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Caddisflies from Bardia National Park, Nepal, with a preliminary survey of Nepalese species (Insecta, Trichoptera)

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Abstract

Adult Trichoptera specimens were collected in February and March 2003 in Bardia National Park, Nepal. The primary collecting method was light-trapping. Many new species were recorded and their distribution between Babai River in the Park and several smaller streams are presented in this paper. Indicator species for the river and the streams are named.

Key words. Trichoptera, Nepal, Bardia National Park, faunistics, indicator species, biodiversity.

Zusammenfassung

Die Arbeit handelt von Faunistik und Ökologie der Trichopteren, die während einer Expedition im Februar - März 2003 im Bardia Nationalpark, Nepal, festgestellt wurden; die Taxonomie wurde schon früher behandelt. Es wurden über 20 für die Wissenschaft neue Arten gefunden. Die Verteilung auf die einzelnen Bäche und den Fluß (Babai Nadi) wird aufgeschlüsselt. Indikatorarten für die einzelnen Gewässer werden genannt.

Introduction

This paper presents results from a biodiversity survey expedition to Bardia National Park (former name: Royal Karnali Wildlife Reserve) conducted in February to March 2003, and organised by the Zoological Society of London, in conjunction with Ussher Tours, the King Mahendra Trust for Nature Conservation Nepal, the Department of Natio-

nal Parks and Wildlife Conservation Nepal and the Natural History Museum, Kathmandu. The main purpose of the expedition was to study fish populations in the Babai River, but other taxa were also studied by the survey's taxonomic specialists.

The timing of the expedition was not conducive to a high abundance of terrestrial insects, such as crickets and butterflies. This was because February / March is within the dry season in Nepal where water levels are low and few plants are in flower. However, the survey period proved highly successful for the collection of aquatic insects. Collection was facilitated due to low water levels enabling good access to streams and river edges. Prior to this expedition, Trichoptera have been virtually unstudied in this region.

Descriptions of the many new Trichoptera species discovered during this expedition have been published separately (MALICKY 2004, 2004a). This paper documents the results on faunistics and ecology.

The sites

The area is situated in the southern-most hills of the Himalaya mountains (Siwalik Range) in south-western Nepal, at the edge of the Northern Indian Plain. The dry forests of the region are dominated by tree species such as *Shorea robusta* (Proteaceae) and *Pinus roxburghii* (Pinaceae). The annual rainfall is between 1400 and 2000 mm, the annual mean minimum air temperature is 17,7°C and the mean maximum 30,5°C.

Between 23 February and 5 March 2003, the expedition's first camp (Camp 1) was established near the Babai River Dam, where the Mahindra Highway crosses the river. This is located at 28°25'N, 81°23'E at about 190 m above sea level. From 6 to 12 March 2003 the second camp (Camp 2) was established near Babai Basar village close to the road between Nepalganj and Birendranagar. This was located at 28°21'N, 81°42'E and 320m above sea level. Both sites were positioned within a few metres of the Babai Nadi (Nadi = river) (Fig. 2).

At Camp 1 there was a stream named Budhi Khola (Khola = stream) (Fig. 1), which was positioned parallel to the river. Budhi Khola had low slope and low water velocity, but its riparian vegetation was open with little shade. In the evening of 5 March we collected near an unnamed side stream of the river some hundred metres below the dam.

There were four streams located near Camp 2. Two of them were unnamed on the map and were a short distance from the camp. In this paper, they are referred to as Eastern brook and Western brook. Both brooks were between 1-3 m wide, with gravel bottoms, cemented by tufa, and covered with a layer of fallen leaves. They were in dense, shaded forest (Fig. 3). As the study was conducted during the dry season, there was little discharge, and the water was not continuous, although a slow flow was found throughout.

Two other streams came down from the hills south of Camp 2, and were crossed by the road to Nepalganj: They were Ratomate Khola (Fig. 4) at 350 m above sea level and Kyuban Khola (Fig. 5) at 460 m above sea level. They had a steep slope and would have been torrents with a high discharge during the rainy season (October to November). Their bottoms consist of gravel and large boulders. During the survey in the dry season, these streams had low water levels that were not continuously flowing, but always had a noticeable current. Discharge was minimal and could not be measured. As tends to be the case in streams with steep slopes, they consisted of a sequence of cascades and pools. During the dry season such cascades can disappear but the pools remain refuges for the fauna, with a rich growth of filamentous algae which explains the abundance of algal



Figure 1: Budhi Khola near Camp 1.



Figure 2: Babai Nadi near Babai Basar, as seen from the bridge



Figure 3: Western brook near Camp 2.

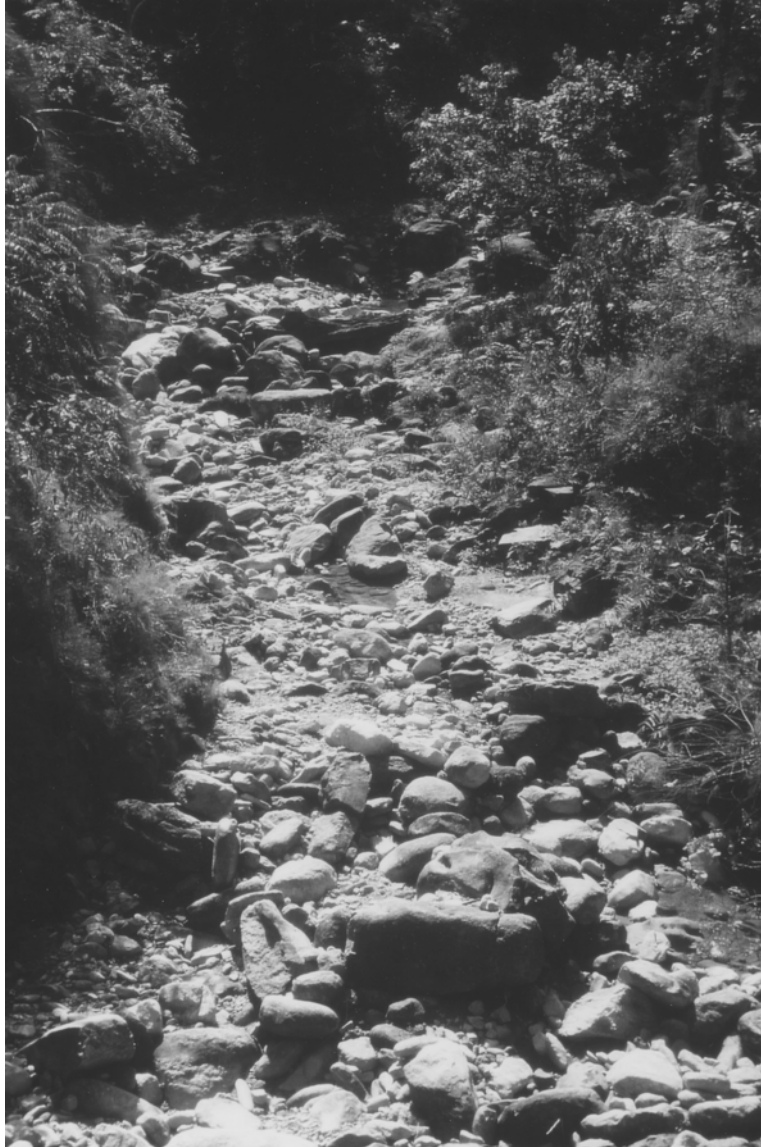


Figure 4: Ratomate Khola.

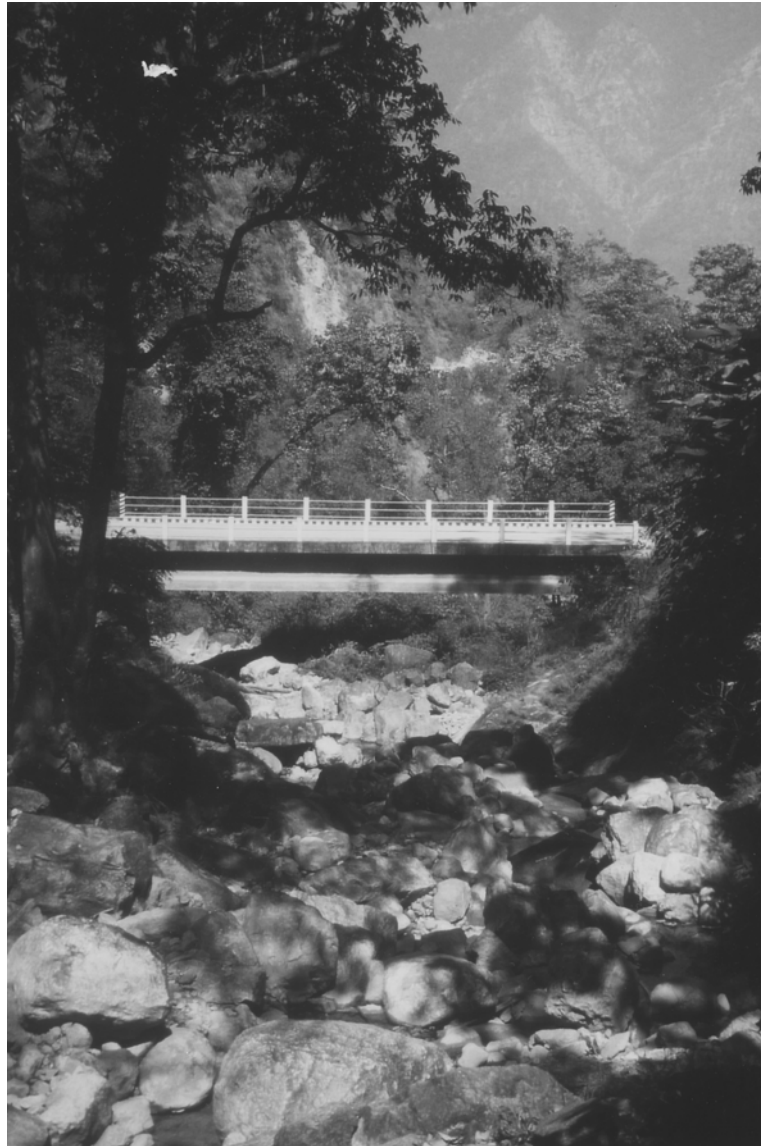


Figure 5: Kyuban Khola.



Figure 6: Hygropetric site near camp 2.

feeding hydroptilids. Ratomate Khola and Kyuban Khola are more than ten metres wide, with a very irregular stream bed.

Methods

During this survey, only adult caddisflies were collected. No attempt was made to collect or identify caddis larvae, due to the complete lack of existing information on species in the region. The main collecting method was light trapping. At the sites of both camps, but also near the four streams, a vertical white sheet was illuminated by strong electric lamps which were powered by a generator. In addition, small pan traps with blacklight tubes of 6 Watts, powered by torch batteries, were set at the edges of the river, streams and brooks. Near Camp 1, these traps were left overnight, but near Camp 2, the traps were not left unattended and so were operated from dusk until approximately 22 h. Sweep-netting was carried out along the streams, but with the exception of hygropetric sites near Camp 2 and along the road near Babai Basar, the sweep-net method was found to be unsuccessful.

The numbers of collected specimens were not strictly comparable because the catch varied from day to day, and was heavily dependent on weather conditions. A statistical evaluation was, therefore, not made.

Identification of specimens was done using available literature and from the author's previous studies. At present, there is no summarised literature on the taxonomy of southern Asian caddisflies. A preliminary list of Trichoptera known to me from Nepal is attached as Appendix I.

It was not possible to correlate females with males in most Hydroptilidae, in *Chimarra pulla* and *C. ram*, *Cheumatopsyche galahittigama* and *C. naumanni*, and all species of *Paduniella*, *Psychomyia*, *Hydropsyche* and *Setodes*. A few females could not be identified to species in the absence of males in the material although they were characteristic: each one species of *Hyalopsyche*, Polycentropodidae, *Ecnomus* (females of *Ecnomus* are well identifiable), *Goera*, *Leptocerus*, *Oecetis* (a specimen with characteristic wing pattern), and *Adicella*.

Results and discussion

Ecological data on tropical Trichoptera are sparse. Nepal is outside the true tropics, but in this respect the conclusions are the same. Native scientists have never studied unusual insects such as caddisflies. Any studies tend to be conducted by international visitors who observe for short periods, thus the conditions during the rest of the year remain unknown. The phenology of tropical caddis is almost unknown. We know only that both cyclic and acyclic development may occur (THANI 1999, LAUDEE 2004, DUDGEON 1996, MALICKY 2003). For the same reasons, running water zonation, characteristic associations, and indicator species are widely unknown (see MALICKY & CHANTARAMONGKOL 1995). The present paper is an initial attempt to address some of these gaps in our knowledge.

Distribution of species in the studied sites

Sufficient comparative material on abundance and frequency data can provide us with information to determine typical species and their associations, characteristic of biotopes.

The difficulty with this study is that one cannot say with certainty in which water body a specimen had developed due to only adults being collected. Adult caddis may fly several hundred metres from their breeding site, although it is highly probable that the majority of adults caught at the edge of a stream would have originally come from that stream. Collections of larvae is useless because they cannot be identified to species. The distribution of species found during the study can be found in Table 1.

Faunistics and zoogeography

The Trichoptera of Bardia National Park were virtually unknown prior to 2003, with earlier collections from this area recorded in Table 2. During the 2003 expedition, more than 20 species were found to be new to science, and there were many more species that have been found to be new records for Nepal. Many of these species were originally described from other countries such as Afghanistan, Pakistan, India, China, Myanmar or Sri Lanka, so their discovery in Nepal is not wholly surprising.

The total number of Trichoptera species in Nepal is still an enigma. With the long east to west extension, the country has enormous differences in altitude one would expect a high species diversity, but the preliminary list published here (Appendix 1) is only a first attempt of such a summary. It must be noted that caddis samples from Nepal tend to include only a small percentage of new species, in contrast to countries such as Thailand or Indonesia where the percentage of new species in a first sample is usually as high as 75%.

In the present study, 110 species were found and this is a high number considering the few collecting sites. At Camp 1, 68 species were found and at Camp 2, 96 species were found. A higher number was obtained at Camp 2 due to the sampling being conducted at four brooks with a higher diversity of biotopes. The high number of 71 species collected at the Western brook can be explained by one exceedingly rich light catch on 16 March, when several thunderstorms passed by in some distance, but without rain at the site. It is known for long that thunderstorms create favourable collecting conditions.

During one of the early collections, prior to the 2003 expedition, *Cheumatopsyche bardiana* was collected from the location of Camp 1, on 30 March 1991 (Table 2). It is surprising that this species was not caught again during the present trip. Several other species were also collected during previous collections near Dhakeri, outside the Bardia National Park, that were not found during the 2003 expedition (Table 2). The collecting site near Dhakeri was in mixed lowland and riverine forest, on the edge of a forest stream and its junction to a small sandy river. Species found here included *Hydroptila molione*, *Stenopsyche griseipenne*, *Triplectides indica*, *Oecetis submaculosa* and an unidentified *Leptocerus* sp.

The most abundant species found during the 2003 expedition were collected at both camps, with the exception of *Ecnomus indicus* and *Chimarra aberrans* which were found near Camp 1 in about 1000 resp. 18 specimens, and none near camp 2, and *Pseudoleptonema quinquefasciata* with 50 specimens near Camp 2, and none near camp 1.

Conclusions on zoogeography are hard to define in a region where only scattered records are available and one can nothing say about faunal elements. We know that a few species have extremely large areas, such as *Pseudoneureclipsis bheri* from Afghanistan to Bali, and *Oecetis tripunctata* from the British Isles and Portugal to Bali. Several species, such as *Rhyacophila scissoides*, *Stenopsyche haimavatika*, *Amphipsyche exsiliens*, *A. meridiana*, *Pseudoleptonema quinquefasciata*, *Hydromanicus truncatus*, *H. inferior*,

Lepidostoma moulmina are also found further afield, such as from Thailand (MALICKY & CHANTARAMONGKOL 1999).

The most surprising find was the record of one specimen of *Limnephilus horstaspoecki* near Camp 1. The genus *Limnephilus* includes many species, many of which are widely distributed in the Palaearctic and Nearctic regions. It was unexpected to find a *Limnephilus* species in Nepal. The closest record of a *Limnephilus* is *L. lakshaman* (OLÁH 1994) from Pakistan, over 1000 km north-west where the Nepalese specimen was found. Other than this, there were no Palaearctic elements among Nepalese caddisflies. Nepalese caddisflies are entirely Oriental, in contrast to other insect groups (see SCHMID 1966).

Indicator species

From the relative abundance of species in Table 1, the following species may be considered to be fairly good indicators of their biotopes:

1. Babai Nadi (Fig. 2): *Stenopsyche haimavatika*, *Paduniella outtara*, *Psychomyia mahayinna*, *Ecnomus indicus*, *E. vaharika*, *Amphipsyche exsiliens*, *Pseudoleptonema quinquefasciata*, *Ceracles hesperida*, *C. iustitia*, *C. kore*, *Oecetis scutulata*, *O. tripunctata*, *Oecetis* sp., *Trichosetodes atisudhara*.

2. Hygropetric sites (Fig. 6): *Microptila ikaros*, *Stactobia kyria*, *Abaria margaritifera*, *A. richika*.

3. Brooks near both camps, including Budhi Khola (Fig. 1): *Agapetus triangularis*, *Hydroptila lyaaios*, *H. oknos*, *Chimarra pulla*, *Cheumatopsyche galahittigama*, *Orthotrichia extensa*.

4. Brooks near Camp 2, but not Budhi Khola (Fig. 3): *Hydroptila perimele*, *H. sanghala*, *Chimarra suryasena*, *C. vasuodeva*, *Gunungiella parthava*, *Nyctiophylax akastos*, *Ecnomus lykos*, *Hydropsyche appendicularis*, *Hydromanicus inferior*, *Anisocentropus salsus*.

5. Streams with low slope and low water velocity, including Budhi Khola: *Hydroptila hyllos*, *H. kalchas*, *H. keres*, *Oxyethira laodameia*, *Orthotrichia marsyas*, *Chimarra pulla*, *Gunungiella bodhidarma*, *Paduniella amphitrite*, *Ecnomus montanus*.

6. Streams with low slope and low velocity near Camp 2, but not Budhi Khola: *Chimarra houvichka*, *Polypsectropus sourya*, *Hydropsyche briseus*, *H. gautamitra*, *Diplectrona kimalaksa*, *Lepidostoma moulmina*.

7. Streams with steep slope and torrential conditions in the rainy season (Figs. 4, 5): *Rhyacophila scissoides*, *R. shakangpa*, *R. shresthai*, *Apsilochorema utchtchunam*, *Paduniella nika*, *Tinodes akantaka*, *Hydropsyche pallipenne*, *Diplectrona sanguana*, *Hydromanicus truncatus*, *Poecilopsyche melanion*.

8. Species with no clear attribution: *Cheumatopsyche naumanni*, *Chimarra ram* and *C. pulla*, *Pseudoneureclipsis bheri*, *Paduniella magadha*, *Psychomyia asvagosha*, *P. mahayinna*, and all *Setodes* species. - *Chimarra pulla* and *ram* were unclear because the females could not be separated although they were common near both camps. At Camp 1, many males of *C. ram* and many more females were found at Babai Nadi and at light near the camp, but at Camp 2, quite a few were found near the river and the Camp, and more were found at the two small brooks. *C. pulla* males were abundant at Budhi Khola but much rarer at the Eastern and Western brooks near Camp 2.

Appendix 1: Trichoptera known from Nepal

On this occasion I give here a preliminary list of caddisflies known to me from Nepal without comments. Most of these data are from KIMMINS 1964, KISS & MALICKY 2003, and my own unpublished results. A detailed paper on faunistics of Nepalese Trichoptera is planned over the next few years, but much material remains to be studied until such a paper can be published.

Rhyacophilidae

Himalopsyche

digitata MARTYNOV, 1935
dolmasampa SCHMID, 1963
horai MARTYNOV, 1936 (= *phedongensis* KIMMINS, 1952)
maitreya SCHMID, 1963
malenanda SCHMID, 1963
tibetana MARTYNOV, 1930

Rhyacophila

aithra MALICKY, 1997
alticola KIMMINS, 1953
bidens KIMMINS, 1953
changpa SCHMID, 1970
chayulpa SCHMID, 1970
chayulpa kaligandaki MELNITSKY, 2005
chembo ghasa MELNITSKY, 2005
chitre MELNITSKY, 2005
dakshi SCHMID, 1970
dongkyapa SCHMID, 1970
hobsoni MARTYNOV, 1930
hreblyi KISS, 2003
hydasypica SCHMID, 1959
kando SCHMID, 1970
laptapa SCHMID, 1970
nandori KISS, 2003
obscura MARTYNOV, 1927
scisoides KIMMINS, 1953
shakungpa SCHMID, 1970
shingripa tatapani MELNITSKY, 2005
shresthai MALICKY, 2004
spinalis MARTYNOV, 1930
tibori KISS, 2003
tukuche MELNITSKY, 2005
vargai KISS, 2003
zhungpa SCHMID, 1970

Glossosomatidae

Agapetus

ainei MALICKY, 1997

dagunagari MALICKY, 1995
jiriensis MALICKY, 1995
triangularis MARTYNOV, 1935
tamrangensis KIMMINS, 1964

Glossosoma

atestatas MAL. & CHANT., 1992
caudatum MARTYNOV, 1931
dentatum MARTYNOV, 1935
balephiana MALICKY, 1995
fissum MARTYNOV, 1935
heliakreya SCHMID, 1958
himalayanum MARTYNOV, 1930
kissottoi MALICKY, 1997

Nepaloptila

coei KIMMINS, 1964

Hydrobiosidae

Apsilochorema

akis MALICKY, 1997
annandalei MARTYNOV, 1935
indicum ULMER, 1905
tigmatejanam SCHMID, 1970
utchtchunam SCHMID, 1970
vaneyam SCHMID, 1970

Hydroptilidae

Hydroptila

hyllos MALICKY, 2004
ion MALICKY, 2004
kalchas MALICKY, 2004
kairos MALICKY, 2004
keres MALICKY, 2004
kreusa MALICKY, 2004
lyaios MALICKY, 2004
molione MALICKY, 2004
morpheus MALICKY, 2004
oknos MALICKY, 2004
parakampsis MALICKY, 2004
perimele MALICKY, 2004
sanghala SCHMID, 1960

Madioxyethira

nepalensis KIMMINS, 1964

Microptila

ikaros MALICKY, 2004

Orthotrichia

extensa MARTYNOV, 1935

hippomenes MALICKY, 2004

marsyas MALICKY, 2004

Oxyethira

laodameia MALICKY, 2004

paieon MALICKY, 2004

Stactobia

kyria MALICKY, 2004

nori SCHMID, 1983

schmidi KIMMINS, 1964

schnorri MALICKY, 2004

Philopotamidae

Chimarra

aberrans MARTYNOV, 1935

aminadab MALICKY, 1993

biatec MALICKY, 1993

bimbltona MALICKY, 1979

biungulata KIMMINS, 1964

burmana KIMMINS, 1957

cumata MAL. & CHANT., 1993

fenestrata KIMMINS, 1964

nigra KIMMINS, 1964

hezron MALICKY, 1993

houvichka SCHMID, 1960

igvarvaria MELNITSKY, 2005

nepalensis KIMMINS, 1964

nonna MALICKY, 1993

nunenada MELNITSKY, 2005

prisna MALICKY, 1986

pulla NAVÁS, 1931

ram MALICKY, 1993

suryasena SCHMID, 1960

vasuodeva SCHMID, 1960

Dolophilodes

dharmakala SCHMID, 1960

dharmaraksa SCHMID, 1960

tibetana KIMMINS, 1955

utto MALICKY, 1993

Gunungiella

bodhidarma SCHMID, 1960

prathava SCHMID, 1968

Kisaura

cf. *intermedia* KIMMINS, 1955

madhyamika SCHMID, 1960

rossi KIMMINS, 1955

scicca MALICKY, 1993

Wormaldia

relicta MARTYNOV, 1935

sunkosiana MALICKY, 1994

Polycentropodidae

Nyctiophylax

akastos MALICKY, 1997

amykos MALICKY, 1997

antenor MALICKY, 1997

Plectrocnemia

aietes MALICKY, 1997

anaktiga MALICKY, 1995

distincta MARTYNOV, 1935

kalachorum SCHMID, 1961

kapchajalaja SCHMID, 1975

obliquofasciata MARTYNOV, 1935

Polyplectropus

amphion MALICKY, 1997

anakempat MALICKY, 1995

jotham MALICKY, 1993

sourya SCHMID, 1960

Pseudoneureclipsis

anakdua MALICKY, 1995

bheri MALICKY, 1993

elektryon MALICKY, 1997

Dipseudopsidae

Dipseudopsis

recta MARTYNOV, 1936

Hyalopsyche

sp.

Stenopsychidae

Stenopsyche

dirghajihvi SCHMID, 1969

griseipennis MCLACHLAN, 1866

haimavatika SCHMID, 1969

himalayana MARTYNOV, 1926

similis ULMER, 1927

Arctopsychidae

Arctopsyche

composita MARTYNOV, 1930

inaequispinosa SCHMID, 1968

lobata MARTYNOV, 1930

Psychomyiidae

Paduniella

amphitrite MALICKY, 1997

lucina MALICKY, 2004

magadha SCHMID, 1961

maurya SCHMID, 1961

nike MALICKY, 2004

outtara SCHMID, 1961

Psychomyia

anaktujuh MALICKY, 1995

arefinae SCHMID, 1997

asvagosha SCHMID, 1961

bhutana OLÁH, 1985

chompu MAL. & CHANT., 1993

dugpa SCHMID, 1975

karkii MALICKY, 1994

maharaksa SCHMID, 1961

mahayinna SCHMID, 1961

siveci MALICKY, 1993

Tinodes

aisakos MALICKY, 1997

akantaka SCHMID, 1972

karkii MALICKY, 1997

ongkot MALICKY, 1993

Xiphocentronidae

Abaria

margaritifera SCHMID, 1958

richika SCHMID, 1982

Ecnomidae

Ecnomus

aigeus MALICKY, 1997

henoch MALICKY, 1993

indicus MARTYNOV, 1935

lykos MALICKY, 2004

montanus MOSELY 1932

penjabi SCHMID, 1961

pusanus MOSELY, 1932

vaharika SCHMID, 1953

Hydropsychidae

Amphipsyche

exsiliens BARNARD, 1984

meridiana ULMER, 1909

Macrostemum

erigone MALICKY, 1998

fastosum WALKER, 1852

fuscum MALICKY, 1998

punctatum BETTEN, 1909

thomasi MEY, 1993

Pseudoleptonema

quinquefasciatum MARTYNOV, 1935

Cheumatopsyche

banksi MOSELY, 1942

bardiana MALICKY, 1997

capitella MARTYNOV, 1927

ceres MAL. & CHANT., 1997

columnata MARTYNOV, 1935

cressida MALICKY, 1997

gaia MALICKY, 1997

galahittigama SCHMID, 1958

jiriana MALICKY, 1997

matuta MALICKY, 2004

naumanni MALICKY, 1986

ningmapa SCHMID, 1975

Diplectrona

burha SCHMID, 1961

kimalaksa SCHMID, 1961

sanguana KIMMINS, 1964

Hydromanicus

diomedes MALICKY, 2000

eleasar MALICKY, 1993

inferior CHANT. & MAL., 1995

truncatus BETTEN, 1909

Hydropsyche

aiakos MALICKY, 1997

appendicularis MARTYNOV, 1931

asiatica ULMER, 1905

assarakos MAL. & CHANT., 2000

atlas MAL. & CHANT., 2000

binaria MEY, 1996

briseus MAL. & CHANT., 2000

broteas MAL. & CHANT., 2000

claviformis MEY, 1996

dhusaravarna SCHMID, 1975

gautamitra SCHMID, 1961

hackeri MEY, 1998

hreblayi MEY, 1998

kaznakovi MARTYNOV, 1914

lobulata MARTYNOV, 1936

nuristanica SCHMID, 1963

orectis MEY, 1999

pallipenne BANKS, 1938

polyphylla TIAN & LI, 1987
rakshakaha OLÁH, 1994
rhomboana MARTYNOV, 1909
sikkimensis MEY, 1996
tabulifera SCHMID, 1963
Hydatomanius
scotosius MEY, 1996
Potamyia
pallidipennis MARTYNOV, 1935
renatae MALICKY, 1997
Phryganeidae
Eubasilissa
maclachlani WHITE, 1862
rahtkirani SCHMID, 1965
Brachycentridae
Micrasema
bricco MAL. & CHANT., 1992
aigisthos MALICKY, 1997
Limnacentropodidae
Limnacentropus
himalayanus MARTYNOV, 1930
Goeridae
Goera
anaksembilan MALICKY, 1995
dierli MAL. & CHANT., 1992
holzschuhi MAL. & CHANT., 1992
mandana MOSELY, 1938
sira MAL. & CHANT., 1992
vaichravana SCHMID, 1991
Uenoidae
Uenoa
hiberna KIMMINS, 1964
Lepidostomatidae
Lepidostoma
assamensis MOSELY, 1949
betteni MARTYNOV, 1936
ganesa MAL. & CHANT., 1994
heterolepidia MARTYNOV, 1936 (?)
kursum MOSELY, 1949
moulmina MOSELY, 1949
nayarkot MAL. & CHANT., 1994
parvulum McLACHLAN, 1875
punjabicum MARTYNOV, 1936 (=kamba
MOSELY, 1939)

sika MOSELY, 1949
simplex KIMMINS, 1964
sonomax MOSELY, 1939
Indocrunoecia
sp.
Paraphlegopteryx
nigropunctata WEAVER, 1999
normalis MOSELY, 1949
Limnephilidae
Apatania
aison MALICKY, 1997
auctumnalis MEY & MALICKY, 1993
bhimagada SCHMID, 1968
dirghabahu SCHMID, 1968
Limnephilus
horstaspoecki MALICKY, 2004
Micropterna
indica MOSELY, 1936
Aplatyphylax
mishmicus KIMMINS, 1950
Philostenax
himalus MOSELY, 1935
Pseudostenophylax
himalayanus MARTYNOV, 1930
latifalcatus SCHMID, 1991
cf. *ovalis* SCHMID, 1991
Leptoceridae
Adicella
acte SCHMID, 1994
dirce SCHMID, 1994
euphrosyne SCHMID, 1994
lais SCHMID, 1994
trifida KIMMINS, 1963
Ceraclea
hekabe MALICKY, 2002
hesperida MALICKY, 2004
iustitia MALICKY, 2004
kore MALICKY, 2004
Leptocerus
bheriensis MALICKY, 1993
datrayukta SCHMID, 1987
madhyamika SCHMID, 1961
Mystacides
indica MARTYNOV, 1936
Oecetis
clavata YANG & MORSE, 2000

- devakiputra* SCHMID, 1995
jacobsoni ULMER, 1930
kambaitensis KIMMINS, 1963
kentauros MALICKY, 2005
lokapala SCHMID, 1995
mekana KIMMINS, 1963
ocresia MALICKY, 2005
penicillata KIMMINS, 1963
pretakalpa SCHMID, 1995
punctatissima SCHMID, 1958
raghava SCHMID, 1995
scutulata MARTYNOV, 1936
submaculosa KIMMINS, 1963
tripunctata FABRICIUS, 1793
uniforma YANG & MORSE, 2000
yogeshwara SCHMID, 1995
Parasetodes
respersella RAMBUR, 1842
Poecilopsycha
melanion MALICKY, 2002
Setodes
abhichobhita SCHMID, 1987
argentiferus McLACHLAN, 1871
fluvialis KIMMINS, 1963
hamadryas MALICKY & CHANTARAMONGKOL, 2006
kadrava SCHMID, 1987
laertes MALICKY & CHANTARAMONGKOL, 2006
nagarjouna SCHMID, 1961
sagaritis MALICKY & CHANTARAMONGKOL, 2006
savibhrama SCHMID, 1987
sternalis MARTYNOV, 1936
tilakita SCHMID, 1987
Triaenodes
pentheus MALICKY, 2005
trivulcio SCHMID, 1994
Trichosetodes
atisudhara SCHMID, 1987
compositus MARTYNOV, 1936
pandrosus MALICKY, 2006
Triplectides
indicus WALKER, 1852
Odontoceridae
Marilia
albofusca SCHMID, 1959
Psilotreta
aidoneus MALICKY, 1997
quinlani KIMMINS, 1964
Calamoceratidae
Anisocentropus
salsus BETTEN, 1909
ulmeri MALICKY, 1998
Molannidae
Molanna
paramoesta WIGGINS, 1968

Table 1: Distribution of species and numbers in the samples

Abbreviations. **Light trap** ...: collection with sheet and lamp near the Camps, powered by generator. **Budhi stream** ...: Budhi Khola, pan traps. **Dam** ...: pan trap near the dam in the slow flowing part of the river. **Babai River** ...: collection with sheet and lamp at the edge of Babai Nadi, powered by generator. **Camp side** ...: side stream below the dam, sheet collecting. **Eastern brook** ...: eastern brook near Camp 2, sheet and pan traps. **Western brook** ...: western brook near Camp 2, sheet and pan traps. **Hygropetric site** ...: hygropetric sites along the road and near Camp 2, netting. **Kyuban stream** ...: Kyuban Khola, sheet and pan traps. **Ratomate stream** ...: Ratomate Khola, sheet and pan traps.

Table 1. The distribution of species and numbers within samples

Genus	Species	Camp 1				Camp 2						
		Light trap	Budhi stream	Dam	Babal River	Camp side	Light trap	Babal River	Eastern brook	Western brook	Hygropetric site	Kyuban stream
<i>Rhyacophila</i>	<i>scissoides</i>							1♂, 1♀			25♂, 7♀	11♂, 1♀
	<i>shakanga</i>							2♂, 1♀	1♂		15♂, 8♀	10♂, 3♀
	<i>shresthai</i>								3♂		1♂	1♂
<i>Apsilochorema</i>	<i>utichutichunam</i>											
	<i>Agapetus triangularis</i>	1♀					1♀	2♀		3♂, 10♀		
	<i>Glossosoma caudatum</i>	2♂, 1♀										
<i>Glossosoma</i>	<i>hyllos</i>	10♂	47♂				1♂					
	<i>ion</i>							19♂	121♂		1♂	3♂
	<i>kairos</i>							6♂				
<i>Hydroptila</i>	<i>kalchas</i>	26♂	91♂	2♂		1♂	1♂	5♂	51♂	3♂		
	<i>keres</i>		4♂						4♂			
	<i>kreusa</i>							1♂	2♂		2♂	
<i>Orthotrichia</i>	<i>lyaios</i>	1♂	4♂				1♂	12♂	16♂	5♂	4♂	12♂
	<i>morpheus</i>		1♂									
	<i>oknos</i>	1♂	2♂					1♂	12♂			1♂
<i>Oxyethira</i>	<i>parakampsis</i>							2♂	2♂			1♂
	<i>perimele</i>		2♂				1♂	124♂	273♂		38♂	101♂
	<i>sanghala</i>							4♂	10♂	2♂	1♂	1♂
<i>Microptila</i>	<i>hippomenes</i>		3♂						1♂			
	<i>extensa</i>								6♂			1♂
	<i>marsyas</i>		4♂									
<i>Stactobia</i>	<i>laodameia</i>	6♂	20♂				1♂	28♂	34♂			2♂
	<i>paleon</i>	1♂	1♂					1♂	3♂			
	<i>ikaros</i>											
<i>Hydroptilidae</i>	<i>kyria</i>											
	<i>nori</i>											
	<i>schnorri</i>											
<i>Hydroptilidae</i>	unidentified ♀♀	50♀	700♀	30♀	20♀	5♀	6♀	57♀	80♀	132♀	2♀	82♀
												80♀

Genus	Species	Camp 1				Camp 2							
		Light trap	Budhi stream	Dam	Babai River	Camp side	Light trap	Babai River	Eastern brook	Western brook	Hygropetric site	Kyuban stream	Ratamate stream
Chimarra	biungulata				4♂, 14♀							1♂	1♂
	aberrans								3♂	23♂			
	houvichka								9♂	11♂	5♂, 1♀		
	pulla	38♂, 349♂, 868♀	72♂, 225♀	2♂, 25♀	16♂		1♂	10♂, 12♀	33♂	81♀			1♂
	ram		2♂		34♂, 800♀				3♀	6♂, 5♀		3♂, 1♀	2♂
Gunungella	suryasena									116♂, 39♀	3♂	65♂, 39♀	17♂, 21♀
	vasudeva		6♂		1♀				31♂, 4♀	51♀			
	unidentified ♀♀				500♀♀				21♀♀	3♀♀		1♀	
	bodhidharma	3♂, 1♀	3♂				1♂	1♂, 1♀	1♂	7♂, 4♀	2♂	3♂	1♂, 1♀
	prathava								7♂, 4♀	13♂, 2♀			7♂, 3♀
Nyctophylax	akastos	3♂			3♂								
	jotham												
Polyplectropus	sourya	1♂, 1♀	1♂, 2♀				3♀	1♂	5♂, 19♀	9♂, 33♀		1♂, 2♀	1♂, 4♀
	bheri	2♂, 2♀	1♀			1♂		5♂, 55♀	19♂, 21♀	1♂, 2♀			
Pseudoneureclipsis									1♀				
Polycentropodidae	g.sp.												
	indicus	44♂, 34♀	2♀	4♂, 46♀	144♂, 714♀					25♂, 33♀		32♂, 137♀	14♂, 26♀
Enomus	lykos		1♀						5♂, 5♀	5♂, 4♀			
	montanus	9♂	3♂, 7♀	1♂, 5♀	2♂			2♀	3♂, 2♀				
Stenopsyche	vaharika	31♂, 43	3♀	7♂, 95♀	4♂, 51♀		2♀	17♀	1♀	3♂, 4♀			
	sp.		2♀		1♀		1♂, 3♀	3♀		2♀		1♂	
Hyalopsyche	haimavalika	3♂, 13♀				1♂							
	sp.	1♀											
Paduniella	amphitrite		8♂		1♂			6♂		6♂		1♂	3♂
	lucina	2♂											

Genus	Species	Camp 1				Camp 2							
		Light trap	Budhi stream	Dam	Babai River	Camp side	Light trap	Babai River	Eastern brook	Western brook	Hygropetric site	Kyuban stream	Ratamate stream
<i>Paduniella</i> cont	<i>magadha</i>	114♂					23♂	4♂	1♂	2♂			
	<i>maurya</i>								1♂				
<i>Psychomyia</i>	<i>nike</i>									1♂		4♂	5♂
	<i>outlara</i>	10♂	8♂	3♂	41♂	1♂	1♂	13♂		3♂			
	unidentified ♀♀	1300♀♀	120♀♀	29♀♀	156♀♀	5♀♀	220♀♀	615♀♀	40♀♀	100♀♀		90♀♀	39♀♀
	<i>asvagoshia</i>	35♂						2♂	4♂	31♂			1♂
	<i>dugpa</i>									2♂			1♂
<i>Tinodes</i>	<i>karkii</i>	4♂											
	<i>mahayinna</i>		1♂					39♂	3♂	18♂			
	unidentified ♀♀	112♀♀				1♀	1♀	14♀♀	12♀♀	51♀♀		2♀♀	
	<i>akantaka</i>										1♂	2♂, 4♀	1♂, 2♀
	<i>margaritifera</i>										1♂		
<i>Hydropsyche</i>	<i>richika</i>		1♂, 1♀								13♂, 11♀		1♂, 1♀
	<i>appendicularis</i>				6♂	1♂	2♂	1♂	9♂	14♂		13♂	10♂
	<i>briseus</i>	1♂							2♂	5♂			
	<i>gautamitra</i>	3♂	1♂		4♂	2♂			4♂	9♂			1♂
	<i>nuristanica</i>	3♂				2♂	1♂						
<i>Diplectrona</i>	<i>pallipenne</i>						3♂		2♂	4♂		72♂, (35♀)	28♂
	<i>rakshakaha</i>						1♂		1♂	1♂		2♂	
	unidentified ♀♀				225♀♀	122♀♀	350♀♀	174♀♀	129♀♀	86♀♀		12♀♀	77♀♀
	<i>kimalaksa</i>	61♀♀	31♀♀	11♀♀						6♂, 1♀		8♂, 6♀	1♂, 5♀
	<i>sanguana</i>										1♂		
<i>Potamyia</i>	<i>pallidipennis</i>					1♂				3♂			
<i>Hydromanicus</i>	<i>renatae</i>												
	<i>inferior</i>	13♂, 3♀					1♂	1♂	1♂	1♂, 1♀		17♂, 5♀	1♂, 1♀
<i>Cheumatopsyche</i>	<i>truncatus</i>												
	<i>banksi</i>												
	<i>gaia</i>	4♂						1♂		1♂			
	<i>galahitigama</i>												
		6♂	80♂, 131♀	1♂	1♂	1♂	43♂, 15♀	4♂	257♂, 202♀	292♂, 293♀		31♂, 74♀	129♂, 71♀

Genus	Species	Camp 1					Camp 2						
		Light trap	Budhi stream	Dam	Babai River	Camp side	Light trap	Babai River	Eastern brook	Western brook	Hygropetric site	Kyuban stream	Ratomate stream
<i>Cheumatopsyche</i>	<i>matuta</i>	5♂ 295♂, 122♀	3♂	39♂, 100♀	3♂, 18♀ 99♀♀	109♂, 23♀	2♂ 47♂, 29♀ 1♂	665♂, 2400♀	49♂	467♂, 198♀			1♂
	<i>naumanni</i>												
	<i>ningmapa</i>												
	unidentified ♀♀												
<i>Pseudopteronema</i>	<i>quinquefasciata</i>												
<i>Amphipsyche</i>	<i>exsilens</i>	63♂, 9♀ 1♀		2♂, 1♀ 2♂	269♂, 115♀	5♂, 1♀ 1♂	2♂	32♂, 17♀ 6♂, 83♀		1♂ 2♂			
<i>Limnephilus</i>	<i>meridiana</i>	1♀											
	<i>horstaspoecki</i>	1♀											
<i>Goera</i>	sp.									1♀ 2♂	1♀ 6♂, 7♀		
<i>Lepidostoma</i>	<i>moulmina</i>									1♂, 1♀ 38♂, 4♀	3♂, 1♀ 1♂		
<i>Anisocentropus</i>	<i>salsus</i>												
<i>Adicella</i>	sp.	1♀					1♀						
<i>Leptocerus</i>	sp.									2♀			
<i>Poecilopsyche</i>	<i>melanion</i>						1♀			3♂, 2♀ 1♂, 2♀ 1♀	1♂	25♂, 53♀	5♂, 8♀ 1♂
<i>Trienodes</i>	<i>trivulcio</i>												
<i>Paraselodes</i>	<i>maculatus</i>							1♀ 245♂, 34♀	27♂	97♂, 6♀			
<i>Trichostodes</i>	<i>alisudhara</i>	248♂, 128♀ 2♂	1♂, 1♀		16♀ 2♂	2♂	10♂, 1♀	1♀ 34♀					
	<i>compositus</i>	2♂											
	<i>fluvialis</i>	4♂						1♂					
<i>Setodes</i>	<i>kadrava</i>	2♂			3♂, 3♀		2♂	5♂, 2♀	5♂				
	<i>argentiferus</i>												
	<i>abichobita</i>							2♂	4♂	4♂			
	<i>nagarjouna</i>	2♂					1♂	2♂	2♂	9♂			
	<i>sternalis</i>	8♂											
	<i>tlakita</i>	7♂				1♂	5♂	4♂	1♂	4♂			
	unidentified ♀♀	8♀♀		1♀			6♀♀	68♀♀	5♀♀	10♀♀			

Genus	Species	Camp 1					Camp 2						
		Light trap	Budhi stream	Dam	Babai River	Camp side	Light trap	Babai River	Eastern brook	Western brook	Hydropetric site	Kyuban stream	Ratomate stream
Ceraclea	<i>hesperida iustitia</i>	(1♂			2♀ 3♀		3♂, 2♀	1♂, 2♀ 1♂					
	<i>kore</i>	(1♂, 9♀ 17♂, 21♀			3♂, 16♀	1♂, 1♀ 1♀	7♂, 6♀ 1♂	37♂, 22♀ 1♂, 1♀	1♀	1♂, 3♀ 3♂, 6♀		2♀	
Oecetis	<i>punctatissima</i>	(1♂											
	<i>raghava</i>	(1♂, 3♀ 15♂, 19♀						1♂		6♂, 6♀			
	<i>scutulata</i>	(1♂			53♂, 13♀		6♂, 1♀	3♂, 2♀ 2♂, 13♀					
	<i>tripunctata</i> sp.	(4♂, 1♀ 8♀	1♀		1♀	1♂ 2♀	1♀ 3♀			1♂, 3♀			

Table 2: Earlier records of Trichoptera in the region, collected by Colonel M. ALLEN

Campsite 1 near dam, as above, 30 March 1991:

Cheumatopsyche bardiana 4 ♂♂

Ecnomus indicus 1 ♂

Babai Nadi at junction of Kali Nala stream, 28°27'N, 81°25'E, 200m, 22 October 1989:

Chimarra ram 1 ♂

Cheumatopsyche naumanni 2 ♂♂

do., 30 September 1991:

Cheumatopsyche naumanni 11 ♂♂

do., 1 November 1994:

Chimarra prisna 96 ♂♂, 32 ♀♀

Stenopsyche haimavatika 1 ♀

Amphipsyche exsiliens 8 ♂♂, 5 ♀♀

Cheumatopsyche galahittigama 1 ♂

Cheumatopsyche naumanni 24 ♂♂, 45 ♀♀

Hydropsyche appendicularis 1 ♂

do., 15 - 16 October 1996:

Amphipsyche exsiliens 5 ♂♂, hundreds of ♀♀

Cheumatopsyche galahittigama 3 ♂♂, 1 ♀

Cheumatopsyche naumanni 35 ♂♂, 57 ♀♀

Bardia District, Dhakeri (10 km SE Kohalpur, outside the National Park), 28°12'N, 81°42'E, 200m, 6 April 2000:

Hydroptila molione 1 ♂

Hydroptila kalchas 1 ♂

Stenopsyche griseipennis 3 ♂♂

Paduniella outtara 2 ♂♂

Triplectides indica 5 ♂♂, 2 ♀♀

Oecetis submaculosa thousands of ♂♂ and ♀♀

Leptocerus sp. thousands of ♀♀

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