pass W Yamputhin (17.V. all :Taplejung).

Vertical: Our records east of Annapurna (for further west, mainly Thakkhola, see above: *P. ater* ssp.) do not cover the entire belt, perhaps due to the fact that *aemodius* is much less common in the wet areas of E Nepal. – Breeding season (E III-VI): records below 3000 m: 2450 m (Gitang Khola, 27.III); 2550 m (Thimang, 16.IV.); 2600 m (N Jiri, 10.IV.); 2800 m (Chordung Mt., 3.IV.); 2820 (ascent to Ting Sang La, 13.IV.); 2900 m (Chordung Mt., 28.III.-2.IV.); – uppermost record: 3350 m (upper Simbua Khola, 12.-14.V.). – Diesselhorst (1968:343) found *aemodius* up to 4000 m in the Everest region, an area somewhat protec-

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Plate 3: Geographic variation of *Parus ater,* mainly in the Himalayan region: a) *P. ater ater,* Dresden MTD C 52967, Austria, Mühlbach am Hochkönig, 16.X.1992. – b) *P. ater rufipectus,* Bonn ZFMK G.X.1.f[b].γ, Kazakhstan or Sinkiang/W China [E Turkestan], Ak-Su, Tarim, 4.XII.1904. – c) *P. ater aemodius,* Bonn ZFMK 95.023, Nepal, Solukhumbu Distr., Imja/Phunki Drangka, 2.X.1970. – d) *P. ater* ssp., Bonn ZFMK 95.024, Nepal, Mustang Distr., Chadziou Khola Valley, 30.X.1969. – e) *P. ater melanolophus,* cinnamon-bellied morph, Bonn ZFMK 95.026 Nepal, Myagdi Distr., Dhorpatan, 20.IV.1970. – f) *P. ater melanolophus,* "normal" grey-bellied morph, Bonn ZFMK 95.026 Nepal, Dolpo Distr., Ringmo/Phoksumdo Lake, 25.V.1970.

Original by K. Rehbinder.

ted against monsoon precipitation. It is still unclear where the upper limit in E Nepal generally lies; very probably close to timberline, but the populations there may be very thin. I did not come across it there.

Habitat (see also *P. ater* ssp., above): Coinciding with *melanolophus* and the Thakkhola population, *aemodius* prefers coniferous forests. However, parts of the upper oak belt *(Quercus semecarpifolius,* locally *Lithocarpus pachyphylla),* which adjoins and partly interdigitates with the *Abies* zone, are also occupied, at least by sparse and thin populations, the

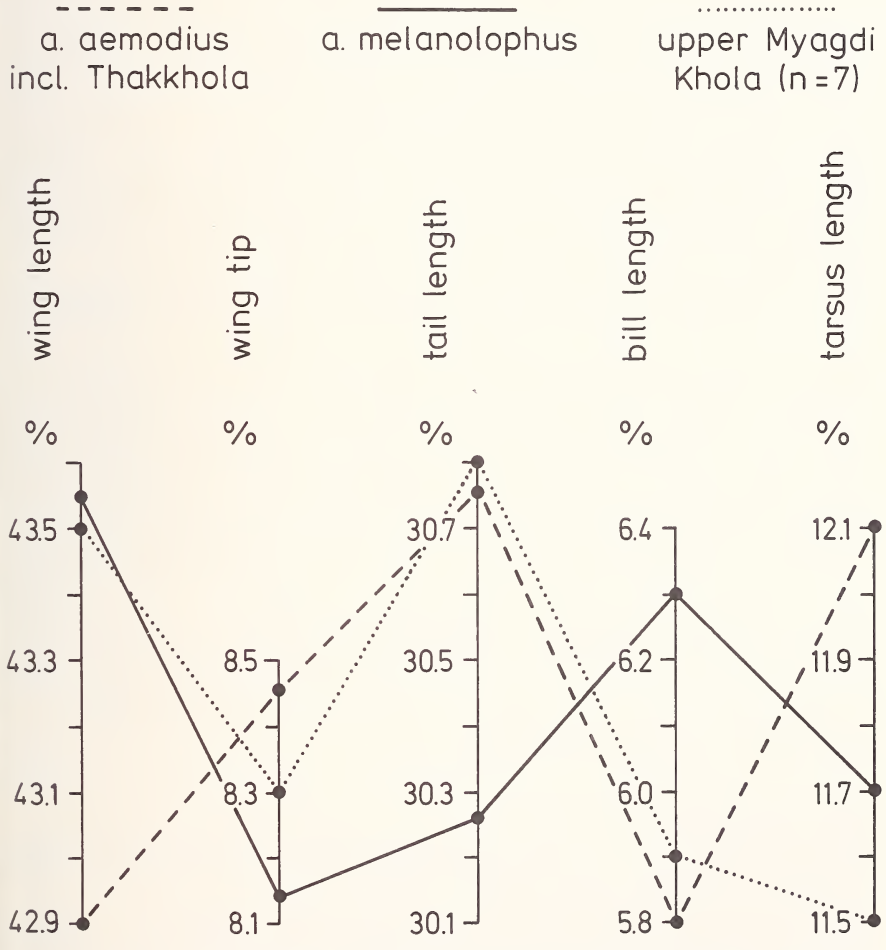

Fig.104: The sum of 5 metric measures (100%) has a somewhat different composition in *Parus ater aemodius* including the Thakkhola Valley population (n=24) than in *P. a. melanolophus* (n=34), as is evident in the different courses of the dashed and in the continuous line. The dotted line (upper Myagdi Khola) "oscillates" between the two other lines, for *aemodius* and *melanolophus.* The 7 birds from the Myagdi Khola also show signs of interbreeding in their colouration (see text).

presence of *Abies* being a prerequisite. Inhabiting the wet eastern Himalayas, there are only a few conifer species at the appropriate altitude that form extended forest communities: *Pinus wallichiana* only in drier parts, namely the upper Marsyandi, *Abies spectabilis* and, in addition, *A. densa* far to the east. *Tsuga dumosa,* a species locally distributed in large stands, but confined to a lower belt than *Abies,* is apparently not among the conifers preferred by the Coal Tit. Generally, in E Nepal, pure *Abies* forest, the preferred forest type, occurs from about 3000 m upwards, intermingled with *Quercus* from about 2800 m with local differences. Tree *Rhododendron* of various species are common. – Lowest records for *aemodius:* 2450 m upper Gitang Khola, in broad-leaved forest, possibly a stray there (27.III.); 2550 Thimang, *Pinus* present (16.IV.); 2600 m N Jiri, a few *Abies* present (10.IV.); 2800 Chordung Mt., *Quercus* (3.IV.); 2820 m ascent to Ting Sang La, a few *Abies* present (13.IV.). – In dense *Abies* stands formed by tall trees, the Coal Tit ranges locally among the most common passerines, outnumbering at least all other syntopic *Parus* species (see Tab.15). Then, territorial song of up to 3 ♂ can be heard from one spot, collected ♂ being replaced within few hours, which gives insight into the high population density and the resulting great population pressure. Such localities have included Syng Gyang/Trisuli Valley (IV 1973); Thodung, but *aemodius* not commoner there than *r. beavani* (IV 1973); upper Simbua Khola (V 1988). These localities range between 3200 m and 3350 m.

Diesselhorst (1968:343), however, considered *aemodius* a sparse species in Khumbu, referring partly to the very localities where I found it to be quite common (Thodung, Ting Sang La). This may be due to annual differences in population size.

Breeding: Apparently the season starts quite early. Upon my arrival in the breeding zone (Chordung Mt., 2900 m, 28.III.), there was regular display of territorial song and at least some ♂ reacted strongly to playback of local song. 1 specimen carried nesting material (28.III.), the nest hole being situated in an *Abies* trunk close to the ground (Martens 1975:407); 1 sp. entered a tree hole apparently to breed/oviposit (Thodung, 3200 m, 4.IV., not 7.IV. and 2 sp. as given by Martens l.c.: 407). Testes of 5♂ collected from 29.III. to 6.IV. (Chordung, Thodung) were strongly developed, indicating full progress of breeding season. – The above data indicate oviposition from B to M IV, thus considerably earlier than in the Thakkhola population (see above) and at least slightly earlier than in *melanolophus* at comparable altitude (around 3000 m). In contrast, Diesselhorst (1968:343) supposes much later onset of the breeding season in Khumbu but with little evidence.

Vocalizations: See *melanolophus* (above).

Parus major nipalensis Hodgson

Material: 5 specimens: **N** Chitawan Distr., Rapti Valley S Tekouli, 300 m, 8.-17.II.1970: 2♂ (the specimen from 8.II. is certainly a ♂), 2♀. **B** Sindhu Palchok Distr., Bhote Kosi Valley, right side of the valley above Bikuti, 1300 m, 11.IV.1973: 1♂.

Measurements: **Wing**-L ♂ (3) 65-66.5 mm; ♀ (2) 61.5-62 mm. – **Tail**-L (graduation) ♂ (3) 57-60 (5-6) mm; ♀ (2) 51-59 (4-5) mm. – **Bill**-L ♂ (3) je 10 mm; ♀ (2) 9-10 mm. – **Tarsus**-L ♂ (3) 17-18.5 mm; ♀ (2) 16-17 mm. – **WTI** (5) 12.9-17.9%; $\bar{x}$=15.5, s_d=2.21 (H8>4). TWI (5) 82.9-95.2%, $\bar{x}$=88.9, s_d=4.44 (!), comp. Eck (1988:121, Abb. 6, *cinereus*-Gruppe). – Tarsus/wing index (5) 25.6-28.5%, $\bar{x}$=26.8, s_d=1.25 and, for comparison, *P. monticolus* (10) from Nepal 25.7-27.6%, $\bar{x}$=26.7, s_d=0.58. – **Testes** large, 8 x 5 mm.

Notes: ♂ from 11.IV. bill blackish, feet slaty grey.

Horizontal: Our records extend from the S Dhaulagiri to near the Sikkim/Darjeeling border. – Bega (16.IV.); Beni (21.III. both :Myagdi); – between Tilhar and Kusma (18./19.III. :Parbat/:Kaski); – Dhumpus (27.IV. :Kaski); – Marsyandi Valley, between Boulboulé and Senghe (10.IV. :Lamjung); – Rapti Valley (8.-17.II.; see Material; :Chitawan); – Kathmandu Valley, Balaju (23.III., 5.V. :Kathmandu); – Bothe Kosi Valley, between Darapani and Bikuti (11.IV.; see Material; :Dolakha); – below Uyam, Iwa Valley (22.IV.); Yektin (21.IV.); below Paniporua, Hinwa Valley (20.IV. all :Panchthar); – between Ilam and Mai Pokhari (9.IV.); Siwalik Mts. near Sunichare (4.-6.IV. :Ilam).

Vertical: Our observations were made from the lowest parts of the country to the upper limit of the species' belt. – Lowest ones: 250 m Siwaliks N Sunichare (4.-6.IV.); 300 m Rapti Valley (18.-17.II.); – uppermost ones: 1300-1350 m Bothe Kosi Valley (11.IV.); 1400 m below Paniporua (20.IV.); Kathmandu Valley (4.V.); 1500 m Yektin (21.IV.); 1550 m Dhumpus; 1600 m between Ilam and Mai Pokhari (9.IV.). – The regular upper limit is near 1600 m, as noted earlier by Diesselhorst (1968:341) and Inskipp & Inskipp (1991). Though belonging to a predominantly Palaearctic species, the *cinereus* subspecies group (including ssp. *nipalensis)* has its strongholds in the tropical/subtropical parts of S Asia. In Nepal, it occupies the lowest belt within all *Parus* species and the populations are markedly thinned out at the upper range limit, where it meets *P. xanthogenys* and *P. monticolus.*

Habitat: The Great Tit is a euryoecious species living in a great array of habitat types, all related to forests, from Sal *(Shorea robusta)* in the Terai lowlands (Chitawan, Rapti Valley) and various mixed broad-leaved types to the only low-altitude coniferous forest consisting of *Pinus roxburghii* (Bothe Kosi below Ting Sang La). Obviously, light forests, clearings and edges are markedly preferred, certainly a useful pre-adaptation to colonize successfully cultivated land wherever tree-rich facies is present. Those habitats are common in lowland Nepal and in parts of the midlands, where the species is locally widespread.

Vocalizations: Territorial song consists (Fig.105a-g) of repetitions of note groups composed of 2-4 notes. The notes of up to 3-note groups are different (Fig.105a-b, g), in 4-note groups there may be identical notes (Fig.105e, f). The individual note is characterized by steep frequency ascents or descents, mostly upstroke and downstroke combined to angular-like notes opened downwards or upwards. As an exception prolonged slightly ascending notes occur (Fig.105d). The individual notes comprise a broad frequency span (up to 5.7 kHz, Fig.105e), the whole verse up to 7 kHz (Fig.105e). Enormous frequency jumps within the note groups are common, but rarely (Fig.105b, d) create separated frequency bands of the notes in a note group. – Song types may be rendered as "wits-ke.." (Fig.105a), "ze-wiss.." (Fig.105b), "ze-weets" (Fig.105d), "wewe-tsts.." (Fig.105f) or "ke-tse.." (Fig.105g). Various songs recall Coal Tit *(P. ater)* and there are indeed similarities in many note types. But there is no inter-species reaction in playback experiments, not even in allopatric areas (Thielcke 1969). Himalayan Great Tit sonagrams are similar to those of Yellow-cheeked Tit *(P. xanthogenys,* Fig.107a-i), but vocal impression differs due to longer notes in *xanthogenys,* slightly recalling song of Green-backed Tit *(P. monticolus).*

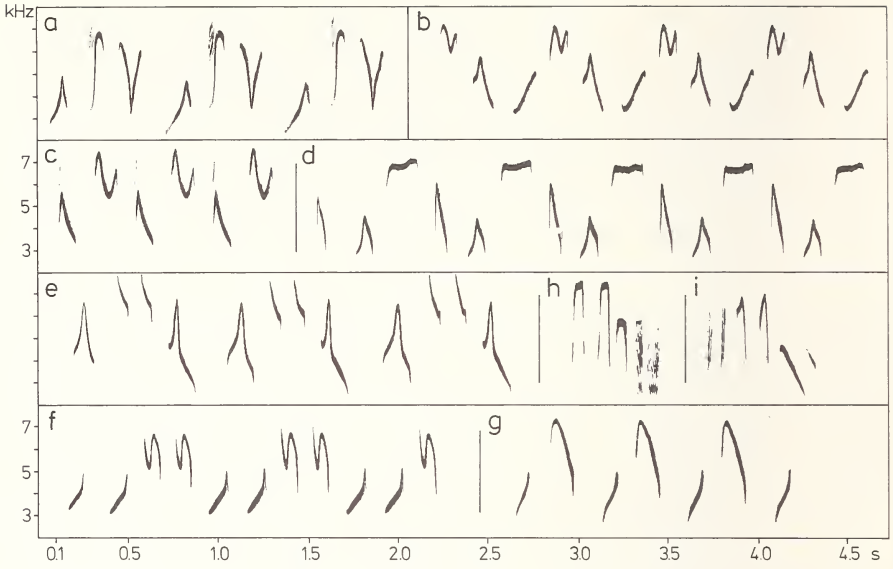

Fig.105: Vocalizations of *Parus major*; territorial song (a-g) and calls (h-i); a) Nodia Khola 6.IV.1988; b) Uyam 22.IV.1988; c-e) 3 verses of 1 ♂, Kathmandu, Balaju 5.V.1973; f-g) 2 verses of 1 ♂, India, Kashmir, Tangmarg 22.V.1976; h) calls given after playback of song (Fig.105c-e), Kathmandu, Balaju 5.V.1973; i) spontaneously given call, preceding song verses (Fig.105c-d), Kathmandu, Balaju 5.V.1973.

Vocalizations of Great Tits of the SE Asian *cinereus* subspecies group, to which the Himalayan populations belong, differ greatly from those of the *major* group (N Palaearctic), less from those of the *bokharensis* group (Central Asia), and are very close to those of the *minor* group (E Asia). The verse shown in Fig.105c elicits full territorial response in the lower Amur (E Siberia) *minor* population (B. Petri pers. comm.). *P. cinereus* subspecies group songs played in *major* areas evoke no response in S Germany (Thielcke 1969) or only fairly good response in Hungary (Sasvári 1980). Within the *cinereus* area however, songs are very similar over long distances: Notes in Afghan songs (Thielcke 1969: Fig.1) are identical to Fig.105b (E Nepal) except for an additional note in the latter. A song type from S India (Sasvári 1980) also fits into those characters. – For calls see Fig.105h-i.

Parus monticolus monticolus Vigors

Material: 10 specimens: **D** Myagdi Distr., Dhorpatan, 3000 m, 11.IV.1970: 1♂, 1♀ * Muri, 2100-2300 m, 25.-31.III.1970: 2♂, 1♀ (oviposition) ** Mustang Distr., Tukche, 2600 m, 4. and 17.X.1969: 1♂, ! pull./juv. * Thaksang above Tukche, 3150 m, 4.VII.1973: 1♂ pull. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 2.X.1970: 1♂, 1♀.

Measurements: **Wing**-L ♂ (5) 66.5-69 mm, $\bar{x}$=67.8, s_d=1.15; 1♂ pull. 67 mm; 1 pull./juv. 66 mm; ♀ (3) 63-68 mm. – **Tail**-L (graduation) ♂ (5) 53-58 (4-7) mm, $\bar{x}$=54.9, s_d=1.95; 1♂ pull. 52 (6) mm; ♀ (3) 48-55 (3-4.5) mm. – **Bill**-L ♂ (5) 9-10 mm, $\bar{x}$=9.7, s_d=0.45; 1♂ pull. 10 mm; 1 pull./juv. 10 mm;

♀ (3) 9-10 mm. – **Tarsus**-L ♂ (5) 18-18.5 mm; 1♂ pull und 1 pull./juv. 18 mm; ♀ (3) 17-17.5 mm. – **WTI** (10) 11.8-16.5%, $\bar{x}$=14.9, s_d=1.41 (H8 4x<4, 3$\bar{x}$=4, 3x>4). – **TWI** (9) 76.2-84.1%, $\bar{x}$=79.9, s_d=2.38. – **Testes** at 25.III. 5 x 6 mm, 31.III. 4 x 6 mm, 11.IV. 4 x 5 mm.

Notes: Relative tarsus length comp. *Parus major.*

Horizontal: The records extend from NW Dhaulagiri to the Sikkim/Darjeeling border. – Suli Gad Valley (19./20. V.); Gompa/Tarakot (11./13.V., 6.VI. both :Dolpo); – Gustung Khola (6.V.); Dhorpatan (11.-14.IV; 23.V.; see Material); Bobang (28.IV.); ascent to Jalja La (A IV); Muri (25.-31.III.; see Material); below Kibang (29.V. all :Myagdi); – Dhumpu (22.III.); Marpha (20.III., 9.V.); Thaksang (4.VII.; see Material); Tukche (26.IV., 4.-17.X.; see Material); Titi Lake (2.V., 4.VII.); Lete (1.V.); Ghasa (25.II., 2.V.); between Dana and Rupshesara (24.II.); Tatopani (3.V. all :Mustang); – between Ghandrung and Landrung (8.V.); Dhumpus (9.V.); descent to Suiketh (10.V. all :Kaski); – between Bagarchap and Thimang (14.IV. :Manang); – Dhunche (22.IV. :Rasuwa); – Godavari (24.III. :Lalitpur); – ascent to Ting Sang La from Bikuti (12. IV. :Dolakha); – Chordung Mt. (29. III. :Ramechap); – confluence of Imja and Phunki Drangka (2.X.; see Material; :Solukhumbu); – Chichila (19.VI.); between Mure and Hurure (9.VI.); Pahakhola (4.VI.); Lungthung (19.V. all :Sankhua Sabha); – Omje Kharka (1.-6.V.); Yamputhin (26.IV.-1.V. both :Taplejung); – Worebung Pass (21.IV.); Paniporua (19.IV. both :Panchthar); – Dhorpar Kharka (14.-16.IV.); Mai Pokhari (27.III., 9.-11.IV.); between Mai Pokhari and Ilam (9.IV. all :Ilam).

Vertical: During the presumed breeding season (IV-VI), our records range from 1300 m to 3400 m, covering a belt of more than 2000 m. – Details: Lowest records: 1300 m below Kibang (29.V.); 1330 m Tatopani (3.V.); 1450 m Modi Khola (8.V.); 1580 m above Ilam (9.IV.); – highest records: 3150 Thaksang (4.VII.) and Gustung Khola (6.V.); 3300 m, 3400 m Gompa/Tarakot (5./6.VI.). – In detail all over the range: 1300-1500 m: 6 localities, 1500-1750 m 5 loc., 1750-2000 m 12 loc., 2000-2500 m 15 loc., 2500-2750 m 7 loc., 2750-3000 m 3 loc., 3000-3400 m 7 loc. According to the above data, the species seems to be evenly distributed all over the vertical belt with no distinct preferences, but densities thin out in the very upper part of the range (see Diesselhorst 1968:342). Inskipp & Inskipp (1991) present a nearly identical distribution: 1370-3100 m (3600 m), but months are not noted.

Habitat: According to its considerably broad vertical belt, the Green-backed Tit occupies a multitude of habitats, all connected with forests or at least scattered trees. Besides native forests, it has adapted to many secondary stands, even to tree-rich agricultural land, where it is locally common. Also within native stands, open and marginal parts are preferred. Of all Nepal tits, the vertical belt of the Green-backed has the most remarkable situation, which no other *Parus* species duplicates. It extends from purely broad-leaved species-rich subtropical vegetation in the lowest parts to virtually Palaearctic facies forest in the upper ones, consisting in at least some areas entirely of coniferous forest, locally of uniform *Betula utilis* stands (Khumbu). The former starts at about 3000 m with the *Abies spectabilis* zone (Dhorpatan, 3000-3100 m), partly intermixed with tree *Rhododendron.* This already broad ecological niche is further enlarged given the fact that the dry Inner Valleys (Thakkhola; Manang, see Lowndes 1955) and northern slopes of the main chain (Barbung Khola near Tarakot, Suli Gad Valley) are also inhabited. *Pinus wallichiana, Juniperus* (Thakkhola) and *Picea smithiana* (Tarakot, Suli Gad) prevail. With respect to the position of its vertical belt,

which includes both wet southern and dry northern habitats, *Parus monticolus* is to be considered the most successful Himalayan tit species.

Breeding: A very early breeder, as previously noted by Biswas (1963a), at least in the lower parts of its range. Testes are already strongly developed E III/B IV (see Measurements); ovary of the ♀ from Muri (25.III., 2100 m) with large follicles, ovipositing; feeding juveniles in the nest (28.IV., 2000 m; 30.IV., 2000 m in another locality; 9.V., 2650 m); fledglings fed by parents 18.V., 1850 m).

Vocalizations: Territorial song (Fig.106a-q) highly variable, consisting of series of identical notes at the same pitch like the Alpine song of European and Asian populations of *Parus montanus* (Fig.106a, c), or of slightly descending (Fig.106b, i) or ascending notes (Fig.106d, f). More common are song types with note groups consisting of two notes which are repeated several times to form the verse (Fig.106e, g, h, k, l-q). Most often a short and a long note are combined within a note group, one ascending, the other descending (Fig.106e, g, h, k-q). In general, long notes are up to 0.45 s in duration (Fig.106k), short ones less than 0.1 s (Fig.106e). Intervals between notes are up to 0.2 s long, giving the song a "slow" motion: "tee-tee-tee.." and "wüp-wüp-wüp.." for one-note-type songs, "seta-seta-seta.." (recalling song of *Parus ater,* Fig.106e), "tse-wüh-tse-wü.." (Fig.106k), "teeye-teeye-teeye" (Fig.106l). Calls, mostly warning calls, are shown in Fig.106r-u.

Parus xanthogenys xanthogenys Vigors

Material: 3 specimens: **D** Myagdi Distr., Myagdi Khola Valley, Bim, 1150 m, 30.V.1995: 1♂ (song specimen), 2♀.

Measurements: **Wing**-L ♂ 69, ♀ (2) 65.5 and 68 mm. – **Tail**-L ♂ 50, ♀ (2) 46 and 48 mm. – **Bill**-L ♂ 12, ♀ 2x10 mm. – **Tarsus**-L ♀ (2) 17.5 and 18 mm. – **WTI** (3) 14.7-16.7%. – **TWI** (3) 70.2-72.5%.

Horizontal: Our records range from S Dhaulagiri to the Sikkim/Darjeeling border. – Myagdi Khola, Bim (30.V.; see Material :Myagdi); between Siuketh and Naudara Ridge (21.II.); Pokhara (26.IV.); Tilhar near Kusma (18.III. all :Kaski); – Kathmandu Valley, Balaju Park (17.-23.III., 4./5.V. :Kathmandu); – above Godavari (24.III., 25.IV. :Lalitpur); – Darapangma near Tumlingtar (20.VI.); ascent to Num from Arun river (8.VI. :Sankhua Sabha); – Kabeli Khola below Limbudin (24.IV.); Yamputhin (27.-30.IV.); confluence of Tada and Kabeli Khola (25.IV. :Taplejung); – Yektin (21.IV. :Panchthar).

Vertical: Our records, all from the presumed breeding season (M III-VI), extend from 850 m to 1900 m. – Lowest: 850 m Pokhara (26.IV.), 1000 m Tilhar (18.III.), Kabeli Khola (24.IV.); 1100 m Kabeli/Tada (25.IV.); – highest: 1900 m Yamputhin (27.IV.). – While Inskipp & Inskipp (1991) give the lower limit of the area belt during summer as "mainly 1500 m", there apparently do exist populations at much lower altitude in various parts of the country, perhaps quite regularly at the eastern area limit. The regular upper limit, where I did not encounter the species, is near 2300 m.

Habitat: The Black-lored Tit is a forest species, but prefers light and open stretches, clearings and edges, and many communities are inhabited, for example: *Schima wallichii* (Arun Valley below Num); riverine *Alnus nepalensis* (Yamputhin), *Pinus roxburghii* (Kathmandu Valley). In addition, the species is regularly met in tree-rich agricultural land, even close

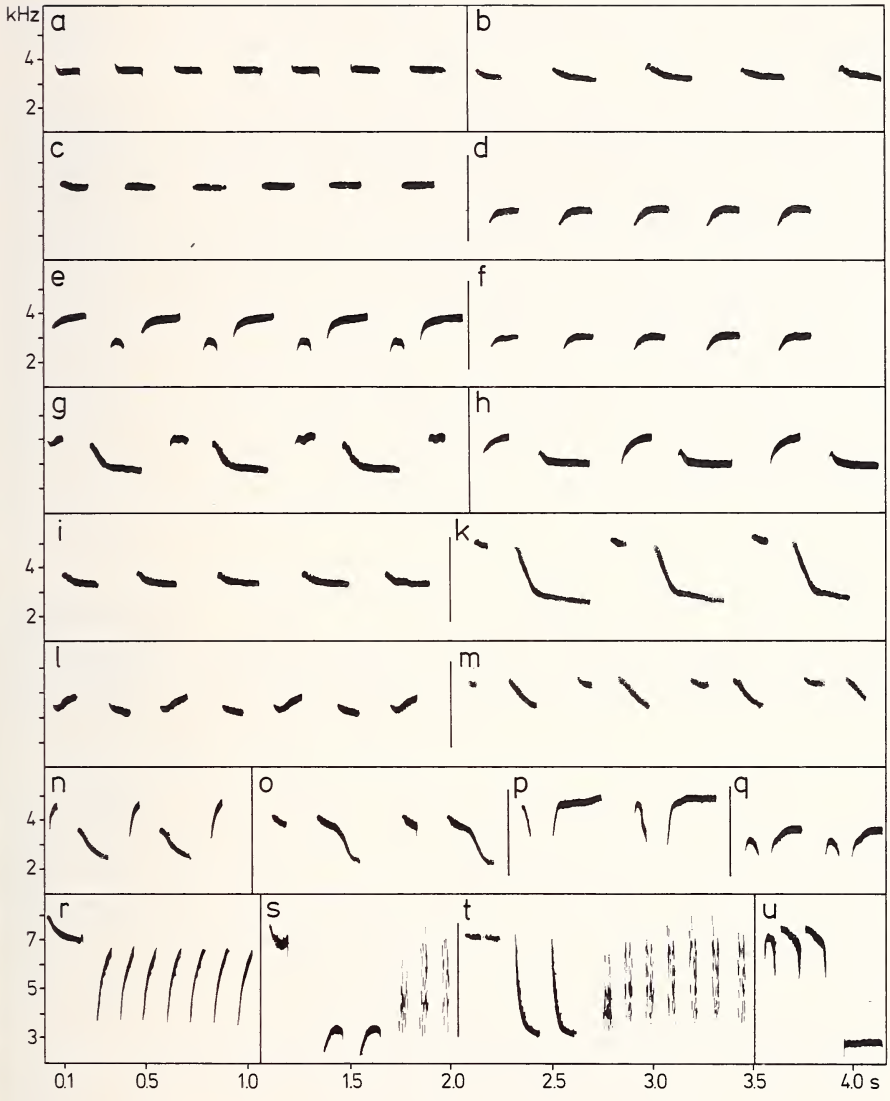

Fig.106: Territorial song of *Parus monticolus;* a) Suli Gad Valley 8.VI.1970; b-d) 3 verses of 1 ♂, Lete 1.V.1980; e-g) 3 verses of 2nd ♂, Lete 1.V.1980; h) between Landrung and Dhumpus 9.V.1980; i-k) 2 verses of 1 ♂, Dhorpar Kharka 15.IV.1988; l-n) 3 verses of 1 ♂, Yamputhin 27.IV.1988; o-q) 3 verses of 1 ♂, verses abbreviated, between Ilam and Mai Pokhari 9.IV.1988; r-u) warning calls, r: Omje Kharka 3.V.1988; s-t: Lungtung 19.V.1988; u: Chichila 19.VI.1988.

to houses. The large-scale deforestation of midland Nepal must have been at least partly advantageous for *xanthogenys,* and at present, it is most numerous in secondary and cultivated growth.

Vocalizations: Territorial song (Fig.107a-i) mostly fits into the *Parus* song scheme, i.e. repetition of note groups consisting of two (Fig.107d-h), three (Fig.107a-c), sometimes four notes. Rarely irregular patterns also occur (Fig.107i) as well as "mixed" verses comprising different note groups (Fig.107f). Characteristic is the broad frequency span of most individual notes (1-4 kHz, mostly above 2 kHz) and even more that of the whole verse (up to 6 kHz). Marked frequency jumps are normal between notes of the note groups, but within the three-note groups two notes are identical. The same note-group types may occur in distant localities (Fig.107a/b and c, localities some 500 km apart). The individual notes are long (up to 0.2 s, shortest ones close to 0.05 s). Notes are well spaced, giving the verses a "slow" motion like those of *P. monticolus* (Fig.106), but *xanthogenys* song is sharper. Individual note groups may be rendered as "we-whits.." (Fig.107a), "kee-wiss.." (Fig.107b), "bee-we-we.." (Fig.107c), "zee-whit.." (Fig.107d), "si-tü.." (Fig.107g), "wize-wize-trrr-tyü.." (Fig.107i).

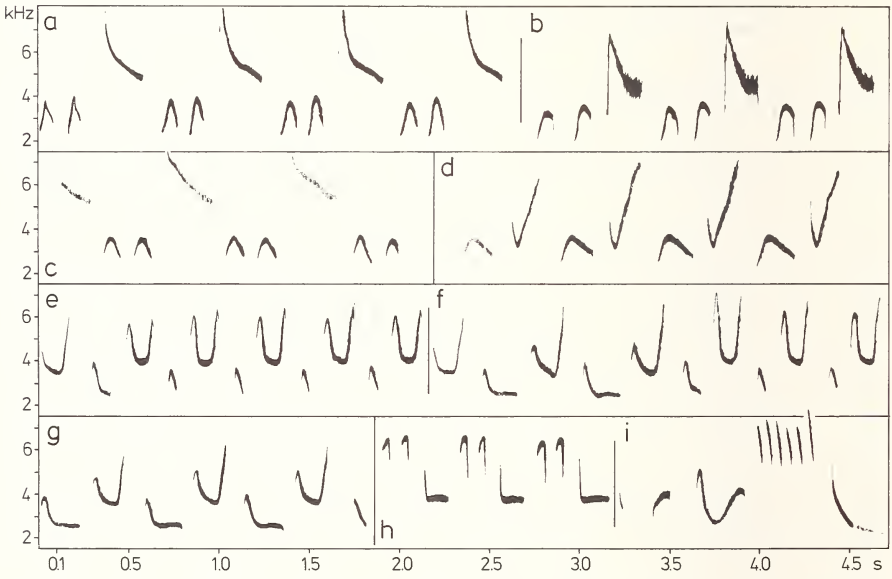

Fig.107: Territorial song of *Parus xanthogenys;* a-b) 2 verses of 1 ♂, Pokhara, P. Alström III 1994; c) Yamputhin 27.IV.1988; d-g) 4 verses of 1 ♂, f: mixed verse, Yektin 21.IV.1988; h-i) 2 verses of 2nd ♂, Yamputhin 30.IV.1988.

SITTIDAE

Sitta

Five species breed in Nepal *(frontalis, castanea, himalayensis, cashmirensis, leucopsis);* 2 species may locally coexist: *frontalis/castanea* in the lowlands and the foothills, *cashmirensis/leucopsis* at high altitudes in the arid NW. Also *castanea* and *himalayensis* have been found at close range, but they are only parapatric altitudinally, not sympatric. While Nepal harbours quite a high number of nuthatch species, which potentially may populate the whole 4000-m-wide forest belt, locally large forested areas remain uncolonized. These are at altitudes above 3400 m in all monsoon-moist parts on the S macroslope of the main chain, which are avoided by *himalayensis,* the species occupying the widest vertical area belt. *S. leucopsis* lives in coniferous forests up to timberline, but is confined to the dry areas in the NW. The monsoon-shadowed mesophilic forests of Thakkhola (upper Kali Gandaki Valley; Fig.30) and even more those of the upper Marsyandi Valley (:Manang), however, though only 60-80 km away are apparently too remote to have been reached by either *leucopsis* or *cashmirensis* along the main chain to the E. In Thakkhola *himalayensis* penetrates northward only where monsoon influence ends.

Sitta frontalis

Horizontal, vertical: I occasionally observed the Velvet-fronted Nuthatch in agricultural land with scattered trees in the Rapti Valley (II 1970: :Chitawan). – A widely distributed species of the lowlands and neighbouring India.

Sitta leucopsis leucopsis Gould

Taxonomic note: *Sitta [carolinensis].* Despite the vocal differences conspecific with *carolinensis* (see Vocalizations)?

Material: 5 specimens: **D** Dolpo Distr., Gompa/Tarakot, 3300 m, 4.VI. 1973: ♂. * Ringmo/Phoksumdo Lake, 3650-3800 m, 12.-14.VI.1973: 4♂.

Measurements: **Wing**-L (5) 77.5-82 mm, x̄=79.5. – **Tail**-L (3) 43-45 mm, x̄=44.0. – **Bill**-L (5) 17.5-19.5 mm, x̄=18.7; **Bill-Width** (4) 2.9-3.4, x̄=3.2. – **Tarsus**-L (5) 18-19 mm, x̄=18.3. – **WTI** (5) 23.5-25.6%, x̄=24.9; – **TWI** (3) 54.3-54.9%, x̄=54.5.

Horizontal: I located only very few sites of *leucopsis* (V 1970, VI 1973) on the NW flank of the Dhaulagiri massif near Tarakot (Gompa; see Material) and near Ringmo/Phoksumdo Lake (see Material), and also in the vicinity when ascending to Bagar La (:Dolpo). Cited by Fleming et al. (1976) for the nearby Suli Gad Valley leading from S to Phoksumdo Lake (Fig.34). These localities belong to the easternmost area splinters in the W Himalayan dry area, which mark the boundary of the *leucopsis* area to the E. Dry landscapes even further to the E ("Inner Valleys": Thakkhola, Fig.30-32; Manang in upper Marsyandi Valley) have not been reached by *leucopsis* (see above: *Sitta*).

Vertical: My finds during the breeding season (V, VI) are at 3300 m (SE Tarakot, 1973), 3600-3900 m on Phoksumdo Lake (1970, 1973), ascent to Bagar La at 3700 m (16.VI.1973, proof by song). These data result in a very narrow span of 600 m. The statement "between

2745 and 4575" (Inskipp & Inskipp 1991) made with no further comment needs clarification. This upper limit is far beyond the forest zone, which is hardly left by any central Himalayan nuthatch.

Habitat: Old mature spruce *(Picea smithiana)* forests of tall trunks and scattered birches *(Betula utilis)* near Tarakot, always in the forest interior. The breeding place at Phoksumdo Lake is even drier; open stands of *Pinus wallichiana* and *Cupressus torulosa* dominate, *Betula* only at highest altitudes near 3900 in moist shallow places. Within the isolated forest patch at Phoksumdo Lake population density seems to be high. Horizontally, territory edges were detected every 200-400 m by playback of local song recordings. Collected specimens were quickly replaced by new territory holders (from 12. to 13.VI.1973). – For review of *leucopsis* biology and distribution see Wunderlich (1988a).

Breeding: In V and VI ♂ displayed marked territorial behaviour, especially on playback of their own voice: when only a few verses where played, the territory holder would approach the loudspeaker within a few seconds. Testes between 5 and 7 mm in M VI are of maximum size and mark the breeding period. No ♀ collected; they were apparently breeding, no carrying of food was observed up to M VI (when leaving the area). In Dolpo oviposition may presumably take place E V/A VI, hatching E VI, fledging as late as (early) VII.

Vocalizations (Fig.108a-e): They are very conspicuous and easily to be identified as territorial song or call over large distances: verses are produced as continuous sequences of nasal notes which are rich in harmonics, a very characteristic "hä hä hä hä .." (however, calls of *Mycerobas carnipes* are somewhat similar). Depending on arousal of individual specimens, distances between notes and note length may differ, but are constant within the verse; 2-11 notes form a verse. Without playback the individual ♂ produced 1 or 2 verse types (Fig.108a, a'/a''). Aggressive ♀ calls on verse playback are shown in Fig.108e/e'.

Songs rich in harmonics are not used by *S. carolinensis,* which is believed to be closely related to *leucopsis* (but see Mayr & Short 1970:65), but are apparent in a few *carolinensis* call types (for sonagrams see Löhrl 1988a Fig. 41). *Sitta* species which are currently placed in distantly related species groups also use this note type *(canadensis:* Löhrl 1988a Fig.34, Chappuis 1976; *krueperi:* Löhrl 1988a Fig.32; *whiteheadi:* Löhrl 1988a Fig.29; *pusilla:* Löhrl 1988a Fig.26; *ledanti:* Vielliard 1978). Species lacking this call type, may have lost it secondarily. Therefore, strongly nasal, harmonic-rich vocalizations are probably an old nuthatch heritage.

Sitta cashmirensis Brooks

Sitta [europaea] cashmirensis

Material: 1 specimen: **D** Dolpo Distr., Gompa/Tarakot, 3300 m; 6.VI.1973: 1♂.

Measurements: **Wing**-L 85 mm. – **Tail**-L 47 mm. – **Bill**-L/-**Height** 15.5/4 mm. – **WTI** 23.5%. – **TWI** 55.3%.

Notes: The ♂ shows marked brightened tips of the lower tail coverts. Kleinschmidt's (1928) interpretation: "Brown coloration nearly completely replaced the white tips and the grey base of the lower tail coverts." See Löhrl (1988:52-57, 189-190).

Horizontal, vertical: I encountered *cashmirensis* only once in the NW Dhaulagiri massif above Gompa village near Tarakot, 3300 m. 1 pair was living at the edge of a mature *Pi-*

cea smithiana forest mixed with *Betula utilis,* which were common along the (artificial) edge (3.-6.VI.1973); the birds were very probably at the breeding site (testes still only slightly developed). No song activity; in the same forest patch *S. leucopsis* (which see) was also present, but apart from *cashmirensis* in the forest interior. This locality marks the E outpost of the small area of this Himalayan endemic. It is a dry region, and in Nepal the

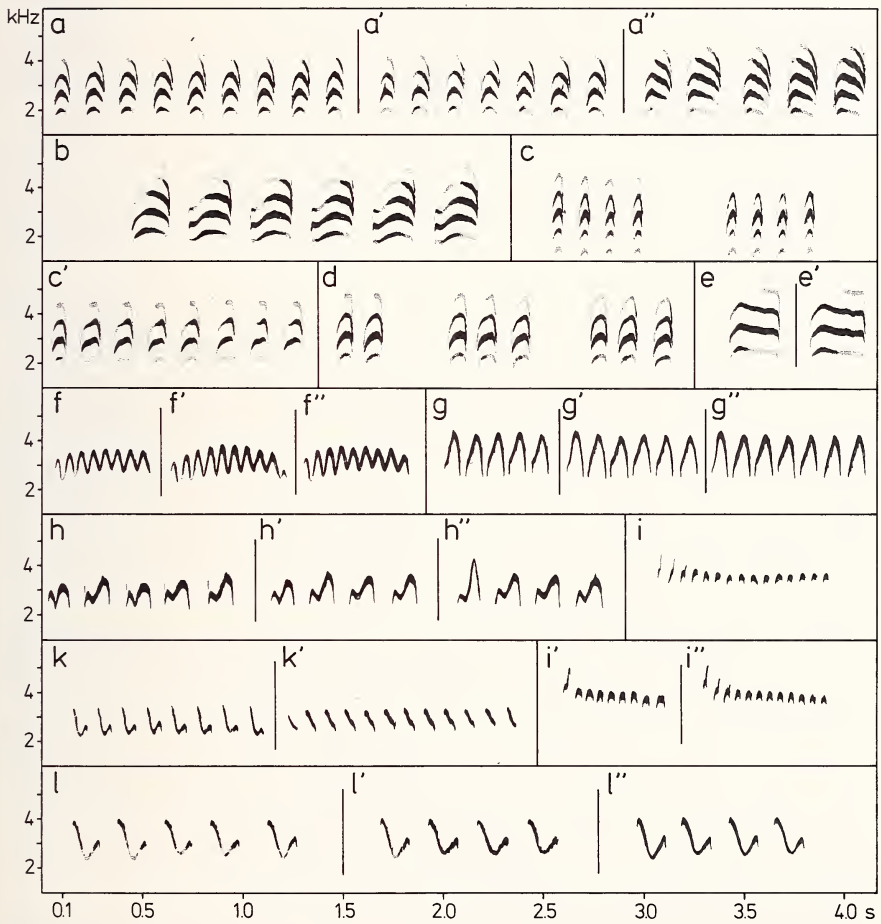

Fig.108: Vocalizations of *Sitta* species. – a-e) *S. leucopsis;* territorial song (a-d) and calls (e); a-a'') 2 spontaneously given verse types, Gompa/Tarakot 4.VI.1973; b) 1st ♂, song given after playback, Ringmo 12.VI.1973; c-d) 2nd ♂, 3 verse types given after playback, Ringmo 14.VI.1973; e-e') ♀ calls given in territorial context after playback, Ringmo 14.VI.1973.
f-h) *S. castanea;* territorial song; f-f'') 3 verses of 1 ♂, Kathmandu, Balaju 5.V.1973; g-g'') 3 verses of 1 ♂, Tada/Kabeli Khola 25.IV.1988; h-h'') 3 verses of 1 ♂, N Sunichare 4.IV.1988.
i-l) *S. himalayensis;* territorial song; i-i'') 3 spontaneously given verses of 1 ♂, Puspati 16.IV.1988; k-k') 2 verses of 1 ♂, k: spontaneously given, k': after playback, Phulchoki Mt. 22.III.1980; l-l'') 3 verses of 1 ♂, l: spontaneously given, l'-l'': after playback, Mai Pokhari 26.III.1980.

species is also apparently confined to dry areas; for historic-ecological reasons it did not succeed in reaching the arid areas of the Inner Valleys to the E (Thakkhola, Manang; cf. *Sitta).* – Inskipp & Inskipp (1991) give the vertical area belt as 2400-3505, but without details. Their remark "Fairly common in the northwest ..." remains to be substantiated.

Sitta himalayensis himalayensis Jardine & Selby

On the relations to *S. pusilla* see Löhrl (1988a:188-189).

Material: 4 specimens: **D** Mustang Distr, Thakkhola, Lete, 2600 m, 5.XII.1969: ♀. **G** Parbat Distr., Ghorapani Pass, 2800 m, 27.VII.1970: ♀. **N** Makwanpur Distr., Mahabarat Mts., Daman, 2500 m, 23.II.1970: ♀. **J** Ramechap Distr., Thodung near Those, 3200 m, 9.IV.1973: ♂.

In addition a ♂ from Ting Sang La was examined (**B** Sindhu Palchok Distr.), 3400 m, V 1969, 14.5 g (ZFMK).

Measurements: **Wing**-L: ♂ (2) 75-77 mm; ♀ (3) 72-74.5 mm. – **Tail**-L: ♂ (2) 39-39.5 mm; ♀ (3) 36-37 mm. – **Bill**-L: ♂ (2) 13.5-14.5 mm; ♀ (3) 3mal 14 mm. – **Bill**-Height (at the thickest part of the lower mandible): ♂ (2) 3.8-4.1 mm; ♀ (3) 4-4.5 mm. – **Tarsus**-L: ♂ (2) 17.5-18 mm; ♀ (3) 17.5-18 mm. – **WTI** (5) 20.1-23.4%, $\bar{x}$=22.1; – **TWI** (5) 49.7-52.7%, $\bar{x}$=50.6.

Horizontal: I met *himalayensis* in all parts of the country I visited, from Thakkhola in the W to the Darjeeling/Sikkim border but not N of the main range. At the sites of appropriate elevation the White-tailed Nuthatch was present nearly everywhere, but not common. In the northward directed valleys it may occur near the S feet of the main range, e.g. Kabeli Khola (near Yamputhin :Taplejung, breeding proven). It inhabits the S parts of the midlands (Daman :Makwanpur, see Material) as well. *S. himalayensis* avoids areas outside the monsoon influence, even sites at appropriate altitude as in Thakkhola. There it is absent N of Lete where large forested areas at medium altitude harbour no nuthatch species at all (see *Sitta).* There is no proof of this absence in additional Inner Valleys (upper courses of Marsyandi and Buri Gandaki) but the situation is very probably the same there.

Vertical: 17 of our observations (out of 22) from 4 years at all seasons were made between 2000 m and 2800 m. Below 2000 m: Yamputhin, 30.IV.1988 (:Taplejung): 1650-1900 m; Dhunche, 27.4.1973 (:Rasua Garha) 1900 m; – above 2800 m: Thodung, 9.IV.1973 (:Ramechap) 3200 m. – Diesselhorst (1968) indicates highest finds at 3400 m (overlooked by Inskipp & Inskipp [1991]), according to the field label even 3800 m (Ting Sang La, B V); but at this altitude only nearly pure *Abies-Rhododendron* forest exists, which is avoided by *himalayensis.* The following sites mark the lowest breeding places: 1560 m: territorial pair at Phulchoki Mt. III-V 1979 (:Lalitpur, Löhrl 1988a); 1650 m breeding record at Yamputhin (:Taplejung).

Habitat: *S. himalayensis* is to be regarded as a species of the subtropical monsoon-influenced evergreen broad-leaved forests of the S Himalayan macroslope, as previously stated by Diesselhorst (1968:352). There are only a few exceptions: At the upper limit *Quercus semecarpifolia* stands fade out, tree *Rhododendron* and *Abies spectabilis* prevail (3200 m, Thodung :Taplejung). In the upper Mai Khola Valley (:Taplejung) I found it in *Tsuga dumosa* forest (2800 m, 16.IV.1988).

Breeding: Early season; the ♂ from Thodung (9.IV.) reacted aggressively on playback of its own song; gonadal state (5 mm) close to maximum. Löhrl (1988) calculated onset of

oviposition of a pair at 2140 m at B IV; on 22./24.III. another nest was under construction (1820 m); feeding of juveniles in nest at 1650 m on 30.IV. Therefore IV is the preferred month for oviposition, breeding and rearing. This is confirmed by Biswas (1963a): skins from III and IV all showed breeding activity; the same holds true for the neighbouring Sikkim for III-V (Ali 1962). Maximum gonadal state is reported by Diesselhorst (1968:352) till M V. – At a breeding hole, an exactly "fitting" woodpecker hole, there were no glued materials to be seen at the outer hole entrance.

Vocalizations: Territorial song (Fig.108i-l) are partly homogeneous trills, sometimes quite harsh with "é" prevailing (Fig.108i/i''), sometimes soft like "djü djü djü..." (Fig.108l/l''). Verses of territorial song consist of only one note type, which, however, may be slightly varied within a verse (Fig.108h/h''). Notes of various song types differ greatly between different ♂ (Fig.108i/k/l) and in individual ♂ (Fig.108k/k'). Up- and downward opened angular notes are used. Frequency band of notes from 720 Hz (Fig.108i) to 1760 Hz (Fig.108l). ♂ aroused by playback of song alter note types to simple downstrokes. Verses are about 0.5 to 1 s long.

Sitta castanea

S. [europaea] castanea

Horizontal: Our observations originate from S Annapurna, from the Kathmandu Valley and from near the E border. – Annapurna, between Tilhar und Kusma (19.III. :Kaski); – Kathmandu, Balaju Park (23.III., 5.V. :Kathmandu); – Siwalik foothills N Sunichare (4.IV.); Mai Khola Valley, ascent to Ilam (8.IV. both :Ilam); – from Paniporua to Hinwa Valley (20.IV. :Panchthar); – confluence of Kabeli and Tada Khola (25.IV. :Taplejung).

Vertical: The few data range between 250 m (Siwaliks) and 1400 m (Kathmandu Valley; Paniporua/Hinwa Valley). Inskipp & Inskipp (1991) note occurrence up to 1830 m, but the upper limit of the breeding belt is yet unclear. Löhrl (1988a) discovered a nest at the foot of Phulchoki Mt. (:Lalitpur, 1540 m), a pair of *S. himalayensis* in the close vicinity at 1560 m, but without proof of breeding. Possibly the two species are parapatrically distributed and may compete where they meet at close range at their lower and upper vertical limits, respectively, though their ecological requirements (see Löhrl 1988a, Diesselhorst 1968) and their vertical distributions are quite different.

Vocalizations: Territorial song (Fig.108f-h) is a short trill of 1 s or less sounding like a rapid "we we we...". When in other song types notes are closer to each other (Fig.108g) or even united to one long "supernote" (Fig.108f), a soft trill results, "é"-notes still being noticeable. The individual note is angular, opened downwards, with sides of equal length in most cases, sometimes the first one also angular in itself. Frequency range narrow, roughly between 2500 and 4500 Hz. According to Löhrl (1988a) free-living S German *S. europaea* did not react to the voices of caged and sexually stimulated *S. castanea,* which they could hear in their breeding territories. – For additional sonagrams see Löhrl (1988a, Fig.19).

TICHODROMIDAE

Tichodroma muraria

Horizontal: Our observations during the breeding season are from the northern parts of the Dhaulagiri range. – Below Phoksumdo Lake (6.VI.), upper Barbung Khola, Charka (21.VI.), ascent to Dudje La, Lo Valley, several sp. (25.VI. all :Dolpo); – Jomosom (21.-27.III.), Tukche (27.III.), Dapa Col above Tukche (18.VII. all :Mustang); – Kusma (20.III. :Parbat).

Vertical: During the breeding season (VI, VII) six records from 3350 m (Ringmo) to 4500 m (Lo Valley), two of them are proof of breeding activity (see below). – Records outside breeding season (III) range from 750 m (Kusma) to 2750 m (Jomosom) (see Inskipp & Inskipp 1991).

Habitat: During the breeding season generelly rock faces where the Wallcreeper searches for food and displays its butterfly-like staggering courtship flight. On the dry monsoon-protected northern slopes of the main range at least the upper parts of the forest belt may also be inhabited during the breeding season (Ringmo). Besides cliffs, horizontal gravel fields and rock debris are regularly visited and are apparently desired feeding areas. Diesselhorst (1968:354) observed Wallcreepers looking systematically for food on gently sloped side moraines of the glaciers in High Khumbu near 5000 m. The gravel banks of rivers are also commonly inhabited, at least outside the breeding season (Kusma, III; Jomosom, III); here the birds crawl even beneath the pebbles in search of food. At least at low altitudes, where rock faces and cliffs are absent, gravel beds along rivers are the regular winter habitats.

Breeding: Until now only two records indicate the season: A nest in an inaccessible cliff was robbed by two martins *(Martes flavigula)* with both parents fluttering around them below Ringmo/Phoksumdo Lake on 6.VI.1970, 3350 m (Martens 1971). One specimen was collecting and carrying food in Lo Valley near Charka on 25.VI. 1973, 4400 m. From 25. to 27.III.1974 one (or several) ♂ sang and displayed in the "sediment rocks" near the Jomosom Airfield (2750 m). This ♂ might also have been at (near) the breeding place. The preferred altitudinal range for breeding is still unknown and may vary greatly according to the local amount of precipitation.

Vocalizations: Apparently very similar to European populations; for sonagram of territorial song recorded at Jomosom see Martens & Geduldig (1990). The species already starts singing in the winter quarters, and the song can be heard from the pebble fields along rivers (Kusma, III).

CERTHIIDAE

Certhia

Four *Certhia* species live in the Central Himalayas, the highest species concentration of treecreepers in the Holarctic Region *(discolor, nipalensis, himalayana, familiaris).* Their breeding area extends from 2000 to appr. 4200 m in altitude, a good hint for the Palaearctic affinities of the genus. The tree-bark niche of the lower forest belt from the Terai lowlands up to 2000 m, however, is not regularly exploited by passerines with long curved pincer-like bills (but see *Alcippe castaneceps*). The ecological separation of the four species is achieved by several factors. (i) Every species inhabits a different altitudinal belt, but they overlap and separation is not complete (especially in *familiaris* and *nipalensis,* partly in *himalayana;* Martens 1981). (ii) Within the preferred congruent altitude, the single species inhabit slightly different forest formations, but separation is again not complete, and up to three species have been found on territory at close range during the breeding season *(familiaris, himalayensis, nipalensis,* Dhorpatan Valley, Martens 1972; Table 17). (iii) Ecological separation of several species in one locality seems to work via different bill lengths and thus different feeding strategies. (iv) Even within the single species, there are marked intraspecific differences in ♂/♀ bill lengths, which do not even overlap in *himalayana* or hardly do so in *familiaris.*

Tab.17: Syntopic occurrence of *Certhia* species during the breeding season (IV, V), recorded mostly within a few hundred meters and within the same forest type (except Purano Marpha). Symbol in brackets: possibly not breeding; altitude in m.

locality	altit.[m]	*familiaris*	*nipalenis*	*himalayana*	*discolor*
Thimang	2550	–	+	–	–
Mt. Phulchoki	2600	–	–	–	+
Paniporua	2700	–	–	–	+
Dhorpatan	2950	+	+	+	–
Purano Marpha	3200	+	–	+	–
Thaksang	3200	+	–	(+)	–
Simbua Khola	3300	–	+	–	–
Gompa/Tarakot	3300	+	–	+	–
Lassetham	3400	+	+	–	–
Phoksumdo Lake	3600	–	–	+	–

Certhia discolor discolor Blyth

Material: 2 specimens: **D** Myagdi Distr., Myagdi Khola between Boghara and pasture Dobang, 2250 m, 21.V.1995: 1♂ (song specimen). **B** Sindhu Palchok Distr., ascent to pass Ting Sang La (E slope), 2350 m, 13.IV.1973: 1♂ (song specimen).

Measurements: Lengths of bill and hallux claw of all treecreeper species is the "chord length", not the slightly longer line along the upper bill/claw surface. Measurements encompass Diesselhorst's material (ZSM). – **Wing**-L ♂ (5) 69-72.5 mm, x̄=70.3; ♀ (1) 69.5 mm. – **Tail**-L ♂ (5) 69-80 mm, x̄=74,1 mm; ♀ (1) 78 mm. – **Bill**-L ♂ (5) 13-17 mm, x̄=15.5; ♀ (1) 15.5 mm. – **Tarsus**-L ♂ (5) 17-18 mm, x̄=17.4; ♀ (1) 17 mm. – **Hallux claw**-L ♂ (5) 8.5-10 mm, x̄=9.1; ♀ (1) 9 mm. – **WTI** (6) 16.4-19.3%, x̄=17.9 – **TWI** (6) 98.6-112.2%, x̄=106.5. – **Bill**-L in % of **Wing**-L ♂ (4) 18.8-22.9%,

$\bar{x}$=21.5; ♀ (1) 22.3%. – **Hallux claw**-L in % of **Bill**-L ♂ (3) 54.6-56.7% (because of its short bill only 76.9% in one ♂); ♀ (1) 58.1%. – **Testes** strongly developed: 9 x 6 and 8 x 5 mm.

Notes: In 1♂ bill dark brown, below lighter, feet grey-brown.

Horizontal: My records range from the SE Dhaulagiri nearly to the Sikkim/Darjeeling border. – Upper Myagdi Khola, near pasture Dobang and between Boghara and Dobang (21.V. :Myagdi, see Material); Phulchoki Mt. (19.-22.III :Lalitpur); ascent to Pass Ting Sang La, E slope (13.IV. :Sindhu Palchok, see Material); N Mai Majuwa (27.III.); between Gitang Khola Valley and Dhorpar Kharka (13.IV., both :Ilam); path to Paniporua from Ilam (16.IV.), Paniporua (17.IV., both :Panchthar). – The records from the upper Myagdi Khola, where at least 2♂ were observed and heard, are the westernmost of the species' range within the breeding season. The skins no. 416, 417 and 418 from Thakkhola and Dhorpatan (Martens 1972), the latter locality even further west than the Myagdi Khola, do not belong to *discolor* but to *nipalensis* (416, 418) and *familiaris* (417).

Vertical: The above records extend from 2100 m (Mai Majuwa) to about 2700 m (Paniporua area), and all additional 8 observations are equally distributed over this vertical belt. Inskipp & Inskipp (1991) give as vertical distribution 2000-2750 m and 3050 m as an exception. In general, during the breeding season the vertical distributional bandwidth does not exceed 800 m. On Mt. Phulchoki (Kathmandu Valley), *discolor* is known from 2000 m (Diesselhorst 1968:356) to 2650 m, close to the summit.

Habitat: Broad-leaved forests in the subtropical cloud zone, mainly oaks, which are the predominant tree at least from 2400 m upwards. I never came across *discolor* in coniferous stands. The Sikkim Treecreeper avoids dense and closed forests, but prefers light forest edges. All my own observations were made in artificially thinned out forest (Phulchoki Mt.), small forest clearings (Mai Majuwa, below Dhorpar Kharka), sometimes close to the next human settlement (Ting Sang La) or to forest edges, which, without exception, originated by human activities, often by forest burning (Paniporua area, 5♂ singing at a few km distance in thinned-out *Quercus semecarpifolia* forest).

Breeding: Apparently an early breeder. Diesselhorst (1968:356) found distinctly enlarged testes on 9.III. (2000 m); singing ♂ on territory on 13.IV. (testes 9 mm, Ting Sang La, 2350 m). Territorial ♂ generally in III and IV, rarely in V (see above). Up to now no breeding record exists for Nepal.

Vocalizations: Territorial song is a loud trill, in general characters and in loudness similar to *himalayana,* but no introductory note is present at the beginning of the verse. For details and sonagrams see Martens (1981a). Recorded song period III and IV, exceptionally to 21.V. (upper Myagdi Khola).

Certhia himalayana himalayana Vigors

Taxonomic note: According to Vaurie (1957c) *C. h. infima* Ripley is at the best to be classified as a subtle form, not as a well marked subspecies.

Material: 9 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 25.V.1970: 1♀ * Gompa/Tarakot, 3250 m, 6.VI.1973: 1♀ ** Myagdi Distr., Dhorpatan, 2950 m, 20.IV.1970: 1♀, 23.V.1973: 1♂ ** Mustang Distr., Purano Marpha, 3150-3300 m, 16.-19.III.1974, 25.IV.1980: 2♂, 1♀, 1 o * Dhumpu near Jomosom, 2900 m, 23.III.1974: 1♂.

Measurements: **Wing**-L ♂ (4) 72-75 mm, x̄=73; ♀ (4) 66-70 mm, x̄=67.6; o (1) 71.5 mm. – **Tail**-L ♂ (4) 64.5-70 mm, x̄=67.5; ♀ (1) 61 mm; o (1) 66 mm. – **Bill**-L ♂ (3) 19-21 mm; ♀ (4) 15-18.5 mm, x̄=16.6. – **Tarsus**-L ♂ (4) 15.5-16.5, x̄=16; ♀ (4) 15-16.5 mm; x̄=15.4. – **Hallux claw**-L ♂ (4) 8-9 mm; ♀ (4) 7-8 mm; o (1) 8 mm. – **WTI** (8) 18.2-22.2%, x̄=19.7, s_d=1.34. – **TWI** (6) 89.6-97.2%, x̄=92.2, s_d=2.62. – **Bill**-L in % of **Wing**-L ♂ (3) 26.4-29.2%; ♀ (4) 22.4-26.4%. – **Hallux claw**-L in % of **Bill**-L ♂ (3) 40.5-47.4% (x̄=43.6); ♀ (4) 43.2-47.1% (x̄=46.0).

Notes: 1♂ (Dhorpatan, 23.V.1973) with well enlarged testes (8 x 5 mm) has bill horn-brown above and whitish below; grey-flesh-coloured legs.

Horizontal: My observations range from NW Dhaulagiri (:Dolpo) to N Annapurna (:Manang), where the species reaches its eastern distributional limit. – Ringmo/Phoksumdo Lake (25.V.), Gompa/Tarakot (6.VI.), Suli Gad Valley (25.V.), Kakkot in upper Barbung Khola Valley (12.VI. all :Dolpo); – Dhorpatan Valley (20.IV., 9.-23.V. :Myagdi); – Thakkhola: dry areas between upper village Ghasa, Lake Titi and Dhumpu/Jomosom (13.-23.III., 23.IV.-1.V., 14.V. all :Mustang); – Marsyandi Valley: between Thimang pasture, Chame and Pisang (17.IV. :Manang).

Vertical: The records mentioned above, all within the breeding season (IV, V), range between 2200 m (Kali Gandaki Valley), 2550 m (Marsyandi Valley) and 3650 m (Phoksumdo Lake), and very likely cover the whole vertical area belt of the species in Nepal. Eleven of the 16 records are between 2900 m (Dhumpu) and 3300 m (Tarakot).

Habitat: In contrast to *familiaris* and *nipalensis, C. himalayana* prefers open forests, especially forest edges, where the trees are gradually thinning out to more or less treeless landscape. Park-like vegetation in agricultural areas, for example peach and apricot orchards close to villages in Thakkhola (:Mustang), is also regularly inhabited (like *brachydactyla* in C Europe). Forests consist of *Pinus wallichiana, Cupressus torulosa, Picea smithiana* (localities in Thakkhola, Dolpo, Manang), in addition *Abies spectabilis* in the Dhorpatan Valley, where *himalayana* lives in the close neighbourhood of *familiaris* and *nipalenis* (Tab.17). Due to the adaptation to arid habitats in central Asia, the area in Nepal is confined to the western drier parts of the country, and in the Dhaulagiri/Annapurna region the species reaches the easternmost limit of its western area (see Portenko & Wunderlich 1980). Very obviously the distribution is confined there to the dry northern slopes and Inner Valleys like Dolpo, Thakkhola and Manang, only the Dhorpatan Valley in SW Dhaulagiri being an exception. In monsoon-reduced central Thakkhola, the dense fir forests of Thaksang, where *familiaris* commonly lives, are largely avoided by *himalayana,* but a few kilometers to the N, above Marpha, habitats for both species are present in close proximity *(Pinus/Cupressus* forests, orchards with old peach trees versus *Abies* forest). At the southern edge of the Dhorpatan Valley, where *himalayana, familiaris* and *nipalensis* coexist, no habitat differences were traceable in IV/V 1970 and 1973; the three species were seen there at close range and caught in a few permanently erected mist nets.

Breeding: Apparently an early breeder. In M III still in flocks of up to 3 specimens but pairs already present (Purano Marpha), first territorial songs heard, but only slight response to playback of song; testes only slightly developed: 2 mm 19.III., 3 mm 23.III. 2 nests 9.V. and 13.V., at least one still with eggs, testes with max. size 8 mm on 23.V. (Dhorpatan, 2950 m). Song period extends from M III (Purano Marpha, 3200 m) at least to M VI (Bar-

bung Khola, 3000 m) and B VII (Thaksang, 3150 m), but none was singing on 10.-12.V. near Purano Marpha. Inskipp & Inskipp (1991) point to early nests on 9.IV. (however not corresponding to testes size, see above) and with young on 8.V.

Vocalizations: Territorial song is a loud trill consisting of nearly identical notes preceded by a spaced-apart and slightly different introductory note. Song is to be heard over fairly long distances and a good indicator of the species' presence. No differences in the territorial song in Afghanistan, Kashmir and Nepal (Löhrl & Thielcke 1969, Martens 1981a). Song period at least from M III to M VI (see Breeding), once heard (and tape-recorded) 8.VII.1970, Thaksang.

Certhia nipalensis Blyth

Material: 5 specimens: **D** Myagdi Distr., Dhorpatan, 2950 m, 23.IV.1970: 1♂ ** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 23.X.1969: 1♀. **G** Manang Distr., Marsyandi Valley, Thimang, N Bagarchap, 15.IV.1980: 1♂ (song specimen), 16.IV.1980: 1♂ (song specimen; in spirit). **B** Sindhu Palchok Distr., Dadar Danda, 3150 m, 23.IV.1995: 1♂.

Measurements: They encompass Diesselhorst's material (ZSM). – **Wing**-L ♂ (5) 71.5-74 mm, x̄=72.9; ♀ (2) 68 and 68.5 mm. – **Tail**-L ♂ (4) 66-69 mm, ♀ (1) 76 mm (measurements of this ♀ from Thakkhola are not in keeping with the rest, the tail being remarkably long). – **Bill**-L ♂ (5) 13.3-15 mm, x̄=14.2, ♀ (3) 13-14.5 mm. x̄=13.8. – **Tarsus**-L ♂ (5) 18.5-19.5, x̄=19.0; ♀ (3) 17-19 mm, x̄=18.2. – **Hallux claw**-L ♂ (5) 8.5-9 mm; ♀ (3) 8-9 mm. – **WTI** (7) 16.8-20.3%, x̄=19.0. – **TWI** (5) 89.2-111.0%, x̄=97.0. – **Bill**-L in % of **Wing**-L ♂ (5) 18.6-20.7%, x̄=19.4; ♀ (2) 19 and 21.3%. – **Hallux claw**-L in % of **Bill**-L ♂ (5) 60-67.7%, x̄=63; ♀ (3) 58.6-64.3%.

Horizontal: Our records extend from SW Dhaulagiri nearly to the Sikkim/Darjeeling border. – Dhorpatan (23.IV.), upper Myagdi Khola N Dobang (24.V., both :Myagdi, see Material); – Chadziou Khola (23.X. :Mustang, see Material); – between Deorali and Chitre (2.V. : Parbat); – Marsyandi Valley, Timang (14.-16.IV. :Manang, see Material); – Dadar Danda W Kalinchok Mt. (19.-23.IV. :Sindhu Palchok); – pasture Lassetham (8.V.), pass Deorali between Yamputhin and Hellok (17.V.), upper Simbua Khola (11.-12.V. all :Taplejung).

Vertical: According to the above records, *nipalensis* occupies an altitudinal belt from 2550 to 3400 m during the breeding season (IV, V). 2550 m (Thimang) seems to be quite low, the next higher records are already 2800 m (Deorali/Chitre) and 2900 m (Simbua Khola) and all others are evenly scattered up to 3400 m (Lassetham, Deorali). Inskipp & Inskipp (1991) extend the range up to 3660 m in summer (no localities given). During summer, the altitudinal belt encompasses about 1100 m, though great local differences seem to exist.

Habitat: *C. nipalensis* inhabits, depending on altitude, a variety of broad-leaved and coniferous forests: open and spaced broad-leaved stands (Thimang), *Abies densa, Tsuga dumosa,* tree *Rhododendron* forest (Simbua Khola), *Abies spectabilis, Pinus wallichiana* (Dhorpatan), *Abies densa, Rhododendron hodgsoni* (Lassetham, Deorali). All habitats have heavy monsoon precipitation and thus most trees are covered by a rich layer of lichens and mosses. They are regularly searched for food, even beneath the large horizontal branches, a good field character for *nipalensis*. Diesselhorst (1968:357) found it even in pure *Rhododendron* stands. The Nepal Treecreeper has a considerably higher population density in

the wet eastern parts of the country, especially east of the Arun (but was likewise common in the Kalinchok area, IV 1995), and is much rarer in the central and western parts, where the species reaches the western limit of its range.

During the breeding season, *nipalensis* was recorded in syntopy with *familiaris,* especially in E Nepal, where *nipalensis* seems to be slightly commoner, and also with *himalayana,* but only in Dhorpatan, where treecreepers are especially abundant (Tab.17).

Breeding: Apparently an early breeder. ♂ from 15.IV. (Thimang, 2550 m) and 23.IV. (Dhorpatan, 2950 m) had testes of maximum size (8 x 4 mm); nest find on 21.IV. with three fresh eggs (Dadar Danda, 3200 m); young are raised in V (for further details see Diesselhorst 1968:357 and Inskipp & Inskipp 1991). The *Certhia* nesting record for Dhorpatan (Martens 1972, Inskipp & Inskipp 1991) does not apply to this species but to *familiaris.* However, *nipalenis* (see Material) is present in the area during breeding season. The nest at Dadar Danda was 80 cm above ground in a fissure of an old fir tree; it was built entirely of dry stems of moss and lined with a few feathers – a quite simple, loose and fragile construction. The first *nipalensis* nest ever recorded.

Vocalizations: Territorial song is a short unobtrusive but shrill trill lasting about 1 s (Martens 1981a for sonagrams), but once the identity is clear, it is a good indicator of the presence of the species. Song period extends at least from M IV (Thimang) to M V (Deorali).

Certhia familiaris mandellii Brooks

Taxonomic notes: The birds breeding in Nepal are *C. f. mandellii,* which in N Punjab are said to mix with *hodgsoni* (Vaurie 1959:539). In his "Systematic Notes" Vaurie (1957c) had not yet mentioned this important situation, and in the AMNH, New York, there is no material to document such mixing apart from a single bird (a *hodgsoni*) from Kashmir. A specimen from Arsu, Kulu District, Punjab (Ann Arbor No. 77739, Koelz leg. 18.XI.1933), probably the westernmost skin of *mandellii* in existence, showed no sign of hybridization with *hodgsoni.* Contact between *mandellii* and *hodgsoni* in the NW Himalayas would be a meeting of two extremely differentiated forms.

Fig.109a shows that the somewhat smaller, distinctly lighter *hodgsoni* has a considerably longer bill and shorter hallux claws than *mandellii. – C. f. hodgsoni:* **Bill**-L in % of **Wing**-L ♂ (6) 26.3-30.0% $\bar{x}$=27.7, s_d=1.27; ♀ (7) 22.7-26.6%, $\bar{x}$=24.4, s_d=1.36 (cf. Fig.109b). – **Hallux claw**-L in % of **Bill**-L ♂ (7) 41.7-47.1%, $\bar{x}$=44.2, s_d=1.76; ♀ (7) 44.1-56.7%, $\bar{x}$=49.4, s_d=4.32.

Evidently the bill-length relationships for *C. f. persica* are much the same as those for *hodgsoni* (according to Stresemann 1928, p. 364 [citation translated]: "In colouration extremely similar to [or indistinguishable from] *C. f. familiaris* ..., but bill much longer, in both sexes just as long as in *C. f. corsa* Hartert."). *C. f. tianschanica* (12 examined in the AMNH and 3 in the Berlin Museum) is also as long-billed as *hodgsoni,* but none of the southern marginal populations *(corsa, caucasica, persica, tianschanica, waschanensis* [see below], *khamensis, mandellii)* is as relatively short-clawed as *hodgsoni.*

The difference between *mandellii* and *hodgsoni* (*mandellii* having a relatively short bill and relatively longer hallux claw) also distinguishes the sexes within each subspecies (cf. the percentage values) and appears in Europe as a difference between the species *C. familiaris*

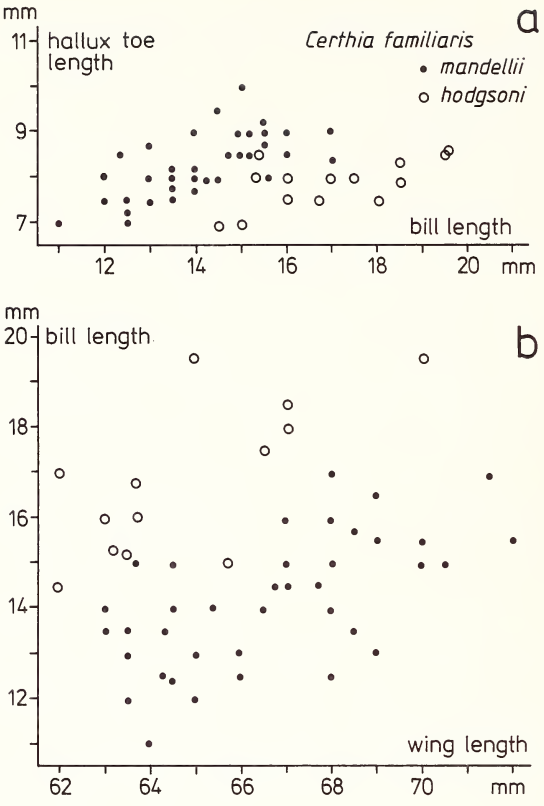

Fig.109: Scatter diagrams to show proportional interrelations of body structures of *Certhia familiaris mandellii* and *C. f. hodgsonii*. a) hallux toe length versus bill length; b) bill length versus wing length.

and *C. brachydactyla*. It is by no means certain that *hodgsoni* actually belongs to the biospecies *C. familiaris;* the file on its taxonomic status is not yet closed.

The treecreepers to the northeast of *mandellii* are generally lumped under the name *khamensis*, but they are not a homogeneous group. For instance, the population of Washan Mt. (*waschanensis* Kleinschmidt & Weigold) is distinct. Birds from SE Tibet, from parts of Szechwan and from Yunnan have **Wing**-L up to 74 mm (12 ♂: 68-74 mm, $\bar{x}$=70.0, s_d=1.76) and belong to *khamensis*. Some of their indices: **Bill**-L in % of **Wing**-L ♂ (10) 21.3-26.4%, $\bar{x}$=23.8, s_d=1.86; ♀ (6) 19.3-23.6%, $\bar{x}$=22.5, s_d=1.65. – **Hallux claw**-L in % of **Bill**-L ♂ (10) 45.7-60.0%, $\bar{x}$=52.5, s_d=4.79; o (6) 51.5-64.3%, $\bar{x}$=57.7, s_d=4.48.

Material: 13 specimens: **D** Dolpo Distr., Gompa/Tarakot, 3300 m, 5.VI.1973: 1♀ ** Myagdi Distr., Dhorpatan, 2950-3400 m, 4.V.1970 (♀ caught by hand on the nest), 11.-23.V.1973: 3♂, 1♀ ** Mustang Distr., Thaksang above Tukche, 3150-3300 m, 25.XI.1969, 4.III.1974, 28.IV.1980: 3♂ (♂ from 28.IV.1980 song specimen) * Purano Marpha, 3200-3300 m, 16.-17.III.1974: 1♂, 1♀ * above Dhumpu near Jomosom, 3000 m, 23.III.1974: 1♂ (?), 1♀. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3300 m, 26.IV.1973: 1♀.

Measurements: This section includes additional skins from Nepal (Nat.Hist.Mus. London, Field Museum Chicago, Zool. Staatssamml. München; altogether 42 skins). – **Wing**-L ♂ (21) 63.5-72 mm,

$\bar{x}$=68.1, s_d=2.48; ♂ pull. (3) 68-69 mm; ♀ (12) 63-69 mm, $\bar{x}$=65.4, s_d=1.82; ♀ pull. (3) 63.5-64.5 mm; o (2) 63.5 and 67 mm. – **Tail**-L ♂ (12) 58.5-70 mm, $\bar{x}$=64.5, s_d=3.49; ♂ pull. (3) 64.5-67 mm; ♀ (7) 54.5-64 mm, $\bar{x}$=60.8, s_d=3.38; ♀ pull. 2x61.5 mm; o 65 mm. – **Bill**-L ♂ (19) 13.5-17 mm, $\bar{x}$=15.3, s_d=1.02; ♂ pull. (3) 12.5-13.5 mm; ♀ (11) 12-14 mm, $\bar{x}$=13.4, s_d=0.81; ♀ pull (3) 11-13 mm; o (2) 12 and 15 mm. – **Tarsus**-L ♂ (7) 16-18 mm, $\bar{x}$=16.7, s_d=0.70; ♂ pull. (2) 16.5 and 17.5 mm; ♀ (4) 16-17 mm, $\bar{x}$=16.4; o (3) 15-17.5 mm. – **Hallux claw**-L ♂ (19) 8-10 mm, $\bar{x}$=8.7, s_d=0.55; ♂ pull. (3) 7-8 mm; ♀ (10) 7-8.8 mm, $\bar{x}$=8.0, s_d=0.51; ♀ pull. (3) 7-8.5 mm; o (3) 8-9 mm. – **WTI** (37) 15.5-20.0%, $\bar{x}$=17.8, s_d=1.11. – **TWI** (25) 86.5-102.4%, $\bar{x}$=94.5, s_d=3.60. – **Bill/wing** index ♂ (19) 20.6-25.0%, $\bar{x}$=22.5, s_d=1.24; ♀ (11) 18.5-22.2%, $\bar{x}$=20.5, s_d=1.25. – **Hallux claw-L/Bill**-L index ♂ (18) 50.0-66.7%, $\bar{x}$=57.5, s_d=4.85; ♀ (10) 56.0-67.7%, $\bar{x}$=59.9, s_d=4.01. – **Testes** between 28.IV. and 23.V. strongly developed: 7-8 x 4-5 mm.

Notes: Bill dark horn-brown to dark brown, base of lower mandible whitish or yellowish (♂) or orange (♀). Feet grey-brown or grey flesh-coloured.

Horizontal: Our records extend from NW Dhaulagiri to close to the Sikkim/Darjeeling border, with most records in the Thakkhola area. – Gompa/Tarakot (5.V., see Material :Dolpo); – Dhorpatan (4.V.1970, 11.-23.V.1973, see Material); upper Myagdi Khola N Dobang (24.V. both :Myagdi); – Thaksang above Tukche (14.-17.III., 27.-29.IV., 25.XI., see Material); Purano Marpha (16.-17.III., 24.IV., see Material), Dhumpu above Jomosom (23.III., see Material; all :Mustang); – Trisuli Valley, Syng Gyang (24.IV., see Material :Rasuwa); – Chordung Mt./Jiri (29.III.-1.IV. :Ramechap); – Thudam (27.V.), pasture Lassetham E Yamputhin (8.V. both :Taplejung.).

Vertical: The above records, all within the breeding season (IV-VI) or close to it (III), range between 2900 and 3500 m. These altitudes indicate only the lower part of the altitudinal belt which is occupied by *familiaris:* Diesselhorst (1968:355) mentions records up to 4200 m in the Khumbu area during and shortly after the breeding season, whereas Inskipp & Inskipp (1991) present the observation of a recently fledged young at only 2800 m, presumably close to the breeding site. Though the affinities of *familiaris* are closest to the cold temperate palaearctically influenced upper forest belt, it may breed locally even below 3000 m and thus penetrate into the upper zone of warm temperate forest types. The vertical belt during the breeding season is about 1000 m wide, but there is considerable variation (see: Habitat).

Habitat: *C. familiaris* inhabits a great variety of differently structured forest types which, as usual at this altitude, consist of various coniferous trees. The only broad-leaved tree, besides various *Rhododendron* species, is *Betula utilis,* the latter only close to timberline. More common forests frequented by *familiaris* consist of *Abies spectabilis,* locally with *Pinus wallichiana* and *Rhodendron arboreum* (Dhorpatan Valley), often interspersed with *Betula utilis* (Thaksang); *Pinus wallichiana* and *Cupressus torulosa* (Purano Marpha in III and IV, absent there in mid V 1995); *Picea smithiana* with *Betula* (Tarakot); *Abies spectabilis* with *Quercus semecarpifolia* (Syng Gyang); *Abies densa* with several *Rhododendron* species, mainly *hodgsoni* (Lassetham, Thudam). Diesselhorst (1968:355) found it in pure *Betula* stands.

The inhabited forests may be very thick/dense and the floor heavily shaded, the trees standing close to each other (*Abies* forests of Thaksang) or they may be open, thinning out to single spaced trees (Dhorpatan Valley). *C. familiaris* seems to have highest population den-

sity in the less monsoon-influenced forest types north of the main range, especially in Thakkhola, where I found a rich population above Tukche (Thaksang) and above Marpha. *C. familiaris* is also present in *Picea* forests of lower Dolpo (Tarakot), but is apparently absent from the dry *Pinus* and *Cupressus* forests on Lake Phoksumdo. Heavy monsoon climate does not seem very favourable for *familiaris,* as it is not commonly encountered E of Mt. Everest close to the Sikkim/Darjeeling border: S of Mt. Kanchenjunga, when staying in the appropriate altitude in IV and V, I found it only twice. The northern, somewhat protected part of the Khumbu area (Mt. Everest) receives less monsoon precipitation, but the species is rare there, too (Diesselhorst 1968:355). Areas near timberline are inhabited only by thin and scattered populations.

Other *Certhia* species occur syntopically with *familiaris* (Tab.17): During the breeding season, it may live in close proximity to *nipalensis* and *himalayana.* Only in the Dhorpatan Valley all three species coexist, with no discernible habitat difference. This also holds true for localities shared by *familiaris* and *nipalensis.* Only *familiaris* and *himalayana,* though they two may live close together, generally keep apart (see *C. himalayana).* However, in the upper Myagdi Khola, where strong climatic gradients prevail, I found three species distinctly spaced: *discolor* at 2250-2400 m (broad-leaved forest), *nipalensis* at 2950 m (*Tsuga* stands) and *familiaris* at 3200 m (*Abies* forest; V).

Breeding: It takes place quite early in the year and is confined to a short period only. In M to E III, small flocks together with *Parus ater, P. rufonuchalis* and *Regulus regulus* were still seen wandering around (Purano Marpha, 3200 m, 16.III.1974; Dhumpu/Jomosom, 3000-3100 m, 23.III.1974.). Song of *familiaris* within these flocks was sometimes heard. E IV (1980) in Thaksang, close to the former two localities, pairs were formed, and upon playback experiments mostly both partners came to the speaker. On 4.V. (1970) a nest with eggs was found (Dhorpatan Valley, 3400 m). In accordance with these data, Diesselhorst (1968:355) did not find any sign of breeding activity M VI, when he arrived in the Khumbu area. All young were fledged, and independent of the adults. Developmental state of testes see above, largest in E IV to E V.

Nest in a hole of a *Rhododendron* tree, 50 cm above the ground, the bottom of the nest consisting of *Rhododendron* bark, above the bottom pieces of rotten wood, feathers and hairs; 4 eggs on 4.V., ♀ incubating (3400 m).

Vocalizations: *C. familiaris* is only an occasional singer, and I heard the spontaneous song only few times: still in flocks with other passerines (M/E III, see above), 8.V.1988 (3350 m, Lassetham), 27.V.1988 (3550 m, Thudam). Even during highest sexual activity in E IV (see above), no spontaneous song was heard in the pair-rich Thaksang population. Very likely, population density, especially in thick shadowy forests, may thus be underestimated. The territorial song in Nepal is very different from that in Europe, but close to the song in Sichuan (Martens & Geduldig 1988, which see for sonagrams). Playback of song from Germany did not provoke any reaction in Thakkhola, but Nepal song is at least partly "understood" in Germany (Martens & Geduldig 1988). Even the meaning of certain calls is different in the two populations (Martens 1981a).

REMIZIDAE

Cephalopyrus flammiceps

Horizontal: My records are from S Dhaulagiri and NE Annapurna. – Muri, Myagdi Khola, 2♂ 1♀ (26.III.1970; at that time the first record for Nepal [see Martens 1972], :Myagdi); – above Bagarchap, Marsyandi Valley, 1♂ 1♀ (14.IV.1980); forest clearing Thimang above Bagarchap, 1♂ 1♀ (15.IV.1980, ♂ singing), 1♂ (16.IV.1980; all :Manang).

Vertical: 2100 m Muri (26.III.); 2400 m above Bagarchap (14.IV.); 2550 m Thimang (15/16.IV.). Altitudinal records from Nepal range between 2100 and 3000 m (Inskipp & Inskipp 1991), but they are not specified with respect to breeding activity.

Habitat: Open broad-leaved forest or clearings with scattered trees (IV, presumed breeding ground; III, still in the winter quarters or on migration). The records near Bagarchap are on the borderline to the dry markedly monsoon-reduced area N of the Annapurna main range. The Fire-capped Tit is extremely local in Nepal; there is only one breeding record from Khaptad National Park.

Vocalizations: The territorial song (Fig.103m; only once recorded near Bagarchap) is a trill of 4 to 25 double notes, the higher-pitched one with an angular structure. The trill is preceded by an introductory descending whistle. Except for the number of double-notes, all recorded verses of this ♂ were alike.

NECTARINIIDAE

Nectarinia asiatica asiatica (Latham)

N. [asiatica] incl. *osea, bouvieri, oustaleti, talatala.*

Material: 6 specimens: **N** Chitawan Distr., Rapti Valley S Tekouli, Hatisar, 300 m, 12.-14.II.1970: 2♂, 4♀.

Measurements: **Wing**-L ♂ (2) 56.5-57 mm; ♀ (4) 53-54.5 mm, $\bar{x}$=53.6. – **Tail**-L ♂ (2) 33.5-35 mm; ♀ (4) 29.5-31 mm, $\bar{x}$=30.1. – **Bill**-L ♂ (2) 16.5-19 mm, ♀ (4) 17-18 mm, $\bar{x}$=17.3. – **Tarsus**-L ♂ (2) 13.5-14 mm; ♀ (4) 13.5-15 mm, $\bar{x}$=14.5. – **WTI** (6) 18.4-22.6%, $\bar{x}$=20.6, s_d=1.92. – **TWI** (6) 55.1-61.4%, $\bar{x}$=57.6, s_d=2.38.

Notes: Though all ♀ originate from the same season, only one is evenly yellow below, another one is patchily yellow. The distal white spots of the outer rectrices differ very much in size.

Horizontal: Dharbang, Myagdi Khola (22.III.); below Muri, ascent to Nerwang (27.III.); Beni (22.III; all :Myagdi); – below Dana (3.V. :Mustang); – Rapti Valley S Tekouli (12.-14.II., see Material; :Chitawan); – Kathmandu Valley, suburb (27.VI; IX, :Kathmandu); – Mai Khola, ascent to Ilam (8.IV. :Ilam).

Vertical: My records range from 300 m (Rapti Valley, see Material) to 1500 m (below Dana) and 1550 m (below Muri). The upper limit of the Purple Sunbird is near 1800 m (Diesselhorst 1968:372, Landmann et al. 1991; IV and V), so that the vertical area comprises about 1500 m.

Habitat: All kinds of arboreal vegetation, but always in open and light parts: forest edges, clumps of bushes on river banks, cultivated land as long as at least scattered trees and bu-

shes remain. This sunbird penetrates into the suburbs of Kathmandu, where it is regularly met in gardens, and breeding in Kathmandu Valley has been confirmed (Inskipp & Inskipp 1991). While hovering in front of distal parts of twigs, a ♂ was capable of picking up arthropods, mainly spiders (Kathmandu, 27.VI.).

Aethopyga

Five species occur in Nepal; all breed *(gouldiae, nipalensis, saturata, siparaja, ignicauda).* Their common vertical area belt ranges from the tropical lowlands (200 m, *siparaja*) to beyond timberline (4100 m, *ignicauda*), but the individual species' distribution is limited to much narrower belts. Though there is considerable overlap at least in some places, all species occupy distinct belts of their own (Martens 1984, Landmann et al. 1991). Only rarely were more than one species found at close range (*nipalensis* and *gouldiae,* Lete 2400 m, V). The five Himalayan species penetrated into their narrow Himalayan areas from much larger area parts east and southeast of the Himalayas. There may be a still undescribed taxon in Nepal that is close to *gouldiae.*

Aethopyga spec.

Material: 1 specimen: **D** Mustang Distr., Chadziou Khola, 2650 m, 1.VII.1970: 1♀.

Measurements: **Wing**-L 51 mm. – **Tail**-L 33.5 mm. – **Bill**-L 15 mm. – **Tarsus**-L 13.5 mm. – **WTI** 24.5%. – **TWI** 65.7%. P10 2 mm > coverts of primaries, P9 between P5 and P4.

Notes: Upper head, the small upper wingcoverts and a broad blurred band across the back of this specimen are conspicuously bronze-coloured, unknown in any other *Aethopyga*-♀ (compared with material of the collections of the British Museum and the museums in Paris, New York, Berlin, Bonn, Dresden, Frankfurt/M. and Munich). According to size, wing/tail proportions and bill sculpture, this ♀ corresponds to *Ae. gouldiae* (Tab.18).

Tab.18: Wing and tail relations (wing/tip index, WTI; tail/wing index; TWI) of some *Aethopyga* subspecies (♀):

	WTI (%)	x̄	n	TWI (%)	x̄	n
Ae. gouldiae dabryi	19.2–23.9	20.8	10	64.2–70.9	67.3	10
Ae. gouldiae gouldiae	17.2–22.0	19.6	4	60.0–69.2	62.8	4
Ae. gouldiae isolata	17.3–20.8	18.7	10	62.1–69.7	67.0	8
Ae. saturata assamensis	13.3–18.2	16.6	8	56.8–70.2	65.3	6
Ae. nipalensis koelzi	15.8–20.0	17.2	6	74.3–87.1	82.3	4

Horizontal, vertical, habitat: The above-mentioned specimen was mist-netted in dense broad-leaved forest, namely at the edge of a clearing with *Arundinara* bamboo thickets up to 5 m high. *Ae. nipalensis* was also present there. This specimen was misidentified in Martens (1984, Fig.13) as *Ae. saturata,* resulting in an unjustified extension of the altitude belt for this species (see Landmann et al. 1991).

Aethopyga nipalensis

Vertical (all subspecies): During the presumed breeding season (E IV-VI) records from 2100 m (Mure/Hurure, 16.VI.) to 3400 m (Baldebas, 30.V.) covering a vertical area belt

1300 m in width. 22 observations (localities) are evenly distributed over this range, but there is a slight concentration of 8 localities between 2550 and 2750 m. Inskipp & Inskipp (1991) indicate 1830-3505 m as vertical span during "summer", but months are not given. Seems to arrive early in the breeding grounds: 29.III. at 2550 m in upper Gitang Khola, but also still in small flocks at this time; 24.IV. at 3200 m in Syng Gyang.

Habitat (all subspecies): The Green-tailed Sunbird, with its broad vertical area belt, inhabits a remarkable array of forest types, a few of which are indicated here: Mixed *Quercus* (Mure/Hurure, 2100 m), *Lithocarpus pachyphylla/Rhododendron/Magnolia* (Dhorpar Kharka, 2700 m), *Quercus semecarpifolia/Magnolia* (Pahakhola, 2750 m), *Abies spectabilis/Pinus wallichiana, Rhododendron* (Dhorpatan, 3000 m), *Picea smithiana/Betula utilis* (Gompa/Tarakot, 3300 m). In any localities, light open forests, clearings and forest edges are preferred. *Ae. nipalensis* also penetrates into the monsoon-reduced NW slopes of Dhaulagiri near Tarakot and the Suli Gad Valley close to Phoksumdo Lake. It is, however, absent in the upper Kali Gandaki Valley N of Lete, where monsoon precipitation abruptly falls nearly to zero.

This species frequently exploits flowers but apparently does not entirely depend on flowers to feed: *Agapetes serpens* (Ericaceae) (11.IV.), *Piptanthus nepalensis* (Leguminosae) (24./25.IV., 9.V.), *Berberis* sp. (Rosaceae) (31.5./1.VI.), *Aeschynanthus sikkimensis* (Gesneriaceae) (16./17.VI.). The birds suck up the nectar while sitting or hanging on twigs or hovering in front of flowers.

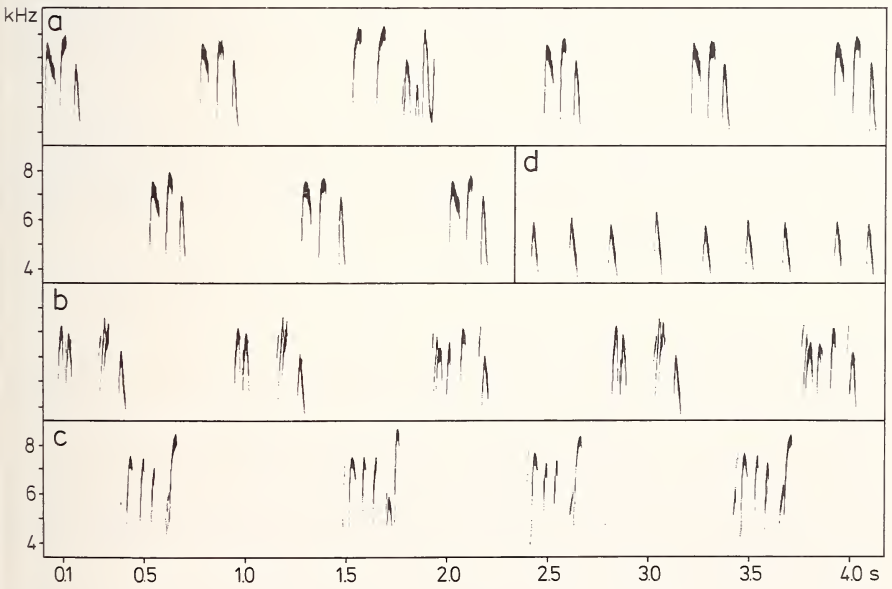

Fig.110: Vocalizations of *Aethopyga nipalensis*. – Territorial song (a-c) and calls (d). a) Paniporua 19.IV.1988; b) 1st ♂ Lassetham/Yamputhin 15.V.1988; c) 2nd ♂ Lassetham/Yamputhin 15.V.1988; d) Gosainkund 24.IV.1973.

Vocalizations: The territorial song (Fig.110a-c) consists of note blocks (phrases; 0.2-0.4 s long), separated by pauses of only slightly longer duration than the blocks (0.5-0.7 s). The homogeneous and consecutive sequences of note blocks and pauses result in a uniform twitter, which is not divided into distinct verses and which may last for minutes. The note blocks consist of 3-7 extremely frequency modulated notes, always beginning with a steep frequency ascent and a similar descent, steepest within the 3 *Aethopyga* species dealt with here; the descent is often reduced. The turning point of most of the angular notes is near 8 kHz, sometimes beyond (Fig.110c). Within the sequence note blocks are repeated without variation, a different note block being sometimes interspersed (Fig.110a, 3rd note block). Note composition and note shape of note blocks may vary considerably (Fig.110a) or only slightly (Fig.110b-c). Frequency range of song of 3♂ is from 4 to 8.2 kHz, band width 4.2 kHz, the individual note's band width is from 1.2-3.8 kHz. – In warning call series (Fig.110d) the nearly identical notes are further apart (0.16-0.2 s), frequency bandwidth is narrower than in the song (1.8-2.2 kHz, slightly varying). – Normally, the song is displayed 3-5 m above the ground in a tree, mostly in good shelter of the foliage, and only rarely on the top of a low tree (seen once, Paniporua, IV).

Aethopyga nipalensis horsfieldi (Blyth)

Material: 5 specimens: **D** Myagdi Distr., Gustung Khola Valley, 2800 m, 28.V.1973: 1♂ ** Dolpo Distr., Gompa near Tarakot, 3300 m, 13.-15.V.1973: 3♂, 1♀.

Measurements: **Wing**-L ♂ (4) 54-57 mm, x̄=55.1; ♀ (1) 50 mm. – **Tail**-L ♂ (4) 62-71 mm, x̄=65.6; ♀ (1) 42 mm. – **Bill**-L ♂ (3) 17.5-19 mm; ♀ (1) 18 mm. – **Tarsus**-L ♂ (4) 15-15.5 mm; ♀ (1) 14.5 mm. – **WTI** ♂ (4) 18.2-21.3%, x̄=19.4; ♀ (1) 18.0%. – **TWI** ♂ (4) 114.8-124.6%, x̄=119.0; ♀ (1) 84%. – **Testes** large, 8 x 5 mm.

Notes: ♂ from 28.V. with bill black, feet grey-black.

Horizontal: Own records from NW to SW Dhaulagiri – Suli Gad Valley, 3200 m, 9.VI.; Gompa near Tarakot, 3400 m, 13.-15.V. (see Material); Baldebas, several records up to 3400 m, 30.V.); Gustung Khola N Thankur, 2800 m, 28.V. (see Material; all :Dolpo); – Dhorpatan, 3000 m, 9.V. (:Myagdi).

Aethopyga nipalensis horsfieldi x nipalensis

Material: 2 specimen: **D** Mustang Distr., Chadziou Khola, 2600 m, 29.VI.1970: 1♂. * Lete Khola opposite Lete, 2400 m, 7.V.1995: 1♀.

Measurements: **Wing**-L ♂ 55; ♀ 50 mm. – **Tail**-L ♂ 65; ♀ 44 mm. – **Bill**-L ♂ 18; ♀ 17.5 mm. – **Tarsus**-L ♂ 16; ♀ 14.5 mm. – **WTI** ♂ 18.2; ♀ 19%. – **TWI** ♂ 118.2; ♀ 88%. – **Testes** 4 x 3 mm.

Notes: ♂: the red-brown margin of the metallically shining nape is markedly broader in birds from more western areas but not as broad as in the 2 ♂ from Syng Gyang (despite the different method used to prepare the study skin).

Horizontal: Lete, up to 2600 m, 1.-7.V.; between Lete and Ghasa, 2400 m, 2.V.; Chadziou near Ghasa, 2600 m (29.V.; see Material, all :Mustang); – Marsyandi Valley, Thimang above Bagarchap, 2600 m, 16.IV. (:Manang).

Aethopyga nipalensis nipalensis (Hodgson)

Material: 2 specimens: **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 24.-25.IV.1973: 2♂.

Measurements: **Wing**-L (2) 52-55 mm. – **Tail**-L (2) 64-66.5 mm. – **Bill**-L (1) 18.5 mm. – **Tarsus**-L (2) 15 mm each. – **WTI** (2) 19.1-21.2%. – **TWI** (2) 120.1-123.1%. – **Testes** enlarged, 6-7 x 4 mm.

Notes: Bill black, feet dark grey.

Horizontal: Trisuli Valley, Gosainkund, Syng Gyang, 3200 m, 24./25.IV. (see Material, :Rasuwa); – Kathmandu Valley, Phulchoki Mt., 2700 m near summit, 24.III., 14.V. (:Lalitpur); – Arun Valley, between Mure and Hurure, 2100 m, 16./17.VI.; Pahakhola, 2750 m, 31.V./1.VI. (both :Sankhua Sabha); – below pasture Lassetham, 2900 m, 3000 m, 15.V. (:Taplejung); – Paniporua, 2300 m, 19.IV.; Dhorpar Kharka, 2700 m, 14.IV.; upper Gitang Khola, 2550 m, 29./30.III. (all :Panchthar); – Mai Pokhari, 2150 m, 11.IV. (:Ilam).

Aethopyga saturata saturata (Hodgson)

Material: 3 specimens: **D** Myagdi Distr., Muri, 2100 m, 31.III.1970: 1♂ * upper Myagdi Khola, Boghara, 1800 m and S Boghara, 1450 m, 27.-28.V.1995: 2♀.

Measurements: **Wing**-L ♂ 63, ♀ (2) 49 mm. – **Tail**-L ♂ 74.5, ♀ (2) 35 and 35.5 mm. – **Bill**-L ♂ 18, ♀ (2) 16 and 17 mm. – **Tarsus**-L ♂ 14.5, ♀ (2) 13.5 and 14 mm, – **WTI** 3x14.3% – **WTI** ♂ 118.3, ♀ (2) 71.4 and 72.4%.

Horizontal: Scattered records from Dhaulagiri, Marsyandi Valley and close to the Sikkim border. – Muri, Myagdi Khola (31.III.; see Material); Boghara and S Boghara (27./28.V. all :Myagdi); – Kali Gandaki Valley, below Ghasa (14.V. :Mustang); – between Turture and Syuribar (8.IV. :Tanhu); – Yamputhin (29.IV. :Taplejung).

Vertical: 600 m Turture/Syuribar; 1450 m and 1800 m Boghara; 1800 m Yamputhin; 1900 m Taplejung; 1950 m below Ghasa; 2100 m Muri. The altitudinal distribution is still unclear, at least with respect to the breeding season. The Muri-♂ already had enlarged gonads E III, the Yamputhin-♂ was actively displaying song, apparently close to or at the breeding ground. The status of the Marsyandi-♂ is unclear; it was probably not within the breeding belt. Inskipp & Inskipp (1991) mention summer records (months?) rarely up to 2200 m. The breeding belt may be less than 1000 m wide.

Habitat: Open *Rhododendron* forest edge (Muri); singing in the bush layer in heavy broad-leaved forest artificially opened to some extent (Yamputhin).

Vocalizations: The territorial song (Fig.111a-b) consists of note blocks (phrases; 0.1-0.4 s), separated by pauses of varying length (0.5-0.7 s). The homogeneous and consecutive sequences of note blocks and pauses result in a uniform twitter ("zwit zitzitzitzewee"), which is not divided into distinct verses and which may last for minutes. The note blocks consist of 2-4 strongly frequency-modulated notes, always beginning with a steep frequency ascent and a similar descent, 2 such angular notes often being combined. Longer notes of low frequency range (Fig.111a), which are only slightly modulated, also occur. The turning point of several of the angular notes reaches 8 kHz, many only 7 kHz. Frequency range of song of the only ♂ recorded is from 4-8.3 kHz, bandwidth 4.3 kHz, the individual note's bandwidth ranges from 0.6 to 3 kHz. – In warning call series (Fig.111c-f) varying angular notes are used, often combined in a rising and falling manner (Fig.111c), also marked frequency jumps between note groups occur (Fig.111e-g). Notes are often prolonged resulting

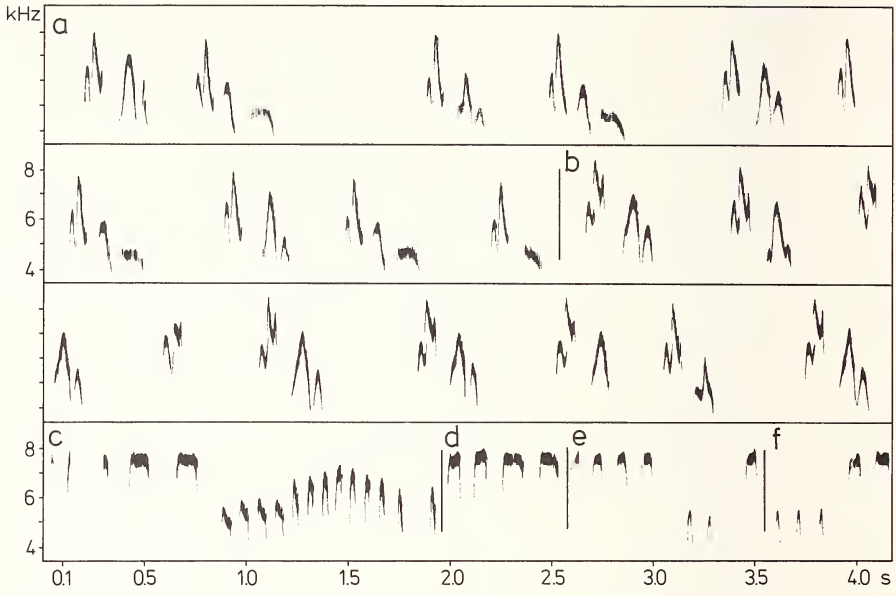

Fig.111: Vocalizations of *Aethopyga saturata*. – a-b) parts of 2 song sequences; c-f) 4 warning call series; a-f: Yamputhin 29.IV.1988.

in whistle-like components. – Song is displayed in dense foliage, often only 2-3 m above ground, the bird being hidden and difficult to see.

Aethopyga siparaja

Horizontal: My records originate from: Trisuli (21.IV. :Nuwakot); – Muri (28.III. :Myagdi); – Khandbari (21.VI. :Sankhua Sabha), N Sunichare (4.IV. :Ilam), – Gunsa Khola below Kibla (12.IX. :Taplejung).

Vertical: The above records range from 250 m (Sunichare), 570 m (Trisuli), 1150 m (Khandbari), near 1800 m (Kibla) to 2100 m (Muri). The last three records are near the upper limit of the species (".. occasionally seen up to 1200 m, and scarce up to 1800 m." [Inskipp & Inskipp 1991]). The Crimson Sunbird is predominantly a lowland species in Nepal; the upper distributional limit during the breeding season is imperfectly known, as is the breeding season at various altitudes. Current breeding records are only from the lowlands.

Habitat: Light *Shorea robusta* (Sunichare) or *Rhododendron* forest (Muri) with clearings, agricultural land even within towns and cities (Khandbari, Trisuli) or even single flowering trees on open deforested slopes (Kibla).

Aethopyga ignicauda ignicauda (Hodgson)

Material: 1 specimen: **M** Taplejung Distr., SW Kanchenjunga, upper Simbua Khola Valley, 3350 m, 12.V.1988: 1♂.

Measurements: **Wing**-L 59.5 mm. – **Tail**-L 115 mm (T1-T6: 84 mm; T2-T6: 18 mm). – **Bill**-L 19 mm. – **Tarsus**-L 15 mm. – **WTI** 19.3%. – **TWI** 193.3%. – **Testes** 6 x 4 mm.

Horizontal: My finds range from W Dhaulagiri to the Sikim/Darjeeling border. – Between Dhorpatan and Thankur (25.V. :Myagdi); – Ghorapani Pass (11.VII. :Parbat); – descent to Pahakhola (30.V.); descent from Pomri La to Pahakhola (29./30.V.); ascent from Thudam to Gabri Khola Valley (29.V.); Thudam (26.V.); from Kangla Khola Valley to Thudam (25.V. all :Sankhua Sabha); – upper Simbua Khola (12./14.V. :Taplejung); – Gitang Khola N Mai Pokhari (30.III.); Mai Pokhari (26.III. both :Ilam).

Vertical: Presumed breeding season (M V-[?]VII): One record at 2700 m (Ghorapani Pass, 11.VII., 2 sp.) is exceptionally low, all other observations range between 3350 m and 4100 m. Due to heavy snowfall within the breeding altitude of that species, at least in the Kanchenjunga massif even within V, the breeding season may start quite late, probably not before mid V or even later at the upper limit of distribution. The actual breeding belt is thus quite difficult to ascertain. At 3350 m, Simbua Khola, during heavy snowfall at higher altitudes on 12./14.V., dozens of Fire-tailed Sunbirds fed at various *Rhododendron* species, but, though ♂ displayed, at least most of them were certainly not at the breeding grounds. In the Kanchenjunga massif, judging from singing and displaying behaviour, the local breeding population is distributed from 3550 m up to 4100 m (Gabri Khola above Thudam, 29.V.). At least in that area, the vertical belt is quite narrow and may in fact not exceed 600 m.

Outside breeding season: E III, the local breeding population mostly still remains far from the breeding grounds at low altitudes: 2200 m, 26.III., 3♂, Mai Pokhari; – 2550 m, 30.III., 1♂, upper Gitang Khola.

Habitat: At least during the breeding season, the Fire-tailed Sunbird is associated with various bush and tree *Rhododendron* species, which are numerous, both in species and numbers, from E Nepal eastwards. They flower over most of the breeding season and the blossoms are regularly visited for nectar and insects. Consequently, the species is most common in areas where *Rhododendron* species prevail (see above data from the Kanchenjunga area). In the lower part of the breeding belt, apart from *Rhododendron,* conifers dominate, mainly *Abies* species, and *Betula utilis.* Near and at the upper limit, only low bushy *Rhododendron* species persist beside *Salix* and *Juniperus. Ae. ignicauda* is a hardy species which readily sustains the climatic hardships even above timberline.

Breeding: A ♀ tore bark from the stem of a living *Rhododendron thomsonii* tree, apparently to use it as nesting material. It was observed twice being accompanied by the ♂ (30.V., 3670 m).

Vocalizations: Territorial song (Fig.112a-e) is a high-pitched twitter; verses are well marked but vary greatly in length (0.5 s/4 notes to 3.1 s/20 notes), pauses between verses are short (1.1-1.6 s). Verses consist of note blocks (phrases), partly regular (repetition of two different notes, Fig.112b, part of Fig.112d), partly irregular (changing composition of single notes within blocks of notes, Fig.112c-e). The 2♂ whose songs are illustrated (Fig.112a; b-e) used about 8 and 12 different notes, respectively. Notes are short (0.05-0.15 s), strongly frequency-modulated; the simpler ones are angular shaped and mostly opened downwards with turning-point often near or even above 8 kHz, rarely above 9 kHz.

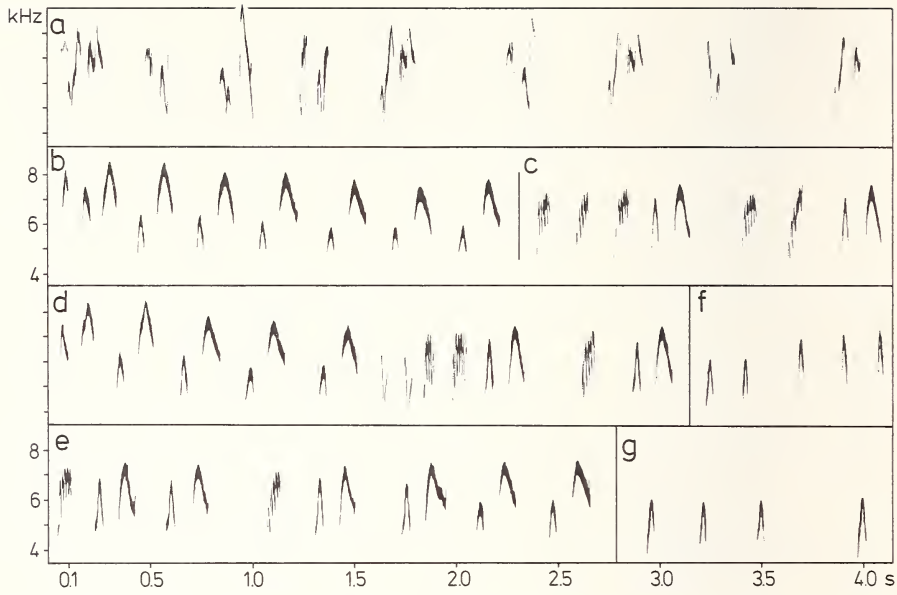

Fig.112: Vocalizations of *Aethopyga ignicauda*. – Territorial song (a-e) and calls (f-g). – a) Thudam 27.V.1988; b-f) above Pahakhola 30.V.1988; g) above Thudam 27.5.1988.

Frequency range of song of 2♂ is from 4 to 9.2 kHz, bandwidth of all verses 5.2 kHz, the individual note's bandwidth ranges from 1 to (rarely) 4.5 kHz.

In warning call series ("zit tititit..", Fig.112f-g) the nearly identical notes are narrowly angular, their distances vary (frequency range is considerably narrower than in verses, 1.5-2.5 kHz).

The ♂ displays song on treetops and bushes, often exposed; when aroused, the long tail is raised.

DICAEIDAE

Dicaeum

Seven species are recorded for Nepal *(agile, chrysorrheum, melanoxanthum, erythrorhynchos, concolor, ignipectus, cruentatum),* probably all breed, but breeding records are lacking for *chrysorrheum, melanoxanthum, erythrorhynchos* and *cruentatum.* In accordance with the tropical origin of the genus, most species are confined to the lowlands in Nepal, but *agile, melanoxanthum, concolor* and *ignipectus* are known to range up to 2000 m (locally even higher). Ecological interrelationships between the Nepal species remain to be analysed.

Dicaeum melanoxanthum (Blyth)

Dicaeum [malanoxanthum], incl. *vincens*

Material: 1 specimen: **G** Parbat Distr., ascent from Sikha to Ghorapani, 2350 m, 11.VII.1973: 1♂.

Measurements: **Wing**-L 73 mm. – **Tail**-L 43 mm. – **Bill**-L 8 mm. – **Tarsus**-L 14.5 mm. – **WTI** 27.4%. – **TWI** 58.9%. – **Testes** enlarged, 5 x 4 mm.

Horizontal, vertical, habitat: The only specimen was encountered at the lower forest edge on the trail from Sikha to Ghorapani Pass, where the forested area above the village starts (or at least did in 1973). As concerns testes development, the specimen was at or at least close to the breeding ground. This is one of the very few summer records from Nepal and among them the lowest one (see Inskipp & Inskipp 1991).

Dicaeum ignipectus ignipectus (Blyth)

Dicaeum [hirundinaceum] ignipectus

Material: 2 specimens: **D** Myagdi Distr., Muri, 2100 m, 27. and 29.III.1970: 1♂, 1♀.

Measurements: **Wing**-L ♂ 50; ♀ 46 mm. – **Tail**-L ♂ 25.5; ♀ 23 mm. – **Bill**-L ♂, ♀ 9 mm. – **Tarsus**-L ♂ 13; ♀ 12.5 mm. – **WTI** (2) 23.9 and 26%. – **TWI** (2) 50 and 51%.

Notes: A detailed analysis of the age differences of the closely related *D. hirundinaceum* was presented by Liddy (1984).

Horizontal: My few records range from S Dhaulagiri to Tamur Valley. – Muri, Myagdi Khola (27.III.-2.IV. :Myagdi; see above); – below Ghasa (14.V. :Mustang); – Trisuli Valley, between Ramche and Dhunche (22.IV. :Rasuwa); – Arun Valley, ascent to Num (8.VI. :Sankhua Sabha); – Tamur Valley, N Lungthung (19.V. :Taplejung).

Vertical: The few records are distributed as follows: 1450 m ascent to Num (8.VI., ♀-like specimen); 1850 m Lungtung (19.V., fledgling being fed); 1800-2000 m Ramche/Dhunche (22.IV., several individuals); 1950 m Ghasa (14.V., ♂); 2100 and 2300 m Muri (27.III.-2.IV.). Inskipp & Inskipp (1991) summarize the present "summer" records from 1830 to 2700 m, but the part of the vertical area in which breeding activity takes place is still unknown.

Habitat: The few specimens observed stayed at forest edges (Muri), in a forest clearing (Num) or in secondary scrub with single trees (Lungthung; Ghasa). The preference of the Fire-breasted Flowerpecker for open forest, even secondary and scrub, is obvious. It may be often overlooked in the canopy of mature forests.

Breeding: Testes of the Muri-♂ were slightly enlarged (about 2 mm; 27.III.); a fledgling was fed with black (dark blue?) berries on 19.V. Both data show that the breeding season (generally ?) starts early, in IV. The Lungthung fledgling represents the third breeding record for Nepal.

ZOSTEROPIDAE

Zosterops palpebrosus (Temminck)

Material: 3 specimens: **N** Chitawan Distr., Rapti Valley S Tekouli, Hatisar, Rapti banks, 300 m, 10.II.1970: 2♂, 1o.

Measurements: **Wing**-L ♂ (2) 53 and 54 mm; o 52 mm. – **Tail**-L ♂ (2) 36.5 and 38.5 mm; o 35.5 mm. – **Bill**-L ♂ (2) 10.5 and 12 mm; o 9.5 mm. – **Tarsus**-L (3) 15-16 mm. – **WTI** (3) 18.5-19.2%. – **TWI** (3) 68.3-71.3%.

Horizontal: Rapti Valley S Tekouli (10.II., see Material; :Chitawan); – Potana (28.IV. :Kaski); – above Ghandrung (30.IV. :Parbat); – ascent to Ilam (8.IV.); below Mai Pokhari (9.IV. both :Ilam).

Vertical: 300 m Tekouli; 700 m ascent to Ilam; 1700 m below Mai Pokhari; 2000 m Potana; 2100 m Ghandrung. The species' altitudinal range is from the lowlands up to 2440 m according to Inskipp & Inskipp (1991).

Habitat: The Chitawan specimens originate from a forest edge on the Rapti bank, the other observations are from agricultural land with scattered trees, in a small ravine with only few bushes and trees below Ilam. At this place adults exploited the red tubular flowers of *Woodfordia fruticosa* (Lythraceae) for nectar and/or insects.

Breeding: In the Mai Khola Valley, a fully grown fledgling was fed by the parents on 8.IV.1988, indicating quite an early start of the breeding season, in III or even in late II.

ORIOLIDAE

Oriolus

Four species occur in Nepal *(traillii, xanthornus, tenuirostris, oriolus);* they are breeding birds except for *tenuirostris.* They are confined to tropical and subtropical altitudes, but vertical belts differ in detail. *Xanthornus* occurs only below 1000 m, *oriolus* from the lowlands up to 1800 m, locally higher. *O. traillii* settles the highest but small belt between 1500 m and 2500 m. *O. tenuirostris* is a local winter visitor. Neither shared habitats nor interactions of two species during the breeding season have yet been recorded.

Oriolus trailli

Oriolus [trailli], incl. *melli*

Horizontal, vertical: I encountered the species only in two places, slopes on the left bank of Kabeli Khola off Yamputhin (27.-29.IV. :Taplejung), 1900 m and above Bega (16.V. :Myagdi), 2300 m. There were several in light mature broad-leaved forest with clearings close to agricultural areas on steep slopes with small ravines (Yamputhin) and in heavy though locally cleared subtropical cloud forest (Bega). The birds roamed about the canopy but were freely seen when sunbathing or crossing ravines. Vertical distribution is 1500-2400 m in summer (Inskipp & Inskipp 1991).

Vocalizations: Much oriole-like, short fluting verses.

Oriolus xanthornus

Horizontal, vertical: The only observation in the Nodia Khola between Sunichare and Soktim (7.IV. :Ilam), 300 m. The singing ♂ was in low bushes close to the forest edge.

Vocalizations: Much oriole-like with fluting notes.

Oriolus oriolus

Horizontal: Own records from the NW Dhaulagiri to the Tamur Valley. – Suli Gad Valley, Parila (7.VI. :Dolpo); – Myagdi Khola above Babiyachaur (30.V. :Myagdi); – above Landrung (8.V.); near Mahandra Gupa (cave) NW Pokhara (11.V. both :Kaski); – Marsyandi Valley, between Turture and Syuribar (8.IV. :Lamjung); – Kathmandu Valley, outskirts of the city, New Baneshwar, 3 sp. (26.VI. :Kathmandu); – Tamur Valley, Hellok (18.V. :Taplejung).

Vertical: The above records, all from the assumed breeding season or close to it (V, VI), range from 600 m (Turture/Syuribar), 950 m (Babiyachaur) to 2600 m (Parila). The observation next below Parila is 1830 m (Landrung). The Parila record surpasses the previously known upper limit of the species range (1830 m, Inskipp & Inskipp 1991) by about 800 m.

Habitat: Open forest, often near edges, also groves and clumps of trees in agricultural land. As in European populations, the birds are mostly hidden in the canopy and are only rarely to be seen. The constantly singing ♂ from Parila was in a "vegetation island" of *Populus* and *Salix,* including some orchards on terraces across otherwise mostly barren slopes. This place is in the Inner-Valley region, which is located N of the main range in monsoon-protected area; this may explain the extraordinary altitude of this locality.

LANIIDAE

Lanius

Of the 6 species recorded for Nepal, 3 breed *(schach, tephronotus, meridionalis* [cf. Eck 1994]); the remainder are winter visitors of differing frequency *(collurio, cristatus, vittatus).* The breeding species, which are of nearly the same size, occupy vicariant altitudinal areas within the total zone inhabited between 100 m and 4000 m. *L. meridionalis* occupies the lowest altitudinal belt and is confined to the Terai plains; *schach* and *tephronotus* are altitudinally vicariant species in Nepal, but not parapatric in a narrow sense, i.e. as a result of competition (contra Haffer 1989) because an unoccupied area belt of several 100 m width normally separates their upper and lower limits.

Lanius collurio* cf. *phoenicuroides (Schalow)

Lanius [cristatus] collurio

Material: 2 specimens: **D** Dolpo Distr., Ringmo, Phoksumdo Lake, 3650 m, 22.V.(!) 1970: 1♀. **S** Solukhumbu Distr., Tarnga, 4050 m, 13.X.1970: 1♀.

Measurements: **Wing**-L 88.5 and 91 mm. – **Tail**-L 73 (graduation 6) and 77 (graduation 14.5) mm. – **Tarsus**-L 22 and 24 mm. – P10 6.5 (**Wing**-L 88.5) and 4.5 (**Wing**-L 91) mm > wingcoverts, P6 only slightly notched. – **WTI** 27.5 and 28.2%. – **TWI** 82.5 and 84.6%.

Horizontal, vertical (see Material): The V-♀ was mist-netted in *Pinus-Berberis* shrubbery on the lake shores; gonadal state not noted. The X-♀ rested in the valley descending from Nangpa La (5600 m), the pass it had presumably crossed earlier when migrating southward (Martens 1971, *cristatus). L. c. phoenicuroides* migrates not only to Africa but also to In-

dia, but had apparently not yet been recorded accurately enough for the Himalayas E of the Indus. Inskipp & Inskipp (1991) mention a *phoenicuroides* skin still in the BM(NH) from the Scully collection and possibly this very specimen is cited by Ripley (1982) under *L. c. isabellinus,* a subspecies otherwise not known from Nepal (determination proven when and by whom?). No substantial documentations seems to exist for Ali & Ripley's (1972, 5) general statement referring to *isabellinus,* "Stragglers recorded from Nepal...". Recent sightings from Nepal are mentioned by Inskipp & Inskipp (1991). The 2 ♀ belong to the *isabellinus* group, even though the subspecies determination is not fully proven.

Lanius cristatus cristatus L.

Lanius [cristatus] incl. *collurio*

Material: 1 specimen: **B** Kathmandu, Chauni 1350 m, 2.II.1970: ♀ juv.

Measurements: **Wing**-L 87 mm. – **Tail**-L app. 81 mm (graduation 19 mm). – **Tarsus**-L 25 mm. – P10 10 mm > coverts, P9 < 5. – **WTI** 26.4% – **TWI** 93.1%.

Horizontal, vertical: Winter visitor and passage migrant, records originate from most parts of the southern half of the country; sojourn from M IX to M V. The find in the Kathmandu Valley, where the species is regularly met, is situated near the upper limit of the winter belt (Inskipp & Inskipp 1991).

Lanius schach tricolor (Hodgson)

Material: 1 specimen: **D** Myagdi Distr., Myagdi Khola, Muri, 2100 m, 28.III.1970: 1♀.

Measurements: **Wing**-L 89 mm. – **Tail**-L appr. 100 mm (graduation 38 mm). – **Tarsus**-L 28 mm. – **WTI** 18%. – **TWI** 112.4%.

Horizontal: My records from S Dhaulagiri to the Sikkim/Darjeeling border: Muri 24./28.III.; (see Material); Bega (14.V. both :Myagdi); – Dhara Khola (5.IV. :Parbat); – lower Kali Gandaki Valley, N Kusma (20.III; :Parbat); – S Annapurna, Ghandrung (30.IV., 8.V.); above Sikha (11.VII. both :Parbat); – near Dhumpus (10.V. :Kaski); – lower Marsyandi Valley, Turture (8.IV. :Tanhu); – Kathmandu Valley (19.II., 22.III. :Kathmandu); – Khimti Khola Valley between Thodung and Jiri (9.IV. :Ramechap); – Arun Valley; Hurure (17.VI.); Chichila (18.VI.); Dharapangma (20.VI. :Sankhua Sabha); – Yektin (21.VII. :Panchthar); – above Ilam (16.IV. :Ilam).

Vertical: I encountered *L. schach* between 530 m (Turture, B IV) and appr. 2200 m (Sikha, VII); the 17 finds are distributed evenly within this belt. The vertical area is not yet defined satisfactorily: breeding records are known from Chitawan (appr. 300 m, Inskipp & Inskipp 1991); the upper limit is unclear, for not all observations during the breeding season are definitely of breeding birds, e.g. Biswas (1961b). *L. schach* may exceed 2500 m only insignificantly (Diesselhorst 1968:196), resulting in a vertical belt appr. 2200 m wide. The altitudinal vicariance between *schach* and *tephronotus* (which see) is clear, but it is not caused by competition. In most parts of the Nepal area there is a gap of several hundred meters between the upper limit of *schach* and the lower limit of *tephronotus,* where both are absent (approximately between 2500 and 3000 m). Only within the arid areas of the Inner Valleys is this span reduced, but sites of parapatric distribution are still open to question. Inskipp & Inskipp (1991), however, mention observations of both *schach* subspecies,

tricolor and *erythronotus,* in the upper Kali Gandaki Valley, where *L. tephronotus* also commonly occurs (Fleming et al. 1975; pers. obs., see below). One should, however, take into account that *L. s. erythronotus* and *L. tephronotus* are nearly indistinguishable in the field. A detailed study of skins is necessary to decide on mixed *schach/erythronotus* populations (including hybrids) within the *tephronotus* area of Thakkhola.

Habitat: In open landscape, also tree-rich agricultural land, even in the garden-rich outer parts of Kathmandu, where the Long-tailed Shrike also breeds. This shrike gained large breeding areas by the large-scale deforestation of the Himalayan midlands. However it is only sparsely distributed along the enormous terraced slopes.

Breeding: Early season; singing ♂ on 19.II. in Kathmandu (1350 m); a courting pair at the same spot 22.III. Accordingly, Biswas (1961b) records an early-stage breeding condition of his specimens from the Kathmanmdu Valley at E III/B IV.

Lanius tephronotus tephronotus (Vigors)

Lanius [tephronotus] incl. *validirostris*

Taxonomic note: All 3 ♂ were collected in V, but the ♂ from Ringmo (:Dolpo) differs considerably from all others: upper side dark grey (back and upper head), while in the others particularly the upper head is light grey.

Material: 6 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 30.V.1970: 1♂ ** Myagdi Distr., Dhorpatan, Uttar Ganga plain, 2950 m, 13.-17.V.1973: 2♂, 2♀. ** **B** Kathmandu New Baneshwar, 1350 m, 17.IV.1995: 1♀.

Measurements: **Wing**-L ♂ (3) 98.5-100 mm; ♀ (3) 97-101 mm. – **Tail**-L ♂ (3) 110-120 (graduation 36-44) mm; ♀ (3) 106.5-111 (graduation 29-34) mm. – **Tarsus**-L ♂ (3) 30-31 mm; ♀ (3) 28-30.5. – **WTI** (6) 19.6-22%, $\bar{x}$=21.1. – **TWI** (6) 105.4-120%, $\bar{x}$=112.2.

Notes: Moult of 2 ♂: 1) P1-3, 6-10 well preserved, P4 and 5 very worn, T1 old, T2-6 new. 2) P1-4 strongly changed to brown and are worn, P5-10 well preserved, T1 and 6 right old, 2-6 left new.

Horizontal: I found the Grey-backed Shrike from NW Dhaulagiri to near the E frontier of the country. Population density varies considerably between the mountain massifs. – Dhaulagiri, Dhorpatan (17.-25.IV., 9.-23.V.; see Material); between Emaka and Dhule, several (7.V. both :Myagdi); – Tarakot (9.VI.); Suli Gad Valley (20./21.V.); Phoksumdo Lake (22.V.-4.VI.; see Material; all :Dolpo); – Thakkhola; above Muktinath (21.IV.); Purano Marpha (11.V., 6.VII.); Thaksang/Tukche (1./2., 6.VII.); also at the floor of the valley from Jomosom to upper village Ghasa (22.IV., 1.V., 5.-13.V., 24.VI.-9.VII. in the years 1970, 1973 and 1995; all :Mustang); – Trisuli Valley, Syng Gyang (26.IV. :Rasuwa); – Kathmandu (17.IV. :Kathmandu); – Thudam (27.V. :Sankhua Sabha); – Walungchung Gola (23.V. :Taplejung).

Vertical: My observations stem from 2200-4000 m in IV-VII, all from the assumed breeding season or close to it (but see Kathmandu); the vertical area comprises hardly more than 1600 m. Population density is not at all uniform and obviously much depends on microclimatic conditions. I found the Grey-backed Shrike most common in the monsoon-protected arid valley of the upper Kali Gandaki (between Lete and Jomosom :Mustang, IV-VII), where pairs had their territory along the *Rosa sericea* shrubberies growing at field edges every 150-200 m. Among these localities are the lowest sites known from Nepal

(down to 2200 m). Similarly low are the breeding areas in the upper Barbung Khola, localities at 2400 m and 2600 m (Tarakot :Dolpo). Also in the upper Marsyandi Valley (:Manang), an arid region as well (N Annapurna), it lives down to 2450 m, locally common (Lowndes 1955, *schach).* If monsoon influence prevails, the lower limit is markedly higher, near 3000 m. The harsh Dhorpatan Valley (:Myagdi) is inhabited by a large population at this altitude. In the extremely wet eastern parts of the country *tephronotus* is rare (2 finds E of Arun, V, 3200 m, 3550 m). Biswas (1961b) recorded it in IV at 4575 m, far beyond suitable breeding localities – a passage migrant from populations NE of the Himalayas? Two specimens were in Kathmandu gardens on 17./18.IV. one still 24.IV.1995, certainly late winter visitors or migrants (see Material).

Habitat: Open landscapes with groups of bushes and single trees up to timberline and beyond into the alpine bush zone. Cultivations are regularly used in areas of high population density at Thakkhola (and Manang?), preferably rose hedges along roads, paths and edges of fields, apple orchards close to villages; overgrown clearings near forest edges are inhabited as well (Thaksang/Tukche).

Breeding: On 22.IV. many pairs in rose bushes between Jomosom and Tukche (:Mustang), 8.V. courtship display on apple trees and prayer flags in Marpha; at this locality fledged juveniles 30.VI. (2650-2750 m); 1.VII. Thaksang (3150 m) and 6.VII. Purano Marpha (3200 m) as well. Data of Diesselhorst (1968:197) from Khumbu integrate into this data set.

Migration: Over short distances only, but even the low breeding sites in Thakkhola are left during winter. M II-27.III.1974 none was present; on 21.IV.1980 the area was fully populated up to at least 3400 m (Muktinath).

DICRURIDAE

Dicrurus

The Nepal list comprises 8 species; all breed (not yet proven for *annectans; macrocercus, leucophaeus, caerulescens, aeneus, remifer, hottentottus, paradiseus).* All live within the tropical and subtropical belts up to about 2700 m *(leucophaeus),* but species-characteristic vertical area limitations are conspicuous. The area below 500 m is occupied by *caerulescens, annectans* and *paradiseus;* up to 1000 m including the Terai lowlands *hottentottus,* up to 2000 m *macrocercus.* Vertical belts omitting the lowlands are inhabited by *leucophaeus* and *remifer.* Ecologically, all species seem to be similar with differences in forest structure preferences. Several species may occur together, but virtually nothing is known about species interactions. Several species invaded the Himalayas from main areas east of

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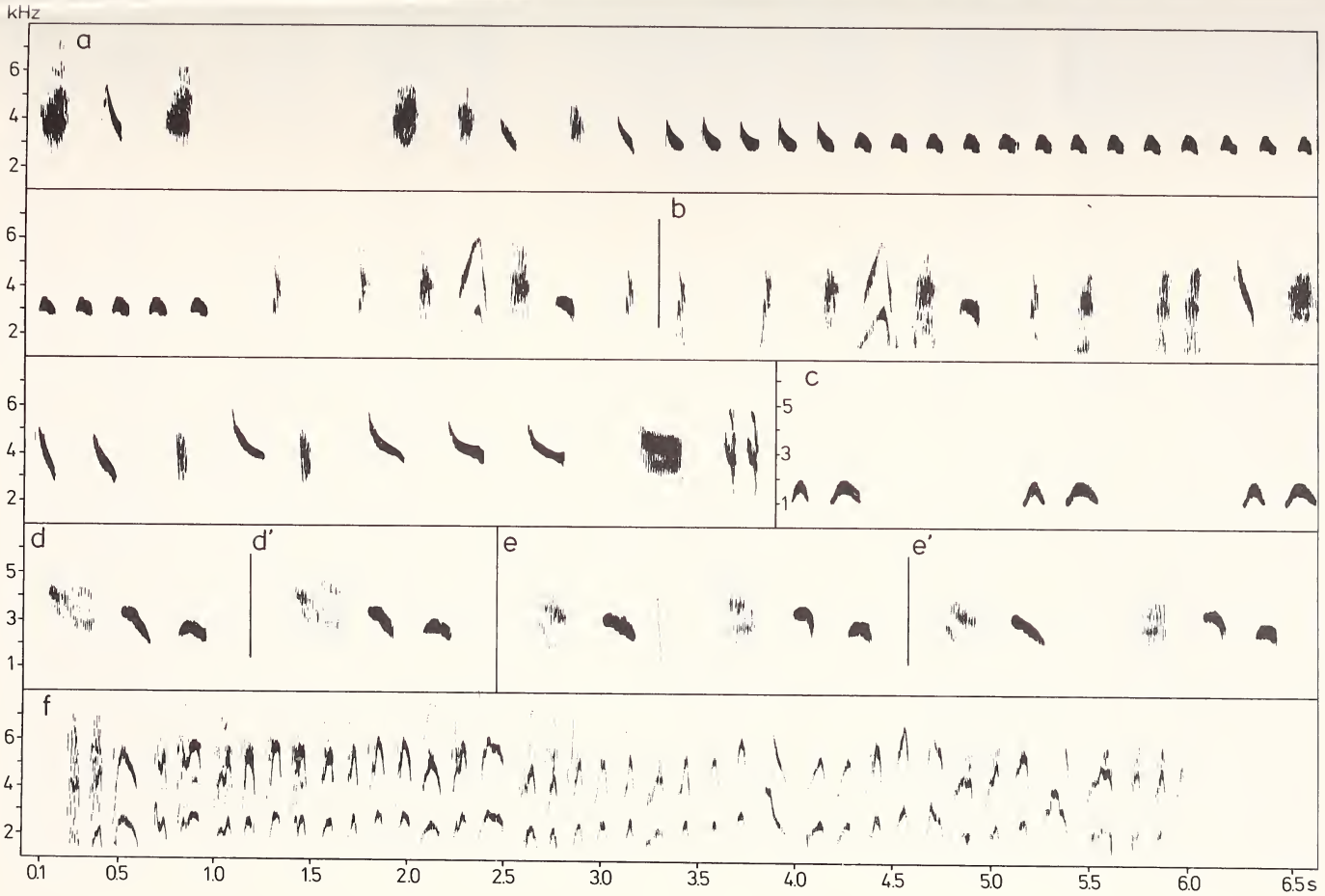
Fig.113: Vocalizations of *Dicrurus* species. – a-b) *D. leucophaeus,* 2 sequences from a long series of territorial song of 1 ♂, Yamputhin 30.IV.1988.
c) *D. paradisaeus,* part of a long series of (?) territorial song, Mai Khola 8.IV.1988.
d-f) *D. macrocercus,* territorial song (d-e) and calls (f); d-d') 2 verses of territorial song; e-e') 2 verses of a 2nd ♂, both from Tumlingtar 22.VI.1988; f) part of a long series of calls of a fledged nearly independent young still being fed by the parents, Kathmandu 28.VI.1988.



the Himalayas *(leucophaeus, annectans, aeneus, remifer, hottentottus)* and several of the area belts are very narrow along the most southern Himalayan outskirts. Only *paradiseus* and *macrocercus* reached the Himalayan rim from S.

Dicrurus macrocercus albirictus (Hodgson)

Dicrurus [adsimilis] macrocercus

Material: 1 specimen: **B** Kathmandu Distr., Kathmandu, Chauni, 1350m, 23.III.1973: ♀ juv.

Measurements: **Wing**-L: 149 mm (P10 20 mm > wing coverts). – **Tail**-L: 153 mm (graduation 50 mm). – **Bill**-L: 18.5 mm; -Height (above nostrils) 8.5 mm; -Width (above nostrils) 8.5 mm. – **Tarsus**-L: 20.5 mm. – **WTI:** 30.2%. – **TWI:** 102.7%. – **Oocytes** appr. 0.5 mm.

Horizontal, vertical: Though the Black Drongo is widespread up to about 1500 m, only a few representative records are given here. – Kathmandu Valley, common even in the outskirts of the City, 1350-1500 m (see above); – Tumlingtar, 500 m (23.VI. :Sankhua Sabha); – descent from Sablako pass to Iwa Khola, 1100 m (22.IV. :Taplejung).

Habitat, breeding: Generally in open country and widely distributed in tree-rich agricultural land. At least in Kathmandu, it breeds close to houses in gardens. 1 grown-up young was still being fed by (both?) parents on 24.VI.(1988) in New Baneshwar, outskirts of Kathmandu City.

Vocalizations: Two probably territorial ♂ called (sang?) as early as 4 a.m., still before dawn, from the tops of tall trees near Tumlingtar airport, 22.VI. Verses (Fig.113d/e) of 3 (1st ♂) or 5 notes (2nd ♂) were given unchanged for long sequences. Correspondence of last 3 notes of 2nd ♂ with all 3 notes of the 1st ♂ is obvious. Alternation between rasping and slightly frequency-modulated warbling notes is characteristic ("quäi-piu-pir" or "kchä-pyä-pyi" for the 3-note verse). An independent young still being fed by the parents rendered long series of twitters, rich in harmonics (Fig.113f; Kathmandu, 24.VI.).

Dicrurus leucophaeus longicaudatus Jerdon

Material: 1 specimen: **J** Dolakha Distr., Bhote Kosi Valley, between Shianku and Bikuti, 1350 m, 11.IV.1973: ♂.

Measurements: **Wing**-L: 136 mm (P10 10mm > wing coverts). – **Tail**-L (tail stretched): 162 mm (graduation 73 mm). – **Bill**-L: 21.5 mm; -Height (above nostrils) 7.8 mm; -Width (above nostrils) 9.5 mm. – **Tarsus**-L: 19 mm. – **WTI:** 36.8%. – **TWI:** 119.1%.

Notes: Testes strongly developed. Bill and feet black. Iris red.

Horizontal: Bobang S Dhorptan (30.IV.); ascent to Jalja La from N (6.IV. both: Myagdi); – above Dhumpus (10.V. :Kaski); – Bhote Khosi Valley between Shianku and Bikuti; see Material (11.IV. :Dolakha); – Arun Valley, Chichila, 3 sp. in flock (20.VI.; Sankhua Sabha); – Yamputhin (27.-29.IV.); Omje Kharka NW Yamputhin (1.V. both :Taplejung); – upper Gitang Khola (28.III. :Ilam).

Vertical: My records range between 1350 m (Bhote Khosi) and at or near 2500 m (Bobang, Gitang Khola) and largely coincide with the data presented by Inskipp & Inskipp (1991): summers between 1220 m and 2745 m.

Habitat: Open parts within forest vegetation, often at edges, also in secondary bushy areas if at least a few larger trees are present (Yamputhin). The Bothe Kosi specimen was on hil-

ly slopes deforested, for agricultural use, close to the lower limit of the species' vertical belt (11.IV.). Black and Ashy Drongo not being easy to tell apart in the field, the ecological requirements of both species in the area of vertical overlap (largely between 1200 m and 1500 m, rarely up to 2000 m) need closer investigation. There might be stronger ecological similarities than commonly believed (Ali & Ripley 1972, 5, Fleming et al. 1976).

Vocalizations: Territorial song (Fig.113a-b) is a combination of series of croaking (sequence of closely-spaced clicks) and whistling (slightly frequency-modulated) notes, the homogeneous note-series often being drawn out for several seconds. The song is intensively given before dawn, less vigorously in the daytime.

Dicrurus hottentottus

Horizontal, vertical: Pokhara, 850 m (26.IV. :Kaski); – Nodia Khola NW Sunichare, 320 m, 1 sp. (7.IV. :Ilam). – The Spangled Drongo is a widespread species of the lowlands hardly exceeding 1000 m.

Dicrurus paradiseus

Horizontal, vertical: ascent from Mai Khola to Ilam, 580 m (8.IV. :Ilam). A presumed ♂ was calling from a treetop within scattered remnants of secondary forest below Ilam. This altitude is above the regular occurrence of the species in Nepal (Inskipp & Inskipp 1991).

Vocalizations: The above-mentioned specimen gave long series of regularly spaced low double calls (Fig.113c), like "kyu-kyu ...", the individual call strongly raising and falling in pitch. Low frequency range: lower limit 1000 Hz, upper 1720 Hz.

ARTAMIDAE

Artamus fuscus

Horizontal, vertical, habitat: Lowland plain near Sunichare, 250 m (6.IV. :Ilam). A flock of 5 birds was roosting on a leafless tree in a cultivated field. Ashy Woodswallows fly and glide like European Starlings *(Sturnus vulgaris),* and are easily to be distinguished even at a distance. The species is well known from that area.

CORVIDAE

Garrulus

Two breeding species occur in Nepal, *glandarius* and *lanceolatus.* The former mainly lives between 1000 and 2000 m, the latter from there up to about 2500 m. Though there is slight altitudinal overlap, interactions of the two species have not been recorded for Nepal. The Himalayan area of *glandarius* is a westward prolongation of its area in China, *lanceolatus* is a W-C Himalayan endemic.

Garrulus lanceolatus

Horizontal, vertical, habitat: Near Bikuti, not far from the bridge crossing the Thamba Kosi River leading to the eastern slope of Pass Ting Sang La (:Dolakha), 11.IV.1973. The 2 specimens, apparently a pair, were flying close together in a *Pinus roxburghii* forest at 1100 m. One was collected by H.S. Nepali. This locality is close to the easternmost record of the species as listed in Inskipp & Inskipp (1991).

Garrulus glandarius

Horizontal, vertical, habitat: Phulchoki Mt., Kathmandu Valley (22.III., 14.V. :Lalitpur); several specimens from 2650 m to 2750 m near the mountaintop in *Quercus semecarpifolia* forest. The Eurasian Jay has long been known in the hills surrounding the Valley where it breeds (Inskipp & Inskipp 1991). The above altitude is beyond the regular occurrence of the species (up to 2440 m).

Urocisssa

Two breeding species occur in Nepal, *flavirostris* and *erythrorhyncha*. The latter inhabits the tropical lowlands up to roughly 2000 m, *flavirostris* lives beyond this altitude. Though their distributional pattern seems to be parapatric, the two have never been found at close range. Possible competition of the 2 species deserves detailed investigation.

Urocissa flavirostris flavirostris (Blyth)

Taxonomic note: Originating from the transition zone of the ssp. *cucullata* Gould and nominate *flavirostris* (Blyth), the specimen is closer to the latter.

Material: 1 specimen.: **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 30.III.1973: 1♀.

Measurements: **Wing**-L 190 mm. – **Tail**-L 365 mm (graduation 280 mm). – **Bill**-L 37 mm, -Height 14.6. – **Tarsus**-L 50 mm. – **WTI** 17.9%. – **TWI** 192.1%.

Notes: Ovary developing; bill yellow, feet orange, iris yellow-green.

Horizontal: I noted scattered finds from Dhaulagiri, Annapurna, the Marsyandi and Arun Valleys eastward to the foothills of Kanchenjunga. – Dhorpatan (23.IV. :Myagdi); – Chitre (4.V.); – Ghorapani Pass (25.VII; both :Parbat); – Kalopani (13.V. :Mustang); – Potana (28.IV. :Kaski); – Chordung Mt. (30.III., see Material :Ramechap); – Marsyandi Valley, Thimang (15.IV. :Manang); – Arun Valley, between Mure and Hurure (12.VI. :Sankhua Sabha); – upper Gitang Khola (29.III.); Dhorpar Kharka, flock of 4 specimens (14./15.IV.); Omje Kharka (3.V.); below pasture Lassetham, 1 sp. (6.V. all :Taplejung).

Vertical: My own records, all from the presumed breeding season or close to it (E III-E VII, see Diesselhorst 1968:204), are concentrated and evenly distributed in a narrow vertical zone from 2000 m (Potana, IV) and 2100 m (Arun Valley, VI) to 3000 m (Lassetham, V; Dhorpatan, IV), the majority between 2500 and 2900 m. Though the altitudinally most exposed sites of *flavirostris* and *erythrorhyncha* slightly overlap (see below), the two have not yet been found syntopically during the breeding season. Inskipp & Inskipp (1991) indicate "mainly above 2440 m .. up to 3660 m" in summer. Diesselhorst (1968:304) found a nest at 3000 m in W of Khumbu, observations up to 3400 m.

Habitat: The Yellow-billed Blue Magpie lives in natural broad-leaved forests of the cloud forest zone, at the upper distribution limit also in mixed broad-leaved/coniferous forests mixed with tree *Rhododendron*. It prefers closed forest stretches, but singles or small flocks of up to 5 specimens also visit forest edges, though they usually stay in the canopy cover, never exposed on treetops. Areas slightly shielded from the monsoon influence remain unsettled (e.g. the upper Kali Gandaki Valley from Lete/Kalopani northward :Mustang), and the species is not partial to the arid northern slopes.

Urocissa erythrorhyncha occipitalis (Blyth)

Urocissa [erythrorhyncha] incl. *caerulea*

Material: 1 specimen.: N Chitawan Distr., S Tikouli, northern foothills of Siwalik Mts., 300 m, 20.II.1970: 1♂.

Measurements: **Wing**-L 201 mm. – **Tail**-L 450 mm (graduation 365 mm). – **Bill**-L. 36 mm, -Height 14.1 mm. – **Tarsus**-L 47.5 mm. – **WTI** 21.4%. – **TWI** 223.9%.

Horizontal: Our sparse scattered finds range from Annapurna massif to near the E border S of the Kanchenjunga. – Annapurna: between Landrung and Dhumpus (9.V. :Kaski) – Marsyandi Valley, several times between Turture, Syuribar and Phalesangu (8./9.IV. :Lamjung), – S Tekouli (20.II., see Material; :Chitawan), – ascent to Ting Sang La from Bikuti (12.IV. :Dolakha); – Arun Valley, below Khandbari (21.VI. :Sankhua Sabha); – Yektin (21.IV. :Panchthar), – between Sablako Pass and Limbudin, several times in agricultural land (22.IV.); – confluence of Tada and Kabeli Khola (22.IV. both :Taplejung).

Vertical: My data from 4 years' observations extend between 300 m (Tekouli) and 2100 m (Landrung/Dhumpus) and are evenly scattered. These limits are close to the boundaries of regular occurrence during summer (see Inskipp & Inskipp 1991), though at least the upper breeding limit is not clarified at all due to lack of breeding records. The distributional limits of both *Urocissa* species are more or less parapatric along middle altitudes of the S macroslope of the main chain, but summer records at close range have not been localized yet (cf. Ali & Ripley 1972,5:211). Their distributional exclusion is probably not caused by competition.

Habitat: The Red-billed Blue Magpie is a typical species of the lower forest zone, but not at all confined to closed mature forest. Very conspicuously, at the eastern distributional limit in E Nepal it also lives in cultivated areas even if only a few scattered trees are available (below Khandbari, 950 m, 21.VI.1988; Tada Khola, 1200 m, 24.IV.1988; Sablako Pass/Limbudin, several times between 1300 and 1500 m, 22.IV.1988; ascent to Worebung Pass from Yektin, 1650 m, 21.IV.1988). Single birds and flocks of up to 3 specimens are able to stay and to hide in the sparse and scattered tree cover of open agricultural landscape. Whether such open fields may serve as a breeding site is unrecorded.

Dendrocitta

Two species occur in Nepal and breed, *vagabunda* and *formosae*. Both are confined to the tropical/subtropical S macroslope and the midlands/terai. *D. vagabunda* occupies the lower belt, *formosae* the higher one up to about 2150 m. It is still open to question whether the two compete ecologically where they meet and whether their distribution within Nepal is actually parapatric in a narrow sense.

Dendrocitta vagabunda

Horizontal, vertical, habitat: Marsyandi Valley, between Turture and Syuribar, 530-620 m, singles and flocks of up to 3 sp., 8.IV.1980 (:Tanhu) in open agricultural tree-rich landscape.

Dendrocitta formosae

Dendrocitta [leucogastra] formosae

Horizontal, vertical: Upper Myagdi Khola, S Boghara, 1450 m (28.V. :Myagdi); – Suiketh Valley NW Pokhara, 1200 m (21.II. :Kaski); – Kali Gandaki Valley N Dana, 1 sp., 1300 m (24.II. :Mustang); – Kathmandu Valley, Balaju, 1350 m (5.V. :Kathmandu); – Arun Valley, ascent to Num, 1200 m, small flock (8.VI. :Sankhua Sabha); – confluence of Kabeli and Tada Khola, 1000 m (24.IV. :Taplejung).

Habitat: In open broad-leaved forest locally mixed with a few pine *(Pinus roxburghii)* in the tropical/subtropical zone, also in open stands with only scattered trees, e.g. tree-rich agricultural land of the Kathmandu Valley or the Suiketh Valley near Pokhara.

Pseudopodoces humilis (Hume)

Material: 3 specimens: **D** Dolpo Distr., Kangar, 4200 m, 18.VI.1973: 2♀ * headwaters of Barbung and Yulung Khola, 4500 m, 25.VI.1973: 1♂.

Measurements: **Wing**-L ♂ 92.5 mm; ♀ 88 and 90 mm. – **Tail**-L ♂ 62+x; ♀ 55+x and 57.5 mm. – **Bill**-L/-Height ♂ 23.5/6 mm; ♀ 24.5/- and -/6.5 mm. – **Tarsus**-L ♂ 28; ♀ 26.5 and 28 mm. – **WTI** (3) 14.8-16.2%. – **TWI** appr. 63-67%.

Notes: Testes large, ovaries undeveloped after oviposition (nest find!). Bill black; feet black (♂) or grey-black (♀).

Horizontal, vertical: My observations stem only from the N flanks of Dhaulagiri. – Tarap Khola Valley, Kangar, 4200 m (17.VI.); Zö La, 4900 m (19.VI.); Yalung Khola, 4400 and 4500 m (25.VI.); below Dudje La, 4850 m, and on the plateau of the Dudje La, 5000-5100 m (27.VI. all :Dolpo). Inskipp & Inskipp (1985) indicated several data from Dolpo, which partly originate from the above-mentioned observations. Additional sightings have been recorded from the Mustang area adjoining Dolpo to the E (up to 5335 m, Thorung La). All areas belong to the arid Tibetan facies N of the main range, which ends at the southern fringe of the trans-Himalayan area N of the Himalayan main axis and which covers extended regions in W Nepal. The vertical breeding belt is not yet delimited, but hardly exceeds 1000 m, from 4200 m upwards.

Habitat: Hume's Ground Jay lives in high mountain steppe in the rain shadow of the Himalayan main arc, preferably on gentle slopes close to valley bottoms with sparse vegetation: meadow-like near rivers, but often on hard, stony ground. However, it also lives on barren passes at 5000 m or higher where closed vegetation cover is absent. At the confluence of Lo and Yulung Khola (4400 m) I saw 1 specimen on undulating meadows, 2 additional specimens at an identical site further up the valley (4500 m). In the Tarap Valley individuals also frequented the fields of Kangar village. Even in its appropriate habitat the Ground Jay is only sparsely distributed in Nepal and only small, widely scattered colonies seem to exist. Its habitat requirements are not yet fully defined and deserve further study.

Fig.114: The nest of *Pseudopodoces humilis* from Kangar, Tarap Valley; 18.VI.1973 J. Martens.

Breeding: At M VI 1973 at least 3 pairs occupied territories around Kangar village (4200 m) near the bottom of the valley. A nest hole was dug in a small but steep earth bank a few meters above the valley floor. The straight tunnel was drilled horizontally into hard earth intermingled with many small sharp stones; it was at least 185 cm long including the nest chamber at its end. This chamber, situated 87 cm below the slope's surface and about 30 cm long, contained the disproportionately large nest (Fig.114). Its foundation was constructed of dry plant material, mostly roots; the upper part consisted almost entirely of animal hairs, including some that had been dyed and used by man, but no feathers. 6 eggs, uniformly grey-white except for a few minor dirty dots; weight of the dry nest 140 g. Ali (1946) reports on nests near Mt. Kailas, S Tibet, only about 250 km NW of the Tarap Valley. A nest tunnel was 4 ft. long, sides of the chamber 9 x 10 in. long; nest weight 1.5 lb. (22.VI.). Another nest contained juveniles on 24.VI.

Pyrrhocorax

The only 2 species of the genus, *pyrrhocorax* and *graculus,* are both widely distributed in Asia, including Nepal. They are high-altitude species, but the association of *graculus* with monsoon-shadowed areas is evident, and its breeding places are very local in Nepal except for the NW. Similarly, *pyrrhocorax* is much more widely distributed but the vertical belts of the local populations differ considerably: more restricted and higher in the wet areas, broader in the dry regions of the NW.

Pyrrhocorax graculus

Taxonomic notes: The geographic variation of the Alpine Chough deserves investigation once again, above all on the basis of much more extensive material than was available for Vaurie's study (1954:6-7). For instance, one of the adult ♂ (below) was very small, with 265 mm wing length.

Material: 2 specimens: **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4250 m, 23.VI.1973: 2♂.

Measurements: **Wing**-L 265 and 280 mm. – **Bill**-L/-Height 30/10.3 and 32/9.5 mm. – **Tarsus**-L 42 and 43.5 mm. – **WTI** of the larger ♂ 37.5%.

Notes: Moult, large ♂: P5-10 old, inner ones growing. T1 lacking (fallen out and apparently growing). – small ♂: P5-10 old, inner ones growing. T1 growing. – Testes in both ♂ appr. 12 x 6 mm.

Horizontal: My observations stem from the NW, N and E flanks of the Dhaulagiri area and from the N flanks of Annapurna. I did not see any Alpine Chough in the extremely wet areas between Arun and Kanchenjunga in the far East (V, VI, IX). – Ascent to Ringmo/Phoksumdo Lake, 15 specimens (10.VI.); Bagar La, N flank, small flocks at the caravan resting place (17.VI.); upper Barbung Khola: Pimring, flocks of up to 5-7 sp.. (13.VI.); Tarang, flocks up to 12 sp. (14.VI.); Tukot, singles (19.VI.); ascent to Parung La and at the pass plateau, singles (20.VI.); below Dudje La, Dudje La (21.VI. all :Dolpo); – below Dapa Col (17.VII.), Cha Lungpa Valley, flocks of up to 15 sp. (22.VI.); Jomosom, flock of appr. 40 sp. (25.III.); W Thorung La, 2 sp. (20.IV. all :Mustang).

Vertical: The majority of data originate from VI, few from III, IV and VII; those close to the breeding season (VI, VII) cover most of the altitude spectrum: 3200-4950 m. Extremes are 2750 m (Jomosom, 25.III.) und 5200 m (Thorung La, 20.IV.). Within the arid areas there is a breeding record near Manang (:Manang) at 3450 m within the forest zone (Inskipp & Inskipp 1991). In the monsoon-wet Everest area the breeding belt is apparently much narrower than in the rain-shadow areas in W Nepal. There its lower limit is apparently no lower than 4500 m, where Diesselhorst (1968:208) recorded newly fledged juveniles at 4800 m. The upper breeding limit in all Nepal is open to question.

Habitat: The Alpine Chough is a very agile species of the Himalayan high mountains, being capable of changing location rapidly. However, in the arid areas N of the main range it is by no means restricted to the zone above the forest belt. Data from VI originate as low as 3200 m (S Phoksumdo Lake). Locally, in the arid areas this Chough lives in close association with the Tibetans, visits caravan resting places and is a regular and quite tame visitor in the villages, but apparently does not breed within villages (Charka, 4300 m; Pimring 3900 m; Tarang, 3600 m). In Thakkhola, where the Red-billed Chough regularly visits the fields from its nearby breeding places, I never saw Alpine Choughs in summer and no bree-

ding localities seem to exist in proximity of the villages. In the Khumbu, the only other presently known breeding area of the Alpine Chough in Nepal, it lives at much higher altitudes and never penetrates into the forest zone, at least during summer. This may be a result of the markedly higher precipitation in this area. Consequently, it is absent on the extremely wet S flanks of the massifs towards the E border (see above).

Breeding: Diesselhorst (1968:208) observed fledged juveniles near Everest from E VII onwards. Therefore the data from VI and VII (see Horizontal) are all to be attributed to the breeding season, but I could not discern clear signs of breeding at any site.

Migration: Even during winter the Alpine Chough stays within the main range; it may shift to lower areas to avoid severe weather, but not to the midlands. A flock of appr. 40 sp. were migrating straight northward on 25.III.1974 close to the valley bottom near Jomosom, 2750 m.

Pyrrhocorax pyrrhocorax himalayensis (Gould)

Material: 2 specimens: **D** Mustang Distr., Nabrikot, 2750 m, 11. and 12. XI.1969: 1♀, 1 o.

Measurements: **Wing**-L ♀ 318. o 321 mm; distance between P5 and P6 5 mm (♀) and 11 mm (o); see Vaurie (1949:5) and Ali & Ripley (1972,5:240). – **Tail**-L ♀ 162, o 167 mm. – **Bill**-L ♀ 57.5, o 61 mm. – **Tarsus**-L ♀ 52, o 62 mm. – **WTI** ♀ 39, o 41.1%. – **TWI** ♀ 50.9, o 52%.

Horizontal: My own finds are from NW Dhaulagiri and N Annapurna eastward to the Kanchenjunga massif with marked data accumulation in the arid areas N of the main chain. – Ringmo/Phoksumdo Lake (10.-14.VI.); Bagar La, N slope, small flocks (17.VI.); below Tarakot at the valley bottom, 50 specimens, drink at stream, then fly down the valley (9.VI.); Pimring (13.VI.); Tarang (14.VI.); Charka (20.VI. all :Dolpo in 1970 and 1973); – Dhorpatan (9.IV.); between Dhorpatan and Thankur (4./5.V., 25.V. both :Myagdi in 1970 and 1973); – near Sangda (22.VI.); Thakkhola, between Jomosom and Tukche, also Thaksang, down the valley to Kalopani/Lete, many observations with flocks of up to 100 specimens in VI/VII and 200 specimens E IV (XI 1969, III 1974, VI/VII 1970, VI 1973, IV/V 1980; V 1995 all :Mustang); – between Thimang and Pisang, several heard (17.IV.); Manang, 2 specimens on fields (19.IV. both :Manang); – near Chitre (5.V. :Parbat); – Chordung Mt./Jiri (30.III. :Ramechap); – pasture Lassetham (8.V.); Ladza Khola above Walungchung Gola, 2 specimens (22.V. both :Taplejung).

Vertical: The 35 localities (III-VII, IX) are situated between 2400 and 4400 m and are evenly distributed within this zone, the extreme data in VI. Thus, for no period a preferred altitude can be recognized, nor can the breeding belt be derived from the observations, this Chough being too mobile and managing large distances and altitudes with ease. – The following data structure is reasonable: Close to breeding (V, VI, VII): occurrence in a vertical belt 2000 m wide, the limits being located in the arid areas N of the main range. The breeding belt proper is narrower (see below), but its lower and upper limit not yet defined; – far from breeding season (XI, III, IV): my data only from the dry Thakkhola (2500-3300 m), where it occurred M III in flocks of up to 100 specimens, once even 200 specimens (30.IV.1980, 2500 m). M III many flew, always pairwise, from the roost places high up in the mountains down to the food-rich fields close to the villages in the valley.

Breeding sites in Thakkhola are at least 3000 m high, probably higher, in side valleys. A breeding record is mentioned for the nearby village Kagbeni, but altitude is not reported (Inskipp & Inskipp 1991). The altitude of breeding sites is much lower in the Thakkhola gorge than in Khumbu, where Diesselhorst (1968:209) did not encounter the Red-billed below 3800 m, with fledged juveniles up to 4750 m. These differences may be connected with its preference, at least in C Asia, for arid, precipitation-protected landscapes, which exist on the Himalayan S flanks only at very high altitudes. In Himalayan arid areas the Red-billed is present even at the lowest altitudes possible (down to 2400 m).

Habitat: The Red-billed Chough lives in open landscapes within the forest zone as well as far beyond in barren rocky areas. But local differences are obvious. Regular occurrences in the forest zone during summer are known only from the monsoon-shadowed areas in W Nepal (Annapurna, Dhaulagiri), while the wetter Everest harbours its populations only far beyond the forest belt, mainly in the alpine zone. But breeding sites are still too scarce to indicate the lower limit in the W and E populations. In search of food, open meadows and high-altitude pastures are regularly visited, also close to man, e.g. at caravan resting places, but unlike the tamer Alpine the Red-billed never enters villages (noticed at Ringmo, Tarakot, Pimring, Charka, in all Thakkhola villages with large fields), although it may approach village edges (seen in Tarang and Pimring). When the juveniles are fledged the adults guide them to harvested fields far below the breeding sites (Thakkhola, 2600 m, VI), and after wheat sowing in autumn the Red-billed is locally hunted as a pest (Thakkhola: Nabrikot, XI).

Breeding: Families with fledged juveniles, the latter still being fed by the parents, on harvested fields (M VII, Marpha, 2700 m). Accordingly, Diesselhorst (1968:210) noticed first fledged juveniles in Khumbu E VII.

Migration: The Red-billed Chough stays within the main chain the year over. Single individuals or small flocks stray further southward, apparently irregularly (e.g. Chitre :Parbat, 2850 m, 5.V.1980; Chordung Mt. :Ramechap, 2900 m, 30.III.1973). Even during the breeding season movements (of non-breeding specimens?) occur: flock of 50 specimens flies down the valley bottom of Barbung Khola below Tarakot, 2400 m, 9.VI.1970. For evasive actions during winter see Inskipp & Inskipp (1991).

Nucifraga caryocatactes hemispila Vigors

Nucifraga [caryocatactes] incl. *columbianus*

Material: 2 specimens: **D** Mustang Distr., Thaksang above Tukche, 3150 m, 28.IV.1980: 1♂, 1♀.

Measurements: **Wing**-L ♂ 216, ♀ 211 mm. – **Tail**-L ♂ 143+x, ♀ 146+x mm. – **Bill**-L /-Breadth (before the forehead) /-Height (at nostrils) ♂ 45/16.8/17.6 mm, ♀ 42.5/15.4/15.4 mm. – **Tarsus**-L ♂ 42, ♀ 41 mm. – **WTI** 26.4 and 25.6%. – **TWI** 66.2 and 69.2%.

Notes: Gonads undeveloped. T6 of ♂ more slender (closer to juvenile state). Moult of body-feathers and wing: ♂ P4-10 old, inner ones growing. ♀ P3-10 old, inner ones growing.

Horizontal: Our finds originate from Dhaulagiri (S, E), Annapurna (S, E) and Langtang massifs (SE), from upper Arun and from the Kanchenjunga (S, SW). – Dhorpatan (13.IV., 15.V. :Myagdi); – Thakkhola: Ghasa (14.V.); Chadziou Khola (29. VI.); Lete (1.V.); Thaksang/Tukche (2./3.III. 1974, 27./28.IV.1980, 6.VII.1970); Purano Marpha (14.III.1974,

23./24.IV. 1980 all :Mustang); – above Chitre (5.V.); Ghorapani Pass (24.VII. both :Parbat); – Marsyandi Valley: between Bagarchap and Thimang (14.IV.); between Thimang, Pisang and Manang several times (17./18.IV. all :Manang); – Trisuli Valley, ascent to Syng Gyang (23.IV. :Rasuwa); – Pahakhola, eastern side valley of Arun (30.V./1.VI. :Sankhua Sabha); – pasture Lassetham (6.V.); Omje Kharka (5.V.); Dhorpar Kharka (14./16.IV. all :Taplejung).

Vertical: The approximately 20 encounters are evenly distributed between 2200 and 3350 m, lower and upper extremes in IV/V, thus within the breeding season. Diesselhorst (1968:206) enlarges this narrow vertical belt up to timberline near 4100 m (VI, VII). The lower limit at 2745 m as defined by Inskipp & Inskipp (1991) is certainly too restrictive.

The lowest sites are: upper village Ghasa (2200 m M V), Lete (2400 m, B V 1980, 1995), Thimang (2400 m, IV), ascent to Syng Gyang (2500 m, IV), Omje Kharka (2500 m, V). The vertical belt in which breeding activity occurs is situated from 2200 m upwards to nearly 4000 m or even beyond and comprises an area belt less than 2000 m wide. But considerable local differences exist (see Habitat).

Habitat: Within the extended belt the spectrum is manifold. It covers mixed broad-leaved forests of the cloud zone (from 2200 m upwards) to the subalpine coniferous belt (up to 3350 m), even to the upper forest limit with *Abies, Juniperus* and *Rhododendron* bush – only the lowest altitudinal belts not exposed to heavy monsoon influence. The timberline locally above 4000 m is, however, reached only rarely and apparently in low population density (Diesselhorst 1968:206); I never met it that high. The lowest sites (see Vertical; all :Mustang) were all exclusively in pure species-rich broad-leaved forests. In the distinctly monsoon-protected Thakkhola (Thaksang, Purano Marpha) the Spotted Nutcracker lives also in pure, partly extended stretches of coniferous forests of *Pinus, Abies, Picea, Cupressus, Betula* and sparse *Rhododendron.* But it is absent in the coniferous forests N of the main range.

Breeding: I noticed fledged juveniles as early as B V: 1 specimen begged parents for food (Lassetham, 3020 m, 6.V.1988); 1 family mist-netted (Lassetham, 3350 m, 8.V.1988); a late exception: adults feed fledged juveniles on 6.VII.1970 (Thaksang/Tukche, 3200 m). Accordingly, Diesselhorst (1968:206) noticed fledged juveniles B VI everywhere in Khumbu. Moult of adults starts early (see above; Diesselhorst 1968:207).

Corvus

Four species breed in Nepal *(splendens, japonensis, levaillantii, corax),* their ecological requirements being very different. The species set covers nearly every altitude and habitat of the cis- and trans-Himalayan zones, but the inter-species differences are enormous. *C. splendens* is confined to the (sub)tropical lowlands and is entirely associated with human settlements. *C. levaillantii* and *japonensis,* for long treated as conspecific (under *macrorhynchos),* form a continuous vertical area belt from the lowlands up to timberline, but are parapatric at locally differing altitudes, mainly near 2000 m. *C. corax* is (nearly) exclusively confined to the trans-Himalayan Tibetan facies as a breeding bird, where it is the only *Corvus* species.

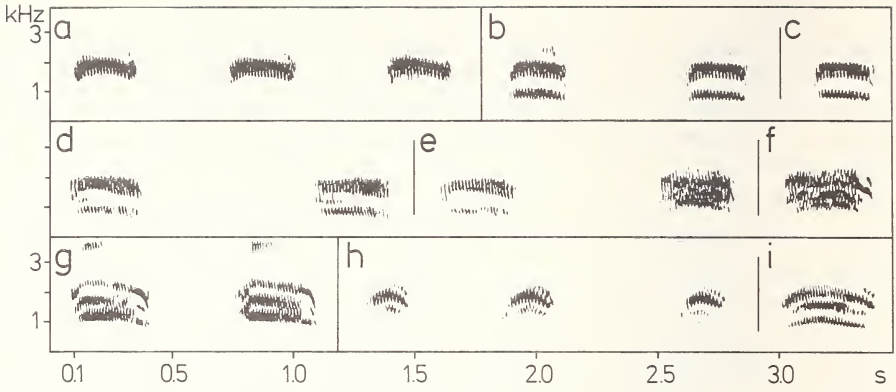


Fig.115: Vocalizations of *Corvus splendens*. – a) 23.III.1973; b-c) calls of 1 specimen, 19.II.1974; d-g) calls of 1 specimen 28.VI.1988 (a-g: Kathmandu); h-i) calls of 1 specimen, India, Kashmir, Srinagar 11.VI.1978.

Corvus splendens

Horizontal, vertical, habitat: The House Crow is closely associated with man in cities, towns and rural settlements all over the tropical and partly the subtropical belt of the Himalayan S macroslope. Though the species is widespread, breeding records are largely lacking (highest altitude proven is the Kathmandu Valley, 1350 m), but details to delimit the (locally varying ?) upper breeding limit are not available at present.

Nesting: A (new?) nest situated on still bare poplars (Kathmandu, Tundikhel) was visited by adults on 30.III.1988.

Vocalizations: Calls (Fig.115a-i) are single heavily frequency-modulated notes at relatively high pitch (ca. 1.8 kHz carrier frequency) with only weakly developed harmonics (Fig.115a); in other call types harmonics are well marked (up to 4). Distance between harmonics is usually wide (up to 800 Hz, Fig.115b-c), but a weak harmonic may be interspersed between the two (Fig.115d, e, i). The harmonics' separations and the strong modulation are characteristic for *splendens* (see *C. japonensis* and *C. levaillantii* for comparison). Many of the calls may be rendered similarly to the calls of the European Laughing Gull *(Larus ridibundus).*

Corvus japonensis intermedius Adams

Taxonomic notes: Hartert (1929:48-54) had a critical look at *Corvus coronoides* sensu Stresemann (1916) and excluded from the Palaearctic Jungle Crows not only the Australian forms but also *macrorynchos* s.str.. He grouped according to the characters of colouration of the bases of neck feathers, structure of neck feathers, contrast between neck and back colouration and gloss of underside. The remaining E and S Asian forms were lumped under *C. levaillantii* but Vaurie (1954:17-19) united the latter without particular reason with *macrorhynchos.* Among others Biswas (1963c: 654) pointed to vocal differences between a large mountain and a small lowland thick-billed crow, referring especially to Nepal. We

believe that the two live parapatrically where they meet (see below). Consequently, Sibley & Monroe (1990) judge *macrorhynchos* (incl. *japonensis*) and *levaillantii* a superspecies. Fleming & Traylor (1968:171) stress the fact that "intergrades between the two races [i.e. *culminatus/levaillantii* and *intermedius*] are not known from Nepal".

Because of the complicated interrelations of all these crows we disregard the question of superspecies status and unite *intermedius* with the C and E Asian species *C. japonensis.*

Material: 2 specimens: **D** Myagdi Distr., Dhorpatan, 2950 m, 8.V.1973: 1♀ "a". **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 28.III.1973: 1♀ "b".

Measurements: **Wing**-L "a" 314 (P6>7), "b" 342 mm (P7>6). – **Tail**-L (graduation) "a" 205 (47), "b" 217 (40) mm. – **Bill**-L (starting with "plush" feathering of forehead) "a" 55, "b" 53 mm, **Bill**-Height "a" 20.8, "b" 20.7 mm, -Width "a" 19.9, "b" 21.7 mm. – **Tarsus**-L "a" 55, "b" 58 mm. – **WTI** "a" 35.0, "b" 34.2%. – **TWI** "a" 65.3, "b" 63.5%. – Bill index (= width in % of length) "a" 36.2, "b" 40.9%.

Notes: The ♀ "a" has in the right half of the tail an additional feather between T4 and T5. – Ovaries of both ♀ are slightly swollen. The bases of the neck feathers is more grey in "a", nearly white in "b", but the same differences are also present in individuals from the same area (Kathmandu, Khumbu) as are revealed by investigation of the crows which were collected by Diesselhorst and Gurung. – Bill and feet black.

Measurements and indices of additional *C. japonensis* from Nepal (Zool. Staatssammlung München): **Wing**-L ♂ 317, 321, 352, 355 mm, ♀ 310, 321, 334, ♀ juv. 305 mm. – **Tarsus**-L ♂ (5) 55-59 mm, $\bar{x}$=56.9; ♀ (3) 56-59 mm; ♀ juv. 54.5 mm. – **WTI** (6) 33.1-36.9%, $\bar{x}$=34.9. – **TWI** (5) 61.4-62.9%, $\bar{x}$=62.2.

Thus the ♀ "a" and "b" have relatively long tails compared with the latter sample, but this must not be overemphasized in view of the small number of specimens.

Horizontal: This is a widespread species in the upper forest zone, though apparently population density varies greatly in relation to forest cover and annual precipitation. Only a summary of records is given here, especially with respect to low-altitude records. – Phoksumdo Lake (13.VI.); Tarakot and environs (10.-18.V., 2.-7.VI.); resting place Phurbang (31.V. all :Dolpo); – Dhorpatan (10.-21.V., see Material; :Myagdi); – Thakkhola (:Mustang) many observations from Muktinath (IV) and Jomosom (III) down to Ghasa (V) and Rupshesara (II); see Tab.19; – Gara (3.V.); Ghandrung (7.V); Ulleri (22.II.), Ghorapani Pass (23.II. all :Parbat); – pasture Thimang above Bagarchap (14.IV.); Manang (19.IV. both :Manang); – Chordung Mt./Jiri (28.III., see Material;); Jiri (10.IV.; see also *levaillantii*); Thodung (4.IV. both :Ramechap); – Thudam (25./26.V.); descent to Pahakhola and below Pahakhola (2.-4.VI. both :Sankhua Sabha); – Dhorpar Kharka (15.IV.); pasture Lassetham (8.V. both :Taplejung).

Vertical: Though Crows are powerful fliers, my records of *japonensis* are concentrated in a limited vertical belt during all seasons. Records in more than 40 localities (with many more observations) scattered over 8 years are mostly between 1850 m (II) and 4200 m (V), but clear indications of breeding activity are considerably more limited in altitude (see Breeding). – Breeding season (E III-VI): lowest record 1920 m (Gara :Parbat, V); 2000-2500 m: 12 localities; 2510-3000 m: 10 loc.; 3010-3500 m: 5 loc.; 3510-4200 m: 4 loc. Highest records are at 3600 m (Muktinath :Mustang, E IV), 3700 m (Ringmo/Phoksumdo Lake :Dolpo, 21.VI.), and 4200 m (resting place Phurbang :Dolpo, 31.V.). – Outside breeding season

(II-M III): lowest record 1850 m (Rupshesara :Mustang, 2 specimens, 24.II.), highest records 3200 m (Thaksang/Tukche, Purano Marpha :Mustang, E II/M III).

These comparatively low records are due to the restriction of field activity at high altitude during winter. In general, pronounced altitudinal migration in winter does not occur, but Inskipp & Inskipp (1991) give the lower limit as 1200 m without seasonal specification, apparently referring to Biswas (1963c: 653). According to his locality list (Biswas 1966), his specimens originate from altitudes between about 1525 m (but probably higher) and 2135 m. Ali & Ripley (1972,5:253) mention records between ca. 1800 and 4500 m, but again seasonal specification is lacking. For a low-altitude winter record at 900 ft (Bilauri, XII) see Rand & Fleming (1957), another possible one from Biratnagar (II) is given by Fleming & Traylor (1965). – For parapatric/sympatric occurrence with *C. levaillantii* see below.

Habitat: The Great Jungle Crow prefers a mixture of both open landscape with scattered trees and small woods and large mature forests. In extended forests, however, clearings are needed, mainly as feeding areas. The human impact, which opened and even reduced the forest cover to a considerable extent, favoured the Jungle Crow and offered a multitude of habitats, even close to human habitations. But the affinities to villages and towns are never close except where rubbish tips and other wastes are present with a certain regularity. Although such cases are still rare at the altitude concerned, like most *Corvus* species Jungle Crows learn quite quickly to exploit irregular and unusual food sources. Camp sites, even at high altitude above timberline and certainly beyond the breeding altitude, are regularly investigated (4200 m, Phurbang, V) and they even accompany mountaineering expeditions to considerable heights (Inskipp & Inskipp 1991; misidentifications with *C. corax* may happen). The species also lives in the dry monsoon-reduced areas north of the main range, but only in forested areas (Phoksumdo Lake :Dolpo, M VI; upper Thakkhola area :Mustang, II-IV, VI). The record near Muktinath, far beyond forest vegetation, is certainly an exception and may refer to a non-breeding area. In high-altitude and dry treeless regions the Jungle Crow is replaced by the Raven, *C. corax*.

Breeding: *C. japonensis* starts breeding early in the season. Adults carrying nesting material were seen on 28.III. (Chordung Mt., 2900 m) and 4.IV. (Thodung, 3200 m); adults bringing food to the nest on 21.V. (Dhorpatan, 3000 m); adults feeding fledglings well on the wing on 27.VI. (below Tukche, 2550 m).

Vocalizations: The calls (Fig.116) commonly heard are harsh and coarse and in most cases are easily to be distinguished from those of *C. levaillantii* (which see), which has a brighter and clearer voice. In general the voices of the 2 Jungle Crow species cannot be heard close to each other because of allopatric distribution except for small linear regions of parapatric occurrence. Calls of the local Himalayan ssp. *intermedius* are quite complexly structured and the single call often consists of a combination of slightly frequency-modulated whistles, which are rich in harmonics; sometimes the harmonics are also whistles (Fig.116e, i') but in most cases a strong frequency modulation ("zig-zag" structure) is superimposed. In Nepal (Fig.116a-g) and Kashmir (Fig.116i-k) 4-7 harmonics (including the key-note) are present, in Kashmir often not as clearly as in Nepal. Presence of harmonics within a single call varies and single harmonics may be thinned out or stressed as the individual

note proceeds (Fig.116c, c', d). Distances between the harmonics are only about 250 Hz, frequency of the main harmonic is between 800 and 1400 Hz. Calls of ssp. *mandshuricus* from Ussuriland (Fig.116h) are especially rich in strong harmonics. – Another note type cuts the multitude of frequency modulations into extremely short click-like pulses (Fig.116a', a'', i, i''). Such notes show less marked harmonics. For renderings of the various notes see legends to Fig.116.

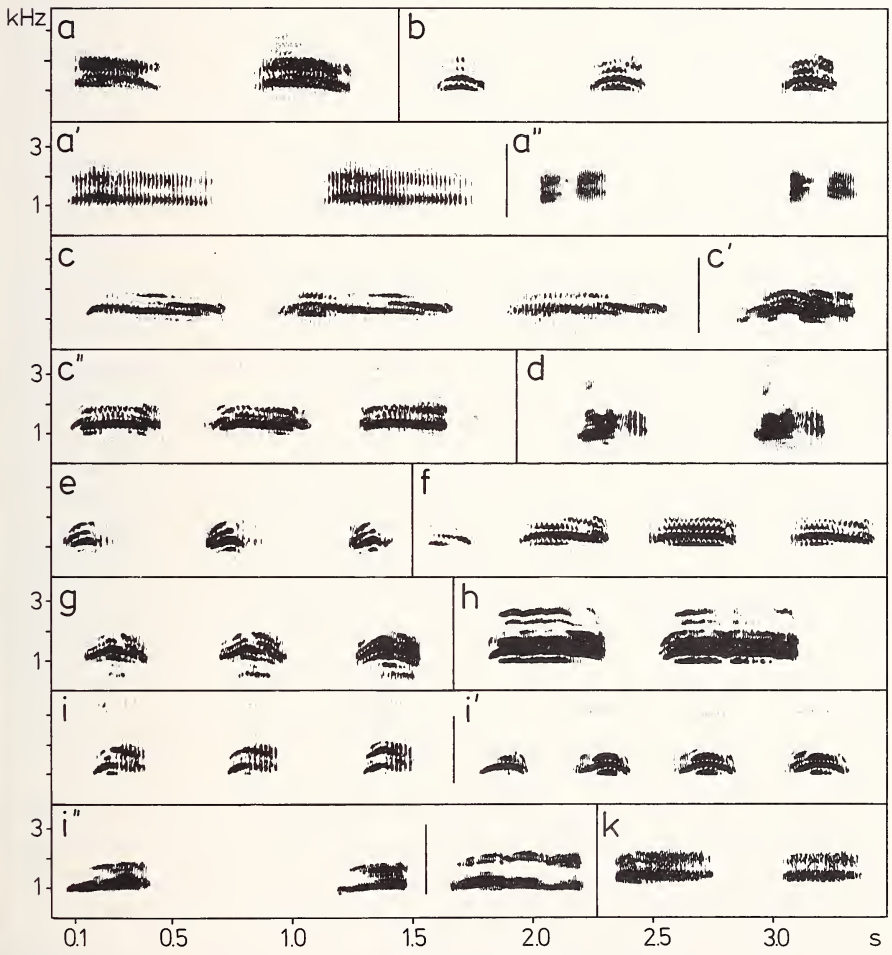


Fig.116: Vocalizations of *Corvus japonensis*. – a-a'') above Chitre 7.V.1980 (a'': "arrak"); b) above Chitre 6.V.1980; c-c'') Pahakhola 2.VI.1973 (last note of c: "arrr"); d) Chordung Mt. 28.III.1973 ("orrk"); e) Dhorpar Kharka 15.IV.1988 (calls given on the wing); f) Dhorpatan 10.V.1973 ("rraak"); g) Lassetham 8.V.1988; h) Russia, Amurland, Bychikha near Khabarovsk 6.VI.1990 (ssp. *mandshuricus);* i-i'') India, Kashmir, Pahalgam 16.V.1978 (i: rasping "rääp"; i'': "rärk"); k) Pahalgam 15.V.1978 ("aarrr").

Corvus levaillantii

Taxonomic note: With respect to species status attribution to the Small Jungle Crow of the Nepal lowlands see the remarks on *C. japonensis.*

Horizontal: My records are from the Dhaulagiri/Annapurna area to near the Darjeeling border. – Southern Thakkhola: Dana (23.II.); between Lete and Ghasa (2.V.); lower village Ghasa, 2sp. (4.V. all :Mustang); – southern Annapurna: Birethanti (22.II.), Gara (3.V.), Sikha (23.II., 3.V. all :Parbat); – between Landrung and Dhumpus (10.V.); Lumlé (21.II.); Suiketh (21.II.); Pokhara (20.II. all: Kaski); – Marsyandi Valley: Dumre (7.IV.); Turture (8.IV.); Syuribar (8.IV. all :Tanhu); – Phalesangu (9.IV.); Samche (11.IV.); Tal (11.IV. all :Lamjung); – Bagarchap (12.IV; :Manang); – Kathmandu Valley: Kathmandu City (17./18.II.); Phulchoki Mt. (22.III. :Lalitpur); – Jiri (10.IV.); Shiaku (11.IV.); Darapani (12.IV. all :Ramechap); – Hurure (17.VI.), Dharapangma (20.VI. both :Sankhua Sabha); – Sunichare (4.-6.IV.); Ilam (25.III., 1.IV.); between Ilam and Mai Pokhari (6.IV. all :Ilam).

Vertical: My records extend from the Terai lowlands to 2660 m with only small local differences of the upper limit. – 180-500 m: 5 records in different localities; 510-1000 m: 5 loc.; 1010-1500 m: 6 loc.; 1510-2000 m: 7 loc. Observation close to or at the upper distributional limit require detailed documentation: 1970 m and 2050 m (lower village Ghasa, 4.V.1995, 2 sp. and 2.V.1980, flock); 2100 m (Landrung/Dhumpus, 9.V.1980); 2110 m (above Sikha, 23.II.1974, 3.V.1980); 2200 m (above Bagarchap, 12.IV.1980); 2660 m (Phulchoki Mt., close to summit, 22.III.1980, 1 pair displaying). These data demonstrate that *levaillantii* is regularly distributed, at least during the breeding season, up to and locally above 2000 m. The record from Phulchoki Mt. is an exception (see below).

Interrelationships between *C. levaillantii* and *C. japonensis:* None of the sightings at the upper and lower limits of *levaillantii* and *japonensis,* respectively, have been proven to be in breeding localities, but the probability of breeding there is high. Most records refer to single birds or pairs, sometimes displaying, within the presumed breeding season (III-VI). The data suggest slight vertical overlap, especially during the breeding season insofar as all data are pooled. But within the single mountain/valley system, distributional areas seem to be virtually parapatric, and there is only slight evidence for minor altitudinal overlap (see Tab.19). Furthermore, with respect to such vigorous birds which may fly for long distances without trouble, the overlap is indeed negligible.

a) Jiri: In and around the village *levaillantii* at 1800 m, 10.IV. 1973; 1 specimen of *japonensis* at 2150 flying downhill, 10.IV.1973.

b) Slopes W and E below Ghorapani Pass (Tab.19): The villages Gara (lower and upper)/Sikha and Ulleri are situated on the western and the eastern slope of the Ghorapani pass ridge, respectively. Concerning the few observations, there is a certain amount of overlap of the two species but not all observations originate from the breeding season.

c) Lower Thakkhola: In the Kali Gandaki Gorge, the zone of contact between *levaillantii* and *japonensis* is near 2000 m; no overlap is known yet, but a search for it should be made.

Field identification: In most cases identification is easy, at least with some experience, in regard to size, voice and shape of tail, even though the two species are rarely to be seen together. *C. japonensis* is the bigger species with harsher voice (Fig.116) and wedge-shaped

Tab.19: Vertical distribution of Indian and Himalayan Jungle Crows *(Corvus levaillantii, C. japonensis)* around Ghorapani Pass and in lower Thakkhola.

Altitude, locality, date	*levaillantii*	*japonensis*
Ghorapani Pass area		
1750 m Gara, lower village, 3.V.1980	+	–
1920 m Gara, upper village, 3.V.1980	–	+
2100 m Sikha, 23.II.1974, 3.V.1980	+	–
2600 m Ghorapani, 23.II.1974	–	+
2000 m Ulleri, 22.II.1974	+	–
Lower Thakkhola		
1650 m Dana, 24.II.1974	+	–
1700 m Rupshesara, 24.II.1974	+	–
1850 m below Ghasa, 24.II.1974	–	+
2100 m Ghasa, 2.V.1980	–	+

tail. *C. levaillantii* is markedly smaller and has a rounded tail, and it voice tends to be more shrill (Fig.117). Regarding these characters *japonensis* is closer to European populations of the Raven *(Corvus corax),* but the local *C. c. tibetanus* is considerably larger than *japonensis* and its voice even coarser.

Habitat: *C. levaillantii* generally inhabits open agricultural land and forest vegetation of the Terai lowlands and in the mountainous midlands. The affinities to human settlements are closer than in *C. japonensis* but considerably less than in *C. splendens.* Deforestation of the midlands seems to have greatly influenced the population density of *levaillantii.* The parapatric distribution with only minor overlap indicate that the two compete. At higher altitudes of the midlands, far from the mass elevation of the main range, where *japonensis* occurs only locally or is absent, *levaillantii* is also found at higher altitudes. It lives close to the top (2660 m) of Mt. Phulchoki, the highest elevation of the ridges encircling the Kathmandu Valley, thus penetrating into the altitudinal belt of *japonensis* and replacing it there.

Vocalizations: Calls (Fig.117) of the Indian Jungle Crow are brighter and much less coarse than those of the Great Jungle Crow, and with little experience the differences are clear-cut in the field in most cases. The aural impression is, however, only partly corroborated by sonagrams. Frequency range of the main harmonic is about 1050-1300 Hz. Only one such harmonic exists, though a 2nd very weak one may be apparent above (Fig.117e, h, k) or below it (Fig.117l/l'). The gap between the 2 harmonics is conspicuously constant, always being close to 500 Hz. The generally 2 harmonics consist of rapidly frequency-modulated notes ("zig-zag" pattern), but this may be reduced to pure whistles in special conditions (Fig.117l/l'; specimen attacking a raptor on the wing). Beside this widespread note characteristic, broad-band noise-like notes also occur with little or no harmonic structure discernible (Fig.117a'/a").

Differences between call notes of *C. japonensis* and *C. levaillantii* refer to the number of harmonics. There are 4 to 6 in *japonensis* but only 1 (rarely 2) in *levaillantii.* In the for-

mer the gaps between the harmonics are smaller (up 250 Hz) than in the latter (close to 500 Hz). In accordance with the larger number of harmonics in *japonensis,* the frequency bandwidth of all discernible harmonics is wider (1000-1500 Hz) here; in *levaillantii* it is about 500 Hz (rarely up to near 1000 Hz if a 2nd harmonic is present). The differences in harmonic structure apply to the differences of aural impression. For renderings of the various notes see legends to Fig.117.

Corvus corax

Corvus [corax] incl. *ruficollis, albus*

Horizontal: All my observations refer to the (i) trans-Himalayan region of Dhaulagiri/Annapurna and (ii) to the Everest region. – In detail: (i) N slope of Bagar La (17.VI.); upper

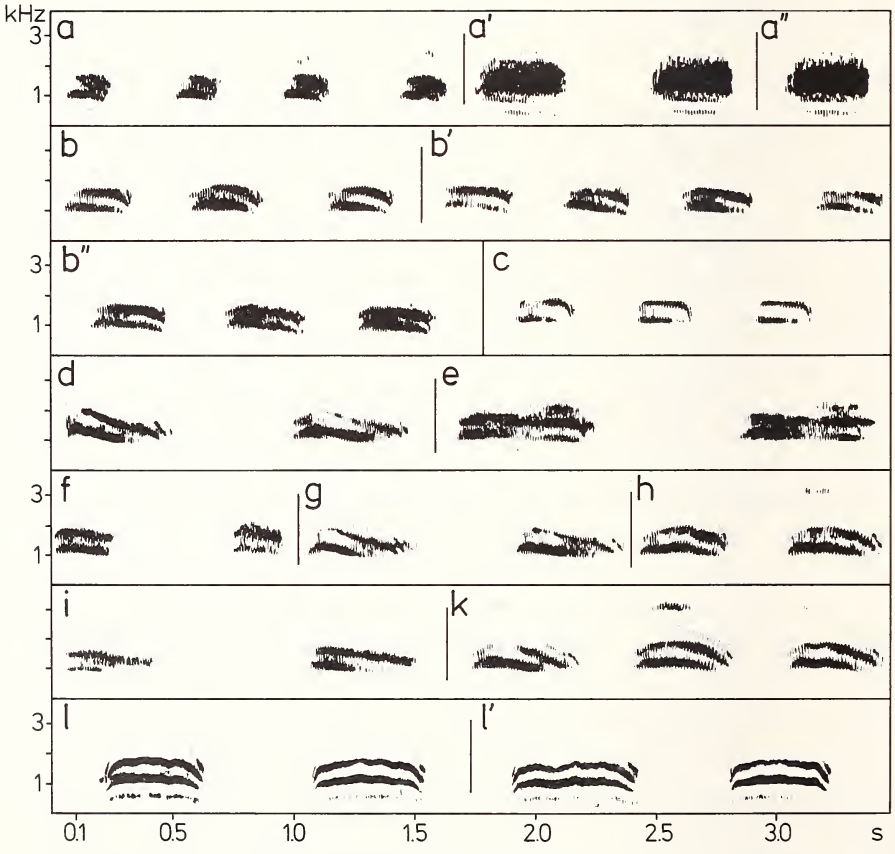


Fig.117: Vocalizations of *Corvus levaillantii.* – a-a") N Sunichare 3.IV.1988 (a: "rock", the 'o' tending to 'ä'; a': "rääk"); b-b") Hurure 17.VI.1988; c) between Ilam and Mai Pokhari 6.IV.1988; d-k) Kathmandu, Chauni 17.IV.1988 (d: "yorr"; and "orr"; e: "karrer"; g: "raar"); l-l') individual attacking *Spilornis cheela* on the wing; Worebung pass 21.IV.1988 (l': closed "göök").

Barbung Khola, Charka (21.VI.); between Tukot and Parung, 4 specimens (19.VI.); Mukut (16.VI. all :Dolpo); – Sangdak, 3 sp. in the village (23.VI.; 28.VI.); Jomosom (21.-23.III., 30.VI.); Tini, 2 sp. (22.III.); Marpha (13., 21.III.); Purano Marpha (5.V.); Dapa Col above Tukche and Marpha, up to 5 sp. at the tent (15.-17.VII. all :Mustang); – below Thorung La, E slope (20.IV. :Manang); – (ii) Gorak Shep and Everest Basecamp (IX); Kalar Pattar (IX); Dingpoche (IX); Namche Bazar (X; all :Solukhumbu).

Vertical: Lowest spring/summer records are from Thakkhola: 2700 m (Marpha), Jomosom (2750 m) and Purano Marpha (3000 m), all others at much higher altitudes: between Sangda (3800 m) and Dápa Col (5000 m), most of them in Dolpo. Inskipp & Inskipp (1991) mention summer records only above 3500 m, but since breeding records are still lacking for Nepal, the actual breeding belt remains unknown. In Khumbu, close to Everest, an area with more pronounced monsoon precipitation than in Dolpo and Thakkhola, the Raven lives at higher altitudes. Shortly after the breeding season (B VII), Diesselhorst (1968:211) found it only above 4500 m. In IX and X, it descends to lower altitude, at least to 3300 m (near Namche Bazar, see above).

Habitat: Dry monsoon-protected area in the Inner Valleys (Thakkhola) and north of the main range (Dolpo, Manang). Lowest altitudes fitting these requirements are located in Nepal only in Thakkhola, where the species occurs during spring and summer, but only in the northern part. In most of its Nepal area, the Raven is the only representative of the genus *Corvus* and is able, without competing species, to occupy most of the niches of the other Himalayan congeners. It lives close to human habitations, villages, and caravan resting sites, but the contact is never close and only temporary. It visits rubbish tips in villages, forages on the flat roofs of the Tibetan houses, visits and even penetrates into tents of shepherds (and scientists).

In the trans-Himalayan area the Raven is quite common, already rare in the markedly moister part at Everest, and I found none at appropriate altitudes in the monsoon-rich area S and W of Kanchenjunga (V, VI, IX).

Breeding: Apparently early in the year as in other regions. H.S. Nepali collected 1 independent juvenile on 21.VI.1973 in Charka.

STURNIDAE

Saroglossa spiloptera (Vigors)

Material: 1 specimen: **J** Dolakha Distr., Bothe Kosi Valley, between Shianku and Bikuti, 1300 m, 11.IV.1973: 1♂.

Measurements: **Wing**-L 109 mm. – **Tail**-L 59 mm. – **Tarsus**-L 21.5 mm. – **WTI** 29.4% – **TWI** 54.1%. – **Testes** large, 8 x 5 mm.

Notes: Bill black, feet dark smoky-brownish, iris creamy white.

Horizontal, vertical: The specimen was among a flock of appr. 5 birds. – 2 sp. in Trisuli, 900 m (21.IV.1973 :Nuwakot).

Sturnus

Five species are on the Nepal list *(malabaricus, pagodarum, contra, vulgaris, roseus).* The former three breed, the latter are uncommon winter visitors. The breeding species are confined to the lowlands *(contra)* or extend the vertical belt up to about 950 m *(pagodarum)* and to the level of the Kathmandu Valley (1350 m, *malabaricus).*

Sturnus malabaricus

Horizontal, vertical: 1 sp. in cultivations at Tumlingtar, 500 m (22. VI.1988 :Sankhua Sabha).

Sturnus pagodarum (Gmelin)

Horizontal, vertical: 2 sp. in cultivations at Tumlingtar, 500 m (22.VI.1988 :Sankhua Sabha).

Sturnus contra

Horizontal, vertical: My finds only from the Dun lowlands. – Rapti Valley S Tekouli, small flocks, 300 m (II 1970 :Chitawan); – Birtamode, few, 200 m (III 1980 :Ihapa); – Kutunabari, small flocks on fields together with *Acridotheres tristis,* 230 m (IV 1988 :Ilam).

Acridotheres

Three species occur in Nepal *(tristis, ginginianus, fuscus);* all breed. Their origin is the tropical Indian Peninsula, and consequently all species are confined to the (sub)tropical zone of Nepal. *A. ginginianus* is restricted to the Terai lowlands, *fuscus* reaches altitudes up to 1550 m and *tristis* up to roughly 1900 m. The latter has been seen in singles here and there at higher elevations but not as a regular breeding bird.

Acridotheres tristis tristis (L.)

Material: 2 specimens: **G** Kaski Distr., Naudhara ridge W Pokhara, 1450 m, 15.VII.1973: 1♂ juv. **B** Kathmandu, suburb Chauni, 1350 m, 28.II.1970: 1♂.

Measurements: **Wing**-L ♂ 152, ♂ juv. 140 mm. – **Tail**-L ♂ 91.5, ♂ juv. 73 mm. – **Bill**-L/-Height ♂ 20/7.6, ♂ juv. 22.5/8.7 mm. – **Tarsus**-L ♂ 41, ♂ juv. 42 mm. – **WTI** 26.3, ♂ juv. 27.9% – **TWI** ♂ 60.2, ♂ juv. 52.1%.

Notes: Testes minute; primary coverts of ♂ juv. with dark-brown patches at tip of the inner webs.

Horizontal: I saw the Common Mynah within the entire expedition area extending from S Dhaulagiri to the E border to Darjeeling and Sikkim.

Vertical: My data cover the Terai lowlands regularly up to ca. 1850 m (Dhumpus :Kaski, V). 3 encounters above 2000 m: 2100 m, 4 birds flying upriver in early evening twilight high above the Myagdi Khola Valley floor, then suddenly dropping to the valley floor, Muri (25.IV.1973 :Myagdi); – 2100 m, Dara, 2 sp. in the village (5.IV.1970 :Myagdi); – 2650 m, Tukche, 1 sp. in the village (26.IV.1980 :Mustang). The regular upper limit of breeding activity is between 1800 m and 1900 m, according to Diesselhorst (1968:202) at 2000 m.

Brood finds above this level, e.g. in the Dhorpatan Valley (:Myagdi, at or even above 2950 m, without further comment in Inskipp & Inskipp 1991), are to be regarded as rare exceptions.

Habitat: The Common Mynah is abundant in all types of cultivation especially in close association with man, in villages as well as in the transition zone between city and suburb. Nevertheless, climatic conditions drastically restrict the upper limit of the vertical belt and confine the Mynah to the subtropical zone. Sometimes *tristis* reaches the upper Kali Gandaki Valley N of the Himalayan gorge. Fleming Jr. (1969) saw 6 sp. in Ghasa (XII/I) just N of the gorge, I myself 1 sp. in Tukche, already in the Inner-Valley zone (26.IV.1980 both :Mustang). Such straying birds have so far been unable to colonize hitherto unsettled areas beyond the subtropical belt. This contrasts with the situation in C Asia (Kazakhstan, Kirgisia), where the Common Mynah very successfully settled in Palaearctic climatic conditions, e.g. even high up in the severe conditions of the Tian Shan Mts., and where it is present even in the smallest settlements.

Vocalizations: Heard as early as 18.II.1974; singing at a tree hole 6.IV.1988.

Acridotheres fuscus

Horizontal, vertical: 1 pair with fledglings on roof of a house, Naudhara ridge W Pokhara, 1500 m (15.VII.1973 :Kaski). – Kathmandu Valley, possibly breeding in the king's forest near the Indian Embassy, several sp. visiting tree holes; 19.IV.1973; 2 sp. at the Swayambunath temple, 23.VI.1988.

PASSERIDAE

Passer

Three species are native to the Central Himalayas *(domesticus, montanus, rutilans)* and breed there; *hispaniolensis* is a winter guest. Their combined vertical area belt comprises 4200 m; but one of them, *montanus,* covers the whole span – the most extended belt of all Himalayan passerines, possibly all Himalayan bird species at all. In the lowlands and midlands, *domesticus* and *montanus* locally coexist within human settlements, *domesticus* being the more restricted of these two synanthropic species. *P. rutilans* inhabits the medium-altitude part of the forest zone, but in addition lives in scattered high-altitude villages N of the main range as does *montanus;* however, their "village patterns" are strictly allopatric (Fig.118).

Passer montanus, malaccensis population group

Taxonomic notes: *P. montanus malaccensis* Dubois (**loc. typ.** Malacca) has a wing length of maximally 72 mm in the S Indonesian area. Populations living further north, e.g. in Nepal, are distinctly larger (see below). Keve (1978:266) published detailed wing measurements in relation to geography (unfortunately not to sex), which, too, stress the pronounced size differences between northern and southern populations. For clarity, we simply use the term *malaccensis* population group.

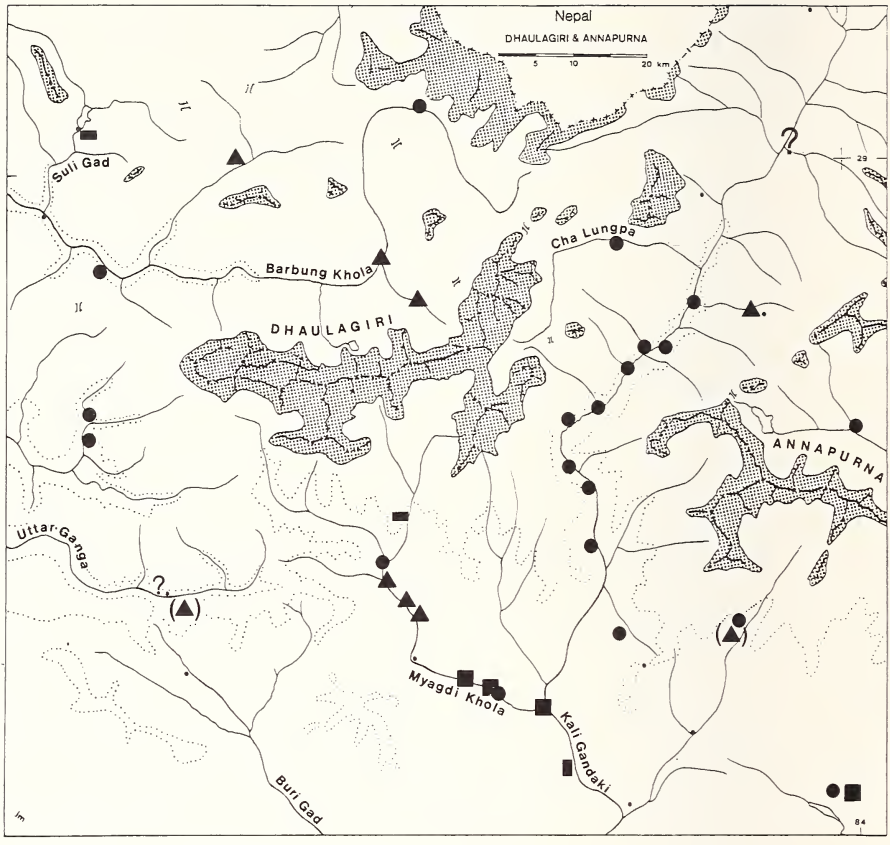


Fig.118: Distribution of 3 *Passer* species in the Dhaulagiri/Annapurna area to show widespread occurrence of *P. montanus* N and S of the main range, restricted distribution of *P. domesticus* in tropical low-altitude areas and large area of *P. rutilans* inhabiting sparse localities mainly in forested areas S of the main range and locally in villages N of the main range. *P. montanus* and *P. rutilans* are strictly allopatric N of the main range in association with man.

In neighbouring Tibet, even S of the Tsang Po Valley, Tree Sparrows breed at the longitude of Nepal, which belong to ssp. *tibetanus* (Cheng 1987). However, ssp. *tibetanus* did not reach the Tibetan facies landscape N of and close to the main range (see Material; Charka). Rand & Fleming (1957) cite *tibetanus* from Thakkhola (Tukche and Jomosom; XI and XII) but according to specimens from VI and VII (see Material) ssp. similar to *malaccensis* is present there. Following Rand & Fleming, Inskipp & Inskipp (1991) confine *malaccensis* to areas below 2000 m, *tibetanus* to higher altitudes. This seems not to be correct.

Material: 21 specimens; **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4250 m, 21.-24.VI.1973: 2♂ 3♀. ** Mustang Distr., Thakkhola, Syang, 2650 m, 30.VI.1973: 1♂ pull. * Thakkhola, Gobang, 2600 m, 8.VII.1973: 3♂. **B** Kathmandu, suburb Chauni, 1350 m, 3.II.-14.III. 1970, 3.VI.1995: 5♂ 5♀, 2♂ pull./juv.

Measurements: **Wing**-L ♂ (10) 72-79 mm, $\bar{x}$=75.1, s_d=2.48; ♂ pull. (3) 70-75 mm; ♀ (8) 68-76 mm, $\bar{x}$=71.6, s_d=3.50. – **Tail**-L ♂ (10) 55-61.5 mm, $\bar{x}$=56.9, s_d=2.02; ♂ pull. (3) 50-52.5; ♀ (8) 52-58.5 mm, $\bar{x}$=55.1, s_d=2.56. – **Tarsus**-L ♂ (10) 16.5-18 mm, $\bar{x}$=17.9, s_d=0.84; ♂ pull. (2) 17.5-18 mm; ♀ (8) 16-19 mm, $\bar{x}$=17.2, s_d=1.10. – **WTI** ♂♀ (18) 19.1-24.3%, $\bar{x}$=23.1, s_d=1.27; ♂ pull. (3) 22.7-23.6%. – **TWI** ♂♀ (18) 73.4-77.9%, $\bar{x}$=76.3, s_d=1.13; ♂ pull. (3) 70-72.2%.

Notes: Pulli of Tree Sparrows are relatively short-tailed in comparison with older specimens (cf. Zool. Abh. Mus. Tierk. Dresden 40:89, Fig.23). 1 ♂ pull./juv., Kathmandu, 3.VI.1995, specimen labelled "Nr.8", nearly finished moult of primaries.

Horizontal, habitat: In most parts of the expedition area from W Dhaulagiri to the Sikkim/Darjeeling border, the Tree Sparrow is a common breeding bird, closely and exclusively associated with man and human habitations. Even isolated farmsteads house a Tree Sparrow pair. It inhabits the monsoon-moist S as well as the rain-shadowed N flanks with Tibetan facies landscape. Nevertheless, a continuous population does not exist. Very remote villages, which may be discovered only by chance, have not been colonized by *montanus*. I found no Tree Sparrows in Hellok (2000 m), Walungchung Gola (3200 m), Thudam (3500 m), Pahakhola (2550 m; all :Taplejung) or Boghara (:Myagdi). Diesselhorst (1968:378) could not detect *montanus* in the Sherpa villages of the upper Khumbu. Villages that are vacated by the local human population during winter, remain unsettled as a rule, e.g. Ringmo/Phoksumdo Lake (:Dolpo). There *Carpodacus pulcherrimus* takes over the ecological niche of the Tree Sparrow. In the sparsely inhabited N Dolpo (N flank of Dhaulagiri) and apparently in the Muktinath area (N Annapurna) *montanus* is a vicariant of *rutilans* (which see). The species that first settles locally "occupies" the village, apparently preventing a second *Passer* species from intruding (Fig.118). It is in these montane steppe areas that the highest *montanus* occurrences within Nepal are found (4250 m, Charka :Dolpo). While these populations also belong to the *malaccensis* group (see above), the colonization of the N flank apparently originated from the S.

Vertical: Our records of breeding *montanus* range from 500 m (Tumlingtar :Khandbari) to 4250 m (Charka: Dolpo); it has been found breeding down to 75 m (Inskipp & Inskipp 1991). Consequently, the Tree Sparrow occupies the widest vertical belt of all passerines of the Central Himalayas. In the Terai lowlands (from 75 m upwards) *montanus* lives only sparsely and locally, its place being taken by *P. domesticus* especially within the new roadside settlements. In Kathmandu (1350 m) the two species coexist, *montanus* preferably within the city, but I found both together in the garden-rich suburbs Chauni and New Baneshwar. According to the specimens mist-netted *domesticus* was the more common species (in II and M IV 1970 only *domesticus,* in IV/V 1995 also *montanus* present).

Breeding: Only in human settlements in and at houses, under the roofs. In accordance with the species' large vertical belt, the season lasts a relatively long time: Kathmandu (1350 m) testes B II largely undeveloped (appr. 2 mm); Pelma (2270 m) fledglings 28.V.; Charka (4250 m, most elevated breeding place in Nepal) 1st fledgling 24.VI. (stay from 20.VI., adults still building nests); in Thakkhola (2600-2800 m) E VI/A VII many fledglings together with adults in the fields, testes still strongly developed (7-9 mm, Gobang, 8.VII.).

Passer rutilans cinnamomeus (Gould)

P. [rutilans], incl. *castanopterus*

Material: 4 specimens: **D** Myagdi Distr., Dhorpatan, Uttar Ganga plain, 2950 m, 9. and 24.V.1973: 2♂ ** Dolpo Distr., upper Barbung Khola, Tarang, 3600 m, 14.VI.1970, 2♀.

Measurements: **Wing**-L ♂ (2) 72-72.5 mm; ♀ (2) 75-75.5 mm; – **Tail**-L ♂ (2) 49-50.5 mm; o (2) 51-53 mm; – **Tarsus**-L ♂ (2) 17.5-18 mm; ♀ (2) 18 / 18 mm; – **WTI** (4) 28-30.6%; – **TWI** (4) 68-70.2%.

Notes: 1♀ (ZFMK 71.760) shows slightly darkened throat.

Horizontal: Our findings of *rutilans* are only from the Dhaulagiri and Annapurna areas. – Kangar (17.VI.); upper Barbung Khola, Tarang (14.VI.; see Material); Mukut, 1♀ (16.VI. all :Dolpo); – Dhorpatan (7.-23.IV., 9.-21.V.; see Material); Bobang S Dhorpatan (29.IV.); between Muri and Nerwang (27.III.); left banks of Myagdi Khola between below Khibang and Darapani (29.V.); Emaka, 2♂ 1♀ close to the village, cf. *P. montanus* (6.V. all :Myagdi); – Thakkhola: Ghasa (25.II.); between Kalopani and Lete (30.IV.); Choya, flock of 10 specimens (25.II.); Titi Lake (2.V.); Tukche, in the village and downriver near Lete (26.IV., 27.VI., 8.VII.); Muktinath, small flocks of up to 5 specimens (21.IV. all :Mustang); – Gara (3.V.), above Shikha (3.V.); Ghandrung (8.V. all :Parbat); – near Landrung (8.V.); above Dhumpus (10.V. both :Kaski); – near Syuribar, Marsyandi Valley (8.IV. :Lamjung).

This area marks the eastern distribution limit of a continuous area extending from the Indus knee to E Tibet and Sichuan (ssp. *cinnamomeus*). The Nepal area covers the monsoon-moist S macroslope of the main range as well as Tibetan facies landscape N of it. Why the S flanks of the E Himalayas remained unsettled is open to question; possibly the precipitation is excessive. Cheng (1987) indicates localities slightly E of E Nepal in S Tibet.

Vertical: Our findings in the monsoon area range from 1300 m (below Khibang :Myagdi), 1400 m (close to Landrung :Kaski) and 1650 m (Gara: Parbat) up to 3000 m (Dhorpatan :Myagdi). During the breeding season (presumably V-VI), the majority of them fall between 2000 m and 2600 m. In the transitional and drought area of the upper Kali Gandaki Valley the population density is reduced and in the Tibetan tree-less barren landscape the species is finally restricted to the small village settlements. The distributional area from S to N flanks, at least in the Kali Gandaki climatic transitional area (Inner Valley), seems to be continuous. But populations to the N are only local and have to compete with the Tree Sparrow *(P. montanus,* which see). The highest known *rutilans* settlements are at Tarang (3800 m, upper Barbung Khola), Mukut (4000 m), Kangar (4200 m, all from VI, :Dolpo), and Muktinath (3600 m, flock of appr. 5 specimens, 21.IV., probably still outside the breeding season, :Mustang). The vertical belt during the breeding season comprises at least 2800 m and probably surpasses 3000 m (cf. Inskipp & Inskipp 1991). In all *rutilans* villages at high altitudes the much more widely distributed *montanus* is absent, consequently one is inclined to assume that the two compete. Probably the species which arrived first in the various villages took control (Fig.118). On the S macroslope *rutilans* is the inferior species with respect to village occupation.

Habitat: On the S flanks, the Cinnamon Tree Sparrow lives in open forest habitats, and there seems to be hardly any preference for natural stands (Dhorpatan, near 3000 m) as degraded or artificial stands at village edges are inhabited; dense woods are avoided. Where *rutilans* and *montanus* live in close proximity in/at villages of the S macroslope, the latter

is confined to the village proper, *rutilans* to the vicinity of village edges. There are only a few exceptions for *rutilans:* Ghandrung, 2100 m, 1 specimen calling in the village, 8.V.; Tukche, 2650 m, 1 specimen calling in the village, 26.IV. (:Mustang). Breeding was not proven there.

Migration: In the breeding areas of the Kali Gandaki Valley there were flocks of 5 and 10 specimens near Ghasa (2100 m) and Choya (2400 m) at the village edge, 25.II. The breeding areas are perhaps not left during winter, but this remains to be shown for the remote and high Dolpo villages.

Passer domesticus, indicus population group

Taxonomic notes: Vaurie (1949:15) designates House Sparrows from Nepal as *parkini* Whistler, 1920 (**loc. typ.** Srinagar/Kashmir), the wing length of which was given as 77.5-83 mm, somewhat larger than that of Nepal specimens. Summers-Smith (1988:119) reports the wide range 71.5-85 mm for *parkini* (♂); apparently he combined several distinct populations. He indicates for ssp. *indicus* 70-83 mm (♂) basing this value on the large ♂ series from Kathmandu (see Measurements). Consequently, to distinguish *parkini* only a slight difference in colouration remains, and we therefore prefer to use no subspecies name for the Kathmandu series.

Material: 18 specimens **B** Kathmandu, suburb Chauni, 1350 m, 20.IX.1969, 3.II.-14.III.1970, 17.-19.IV.1973, 3.VI.1995: 10♂, 5♀, 1♀pull., 2? (presumably ♀ with dark throat, in one case with dark rusty brown small wing coverts).

Measurements: The material of this section was enlarged by ♂ of the Diesselhorst collection originating from Kathmandu (ZSM). – **Wing**-L ♂ (26) 75-80 mm, $\bar{x}$=77.5, s_d=1.54; ♀ (5) 74-76 mm, $\bar{x}$=75.1; ♀ pull. 74 mm; ? (2) 76-77 mm; – **Tail**-L ♂ (24) 54-58.5 mm, $\bar{x}$=56.5, s_d=1.36; ♀ (5) 53-56 mm, $\bar{x}$=54.7; ♀ pull. 48 mm; ? (2) 54-56 mm; – **Bill**-L ♂ (25) 10.5-13.5, $\bar{x}$=11.9, s_d=1.00; ♀ (4) 11-12.5 mm, $\bar{x}$=11.9; ? (1) 13 mm; – **Tarsus**-L ♂ (24) 16.5-19 mm, $\bar{x}$=17.6, s_d=0.66; ♀ (5) 16-18.5 mm, $\bar{x}$=17.5; ? (2) 17-18 mm. – **WTI** (n=28) 22.2-29%, $\bar{x}$=26.4, s_d=1.60 (for comparison in 7 *P. d. bactrianus* 27.3-31.5%, $\bar{x}$=29.5, s_d=1.58), primary relations: 16 times H 9 > 7, 13 times H 9 < 7, 4 times H 9 = 7. – **TWI** (30) 70.9-76.3, $\bar{x}$=73.1, s_d=1.31 (in 7 *P. d. bactrianus* 71.4-73.5%, $\bar{x}$=72.5, s_d=0.92), ♀ pull. 64.9%.

Notes: 1♂ ad. (17.4.1973) has grey ear coverts; cf. Hartert (1904:151).

Horizontal: Only in the towns and villages of the Terai and Dun lowlands is the House Sparrow the dominant *Passer* species. Within this altitude range I found it in the Suiketh Valley NW Pokhara (:Kaski), in Pokhara town (:Kaski), in the lower Myagdi Khola (villages Babyachaur, Tatopani, Beni :Myagdi), in the lower Marsyandi Valley (Phalesangu :Lamjung), in Trisuli (:Nuwakot) and in Kathmandu (see Material). Predominantly in the modest shack settlements along the new roads of the lowlands, the House Sparrow is present virtually everywhere; I never encountered the Tree Sparrow there. According to the map of Inskipp & Inskipp (1991) the whole S part of the country is inhabited.

Vertical: Very limited from the lowest parts of the country (Birtamode, 180 m, III; Kutunabari, 230 m, IV, both :Ilam) up to the Kathmandu Valley (1400 m). Fleming (Fleming & Traylor 1961) collected *domesticus* near the W Nepal border at Baitidi at 6500-6900 ft. (= 2000-2060 m), remarkably high. Vertical breeding belt appr. (including the lowest altitude recorded in the country) 1200 m, 1650 m if the Baitidi record is included. In the upper part

of the area the species occurs only locally and is restricted to towns and cities (Pokhara: 800-1000 m; Myagdi Khola: 800-1000 m; Kathmandu; Baitidi).

Breeding: Only within human settlements, even in tree-rich suburbs of Kathmandu (cf. *montanus*). Gonadal development starts in B-M III (testes up to 4 mm), and is maximal in specimens from M IV (10-12 mm). A fledgling was being fed as early as 31.III.1980 in Kathmandu city. Accordingly, Biswas (1963b) indicates active gonads in III/IV. Dieselhorst (1968:376) describes gonadal development and moult as irregular including "very deficient synchronisation of periodic processes".

Montifringilla and *Pyrgilauda*

The 4 species of the Nepal list *(M. adamsii, P. blanfordi, P. taczanowskii, P. ruficollis)* are inhabitants of the Tibetan facies landscape N of the Himalayan axis. Their main areas are in C Asia, largely Tibet; only minute area splinters reach into far NW Nepal. A breeding record exists only for *adamsi.* Gebauer & Kaiser (1994) put in a plea for recognizing two Snowfinch genera, *Montifringilla* and *Pyrgilauda.*

Montifringilla adamsi adamsi Adams

Montifringilla [nivalis] adamsi

Taxonomic notes: Stegmann (1932:100-101) gave the first reasons for the specific difference of *adamsi* and *nivalis* (and specific identity of the latter with *henrici*). But it is suspected that the large Tibetan *henrici* with its conspicuously dark neck sides is even more isolated from *nivalis* than *adamsi.* The two geographically neighbouring forms *M. n. kwenlunensis* and *M. a. xerophila* are nearly of equal size (smaller than the Central Asian *M. n. alpicola*), similarly fallow brown, but differ in the colour pattern of the secondaries. In the *adamsi* populations the base of the secondaries is extensively dark brown to black including the outer webs. The dark base is narrow in *alpicola* and related populations and nearly hidden below the wing coverts. But these differences may be judged as merely a trend, for the base is still narrower in European *nivalis* and broadest in *adamsi.*

A pronounced difference exists in the wing and the wing/tail proportions. The small *M. a. adamsi* has low WTI of $\bar{x}$=37.2%, s_d=1.59 (n=45), the larger *M. n. alpicola* has WTI of 41.5%, s_d=1.32 (n=33) (12 *M. n. kwenlunensis* $\bar{x}$=39.9%, s_d=1.42), and that of *nivalis* s.str. is $\bar{x}$=41.2%, s_d=0.92 (n=32). On the other hand (according to a "compensation rule"), the TWI is very high in *adamsi,* $\bar{x}$=61.4%, s_d=1.75 (n=44), but in *alpicola* only $\bar{x}$=58.5%, s_d=1.45 (n=32) (12 *kwenlunensis* show 58.8%, s_d=1.13), very similar to *nivalis* s.str. $\bar{x}$=59.5%, s_d=1.53 (n=32). If *M. n. kwenlunensis* and *M. a. xerophila* actually do not mix in the area of contact (cf. maps in Portenko & Vietinghoff-Scheel 1974, as well as maps 749 and 750 in Cheng 1987), the following systematic division of these large Snowfinches is to be considered: superspecies *M. [nivalis]* including the parapatric allospecies *M. nivalis* and *M. adamsi;* isospecies *M. henrici* (for terminology cf. Amadon & Short 1992).

M. henrici ist relatively long-billed. Bill length in percent of wing length in 6 *M. henrici* is 13.1-14.7%, $\bar{x}$=14.1; in 12 *M. n. kwenlunensis* 10.7-12.6%, $\bar{x}$=11.7, s_d=0.69; in 33 *M. a. adamsi* 10.2-12.7%, $\bar{x}$=11.7, s_d=0.54. Watson (1961) described specimens from Turkey as *M. n. fahrettini (= leucura),* the wing/tail measurements (n=9) of which are nearly con-

gruent in the scatter diagram with those of *adamsi*. This seems not to be based on different measuring technique as can be shown of Watson's other *M. nivalis* measurements, which are consistent with my own of *leucura*.

Material: 4 specimens: **D** Dolpo Distr., Tarap Valley, Kangar, 4200 m, 18.VI.1973: 2♀ * Charka, upper Barbung Khola Valley, 4250-4300 m, 20. and 23.VI.1973: 1♂, 1♀.

Measurements: **Wing**-L: ♂ 113 mm, ♀ (3) 108-113 mm. – **Tail**-L: ♂ 70 mm, ♀ (3) 68-70 mm. – **Bill**-L: ♂ 13 mm, ♀ (3) 13-13.5 mm. – **Tarsus**-L: ♂ 23 mm, ♀ (3) 21-22 mm. – **WTI:** (4) 34.3-38.9%, $\bar{x}$=37.5. – **TWI:** (4) 60.6-63.0%, $\bar{x}$=62.0. – Bill index (height in % of length) 59.2-63.8%, $\bar{x}$=61.1 (n=4).

Notes: Bill of ♂ black, that of ♀ grey-brown or grey-black. Feet dark-grey (♂) and grey-black and black (♀).

Horizontal: Our own finds originate from the arid areas N and NW of Dhaulagiri (:Dolpo and :Mustang). – Tarap Valley, Kangar, near the village (17./18. VI.1973; see Material); upper Barbung Khola Valley, Charka, breeding record (21.-25.VI.1973; see Material; both :Dolpo); – W slope of Dudje La, singles (21.VI.1970 and 26./27.VI.1973); Thakkhola: Dapa Col, 2 specimens (15.VII.1970 :Mustang). – Observations during summer were already known from N Dolpo, but a breeding record was previously lacking (Fleming et al. 1976, Inskipp & Inskipp 1991).

The finds in Nepal, all N of the main range, delimit the SW margin of the species' area; therefore the Tibetan Snowfinch is restricted to the NW parts of the country. N Annapurna and N Manaslu are apparently outside this area splinter.

Vertical, habitat: Our own finds are situated between 4200 m (Kangar) and 5100 m (Dudje La); a vertical area belt appr. 1000 m wide seems to apply for Nepal. Inskipp & Inskipp (1991) indicate 3600 m as lower limit (no details), but this is a forest belt altitude. All my finds are situated far beyond the timberline in arid Tibetan steppe facies in low valley bottoms, often with rocky outcrops, with sparse dry bush vegetation *(Rhododendron, Hippophae),* much degraded near the villages, which *adamsi* frequents. On the passes around 5000 m (Dudje La, Dapa Col) the vegetation is limited to scattered cushion-plants. It is difficult to decide where the population is actually concentrated. In the relatively low villages the Tibetan Snowfinch is conspicuous, but even at 5000 m it was present, though there and beyond encounters happen mainly by chance. Schäfer (1938) found *adamsi* in Tibet only in rocky valleys, largely paralleling the Nepal situation.

Breeding: 1♀ from 16.VI. starts or already started oviposition (4200 m); at 26.VI. juveniles were fed at the village edge of Charka (4250 m): nest inaccessible in a cavity below a large boulder; 1st breeding record for Nepal. Schäfer (1938) mentions nest building activity as early as B V in NE Tibet; he discovered numerous nests at 11./12.VI., all with young and built in rock fissures; fledglings first seen by him on 4.VII.

PLOCEIDAE

Ploceus philippinus philippinus (L.)

Material: 1 specimen: **N** Chitawan Distr., Rapti Valley S Tekouli, Hatisar, 300 m, 14.II.1970: 1♀.

Measurements: **Wing**-L 73.5 mm. – **Tail**-L 51 mm. – **Bill**-L 19 mm. – **Tarsus**-L 21.5 mm. – **WTI** 20.4%. – **TWI** 69.4%.

Habitat: The specimen was mist-netted in bushes close to the river course.

ESTRILDIDAE

Lonchura striata

L. [striata] incl. *leucogastroides*

Horizontal, vertical, habitat: Siwalik Mts., Nodia Khola, 260 m (7.IV. :Ilam). – A flock of about 30 specimens searched for food in grain fields ready to be harvested, near a small village in the Nodia Valley.

FRINGILLIDAE

Fringilla coelebs

Horizontal, vertical: Lake Titi, 2700 m, 2 sp. (25.II. :Mustang). – The Chaffinch is an uncommon winter visitor but was previously recorded in the Kali Gandaki Valley (Inskipp & Inskipp 1991).

Serinus pusillus (Pallas)

Material: 4 specimens: **D** Dolpo Distr., Kangar, 4200 m, 17./18.VI.1973: 2♂ ** Mustang Distr., Tukche, 2630 m, 8.VII.1973: 1♂, 1 pull.

Measurements: **Wing**-L: ♂ (3) 78.5-79 mm; feathers of the pullus still growing – **Tail**-L: ♂ (2) 55.5-58 mm; pull. 52 mm. – **Bill**-L: ♂ (3) 7-8.5 mm, pull. 7 mm; **-Height:** ♂ (3) 5.5-5.6 mm; pull. 5.2 mm. – **Tarsus**-L: ♂ (3) 14-15 mm, pull. 14.5 mm. – **WTI:** (3♂) 27.8-29.1%. – **TWI:** (2♂) 70.7, 73.4%.

Notes: **Testes** 5-6 mm long; bill (♂) black, tarsus grey-black.

Horizontal: During the breeding season my records in the N, NE and E Dhaulagiri and in the NW Annapurna massifs, only in areas beyond monsoon influence. – Tarap Khola, Kangar, several, also in flocks up to 3 sp. (17./18.VI.); upper Barbung Khola, Kakkot 3150 m, flock of about 10 sp. (12.VI. both :Dolpo); – Kali Gandaki Valley: valley slopes between Muktinath and Kagbeni: Serku (21.IV.), slopes above Kagbeni (23.VI.) and near Dangarjong (29.VI.), valley bottom near Jomosom (24. III.), Syang (27. III.), Marpha (1. VII.). Choiro (5.VII.), Tukche (30.VI., 20.VII.), Choya (2.V.): Lete Khola opposite Lete (7.V. all :Mustang).

The area parts in Thakkhola represent the easternmost peripheral splinters of the area finger along the W Himalaya. The Fire-fronted Serin was observed slightly further east in the upper Marsyandi Valley (N flanks of Annapurna :Manang), also a monsoon-reduced valley, but in XI. In the Inner Valleys and on the N flanks of the main chain *pusillus* lives in

Tibetan climate, but the Tibetan plateau was not occupied (contra Harrison 1982, map 611) on a large scale (see Cheng 1987, map 760).

Vertical: The above records range between 2400 m (Lete; V), 2500 m (Choya; V) and 4200 m (Kangar, VI). There seems to exist no optimum altitudes within the preferred climatic zone. In the dry parts of lower Thakkhola the species is to be met in many places and Fleming et al. (1975) mention records up to 4575 m.

Habitat: Open steppe-like landscape with few scattered dwarf bushes *(Rhododendron, Caragana, Lonicera, Hippophae tibetana)* at the upper altitudinal limit, in addition higher and more closed bushy vegetation, but still open and spaced out with *Juniperus, Cupressus torulosa, Hippophae rhamnoides* at lower altitudes. As soon as medium-sized or high trees dominate, *pusillus* avoids the area, even larger clearings within timber forest, e.g. the clearing Thaksang (above Tukche). The strict limitation to summer-dry monsoon-free landscapes explains the vertical width of the area. Such areas are lacking in Nepal below 2400 m and the upper limit may be caused by still undefined climatic hardships. In S Thakkhola the local population approaches monsoon-influenced landscape to within about 2-3 km (Choya and Lete).

Breeding: Fledged pullus at 8.VII. (Tukche, 2650 m, see Material). Start of oviposition can be backdated at least to B VI, probably to M/E V. Even during the breeding months, *pusillus* can be seen in small flocks of up to 10 specimens, in even larger ones before the onset of the breeding season. We suspect lack of strict territorial behaviour and strong social affinities of pairs living close to each other.

Migration: Breeding areas are left at least partly during the winter. Still wintering flocks of 10-12 specimens were present at Muri, 2100 m, E III 1970 on the S flank of Dhaulagiri (:Myagdi; Martens 1972). Return to the breeding grounds (Thakkhola) as early as M III (first record 17.III.1974 3 specimens Purano Marpha, 3100 m; my stay in the area from 25.II.). At this time flocks of up to 30 specimens can be observed.

Carduelis

6 species are on the Nepal list; *spinoides, carduelis* and *flavirostris* are breeding birds, *thibetana, spinus* and *cannabina* are regular or occasional winter guests. Within their altitudinal belts, the breeding species are at least partly *(spinoides)* or entirely confined to its Palaearctic part *(carduelis, flavirostris). C. carduelis* and *flavirostris* are dry-adapted; the former lives in the Inner-Valley facies, the latter in Tibetan steppe habitat in extreme high altitude.

Carduelis thibetana

Taxonomic note: See Wolters (1979:302) and Beaman (1994:97) for the systematic position.

Horizontal, vertical: My records are from Thakkhola and near Jiri to Thakkhola: Purano Marpha, 3200 m, 1♂ singing (25.IV.1980); Thaksang above Tukche, 3150-3500 m, singing, single specimens and in flocks of up to 3 specimens (28., 29.IV.1980; all :Mustang); – near the pass N of Jiri Valley, flock of about 8-10 specimens (10.IV.1973 :Ramechap). – The

Tibetan Siskin is believed to be a guest species in Nepal. Records from Thakkhola are already known and represent the westernmost observations. Those mentioned here are the latest as concerns season (Inskipp & Inskipp 1991).

Habitat: In the monsoon-dry area of Thakkhola slightly N of the main chain in spaced *Pinus/Cupressus* forest (Purano Marpha) and in *Pinus/Abies/Betula/Rhododendron* forest, respectively, always high in the canopy.

Carduelis spinoides spinoides Vigors

Material: 2 specimens: **D** Dolpo Distr., near Rohagaon/Suli Gad Valley, 3000 m, 8.VI.1973: ♂. **G** Parbat Distr., Ulleri, S Annapurna, 2000 m, 12.VII.1973: ♂.

Measurements: **Tarsus**-L: (2) 78-79 mm. – **Tail**-L: (2) 47-47.5 mm. – **Bill**-L: (2) 10-11 mm; -**Height** (above nostrils): twice 7.9 mm. – **Tarsus**-L: 15-16 mm. – **WTI:** (2) 31.6-33.3%. – **TWI:** 59.5-60.9%. – **Testes** 4 (VI) and 8 mm (VII) long.

Horizontal: Our finds extend from NW Dhaulagiri (Phoksumdo Lake :Dolpo) to the Kanchenjunga massif (Yamputhin :Taplejung). Accordingly, all Nepal probably belongs to the breeding area within the respective altitude belts (Fleming et al. 1976, Inskipp & Inskipp 1991).

Vertical: Records from 530 m (8.IV., Turture, lower Marsyandi :Tanhu) to 3650 m (12.VI., Phoksumdo Lake :Dolpo), from 8.V. onward only above 1800 m. The previously recorded all-season vertical area band is even wider: 274 m (Fleming et al. 1976) to 4400m (Diesselhorst 1968:379). Hitherto it has not been possible to delimit the breeding belt from this vast altitude or simply to substantiate a single breeding record.

Habitat: The spectrum of basic patterns always incorporates types of open landscapes: forest edges with shrubberies, bushy areas near or herbs along field edges or on pebble areas along large rivers (Kali Gandaki), human settlements with single or scattered trees even in the suburbs of Kathmandu, scattered bush clumps even above timberline up to 4400 m (Diesselhorst 1968:379). There is no preference for either broad-leaved or coniferous trees. These remarks refer to summer and winter stay and do not specify the requirements for the breeding habitat.

Breeding: Season is not definitely defined yet, but breeding is said to take place during summer, according to Diesselhorst (1968:380) "extraordinary late, ... not until August and September", Ali & Ripley (1974, 10) indicate "til October at higher altitudes". Actually, the breeding season seems to be very extended. I noticed just-fledged juveniles on 22.V. (1973, 3000 m, Dhorpatan :Myagdi), mixed flocks of adults and juveniles on 1.VII. (1973, 2650 m, Tukche :Mustang), at the same place on 28.VI.1970 up to 30 specimens. – Testes on 8.VI. (1973, 3000 m, Rohagaon :Dolpo) only slightly (4 mm), at 12.VII. (1973, 2000 m, Ulleri :Parbat) strongly developed (8 mm). This are hints of late breeding. Biswas (1963a) stated "signs of enlargement" of gonads of his skins from M III and M IV. Diesselhorst (1968) reports testes of 2♂ from B and E VIII (4400 m: Solukhumbu) measuring 4.5 und 5.5 mm. The latter specimens may have already finished breeding activity. Even during the supposed breeding months (V-VIII/IX) *spinoides* may live in flocks, an additional indication for considerable scattering and desynchronisation of the breeding period.

Carduelis carduelis caniceps Vigors

Material: 2 specimens: **D** Mustang Distr., Tukche, 2650 m, 1.VII.1973: ♀ * Marpha, 2700 m, 5.VII.1973: ♀.

Measurements: **Wing**-L: (2) 77-80 mm. – **Tail**-L: (2) 48-50 mm. – **Bill**-L: (2) 13-14 mm; -**Height** (at nostrils): 7-7.4 mm. – **Tarsus**-L: (2) 14.5-15 mm. – **WTI:** (2) 31.3-32.5%. – **TWI** (2) 62.3-62.5%. WTI of the lighter and larger C Asian grey-headed Goldfinches is (n=30) 31.7-36.1%, $\bar{x}$=33.9, s_d=1.05 (in 27 C European *carduelis* 32.5-36.1%, $\bar{x}$=34.4, s_d=0.90); TWI (n=29) 61.2-67.1, $\bar{x}$=64.1, s_d=1.38 (in 27 C European *carduelis* 61.3-65.9%, $\bar{x}$=63.3, s_d=1.27).

Notes: Ovaries undeveloped after end of breeding season.

Horizontal: I succeeded in observing the species only in the Dhaulagiri area. – Suli Gad Valley, flock of 20 specimens (9.VI.); Phoksumdo Lake, flock of 6-7 specimens (11.VI.), simultaneously also single singing specimens (:Dolpo); – near the villages Choiro, Tukche (see Material), Marpha (see Material), Purano Marpha, forest clearing Thaksang, regularly single individuals, small or large flocks of 30 up to 60-70 specimens E VI to B VII (1970 and 1973), larger flocks always on harvested fields near villages (:Mustang); – Muri, Myagdi Khola (27.III. :Myagdi).

Finds during summer in Dhaulagiri and further E in Annapurna area refer to the easternmost area outposts of the southern (=Himalayan) area fingers of the *caniceps* subspecies group. There the Goldfinch is restricted to the monsoon-protected dry areas on the N flanks (:Dolpo; upper Marsyandi on the N Annapurna; see Lowndes 1955) and the Inner Valleys (Thakkhola). Finds further E to Helambu (Fleming et al. 1976) do not concern breeding birds.

Vertical: Our summer data (VI, VII) are restricted to 2650-3100 m in Thakkhola and to 3000-3650 m in S Dolpo. Because still lower monsoon-protected areas do not exist in Nepal and altitudes beyond 3700 may be too inhospitable climatically, the vertical area belt probably does not exceed 1000 m in width. Citations up to 4200 m (Inskipp & Inskipp 1991) are situated beyond the forest zone and are unlikely to concern breeding birds.

Habitat: The Nepal summer resorts are situated in open mixed forests, often in/near edges and clearings; in the post-breeding period flocks concentrate on seed-rich havested fields, often near villages.

Breeding: Season not yet well specified. 1♂ out of a flock of appr. 20 specimens showed moderately developed testes (4 mm, 9.VI., 3000 m, Coll. H.S. Nepali); flocks of up to 7 sp. and song display at 11./12.VI. (3600 m), flocks of up to 70 sp. E VI/A VII; regressive ovaries point to already finished breeding season.

Migration: A flock of app. 20 sp. near Muri, 2100 m, S Dhaulagiri (27.III. :Myagdi) stayed outside the potential breeding area. Vertical migrations down to the Terai lowlands are known (Fleming et al. 1976).

Loxia curvirostra

Horizontal, vertical: Only 2 personal finds: Thaksang above Tukche, 3200 m, ca. 20 specimens (7.VII.1970 :Mustang); – near Braga 3300 m, ca. 10 specimens (18.IV.1980 :Manang).

Habitat: In both cases in coniferous forest: *Abies spectabilis* (Thaksang) and *Pinus wallichiana* (Braga), respectively.

Leucosticte

The 2 resident species, *nemoricola* and *brandti,* live at high altitudes, preferably in the dry areas of the Inner-Valleys and Tibetan-steppe facies. Both occupy largely the same altitudinal belts and locally coexist. *L. nemoricola* is the more numerous species. Their ecological differences are not yet worked out in detail.

Leucosticte nemoricola

Taxonomic note: Probably ssp. *nemoricola* (Hodgson), but the 3 specimens from Dolpo hardly show any yellow colour on the axillaries.

Material: 9 specimens: **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4250 m, 23.-25.VI.1973: 3♂. **G** Ghorka Distr., NW Rupina La, Manaslu massif, 4000 m, 8.VIII.1983: 1 o. **J** Ramechap Distr., Thodung, 3200 m, 5.-8.IV.1973: 2♂ juv., 2 ♀. **S** Solukhumbu Distr., SW Everest area, Thame Teng, 3900 m, 6.X.1970: 1♂ pull.

Measurements: **Wing**-L ♂ (5) 96-102 mm, $\bar{x}$=99, ♂ pull. 99.5 mm, ♀ (2) 96 and 97 mm; o 99 mm. – **Tail**-L ♂ (5) 65-70 mm, $\bar{x}$=68.1, ♂ pull. 67 mm; ♀ (2) 65.5 and 66 mm, o 69 mm. – **Bill**-L ♂ (4) 10.5-12 mm (**Height** [5] 6.6-6.9 mm) ♂ pull. 11 mm (**Height** 7 mm); ♀ (2) 11 and 12 mm (**Height** 6.9 and 7.4 mm); o 11 mm (**Height** 7 mm). – **Tarsus**-L ♂ (5) 19.5-21 mm, $\bar{x}$=20.1, ♂ pull 19 mm; ♀ (2) 20 and 20.5 mm; o 19.5 mm. – **WTI** (9) 30.2-33.7%, $\bar{x}$=31.4, s_d=1.03. – **TWI** (9) 67.3-70.0%, $\bar{x}$=68.6, s_d=0.98.

Notes: Testes of the 3 VI-♂ large, of the IV-♂ minute; ovaries of both ♀ (IV) also undeveloped. IV-specimens finish moult of body-feathers; bill of ♂ and ♀ grey to black, basis of lower mandible lighter. Feet dark grey-brown to grey-black.

Horizontal: Our finds in the larger massifs of the main chain from NW (:Dolpo) und E Dhaulagiri (:Mustang), N Annapurna (:Manang), Manaslu (:Lamjung) and Everest (:Solukhumbu). – Near breeding season: especially common in the dry and high areas of Dolpo on the N flank of Dhaulagiri on or near the passes Bagar La, Zö La, Büko La and Dudje La, also at Charka (17.-26.VI. all :Dolpo; see Material). All other records outside the breeding season or still outside the vertical breeding belt: Suli Gad Valley near Rohagaon, flock of 50 sp. (7.VI. :Dolpo); – Dhorpatan (9.IV. :Myagdi); Thaksang above Tukche (27.II.-10.III. all :Mustang); – near Manang, airstrip (18.IV. :Manang); – Rupina La (8.VIII. :Gorkha; see Material); – Thodung (4.-8.IV. :Ramechap; see Material); – Thame Teng (6.X. :Solukhumbu; see Material).

The breeding area within Nepal is a southern outpost of the large C Asian area which is entirely situated in arid climatic conditions. Hence the very localized breeding sites within Nepal are in dry areas (e.g. Dolpo, Mustang, Manang, Langtang, N Manaslu). This applies only partly to the Khumbu (Everest) area. Although the area is reached by monsoon precipitations, the high altitude breeding sites of the main chain receive only reduced amounts. Accordingly, I was unable to trace *nemoricola* between the upper Arun and S and W flanks of Kanchenjunga (:Sankhua Sabha, :Taplejung; IV, V, IX), areas of extremely high rainfall rates.

Vertical: Sightings between 2950 m (IV) and 4900 m (VI) include birds still in the winter quarters and at the breeding sites. – Outside breeding season (II, IV, VI, X): from 2950 m (IV, Dhorpatan) to 3900 m (X, Thame Teng), altogether 7 loc. (see Horizontal) – Close to or at breeding sites: 4000 m (8.VIII., Rupina La) to 4900 m (19.VI.; Büko La, Zö La), al-

together 6 localities in VI and VIII. The breeding distribution in Dolpo spans approximately from 4300 m to 5000 m, but altitudes above 5000 m could not be scrutinized in detail. The lower limit in Khumbu (Everest area) is higher, at appr. 4500 m, the main altitudinal span extending only from 4800 m to near 5000 m, sporadically near 5200 m (Diesselhorst 1968:382).

Habitat: Near breeding season: In the study area the Plain Mountain-Finch lives in high altitude steppe with scanty dwarf vegetation, mainly bushes of *Rhododendron, Caragana* and *Lonicera,* often only cushion plants or locally completely without vegetation; all sites mainly in the rain shadow of the main chain. Lack of vegetation often is a sign of overgrazing by cattle. Preferred habitats are open, somewhat rolling plains in broad river valleys or spacious passes. In Charka the Plain Mountain-Finch regularly lived close to and even within the village, searching for food in company of the also common Tree Sparrows. – Besides breeding season: At the earliest in X it descends to the upper forest zone. There it spends the whole winter in the transition zone forest/forest edge and bushes close to forests, never in closed forests and mostly in flocks of up to 150 specimens. Only very big flocks (up to 1000 specimens) leave the shelter and may invade open grassy valleys (Dhorpatan, 2950 m, B IV).

Breeding: The season is difficult to delimit, for this Snow Finch behaves very socially immediately before onset or even within (Diesselhorst 1968:381) the breeding season. Apart from the winter flocks I noticed small flocks on 19.VI. between Zö La and Büko La (4600 m, 4900 m); repeatedly flocks of up to 150 specimens on 20.VI. when walking to Charka (appr. 4500 m); from 21.-23.VI. in and near Charka flocks of various sizes up to appr. 100 specimens (4300 m). From those flocks E VI separated pairs, ♂ displayed in front of ♀ with hanging wings (21.VI.1973, Charka), but flocks continued to exist. Thus oviposition may start in Dolpo no earlier than B VII, corresponding to Diesselhorst's data (1968:382) from the Everest area.

Migration: Slightly vertical; the breeding belt is probably completely left in order to settle in the upper forest belt down to slightly below 3000 m, according to Inskipp & Inskipp (1991) down to even 2000 m (data ?). At E IX 1970 I could not find any *nemoricola* at the Khumbu study sites of Diesselhorst (1968) above 5000 m (Gorak Shep), although *L. brandti* was present there; only B X a specimen at 3900 m already below the breeding belt. When the breeding belt is resettled during spring is unknown. Only Biswas (1963a) indicates observations at 4265-5335 m at E III-V. Migrations from the main chain area to the midlands are rare events, the finds at Thodung being already markedly exposed to the S. According to the late onset of the breeding season, flocks are still to be met in the forest zone in VI (3100 m, 7.VI.1970, 50 specimens; Rohagaon :Dolpo).

Leucosticte brandti haematopygia (Gould)

Leucosticte [arctoa] brandti

Material: 6 specimens: **D** Dolpo Distr., upper Barbung Khola Valley, Charka, 4250 m, 22.VI.1973: 1♂, 1♀. **S** Solukhumbu Distr., SW Everest area, Gorak Shep, 5150 m, 25.-27.IX.1970: 1♂, 1 o ad., 1♀ pull., 1 o pull.

Measurements: **Wing**-L ♂ (2) 110 and 119 mm; ♀ 111 (ad.) and 117 (pull.) mm, o (2) 110 (ad) and 112 (pull.) mm. – **Tail**-L ♂ (1) 80.5 mm; ♀ 71 (ad.) and 76 (pull.) mm; o (2) 73 (ad.) and 75 (pull.) mm. – **Bill**-L/-**Height** ♂ (2) 11.5/7.5 and 12/8.5 mm; ♀ 12/8 (ad.) and 10.5/8 (pull.) mm; o (2) 11/8 (ad.) and 10.5/8 (pull.) mm. – **Tarsus**-L ♂ (2) 21 and 22 mm; ♀ 21.5 (ad.) and 22.5 (pull.) mm; o (2) 22 (ad.) and 21 (pull.) mm. – **WTI** (4) 31.9-35.1%, $\bar{x}$=33.8. – **TWI** (6, in addition to a ♀ collected by Diesselhorst) 64.0-67.6%, $\bar{x}$=66.0, s_d=1.32.

Notes: VI-specimens: ovaries active, testes enlarged (8 x 6 mm). – Bill and feet black. Severely worn plumage with few fresh feathers in both adult E IX-specimens (Gorak Shep).

Horizontal: Our observations only in N Dhaulagiri, N Annapurna and in the Mt. Everest area. – Upper Barbung Khola Valley, Charka, pairwise near and in the village (22./23.VI.; see Material); between passes Büko La und Mo La (20.VI.1973, 2 specimens in Coll. H.S. Nepali); Yalung Khola ascent to Dudje La, several times flocks of up to 10 specimens (25./26.VI.1973); Dudje La, on the pass singles (21.VI.1970, 27.VI.1973; all :Dolpo). – Thorung La, single specimens and flock of 10 on snow field (20.IV.1980 :Mustang); – Gorak Shep below Kala Pattar, small flocks E IX. 1970 (25.-27.IX.1970, see Material :Solukhumbu).

L. brandti inhabits the C Asian mountains and high altitude steppes (its area being nearly congruent with that of *L. nemoricola),* and its southern area outposts reach the N flanks of the C Himalayas. Consequently it lives in Nepal (only) in the local arid areas (where it is conspicuously rarer than *nemoricola).* At the appropriate altitudes I did not observe it in the extremely moist ranges between upper Arun und Kanchenjunga (IV, V and IX).

Vertical: My records in :Dolpo and :Mustang are evenly scattered between 4300 m (Charka) and 5000 m (Dudje La). According to VI-dates and gonadal states this vertical span is to be attributed to the breeding belt; areas beyond could not be scrutinzed in detail. The Everest population studied by Diesselhorst (1968:383) occupies an even narrower belt, the lower limit of which is situated appr. 500 m higher, main zone 5000-5300 m, more sparsely down to 4800 m. This difference may be caused by the higher precipitation values at Everest. The extent to which altitudes up to 6000 m (Inskipp & Inskipp 1991) actually belong to the breeding belt is an unsolved question.

Habitat: In Dolpo apparently congruent with that of *L. nemoricola,* also with respect to vertical distribution no difference was discernible. In the Khumbu it inhabits slightly higher and more stony/rocky landscape structures, though still largely overlapping with the requirements of *nemoricola.*

Breeding: According to gonadal states oviposition in Dolpo and Khumbu beginning E VI/B VII; in Khumbu just-fledged juveniles till E VIII (Diesselhorst 1968:384). Even during the breeding season *brandti* is a highly social bird, which regularly lives in small societies, at E VI still congregates in flocks no larger than 10 specimens in Dolpo.

Migration: Contrary to *nemoricola,* which is a regular altitudinal migrant (which see), *brandti* stays in its breeding grounds all year round except for unusual and severe weather conditions.

Carpodacus

12 species have been found in Nepal *(nipalensis, erythrinus, pulcherrimus, rhodochrous, vinaceus, rhodopeplus, thura, rubicilloides, rubicilla, puniceus, edwardsii, rubescens);* at least 10 breed there, and presumably the rare *edwardsii* and *rubescens* do so as well. The genus is Palaearctic in origin; no species has adapted to subtropical-temperate climates and forest formations below 3000 m (Martens 1984). The breeding area of all species together has a vertical extent of about 2200 m, with its upper limit at a little over 5200 m *(puniceus).* For the individual species this belt is usually relatively narrow, rarely exceeding 1000 m. The three species have been found next to one another at breeding time *(erythrinus, rhodochrous, vinaceus;* Thaksang/Tukche, 3150 m, VII; Martens 1979). Nepal is particularly species-rich, because here two different distribution types of rosefinches meet. One group comprises the western Chinese/Himalayan species, mainly distributed in the forested and geomorphologically diverse regions of SW China; most of these have expanded their range westward in a narrow strip along the S flank of the Himalayas. Some have advanced to the knee of the Indus in the W *(thura, nipalensis),* others reach only the central Himalayas *(rubescens, vinaceus, rhodopeplus, edwardsii).* The second group lives primarily in the high mountain steppes of Central Asia and reaches Nepal in corresponding offshoots from biotopes to the N *(pulcherrimus, rubicilla, rubicilloides, puniceus)* or NW/NE *(erythrinus).* These species are dry-adapted and avoid areas of intense monsoon. Of this group, only *pulcherrimus* and *erythrinus* invade the upper, open forest zone from above. The ecological subdivisions of this multitude of species remain to be investigated.

Quite a few *Carpodacus* species, though they differ conspicuously in distribution, colouration and overall size (!), form a continuous series regarding transformation of the bill shape. Breadth and height of the bill tend to be relatively less if the bill is long (Fig.119).

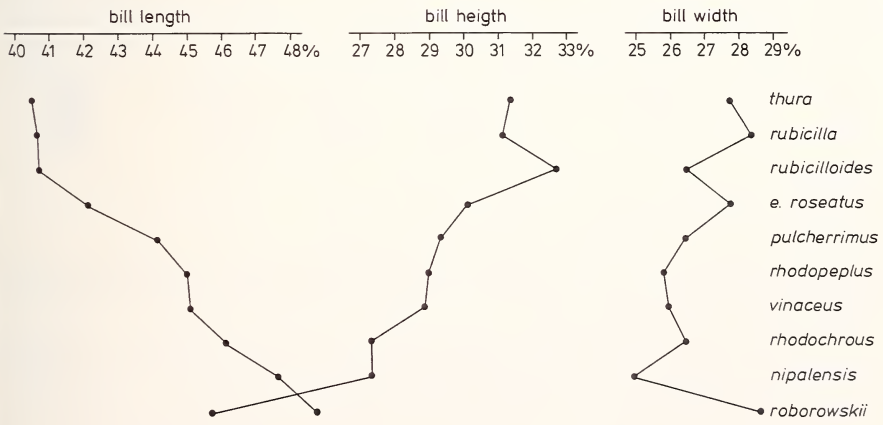


Fig.119: Transformation of bill length, width and height in the genus *Carpodacus.*

Carpodacus nipalensis nipalensis Hodgson

Material: 1 specimen: **M** Taplejung Distr., pasture Lassetham NW Yamputhin, 3350 m, 8.V.1988: ♀.

Wing-L.: 82 mm. – **Tail**-L: 55 mm. – **Bill**-L: 12 mm; **Bill**-Height (at nostrils): 6.9 mm; **Bill**-Width: 6.3 mm. – **Tarsus**-L: 21 mm. – **WTI:** 24.4%. – **TWI:** 67.1%.

Notes: Ovary undeveloped. Moult of body-feathers. Colouration very dark.

Horizontal, vertical: This specimen represents the only sighting we have obtained. The bird was caught in an *Arundinaria*-bamboo thicket in open *Abies densa* forest. A crust of *Rhododendron* pollen was stuck to its beak. At least five species, bush- to treelike in growth form, were in bloom in the immediate vicinity, some in large stands, especially *R. hodgsoni.*

Breeding: In accordance with the late breeding season (Diesselhorst 1968:387), the ovary was undeveloped.

Carpodacus rubescens (Blanford)

Material: 1 specimen: **D** Myagdi Distr., upper Myagdi Khola, N of pasture Dobang, 2950 m, 24.V.1995: 1♂.

Measurements: **Wing**-L 86 mm. – **Tail**-L 56 mm. – **Bill**-L 13 mm, -Height 7 mm, -Width 6.4 mm. – **Tarsus**-L 19 mm. – **WTI** 29.1%. – **TWI** 65.1%. – **Testes** 7 x 6 mm.

Horizontal, vertical, habitat: 2♂ were mist-netted in the upper Myagdi Khola in a bushy area with tree *Rhododendron* and *Betula utilis* shrub in the transition zone of *Tsuga dumosa* and *Abies spectabilis* forest, at 2950 m (24.V., see Material). Gonadal state of the collected individual strongly suggests a specimen at the breeding ground or close to it. There were more specimens present in the area, an additional sign of a local breeding population. This record represents the western-most distributional locality of the species' range and the first one in Nepal from the presumed breeding season and presumed breeding site (see Ali & Ripley 1974,10:169, Inskipp & Inskipp 1991).

Vocalizations: Call notes (Fig.120n) are angular, opened downwards and 0.1-0.23 s long. Most characteristic is a configuration of up to 18 harmonics placed close to each other (narrow band filter, 150 Hz); they cover a frequency range from 1-7.5 kHz. Highest amplitude is concentrated in the center or in the lower half of the set of harmonics. Aural impression is a vigorous nasal and squeaky "gvae..", mostly repeated several times.

Carpodacus erythrinus

Carpodacus erythrinus erythrinus (Pallas), winter visitors

Material: 6 specimens: **D** Myagdi Distr., Dhorpatan/Uttar Ganga plain, 2950 m, 14.V.1973: 1♀. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 25.IV.1973: ♂ juv. **N** Chitawan Distr., Rapti Valley S Tekouli, 300 m, 12.-14.II.1970: 1♂, 3♀.

Measurements: **Wing**-L. ♂ 85 mm, ♂ juv. 84 mm; ♀ (4) 81-83.5 mm, $\bar{x}$=82.3. – **Tail**-L ♂ 57 mm, ♂ juv. 57.5 mm; ♀ (4) 54-58 mm, $\bar{x}$=56.3. – **Bill**-L ♂ 11.5 mm, ♂ juv. 10 mm; ♀ (4) 11-11.5 mm, **Bill**-Height ♂ 8 mm, ♂ juv. 8.2 mm; ♀ (4) 8.2-8.9 mm, **Bill**-Width ♂ 7, ♂ juv. 7.8 mm; ♀ (4) 7.2-8.5 mm. – **Tarsus**-L ♂ 18.5 mm, ♂ juv. 19, ♀ (4) 18-19.5 mm. – **WTI** (6) 29.8-32.3%, $\bar{x}$=30.9, s_d=0.93 (19 *erythrinus* from N Europe 28.9-32.2%, $\bar{x}$=30.3, s_d=0.82) – **TWI** (6) 65.8-69.5%, $\bar{x}$=68.1, s_d=1.40.

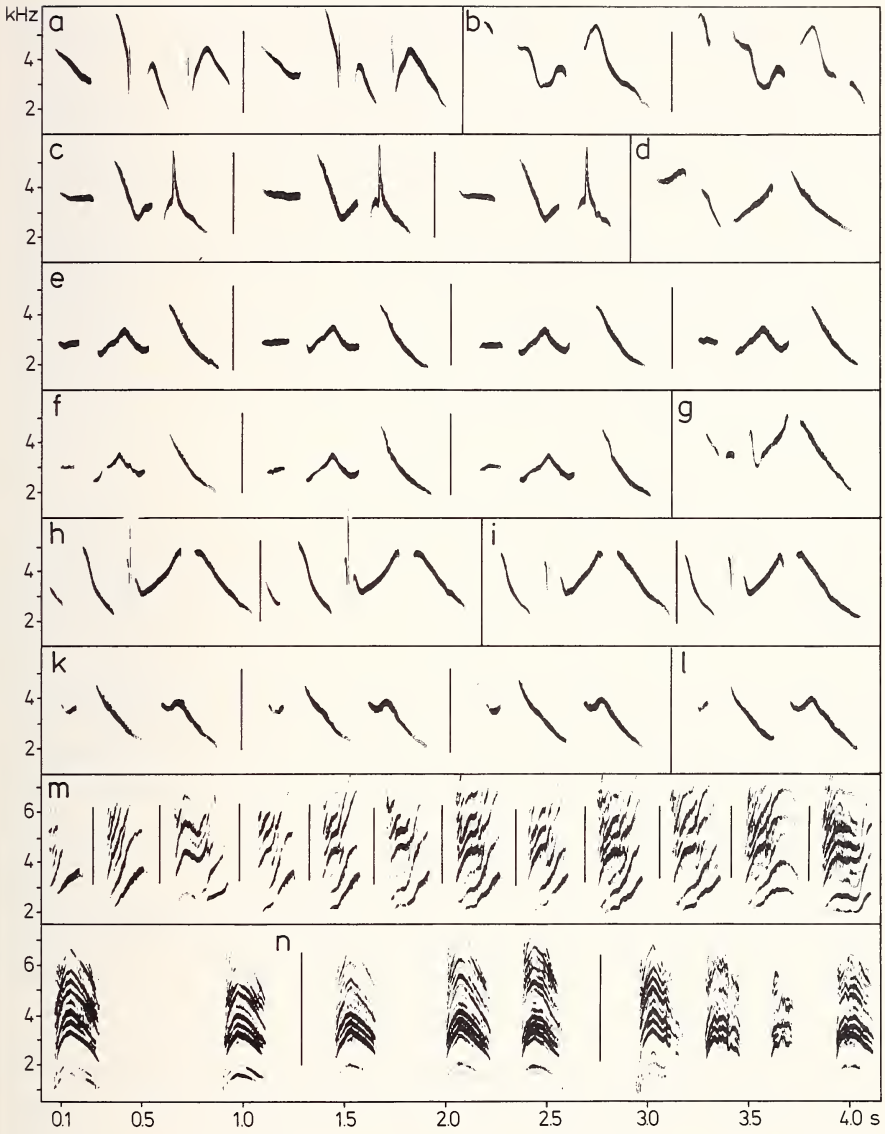


Fig.120: Vocalizations of *Carpodacus* species. – a-m) *Carpodacus erythrinus;* territorial song (a-l) and calls (m); a) 2 verses of a red ♂, Ringmo 12.VI.1973; b) 2 verses of probably another ♂, Ringmo 12.VI.1973; c) 3 continuously given verses of another ♂, Ringmo 15.VI.1973; d) 1 verse of another ♂, Ringmo 12.VI.1973; e) 4 continuously given verses of 1 ♂, Purano Marpha 23.IV.1980; f) 3 continuously given verses of another ♂, Purano Marpha 24.IV.1980; g) Purano Marpha 7.VII.1973; h-i) 2 verses each of 2 ♂, Purano Marpha 12.V.1995; k) 3 continuously given verses of 1 ♂, Thaksang 9.VII.1970; l) 1 verse of another ♂, Thaksang 9.VII.1970; m) calls of various specimens, Purano Marpha 12.V.1995.
n) *Carpodacus rubescens;* 3 series of call notes, upper Myagdi Khola 24.V.1995.

Notes: ♂ juv, ♀: Gonads undeveloped, beak horn-gray, feet gray-brown (♀ juv) and horn-gray/flesh-coloured (♀). Iris sepia-gray-brown (♀). Distinctly lighter than *roseatus,* including the ♀ of 14.V.1973. Cf. WTI.

Horizontal: Our finds (see Material) came from Dhorpatan (:Myagdi), Gosainkund (:Rasuwa), the Rapti Valley (:Chitawan) and the Kathmandu Valley (several ♂ 2.IV.).

Vertical: Because departure for the N Asian breeding grounds was beginning, the finds were widely spaced: birds in Chitawan (M II) and in the Kathmandu Valleu (B IV) were still in the winter quarters, that from Syng Gyang (E IV, 3200 m) was probably heading north, and that from Dhorpatan (14.V., 2950 m, latest documented in Nepal to date) may already be outside the norm. Diesselhorst (1968:386) notes an observation on 26.IV. at the Indrawati Khola, Biswas (1963a) a specimen dated 6.V. from Thankot, and Rand & Fleming (1957) one from Kathmandu dated "V". *C. e. erythrinus* is considered a widespread winter visitor, but the altitude distribution over the winter half-year is not known, nor is the date of arrival at the S foot of the Himalayas in autumn.

Carpodacus erythrinus roseatus (Blyth), breeding birds

Material: 19 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 and 3950 m, 28.V.-4.VI.1970: 7♂, 6♀ * Tarang, Barbung Khola, 3600 m, 14.VI.1970: 1♀. ** Mustang Distr., Tukche, 2650 m, 19.X.1969: 1♂ juv. * Thaksang above Tukche, 3150 m, 5./6.VII.1970, 1973: 2♂. **S** Solukhumbu Distr., Pangpoche, 4000 m, 29.IX.1970 1♀ (very worn plumage, apparently pullus). * Thame Teng, 3900 m, 6.X.1970: 1♀ juv. (yellow-brownish, fresh plumage).

Measurements: **Wing**-L. ♂ (9) 85.5-91 mm, $\bar{x}$=87.4, s_d=1.53, ♂ juv. 84 mm; ♀ (9) 80-85 mm, $\bar{x}$=82.6, s_d=1.78. – **Tail**-L ♂ (9) 58-62 mm, $\bar{x}$=59,9, s_d=1.49, ♂ juv. 56.5 mm; ♀ (9) (51) 55-58.5 mm, $\bar{x}$=56.2, s_d=2.31. – **Bill**-L ♂ (9) 11-12.5 mm, ♂ juv. 11.8 mm; ♀ (9) 10.8-12 mm, **Bill**-Height ♂ (9) 7.7-8.9 mm, ♂ juv. 8.4 mm; ♀ (9) 7.8-8.6 mm, **Bill**-Width ♂ (9) 7.2-8.8 mm, ♂ juv 6.9 mm; ♀ (9) 7.3-8.2 mm. – **Tarsus**-L ♂ (9) 17-20 mm, $\bar{x}$=18.8, s_d=0.94, ♂ juv. 18 mm; ♀ (9) 18-19.5 mm, $\bar{x}$=18.9, s_d=0.39. – **WTI** (19) 24.8-30.4%, $\bar{x}$=27.8, s_d=1.41. – **TWI** (18) 66.7-70.1%, $\bar{x}$=68.5, s_d=1.00.

Notes: Testes tiny or slightly swollen in V and VI, distinctly larger in VII: 6 x 5 mm in one case, 8 x 6 mm in another. The latter ♂ (Thaksang) had yellow-gold neck feathers.

Horizontal: Our own finds are limited to the NW and N flank of the Dhaulagiri (:Dolpo), the upper Kali Gandaki Valley (Thakkhola :Mustang) and the High Khumbu at the foot of Everest (:Solukhumbu). In these regions *roseatus* breeds, as shown for the Khumbu by Diesselhorst (1968:385).

Vertical: Our finds (IV-VII), between 2650 or 3150 m (Tukche, IV and Thaksang/Tukche, VII respectively :Mustang) and 4300 m (E VI; Charka :Dolpo), are all in the potential breeding zone, which could thus be about 1650 m wide. Its actual extent has not yet been confirmed. Breeding of *roseatus* is evidently determined less by a particular altitude zone than by the need for regions of low precipitation in the rain-shadow of the main Himalayan chain and the Inner Valleys. Hence the lower limit of the breeding zone is fixed by lack of dry areas and the upper by the tree line and adjacent bushy vegetation. These bounds encompass previous data (Marsyandi Valley :Manang, Lowndes 1955; Langtang :Rasuwa; Polunin 1955; Everest :Solukhumbu, Diesselhorst 1968) as well as our own: Dolpo: Ringmo/Phoksumdo Lake: common between 3600 and 4000 m (V/VI 1970 and 1973); more scattered but routine in the upper Barbung Khola: Tarang (3800 m, VI), Tukot (4000 m, VI),

Charka (4300 m, VI), ascent to Dudje La from W (4250 m, 26.VI.). – Thakkhola (:Mustang): Tukche (2650 m, 30.IV., singing sp. certainly passage), Thaksang above Tukche (3150 m, 2-5.VII.), Purano Marpha (3200 m, 7.VII.) – Khumbu (:Solukhumbu): Pangpoche (4000 m, 29.IX.), Thame Teng (3900 m, 6.X.). In the extremely moist regions at the S and W flanks of the Kanchenjunga (:Taplejung and :Sankhua Sabha) up to the tributaries of the Arun (at Thudam, at Pahakhola :Taplejung) I found no *roseatus,* either in IX 1983 or V/VI 1988.

Habitat: Forms a pattern of semi-open bush and tree vegetation, usually groups of bushes at the edges of open areas that are cultivated in many cases. Forest margins may be nearby, but tall forest is avoided. – Thaksang (VII): large, bushy, isolated clearing *(Berberis, Rosa,* scattered *Arundinaria*-bamboo) with abandoned fields surrounded by tall forest *(Abies, Picea, Pinus);* – Purano Marpha (IV, VII): *Berberis*-bushes on open dry terraces, close to edge of *Cupressus* and *Pinus* forest; – Ringmo (V/VI): groups of bushes including *Caragana, Lonicera, Berberis* between cultivated fields, *Salix* at moist sites, *Cupressus* and *Pinus* forest nearby; – Tarang, Charka (VI): scattered *Juniperus* bushes, *Caragana, Lonicera,* no more closed forest. Cf. the data given by Diesselhorst (1968:385) for the Khumbu population.

Breeding: Of the specimens from V-VII and IX/X only those from VII have gonads in breeding condition. Diesselhorst (1968:385) limits the breeding season in the Khumbu to VIII. In Kashmir eggs are laid in the last week of VI, but nests are still being built E VII (Bates & Lowther 1952), see also Roberts (1992) for Pakistan.

Migration: *C. e. roseatus* leaves the breeding grounds in autumn and migrates to India, not only to the S foot of the Himalayas (Ali & Ripley 1974, 10). Latest recorded dates 19.X.1969 (Tukche, 2600 m) and 6.X.1970 (Thame Teng, 3900 m). Return to the breeding grounds in spring seems strongly staggered; arrival is particularly late in the northern areas of the main chain and much earlier in the more easily accessible regions in the large valleys that cut through the mountains N-S. – Details: Thakkhola, Kali Gandaki Valley (:Mustang): 23.IV.1980 (Purano Marpha, 3250 m, singing), 30.IV.1980 1 ♂ (near Tukche, 2650 m, singing, passage migrant?); a few km to the south in the main valley active migration on 2.V.1980 at Ghasa, 2100 m: about 15 indiv. resting in small groups or singly. – Ringmo, 3600 m (:Dolpo; observations from 21.V.): 1st net catch on 25.V.1970, 1st singing ♂ on 1.VI, common from then on. From arrival in breeding grounds to egg laying 2-3 months elapse, depending on location. Territories probably staked out late, because new wandering specimens can be caught repeatedly at certain groups of bushes (Ringmo). Diesselhorst (1968:385) reports delayed occupation of breeding territories at Everest as late as VII; in Kashmir the majority does not reach the breeding grounds before V (Bates & Lowther 1952), apparently earlier in Pakistan (Roberts 1992).

Vocalizations: Territorial song (Fig.120) is a flute-like melodious whistle 0.8-1.05 s long, length depending on number of notes forming the verse. General verse characters are as in other Asian or in European populations belonging to different subspecies. The 10 ♂ of the 2 populations investigated (Ringmo; Thakkhola) sang 3-note verses (Fig.120b-i) except for 1 ♂ in Ringmo with a 4-note type (Fig.120a). Of the individual ♂ only 1 verse type was recorded; within a given verse type, however, slight variation of frequency modulation re-

gularly occurs. ♂ of local populations may use identical verse types (Fig.120e/f, h/i). It is open to question whether this phenomenon depends on imprinting during a sensitive period after fledging or on song matching during adulthood within the breeding population. According to Björklund (1989) the latter case seems to be correct, at least in Swedish populations.

Call notes (Fig.120m) give a nasal aural impression due to complicated and "irregular" harmonics, which show only slight amplitude differences (nasal rising "veet .."). Bandwidth of the individual note large, up to 6, sometimes nearly 7 kHz (1.5-7.5, rarely nearly 8 kHz), 0.2-0.25 s long.

Carpodacus pulcherrimus pulcherrimus (Moore)

Material: 47 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake 3650-3950 m, 24.V.-4.VI.1970: 8♂, 3♂ juv., 10♀ * Gompa near Tarakot, 3300 m, 13./14.V.1970: 1♂ juv., 2♀ * Tarang/Barbung Khola, 3600 m, 14./15.VI.1970: 3♂ ** Mustang Distr., Thaksang above Tukche, 3150 m, 16. and 20.XI.1969, 3.III.1974: 2♂, 1♂ ** Myagdi Distr., Muri, 2300 m, 1./2.IV.1970: 1♂, 1♀. **S** Solukhumbu Distr., Pangpoche, 4000 m, 29.IX.1970: 1♂, 5♂ juv., 7♀ * Phulung Karpo/Periche Valley, 4350 m, 28.IX.1970: 1♀ * Thame Teng, 3900 m, 6.X.1970: 1♂ juv.

Measurements: see Tab.20. There are pronounced differences in wing length between ♂ ad., ♂ juv. and ♀ (Fig.121).

Tab.20: Measurements of *Carpodacus pulcherrimus*

sex	n	**Wing**-L (mm)	$\bar{x}$	s_d
♂ ad.	15	77-80.5	78.6	1.14
♂ juv.	10	74-77.5	76.2	1.18
♀	21	73-77 (79)	75.5	1.43

sex	n	**Tail**-L (mm)	$\bar{x}$	s_d
♂ ad.	14	61.5-66.5	63.8	1.34
♂ juv.	10	59.5-64	61.7	1.67
♀	18	57-63.5	60.7	1.65

sex	n	**Bill**-L (mm)	$\bar{x}$	s_d
♂ ad.	15	10-12	10.8	0.49
♂ juv.	10	9.5-12	10.5	0.73
♀	21	10-12	10.7	0.53

sex	n	**Bill-height** (mm) (betw. gonys/nostr.)	$\bar{x}$	s_d
♂ ad.	15	6.5–7.6	7.13	0.26
♂ juv.	10	6.4–7.2	6.80	0.32
♀	21	6.9–7.6	7.27	0.24

sex	n	**Bill-width** (mm) (at nostrils)	$\bar{x}$	s_d
♂ ad.	15	6.0–6.9	6.42	0.28
♂ juv.	10	6.1–6.7	6.38	0.21
♀	21	6.0–7.0	6.51	0.29

sex	n	**Tarsus**-L (mm)	$\bar{x}$	s_d
♂ ad.	15	19–21	20.1	0.59
♂ juv.	10	19.5–21	20.0	0.44
♀	21	19–21	19.9	0.55

WTI (41) 20.5-26.5%, $\bar{x}$=23.3, s_d=1.32. – **TWI** (43) 77.3-83.6%, $\bar{x}$=80.9, s_d=1.39. – **Bill index** (=height in % of length) (46) 60-74%, $\bar{x}$=66.6, s_d=3.61.

Notes: The testes of both juvenile and adult ♂ very small in all cases. 1 ♂, Thaksang, 3.III.1974, considered "very fat", weighed 20.5 g. – Remarkably little variability in colouration. The juvenile ♂, also identified as such by more slender tailfeathers, are distinctly smaller than the adults (see Fig.121).

Horizontal: I found *pulcherrimus* in most of the larger mountain massifs from the NW Dhaulagiri to the foot of Everest, but did not detect it in the extremely wet W Kanchenjunga region near the E border of the country, extending W to the Pahakhola, a left-side tributary of the Arun (IV/V, IX). Most observations were of wandering birds outside breeding time (II-V, IX-X); at most, the VI/VII finds can be categorized as breeding or near-breeding season. – Dhaulagiri: S (:Myagdi): Dhorpatan (IV, frequent visitor), Muri (1./2.IV., see Material, visitor), W and N (:Dolpo): Suli Gad Valley, Rohagaon (8.VI., visitor), Ringmo/Phoksumdo Lake (V, VI, breeding grounds), at many places in the Barbung Khola: Tarang, Tukot, Charka, ascent to Parung La (all VI), E (Thakkhola :Mustang): in the whole valley landscape, common in the winter half-year during all months of residence (XI, II, III, IV, V, visitors; 18.VII. only at high altitudes). – Marsyandi Valley (:Manang): Thimang, between Thimang and Pisang (17.IV., visitors). – Everest region (:Solukhumbu): Pangpoche, Phulung Karpo (IX), Thame Teng (X, local breeding birds at both places).

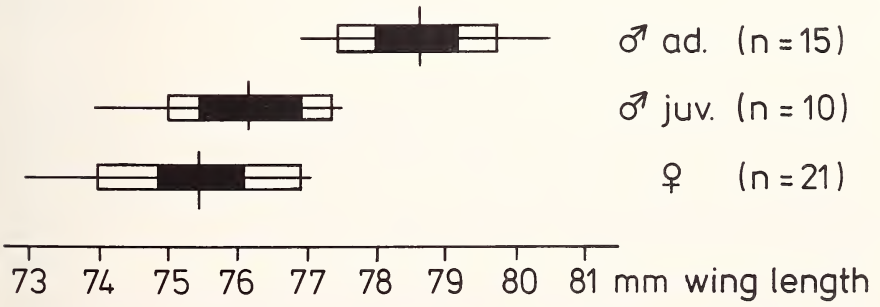


Fig.121: Wing length values of *Carpodacus pulcherrimus* to show size differences between ♂ ad., ♂ juv. and ♀.

Vertical: Our own finds were between 2050 m (II) and 4300 m (E V) and involved, in the course of the whole year, breeding birds and winter vertical migrants. Breeding sites occupied only during a comparatively brief period and because of the late breeding season in the monsoon, only rarely sought there. Inskipp & Inskipp (1991) report up to 4650 m. – Near breeding season (VI-VII): Dolpo: Ringmo (3600-4000 m), open terrain at edge of coniferous forest with *Berberis, Caragana* and *Rosa* bushes, young *Pinus, Salix* thickets at snowfields (V, VI); Barbung Khola (Tarang, Tukot, Charka; 3800-4300 m): at this altitude a nearly treeless, barren, stony dry valley, scattered groups of bushes (VI); Thakkhola: valley on the right of the Kali Gandaki (at Sangda and near Dapa Col; 3800 m, 4000 m), on high mountain meadows with scattered dwarf *Juniperus* (VI, VII). – Far from breeding season (XI-B VI): Sightings between 2050 m (Ghasa :Mustang, E II) and 3300 m (Gompa/Tarakot :Dolpo, M V, see above); consistent with 2100-3300 m reported by Inskipp & Inskipp (1991). Only Biswas (1962c) found *pulcherrimus* in the Khumbu, III-V, between 3655 and 4570 m.

Habitat: Cf. above. In the Dhaulagiri-Annapurna region in breeding season a species of the upper coniferous zone from ca. 3600 m; occurrence higher severely limited by the gradual thinning out of the alpine shrub layer, which is greatly promoted by pastoral activities. It is not known what minimum of shrub cover *pulcherrimus* requires to breed there, nor the altitude that marks the lower limit for nesting and what local differences there are. *Pulcherrimus* is a common species in the dry Dolpo as well as in the monsoon-reduced High Khumbu (Diesselhorst 1968:391). It could not be found during two extensive trips (V, VI; IX) in the extremely moist NE Nepal E of the Arun. – In the winter quarters *pulcherrimus* also occupies open terrain with hedges and bushes and frequents the vicinity of forest, but is never found in the forest interior, even in small glades. However, the large forest clearing Thaksang (:Mustang), with abundant bushes, is occupied regularly for long periods during autumn and winter. The upper limit during midwinter is not known, nor even whether the breeding grounds are entirely deserted. In some Dolpo villages that are left during the winter by the human population, *pulcherrimus* becomes the ecological equivalent of sparrows. It is entirely familiar with these places and even comes into the houses (Ringmo, 3600 m; Pimring, 3900 m). Diesselhorst (1968:392) makes similar remarks about settlements in the Khumbu.

Breeding: Very late, in VII and VIII according to Diesselhorst's (1968:391) evidence from the gonads. No data of our own.

Migration: Conspicuous vertical migrator, which stays in the region of the main chains and does not fly out into the lower hills. The local populations (joined by immigrants from further away?) invade the nearby high valleys and form striking flocks of 20-30 individuals. In Thakkhola (:Mustang) the winter quarters, between 2000 and 3000 m, are reached in M XI; visitors are always still present at B V (2.V.1980, Titi, 2700 m). A flock of 30 individuals in Suli Gad Valley (7.VI., Rohagaon, 3000 m :Dolpo) was also not yet at its breeding site.

Vocalizations: There is no marked territorial song. Singly or in groups the birds utter sparrow-like calls. If the extremely social *pulcherrimus* defends territories at all, which is doubtful, then certainly not vocally.

Carpodacus rhodochrous (Vigors)

Material: 9 specimens: **D** Mustang Distr., Chadziou Khola, 2600 m, 23.X.1969: 1 o juv. * Thaksang above Tukche, 3150 m, 8.VII.1970 and 5.VII.1973: 1♂, 1♂ juv. * Nabrikot, 2750 m, 10.XI.1969: 1♂ ** Myagdi Distr., Dhorpatan/Uttar Ganga plain, 2950 m, 14.V.1973: 1♂ juv. * S Dhaulagiri, Myagdi Khola, Muri, 2100 m, 25.III.1970: 1♂. **B** Rasuwa Distr., Gosainkund, Syng Gyang, 3200 m, 24.IV.1973: 1♂ juv. **J** Dolakha Distr., Thodung, 3200 m, 9.IV.1973: 1♀. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 1.X.1970: 1♂ juv.

Measurements: **Wing**-L ♂ (3) 72-75 mm, ♂ juv. (4) 69.5-71.5 mm, $\bar{x}$=70.8, o juv. 69.5 mm; ♀ 70 mm. – **Tail**-L ♂ (3) 57-63 mm, ♂ juv. (3) 55.5-58 mm, o juv. 55 mm; ♀ 52 mm. – **Bill**-L ♂ (3) 10-11 mm (-Height 6.2-6.5, -Width 5.8-6.2 mm), ♂ juv. (3) 10-11 mm (-Height 5.5-6.7, -Width [n=4] 6-6.5 mm), o juv. 9 mm (-Width 4.5 mm); ♀ 12 mm (-Height 6.8, -Width 6.2 mm). – **Tarsus**-L ♂ (3) 19-21 mm; ♂ juv. (4) 18-20.5 mm, $\bar{x}$=19.3; o juv. 19 mm; ♀ 21 mm. – **WTI** (8) 21.1-23.0%, $\bar{x}$=21.8, s_d=0.66; the ♀ 26.4% (but 1 ♀ from Simla also only 21.6%). – **TWI** (7) 78.9-84.0%, $\bar{x}$=80.4, s_d=1.79, but the ♀ only 74.3% (however that from Simla 78.4%).

Notes: The XI-♂ is remarkably light. Testes of adult ♂ in III minute, in VII large (5 x 4 mm). Testes of ♂ juv. in IV and V very small, in VII large (8 x 5 mm); breeding season according to Ali & Ripley (1974,10:172) from VII to IX; see Roberts (1992:544).

Horizontal: Our own finds widely scattered geographically, from the NW Dhaulagiri to the S foot of Everest: Ringmo/Phoksumdo Lake (15.VI.1973, 1♂ :Dolpo); – Dhorpatan (see Material), Muri (see Material; both :Maygdi); – Thakkhola: Chadziou Khola (see Material), Nabrikot (see Material), Thaksang above Tukche (see Material :Mustang); – Gosainkund, Syng Gyang (see Material :Rasuwa); – Thodung (see Material :Ramechap); – Phunki Drangka (see Material :Solukhumbu). – Endemic to Himalayas.

Vertical: Sightings between 2100 m (Muri, III) and 4000 m (Ringmo, VI), 4 below 3000 m, 3 at 3200 m and slightly higher, only one at 4000 m. In view of the late breeding period only two can be considered near breeding: Thaksang, 3150 m (VII 1970 and VII 1973; cf. gonads); Ringmo, 4000 m (VI 1973). The breeding area is not yet well known, probably restricted to ca. 3000-4000 m (cf. Inskipp & Inskipp 1991). Generalizations for Nepal by Ali & Ripley (1974,10:171) have not been confirmed.

Habitat: At breeding time in dense bushes and hedges near the forest margin that offer good cover; on Thaksang mainly *Berberis* and *Rosa,* young *Pinus;* at Ringmo in *Salix* bushes taller than a man. In summer foliage the native *rhodochrous* is hard to see.

Migration: Small, only vertical. Of the finds listed, only that at Muri (2100 m; III) and that from the Chadziou Khola are outside the presumed breeding range.

Carpodacus vinaceus vinaceus (Verreaux)

Material: 2 specimens: **D** Mustang Distr., Thakkhola, Chadziou Khola, 2600 m, 3.XI.1969: 1♂. * Thaksang above Tukche, 3150 m, 3.VII.1973: 1♀.

Measurements: **Wing**-L. ♂ 76, ♀ 67.5+x mm. – **Tail**-L ♂ 61.5, ♀ 53+x mm. – **Bill**-L /height/width ♂ 12/-/7.8, ♀ 12.5/8/7.2 mm. – **Tarsus**-L ♂ and ♀ 20.5 mm. – **WTI** 18.5 and 19.1%. – **TWI** 78.5 and 80.9%.

Notes: Ovary active. ♂ P8 and P9, several S und outer T growing.

Horizontal: I found it at 2 sites in Thakkhola (:Mustang), separated by ca. 10 km (see Material): Chadziou Khola Valley slightly E of Ghasa (XI, 2600 m; Martens 1972) and in the

large clearing Thaksang above Tukche (VII, 3150 m), both on the W flank of the Annapurna massif. These data have been referred to by Fleming et al. (1976), Ali & Ripley (1974,10:172), Ripley (1982) and Inskipp & Inskipp (1985, 1991) and in part erroneously quoted. Inskipp & Inskipp (l.c.) report a few additional finds, widely scattered over the entire country. Probably *vinaceus* has previously been overlooked. It is an inconspicuous inhabitant of the undergrowth, one indication of which are its extremely rounded wings (cf. WTI).

Vertical: Only in a narrow range of altitudes, between 2600 and 3150 m. In XI stays in small groups in overgrown glades at the edge of the forest; forest with dense undergrowth, of *Juglans, Quercus, Acer, Rhododendron,* above the find site also *Pinus;* glade with much bamboo. The ♀ comes from the very bushy large clearing Thaksang slightly N of the E-W axis of the main Himalayan chain (Fig.31), and hence in the region of reduced monsoon influence. At the capture site there were dense hedges of *Berberis* and *Rosa* as well as young growth of *Pinus wallichiana.*

Breeding: The ♀ in egg-laying stage; hence *vinaceus* should be considered as breeding in the Himalayas – more than 1000 km W of the Chinese and Burmese breeding grounds (cf. Cheng 1987). The ♂ was moulting the wing and tail feathers and presumably was also not far from the breeding site. The breeding season is evidently delayed until late in the monsoon in this species as well.

Carpodacus rhodopeplus rhodopeplus (Vigors)

Material: 6 specimens: **D** Mustang Distr., Chadziou Khola, 2600 m, 1.XI.1969: 1♂, 1♀ * Thaksang above Tukche, 3150 m, 26.XI.1969: 1 o ** Myagdi Distr., Dhorpatan/Uttar Ganga Valley, 2950 m, 20.V.1973: 1♂ juv. **B** Rasuwa Distr., Syng Gyang, 3200 m, 24.V.1973: 1♀ ** Sindhu Palchok Distr., Ting Sang La, 3200 m, 15.IV.1973: 1♂.

Measurements: **Wing**-L. ♂ (2) 84 and 85 mm, ♂ juv. 79.5 mm; ♀ (2) 81 and 81.5 mm, 1 o 82.5 mm. – **Tail**-L ♂ (2) 71 and 73 mm, ♂ juv. 66.5 mm; ♀ (2) 66.5 and 68 mm; 1 o 69 mm. – **Bill**-L /height /width ♂ (2) 16/9/8.8 and 14/9.5/8.3 mm, ♂ juv. -/9.5/7.9 mm; ♀ (2) 13.5/9.7/8.6 and 14/10/8.4 mm, 1 o 16/9/8.2 mm. – **Tarsus**-L ♂ (2) 22.5 and 23.5 mm, ♂ juv. 23 mm; ♀ (2) 23.5 and 24 mm; 1 o 23.5 mm. – **WTI** (6) 17.3-19.0%, $\bar{x}$=18.5. – **TWI** (6) 82.1-86.9%, $\bar{x}$=83.9.

Notes: In the XI-♀ P7-P9 growing; measuring of wing possible, P6 forming the wing tip. – Testes of V-♂ only 1.5 mm.

Horizontal: Our own finds, mostly skin specimens (see Material), from Dhorpatan (:Myagdi); from the upper Kali Gandaki Valley (Chadziou Khola; Thaksang; Thini; all :Mustang); Gosainkund, Syng Gyang (:Rasuwa) and from Ting Sang La Pass (:Sindhu Palchok).

Vertical: My sightings from the months II, III, IV, V, VII and XI are limited to 2600-3200 m, a very narrow range of altitudes. Diesselhorst (1968), Inskipp & Inskipp (1985, 1991) expand it to 2000-4000 m. The (upper) region in which breeding occurs is unknown, but the records near breeding season are again very restricted: 3150 m (VII, Thaksang), 2950 m (V, Dhorpatan), 3200 m (V, Thodung; Diesselhorst 1968). According to ♂ gonadal state in V, the breeding season must lie in VII or even VIII (see above, Diesselhorst l.c.). In the forest clearing Thaksang (3150 m) birds were sighted in II, VII and XI, suggesting a year-round presence (and breeding) at this site.

Habitat: Coniferous-*Rhododendron* forests are preferred, especially the marginal parts with dense bushes of *Berberis, Rosa* etc., and bushy glades.

Carpodacus thura thura Bonapate & Schlegel

Material: 4 specimens: **D** Mustang Distr., Thakkhola, Thaksang above Tukche, 3150 m, 27.II.-6.III.1974: 2♂, 2♀.

Measurements: **Wing**-L.: ♂ (2) 84 and 86 mm ♀ (2) 82 and 84 mm. – **Tail**-L: ♂ (2) 75 and 77 mm; ♀ (1) 74+x mm. – **Bill**-L: ♂ (2) twice 12 mm; ♀ (2) 12 and 12.5 mm. – **Tarsus**-L: ♂ (2) twice 24.5 mm; ♀ (2) 24 and 25 mm. – **WTI:** (4) 16.7-19.5%, x̄=18.5. – **TWI:** (3) 89.3-90.3%.

Notes: The 2 ♂ from B III weighing 32 g each are very fat.

Horizontal: I encountered the species in Thakkhola (II-III 1974 :Mustang, see Material); – Chordung Mt. near Jiri (31.III.1973 :Ramechap); – Lumbasumba Himal W of the Kanchenjunga massif, above Thudam (25.V.1988 :Taplejung). Only the latter is likely to be a potential breeding site.

Vertical, habitat: Visitors E II/B III at 3150 m in a large forest clearing overgrown with bushes (Thaksang), in small flocks, sometimes accompanied by *C. pulcherrimus;* E III down to only 2900 m (Chordung); E V at 3950 m, above the tree line among *Salix* bushes and large bushy *Rhododendron.*

Carpodacus rubicilloides lucifer R. & A. Meinertzhagen

Material: 4 specimens: **D** Dolpo Distr., Charka/upper Barbung Khola Valley, 4250-4350 m, 22./23.VI.1973: 2♂ ** Mustang Distr., Thaksang above Tukche, 3150 m, 5.III.1974: 1♂. **S** Solukhumbu Distr., Tarnga, 4050 m, 11.X.1970: 1♂ juv.

Measurements: **Wing**-L ♂ (3) 110.5-112 mm; ♂ juv. 109 mm – **Tail**-L ♂ (3) 87-92 mm. – **Bill**-L/-height/-width ♂ (3) 14/11.4/9.4, 16/12/9.3 and 14.5/12.3/9.5; ♂ juv. 13.5/11/9.4 mm. – **Tarsus**-L ♂ (3) 23-24 mm; ♂ juv. 25 mm. – **WTI** (4) 25.7-27.7 %, x̄=26.7. – **TWI** (3) 77.7-83.3 %.

Notes: Testes of the two VI-♂ very large, undeveloped in the III-♂ (which was very fat, 40 g). – VI-♂: beak horn-gray above, lighter (yellowish) below. Feet black-gray.

Horizontal: A few finds of our own in the N Dhaulagiri (Barbung Khola and further N :Dolpo), Thakkhola (:Mustang) and the Everest region (:Solukhumbu), all substantiated by specimens. These regions adjoin the Tibetan/Central Asian area, which sends a few limited offshoots to N Nepal. Summertime occurrence in the Dolpo was reported by Fleming et al. (1976).

Vertical: Varies according to season: in the Dolpo summer finds range upward from 4250-4350 m (Charka, see above), 4450 m (above Charka, ♂ in Coll. H.S. Nepali, 20.VI.1973) or 4600 m (below Büko La, 20.VI.1973) to below the Mo La (4700 m, 20.VI.1973). On this day they were visible at many places within this range. In Thakkhola (:Mustang) winter visitors (E II/B III) down to 2750 m (Jomosom), in the forest clearing Thaksang as many as 10 individuals in a flock (3150 m, 27.II.1974). The X-♂ from the foot of Everest (see above) may be an immigrant from Tibet, because Diesselhorst (1968) did not see the species there in a several-months stay (VI-IX). Since then, however, Inskipp & Inskipp (1991) have reported a V date from there.

Habitat: In the breeding region, dry high-mountain steppe N of the main chain with occa-

sional bushes or groups of bushes, hip- to at least head-high, of *Lonicera, Caragana, Juniperus, Salix* in wet sites, dwarf *Rhododendron.* Where the bush vegetation is lower or altogether absent, *rubicilloides* is also absent.

Breeding: From 20. to 25.VI. usually pairwise; egg-laying possible at this time. Gonad development as above.

Migration: Overwinters in the higher parts of neighbouring valleys, but so far known only in Thakkhola; does not leave the dry vegetation in the region shielded from monsoon, down to ca. 2700 m (cf. Rand & Fleming 1957).

Carpodacus rubicilla severtzovi Sharpe

Material: 2 specimens: **S** Solukhumbu Distr., SW flank of Everest, Gorak Shep, 5150 m, 23.IX.1970: 2♀.

Measurements: **Wing**-L.: (1) 114.5 mm. – **Tail**-L 81 and 87 mm. – **Bill**-L/height/width 15/11/10.3 and 13,5/10.8/9.6 mm. – **Tarsus**-L 23 and 23.5 mm. – **WTI** (1) 29.7%. – **TWI** (1) 76%.

Notes: 1♀ moults: P9 old, the remaining ones new or growing. T1, T2 new, all others growing.

Horizontal, vertical, habitat: I found the Great Rose Finch in the N Dhaulagiri (:Dolpo) and at the S foot of Everest (:Solukhumbu), both previously known points in its range (cf. Inskipp & Inskipp 1991). In the Dolpo between the passes Büko La and Mo La at 4450 m (20.VI.1973); a red ♂ from there was acquired for the Coll. H.S. Nepali (cf. under *C. rubicilloides,* which was the more common species there). The exact niches occupied by the two similar species in the Dolpo are unknown. – In Khumbu I found it at the sites characterized ecologically in detail for the species by Diesselhorst (1968). Like *rubicilloides, rubicilla* reaches Nepal only in small splinters in climatically favorable, i.e. monsoon-dry, N-exposed small areas as offshoots of the Central Asian/Tibetan distribution. Although the Khumbu is considerably wetter than the Dolpo and is protected from heavy precipitation only by outlying chains to the S, it seems adequate for the needs of *rubicilla.* The species is rare in the Dolpo, as in Khumbu (cf. Diesselhorst 1968). The lower limit of its breeding area in the Khumbu is about 500 m higher than in the Dolpo – an effect of the differences in amount of precipitation? This phenomenon, also found in other species, can be called an "altitude shift of vertical breeding distribution under influence of monsoon".

Carpodacus puniceus Blyth

Horizontal, vertical: Our own data from the W side of the Dudje La (:Dolpo) at 4600 m 1 red ♂ 26.VI.1973 (in Coll. H.S. Nepali); E flank of the Thorong La (:Manang) at 4800 m and at 4880 m, 1 ♂ each, 20.IV.1980; N flank of the Pomri La (:Taplejung), 1 ♂ each at 4500 and 4600 m 29.V.1988. All altitudes are far above the tree line and even above the dwarf-shrub zone.

Birds foraged in pairs on 20.IV. in thawed places on large snowfields, and on 29.V. in alpine grassy heath with many rocks. Sites of occurrence in N Nepal are located at the S margin of the area in the Asian highlands; there is still no breeding evidence for Nepal.

Pinicola subhimachala (Hodgson)

Taxonomic note: With respect to sexual dimorphism and wing shape *P. subhimachala* resembles *P. enucleator.* The flatter bill, similar to that of the *Pyrrhula* species, presumably is only a deviation caused by different size.

Material: 2 specimens: **D** Mustang Distr., Thaksang above Tukche, 3150 m, 6.VII.1970: 1♀. **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 31.III.1973: 1♂.

Measurements: **Wing**-L ♂ 103, ♀ 91 mm. – **Tail**-L ♀ 70.5 mm. – **Bill**-L/-**Height** ♂ 13/10.5; ♀ 12/10.7 mm. – **Tarsus**-L ♂ 23; ♀ 21 mm. – **WTI** ♂ 25.2%; ♀ 18.7%. – **TWI** ♀ 77.5%.

Notes: ♂ bill horn grey; feet dark grey.

Horizontal: Only few scattered findings of my own: – Thaksang above Tukche (27.IV., 6.VII., see Material :Mustang); – Chordung Mt./Jiri (31.III., see Material :Ramechap), – Thudam (27.V. :Sankhua Sabha). – The upper Kali Gandaki Valley is said to be the western outpost of the Crimson-browed Finch's area (Inskipp & Inskipp 1991).

Vertical: My own records restricted to a narrow vertical band: 2950 m (Chordung), 3150 m (Thaksang, also VII), 3550 m (Thudam). Except for the Thaksang record in VII the specimens not yet have been at their breeding sites. The IV-pair in Thaksang, however, sang and may have been close to it (see Inskipp & Inskipp 1991).

Habitat: Close to breeding season (V, VII) in shrubbery/bushy understorey near forest edges within the coniferous belt; outside the breeding season (III, IV) here as well, but also down to the conifer-oak belt, timber forest. This is an exceedingly secretive species and it is very probably underrepresented, at least during the breeding season (see Diesselhorst 1968:398). The sighting at B VII (Thaksang) suggests broods in the rain-shadowed drier parts of the Inner Valleys down to 3150 m; Diesselhorst (1968:397) found it in the much moister Khumbu down to 3550 m (VI, VIII). The Thakkhola observations extend the summer quarters locally downwards for about 400 m (cf. Inskipp & Inskipp 1991). The vertical area band may be nearly 1000 m wide (between 3100 and 4100 m). – A flock of 1♂ 2♀ fed on the white flowers of *Clematis montana* (Thudam).

Breeding: Apparently very late in VII and VIII (cf. Diesselhorst 1968:397); regarding the above observations, only the VII-♀ from Thaksang was at the breeding site proper.

Pyrrhula

Two species are on the Nepal list: *erythrocephala* and *nipalensis;* both breed in the area. Though their vertical belts do at least partly overlap, they have never been found at close quarters. *P. erythrocephala* prefers higher altitudes within the Palearctic belt, *nipalensis* subtropical conditions mainly within the cloud zone. *P. erythrocephala* is a Himalayan endemic, *nipalensis* extends to the S flanks of the Himalayas from a larger Indo-Chinese area.

Pyrrhula erythrocephala Vigors

P. [erythrocephala], incl. *aurantiaca, erythaca*

Material: 15 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3600-3650 m, 31.V.1970: 1♂, 1♀ * Gompa near Tarakot, 3300 m, 13.V.1970: 1♂ ** Mustang Distr., Tukche, 2900 m, 28.XI.1969: 1♀ * Thaksang above Tukche, 3150 m, 2.VII.1973: 2♂, 1♀ ** Myagdi Distr., Dhorpatan, 12.V.1973: 1♂,

1 ♀. **B** Sindhu Palchok Distr., Dadar Danda SW Kalinchok Mt. NW Charikot, 3150 m, 20.IV.1995: 1 ♂, 1 ♀. **J** Ramechap Distr., Chordung Mt./Jiri, 2900 m, 29.III.1973: 1 ♀. **S** Solukhumbu Distr., confluence of Imja and Phunki Drangka, 3250 m, 1.X.1970: 2 ♂, 1 ♀ pull.

Measurements: **Wing**-L ♂ (8) 77-82 mm, $\bar{x}$=80.1, s_d=1.64; ♀ (6) 77.5-81 mm, $\bar{x}$=79.4, s_d=1.20; ♀ pull. 78.5 mm. – **Tail**-L ♂ (7) 61-66.5 mm, $\bar{x}$=64.4, s_d=1.82 (graduation 9-14 mm); ♀ (5) 61.5-66.5 mm, $\bar{x}$=64.5, s_d=2.00 (graduation 8-11.5 mm); ♀ pull 57 mm (graduation 10 mm). – **Bill**-L ♂ (7) 9-10 mm (-**Height,** proximal from gonys, 7.8-8.7 mm, -**Width** 9-9.8 mm); ♀ (5) 9-10.5 mm (-**Height** 8.1-9 mm, -**Width** 8.5-9.5 mm); ♀ pull. 29 mm (-**Height** 7.6 mm, -**Width** 8.2 mm). – **Tarsus**-L ♂ (7) 16.5-18 mm, $\bar{x}$=17.1, s_d=0.54; ♀ (5) 17-17.5 mm, $\bar{x}$=17.3, s_d=0.27; ♀ pull. 17.5 mm. – **WTI** (12, incl. pulli) 19.8-22.8%, $\bar{x}$=21.0, s_d=0.86. – **TWI** (12) 78.1-83.1%, $\bar{x}$=80.7, s_d=1.49; ♀ pull. 72.6%.

Notes: Testes in M V minute: 1 and 2 mm, at B VII slightly swollen: 5 and 6 mm. In a few ♂ the red colouration is slightly, in the V-♂ from Gompa heavily intermingled with green. XI-♀ (Tukche) moults wings and tail.

Horizontal: Our own finds originate from Dhaulagiri/Annapurna area (:Dolpo, :Myagdi, :Mustang), from Everest (:Ramechap, :Solukhumbu) and from the S Kanchenjunga area (:Taplejung). – Phoksumdo Lake (31.V.; see Material); Gompa/Tarakot (13.V.; see Material); Suli Gad Valley (9.VI. all :Dolpo); – Dhorpatan (10.-12.V.; see Material); Myagdi Khola, Muri (30.III. both :Myagdi); – Nabrikot (M XI); Tukche, Dambush Khola (28.XI.; see Material); Thaksang/Tukche (6.VII.1970; 2./3.VII.1973; see Material, all :Mustang); – Chordung Mt./Jiri (29.III.; see Material, :Ramechap); – Imja- and Phunki-Drangka (1.X.; see Material, :Solukhumbu); – upper Simbua Khola, small flock (8.IX. :Taplejung).

Vertical: Our records are resticted to a narrow belt 1300 m wide, but only 650 m wide during V-VII, months which are close to the breeding season: 2300 m (Muri, III); 2900 m (Chordung Mt., III); 2950 m (Dhorpatan, V); 3150 m (Thaksang, VII 1970 and 1973); 3200 m (Suli Gad Valley, VI); 3250 m (Phunki, X); 3450 m (Simbua Khola IX); 3300 m (Gompa/Tarakot, V); 3600 m (Ringmo, V). – The sighting at 2300 m is below the breeding belt; breeding records may be expected from 3000 m upwards; the Red-headed Bullfinches from Thaksang (B VII, 2 years) apparently were at the breeding place immediately before onset of breeding. – Diesselhorst (1968:398) recorded this Bullfinch during the breeding months VII and VIII (proof by gonadal state) between 3400 and 4200 m, the lower limit distinctly higher than in Thakkhola (see above); Inskipp & Inskipp (1991) indicate summer residence (months?) from 3050-4000 m, but proved breeding records are still lacking for Nepal.

Habitat: Forest and forest edge facies in the conifer and *Rhododendron* belt, preferably in secondary shrubberies with young conifers, *Berberis, Rosa* also during the breeding season. The close relationship to *Betula utilis* stands, which is stressed by Diesselhorst (1968:399) for the Khumbu, does not exist in other parts of the country (Thaksang :Mustang, :Dolpo). Thaksang and partly Gompa/Tarakot are situated below the birch zone, and birches are sparse near Ringmo because of the slight precipitation. The dry rain-shadowed areas of W Nepal (:Dolpo) and of the Inner Valleys (:Mustang) are regularly inhabited and apparently belong to the breeding area.

Migration: Slightly vertically, but *erythrocephala* remains within the main chain area. The Muri site is markedly S of the Dhaulagiri main massif, but this Bullfinch has been reported at even lower altitudes: 1830 m (Inskipp & Inskipp 1991). Keeps in small flocks of up

to about 10 specimens outside the breeding season (Simbua Khola, IX; Nabrikot, XI); even immediately before the onset of the breeding season up to 20 specimens have been noticed (Thaksang, 2.VII.1973).

Mycerobas

Three species live in Nepal *(melanozanthos, affinis, carnipes).* The 2 latter are widely distributed in the (Palearctic) upper forest zone, partly up to the timberline. They coexist locally, but their interspecific relations are undescribed. *M. carnipes* is partial to *Juniperus* species, which are common in the arid areas and the fruits of which it feeds on. *M. melanozanthos* occurs locally and sparsely.

Mycerobas affinis (Blyth)

Material: 1 specimen: **B** Sindhu Palchok Distr., Ting Sang La, 3250 m, 14.IV.1973: ♂.

Measurements: **Wing**-L: 132.5 mm. – **Tail**-L: 93 mm. – **Bill**-L: 24 mm; **-Width** (at mandible feathering) 15.7 mm; **-Height** (above gonys) 16.6 mm. – **Tarsus**-L: 29 mm. – **WTI:** 26.4%. – **TWI:** 70.2%.

Notes: Testes bluish and large. Bill blue-grey, tarsi flesh-coloured-grey, iris reddish-grey. – The plumage looks as fresh as described by Diesselhorst (1968:403) for specimens from V. – Mallophaga collected, indet. – Gonads 7 mm, 6 mm from an additional ♂ from Trisuli Valley (Syng Gyang, 25.IV.1973, Coll. H.S. Nepali).

Horizontal: Our data range from the SE Dhaulagiri to the Kanchenjunga massif: Upper Myagdi Khola, N Dobang (24.V. :Myagdi); – Trisuli Valley, Syng Gyang, 1♂ (25.IV.1973 :Rasuwa); – Dadar Danda, Kalinchok Mt. (19.-23.IV.); Ting Sang La (14./15.IV.1973; see Material, both :Sindhu Palchok); – Lassetham NE Yamputhin (9.IV.1988 :Taplejung). – *M. affinis* has been recorded in most parts of the country except for the arid ones; sparse or even lacking in the E (Inskipp & Inskipp 1991).

Vertical, habitat: The data (IV, apparently close to the breeding season) originate from a narrow vertical belt less than 300 m wide: 3100 m (Thaksang), 3200 m (Syng Gyang; Dadar Danda; Myadgi Khola), 3250 m (Ting Sang La) and 3350 m (Lassetham); consequently the coniferous forest facies that the species inhabits are very similar at all the sites: timber forest of *Pinus wallichiana* (Thaksang), *Abies spectabilis* with scattered *Quercus semecarpifolia* (Syng Gyang; Dadar Danda; Myagdi Khola), *Abies spectabilis/Juniperus* (Ting Sang La) and *Abies densa* with tall *Rhododendron,* mostly *R. hodgsoni* (Lassetham). Inskipp & Inskipp (1991) give a wider belt during the summer: 3000-3900 m.

Breeding: *M. affinis* seems to be one of the very few finches of the central Himalayas with an early breeding season; data from IV already indicate its onset. Diesselhorst (1968:402) found maximally developed gonads in V; carrying nesting material B V (Inskipp & Inskipp 1991); ad. with fledged juvenile 22.VII. (Fleming & Traylor 1968). For biology and distributional limits of the Collared Grosbeak comp. Neufeldt & Vietinghoff-Scheel (1986).

Mycerobas carnipes carnipes (Hodgson)

Material: 3 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650 m, 12.VI.1973: 1♀ ** Myagdi Distr., Dhorpatan, 3000 m, 16.IV.1970: 1♂. **B** Sindhu Palchok Distr., Ting Sang La, 3250 m, 14.IV.1973: 1♂ juv.

Measurements: **Wing**-L ♂ 119, ♂ juv. 111; ♀ 115 mm. – **Tail**-L ♂ 97.5, ♂ juv. 88; ♀ 91 mm. – **Bill**-L/-**Height** (above gonys)/-**Width** ♂ 22/18/15.8, ♂ juv. 21/15.8/14.2; ♀ 23.5/16.7/15.6 mm. – **Tarsus**-L ♂ 26, ♂ juv. 24.5; ♀ 25 mm. – **WTI** (3) 26.1-28.8%. – **TWI** (3) 79.1-81.9%.

Notes: ♂ juv.: a few dull black feathers on the breast, otherwise like ♀, but testes markedly enlarged (8 x 5 mm)! Bill above horn-grey, below beige. Feet flesh-coloured-grey.

Horizontal: Our records are from the Dhaulagiri/Annapurna massifs and from the Ting Sang La area. – Dhaulagiri N: Ringmo/Phoksumdo Lake, (22.-28.V.1970, 11.-16.VI.1973; see Material); Suli Gad Valley, near Rohagaon (19.V.); ascent to Bagar La (16.VI.); ascent to Parung La (20.VI. all :Dolpo); – S: Dhorpatan, flocks of up to 5 specimens (7.-19.IV., see Material :Myagdi); – E: descent from Sangda to Kali Gandaki Valley (28.VI.); Purano Marpha (18.III.1974, 23.IV.1980); above Tukche (13.V.); Thaksang/Tukche (3.VII.1973; 27.II.-5.III.1974; all :Mustang); – Marsyandi Valley, betwen Pisang and Manang (18.IV. :Manang); – Ting Sang La: singles, not rare (14.IV., see Material :Sindhu Palchok). – I did not encounter a single specimen in the extremely wet areas immediately E of the Arun to the Kanchenjunga massif (V, VI, IX).

Vertical: Our finds (II, III, IV, VII) are concentrated within a narrow vertical belt: far from breeding (II, III, IV): 2950-3300 m (Dhorpatan; Thaksang; Purano Marpha; Ting Sang La); – near breeding (VI): 3150 m (Thaksang), 3600-3900 m (Ringmo), 3900 m (Bagar La), 4000 m (Sangda), 4400 m (Parung La). – Little is known about the vertical belt of breeding activity in Nepal. According to my and Diesselhorst's (1968:401) data it may comprise a belt appr. 1300 m wide downwards from the alpine bush zone above timberline. But the lower limit near 3000 m may be reached only locally, especially in the arid areas (e.g. :Mustang), but see Dhorpatan, a climatically severe area, quite suitable as a breeding place. Inskipp & Inskipp (1991) indicate "occurs chiefly between 3050 m and 4200 m".

Habitat: The White-winged Grosbeak is confined to the (upper) conifer/*Rhododendron* zone and the zone of alpine bush of *Juniperus* and dwarf *Rhododendron* beyond timberline. Within the coniferous zone it prefers open places, light forest stretches and bush/shrubberies near forest edges and open valley bottoms. Far-ranging forest reduction within the alpine bush zone and at timberline to extend alpine pastures may have favoured this Grosbeak. Often only bushes (sometimes trees) of the 4 *Juniperus* species of the area, on the seed of which it feeds, have survived (e.g. in the upper Kali Gandaki Valley). In the arid areas N of the main range, which are especially rich in various *Juniperus* stands, I found the White-winged most common.

Breeding: According to Diesselhorst (1968:401) oviposition starts in VII. With respect to the above data, only the specimens from Thaksang (VII, song) were definitely at their breeding place. No nest finds for Nepal yet.

EMBERIZIDAE

Emberiza

Only 2 species breed in the C Himalayas, *cia* and *fucata.* Most species of the predominantly C and E Asian genus avoid the monsoon-moist S flanks of the Himalayas and the majority of the sites of both breeding species are situated in dry areas. 11 additional species are winter visitors from the N Asian taiga belt.

Emberiza fucata arcuata Sharpe

Taxonomic notes: The *fucata* populations are only slightly differentiated. Jacobi (1923:36) attached specimens from Sichuan to ssp. *fucata,* Cheng (1987) to ssp. *arcuata.* Vaurie (1956:21) also emphazises slight differences. The Nepal specimen (V) differs markedly from Sichuan birds (IV, V).

Material: 1 specimen: **D** Myagdi Distr., Pelma (path from Dhorpatan to Tarakot), 2300 m, 29.V.1973: ♂.

Measurements: **Wing**-L 73 mm. – **Tail**-L 66 mm. – **Bill**-L 11.5, -**Height** (above nostrils) 5.7 mm. – **Tarsus**-L: 18 mm. – **WTI:** 17.8% – **TWI:** 90.4%.

Notes: Testes large, 9 x 6 mm. Bill horn-brown, below lighter blue-grey; tarsi (grey-) flesh-coloured.

Horizontal, vertical: The only record originates from the W slope of Dhaulagiri at the edge of the village Pelma, 2300 m. On 29.V. at least 2 ♂ were singing there in bushy fallow lands and fields; 1 additional ♂ and 1 ♀ were collected by H.S. Nepali. According to singing activity and gonadal state, these specimens represented a small isolated breeding population. This is the easternmost site of the Chestnut-eared Bunting hitherto known within the small isolated area splinter of the W Himalayas, which extends from W Dhaulagiri to Chitral. The few other Nepal findings during the breeding season are located in the far W in the Jumla area (:Jumla) (Inskipp & Inskipp 1991, Fleming et al. 1984).

Vocalizations: Territorial song (Fig.122) is a distinct verse 1.0-1.8 s long. Verse syntax is irregular, an assemblage of closely spaced notes showing hardly any repetition of individual notes or note groups (for the only exception found see Fig.122a-e, k; arrows). The notes tend to have a click-like character due to extremely rapid frequency changes including repeated frequency modulations of single notes. Frequency range of the whole verse is high, starting near 2 kHz and extending to about 8 kHz or even higher; bandwidth of individual notes is up to 4 kHz. Strong frequency modulation and alternation of numerous click-like notes with (narrow bandwidth) near-whistle-like notes up to 0.1 s long give the song a shrill, metallic aural impression, in some cases similar to European Dunnock *(Prunella modularis)* and Whitethroat *(Sylvia communis).* – The individual ♂ uses several verse types; a single type may be repeated several times, followed by a switch to another type. Verse types may differ completely with notes all different (Nepal: Fig.122f-g; Siberia: Fig.122i-k) or may differ only insofar as the position of single note blocks changes within the verse, the overall note contents remaining unchanged (Nepal: Fig.122 a/d, b/e).

The widely disjunct Himalayan and N Asian populations, though subspecifically distinct (*E. f. arcuata, E. f. fucata*), do not seem to differ much vocally. Song of a population from the lower Ussuri (Fig.122h-n) is very similar to the only ♂ song of ssp. *arcuata* from Nepal

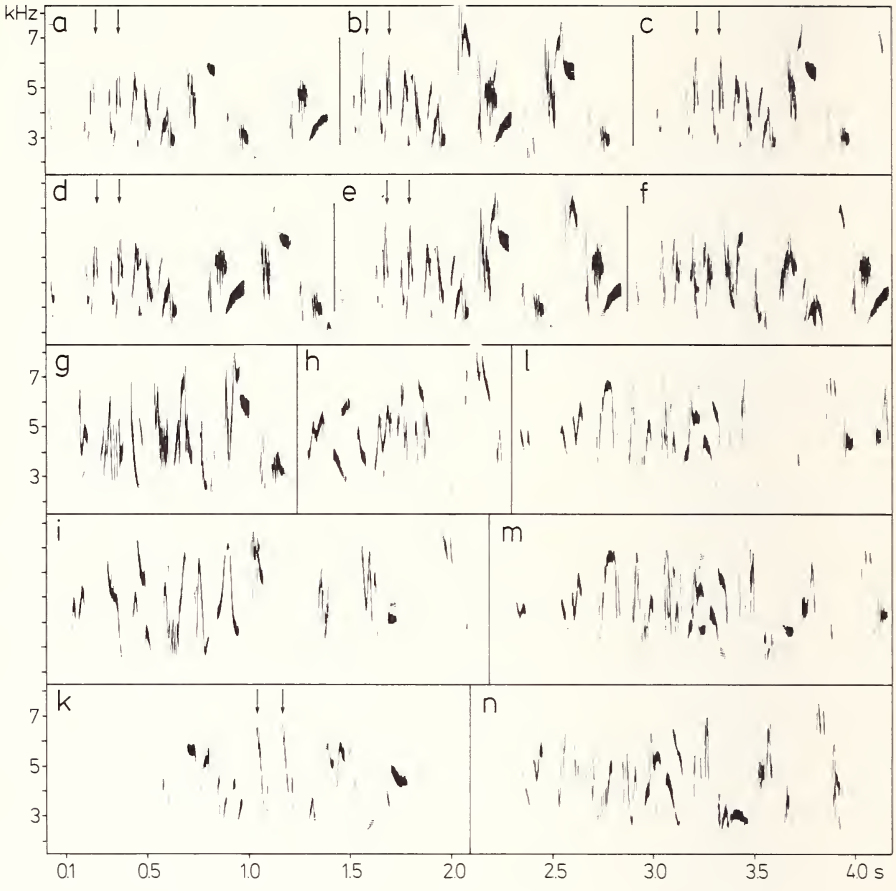


Fig.122: *Emberiza fucata*, territorial song. – a-g) *E. f. arcuata*, 7 verses of 1♂: Pelma 29.V.1973; – h-n) *E. f. fucata*, 6 verses of 3♂. h) 1st ♂, 26.V.1990; i-k) 2nd ♂, 26.V.1990; l-n) 3rd ♂, 27.V.1990; all from E Siberia, lower Ussuri, Boitzovo NE Bikin. Identical verse parts are strippled.

with respect to verse length, bandwidth, minimum/maximum frequency, frequency modulation and scarce note repetitions. But playback experiments in the field to detect minor differences not easy to recognize on the sonagrams have not been carried out.

Emberiza pusilla Pallas

Material: 1 specimen: **J** Ramechap Distr., Chordung Mt./Jiri, 2500 m, 3.IV.1973: ♂.

Measurements: **Wing**-L 72 mm. – **Tail**-L 59 mm. – **Bill**-L 10.5 mm; -**Height** 5.2 mm. – **Tarsus**-L 17.5 mm. – **WTI** 23.9%. – **TWI** 83.1%.

Notes: Testes very small. Bill black, tarsi grey-flesh-coloured.

Migration: Nepal belongs to the passage and wintering area of the Little Bunting. – Near Manigaon, Trisuli Valley (:Nuwakot), 1350 m 1 specimen 21.IV. 1973; Chordung Mt./Jiri

(:Ramechap), 2300 m 1 specimen 3.IV.1973 (see Material); singles in the surroundings of Mai Pokhari, 2150 m, 27. and 31.III.1980; below Mai Pokhari, 1800 m, flock of about 15 specimens 9.IV.1988 (both :Ilam).

Stay in open (perennial) herb and grass area, bushes and small groups of trees nearby. Consequently, the overwintering birds are to be met in open (semi-) cultivated land, even in extensive stretches wich are "infested" by the introduced weed *Eupatorium.*

Emberiza cia

Emberiza cia cf. ***par*** Hartert

Material: 1 specimen: **D** Mustang Distr., Kali Gandaki Valley, Tukche, 2600 m, 16.X.1969: ♂. Martens (1972:119) was unable to distinguish this specimen from Afghan *par.*

Measurements: **Wing**-L 83 mm. – **Tail**-L 77 mm. – **Bill**-L 12.5 mm. – **Tarsus**-L 20.5 mm. – **WTI** 20.5% – **TWI** 92.8%.

Emberiza cia flemingorum Martens

Material: 13 specimens: **D** Dolpo Distr., Ringmo/Phoksumdo Lake, 3650-3700 m, 24.V.-3.VI.1970, 11.VI.1973: 4♂, 1♀ * Kangar, 4200 m, 18.VI.1973: 1♂ * Rohagaon/Suli Gad Valley, 3000 m, 8.VI.1973: 1♂ * Gompa near Tarakot, 3300 m, 13.V.1970: 1♂, 1♀ * Tarang (**locus typicus**) /Barbung Khola, 3600 m, 14.VI.1970 : 2♀ ** Myagdi Distr., Dhorpatan, 2950-3000 m, 3.V.1970 und 12.V.1973: 2♂. – **Holotype:** ZFMK 71.809, ♀ from 14.VI.1970 and 8 **paratypes;** these are all skins of the type series except the 4 collected in 1973.

Measurements: **Wing**-L ♂ (9) 81-86 mm, $\bar{x}$=83.4, s_d=1.90; ♀ (4) 74-79. – **Tail**-L ♂ (9) 73.5-81 mm, $\bar{x}$=77.3, s_d=2.95; ♀ (4) 69-73 mm. – **Bill**-L ♂ (8) 11-12 mm, $\bar{x}$=11.5, s_d=0.39; ♀ (4) 10-12 mm. – **Tarsus**-L ♂ (9) 19-21 mm; $\bar{x}$=20.3, s_d=0.66; ♀ (4) 20-21 mm. – **WTI** ♂ (9) 14.8-19.8%, $\bar{x}$=18.0, s_d=1.47; ♀ 17.3-18.2%. – **TWI** ♂ (9) 89.6-94.6%, $\bar{x}$=92.7, s_d=1.78; ♀ (4) 92.0-93.2%.

Notes: The markedly smaller ♀ show a slight olive tinge on the upper side. Gonadal states differ as to season, particularly developed in VI. Bill in 2♂ from V and VI horn-grey, one grey-black above, the other blue-grey below; feet of a ♂ flesh-coloured. We refer to the detailed original description of this light form, which, also according to the maximum method (used by Vaurie), is slightly smaller than *E. c. stracheyi.*

Horizontal: My own finds are from Phoksumdo Lake NW of Dhaulagiri, Thakkhola and the upper Marsyandi Valley. – Ringmo/Phoksumdo Lake (22.V.-11.VI.[1970, 1973]; see Material); Suli Gad Valley, Rohagoan (21.V., 8.VI.; see Material); Dunahi (8.VI.); Gompa/Tarakot (13.V.; see Material); Tarakot (10.V., 7.VI.); Tarap Valley, Kangar (18.VI.; see Material); upper Barbung Khola Valley, between Kakkot and Pimring (12.VI.); Tarang (14.VI.; see Material; all :Dolpo); – Dhorpatan (8.IV.-3.V., 12.-17.V.[1970, 1973]; see Material :Myagdi); – upper Kali Gandaki Valley, on the valley bottom and on the lower bushy slopes, regularly seen, mostly common in places with scattered trees: Muktinath (21.IV.); Dangarjong (30.VI.); between Jomosom (21.III., 21.IV., 30.VI.), Marpha and Tukche (26.II., 12.III., 25.-30.IV., 30.VI., 15.X.), Purano Marpha (13.III.; 6./7.VII.), down the valley as far as Choya (25.II.) and ascent to Titi (2.V.); Lete (9.VII.); Dana (24.II. all :Mustang); – Marsyandi Valley: Pisang (18.IV. :Manang).

Vertical: My own records from the presumed breeding season (V-VII) range from 2350 m (Dunahi), 2400 m (Dana; lowest records) up to 4200 m (Kangar; highest record). All other

finds are evenly and regularly distributed within this belt, but the Rock Bunting is common only up to (locally variable) ca. 3600 m; higher there exist only sparse records: Tarang 3600 m, Ringmo up to 4000 m, Kangar 4200 m; all from the arid NE. The lower limit

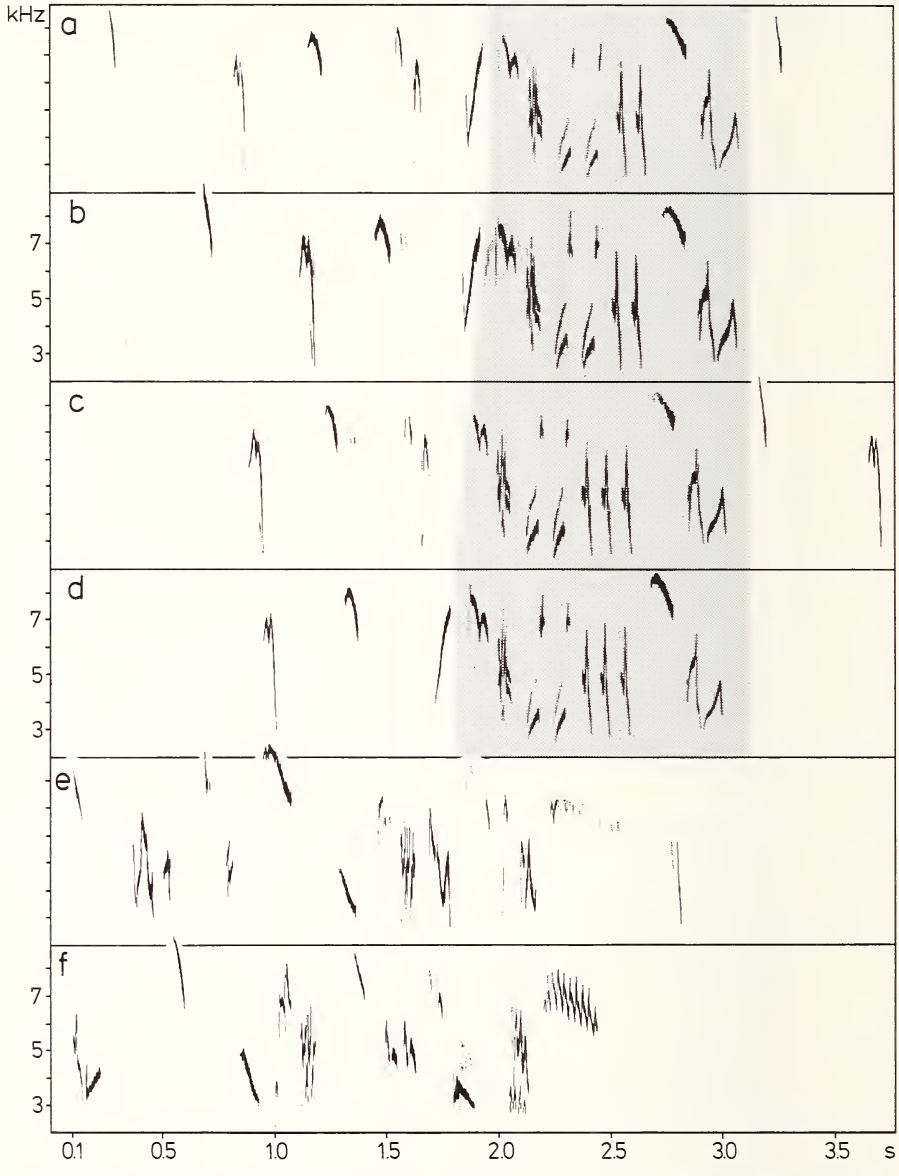


Fig.123: Territorial song of *Emberiza cia*. – a-d) 4 verses of 1 ♂, Ringmo/Phoksumdo Lake 12./13.VI.1973; e) Purano Marpha 18.III.1974; f) Jomosom 30.VI.1973. Stippled parts mark identical verse parts.

of the vertical distribution is determined by the Rock Bunting's association with monsoon-protected arid valleys (they exist down to ca. 2300 m in the Barbung Khola Valley), the upper limit by the fading-out of alpine scrub vegetation, which is followed by *cia* at least up to 4200 m. Its vertical breeding belt only insignificantly exceeds 1800 m. Inskipp & Inskipp (1985) cite (unspecified) finds up to 4600 m during summer.

Habitat: In the Nepal breeding area the Rock Bunting prefers open areas, which are only sparsely covered by few trees, often really arid slopes with widely spaced bushes of *Berberis, Juniperus, Caragana,* also close to forests (young growth of *Betula utilis, Pinus, Picea),* but it never penetrates into the forest proper and avoids even large forest clearings (e.g. the Thaksang clearing above Tukche). Bushes along fields and agricultural land in general are inhabited (Tarakot, 2900 m, VI). Above timberline it lives only locally in just knee-high dwarf *Rhododendron* (Kangar, 4200 m, VI). The only precipitation-rich breeding place on the S Himalayan macroslope hitherto known is the climatically harsh Dhorpatan Valley (3000 and above: Fig.21): a man-made open flat and spacious valley bottom, partly rich in bushes with few scattered trees remaining on the N slopes, *Abies* forest edge at the S fringe (Martens 1972).

The Nepal breeding area represents the easternmost part of the S *cia* area finger spreading from the NW into the C Himalayas. It ends in the Marsyandi Valley and seems to be restricted there for climatic reasons. The Dhorpatan breeding site is thus all the more astonishing (see *Certhia himalayana*). The E Asian *godlewskii* subspecies group, sometimes regarded as a separate species (Mauersberger 1972), reaches westward into the N Everest massif but has not yet been found within Nepal borders.

Breeding: Maximum ♂ gonadal development in VI; adults carrying food to nest (or fledged young) on 7.VII. (Purano Marpha, 3200 m), thus main season may be in VI/VII, perhaps somewhat earlier in the lower parts of the area belt.

Migration: Vertical. From E II to E III (1970) many single specimens or small flocks stayed on the sheltered valley bottom and on the lower slopes of the Kali Gandaki Valley (:Mustang) in bush-rich agricultural land (between 2400 m and 3200 m), apparently in their winter quarters. Remarkably large parts of the local breeding population seemed to be concentrated there, and the Rock Bunting was locally the most common passerine there outside the forests. Migrations down the valley are insignificant (Dana, 1650 m, 1 sp. 24.II.).

Vocalizations: Territorial song (Fig.123) consists of distinct verses appr. 3-3.5 s long. Notes are spaced apart at the beginning of the verse and closer together towards the end. Most notes change frequency extremely rapidly within a broad frequency band up to 4 kHz; frequency of the whole verse ranges from 3 to 9 kHz. Syntax is irregular, and the individual note repertoire is rich, every ♂ producing several quite different verse types. A few central notes (note groups), however, are identical and are markers of the individual ♂ (Fig.123a-d). Verse types of different ♂ vary considerably.

Melophus lathami Gray

Horizontal: My finds range from S Dhaulagiri, across the valleys of Kali Gandaki, Marsyandi, Bothe Kosi and Arun to near the E border. – Dhaulagiri: Darapani (22.III.); Muri (23.III.); Beni (21.III. all :Myagdi); – Thakkhola: Ghasa (22.VII. :Mustang); – between

Chitre and Gara (3.V. :Parbat); – Landrung (8.V. :Kaski); – Marsyandi: between Boulboulé and Senghe (10.IV.); near Phalesangu (9.IV. :Lamjung); – Tamba Kosi, between Bikuti and Darapani several times (11.IV. :Dolakha); – Arun: Chichila (17.VI. :Sankhua Sabha); – Paniporua (20.IV.); ascent to Sablako pass, Uyam (21.IV. both :Panchthar); – Yamputhin (16.IV. :Taplejung).

Vertical: Of the months III-VII in which observations were recorded, IV, V, VI (and VII ?) may fall within the breeding season. Frame data are 850 m (Boulboulé/Senghe, IV; below Beni, V) and 2200 m (Ghasa, VII). Of the ca. 25 sites 17 are concentrated between 1000 m and 1950 m. Besides Ghasa, Muri (2100 m, III) is also close to the upper area limit. The data of Inskipp & Inskipp (1991) included, the vertical area belt extends from ca. 1000 m to 2400 m, but occurrence above 2200 m during summer is exceptional (cf. Diesselhorst 1968:404). Altitudes of the breeding records hitherto known are not recorded.

Habitat: The Crested Bunting is closely associated with agricultural land and lives in any type of cultivated landscape, even near village edges. A few bushes or single trees are needed to serve as song perches. The large-scale forest reduction in the lower and middle altitudes in Nepal has favoured the Crested Bunting with respect to available open habitat. Nevertheless, it is a sparse, more or less local bird, which does not exploit the extended deforested slopes by high population density. Valleys at the piedmont of the large massifs

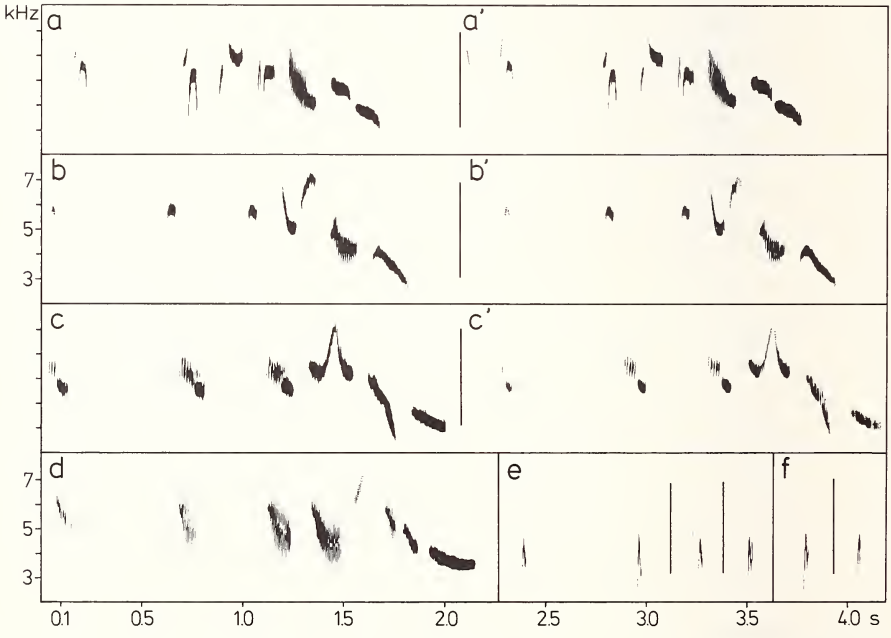


Fig.124: *Melophus lathami*, territorial song (a-d) and calls (e-f). – a/a') 2 verses of 1♂, Thulo Khola 18.V.1995; b/b') 2 verses of 1♂, Yamputhin 18.V.1988; c/c') 2 verses of 1♂, Worebung 21.IV.1988; d) Uyam 22.IV.1988; e) 4 calls of 1♂, interval unchanged in the 2 first calls, Thulo Khola 18.V.1995; f) 2 calls of 1♂, above Bega 16.V.1995.

of the main chain are inhabited: e.g. Ghasa in S Thakkhola, Yamputhin at the S foothills of Kanchenjunga.

Vocalizations: Territorial song (Fig.124) consists of distinct verses 1.65-2.1 s long (4♂) and formed by 7-12 notes, which are grouped into a peculiar syntax. An introductory part contains 3-4 notes (Fig.124b, d) or note groups (Fig.124 a, c). Intervals are large (0.5-0.6 s) at the beginning; they are shortened from note (group) to note (group). The remainder of the verse comprises differing notes with a larger frequency span and descending in overall frequency, the last note always being the lowest. Within the verse at least one (up to 5) notes are heavily frequency-modulated, resulting in a combination of narrowly spaced click-like sub-units. Bandwidth of the verse is from near 3 to 7 kHz, but the individual note reaches only a maximum width of about 2 kHz, often considerably less. The accelerating "speed" of the verse and the combination of tonal and atonal notes causes the verse's peculiar aural impression ("tse...tse..ze syü"). The individual ♂ seems to use only 1 verse type; for long verse sequences no variations could be detected in 4♂. – Calls (Fig.124e-f) are angular, with steep frequency ascent and descent – similar to a woodpecker-like "kick" but notably softer.

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