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**Lycosidae from the high alpine zone of the Caucasus range,
with comparative remarks on the fauna of the Alps
(Arachnida: Araneae)**

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A b s t r a c t : Eight species of Lycosidae collected in the high alpine zones of the Central and East Caucasus, mainly in 1989, are listed with locality data. Three species are described as new in both sexes: *Pardosa aquila* n.sp., *P. dagestana* n.sp., *P. ibex* n.sp. The high alpine Lycosidae faunas of the Alps and of the Caucasus range are very different. Close affinities to boreal and arctic Lycosidae are present in the fauna of the Alps, but not in Caucasus species.

K e y w o r d s : Lycosidae, taxonomy, high alpine zone, Caucasus, Alps

Introduction

Spiders are a major component in the alpine zone of mountains, as in arctic regions. Lycosidae, together with Linyphiidae and Gnaphosidae, are one of the main families present in alpine spider communities. The Lycosidae of the main European mountains are comparatively well known, see faunal lists of the Pyrenees (BOSMANS & DE KEER 1985), of the Alps (MAURER & HÄNGGI 1990) and of the Carpathian system (FUHN & NICULESCU-BURLACU 1971, DELTSHEV & BLAGOEV 1995). The Caucasus is a mountain system at the border between the temperate and the meridional zones, separated from the Alpine system by wide lowlands. This system is longer than the Alps, extending for 1500 km between the Black and Caspian Seas, with higher summits; altogether 16 peaks are higher than Mont Blanc. Ecologically the Caucasus system is highly diverse and rich in species, many of them endemic (MANI 1968, ZIMINA 1978), which holds true also for spiders (OVTSHARENKO 1979, TANASEVITCH 1990, MKCHEIDZE 1997). It was therefore attractive to study a small amount of material of Lycosidae from the alpine zone of the central and eastern Caucasus and to compare this fauna with the Lycosidae community of the high Alps (BUCAR & THALER 1995, 1997, THALER & BUCAR 1994, 1996). The material was collected mainly by K.Th. and other participants of an excursion organised by Prof. Dr. H. Franz (Vienna), Prof. Dr. G. Nakhuzrsvili (Tbilisi) and Prof. Dr. B. Striganova (Moscow) in 1989 (FRANZ 1991). Lycosidae mainly came from ascents of mt. Kazbek 5047 m in central Caucasus 28.6.-2.7. and of mts. Nesendag c. 3900 m and Schalbusdag 4151 m around Kurush, Dagestan, 8.-10.7. 1989.

Depository: Specimens are deposited in BZL Biologiezentrum Linz; NMW Naturhistorisches Museum Wien; MHNG Muséum d'Histoire naturelle Genève; ZMM Zoological Museum of the Moscow State University. Some specimens are kept in the authors' reference collections (CB, CTh).

Measurements: All measurements in mm.

List of Species

Alopecosa accentuata (LATREILLE 1817)

Material: Russia, Dagestan: Korusch 1800 m, among shrubs of *Salix*, *Betula*, 1 ♀ NMW 10. July 1989, leg. Dosza-Farkas.

In a broad sense this is a widely distributed palaeartic species, which has been recorded in Russia from Fennoscandia to the Amur-Maritime area (MIKHAILOV 1997). From the Caucasus it is mentioned from the beech wood zone at 500-1200 m by OVTSHARENKO (1979), but across a wide range of altitudes in Azerbaidjan, 200-3300 m (DUNIN 1989). Also in the Alps *A. accentuata* is a euryzonal species, occurring on dry and open slopes from the colline zone up to alpine grasslands, highest records at c. 2500 m (THALER & BUCAR 1994). Recently it was shown (CORDES & HELVERSEN 1990) that in Mid Europe there are at least two sibling species involved with this species name, differing in phenology, in secondary sexual characters of first tibiae of male, and in courtship behaviour. It is not yet known how this species concept can be applied to populations in Caucasus and in Russia.

Pardosa schenkeli LESSERT 1904

Material: Georgia: Kasbegi, surroundings of village, 1800 m, 1 ♂ NMW 2. July 1989, leg. Tiunov, 2050 m, 3 ♀ ♀ CTh, BZL 15.-20. Aug. 1979, leg. Körner. Kasbegi, track to observatory, Gergeti 3000 m, 1 ♀ 1. July 1989, 1 ♂ CTh 2. July 1989, leg. Th. - Russia: Dagestan: Korusch, Nesendag 2500-3000 m, 1 ♀ NMW 8. July 1989, leg. Th. Schalbusdag 2500-3500 m, 1 ♂ NMW 9. July 1989, leg. Stockner.

All specimens came from alpine grassland. Apparently *P. schenkeli* is a regular inhabitant of the alpine zone of the Caucasus, where it occurs on south-facing grassy slopes. Also OVTSHARENKO (1979) records this species from an altitude of 2200-3500 m. In the Alps *P. schenkeli* is very rare and known only from Valais, where it occurs in subalpine forest and grassland (LESSERT 1910) at 1960-2500 m, the last records c. 50 years ago from Saas-Fee (SCHENKEL 1927, 1933) and from Zermatt (VOGELSANGER 1944). This occurrence and another isolated outpost in southern Norway (HAUGE & KVAMME 1983) are the westernmost records of a transpalaeartic range (MARUSIK 1994). From Europe very few scattered populations of *P. schenkeli* have been recorded (BUCAR & THALER 1997), which therefore might qualify as a protocratic species.

***Pardosa aquila* n.sp. (Figs. 1-3, 7)**

M a t e r i a l : Georgia: Kasbegi, in alpine grassland, track to observatory 2600-3000 m 2♂♂ 4♀♀ CB, CTh, BZL 2. July 1989, leg. Th.; Gergeti 3000 m, 1♂ ZMM 1. July 1989, 3♂♂ 1♀ NMW 2. July 1989, leg. Th.; 1♂ 1♀ ZMM 1. July 1989, leg. Stockner; on glacial moraine 3100 m, 1♀ ZMM 1. July 1989 leg. Th. - Russia, Dagestan: Kurusch, ascent to Schalbusdag 2500-3500 m, 1♂ HOLOTYPE NMW, 1♂ 4♀♀ NMW 9. July 1989, leg. Th.; 3♂♂ 4♀♀ BZL, ZMM, MHNG 9. July 1989, leg. Stockner; upper limit of grassland 3500 m, 2♀♀ NMW 10. July 1989, leg. Th. - Additional specimens to the holotype have been labelled as paratypes.

D i a g n o s i s : *P. aquila* n.sp. is closely allied to *P. italica* TONGIORGI 1966; see tegular apophysis and central part of shield. It shows distinct differences in the male palp: tegulum sculptured, tegular apophysis not tapering to retrolateral side, male palp very dark; and in altitudinal occurrence.

S o m a t i c f e a t u r e s : Total length ♂ 5.8, ♀ 6.6, 9.1, length (width) of prosoma ♂ 3.4 (2.6); ♀ 3.9, 3.8 (3.2, 3.2). Colour of body in most specimens very dark, pattern indistinct; at each side at most three small spots present as vestiges of lateral bands, median band tapering. Male palp very dark, patella brownish in some specimens. Legs: femora dark, patellae and tibiae suffused with black, metatarsi and tarsi brownish. In light specimens patellae and tibiae brownish, opisthosoma with anterior lanceolate band and pairs of brown spots.

♂ palp: Fig. 1. Length of cymbium 1.2. Tegulum densely covered with distinct warts, tegular apophysis stouter than in *P. italica* and not tapering (Fig. 2), terminal part with central process, extending to conductor, terminal apophysis bifid, embolus straight (Fig. 3).

Epigynum: Fig. 7; similar to *P. italica*, see TONGIORGI (1966), BUCHAR (1968), ZJUJIN (1976). Septum with narrow stalk and anterior bilobed hood, with posterior trapezoid plate, lateral grooves distinct. Receptacula as in *P. italica valenta* (see ZJUJIN 1976).

D i s t r i b u t i o n : *P. aquila* n.sp. was collected in the upper zone of alpine grassland both in central and in eastern Caucasus, c. 2500-3500 m a.s.l. Apparently it is not present in the Elbrus region, as it was not found there either by J.B. or by OVTSHARENKO (1979). In the high alpine zone of the Caucasus it therefore might be an offshoot of its close relative *P. italica*, which was described by TONGIORGI (1966) from "the edges of rivers, streams and lakes at low elevations" in peninsular Italy. Later *P. italica* was collected on the coast of the Black Sea in Bulgaria (BUCHAR 1968, DELTSHEV & BLAGOEV 1995), and in Southern Russia from Crimea to West Siberia (ZJUJIN 1976, 1979, MIKHAILOV 1997), but also from the foothills of the Caucasus in Azerbaidjan, below 600 m (DUNIN 1989).

E t y m o l o g y : Noun in apposition, referring to a bird, the Golden Eagle.

***Pardosa ibex* n.sp. (Figs. 4-6, 8)**

M a t e r i a l : Georgia: Kasbegi, Gergeti, glacial moraine 3000 m, 1♂ ZMM 28. June 1989, leg. Th.; same, 3200 m, 1♂ HOLOTYPE NMW 2♀♀ NMW 1. July 1989, leg. Th.; same, 3000 m 1♂ (without palps) NMW 2. July 1989, leg. Th. - Russia, Dagestan: Kurusch, ascent to Nesendag 2500-3000 m, 2♀♀ NMW 8. July 1989, leg. Th.; same, from rock near summit 3800-3900 m, 1♀ NMW, 1 juv., 8. July 1989, leg. Th.; Nesendag 3900 m, 1♀ ZMM 8. July 1989, leg. Meyer. Ascent to Schalbusdag 2500-3500 m, 1♂ ZMM 9. July 1989, leg. Stockner; same, 3500 m, 2♀♀ 10. July 1989 CTh, leg. Th.; Schalbusdag 4000 m, on rock near summit, 1♂ 9. July 1989 CTh, leg. Th. - Additional specimens to the holotype have been labelled as paratypes.

D i a g n o s i s : *P. ibex* n.sp. is best characterised by its epigynum (similar to *P. pseudostrigillata* TONGIORGI 1966) and by its palpal organ, tegular apophysis similar to *P. aquila* n.sp., but peripheric process of shield present, terminal apophysis undivided (Fig. 6).

S o m a t i c f e a t u r e s : Total length ♂ 6.1, ♀ 7.5-7.9, length (width) of prosoma ♂ 2.7 (2.3); ♀ 3.6 (2.8). Males very dark, almost black, only ventral coxae proximally with three yellow spots. Palps dark brown, tibia and cymbium black. Femora I-IV blackish, I-II in proximal half only, distal segments yellowish brown. Females as male, but venter greyish. Femora I-IV with two yellow annulations; distal segments as in male, annulations obscure.

♂ palp: Fig. 4. Length of cymbium 1.5. Tegulum without sculpture, tegular apophysis blade-like (Fig. 5), twice as long as broad, distally rounded, directed to retrolateral side, with proximal side tooth. Peripheric process of shield distinct, distally rounded, central part as a strongly sclerotised, indistinct area, extending to conductor. Terminal apophysis undivided, spoon-like; embolus straight, Fig. 6.

Epigynum: Fig. 8. Epigynal area broad, septum with narrow stalk, leading to anterior bipartite hood, posterior part of septum as a rhomboid plate; similar to *P. pseudostrigillata*.

A f f i n i t i e s : *Pardosa ibex* n.sp. stands clearly among the species placed by ZIUZIN (1979) in the *proxima*- and *wagleri*-groups of *Pardosa*. Therefore the mutual relationships of the species involved deserve further investigation. The shape of the tegular apophysis resembles *P. aquila* n.sp., which nevertheless differs in sculpture of tegulum and absence of peripheric process of shield, moreover its terminal apophysis is bipartite. A peripheric process is also present in *P. pseudostrigillata*, a central sclerotised part of shield both in *P. pseudostrigillata* and in *P. wagleri* (HAHN 1822), the terminal apophysis being divided in *P. pseudostrigillata*, but entire in *P. wagleri*. All these species are inhabitants of river banks in mountain regions of mid and southern Europe.

D i s t r i b u t i o n : Hitherto known only from the alpine and subnival zones, 3000-4000 m, in central and eastern Caucasus, from glacial moraines in the Kasbegi region and from open ground with boulders and vegetation fragments around Kurusch.

E t y m o l o g y : Noun in apposition, referring to a the wild European goat.

***Pardosa agrestis* (WESTRING 1861)**

M a t e r i a l : Georgia: Kasbegi 2200 m, pasture near village, 1♂ NMW 2. July 1989, leg. Tiunov. According to details of terminal apophysis and the black tips of legs I, this male clearly belongs to this common trans-palaeartic species, which ranges from western Europe (Great Britain) to Amur-Maritime area (MIKHAILOV 1998). Its capture at Kasbegi is possibly accidental. Highest occurrences in the northern Alps come from meadows at 1000m a.s.l., above the timberline only wind-blown specimens have been collected (BUCHAR & THALER 1997). OVTCHARENKO (1979) mentions *P. agrestis* from the lowest zones < 1200 m only; its vertical distribution on the Azerbaidjanian slope must be much wider, from 170-2400 m (DUNIN 1989).

***Pardosa buchari* OVTSHARENKO 1979 (Figs. 14-15)**

M a t e r i a l : Georgia: Kasbegi, in pasture 2050 m, 1♂ 2♀ NMW 15.-20. Aug. 1979, leg. Kömer; 1800 m, 4♂♂ 2♀♀ CTh, BZL 2. July 89, leg. Tiunov; "Kreuzpaß" 2450 m, 1♀ NMW 2. July 1989, leg. Tiunov. - Russia, Dagestan: Kurusch 1800 m, 1♀ NMW 10. July 1989, among shrubs of *Salix*, *Betula*, leg. Dosza-Farkas; in pasture 2500 m, 2♀♀ NMW 9. July 1989, leg. Dosza Farkas; 2300-2800 m, 2♀♀ NMW 12. July 1989; ascent to Schalbusdag 2500-3500 m, 1♂ NMW 9. July 1989, leg. Th.; same, 1♀ NMW 9. July 1989, leg. Stockner.

I d e n t i f i c a t i o n : Males correspond well to the original description, also in the shape of tegular and terminal apophyses; moreover, they are identical to specimens collected by J.B. from localities also visited by OVTSHARENKO (Elbrus region, Baksan valley). All females collected around Kasbegi and in Dagestan have been assigned to this species, which was identified with certainty in these collections from males (see *P. incerta*, below).

S o m a t i c f e a t u r e s : Total length ♂ 5.4, ♀ 6.2, length (width) of prosoma ♂ 2.4 (2.0); ♀ 2.6 (2.1). Colour and pattern basically as in original description (OVTSHARENKO 1979). Males: colour of body very dark, brownish, almost black, as also sternum and venter. Pattern of prosoma indistinct, median band tapering. Palps black, with patellae dorsally brownish, with white pubescence. Femora of legs black, with longitudinal light stripes; distal segments brownish, without sexual dimorphism in leg hairs. Tarsi of first legs as in female. Females: pattern distinct, median band brown, mostly tapering, in some specimens diamond-shaped, lateral bands continuous, in some specimens subdivided by two faint dark lines into three segments. Opisthosoma with light lanceolate stripe and paired spots. Sternum black, venter and ventral coxae light. Legs brown, annulated.

♂ palp: Tegular apophysis slender; terminal apophysis with distinct tooth, Figs. 14-15.

Epigynum: Septum broad, its hind angles pointed.

D i s t r i b u t i o n : *P. buchari* apparently is an endemic species in the Caucasus range. It was collected from the subalpine and alpine zones, c. 1800-2500 m, of the western and central Caucasus by OVTSHARENKO (1979), with type locality in Krasnodar district (mt. Pseashcho, 2000 m), and is now recorded also from Dagestan. *P. buchari* is not known from the Azerbaidjanian slope as this species is not included in DUNIN's list (1989).

***Pardosa dagestana* n.sp. (Figs. 9-13)**

M a t e r i a l : Russia, Dagestan: Kurusch, in pasture and alpine grassland, ascent to Nesendag 2500-3000 m, 1♂ HOLOTYPE NMW 2♀♀ NMW 8. July 1989, leg. Th.; ascent to Schalbusdag 2500-3000 m, 2♂♂ 2♀♀ NMW 9. July 1989, leg. Th. - Additional specimens to the holotype have been labelled as paratypes.

D i a g n o s i s : *P. dagestana* n.sp. is similar to *P. pontica* in its yellow face, but differs in the pattern of the male palp, especially by presence of a yellow spot at base of cymbium.

S o m a t i c f e a t u r e s : Total length ♂ 4.8, ♀ 6.9, length (width) of prosoma ♂ 2.4 (1.9), ♀ 3.2 (2.6). Male: darker than female, lateral bands in some specimens broken at sides of head, clypeus and chelicerae yellow, opisthosoma with lanceolate stripe only. Palps: Femur dark, patella and tibia yellow, tibia suffused with grey pigment, cymbium black, at its base a distinct yellow spot. Legs: Femora dorsally dark brown, with two pairs

of longitudinal yellow stripes, one pair in proximal and one in distal half. Tarsi of leg I brownish, as in female. Female: carapace dark brown, with dark margins. Pattern distinct with yellow bands, median band narrow and tapering, lateral bands unbroken, broad, continuous around clypeus. Opisthosoma grey with lanceolate stripe and paired brown spots. Sternum dark brown, with narrow anterior mid-stripe. Coxae yellow, venter yellowish with dark speckles. Femora yellow, with dorsal brown marks, distal segments brownish, marks obscure.

♂ palp: Fig. 10. Tip of cymbium with three long claws (Fig. 13). Tegular apophysis stout (Fig. 11), terminal apophysis with large side tooth (Figs. 11-12), similar to *P. pontica*, much smaller than in *P. blanda*.

Epigynum: Variable, Fig. 9. Anterior pockets mostly separate (n=3), in one specimen joined to common anterior arch. Septum broad, in two specimens as broad as epigynal groove, in another two specimens less broad, side margins of groove free. Posterior septum as broad as groove, constricted, its angles pointed.

Affinities: *P. dagestana* n.sp. is clearly allied to the *blanda*-subgroup, consisting of species with a strong anterior tooth on terminal apophysis. This group apparently is absent in boreal regions, but vicariant species are present in the mountain systems of the west Palaearctic region. Probably *P. dagestana* n.sp. is close to *P. pontica* (THORELL 1875), which is widely distributed in southern Russia and has been recorded in the Caucasus from regions below 1200 m (OVTSHARENKO 1979, DUNIN 1989). Other species exist in the Hindukush system (*P. pseudotorrentum* MILLER et BUCHAR 1972) and on European mountains: *P. blanda* (C.L. KOCH 1833) in alpine grassland of the Alps and adjacent mountain chains; *P. albatula* (ROEWER 1951) on mountains of the Balkan peninsula northwards to the southern Alps, again in alpine grassland. *P. torrentum* SIMON 1876 occurs on the shores of mountain rivers in the Alps, Apennines and Pyrenees.

Distribution: *P. dagestana* n.sp. was found in eastern Caucasus, around Kurusch. Specimens were taken in alpine pastures and grassland, at 2500-3000 m a.s.l.

E t y m o l o g y : adjective, latinized, referring to the type region.

***Pardosa incerta* NOSEK 1905**

M a t e r i a l : Georgia: Kasbegi surroundings, in pasture 2200-2500 m, 1♂ CTh 22. July 1978, Kömer ded.

I d e n t i f i c a t i o n : TONGIORGI (1966 b), ZJUZIN & OVTSHARENKO (1979).

P. incerta ♂ can easily be recognised by sexual dimorphism of its first legs, the distal segments being provided on both sides with a dense fringe of long erect hairs. It differs from the lowland species *P. plumipes* (THORELL 1875) also in the anterior tooth of the terminal apophysis. The species is known from the Elbrus region and from western Caucasus in alpine grassland at c. 2100-3100 m (ZJUZIN & OVTSHARENKO 1979); its range extending to Asia Minor, Erdschias-Dag. The single male reported above corresponds perfectly to the descriptions of *P. incerta* and to material collected by J.B. in Elbrus region. As *P. incerta* occurs also around Kasbegi, the exact identity of some females reported above as *P. buchari* might be questioned.

Comparative Remarks

In this report eight species (*Alopecosa* 1, *Pardosa* 7) are mentioned from high alpine zones of the Caucasus, 1800-4000 m. The reviews of OVTSHARENKO (1979) and DUNIN (1989) include altogether 18 species from elevations above 1800 m, in western and central Caucasus eight and on the Azerbaidjanian slope 13 species. Nevertheless, six species among our material come from localities > 2400 m, as do six species in the literature. Two of these were absent in our material: *Alopecosa pulverulenta* (CLERCK 1757) and *Pardosa abagensis* OVTSHARENKO 1979; therefore the total number of species recorded from the Caucasus from such elevations is eight. From the Austrian Alps at least twelve species are known from high alpine zones (BUCHAR & THALER 1995, 1997, THALER & BUCHAR 1994, 1996), some of them occurring only regionally or even locally: *Acantholycosa norvegica sudetica* (L. KOCH 1875), *A. pedestris* (SIMON 1876), *Alopecosa accentuata* (LATREILLE 1817), *Arctosa a. alpigena* (DOLESCHALL 1852), *Pardosa amentata* (CLERCK 1757), *P. blanda*, *P. cincta* (KULCZYNSKI 1887), *P. giebelsi* (PAVESI 1873), *P. mixta* (KULCZYNSKI 1887), *P. nigra* (C.L. KOCH 1834), *P. oreophila* SIMON 1937, *P. saturator* SIMON 1937. In the western and southern Alps some other high alpine species exist: *Acantholycosa rupicola* (DUFOR 1821), *P. albatula*, *Pardosa schenkeli* (see MAURER & HÄNGGI 1990, BUCHAR & THALER 1993, 1997), and in the south-westernmost part of the Alps also a famous relict species, *Vesubia jugorum* (SIMON 1881) (TONGIORGI 1968, 1969; MAURER & THALER 1988). So further fieldwork probably will augment the number of high altitude Lycosidae in the Caucasus range, although a tentative comparison may already be justified.

Four species are common to Alps and Caucasus. Among these are three rather euryoecious species, which are widespread in lowlands, but able to spread casually or even regularly into the subalpine and alpine zones: *Alopecosa accentuata*, *A. pulverulenta*, *Pardosa agrestis*. Surely *P. amentata* must be added to this list. We will not consider these further. On the contrary, *P. schenkeli* has its centre of distribution in Siberia, so the occurrences in the Caucasus and in the Alps might be relicts from a past transcontinental distribution in the cold phase of a glacial cycle. The other species are different between the two regions.

With present knowledge six species must be regarded as endemics of the Caucasus and possibly of adjoining ranges; some of them may result from local speciation in the high altitude environment. Two of three species belonging to the *monticola*-group apparently show close affinities to species from surrounding lowlands, *P. incerta* to *P. plumipes*; *P. dagestana* n.sp. to *P. pontica*; for *P. buchari* a sibling cannot be indicated now. The same history might apply to another two endemics allied to *P. italica*, which apparently ranges from southern Italy to central Asia: *P. aquila* n.sp., *P. ibex* n.sp. A specimen of the latter species is the highest record of a lycosid in our collections and was taken at c. 4000 m on Schalbusdag. We do not know *P. abagensis* from personal experience, as it is known from West Caucasus only. The original description suggests that this species belongs to the *nigra*-group, which is holarctic, with members preferring high altitudes and boreal environments.

Some of altogether nine high alpine endemic lycosids in the Alps belong to the same species groups as their congeners in the Caucasus. Endemic members of the *monticola*-group in the Alps are *P. blanda* and *P. mixta*, of *wagleri*-group *P. saturator*, of *nigra*-group *P. nigra* and *P. giebelsi*. With two exceptions all of these are without a close rela-

tive in European lowlands; *P. saturator* is replaced at low elevations by *P. wagneri*, *P. blanda* by another shore lycosid, *P. torrentum*. Further endemic species in the high Alps belong to other species groups and even genera: *Acantholycosa pedestris*, *P. cincta*, *P. oreophila*, *Vesubia jugorum*. Unlike the representatives in the Caucasus, some of these show clear affinities to boreal and circumpolar species: *P. oreophila* to *P. hyperborea*, *P. cincta* to *P. lapponica*, the affinities of *P. giebeli* and *A. pedestris* being less clear. Two further high alpine species even show an arctic-alpine separation of their range according to present opinion, *Arctosa alpigena* and *Acantholycosa norvegica*. In the western Alps two further chorological types occur: *A. rupicola* as a western element, which is present also in S. Spain (BUCHAR & THALER 1993), and a palaeoendemic relict, *Vesubia jugorum* in the Maritime Alps, the type species of this monotypic genus.

With the exception of *P. schenkeli*, species assemblages and affinities of high alpine Lycosidae are very distinct in the Caucasus and in the Alps. Both faunas reflect regional speciation and immigration from surrounding mountain ranges, whereas close affinities to the boreal and arctic fauna are evident only in the Alps. These differences exist also in other high alpine arthropods (FRANZ 1991, ABDURAKHMANOV 1991) and in plants (OZENDA 1985).

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Zusammenfassung

Wolfspinnen aus der hochalpinen Stufe des Kaukasus – mit vergleichenden Bemerkungen zu den Lycosidae der Alpen (Arachnida: Araneae)

Acht großteils 1989 in der alpinen und nivalen Stufe des Zentral- und Ost-Kaukasus anlässlich einer von Prof. H. Franz geleiteten Exkursion gesammelte Wolfspinnen werden aufgelistet. Drei als neu beurteilte Arten werden in beiden Geschlechtern beschrieben: *Pardosa aquila* n.sp., *P. dagestana* n.sp., *P. ibex* n.sp. Das hochalpine Artenspektrum der Wolfspinnen des Kaukasus unterscheidet sich beträchtlich von der Fauna der Alpen, insbesondere treten die in den Alpen sehr auffälligen Beziehungen zu den Wolfspinnen des Hohen Nordens sehr zurück.

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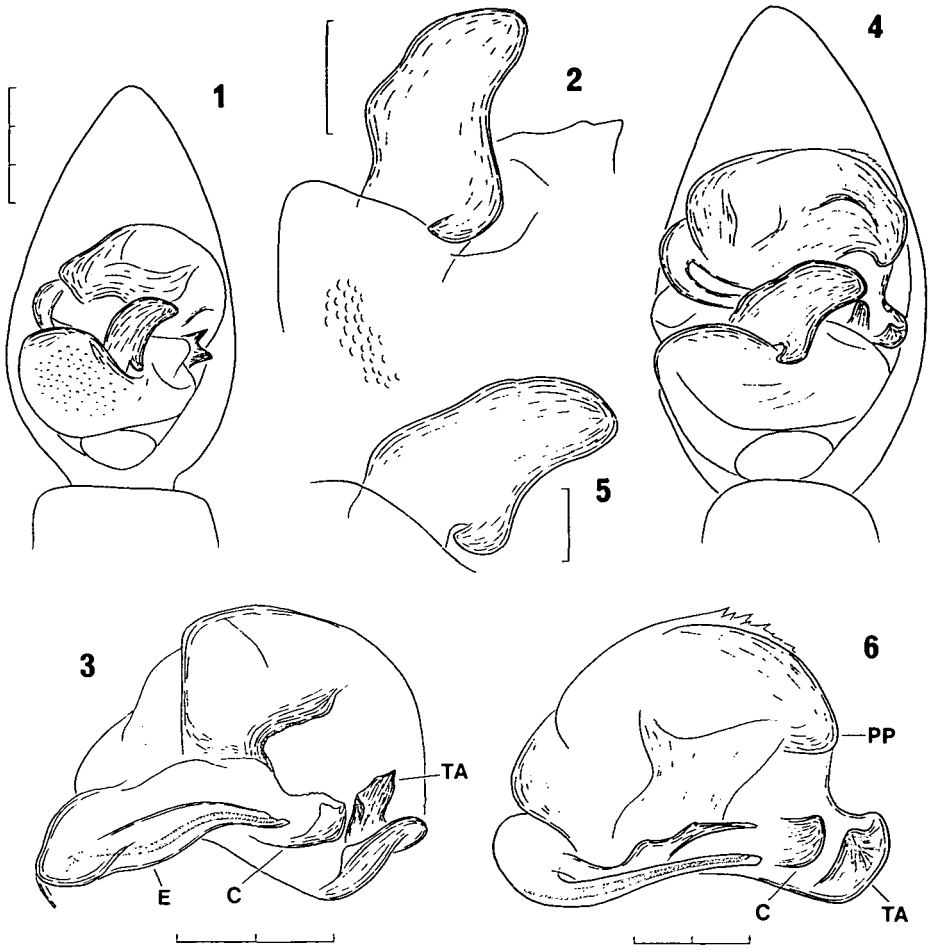
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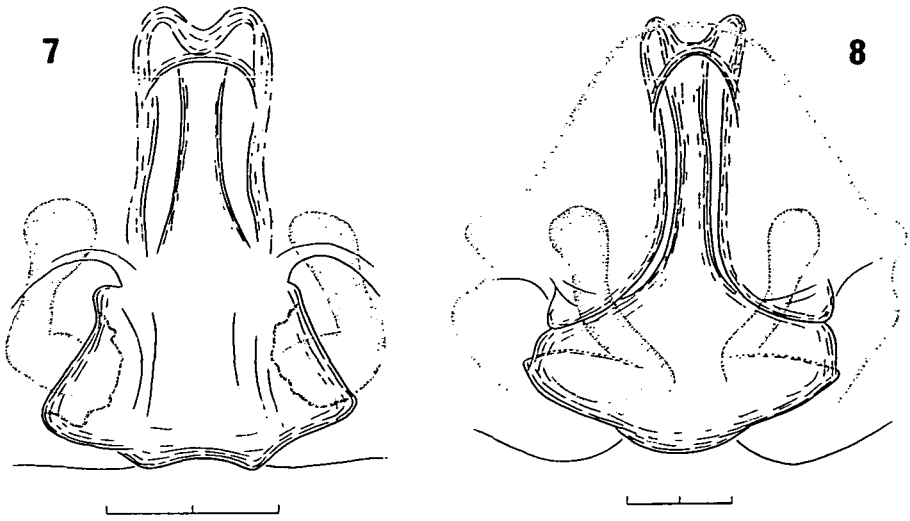
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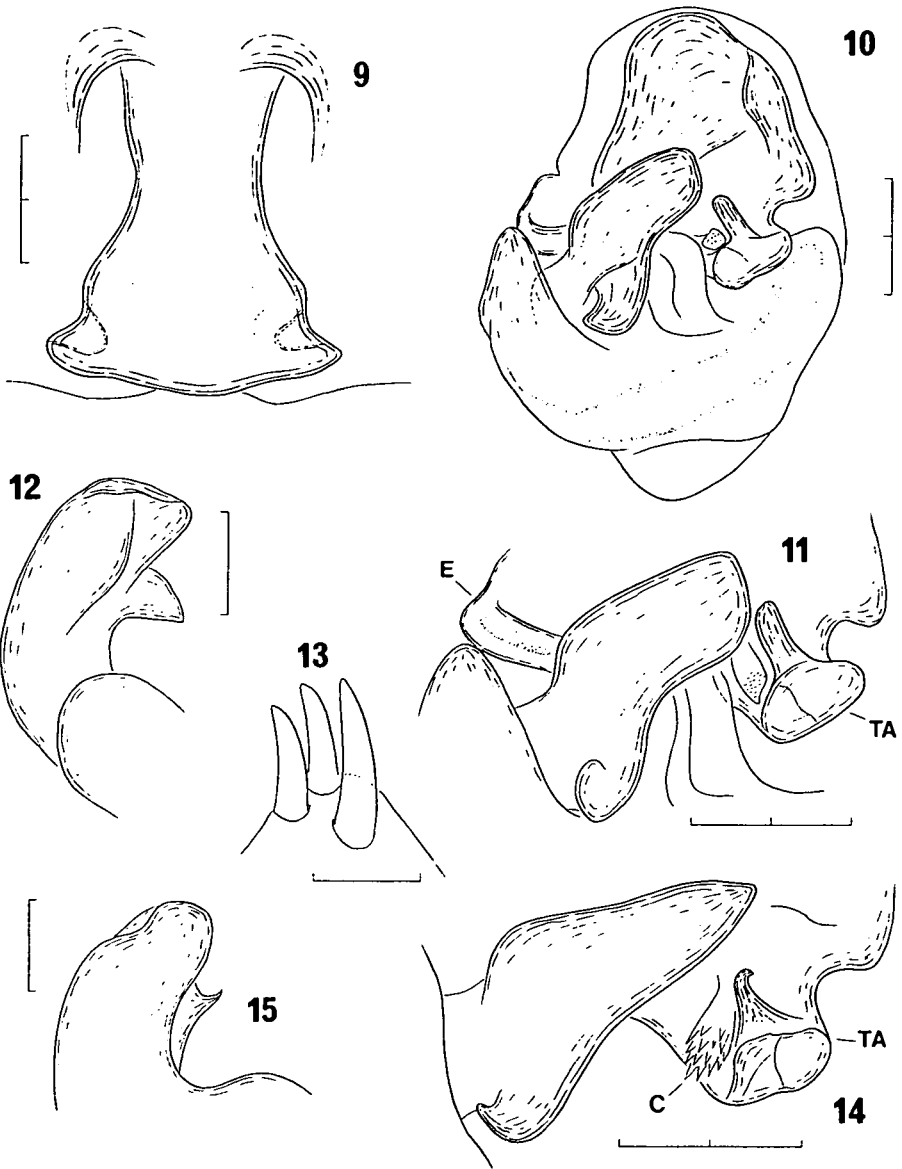
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Figs 1-6: *Pardosa aquila* n.sp. (1-3), *P. ibex* n.sp. (4-6). – ♂ palp, ventral view (1, 4). Tegular apophysis (2, 5). Terminal part of palpal organ (3, 6). – Scale lines: 0.10 (2, 5), 0.20 (3, 6), 0.30 (1). Fig. 4 without scale. C Conductor, E Embolus, PP Peripheral process of shield, TA Terminal apophysis.



Figs 7-8: *Pardosa aquila* n.sp. (7), *P. ibex* n.sp. (8). - Epigynum (7, 8). - Scale lines: 0.20.



Figs. 9-15: *Pardosa dagestana* n.sp. (9-13), *P. buchari* OVTSHARENKO (14-15). - Epigynum (9). Palpal organ, ventral view (10). Tegular and terminal apophysis (11, 14). Terminal apophysis, retrolateral view (12, 15). Claws at tip of cymbium (13). - Scale lines: 0.05 (13), 0.10 (12, 15), 0.20 (9-14). C Conductor, E Embolus, TA Terminal apophysis.