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SOME ORIBATID MITES (ACARI) FROM THE SERRA DO MA AND SERRA DO MATIGUÉRA (BRAZIL, SÃO PAULO)

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The description of four new species, list of the identifications and remarks on the distribution of the so-called "Gondwanan" species and genera are given.

Key words: Oribatids, Gondwana theory, taxonomy, new species

INTRODUCTION

RODOLPHO ROHR (Campinas, São Paulo State), engineer and entrepreneur of Hungarian descent called our attention in 1989 to the few remnant patches of apparently undisturbed rainforest between São Paulo and Rio de Janeiro, in a heavily populated area. This area used to be covered largely by continuous forest up to the last century, but most it has been felled. The remaining patches are either national parks, or areas under the supervision of state forestry. It was suggested to us that we carry out studies in this zoologically completely unexplored area. Since the flora of the area is richer than that of Amazonia, it is not surprising that its fauna is likewise rich. Perhaps it is the last chance for scientists to study the soil fauna of the area. ROHR offered his fazenda near Pindamonhangaba to serve as a research base for our studies. The exploratory studies were carried out by J. BALOGH between 8 and 18 May, 1990. The oribatid fauna extracted from soil samples with the help of Berlese funnels was found to be so promising that in the same year we decided to embark upon systematic studies.

The area in question belongs to the class of extraequatorial tropical rainforests in the climate classification of WALTER and BRECKLE (1983). Although it is relatively distant from the equator, it is situated in the zone of seasonal rains, in the group Zonobiom II (ZB II), the clouds arising from the Atlantic Ocean precipitate here and thus the coastal area is a perhumid subzonobiom (sZB II/e I). For simplicity's sake, we will call it tropical rainforest. The vegetation profile of the area is illustrated by HUECK (1966).

The daily variation in temperature, especially in the soil, is quite small in typical equatorial rainforests, and the mean annual temperature hardly changes. It is similar in the perhumid Subzonobiom of Zonobiom II. In the orobioms joining the tropical Zonobioms, i.e. in the mountains, the mean annual temperature drops on the average by 0.5–0.6 °C at every 100 m altitude. On misty slopes this drop can be 0.75 °C/100 m or even more. The variation in temperature has a decisive effect on the faunas of tropical rainforests, especially on those of the soil. The species of low tolerance, the so-called stenothermic species can only survive in lowlands and mountain rainforests of lower altitudes. The upper limit of their altitudinal range is around 1000 m a.s.l. The following vertical distribution limit is around 1700–2000 m, where the tropical mountain forest is replaced by mossy forest. The diversity of the soil fauna is the greatest here. Finally, the fauna above the tree line is completely different. Diversity drops and only cold-tolerant species are present.

It can be inferred from the vegetation profile that the area lends itself to transect studies. Although most of the original vegetation of the Paraiba valley disappeared, and the coast has been altered, the slopes receiving rain of the Serra do Mar and the Serra do Matiguéra contain undisturbed mountain forests and mossy forests, and the campo above the tree line was also fairly untouched. The base at Pindamonhangaba was also ideal for starting transects up to the campo above the tree line. Extraction was carried out first by 48, later by 64 Berlese–Tulgren funnels of a basal area of 30 × 30 cm warmed by 100 W electric bulb from above. The movement of the animals out of the samples was terminated by the end of the third day, and samples were spread out in a thin layer, and hence lost completely their water content. Adding the supplementary collections made in Ceara, Goiania and Panatanal, a total of exactly 600 samples have been extracted from the 200 localities visited on three trips. Thus large series (sometimes over 1000 specimens) have been obtained of the dominant–subdominant oribatid species. It will take some time to completely study the material. In this paper we report our preliminary findings, our first impressions regarding the material, and some species identified so far. In recent years PÉREZ-IÑIGO and BAGGIO (1980, 1985, 1986, 1988, 1989, 1991, 1993) have carried out detailed studies on the taxonomy of the oribatid mites of the lowland tropical forest of São Paulo State, and they have shown that the area is suprisingly rich in endemic species. One of our objectives was to supplement this list with species from the higher altitudes. Primarily we wanted to know how much the oribatid fauna of the mountain forest, mossy forest and paramo correspond to the vegetation zones of the Andes range.

Studies on the world distribution of oribatid mites often refer to the so-called Gondwana theory (HAMMER and WALLWORK 1979). The species usually cited as examples are mainly from the higher altitudes, mossy forest or paramo species, the zonal distribution of which parallels that of the climate zones. On the other hand, most of the large mountains of tropical or subtropical climate are found in the southern continents. We believe that in order to elucidate the question involving the species and genera of the four main vegetation zones – tropical rainforest, montane forest, mossy forest and paramo need are compared separately. To do this, however, it is necessary to study the oribatid faunas of many tropical and subtropical sites that have not or hardly been studied. Because of these difficulties we will not deal with the Gondwana theory when discussing the distributions of oribatid mites, instead we will study the vegetation zones and their predominant climate. The WALTHER–LIETH climate diagrammes give us information about the yearly, and partly the daily changes in the macroclimatic conditions of the different zones. From these diagrammes one may infer what the tolerance of the fauna living there is like. In the the analysis of Berlese samples, the species of higher dominance values, the so-called characteristic species are very important. Although the oribatid species in the Berlese samples are represented often in great number of individuals, it is almost always possible to find a few characteristic species, which, combined with one or several species of high dominance value, distinguish the given sample from the rest of the Berlese samples. In essence this is how STRENZKE (1952) in Germany, and BECK (1963) in Peru studied oribatid assemblages. BECK's study was a pioneer work in the study of tropical oribatids in its concept, but could only achieve its goals partially since most of the South American oribatids were unknown or yet undescribed in those days. This example shows again that an animal group must be known taxonomically to a certain critical degree in order to draw ecological and taxonomic conclusions. In the table 17 genera and species groups have been compiled. Some of these are "Gondwana species" in HAMMER and WALLWORK's terminology. We have grouped the species according to altitude and vegetation zones.

1. *Malacoangelia, Archegozetes, Afronothrus, Allonothrus, Cyrthermannia*: are characteristic for tropical rainforest, have circumtropical distribution, all species occur in tropical rainforest up to a certain altitude in tropical montane forest.

2. *Platynothrus skottsbergi* group, *Platynothrus altimontanus* group, *Camisia, Crotonia, Holonothrus, Nodocepheus*: are found in the paramo region and in tropical rainforests (exceptionally in tropical montane forest), but absent from the Oriental Region (?). Perhaps these are the real "Gondwanan species".

3. *Eutegaeus, Anderemaeus, Maorizetes*: neotropical and Australian species. Occur in the paramo, mossy forest and in tropical montane forest.

4. *Hamotegaeus, Williamszetes, Hamobates*: species occurring exclusively in the Neotropic region (?), in the upper region of the paramo and the mossy forest.

It is noteworthy that from the first 10 species/genera of BECK's table 8 (except *Crotonia* and *Holonothrus*) reproduce parthenogenetically, being good colonizers and live mostly in disclimax habitats. They also have a relatively r-selected life history with high fecundity and short generation time. *Archegozetes*, which lives in the large tropical wetland of Brazil must be noted: in the Pantanal after the flood recedes, soon the dry land is populated by species in great abundance (P. BALOGH, unpublished data).

We are confident that the work of R. A. NORTON and his co-workers on the parthenogenesis of oribatid mites, besides the evolutionary and genetic significance, will shed new light on the oribatid assemblages living in the soils.

The types of these species are deposited in the "Balogh Collection" of the Zoological Department, Eötvös Loránd University, Budapest.

In the following a list of the so far identified species is given and a few new species of outstanding taxonomic importance are described.

Anderemaeus hidasii sp. n.
(Figs 1-3)

Measurements. – Length: 652–689 μm, breadth: 451–459 μm.

Prodorsum: Sensillus setiform, very long: almost as long as prodorsum; with very slightly dilated end. Setae *in* medium length, sparsely ciliate. Setae *ex* short, well observable; setae *le* and *ro* setiform. There is a sclerotized tubercle behind seta *in*. Costula converging apices near to each other. Subcosotulae almost parallel.

Notogaster: Dorsosejugal suture almost straight. Setae c_2 *(ta)* and p_1 setiform, medium length, the remaining notogastral setae about twice longer, sparsely ciliate and with fine, flagellate end. Notogaster neither foveolate nor granulate.

Ventral side: Type of *Anderemaeus*, i.e. 6 pairs of genital, 1 pair of aggeanital, 2 pairs of anal, 3 pairs of adanal setae. Except some genital setae all ventral setae short and fine. Fissurae *iad* apoanal, between setae *ag* and ad_3.

Material examined: Brazil, São Paulo, Serra do Mantiguéra, tropical montane forest about 1200–1300 m (BR.1990, B.44); holotype and 45 paratypes.

I dedicate the new species to Prof. José Hidasi, Director of the Natural History Museum of Goiania, Goiania.

Xenillus baggioi sp. n.
(Figs 4-8)

Measuremensts. – Length: 467 μm, breadth: 316 μm.

Prodorsum: Sensillus long, straight, bacilliform, apically with very short, scattered cilia. Setae *in* much shorter than sensillus, but about twice longer than notogastral setae. Setae *le* longer than notogastral setae, finely ciliate, originating on the surface of cuspis. Lamellar cuspis neither incised nor truncated, each ending in a triangular cuspis.

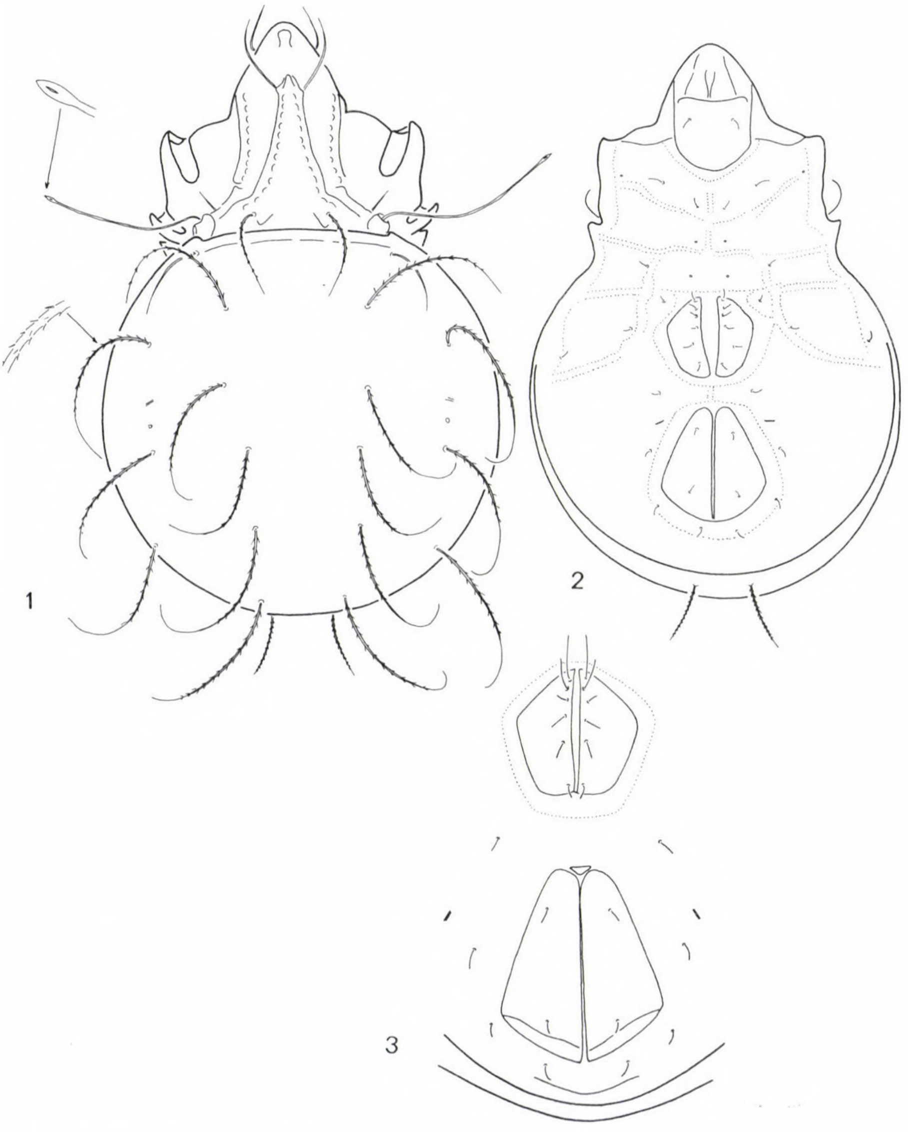
Notogaster: Ten pairs of short, straight notogastral setae with very small, scattered cilia. The shoulder setae (c_1 and c_2) similar to the remaining notogastral setae, but a little bit smaller. Notogaster sparsely and finely punctuate.

Ventral side: Type of *Xenillus*.

Material examined: Brazil, São Paulo, Serra do Ma, Caraugatatuba National Park, tropical montane forest with ferntrees and Bromeliaceae, about 1000 m (BR. 90, B.22); holotype, 10 paratypes.

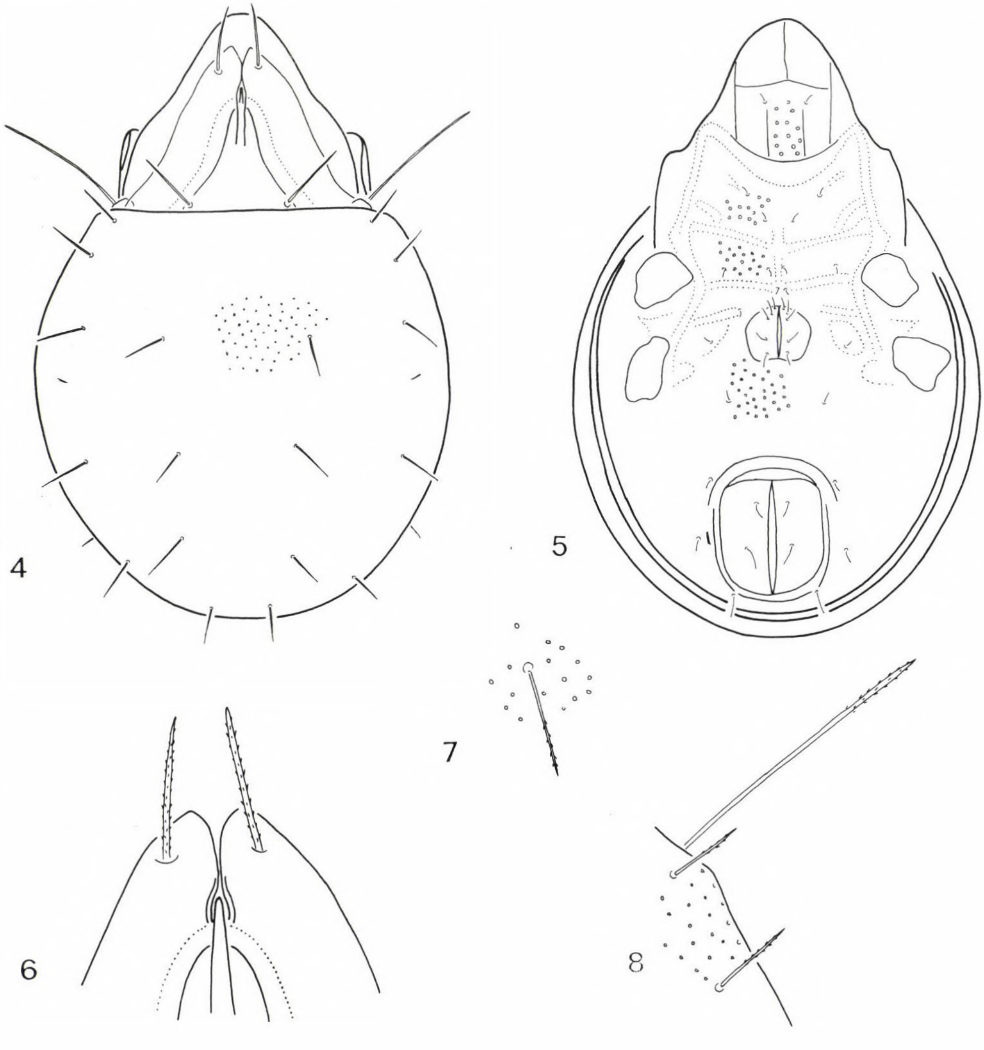
Remarks: Distinctive characters of the new species 1. Sensillus bacilliform, 2. short, straight notogastral setae with very small cilia, 3. lamellae with triangular cuspis, 4. setae c_1 and c_2 resembling remaining notogastral setae.

I dedicate the new species to Dr D. BAGGIO (Brazil), the renown specialist of South American oribatids.



Figs 1-3. *Anderemaeus hidasii* sp. n.: 1 = dorsal side, 2 = ventral side, 3 = anogenital region

Figs 4-8. *Xenillus baggioi* sp. n.: 4 = dorsal side, 5 = ventral side, 6 = lamellar cusps, 7 = sculpture of notogaster, 8 = sensillus and the shoulder part of notogaster



Rostrozetes perezinigoi sp. n.
(Figs 9-10)

Measurements. – Length: 496–527 µm, breadth: 496–504 µm.

Prodorsum: Sensillus long, with abruptly dilated, small, spherical head. Setae *in* very short, much shorter than lamellar and rostral setae.

Notogaster: 10 pairs of heterotrichous setae. Setae *lp* (=ms) long, thickened, straight, with obliquely truncated tip; h_2 ($=r_2$) very small, straight but thickened, setae *la (=te)* setiform, medium long, c_2 (=*ta*), *lm* (=*ti*), r_3 (=h_3) and h_1 (=r_1) setiform, short and the *p1, p2, p3* setae setiform and very short. Dorsosejugal suture with one arch. There is an almost circular crest originating from setae c_2 and touching setae *la* and r_3, then runing almost parallel with the posterior margin of notogaster. Notogaster densely tuberculate, pteromorphae with foveolae.

Ventral side: type of *Rostrozetes*, with wrinkles, tubercles and foveolae.

Material examined: Brazil, São Paulo, Ilha de São Sebastiano, Parque Estadual de Ilhabela, 8 May, 1990, tropical rainforest, altitude 350 m (BR. 1990, B. 20); holotype, 15 paratypes.

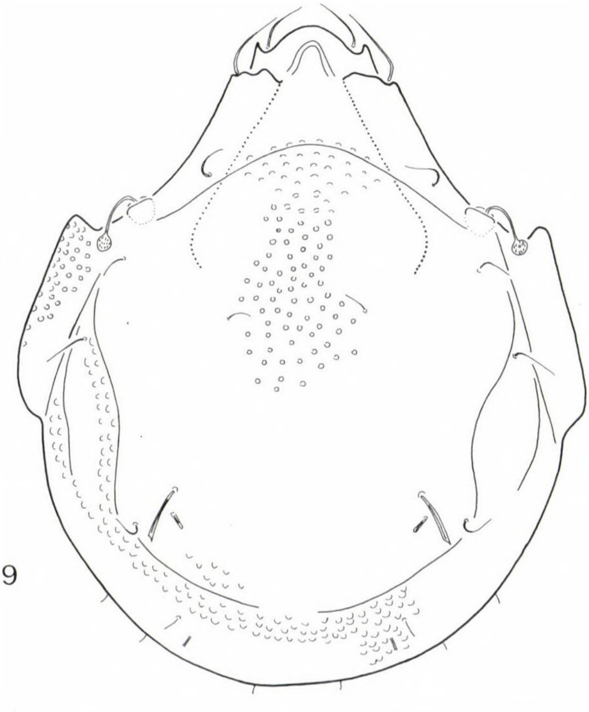
I dedicate the new species to Dr C. PÉREZ-IÑIGO (Spain) the excellent specialist of world oribatids.

Remarks: The type and position of setae *lp* and h_2 are unique in the genus *Rostrozetes*.

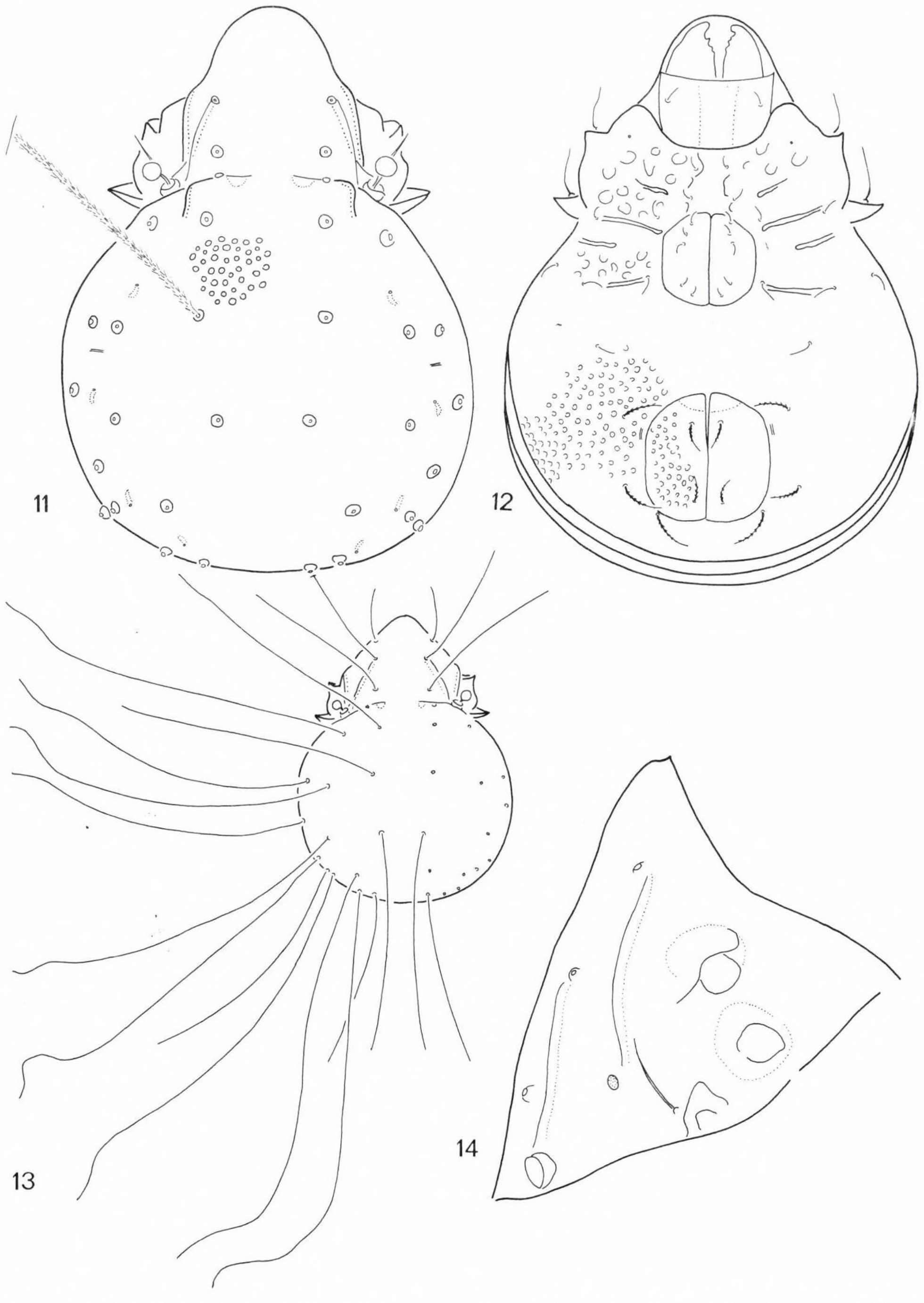
Stelechobates brazilianus sp. n.
(Figs 11-14)

Measurements. – Length: 480–525 µm, breadth: 324–480 µm.

Prodorsum: Sensillus short, with short stalk and small, black spherical head. Bothridium and lamellar setae connected by thin, converging lamellae. Setae *in* and *le* very long, longer than pro-



Figs 9-10. *Rostrozetes perezinigoi* sp. n.: 9 = dorsal side, 10 = setae *lp* and h_2



Figs 11-14. *Stelechobates brazilianus* sp. n.: 11 = dorsal side, 12 = ventral side, 13 = habitus, 14 = prodorsum from lateral side

dorsum; setae *ro* as long as lamellae, removed far from each other. Setae *ex* longer than sensillus. Prodorsum much broader than long (ratio about 9:6). Rostrum very broad, rounded. Sublamella well developed, prolamella absent.

Notogaster: Dorsosejugal suture medially interrupted, with a short costula (between the alveoli of setae c_1 and c_2). Sacculi *Sa, S1, S2* and *S3* short, tubular, hardly observable. Notogaster densely foveolate. Notogaster with 14 pairs of extremely long, blackish, densely pilose setae. Setae h_1 the shortest (about as long as the notogaster); setae c_1, *da, dm* and h_2 a little longer, the remaining setae about twice longer than notogaster.

Ventral side: Epimeral setal formula: 3-1-3-3.5 pairs of genital, 1 pair of aggenital, 2 pairs of anal, 3 pairs of adanal setae. Fissurae *iad* in adanal position in the lebel with 1st anal setae. Ventral and genital plates densely foveolate.

Material examined: Brazil, São Paulo, Serra do Mantiguéra, tropical rainforest, about 1200–1300 m, mosses on large trees, holotype, 2 paratypes.

Remarks: *Stelechobates megalotrichus* Grandjean, 1965 from Mexico has 2 pairs of short *p* setae and the foveolae on the notogaster are much smaller, punctiform.

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NOTES ON THE GENUS OREOVALGUS KOLBE (COLEOPTERA, CETONIIDAE: VALGINI)

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Oreovalgus cristatus (GESTRO, 1891) is shown to occur in Sumatra extending the distribution of the genus, previously confined to Borneo. A new species, *O. merkli* sp. n., is described from Kalimantan Barat (Indonesia). With 5 figures.

Key words: new species, *Oreovalgus*, Coleoptera, Indonesia

Having studied all the types and the available specimens preserved in various museums I do not have enough basis for a complete revision of the very interesting genus *Oreovalgus* owing to their small number collected so far. Future entomological research in Borneo is expected to bring forth many surprising findings. Presently, two interesting novelties are published hereunder which may contribute to our knowledge on this genus.

Abbreviations: BMNH – The Natural History Museum, formerly British Museum (Natural History), London, United Kingdom; CA – collection of Enrico Ricchiardi, Torino, Italy; HNHM – Hungarian Natural History Museum, Budapest, Hungary; MCSN – Museo Civico di Storia Naturale "Giacomo Doria" Genova, Italy; ZMHU – Zoologisches Museum der Humboldt Universität, Berlin, Germany.

Oreovalgus KOLBE, 1904

Type species: *Oreovalgus montuosicollis* KOLBE, 1904, by monotypy. General distribution: Borneo, Sumatra (new record).

Checklist of species

Oreovalgus bryanti ARROW, 1944 – Sarawak
    cristatus (GESTRO, 1891) – Sarawak, Sumatra
        = *montuosicollis* KOLBE, 1904 – South-East Kalimantan
    merkli sp. n. – Kalimantan Barat
    sandakanus MOSER, 1921 – Sabah

Affinities. As already emphasized by KOLBE (1904) and ARROW (1944) *Oreovalgus* is more closely related to the African Valgini than to the other Oriental genera.

Morphology. The specimens belonging to the genus *Oreovalgus* KOLBE can easily be distinguished by the following characters:

- fore tibiae in both sexes with four teeth;
- propygidial terminal spiracles at the middle of the side of propygidium in both sexes;
- female with a long pygidial stylus bent downwards.

Oreovalgus cristatus (GESTRO, 1891)

Valgus cristatus GESTRO, 1891
Oreovalgus montuosicollis KOLBE, 1904
Oreovalgus cristatus: SCHENKLING, 1922; ARROW 1944; KRIKKEN 1978, 1986.

Material examined. Holotype, male: Malaysia, Sarawak, ex coll. G. Doria (MCSN).

Other studied specimens: South-East Borneo (male, type of *O. montuosicollis* KOLBE, 1904, ZMHU); Malaysia, Sarawak, Puak, 6.V.1914, leg. G. E. BRYANT (1 female, BMNH); Sumatra, Harau Valley env., II.1991, leg. S. JAKL (2 males, CA); Sumatra, Harau Valley, IX.1991, leg. BODYANS (8 males, CA); Sumatra, Harau Valley, Payakumbuh, leg. E. MARLIN (1 male, CA); Harau Valley env, 3.IV.1991, leg. S. JAKL (1 male, CA); Sumatra, Singgalang, Padang-Panjang, III.1992 (4 males, CA).

Remarks. The specimens found in Sumatra considerably extend the known range of the species and the genus, previously it has been known only from Borneo. Slight differences with the holotype do not justify, in my opinion, the separation of a subspecies.

Oreovalgus merkli sp. n.
(Figs 1-5)

Material examined. Holotype, male: Indonesia, Kalimantan Barat, Gunung Palung National Park, Cabang Panti research site, 1°13'S, 110°7'E, lowland rainforest, swept & beaten, No. 11, 18-26.VII.1993, leg. O. MERKL (HNHM).

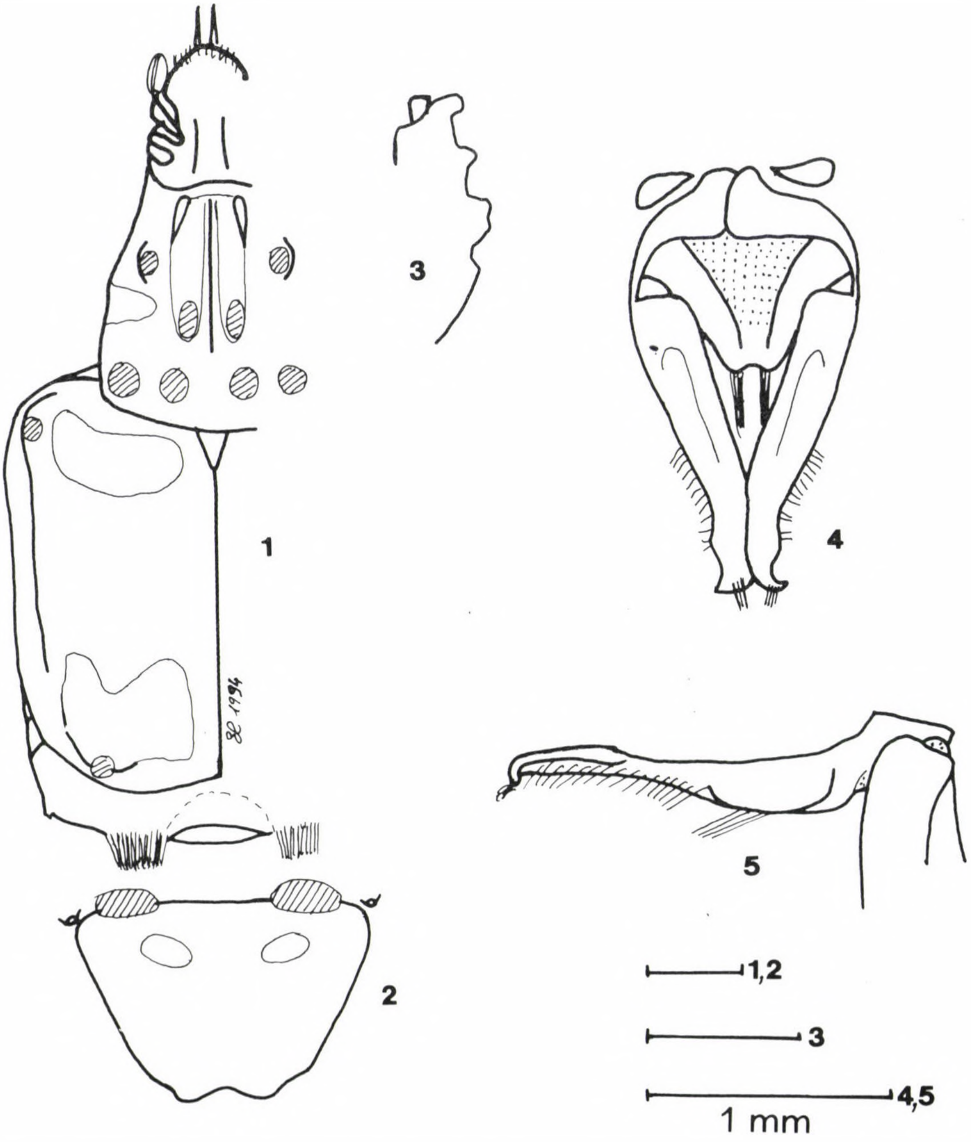
Description. Length (between fore border of pronotum and hind border of propygidium) 7 mm, width (maximum width of elytra) 4,4 mm. Ground colour black. Habitus as in Fig. 1.

Head covered by scattered, semierect, lanceolate, orange scales. Clypeus rounded anteriorly and with setiform scales. Suctorial brush very long.

Pronotum tapering anteriorly, with sides not crenulate. Hind angles rounded. Posterior border evenly curving toward scutellum. Median carinae situated on a parallel-sided obsolete elevation, well raised anteriorly, but short, not reaching the anterior border of pronotum ending at hind quarter of pronotal length. Lateral carinae well noticeable, short but not pointed, dentiform. At the elevation ends, on the lateral carinae, a small tuft of black scales. Four similar tufts of scales are at the posterior border of pronotum. Zone around prescutellar area covered by semierect, lanceolate, orange scales.

Scutellum short, tapering, rounded apically, covered by orange scales.

Elytra covered by semierect, lanceolate, dense black scales forming black tufts on the anterior umbones. Disc with two isolated areas each of mixed orange and black scales between anterior umbones and scutellum and between posterior umbones and suture. The latter area forms an orange tuft on the posterior umbones.



Figs 1-5. *Oreovalgus merkli* sp. n., holotype: 1 = habitus, 2 = pygidium, 3 = right anterior tibia, 4 = paramera, dorsal view, 5 = paramera, left lateral view

Propygidium, with conical spiracles situated at the middle of propygidial length, covered by lanceolate, dense and semierect black scales forming two tufts of black scales on the hind border. Scales ochraceous between the two scale tufts.

Pygidium (Fig. 2) slightly narrowing posteriorly, with a round, large apical emargination. Surface covered with ochraceous scales, similar to those on propygidium. Anterior half with two small, isolated areas covered by black scales. Ventral side covered by black scales, ochraceous on sternites and on the posterior part of mesosternum.

Legs, including tarsi, covered with black scales, being orange-ochraceous on anterior border of hind femora. Fore tibiae with four external teeth, second tooth blunt and wider, the others pointed but not sharp (Fig. 3). Middle tibiae lacking the central external tooth. First segment of hind tarsi twice longer than second. Paramera as in Figs 4-5.

The new species is easily distinguished from its congeners by the colour pattern and the general body shape. Another distinctive feature is the emargination of the pygidial apex. The paramera are also very characteristic.

Derivatio nominis. This new species is dedicated to Dr. O. MERKL, curator of the Coleoptera Collection, HNHM. I am indebted to him for having sent me for study this interesting specimen collected by him in Borneo.

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MORPHOLOGY OF PERISCELIS ANNULATA THIRD INSTAR LARVA AND TURANODINIA TISCIAE LARVA AND PUPARIUM (DIPTERA: PERISCELIDIDAE AND ODINIIDAE)

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Third instar larvae of *Periscelis (Myodris) annulata* (FALLÉN) and *Turanodinia tisciae* (L. PAPP) as well as puparium of the latter are described and illustrated. Larval characteristics of these two families are discussed. *Turanodinia* STACKELBERG, 1944 is re-established as a genus. With 16 original figures.

Key words: Periscelididae, Odiniidae, *Periscelis (Myodris)*, *Turanodinia*, developmental stages, larva, puparium

In the course of the preparatory works for the new *Manual of Palaearctic Diptera*, where larval morphology is one of the priorities, also several undescribed larvae preserved in the collection of the Hungarian Natural History Museum were studied. Following the description of some heleomyzid larvae and puparia (PAPP 1994), some developmental stages of one species each of the families Periscelididae and Odiniidae were studied, described and illustrated. Summarily, a list is given of those features, which are thought to be common characters for these two families.

The cyclorrhaphan larvae possess not much less numerous external morphological features (incl. those of the cephalopharyngeal skeleton, cf. PAPP 1994) than the imagoes of the same species but several larval features are much smaller compared to the body size. Most of the illustrations published in the past decades are less detailed and were prepared under lower magnification (in some cases even misleadingly poor) than required for a modern comparison. Below comparisons only to those former works are made, which include illustrations detailed enough in our sense. HENNIG's (1952) compilation of the literature on the developmental stages is still an important handbook for all. SMITH (1989) published another useful compilation for the immature stages of British flies. FERRAR's (1987) excellent work on the breeding habits and immature stages of cyclorrhaphan Diptera is and will be one of the most important handbooks for dipterists and applied entomologists. However, it goes without saying that they could not be more accurate than the original publications.

PAPP (1987) described *Odinia (Turanodinia) tisciae* as a new species based on imagoes only, although larvae and puparia had been collected together with the imagoes. Contrarily, larvae collected together with the imagoes of *Periscelis kabuli* L. PAPP, 1988, were included among the paratypes of that species.

The larvae and puparia described below are preserved in 70% ethyl alcohol and kept in a refrigerator at 5 °C in the Department of Zoology, Hungarian Natural History Museum, Budapest (killed in boiling water but minute wood particles adhered to some of them). Preparations were made by sodium-hydroxide, or only muscles were removed from cephalopharyngeal skeletons.

PERISCELIDIDAE

Periscelis (Myodris) annulata (FALLÉN, 1820)
(Figs 1-7)

Third instar larva

Body 3.2 to 4.1 mm long, dorsoventrally strongly flattened (Fig. 1) with numerous long setose protuberances, 0.75 to 1.35 mm wide at middle. Body white or partly transparent (mainly on cephalic and thoracic segments) but seemingly coloured owing to pale grey or light brown wood particles glued to the setae of tubercles.

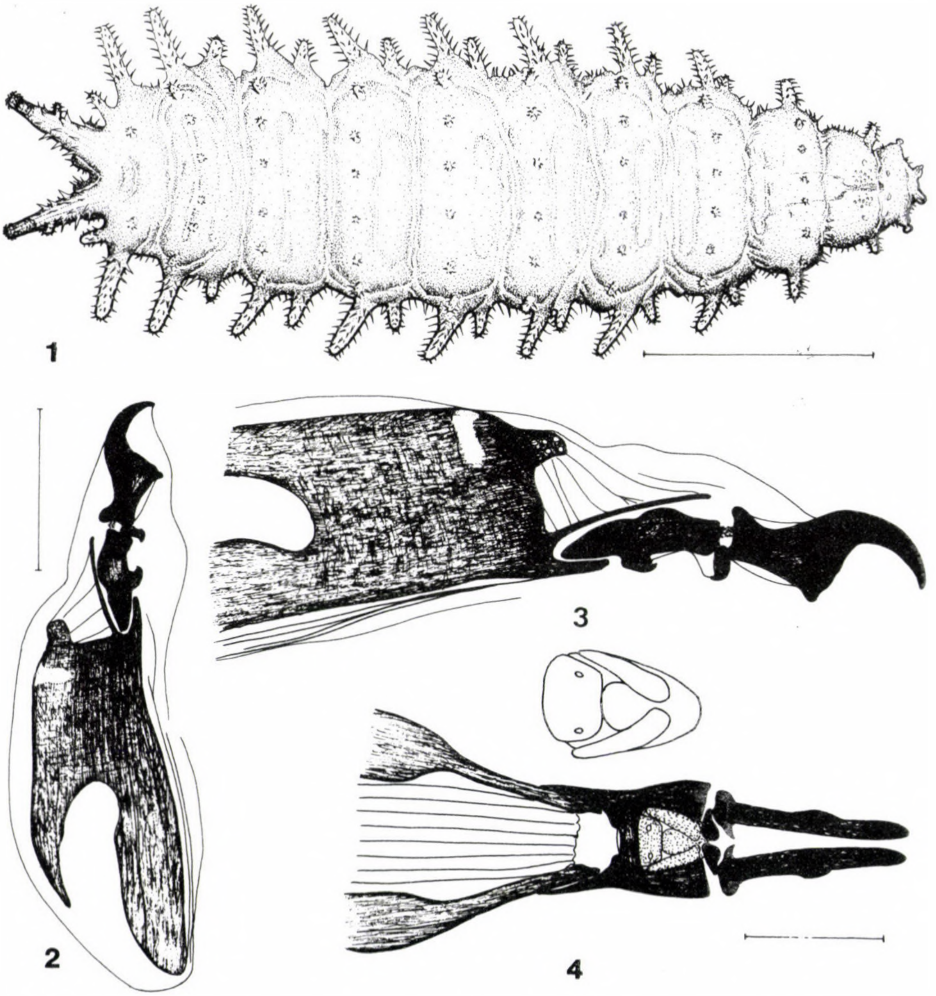
Antennomaxillary lobes distinct though very small (*not* to be misinterpreted for the pair of protuberances of the cephalic segment), conical, well above oral opening; oral ridges very shallow. Cephalic segment with 3 pairs of short, bulbous and spiculate tubercles (Fig. 5). Anterior (prothoracic) spiracles opening (Fig. 6) on a big obtuse tubercle each, spiracle itself short bearing some very short bulbous papillae (i. e. different from Fig. 73 of TESKEY 1976). First and second thoracic segments with one pair, third thoracic and abdominal segments with 2 pairs of setiferous lateral tubercles each (Figs 1, 5): anterior ones half as long as posterior ones. First thoracic segment with 2 pairs, second and third thoracic segments and six abdominal segments with 3 pairs of dorsal setiferous bulbs each (only one pair on the 7th abdominal segment). Posterior spiracles (Figs 1, 7) widely separated on a pair of long (0.42-0.44 mm) spiculate tuberculate processes arising caudally (and somewhat dorsally) on terminal abdominal segment. Other spiculate tubercles on body differing from spiracular tubercle only in the latter being longer but their tracheal structure also visible without dissection. Tip of spiracle with fully lateroclinate short hairs.

Cuticle covered all over with small spinules save tubercles. Creeping welts rather small (or not even discernible) on anterior ventral margins of all abdominal segments. Minute spinules on welts. Subanal pads very small but a pair of inflated white protuberances can be extroverted from anus (seen on four specimens here).

Cephalopharyngeal skeleton (Figs 2-4) rather characteristic: body robust, dorsal cornu obviously shorter than ventral one, dorsal bridge with several holes laterally, parastomal bar extremely long thin and almost straight (Figs 2, 3), only slightly inclinate in dorsal view; hypopharynx robust with a strong ventral process at middle, but tapering posteriorad in ventral view (Fig. 4), a weakly sclerotized complex labial sclerite medially; dental sclerite small but distinct (*not* fused with mandible); mandible with extremely strong posterior part, a very strong ventral process between apical and basal parts *and* a pair of strong dorsal and ventrobasal processes each at caudal end.

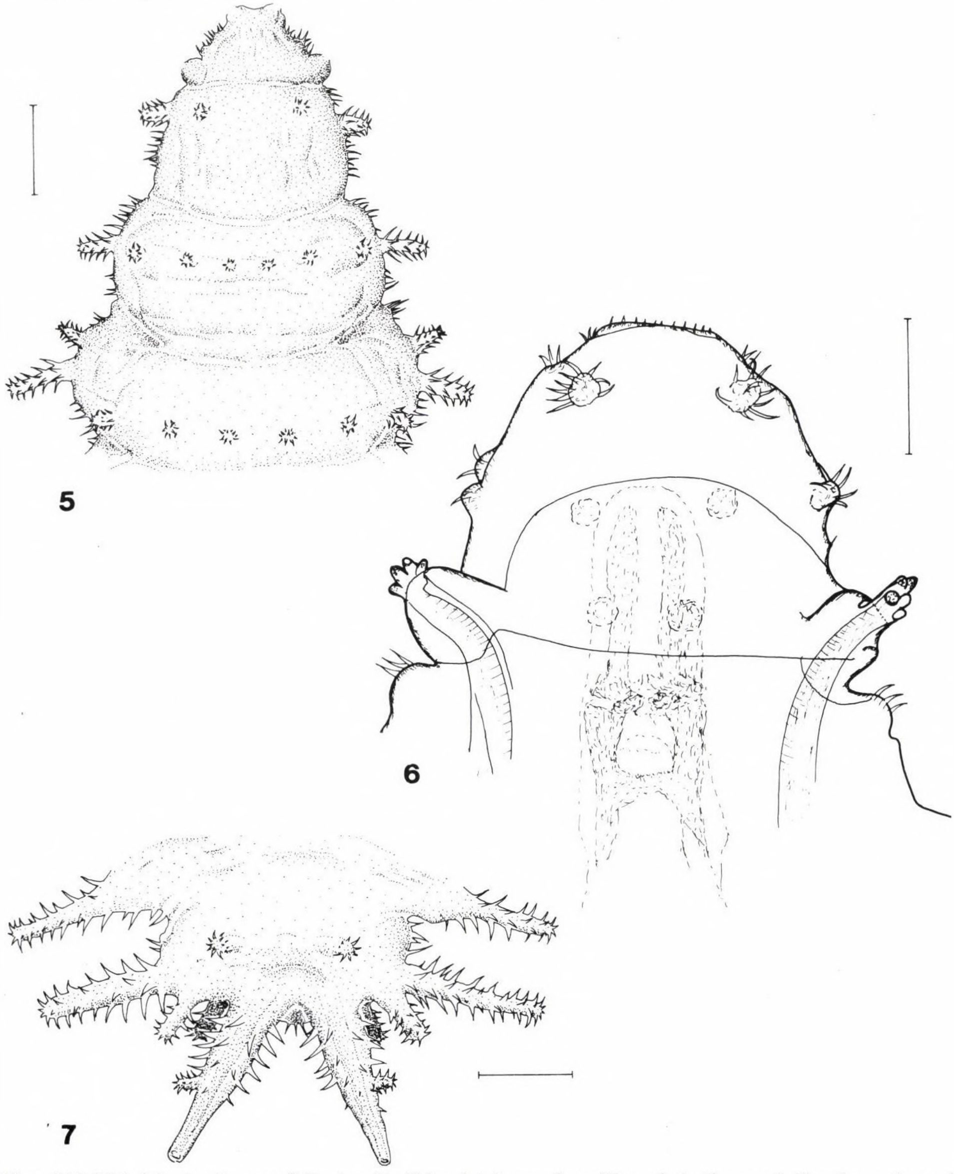
Material studied: 9 ex. L3: Budapest, Pest[szent]lőrinc, Péterhalmi-erdő [forest], szilfa kicsorgó nedvéből [from oozing sap of an *Ulmus* tree], 1991. jún. 29., leg. PAPP L.

In contrast to former questionableness, I think now, DUDA's (1934) reproduction of HEEGER's figure on "*Drosophila variegata* FALL.", which he published as "*Microperiscelis Heegeri* n. nom." and mentioned also by HENNIG (1952), and reproduced by FERRAR (1987, Fig. 62.4)) is really the larva of a periscelidid but not suitable for identifying it to species. The larva of *P. annulata* has repeatedly been mentioned in the literature but all those are based on the same single specimen: TESKEY (1976) depicted and described the larva of *Periscelis*



Figs 1-4. Third instar larva of *Periscelis (Myodris) annulata* (FALLÉN): 1 = habitus in dorsal view, 2-4 = cephalopharyngeal skeleton: 2 = laterally under lower magnification, 3 = cephalic part laterally, 4 = same, ventrally. Scales: 1.0 mm for Fig. 1, 0.1 mm for Figs 3, 4, 0.2 mm for Fig. 2

(Myodris) flinti (MALLOCH, 1915) under the name of *P. annulata* (FALLÉN). MCALPINE (1987*b*), FERRAR (1987) and SMITH (1989) reproducted only the figures of TESKEY (1976). The two species which distinctly differ in some male genital structures (this will be discussed in a subsequent paper of W. N. MATHIS and L. PAPP), are similar to each other in the larval instars.



Figs 5-7. Third instar larva of *Periscelis (Myodris) annulata* (FALLÉN): 5 = cephalic, thoracic and first abdominal segments in dorsal view, 6 = anterior spiracles, 7 = caudal segments with posterior spiracles in dorsal view. Scales: 0.1 mm for Fig. 6, 0.2 mm for Figs 5, 7

In the course of present study these larvae were compared to the larvae of *Periscelis (Myodris) kabuli* L. PAPP, 1988. It was found that the anterior lateral processes of segments of *P. annulata* are half the length of the posterior ones (or a little longer than their half length), while the anterior lateral processes of *P. kabuli* are less than half the length of the posterior ones (Fig. 1, cf. Fig. 15 of PAPP 1988). The spiracular projections of *P. annulata* are somewhat longer and distinctly thicker than in *kabuli*: near base they are thicker than the distance of bases of the pair (in *P. kabuli* they are definitely thinner than distance of bases). *P. flinti* seems closer to *P. annulata* in this respect. The parastomal bar of the third instar larva of *P. kabuli* is a little longer than in the two larvae of *P. annulata* studied (Figs 3, 4 cf. Figs 16, 17 of PAPP 1988) but I do not know how reliable this difference is.

Larvae of the periscelidid genera are little known (actually we know only larvae of the three species of the subgenus *Periscelis (Myodris)*), we venture to summarize some characteristics which apparently define the family Periscelididae, since they are so much different from the related families. The common features are: 1) body strongly flattened dorsoventrally; 2) all body segments with fleshy digitiform processes laterally and with several other bulbous processes, all processes with large, partly curved spinules; 3) subanal pads indistinct (but there is a bifid inflated protuberance which can be extroverted from anus in *P. annulata*); 4) anterior spiracles short, bulbiform with 5(4) small bulbous papillae; 5) posterior spiracles (with lateroclinate intraspiracular hairs) on a pair of very long diverging spiracular processes; 6) cephalopharyngeal skeleton with robust body (pharynx); 7) mandibles very strong composed of a curved apical part and a robust basal (posterior) part and with one pair of ventrobasal, midventral and dorsal processes each; 8) extremely long and thin parastomal bar; 9) well sclerotized dental sclerites and weakly sclerotized but complex labial sclerite; 10) dorsal cornu much shorter than ventral; 11) ventral cornu robust but simple.

ODINIIDAE

Turanodinia tisciae (L. PAPP, 1987)
(Figs 8-16)

Odinia (Turanodinia) tisciae L. PAPP, 1987: 287-288.

Third instar larva

Body (Fig. 8, 12) slender, silky white, S-curved in lateral view; borders of segments *not* defined dorsally, with 6 pairs of large creeping welts. Posterior spiracles on short dorsal projections, subanal pads large bulbous and enlarged laterad, i.e. sausage-shaped (Figs 8, 12, 14). Body length 2.71-3.20 mm, only 0.25 to 0.375 mm thick at middle.

Cephalic segment comparatively very long and narrow. Antennomaxillary lobes indistinct; antennal sensory papilla and maxillary sensory papilla very short, just above oral opening; oral ridges dense and shallow, there are rather long thin and curved hairy perioral papillae at mouth opening (Fig. 10).

Cephalopharyngeal skeleton (Fig. 9-11)

Mandibles (mouth hooks) with a simple curved digitiform apical part, basal part of an intricate form: with a large curved midventral process (Figs 9, 10), with a high though not thick dorsal process at caudal end and with another large caudal process; dental sclerite black and dentiform indeed placed between the processes of mandible (Fig. 10); labial sclerite a complex but less sclerotized structure between anterior arms of hypopharynx; hypopharynx though H-shaped as usual, curved at middle in lateral view, posterior arms long and tapering posteriorad (Fig. 11); parastomal bar long and thin, apex not reaching apex of hypophaynx (Fig. 10); pharyngeal sclerite rather narrow and pale together with cornua; dorsal bridge not much extended cranially; dorsal cornu comparatively long and not much narrowed posteriorly; ventral cornu very long *without a subbasal protrusion* (all the other known odiniid genera with a protrusion) and with a dark "eye" subapically. Pharynx with deep longitudinal ridges.

Cuticle smooth without small spinules (not even on area around posterior spiracles).

Large creeping welts on anterior ventral margins of the 2nd to 7th abdominal segments, no such welts on thoracic segments. Spinules of welts comparatively strong and curved, in 4 transverse rows. Size and shape of subanal pads readily characterize these larvae: very large also in comparison to the *Odinia* species (cf. Fig. 6/3 of KRIVOSHEINA 1979), their longitudinal axis perpendicular to that of the body.

Anterior spiracles (Fig. 15) on very short bulbous protuberances, each with 6 openings (like in some species of *Odinia)*.

Posterior spiracles (Fig. 14) not separated on short convergent processes, with 3 openings. Spiracular hairs not observed.

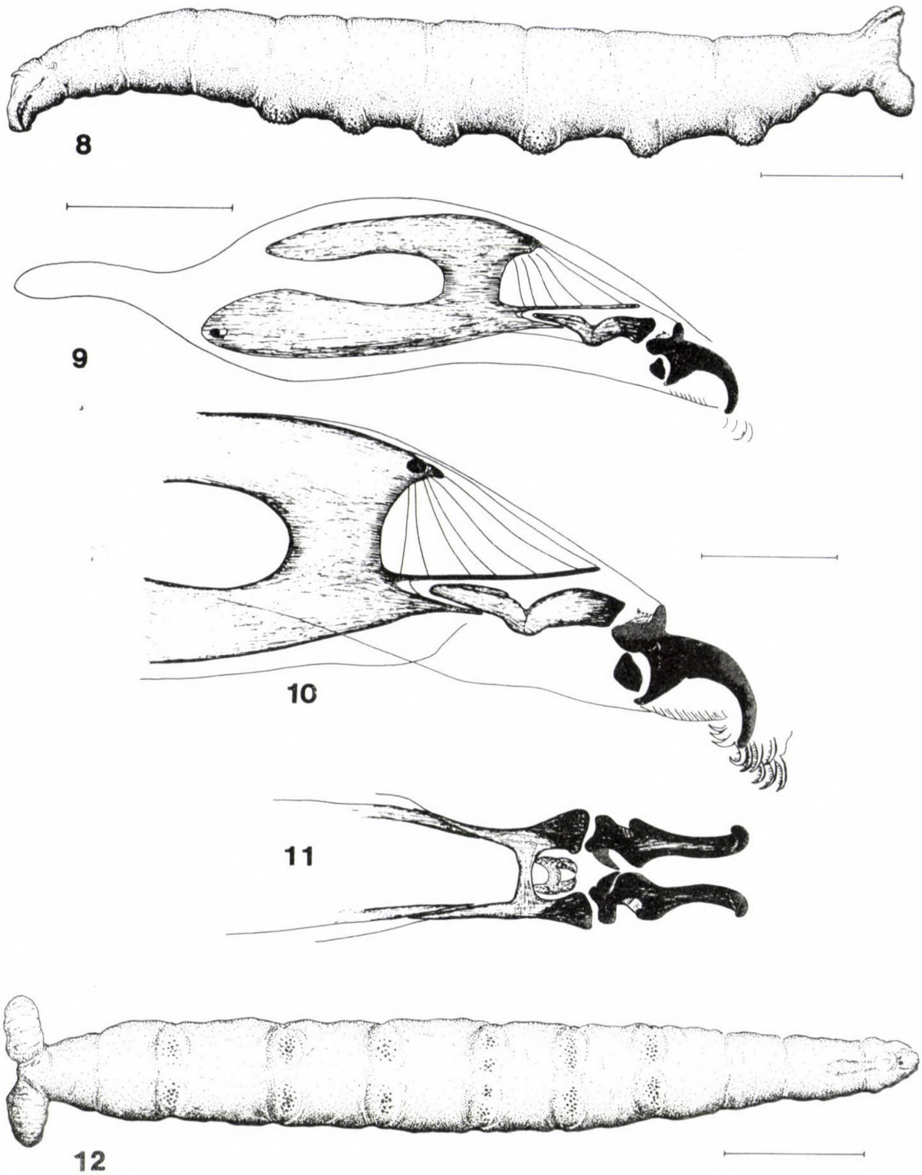
Morphological features of *Turanodinia tisciae* larvae do not reflect any predatory adaptation.

Puparium (Fig. 16)

Light brown, or only ochreous, barrel-shaped but slightly dorsoventrally depressed/flattened, 1.67-1.96 mm long, its diameter at middle 0.67-0.75 mm; anterior spiracle most cranial; subanal pads minute, i.e. shrunken during pupariation. Posterior spiracles on a short tubercle, i.e. they keep their subcubic shape.

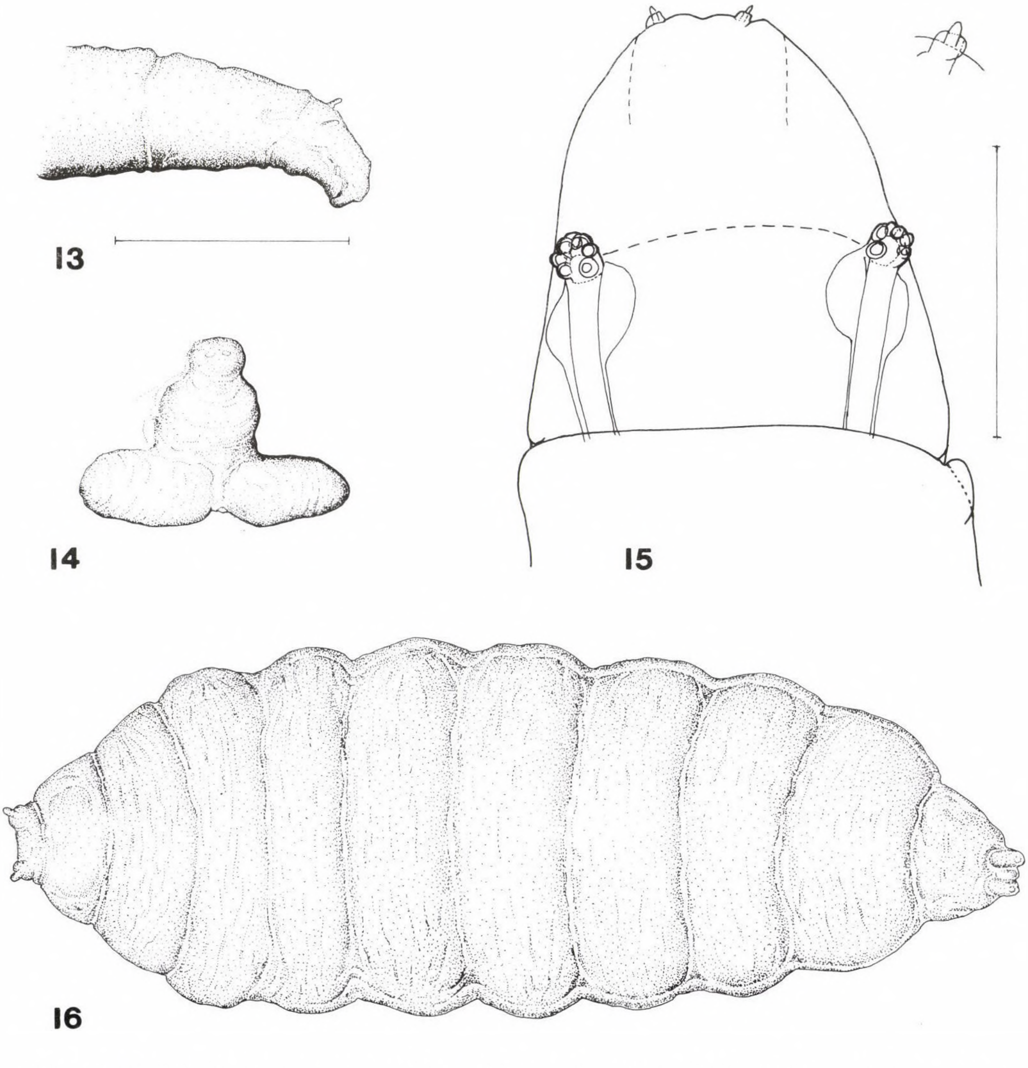
Material studied (all collected by L. PAPP): 2 ex L3, 10 ex. P, 9 pupal shells: Lakitelek, Tőserdő, fehér nyár kicsorgó nedvéből [from oozing sap of a poplar tree (*Populus alba*)], 1978.V.25.

Turanodinia STACKELBERG, 1944 was described as a monotypic genus based on the species *coccidarum*, which was described on the basis of a single specimen. When describing the second species, PAPP (1987) regarded it only as a subgenus of *Odinia* ROBINEAU-DESVOIDY, 1830, since the reduction of hind crossvein in *Turanodinia* is not a synapomorphy (found also in some species of *Odinia*). KRIVOSHEINA's (1979) distinction, namely the difference in the shape of the flagellomere and in the form of radial vein R_{4+5}, however, seems reliable. Furthermore, some additional good differences are found now in the morphology of the larvae: the larvae of *T. tisciae* possess extremely large subanal pads but there is no subbasal protrusion on dorsal edge of ventral cornu. Thus, *Turanodinia* STACKELBERG, 1944 is re-established as a genus.



Figs 8-12. Third instar larva of *Turanodinia tisciae* L. PAPP: 8 = habitus in lateral view, 9-11 = cephalopharyngeal skeleton: 9 = laterally under lower magnification, 10 = cephalic part laterally, 11 = same, ventrally; 12 = habitus in ventral view. Scales: 0.5 mm for Figs 8, 12, 0.2 mm for Fig. 9, 0.1 mm for Figs 10, 11

Larvae of a number of odiniid genera have been studied hitherto. There are descriptions and figures on larvae of several species of *Odinia* (*O. czernyi, O. foliata, O. meijerei* and *O. xanthocera*) published so far (KRIVOSHEINA 1979, LEWIS 1979, FERRAR 1987, SMITH 1989) and also on puparia (*O. foliata, O. meijerei, O. xanthocera*). SHEWELL (1960) published good figures on the larva and puparium of *Traginops irrorata* COQUILLETT, 1900. The three figures on the



Figs 13-16. Third instar larva and puparium of *Turanodinia tisciae* L. PAPP: 13 = cephalic and thoracic segments in lateral view, 14 = posterior end caudally, 15 = anterior spiracles, 16 = puparium in dorsal view. Scales: 0.5 mm for Figs 13-14, 16, 0.2 mm for Fig. 15

larvae of *Neoalticomerus seemansi* SHEWELL, 1960 are the same in SHEWELL (1960), in TESKEY (1976) and in MCALPINE (1987*a*).

Although some of the figures published are not detailed enough, several common characteristics still seem to define the larvae of the family Odiniidae. They are e.g.: 1) body cylindrical and rather S-shaped in lateral view; 2) thoracic segments, first and last abdominal segments without creeping welts, the 6 pairs of welts bear large curved spinules in 4(3) rows; 3) subanal pads distinct or very large and bulbous or even sausage-like; 4) anterior spiracles very short, knob-like with 6 to 11 comparatively small openings; 5) posterior spiracles (without intraspiracular hairs or with a group of thin hairs) close to each other or even converging into a dorsal projection; 6) cephalopharyngeal skeleton slender, dark pigmented on the cephalic parts only (mandibles, dental sclerite, anterior part of hypostomal sclerite); 7) mandibles slender curved with distinct ventral dorsal and caudal processes; 8) long and thin parastomal bar; 9) distinct well sclerotied dental sclerites and weakly sclerotized but complex labial sclerite; 10) dorsal cornu long though of various shapes; 11) ventral cornu very long or even robust with (or in *Turanodinia without*)a subbasal protrusion.

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DESCRIPTION OF A NEW MADELEINEA (LEPIDOPTERA, LYCAENIDAE) SPECIES FROM ECUADOR*

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A polyommatine lycaenid is described from the high Andean region of Ecuador: *Madeleinea carolityla* (type locality: Quillo Turo, Pululahua Geobotanical Reserve, Pichincha Province). The newly discovered species belongs to the *koa*-group of *Madeleinea*, sympatric and synchronic with its very recently described congener *Madeleinea nodo* BÁLINT & JOHNSON. The complete checklist of the *Madeleinea* species is given.

Key words: Andes, Lycaenidae, diversity, *Madeleinea nodo*, paramo

INTRODUCTION

Recently the genus *Madeleinea* BÁLINT, 1993 was revised by us (BÁLINT and JOHNSON 1994*c*). Fifteen species were distinguished and divided into three species groups.

The "*lolita* species-group" includes two taxa, restricted to high mountains of Peru. The "*moza* species-group" occurs in the southern range of the genus while the "*koa* species-group" is more widely distributed, ranging from Lake Titicaca region throughout the high Andean Peru and Bolivia north to the Colombian paramos. All three species-groups are sympatrically found in the high mountain regions of Peru.

The "*koa* species-group" comprises four species of which three were recently recognized by BÁLINT and JOHNSON (1994*c*), whilst the historically confused status of the oldest taxon, described in 1876 as "*Lycaena koá*", was also convincingly clarified by lectotype designation.

The present paper describes a new member of the "*koa* species-group". Attention is drawn to the importance of the high mountainous Ecuador regarding the Neotropical polyommatine diversity.

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* Polyommatine lycaenids of the oreal biome in the Neotropics, part IV.

MATERIALS AND METHODS

Collections. Extensive material was compared from unelaborated historical samples at the American Museum of Natural History (AMNH) and the Natural History Museum (BMNH) (see BÁLINT 1993 and BÁLINT and JOHNSON 1994*c*). Very recently material from surveys of preserves in the mountainous parts of Ecuador by G. KAREOFELAS and C. WITHAM became available for study. The specimen, serving to be the holotype of the new taxon described below, originates from the 1992 expedition, which also discovered the holotype of *Madeleinea nodo* BÁLINT & JOHNSON, a closely related congener.

Genitalia dissections. Drawings of genital structures were prepared by using conventional binocular microscopy. Dissections are stored in glycerin vials deposited at the relevant institution based on the number sequence of the senior author.

Terminology. For brevity, morphological terminology follows that of the previous parts of the series (BÁLINT and JOHNSON 1994*a*, 1994*b* and BÁLINT and LAMAS 1994).

Madeleinea carolityla BÁLINT & JOHNSON sp. n.
(Figs 5, 6 and 13)

Diagnosis: Superficially highly similar to *M. nodo* but VHW with superficial appearance resembling *Itylos* DRAUDT, 1921 (cf. BÁLINT and JOHNSON 1994*b*). Male genitalia resembling the subclade including the taxa *M. nodo, M. odon* and *M. koa* but with prominently straight, short uncus and large gnathos, aedeagus with conspicuously short subzonal part; anterior lobe valva larger than that of other taxa of the subclade.

Description: FW length: 9.5 mm (Holotype). Male DW ground unicolorous napoleon blue (MAERZ and PAUL 1950: Pl. 44/c12), veins gleaming, wide marginal border black and very wide. VFW ground gray with basal suffusion of hathi grey coloured scales (MAERZ and PAUL, op. cit., Pl. 37/c1) and white postmedian row of spots. VHW ground hathi grey with postmedian row of ruptive white spots.

Male genitalia: Uncus shorter than in *M. nodo* or *M. odon*, gnathos very strong with smaller humerulus; aedeagus with suprazonal element twice longer than subzonal; valvae large with a high Baird's angulation and conspicuously large anal lobe.

Female: Unknown.

Type material: Holotype, male, labelled as: "Holotypus, Madeleinea carolityla, det. Bálint and Johnson, 1994, October 28., Budapest; #. 504, Quillo Turo, 2700 m, Pululahua Geobotanical Reserve, Pichincha Province, Ecuador, 17.I.1992, leg. G. Kareofelas and C. W. Witham; gen. prep. No. 543, Bálint", deposited AMNH.

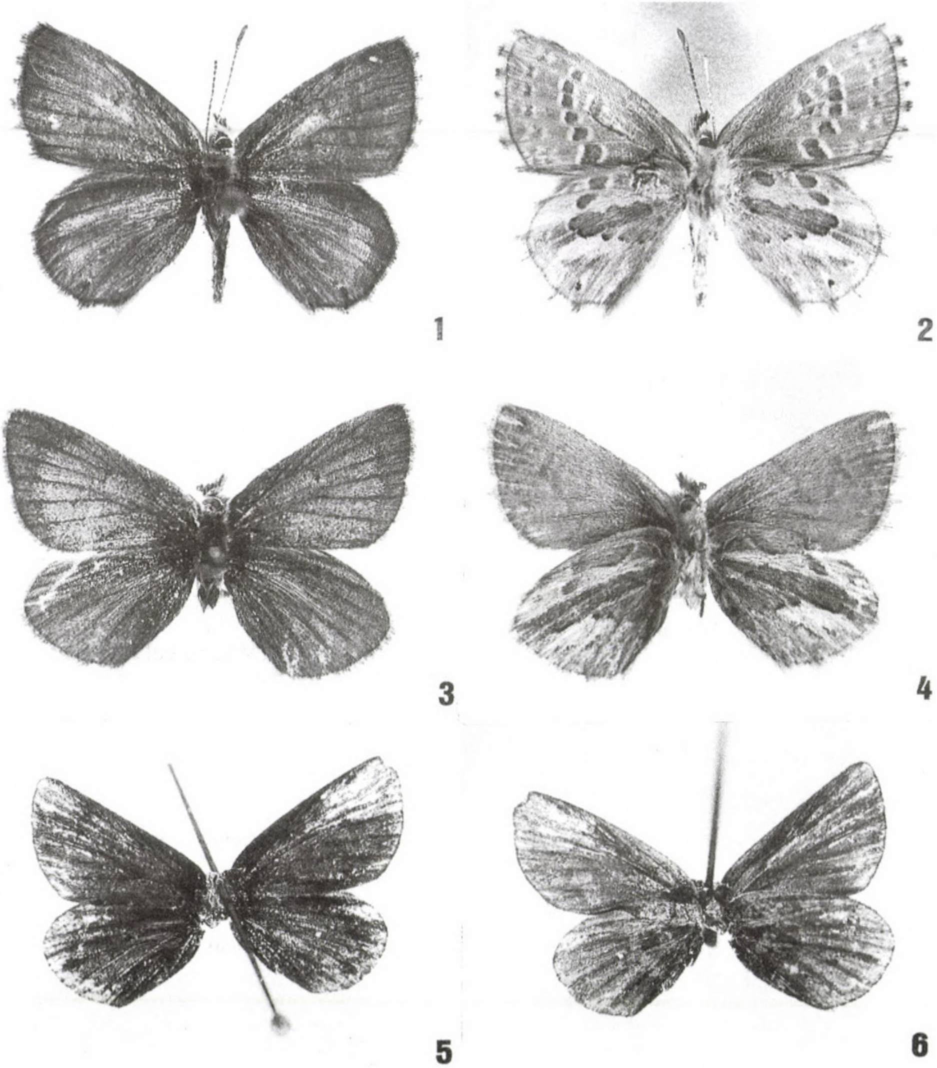
Type locality: Ecuador, Pichincha Province, Pululahua Geobotanical Reserve, Quillo Turo.

Distribution: Spatial – currently known only from the type locality, at high elevation (2700 m). Temporal – the holotype specimen was collected in January.

Biology: The holotype specimen was caught flying at noon in full sun. The general habitat, paramo/forest ecotone, is similar to that in which *M. nodo* flies. The biotope is comprised of a moist paramo vegetation that ends abruptly at an open, rocky, steep slope. The trail then goes over a small saddle into a moist, bamboo dominated, cloud forest (notes of C. W. WITHAM and G. KAREOFELAS).

Etymology: The name is a noun, considered feminine. *Carol* – the new species is dedicated to CAROL W. WITHAM, the collector of the holotype specimen. *Ityla* – a feminized name of *Itylos* (cf. BÁLINT and JOHNSON 1994*b*), referring to the somewhat superficially similar appearance.

Remarks: The specimen was damaged in the envelope most probably by *Anthrenus* larvae. Accordingly almost the whole thorax is missing, so the wings were again fixed by fluid glue to the remnants of the thoracal segments. The vinculum of the male genitalia was also strongly destroyed thus the whole structure felt into three parts when the dissection was prepared: gnathos and uncus with lateral process of tegumen, aedeagus and valvae with juxta.



Figs 1-6. The members of the *koa* species-group of *Madeleinea* BÁLINT: 1 = *M. koa* (DRUCE), male, dorsal (La Oroya, Peru, HNHM), 2 = same, ventral; 3 = *M. odon* (BÁLINT & JOHNSON), holotype male, dorsal (AMNH), 4 = same, ventral; 5 = *M. carolityla* sp. n., holotype male, dorsal (AMNH), 6 = same, ventral

DISCUSSION

Key to male genital structures of taxa comprising the koa *species-group*

1 Aedeagus with suprazonal element elongate, uncus sligthly pointed and with relatively parallel edges (Figs 1, 2 and 11) *M. koa*

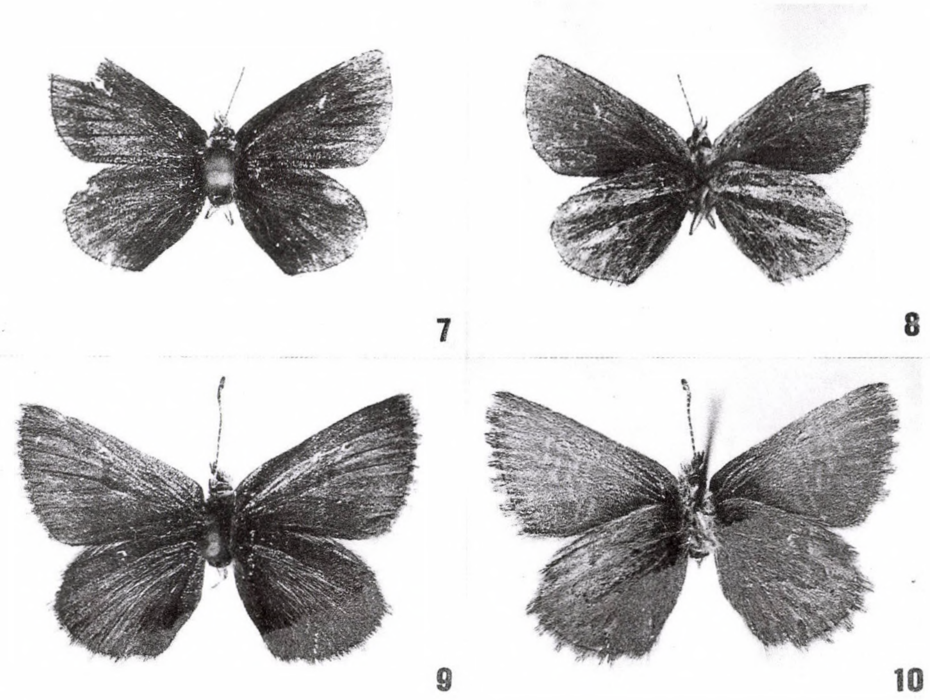
– Aedeagus with shorter uncus and stronger gnathos 2

2 Aedeagus with suprazonal and subzonal elements of about equal length; uncus with less remarkable innovation than *M. koa* (Figs 3, 4 and 12) *M. odon*

– Aedeagus with longer suprazonal element than subzonal element 3

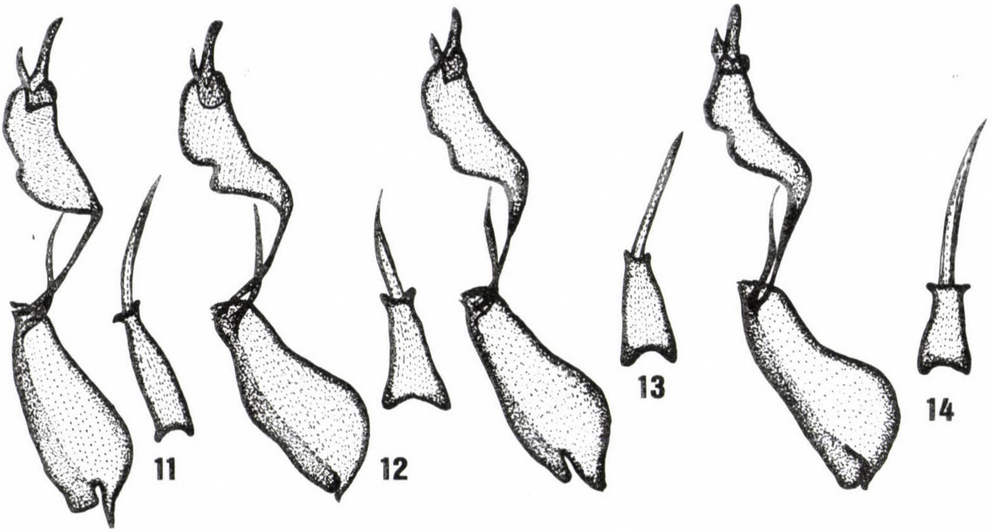
3 Uncus as in *M. koa* but shorter, suprazonal part twice longer than subzonal element (Figs 5, 6 and 13) *M. carolityla* sp. n.

– Genital uncus as in *M. koa*, suprazonal part only somewhat longer than subzonal element (Figs 7, 8 and 14) *M. nodo*



Figs 7-10. The members of the *koa* species-group of *Madeleinea* BÁLINT: 7 = *M. nodo* BÁLINT & JOHNSON, holotype male, dorsal (ANHM), 8 = same, ventral; 9 = *M. vokoban* BÁLINT & JOHNSON, holotype female (AMNH), 10 = same, ventral

Figs 11-14. Male genitalia of *Madeliena* species: 11 = *M. koa* (Druce); 12 = *M. odon* Bálint & Johnson; 13 = *M. carolityla* sp. n.; 14 = *M. nodo* Bálint & Johnson



Phylogenetic relationship of M. carolityla *in the* koa *species-group*

Monophyly of the *koa* species-group is based on the following characters: (1) female genitalia elongate with oval anterior lamella, ductus bursae relatively less corrugated (compared to members of the *moza* species-group)*, (2) aedeagus with pronounced subzonal element, clasper with narrow uncus in lateral view.

An analysis of the relationships within the species-group is complicated owing to the incomplete data base (cf. footnote). Accordingly herewith only preliminary considerations can be outlined.

Two taxa, *M. nodo* an *M. vokoban*, possess tailed anterior lamella in the female genitalia, while this structure in *M. odon* and *M. koa* is ovate (cf. Bálint and Johnson 1994*c*, Figs 14-17) suggesting two sister groups (*nodo–vokoban* and *odon–koa*) of the subclade.

The newly described *M. carolityla*, with its pronounced suprazonal element of the aedeagus and its geographical distribution, suggests a sister relationship with *M. nodo*. Since the female is unknown at present we do not know whether its structures indicate the same affinities within the species-group (see key above).

Despite the fact that the distributional patterns outlined here can be interpreted by vicariance (fragmentation of the high Andean paramos leading to allo-

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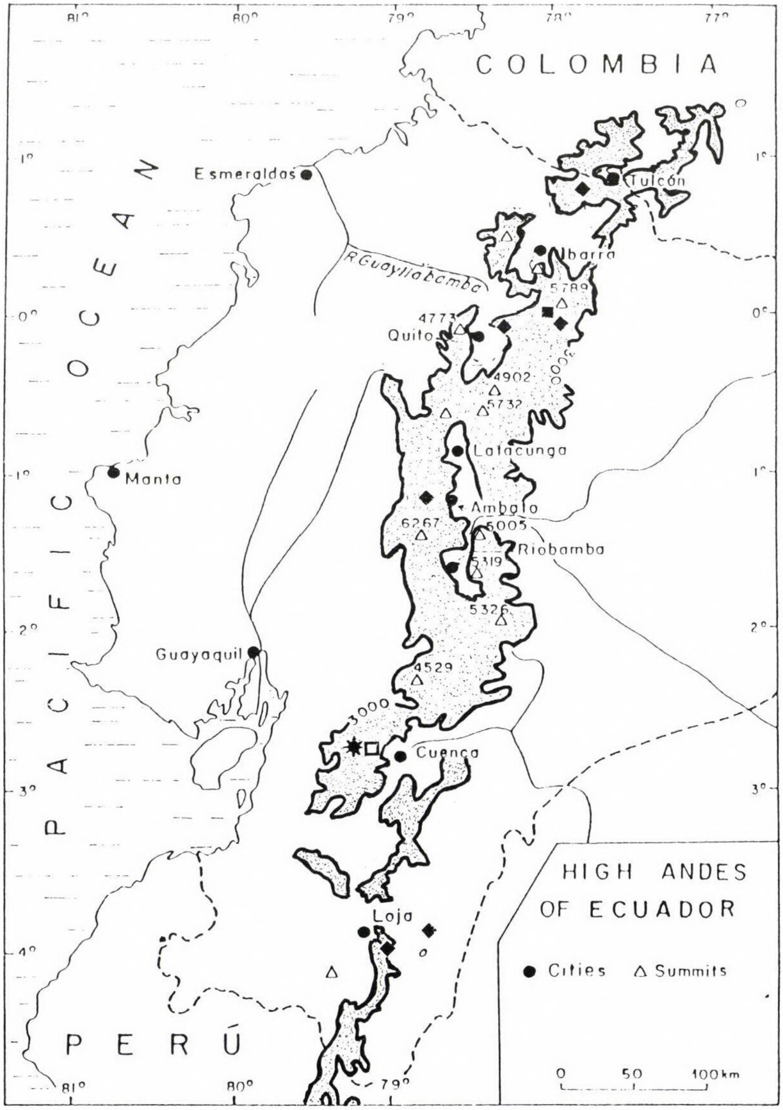
* The male genital structure of *M. vokoban* Bálint & Johnson and the female genital structure of *lolita* species-group are not known.



M. nodo = ◆

M. carolityla = ■

M. odon = ✸

M. vokoban = □

Fig. 15. Distribution of the *koa* species-group in high Andean Ecuador

patric speciation), we are still sceptic because of the following: investigations made in other Neotropical polyommatines clearly showed that sexual characters are in many cases complementary and do not support the different groupings resulting from the usage of different characters chosen arbitrarily (cf. BALLETTO 1993). Since the female genital structures of *M. carolityla*, and the male structure of *M. vokoban* (Figs 9, 10), are unknown, the considerations above must looked upon as hypothetical and tentative for the time being.

Polyommatine diversity in Ecuador

DESCIMON (1986) listed *Leptotes andicola* (GODMAN and SALVIN, 1891) as the single polyommatine (sensu lato) species from Ecuador. Most likely, the only source of data for him, besides old publications like GODMAN and SALVIN (1891), STAUDINGER (1894) etc. (see various publications cited in DESCIMON, op. cit.), was NABOKOV's seminal paper on the Latin American polyommatines (NABOKOV 1945). SHAPIRO (1994: 39) indicated that early collecting in the high Andes was so fragmentary, faunistic data summarized in such early publications are hardly complete. Even the recent studies based on old material from various European museums (BÁLINT 1993 and 1994, JOHNSON 1992), although they added many new species, only elaborated scattered and disjunct distribution data.

The senior author recently published a catalogue of historical polyommatine samples giving a general survey of the high Andean *Polyommatus* (*sensu* ELIOT, 1973) fauna (BÁLINT 1993, Table 2). He recorded *Hemiargus hanno* (STOLL, 1790), *Nabokovia faga* (DOGNIN, 1893), *Echinargus martha* (DOGNIN, 1887) and *Madeleinea koa* (DRUCE, 1896) from Ecuador.

Two additional polyommatine species, *Leptotes cassius* (CRAMER, 1775) and *Zizula cyna* (EDWARDS, 1881) were also found in old museum samples (BÁLINT 1994). *H. hanno* and *Z. cyna* are the most common polyommatine lycaenid butterflies of the Neotropical region (BROWN 1993: 55) inhabiting both non-arboreal and arboreal biomes. The Colombian paramos are inhabited not only by *H. hanno* but also by *H. bogotanus* (DRAUDT, 1921), an obvious offspring of the widely distributed *H. hanno* (cf. BÁLINT 1993: 15). *H. bogotanus* most likely also occurs in northern Ecuador.

Both *N. faga* and *E. martha* were described from the environs of Loja (DOGNIN 1887 and 1895), a fact of which DESCIMON was unaware. *N. faga* is a widely distributed trans-Andean species (BÁLINT and JOHNSON 1994*b*: 112-114), but at the southern limit of the range of the genus the sister species *N. ada* BÁLINT & JOHNSON, 1994 occurs. Presumably, if a highly disjunct population of *Nabokovia* will be found in the environs of northern Ecuador (*Nabokovia* was only found in Loja), it might prove to be different at the specific or subspecific level from the nominal populations.

Once the taxonomic and geographic status of *M. koa* was clarified, the historical *M. koa* (sensu BÁLINT 1993: 26) material from Ecuador turned out to be polytypic, representing a sister species pair. Of this pair, *M. nodo* is more widely distributed (see the type material of *M. nodo* in BÁLINT and JOHNSON 1994 and Fig. 15). *M. odon*, on the other hand, appears locally endemic – restricted to the environs of Cuenca, southern Ecuador. Another member of the species-group is known only by the holotype collected in Azuay Province, southern Ecuador (*M. vokoban*).

Accordingly, the speciation of *Madeleinea* in the high Andean paramos of Ecuador is quite remarkable, paralelling that of mountain regions of Peru.

* * *

Acknowledgements – We thank the husband and wife team of GREG KAREOFELAS and CAROL WITHAM for making available the material collected and notes from their expeditions to the high mountains of Ecuador.

APPENDIX

CHECKLIST OF THE MADELEINEA SPECIES

Madeleinea BÁLINT, 1993

lolita species-group
    M. lolita BÁLINT, 1993
    M. huascarana BÁLINT and LAMAS, 1994

koa species-group
    M. koa (DRUCE, 1876)
    M. nodo BÁLINT and JOHNSON, 1994
    M. carolityla BÁLINT and JOHNSON, sp. n.
    M. odon BÁLINT and JOHNSON, 1994
    M. vokoban BÁLINT and JOHNSON, 1994

moza species-group
    M. moza (STAUDINGER, 1894)
    M. pacis (DRAUDT, 1921)
    M. cobaltana BÁLINT and LAMAS, 1994

M. lea BENYAMINI, BÁLINT and JOHNSON, 1994
M. tintarrona BÁLINT and JOHNSON, 1994
M. sigal BENYAMINI, BÁLINT and JOHNSON, 1994
M. ludicra (WEYMER, 1890)
M. pelorias (WEYMER, 1890)

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A NEW NOCTUID SPECIES FROM IRAN: CHERSOTIS EBERTI SP. N. (LEPIDOPTERA: NOCTUIDAE)

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Description of a new species: *Chersotis eberti* sp. n., belonging to the *elegans*-group of the genus. Distribution: N & W Iran. With 27 figures and 2 photoplates.

Key words: *Chersotis, elegans*-group, Noctuidae, Iran

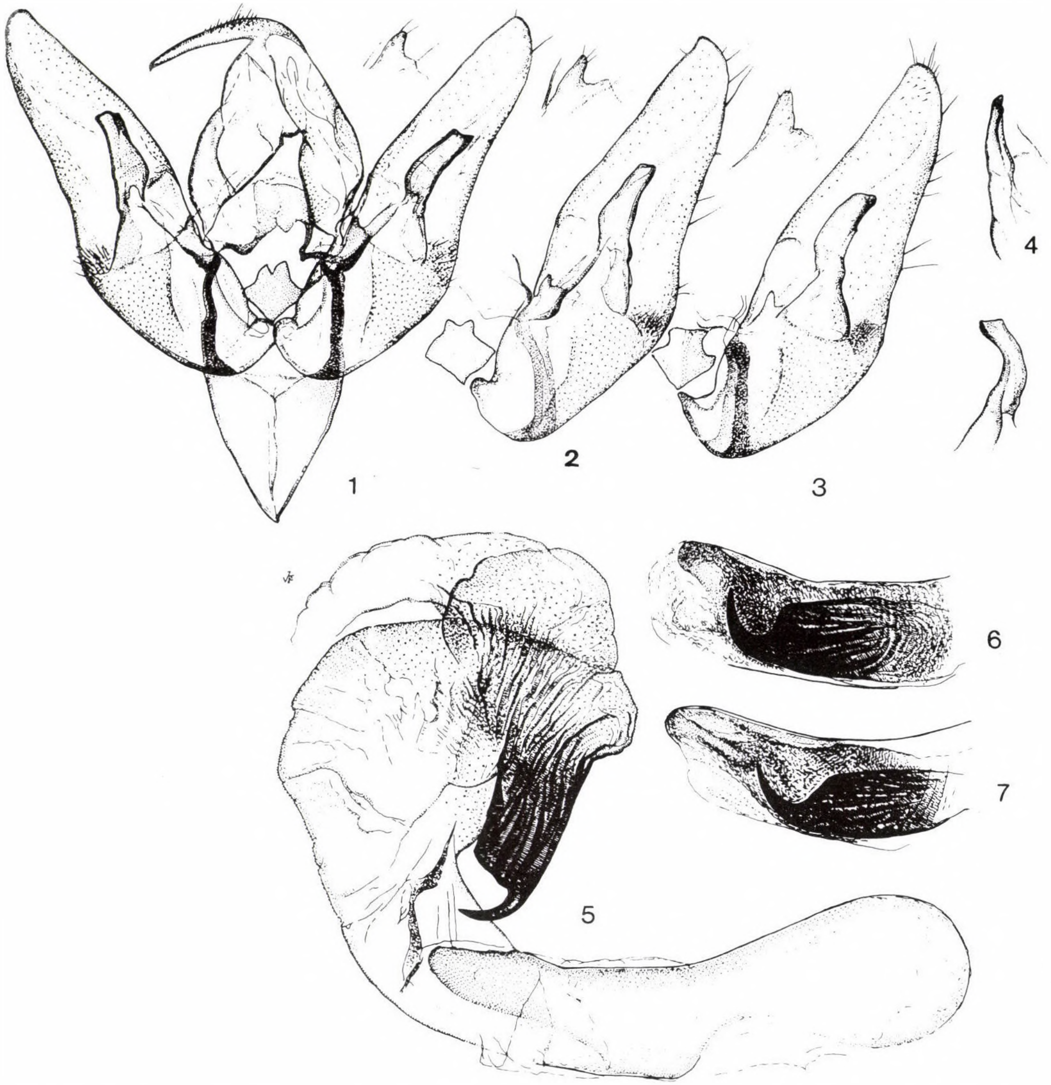
The study on the Noctuidae materials of some large collections revealed that in several parts of Iran (Mts Elburs, Laristan and Fars) two externally very similar species of the *Chersotis elegans*-group occur sympatrically. One species is the widespread *Chersotis anatolica* (DRAUDT, 1936) (= *elegantula* BOURSIN, 1945; on synonymy see: DUFAY 1986, VARGA 1986) which displays a considerable external variation, but – with the exception of the Transcaspian area – without any clear infraspecific subdivision. The other one, seemingly more closely related with other members of this species group, *Ch. elegans* (EVERSMANN, 1837); = *grammiptera* (RAMBUR, 1839) and *Ch. kacem* (LE CERF, 1933), represents an undescribed species. It is dedicated here to Mr G. EBERT (State Museum for Natural History, Karlsruhe, Germany), who collected numerous specimens of this species during his study trips in Iran.

Chersotis eberti sp. n.
(Figs 1–7, 24, 27–28, 39–43)

Holotype: male, "Iran, Fars, Strae Ardekan-Talochosroe, Comée (Barm i Firus), 3750 m, 12-20.07.1937", coll. BRANDT (slide CL. DUFAY no. 4261, coll. State Museum for Natural History, Karlsruhe [LNK]).

Paratypes: 3 males from the same locality, but 2600 m, 15.07.1937, coll. BRANDT (slides 5889 and 6618, VARGA, coll. LNK, Zoological State Collection, Munich and coll. Schwingenschuss, Wien), 9 males and 5 females, W Iran, Laristan, Darud, pass S. Darya-dhe-Gahar, "Partsche Kabud", 2800 m, 1-3.08.1975, EBERT & FALKNER leg. (slide CL. DUFAY no. 4261, coll. LNK & DUFAY), 1 female, W Iran, Laristan, Darud, 4 km SE Saravand, "Normiyeh", 2400 m, 4-6.08.1975, EBERT & FALKNER leg. (coll. LNK), 1 male, Persia, Elburs Mts, "Tarseegebiet", 2200 m, 14-17.07.36 (slide 2613, VARGA, leg. & coll. Schwingenschuss, Wien), 5 males and 2 females, Elburs Mts, Shemshak, 2300 m, 1-22.07.1970, leg. A. & E. VARTIAN (slides 2442, 3024 [males], 3034 [female], VARGA, coll. VARTIAN & VARGA), 2 males and 9 females, N Iran, Elburs Mts, Prov. Tehran, 15 km E "Gatschsar", 2600 m, 5.08.1972; 2 females, same locality, but 2800 m, 07.08.1972; 1 male and 2 females, same locality and elevation, 17.08.1972, all: leg. EBERT (coll. LNK & DUFAY).

Description. Wingspan 34-37 mm, length of forewing 15.5-17 mm (both sexes), head and thorax greyish-brown, palpi and the ventral side of the thorax with lighter greyish hairs, collar with a double, fine lighter margin, abdomen lighter greyish-brown. Forewing dark greyish-brown, ante- and postmedian crosslines double, medially with blackish markings, maculation regular with whit-



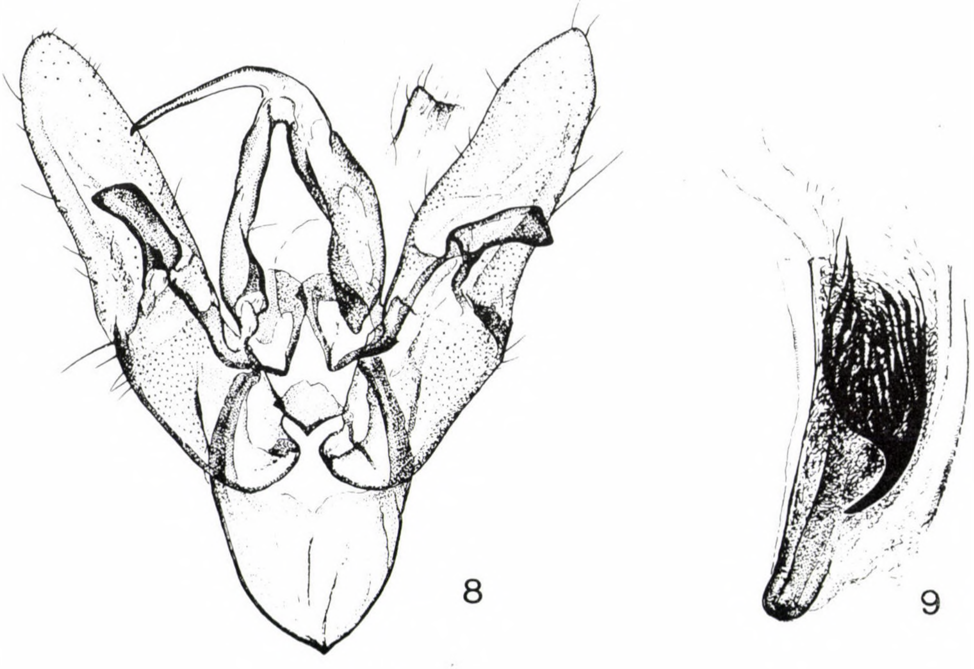
Figs 1-7. *Chersotis eberti* sp. n., male genitalia: 1 = Iran, Elburs, genital capsula, with clavus enlarged, slide 2613 (VARGA), 2–3 = id., valva, juxta and clavus enlarged, slides 2442 and 3024 (VARGA), 4 = id., harpe from two different lateral views, slide 3024 (VARGA), 5 = id., aedeagus with everted vesica, slide 3024 (VARGA), 6-7 = id., cornuti, slides 2613 and 2442 (VARGA)

ish margins, intracellular spots and arrowheads blackish-brown. Fringes brownish-grey, outer part lighter. Hindwing whitish with a silky shine and with obsolescent light brownish marginal shadow and darker veins, fringes white with brownish shadow. Both sexes similar, but the hindwing of the females darker, with brownish-grey veins and obsolescent medial line. Underside of wings light whitish-grey, with brownish-grey medial lines and marginal shadow.

Male genitalia (Figs 1-7). The same type as those of *Ch. elegans* (Figs 10-15) and – especially – *Ch. kacem* (Figs 8-9). Valva relatively short, its saccular part broad, nearly triangular; clavus minute, united with dorsal margin of sacculus, covered with some strong setae; cucullus and corona reduced; harpe very short, from lateral view slightly curved, distally not dilated and not acute. Juxta shield-like, relatively small, upper part narrower. Aedeagus broad, slightly curved, ampulla globular. Vesica broad, recurving with one large, curved cornutus which is sitting on a huge sclerotized plate.

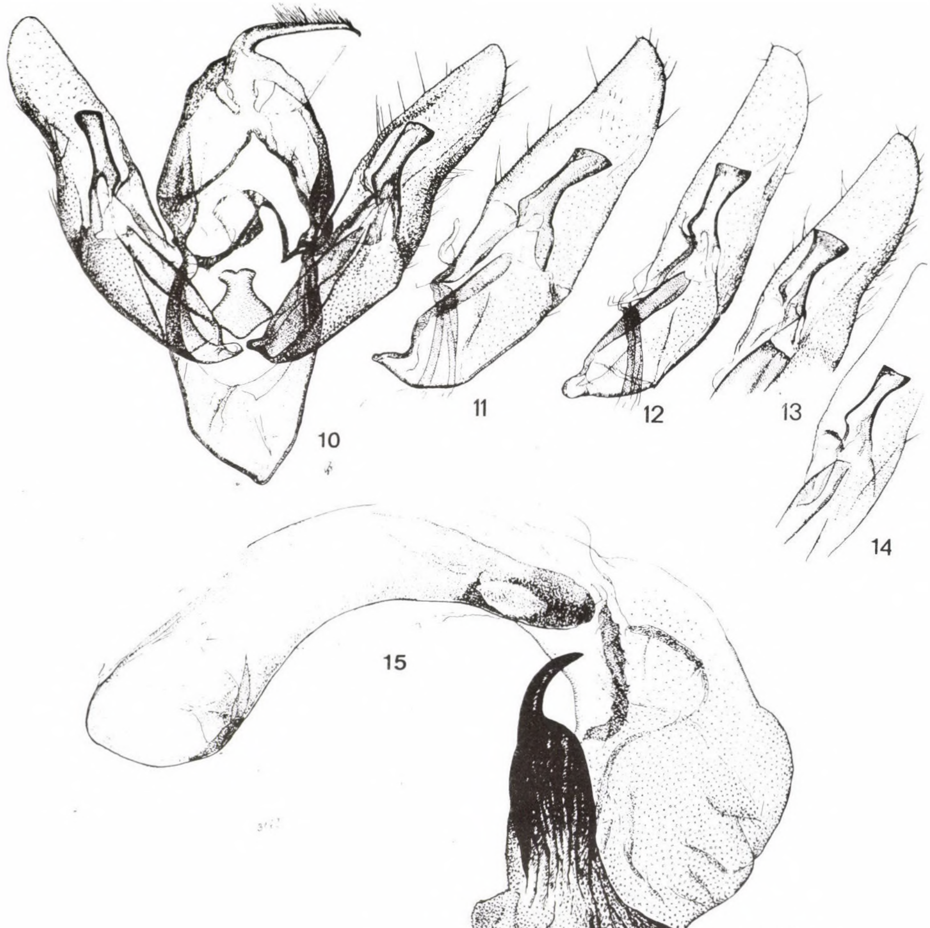
Female genitalia (Fig. 24). Ovipositor broad with fine setae, ostium with a broad, angular incision, ductus bursae bilaterally folded, distal part of cervix rugulose with a specialised pocket (obviously for the reception of the big cornutus of the male). Corpus bursae with four stripe-like signa.

Chersotis eberti (Figs 39–43) is habitually very similar to all related species and cannot be surely distinguished by external features. It displays the greatest external similarity with *Ch. kacem* (Fig. 44), due to its relatively small size and short forewings, but the hindwings of *Ch. kacem* are duller greyish-brown with an obsolescent medial line and the distribution of both species is completely remote from each other. *Ch. elegans* (Figs 45–46) shows on its forewings

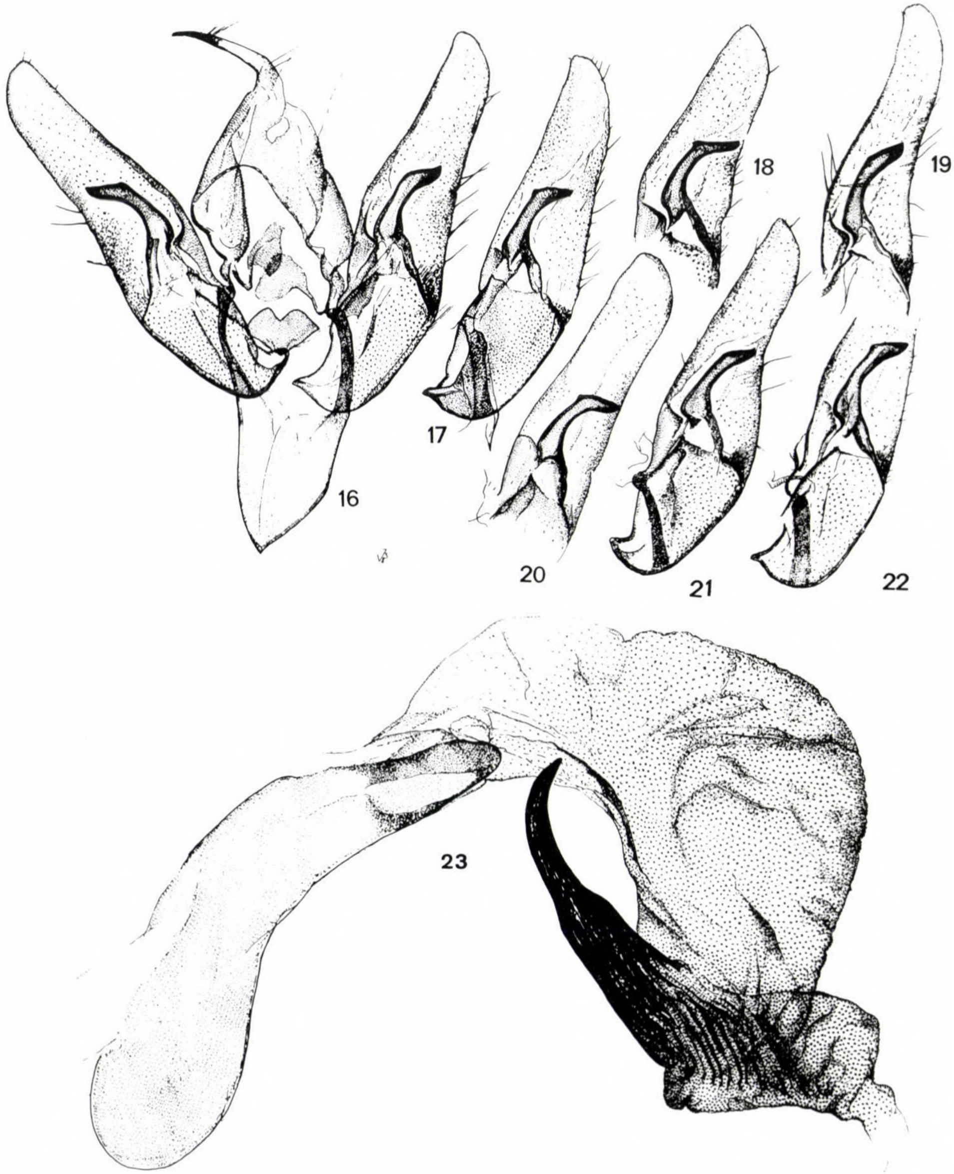


Figs 8-9. *Chersotis kacem* LE CERF, male, Morocco, genital capsula and aedeagus, slide 2617 (VARGA)

Figs 10-15. *Chersotis elegans* EVERSMANN, males: 10 = Krym, Kertsch, genital capsula, slide 2612 (VARGA), 11-14 = Armenia: Geghard, France: Alpes Maritimes, Greece: Tymfristos, Spain: Albarracin, valvae, slides 2444, 2623, 3069 and 2625 (VARGA), 15 = Greece, Tymfristos, aedeagus with everted vesica, slide 3069 (VARGA)

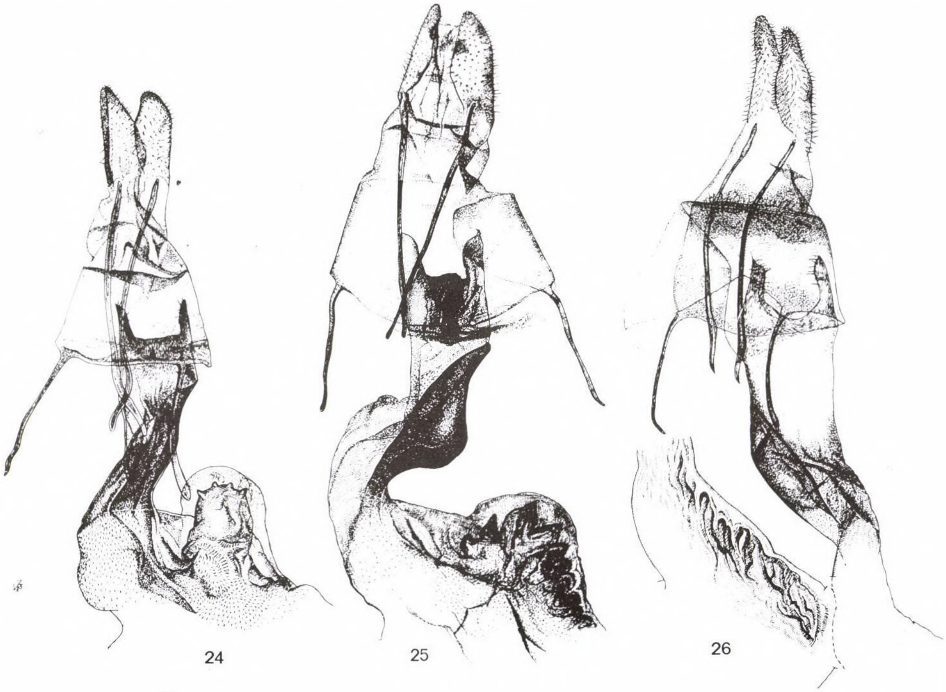


Figs 16-23. *Chersotis anatolica* Draudt, males: 16 = Turkey, Sultan dagh, lectotypus, genital capsula, slide 2616 (Varga), 17-22 = valvae, Makedonia: Sar-planina, Armenia: Geghard, Iran: Elburs, Turkey: Sultan dagh, Italia: Abruzzi, Makedonia: Pelister, slides 1244, 2443, 2620, 2614, 2622, 2455 (Varga), 23 = Greece, Tymfristos, aedeagus with everted vesica, slide 3065 (Varga)



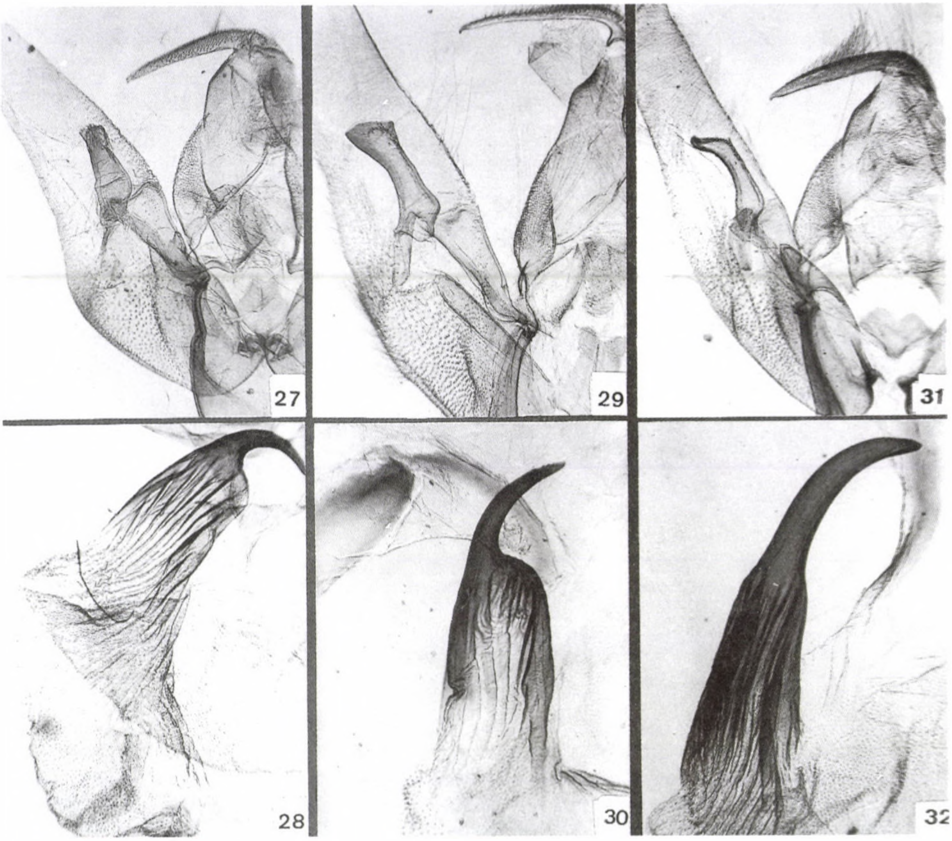
broader and purer white transversal lines, orbicular more globular. Hindwings purer whitish, without darker veins, at least with an obsolescent marginal shadow.

Genitalia of both sexes are clearly distinctive. *Ch. eberti* has the shortest and proportionally the broadest valvae with very short and distally not dilated harpe. Harpe is distally dilated in *Ch. elegans* and *Ch. kacem*, long, acute and apically curved in *Ch. anatolica*. Cornuti are similar only in *Ch. eberti* and *Ch. kacem*; relatively short and curved. Cornutus of *Ch. elegans* is of similar shape, but essentially longer. *Ch. anatolica* has the cornutus huge, acute, only slightly arcuate (Fig. 23). In female genitalia the rugulose part of the cervix bursae with the typical "lock" for the huge cornutus of the male and the shape of the incision on the ostium are the best features for differentiation (Figs 24-26). Latter one can be recognised by brushing of the hairs of the ventral side of the last abdominal segments, without making genital slides. The females of the sympatrically occurring *Ch. eberti* and *anatolica* can be easily distinguished also by the more elongate and acute ovipositor of the latter species, covered with very strong setae. One can conclude that the different mode of oviposition may be one of segregating factors between these closely related species.



Figs 24-26. Female genitalia: 24 = *Chersotis eberti* sp. n., Iran, Elburs, slide 3034 (VARGA), 25 = *Ch. elegans* EVERSMANN, France: Alps Maritimes, slide 3036 (VARGA), 26 = *Ch. anatolica* DRAUDT, Iran: Elburs, slide 2657 (VARGA)

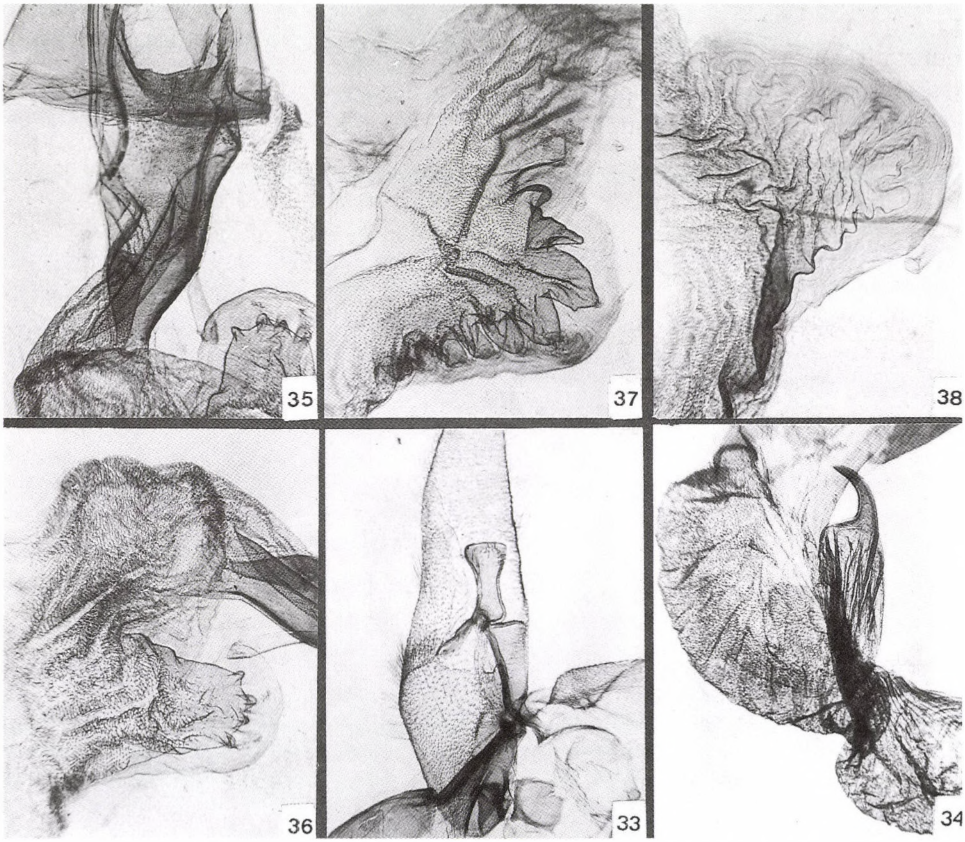
Figs 27-32. Details of genitalia. 27-28 = *Chersotis eberti* sp. n.: valva, cornutus; 29-30 = *Chersotis elegans* EVERSMANN, valva, cornutus; 31-32 = *Chersotis anatolica* DRAUDT, valva, cornutus



Chersotis anatolica iranica SCHWINGENSCHUSS, 1939 **syn. nov.**
(= *Ch. anatolica anatolica* DRAUDT, 1936)
(Figs 16–23, 26, 31, 32, 38, 47–50)

Together with our studies on the new species, we have revised a series of specimens of *Chersotis anatolica* DRAUDT from Northern Iran, too (Figs 47–50). We could conclude that the specimens captured in the Elburs Mountains can only be considered as a slightly different local form with somewhat darker coloration and without any structural differences in the genitalia of both sexes. Thus, they cannot be separated under a subspecific name *Chersotis anatolica iranica* SCHWINGENSCHUSS (1939) from *Ch. anatolica anatolica*, described (as a subspecies of *Ch. elegans*) by DRAUDT, 1936 from Central Turkey (Sultan Dagh, Akshehir).

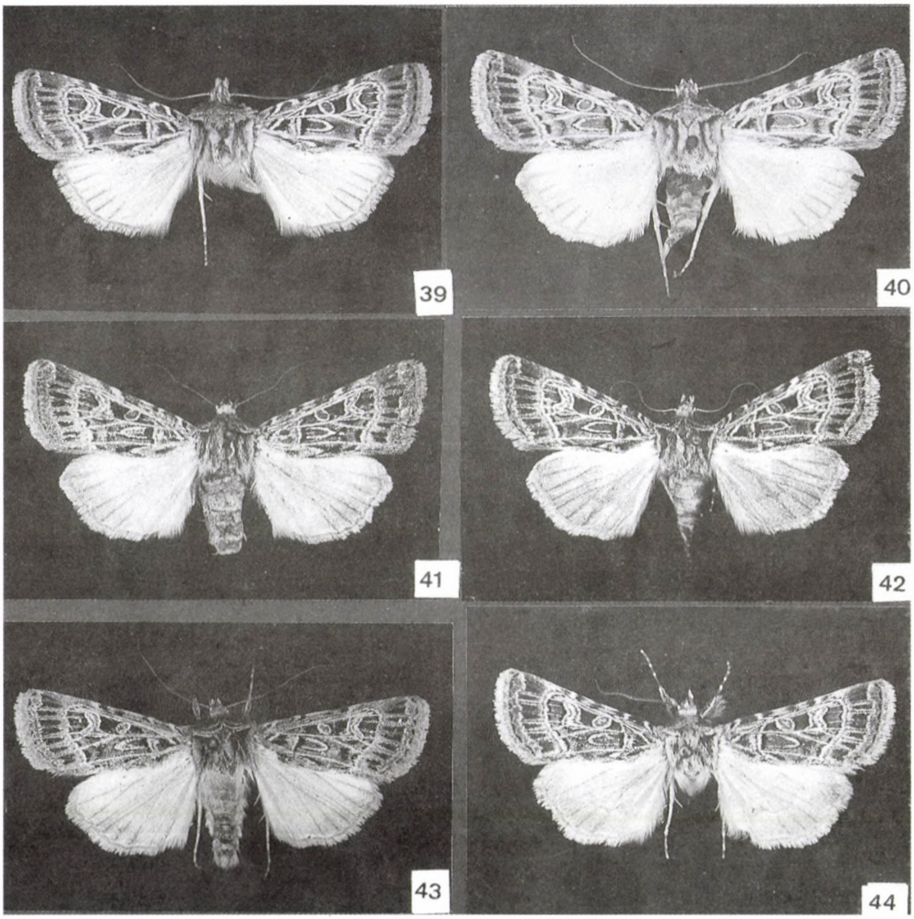
Figs 33-38. Details of genitalia. 33-34 = *Chersotis kacem* LECERF, valva, cornutus; 35-36 = *Chersotis eberti* sp. n., ostium and ductus bursae, cervix bursae (rugulose part), 37 = cervix bursae; 38 = *Chersotis anatolica* DRAUDT, cervix bursae



Material studied: N-Iran, Elburs Mts: 5 males and 2 females, Rehne-Demavend, ca. 2700-3300 m, 20-27.07.36, leg. SCHWINGENSCHUSS & WAGNER; 2 males and 1 female, Kendevan-pass, 2800-3000 m, 3-5.07. and 22-27.07.1935, leg. PFEIFFER & WAGNER; 2 males, "Tarseegeb.", 2200 m, 14-17.07.36. leg. SCHWINGENSCHUSS; 14 males and 11 females, prov. Tehran, 15 km E "Gatschsar", 2800 m, 17.08.1972, leg. EBERT; 1 female, Masandaran, Pelur, Demavend, 2200 m, 11.07.1972, leg. EBERT & FALKNER; 1 male, id. Masandaran, "Lar-Tal", NW Pelur, 2200-2500 m, 20.07.1975, leg. MÜLLER; 4 males and 2 females, Kendevan, 2300-2800 m, 21-25.08.1978, leg. THOMAS (slides: 2610, 2611, 2618, 2620, 2621, 2625, 2657 VARGA). The externally very distinct form, collected in many places of the Kopet-dagh Mountains (Turkmenistan) will be described as a separate subspecies by the junior author in a separate paper.

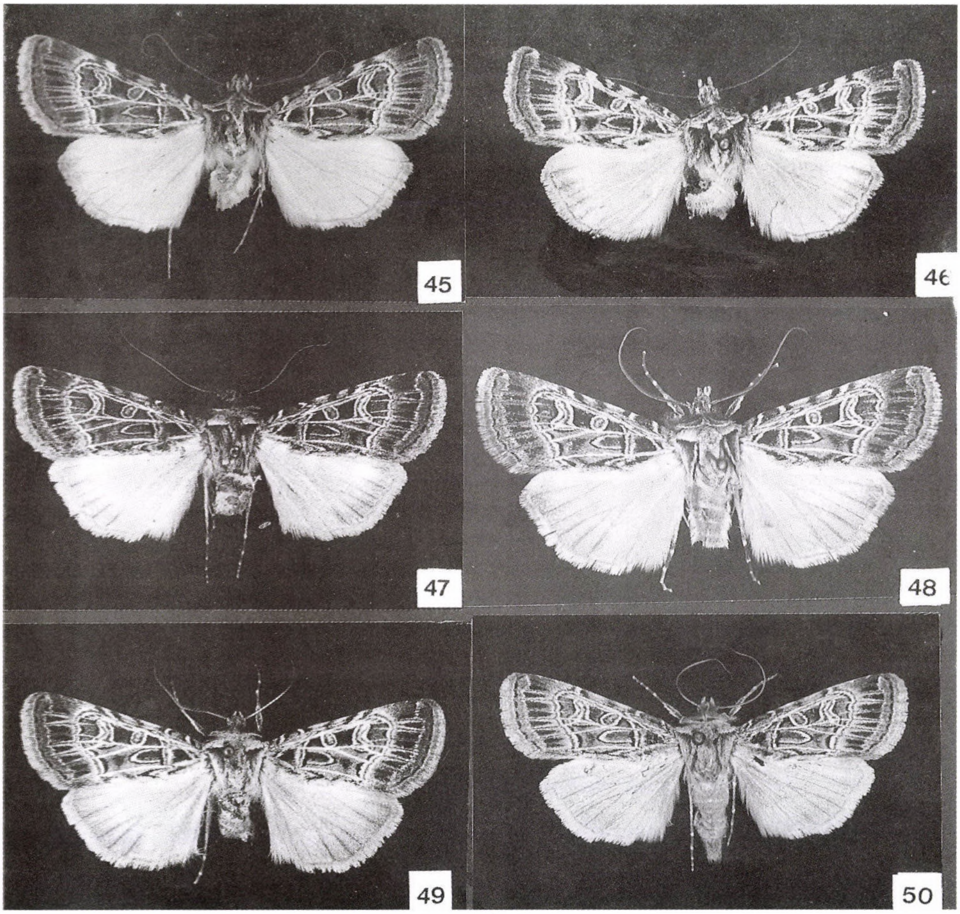
BIOGEOGRAPHIC AND PHYLOGENETIC CONSIDERATIONS

The group *elegans* of the genus *Chersotis* BOISDUVAL, 1940 consists of four closely related species. The outgroup of these, obviously monophyletic species-group is probably *Ch. larixia* BOISDUVAL which displays, however, several distinctive features. The shape of the cornutus and harpe can be considered as mostly specialised in *Ch. anatolica*. The strong sclerotisation of the genital apparatus, the large distribution area nearly without any subspecific differentiation but with considerable individual variation range are good evidences for a relatively recently expanded species. The other main phylogenetic "line" is represented by the widely distributed *Ch. elegans*, which occurs sympatrically in many places with *Ch. anatolica* (see: DUFAY, 1981, 1986) and by two strictly localised species: *Ch. kacem*, endemic for the High Atlas in Morocco and the newly described one: *Ch. eberti*, occurring only in some high mountains of



Figs. 39-44. *Chersotis eberti* sp. n.: 39–40 = male, paratype, Iran, Fars, 41 = id., Elbursgeb. Tarseegebiet, 42 = id., Elbursgeb. S-Seite, Shimshak, 43 = id., female, same locality; 44 = *Ch. kacem* LE CERF, male, Ht. Atlas, Morocco, Tachdirt

Figs 45–50. *Chersotis elegans* EVERSMANN: 45 = male, Armenia, Geghard, 46 = id. Krym, Kertch; *Ch. anatolica* DRAUDT 47 = male, lectoholotypus, Asia min. c. Akshehir, Sultan dagh, 48-49 = id., males, Elburs Mts, Rehne-Demavend (paratypes of *Ch. elegans iranica* SCHWINGENSCHUSS), 50 = id., female, same locality



Northern and Western Iran. It is quite conspicuous that the latter species was not captured either in Eastern Turkey, or in Turkmenistan, despite of the very intensive collections in both areas during the last decennium. *Ch. anatolica* and *eberti* occur sympatrically *only* in some parts of the Elburs Mts in Northern Iran, but the large series of specimens, collected at high elevations by SCHWINGENSCHUSS, contains almost exclusively *Ch. anatolica*. On the other hand, the specimens, collected by Mrs VARTIAN at Shemshak, at moderate altitudes of the southern slope of Elburs and also the large series from Laristan, collected by EBERT and FALKNER, belong to the new species. One may conclude, therefore, that some habitat segregation must occur between the two species. The more closely related *Ch.*

elegans, kacem and *eberti* are, however, strictly allopatric. The two latter species seem to be localised at the extreme margins of the distribution of the widely distributed sister species. A complete revision of the genus is under preparation by the junior author in which further biogeographic and phylogenetic problems will be considered.

Ackowledgements – The authors are deeply indebted to Mrs EVA VARTIAN (Wien), the late Dr F. KASY, Dr W. DIERL, Mr G. EBERT, Dr M. HREBLAY, Mr GY. M. LÁSZLÓ and G. RONKAY for their kind help in our studies and for lending valuable materials. The technical assistance of Mr P. KOZMA is appreciated. Dr L. RONKAY made some useful comments on the manuscript.

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NEW TAXA OF THE GENUS HIMALISTRA HACKER & RONKAY, 1993 (LEPIDOPTERA, NOCTUIDAE)*

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Descriptions of five new species of the genus *Himalistra* HACKER et RONKAY, 1993, *H. variabilis* sp. n. (China, Tibet), *H. obscura* sp. n. (India, Himachal Pradesh), *H. hackeri* sp. n. (Nepal), *H. rubida* sp. n. (Nepal) and *H. aristata* sp. n. (Nepal) are given, respectively. With 30 figures and three tables.

Key words: new species, *Himalistra*, Xylenini, Noctuidae

Present paper contains the results of the further investigations on the autumnal Xylenini complex of the Himalayan region, including the material of two expeditions to Nepal made in September-October, 1994. It was pointed out that our previous knowledge about the distribution patterns and the bionomics of the genera *Himalistra* and *Estagrotis* NYE, 1975 was rather incomplete: there are well-defined species groups of *Himalistra*, the species of which occur in the south and south-eastern parts of the Himalayan chain, inhabiting the humid, shrubby forest edges at the timber line and the subalpine meadows up to about 4000 m altitude. The descriptions of the new taxa are given hereunder, while the newly discovered other Xylenini species (e.g. *Estagrotis*, "*Conistra*", *Hyalobole* WARREN, 1911, etc.) will be published in separate papers.

CHECKLIST OF THE GENUS

Himalistra HACKER & RONKAY, 1993
    eriophora eriophora (PÜNGELER, 1901)
    eriophora perspicua (PÜNGELER, 1925)
    nekrasovi HACKER & RONKAY, 1993
    tahiricola RONKAY & HREBLAY, 1994
    caesia HREBLAY & PLANTE, 1994
    nivea HREBLAY & PLANTE, 1994

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* Part II.

delicata (RONKAY, VARGA & BEHOUNEK, 1991)
fusca fusca HACKER & RONKAY, 1993
fusca fumata HREBLAY & PLANTE, 1994
variabilis HREBLAY & PLANTE, sp. n.
arcessita HACKER & RONKAY, 1993
extera HACKER & RONKAY, 1993
carnea (HAMPSON, 1907)
obscura HREBLAY & PLANTE, sp. n.
hackeri HREBLAY & RONKAY, sp. n.
propria (HACKER & PEKS, 1993), **comb. n.**
aristata HREBLAY & RONKAY, sp. n.
rubida PLANTE & RONKAY, sp. n.*

Himalistra variabilis HREBLAY & PLANTE sp. n.
(Figs 1-3, 17, 18, 27)

Holotypus: male, "China, Tibet, 1 km S of Nyalam, 85°56'E, 28°07'N, 3700 m, 3. X. 1994, leg. M. Hreblay & T. Csővári". Slide No. HREBLAY: 6790. (coll. M. HREBLAY, Érd, Hungary; deposited in the Hungarian Natural History Museum, Budapest (HNHM)).

Paratypes: 9 specimens with the same data (coll. J. PLANTE, Martigny, Switzerland; M. HREBLAY, Érd; T. CSŐVÁRI, Budapest, Hungary).

Slide Nos HREBLAY: 6783 male, 6792, 6801 females.

Description: wingspan 35-37 mm, length of forewing 14-16 mm. Coloration of body and forewing variable, orange-brown to dark reddish brown; antennae of males shortly bipectinated, those of females filiform with short setae. Forewing elongate with apex finely pointed. Transverse lines broadly double, curved, darker than ground colour, filled with lighter ochreous-brownish. Orbicular and reniform stigmata encircled with darker lines, their filling somewhat lighter than ground colour, lower third of reniform filled with dark brown. Subterminal line represented by some darker spots and a lighter stripe. Terminal line usually dark, in some cases absent. Cilia same as ground colour. Hindwing pale grey, discal spot invisible; cilia reddish. Underside of wings reddish grey, medial part of forewing with intensive darker irroration. Crosslines and discal spots pale, diffuse; cilia reddish.

Male genitalia (Figs 17, 18): uncus short, wide, strong, apical third strongly tapering and curved. Tegumen low, broad, fultura inferior sclerotized, cordiform, with short apical arms and a rounded medial protuberance. Valva elongated-elliptical, apical part tapering and rounded; sacculus

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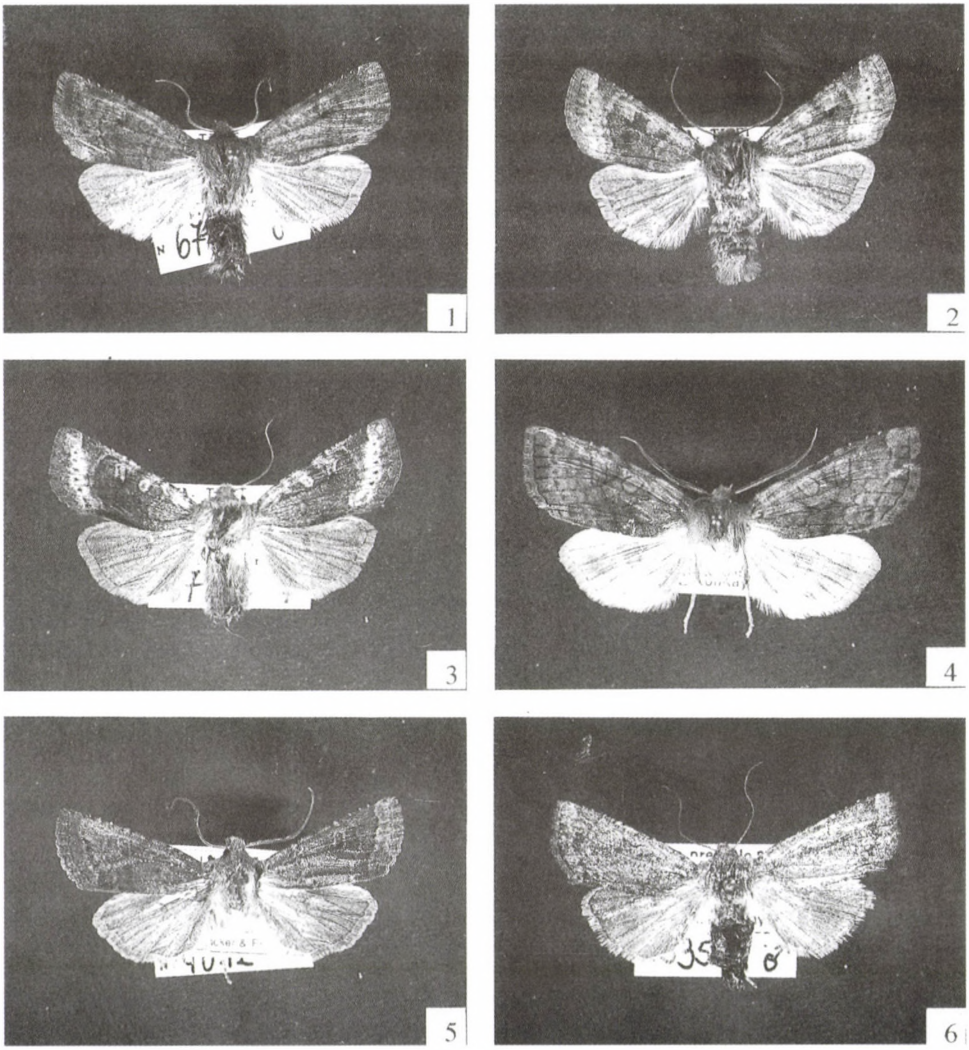
* 1. The species *propria* was originally described as *Agrochola*, on the basis of two female specimens. A study of the female genitalia and the discovery of the closely related *rubida* sp. n. and *aristata*, in Nepal clarified that *propria* is a true *Himalistra*, a member of a species group occurring only in the southern and south-western parts of the Himalayan region.

2. "*Himalistra*" *dentata* (HAMPSON, 1894): it was a former misidentification of *Himalistra fusca fusca* HACKER & RONKAY, 1993 (see HACKER & WEIGERT 1990, page 257-258, Fig. 21, plate B, Fig. 10; corrected firstly by HACKER & RONKAY, 1993. Unfortunately the invalid combination was cited again in the checklist of the genus by HREBLAY, PLANTE & RONKAY (1994). The true *dentata* is a *Trichoridia* HAMPSON, 1906 species, the holotype of which was checked. The results of the studies on the Himalayan *Trichoridia* species will be published in a separate paper.

short. Harpe strong, basal part strengthened bearing a bifurcate extension. Inner arm bigger, thick, distally dilated, rounded, and recurved, outer arm smaller, tapering to apex. Costal plate strong, broad, with a medial angle, apical part double-peaked. Aedeagus short, cylindrical, ventral extension of carina longer. Vesica tubular, short, broad at base, distally tapering and recurved dorsally; with a diverticulum at proximal third bearing no cornutus. Basal half with numerous spiniform cornuti, terminal part bears also some fine spinules.



Figs 1-6. 1-3 = *Himalistra variabilis* sp. n.: 1 = holotype male, 2 = paratype male, 3 = paratype female; 4 = *H. rubida* sp.n., paratype male, Nepal, Annapurna Himal; 5–6 = *H. obscura* sp. n.: 5 = holotype male, 6 = paratype female, Pakistan, Astor

Table 1. Character table of the *Himalistra fusca* species group

Character	*fusca*	*variabilis*	*arcessita*
Hindwing coloration	ochreous to pale ochreous-brownish	dark, uniform grey-brownish	light whitish-ochreous
Hindwing discal spot	well-visible	pale, diffuse or absent	well-visible
Apical arms of fultura	shorter	stronger, longer	-
Medial process of fultura	long, liguliform-triangular	shorter, smaller	-
Dorsal arm of harpe	longer, narrower, more folded	shorter, broader	-
Costal angle	smaller, sometimes very small	larger, stronger	-
Ductus bursae	short, straight	longest, curved	medium-long, curved

Female genitalia (Fig. 27): ovipositor short, posterior papillae anales weak, gonapophyses slender, short. Ventral plate of ostium bursae flattened, relatively weakly sclerotized, dorsal plate strong, broad, short, elliptical. Ductus bursae broad, inner surfaces with granulosely sclerotized, short crests and folds. Cervix bursae short, membranous, corpus bursae spacious, elliptical.

The closest relatives of *H. variabilis* are *H. arcessita* and *H. fusca*, the new species differs from them by its generally darker hindwings. The detailed comparison of these three species is given in Table 1.

Himalistra obscura HREBLAY & PLANTE sp. n.
(Figs 5, 6, 19, 20, 28)

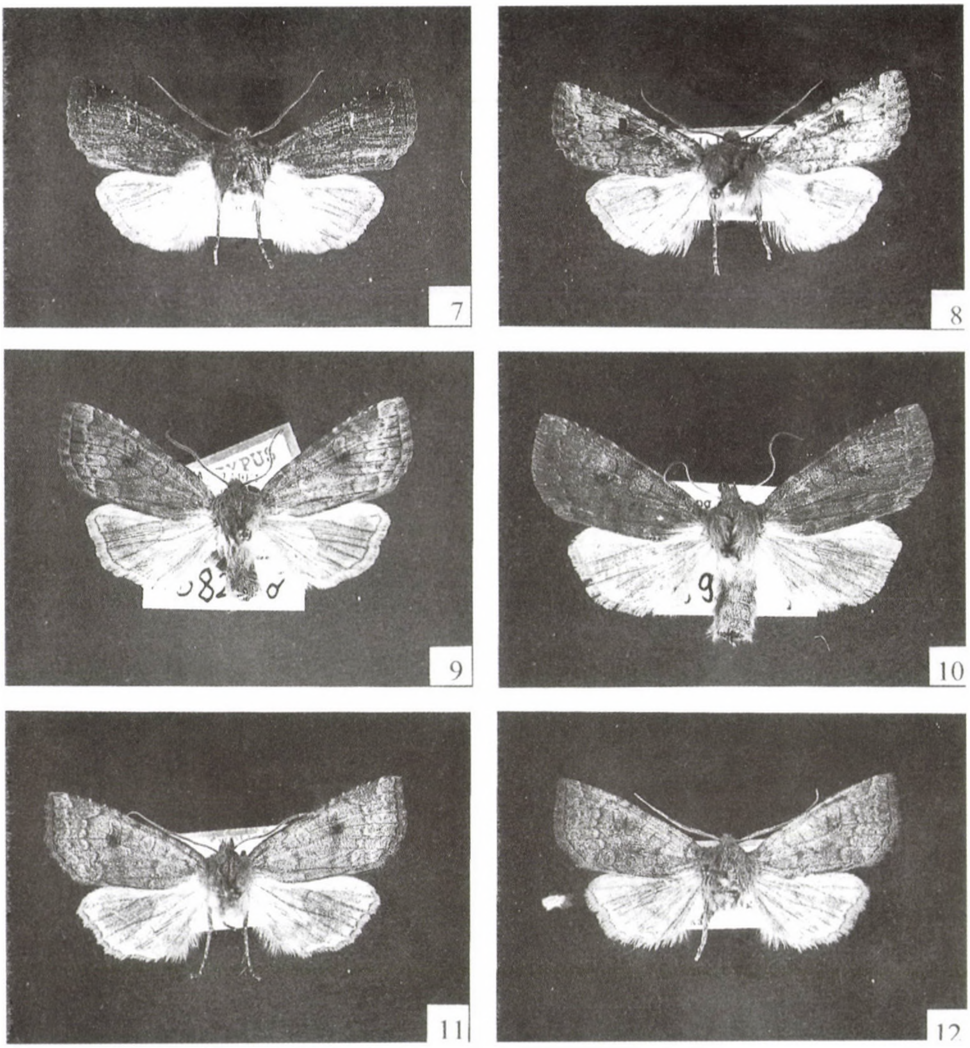
Holotypus: male, "Indien, Himachal Pradesh, Rohtang-Paß-S-Seite, ob Gulaba, 32°22'N, 77°15'E, 2800 m, leg. Hacker & Peks". Slide No. HREBLAY: 4012. (coll. M. HREBLAY, deposited in HNHM Budapest).

Paratypes: India: 50 males and females, Himachal Pradesh, Rohtang Pass, near Kothi, 2400 m, 32°22'N, 77°15'E, 22.XI.1992. leg. HACKER & PEKS (coll. HNHM, HACKER, PEKS and G. RONKAY). Pakistan: 1 male and 2 females, Himalaya Mts, 10 km SW of Astor, Rama, 3000 m, 35°20'N, 74°46'E, 30.V. – 5.VI.1992, leg. M. HREBLAY and G. CSORBA (coll. M. HREBLAY, and J. PLANTE).

Slide Nos: 6070, 6123, 6126, 6130, 6131, 6134, 6135, 6137 HACKER, 3394 HREBLAY, 4988, 4989 RONKAY (males), 6127 HACKER, 3352 HREBLAY (female).

Description: wingspan 36-38 mm (males), 36-39 mm (females), length of forewing 15-17 mm. Head, thorax and forewing dark greyish brown. Antennae of male shortly bipectinated, those of females filiform. Forewing elongated with apex finely pointed. Transverse lines broad, double, less sinuous, darker than the ground colour, their filling somewhat lighter. Orbicular and reniform stigmata encircled with a lighter ochreous annulus and a darker outline, filled with ground colour. Subterminal line an ochreous shadow, defined by some diffuse, darker spots. Terminal line dark grey-brown, cilia brown. Hindwing unicolorous brownish grey, discal spot absent; cilia brownish. Underside of wings dark brownish grey, medial part of forewing with intensive darker irroration; discal spot and transverse line stronger on hindwing.

Male genitalia (Figs 19, 20): uncus short, wide, strong, apical third strongly tapering and curved. Tegumen low, broad, fultura inferior sclerotized, characteristically cordiform, with long, curved apical arms and with a big, well sclerotized liguliform extension at middle. Valva elongated-elliptical, cucullus rounded. Sacculus short, clavus reduced. Harpe strong, basal part strengthened, apical part forming a bifurcate extension. Inner part large, discoidal, irregularly folded. Outer arm sword-like, long, narrow. Costal plate strong, broad, straight, apically double-peaked. Its costal margin dentate. Aedeagus short, cylindrical, carina with elongated ventral extension. Vesica tubular, short, broad at base, distally tapering and recurved dorsally, with a lateral diverticulum at



Figs 7-12. 7–8 = *Himalistra hackeri* sp. n.: 7 = holotype, 8 = paratype; 9–10 = *H. rubida* sp. n.: 9 = holotype, 10 = paratype female, Nepal, Taplejung area; 11-12 = *H. aristata* sp. n.: 11 = holotype, 12 = paratype male, Nepal, Langtang

proximal third bearing a minute cornutus. Basal part of vesica covered with numerous spiniform cornuti, with their length steadily decreasing distally. Terminal part with a distinct, small field of cornuti consisting of fine spines.

Female genitalia (Fig. 28): ovipositor short, papillae anales weak, gonapophyses slender, short. Ostium bursae sclerotized, ventral lamina a big, rounded plate, dorsal lamina broad, short, elliptical. Ductus and cervix bursae broad, inner surfaces with granulosely sclerotized, short crests and folds. Corpus bursae membranous, spacious, sacculiform.

The newly described species is conspecific with *H. carnea* sensu HACKER & RONKAY (1993, p. 199, Fig. 23: d, p. 201, Fig. 24: a, b, p. 202, Fig. 25: a, Plate G: 3). The specimens differ from the holotype of *H. carnea* by their smaller size, unicolorously darker hindwing and the structure of ostium, ductus and cervix bursae, respectively. The (female) genitalia of the holotype of *H. carnea* are published by HACKER & RONKAY (op. cit., p. 200). The main genital differences between them lie in the structures of ostium bursae and are discussed in Table 2.

Table 2. Identification table of the *Himalistra carnea* species group

Character	*carnea*	*obscura*	*hackeri*	*extera*
Wingspan (mm)	40	36-39	35	34-35
Forewing apex	pointed	acute	acute	pointed
Reniform stigma	large, elliptical, lower part dark	narrow, lower part dark	narrow, almost straight, fully dark	narrow, arcuate, fully dark
Hindwing coloration	light greyish	dark grey-brownish	uniformly grey-brownish	light ochreous-grey
Hindwing discal spot	large, diffuse	small, diffuse	rather large,sharper	large, sharp
Uncus	-	relatively narrow	broader, apical hook longer	-
Fultura inferior	-	broader	narrower	-
Medial process of fultura	-	liguliform, large	short, small	-
Cucullus	-	broad, rounded	narrower, rounded	-
Dorsal arm of harpe	-	irregularly folded, less discoidal	large, smooth, discoidal	-
Ventral arm of harpe	-	very long, horn-like	moderately long, apical part spine-like	-
Costal plate	-	long, dentated dorsally, apex double-peaked	very long, without dorsal teeth, apex triangular or only slightly double-peaked	-
Costal angle	-	minute or absent	large, triangular	-

Table 2 continued

Character	*carnea*	*obscura*	*hackeri*	*extera*
Ventral extension of carina	-	short, rounded	short	-
Shape of vesica	-	not T-shaped	T-shaped	-
Diverticulum	-	short, conical	long, tubular	-
Main tube of vesica	-	main tube broad at base, covered with small spiculi	main tube narrow, scobinate	-
Terminal cornuti field	-	large, consisting of long cornuti	small, cornuti fine, short	-
Ventral plate of ostium	very large, broad, caudally less rounded	smaller, narrower, more rounded	-	?
Dorsal plate of ostium	broad, arcuate	broad, less arcuate	-	narrower but longer, trapezoidal
Ductus bursae	relatively long, caudal half strongly tapering proximally ("funnel-like")	relatively long, margins of caudal half almost parallel	-	shorter, continuously tapering proximally
Cervix bursae	more or less conical, with spinulose wrinkles	more rounded apically, with spinulose wrinkles	-	smaller, membranous

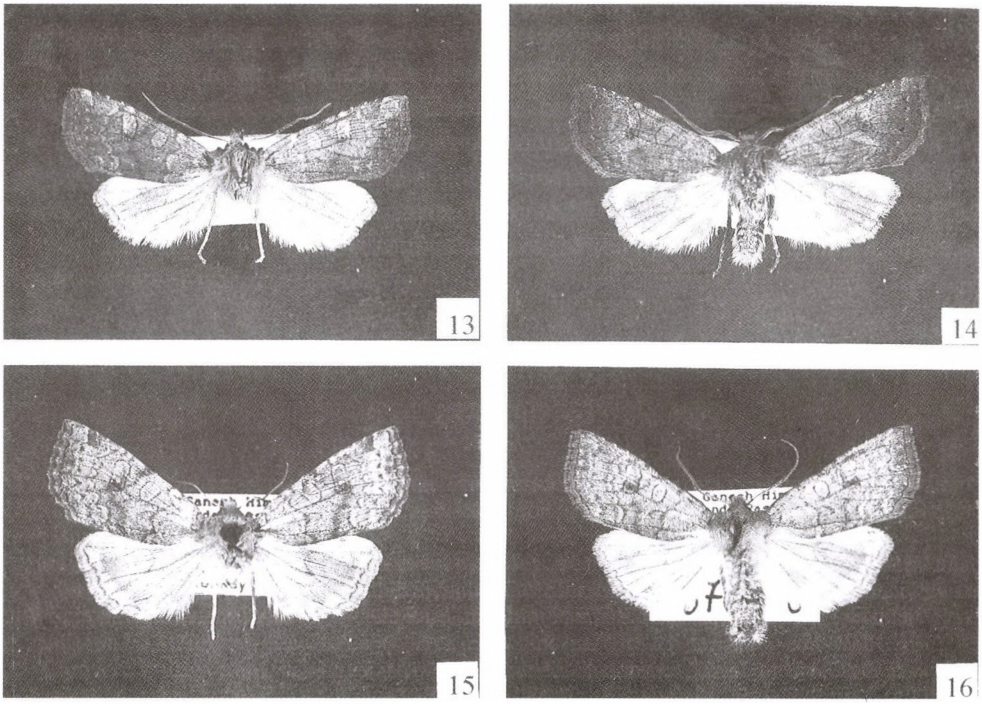
Himalistra hackeri HREBLAY & RONKAY, sp. n.

(Figs 7, 8, 21, 22)

Holotype: male, "Nepal, Langtang, 3500 m, between Cholang Pati and Dimsa, 85°22'E, 28°05'N, 26.IX.1994, leg. Csorba & Ronkay", slide No. 4907 L. RONKAY (coll. HNHM Budapest)
Paratype: one male with the same data (coll. G. RONKAY, Budapest, Hungary).
Slide No. 4913 L. RONKAY (male).

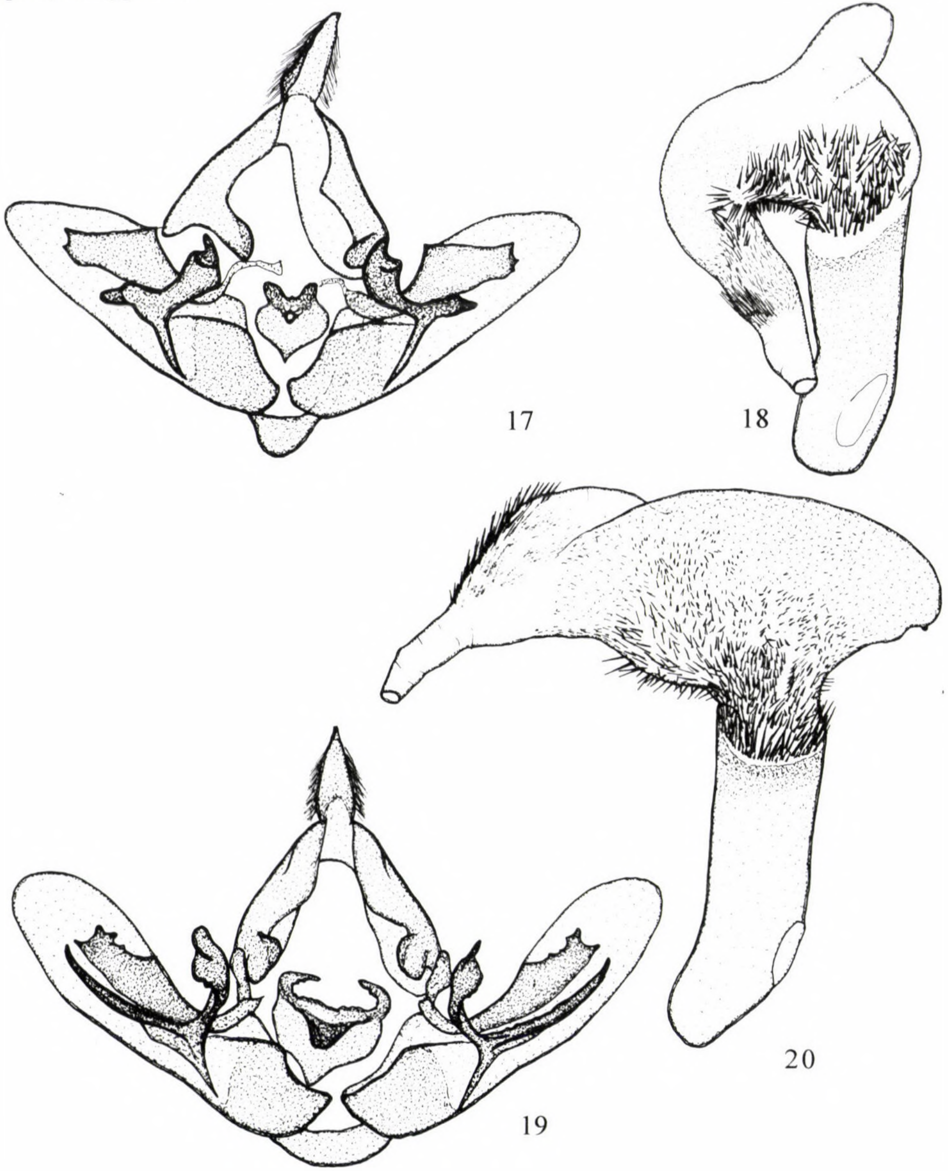
Description: wingspan 35 mm, length of forewing 15 mm. Head and thorax dark reddish- or chocolate-brown, sides of palpi blackish grey; abdomen grey with reddish hairs. Forewing elongated, rather narrow with apex pointed, outer margin regularly arcuated. Ground colour of holotype unicolorously dark chocolate-brown, ante- and postmedial crosslines very pale, their filling only slightly lighter than ground colour. Orbicular and reniform stigmata present, encircled partly with fine ochreous lines and somew darker brown scales, orbicular flattened, oblique, reniform elongated, almost straight, filled completely with dark plumbeous grey; claviform absent. Subterminal slightly sinuous, ochreous white, terminal line very fine, pale ochreous, cilia unicolorous dark brown. Ground colour of paratype male light ochreous-brown with rosy-grey shade and darker brown irroration in basal area, in and below cell; costa broadly covered with ochreous at basal third of wing. Ante- and postmedial crosslines sinuous, double, darker brown, filled with ochreous, medial line sinuous, diffuse, shadow-like. Orbicular and reniform stigmata encircled with ochreous, orbicular strongly flattened, oblique, filled with red-brown, reniform narrow, straight, filled with dark plumb-grey. Subterminal ochreous, interrupted, defined by some blackish arrowheads and a large, dark triangular spot at costa. Terminal line fine, dark grey, cilia reddish-ochreous, spotted with brown. Hindwing of both specimens fuscous, crossline very pale, discal spot large, grey-brown. Terminal line darker brown, cilia rosy-brown or red-brown. Underside of shiny ochreous, irrorated with brown and ashy grey, central part of forewing darkened. Crossline diffuse on both wings, discal spot shadow-like on forewing, much stronger, sharper on hindwing.

Male genitalia (Figs 21, 22): uncus strong, short, broad, with strong dorsal crest and long apical hook. Tegumen low, broadly triangular, penicular lobes small. Fultura inferior sclerotized, lyriform with long, flattened apical arms. Medial plate deeply sinking, medial protuberance small, rounded; vinculum V-shaped. Valva elongated-elliptical, costal angle large, strong; cucullus rounded. Sacculus short, clavus reduced to a setose surface. Harpe strong, bifurcate, dorsal arm large, mushroom-shaped with flattened, rounded apical disc, ventral arm long, slender, spiniform. Costal plate heavily sclerotized, elongated, distally tapering, apically double-peaked. Aedeagus short, cylindrical, slightly flattened, ventral extension of carina rather short. Vesica narrow, tubular, everted laterally, subbasal diverticulum long, tubular, slightly arcuate, therefore combined aedeagus and vesica T-shaped. Diverticulum bears a tiny subapical cornutus. Basal and proximo-lateral parts of vesica covered with numerous spinules, mostly on dorsal surface, their size steadily decreasing terminally. Medial and terminal parts finely scobinate, terminal field of cornuti small, consisting of fine spiculi.

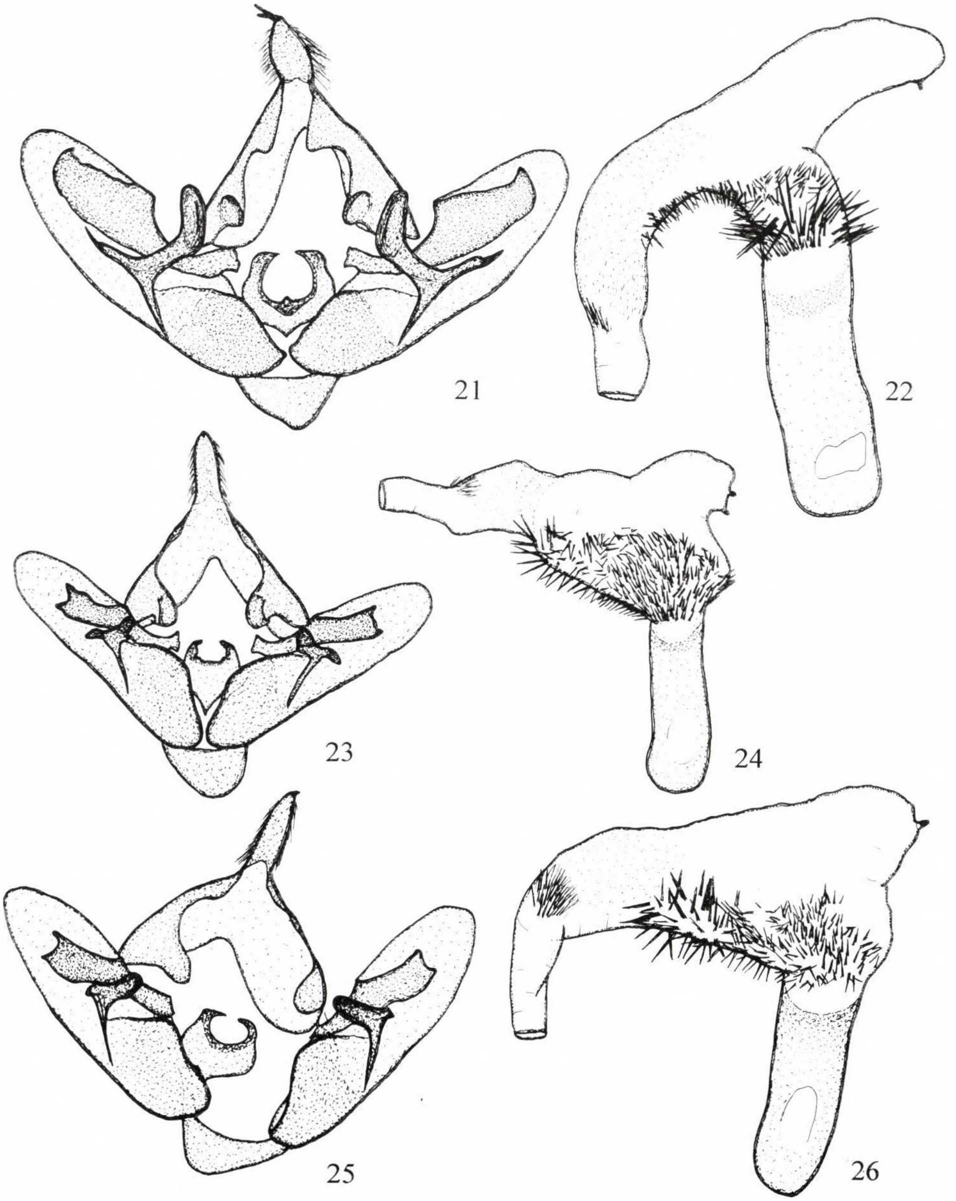


Figs 13–16. *Himalistra aristata* sp. n.: 11 = holotype, 12-14 = paratype males, Nepal, Langtang, 15 = paratype female, Nepal, Ganesh Himal, 16 = paratype male, Nepal, Ganesh Himal

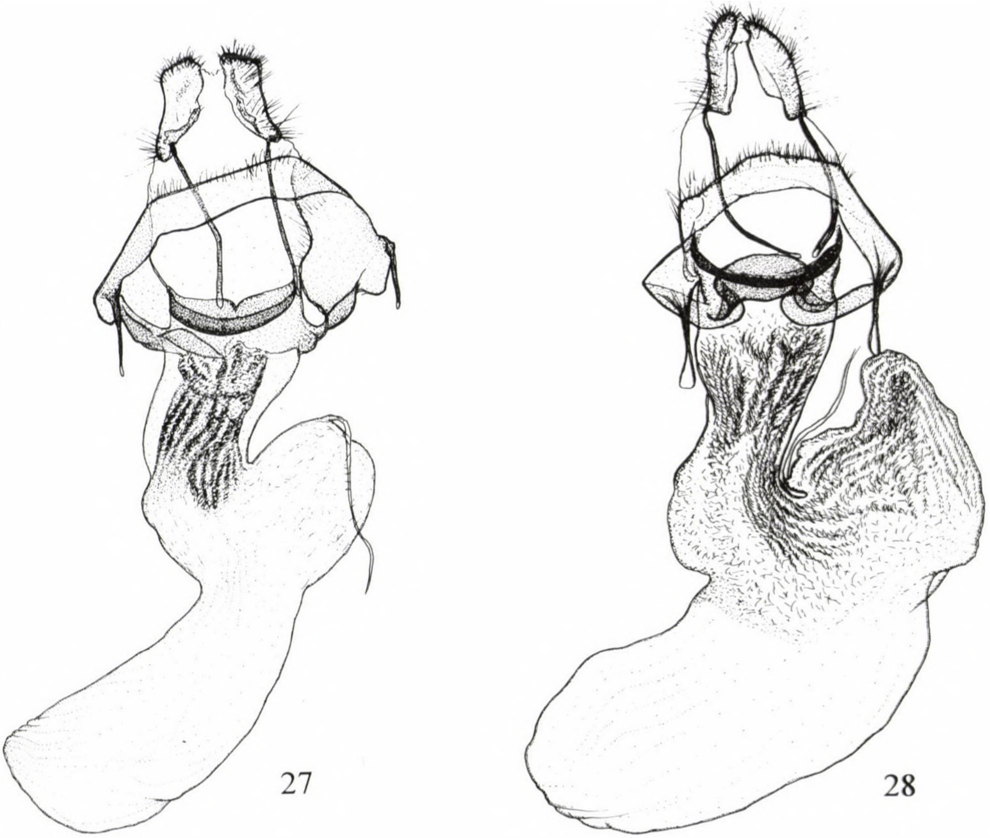
Figs 17-20. 17–18 = *Himalistra variabilis* sp. n., holotype male, China, Tibet; 19–20 = *H. obscura* sp. n., holotype male



Figs 21-26. 21–22 = *Himalistra hackeri* sp. n., holotype male; 23–24 = *H. aristata* sp. n., holotype male; 25–26 = *H. rubida* sp. n., holotype male



The new species is closely related to *H. carnea* HAMPSON, *H. extera* HACKER and the newly discovered *H. obscura* sp. n., forming a well-defined species group. The specific differences are discussed in Table 2. The species resembles also to the members of the *H. fusca* species group, differing from them by the fully darkened reniform stigma and several features of the male genitalia (see Figs 17-22 and Tables 1 and 2).



Figs 27–28. 27 = *Himalistra variabilis* sp. n., paratype female; 28 = *H. obscura* sp. n., paratype female, Pakistan, Astor

Himalistra rubida PLANTE & RONKAY sp. n.
(Figs 4, 9, 10, 25, 26, 29)

Holotypus: male, "China, Tibet, 8 km S of Nyalam, 85°57'E, 28°07'N, 3220 m, 4. X. 1994, leg. M. Hreblay & T. Csővári". Slide No. HREBLAY 6825. (coll. J. PLANTE) *.

Paratypes: China: 6 specimens with the same data. Nepal: 7 specimens, Taplejung area, Mt. Patibhara, 3155 m, 13-14. X. 1994, leg. M. HREBLAY & T. CSŐVÁRI (coll. J. PLANTE, M. HREBLAY and T. CSŐVÁRI); 1 male, Annapurna Himal, near Deorali, 3100 m, 83°43'E, 28°24'N, 5-6.X.1994, leg. G. CSORBA & L. RONKAY (coll. HNHM Budapest).

Slide Nos 6810, 6921 HREBLAY, 4910 RONKAY (males), 6811, 6922 HREBLAY (females).

Description: wingspan 35-39 mm (males), 40-41 mm (females), length of forewing 16-20 mm. Pubescence of head and thorax dark reddish brown. Antennae of males shortly bipectinated, those of females filiform. Forewing elongated with apex pointed, outer margin slightly concave below apex. Ground colour bright reddish brown, irrorated with some darker grey-brown, veins often somewhat darker. Transverse lines broadly double, sinuous, dark brown, filled with lighter reddish brown. Orbicular and reniform stigmata encircled with darker brown, their filling usually somewhat lighter than ground colour; lower third of reniform filled with dark brown-grey. Subterminal line a diffuse, waved, ochreous shadow, defined with dark brown sagittiform spots. Terminal line fine, continuous, dark brown, base of cilia ochreous, outer part reddish brown, spotted with darker brown. Hindwing ochreous, basal and submarginal areas suffused with ashy grey, veins finely covered with darker grey. Discal spot regularly pale, only a fine greyish arch, terminal line brown, cilia ochreous. Underside of wings pale ochreous, medial part of forewing with intensive darker irroration. Crosslines and discal spots weak, fine, sometimes absent.

Male genitalia (Figs 25, 26): uncus strong, short and wide, apical third strongly tapering and curved. Tegumen low, broad, fultura inferior strong, cordiform, with long, curved apical arms. Valva elongated-elliptical, costa with a sclerotized angle at middle; cucullus rounded. Sacculus short, clavus reduced to a setose surface. Harpe strong, basal part strengthened, apical part a bifurcate extension. Inner arm thicker, much longer, with apex rounded, outer arm very small, round. Costal plate strong, broad, terminated in double apex. Aedeagus short, cylindrical, with longer ventral extension of carina. Vesica broadly tubular, short, distally tapering, everted dorso-laterally. Proximal third with a broad but short diverticulum bearing one or two tiny cornuti. Basal and proximo-lateral parts covered with numerous spiculiform cornuti, their size increasing terminad. Medial and terminal parts finely scobinate, with a small cornuti field close to ductus ejaculatorius.

Female genitalia (Fig. 29): ovipositor relatively long, gonapophyses long, slender. Ostium bursae sclerotized, ventral lamina liguliform, broad, flattened, dorsal lamina elliptical, broad and short. Ductus bursae relatively long, wide, inner surfaces with granulosely sclerotized, short crests and folds. Cervix bursae short, membranous, corpus bursae spacious, elliptical.

The species *H. propria* HACKER, *H. rubida* sp. n. and *H. aristata* sp. n. form a complex of closely allied species occurring in the southern Himalayan region. The specific differences lie in the size and coloration of the species and some features of the genitalia, which are discussed in Table 3.

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* The collection of J. PLANTE is bequested to the Natural History Museum of Geneva, by the agreement between the two partners.

Figs 29–30. 29 = *Himalistra rubida* sp. n., paratype female, Nepal, Taplejung area; 30 = *H. aristata* sp. n., paratype female, China, Tibet

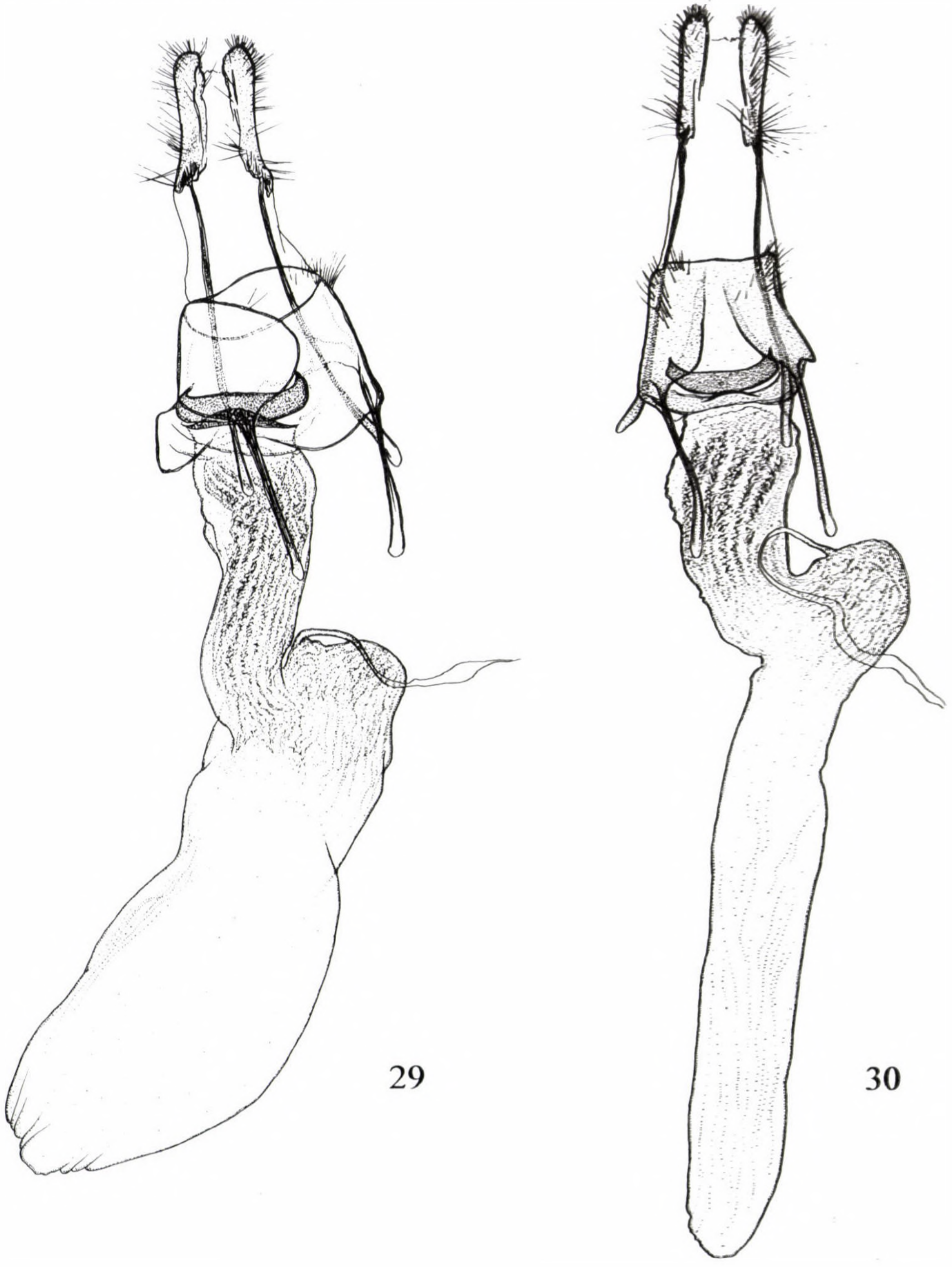

Table 3. Identification table of the *Himalistra propria* species group

Character	*propria*	*rubida*	*aristata*
Size(mm)	33	34-36,5	35-41
Forewing apex	pointed	pointed	acute
Outer margin at apex	less concave	less concave	more concave
Forewing ground colour	light ochreous	strongly variable,red-brownish to dark brown	strongly variable, ochreous-brownish to dark brown
Orbicular stigma	large, less sharply defined	smaller, sharper	smaller, rather sharp
Reniform stigma	less darkened	upper part light, lower part dark brown-grey	narrow, darkened, sometimes with lighter upper part
Crosslines	less sinuous	sinuous	sinuous
Medial line	rather strong	usually diffuse but strong	regularly indistinct
Male genital apparatus	-	generally larger	generally smaller
Fultura inferior	-	broader, arms stronger, ventral extension broadly triangular	narrower, arms weaker, ventral extension narrow triangular
Dorsal arm of harpe	-	broad, long,much longer than ventral arm	smaller, shorter
Ventral arm of harpe	-	small, rounded	narrow, often as long as dorsal arm
Costal plate	-	broader, apically more dilated	narrower, apically less dilated
Costal angle	-	relatively strong, triangular	smaller, weaker
Diverticulum of vesica	-	larger, semiglobular	smaller, more conical
Ventral plate of ostium	liguliform lobe large, longest in group	liguliform plate medium-sized	liguliform plate small
Dorsal plate of ostium	sclerotized ring strong, broad, arcuate	less broad but strong	rather narrow, weaker
Ductus bursae	relatively short, caudally tapering	relatively long, margins of caudal part almost parallel, proximally tapering	relatively short, caudally dilated

Himalistra aristata HREBLAY & RONKAY, sp. n.
(Figs 11-16, 23, 24, 30)

Holotype: male, "Nepal, Langtang, 3500 m, between Cholang Pati and Dimsa, 85°22'E, 28°05'N, 26.IX.1994, leg. Csorba & Ronkay", slide No. 4906 L. RONKAY (coll. HNHM Budapest)

Paratypes: Nepal: four males with the same data (coll. HNHM and G. RONKAY); 62 specimens, Ganesh Himal, Khurpudanda Pass, 85°13'E, 28°11'N, 3650 m, 20.IX.1994, leg. M. HREBLAY and T. CSŐVÁRI (coll. the collectors and J. PLANTE); 1 male, Ganesh Himal, 1 km S of Somdang, 85°12'E, 28°11'N, 3180 m, 21.IX.1994, leg. M. HREBLAY and T. CSŐVÁRI. China, Tibet: 3 males, 1 female, 1 km S of Nyalam, 85°56'E, 28°07'N, 3700 m, 3.X.1994, leg. M. HREBLAY and T. CSŐVÁRI; 3 males, 8 km S of Nyalam, 85°57'E, 28°07'N, 3220 m, 4.X.1994, leg. M. HREBLAY and T. CSŐVÁRI (coll. the collectors and J. PLANTE).

Slide Nos 6703, 6704, 6705, 6706, 6784, 6791 HREBLAY, 4905, 4908, 4909 L. RONKAY (males), 6802 HREBLAY, 4921 L. RONKAY (females).

Description: wingspan 34-36,5 mm, length of forewing 15-18 mm. Body rather slender, head small, palpi short, slightly upturned, third joint straight, porrect, relatively long. Antennae of male finely bipectinate with fine cilia on branches, those of female very fine, filiform, with short cilia. Pubescence of head and thorax homogeneous, regularly red-brown or darker fuscous, mixed with some ochreous brownish hairs. Abdomen more brownish, dorsal crest absent, lateral ridges orange- or red-brown. Forewing relatively broad with apex acute, outer margin slightly concave below apex. Ground colour variable, light red-brown to dark fuscous, often unicolorously darkened. Ante- and postmedial crosslines sinuous, more or less double, darker brown, filled with ochreous; medial line a diffuse, broad, darker grey-brown stripe. Stigmata present, orbicular and reniform encircled with brown, their filling somewhat lighter than ground colour, lower half of reniform dark plumbeous grey. Claviform stigma variably strong, usually marked as a pale brown lunule defined with some ochreous-brown scales. Subterminal line a diffuse, more or less interrupted brown line defined with ochreous on outer side. Terminal line fine, brown, often with small triangles between veins, cilia brown with lighter basal line and pale darker brown spots. Hindwing ochreous, basal and medial areas suffused with brownish grey, costal and marginal fields usually remain ochreous. Crossline and discal spot pale, diffuse, terminal line brown, cilia ochreous. Underside of wings ochreous with some reddish-brownish irroration, central area of forewing suffused with grey-brown. Crosslines and discal spots diffuse but well discernible, dark greyish, forewing discal spot with lighter centre.

The light forms of the species have the forewing markings darker than the ground colour and the elements of the pattern are relatively sharp. In the darker, more unicolorously brown specimens the marking are often obsolete or represented by their lighter fillings and/or definition.

Male genitalia (Figs 23, 24): uncus strong, short, rather narrow, more or less constricted at base, apical hook short. Tegumen low, broad, fultura inferior strong, cordiform, with long, curved apical arms. Valva elongated-elliptical, costal angle small, oblique, less sclerotized; cucullus rounded. Sacculus short, clavus reduced to a setose surface. Harpe strong, basal part strengthened, apical part bifurcate, with almost equally long arms, but dorsal arm usually broader, more rounded. Costal plate strong, broad, terminated in double apex. Aedeagus short, cylindrical, with longer ventral extension of carina. Vesica broadly tubular, short, distally tapering, everted dorso-laterally. Proximal third with a short, semiglobular diverticulum bearing one or two tiny cornuti. Basal and proximo-lateral parts covered with numerous spiculiform cornuti, their size increasing terminad. Medial and terminal parts finely scobinate, with a small cornuti field close to ductus ejaculatorius.

Female genitalia (Fig. 30): ovipositor relatively long, gonapophyses long, slender. Ostium bursae sclerotized, liguliform extension of ventral lamina narrow, small, dorsal lamina elliptical, rather broad, short. Ductus bursae relatively short, wide, inner surfaces with granulosely sclerotized, short crests and folds. Cervix bursae short, membranous, corpus bursae spacious, elliptical.

The taxonomic relationships of the species are discussed under the preceding taxon, the differential diagnoses are given in Table 3.

* * *

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NEW TAXA OF THE EUGNORISMA–EUGRAPHE GENERIC COMPLEX (LEPIDOPTERA, NOCTUIDAE)*

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Descriptions of *Eugnorisma jubilans* sp. n. from Uzbekistan, W Tien Shan Mts, in comparison with the members of the *E. trigonica* species group and *Oligarcha* gen. n. for "*E.*" *coryphaea* PÜNGELER are given. With 12 figures.

Key words: Noctuidae, *Eugnorisma*, taxonomy, new taxa

During our recent studies of various large collections we had to face some new taxonomic problems and found two unrecognized taxa. Thus, after the taxonomic revision (Part I) and phylogenetic-biogeographical survey (Part II) of the genus *Eugnorisma* we decided to separate of some curious and seemingly isolated taxa (Part III and present paper). We propose to erect a new genus for "*Agrotis*" *coryphaea* PÜNGELER, 1900, which represents a partly specialised, partly transitional stage within some related genera of Xestiini and describe a new species from the "*trigonica*"-species group of the genus *Eugnorisma* s. str.

Oligarcha gen. n.

Type species: *Agrotis coryphaea* PÜNGELER, 1900
Gender: feminine.

Description. External morphology: the description of the species is satisfactorily made by PÜNGELER (1900) in the original description and given also by VARGA & RONKAY (1987). The newly found male specimen is illustrated in Fig. 1.

Male genitalia (Figs 5, 6): uncus short, flattened, medially dilated, apex slightly recurved, rounded. Tegumen narrow, weak, moderately high, fultura inferior a rather weakly sclerotized, subdeltoidal plate with truncated apex; vinculum strong, V-shaped. Clavus absent. Valvae elongated-triangular with apex acute, cucullus shortly triangular, corona absent. Ventral margin slightly wrinkled distally, pollex (and digitus) absent. Sacculus relatively short, narrow, without differentiated clavus; pulvillus elongated, densely setose. Harpe strong, relatively short, thick, slightly arcuate with acute apex, apical part covered with fine, short sensory setae. Aedeagus moderately long, cylindrical, dorsal part of carina a broad, sclerotized plate covered with minute teeth, continued in a

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* Revision of the genus *Eugnorisma* BOURSIN, 1946, IV.

long, rather broad lamina. Ventral part of carina bearing a small, dentate crest passing into a narrow, sclerotized bar which is connected with a strong, large, eversible, dentate ventral plate. Vesica broadly tubular, basal part with fine dorsal-dorsolateral wrinkles. Medial part inflated, distal part narrow-tubular, with a strong, reticulated ribbon running on ventral side to ductus ejaculatorius. Diverticulum small, semiglobular, originated laterally from base of distal tube, armed with a fine, small apical cornutus.

Female genitalia: ovipositor short, broad, weak, gonapophyses short. Ostium and ductus bursae heavily sclerotized, attached by a fine membranous neck. Ostium broad, relatively short with lateral margins finely sinuous, ductus bursae long, flattened, slightly constricted at middle, medial part bearing fine dorsal crests. Cervix bursae less developed, rounded, corpus bursae large, spacious, weakly membranous, without signa.

The figure of the genitalia of the holotype female is given in VARGA & RONKAY (1987, p. 254, Fig. 132).

The new genus belongs to the *Eugraphe–Eugnorisma* generic complex. It contains only a single species, displaying a special mixture of genital features of various Xestiini groups, together with several autapomorphic ones.

The general impression of the male genital capsula is similar to that of *Ammogrotis suavis* STAUDINGER, 1888, but with some essential differences. The entirely different shape and structure of harpe and the complete reduction of clavus indicate that the resemblance of the two taxa is only a superficial one. The long, tubular vesica with a retroflexed, small, needle-like subbasal cornutus shows also only some parallelisms, because the distal dentition of the aedeagus and the structure of carina display several essential differences (see Figs 67-70 in VARGA, RONKAY & YELA 1989). The heavily sclerotised, dentate carina with the ribbon-like ventral extension has essentially the same general features as in the presumably related genera *Eugraphe* and *Xestia*, esp. subgenus *Pachnobia* of the latter (see Figs 50-64, l.c.).

Female genitalia very simplified, displaying only some similarities with the general features of some Xestiini genera, e.g. *Sinognorisma*, ductus bursae not folded and/or twisted, cervix bursae reduced, smooth, corpus bursae membraneous, without signa.

Eugnorisma jubilans sp. n.

(Figs 2-4, 7-12)

Holotype: female, Uzbekistan, Chimgan, 1600 m, 20.IX.1992, leg. L. MISKÓ. Slide No. 595 P. GYULAI. Coll. P. GYULAI (Miskolc), deposited in coll. Hungarian Natural History Museum (= HNHM), Budapest.

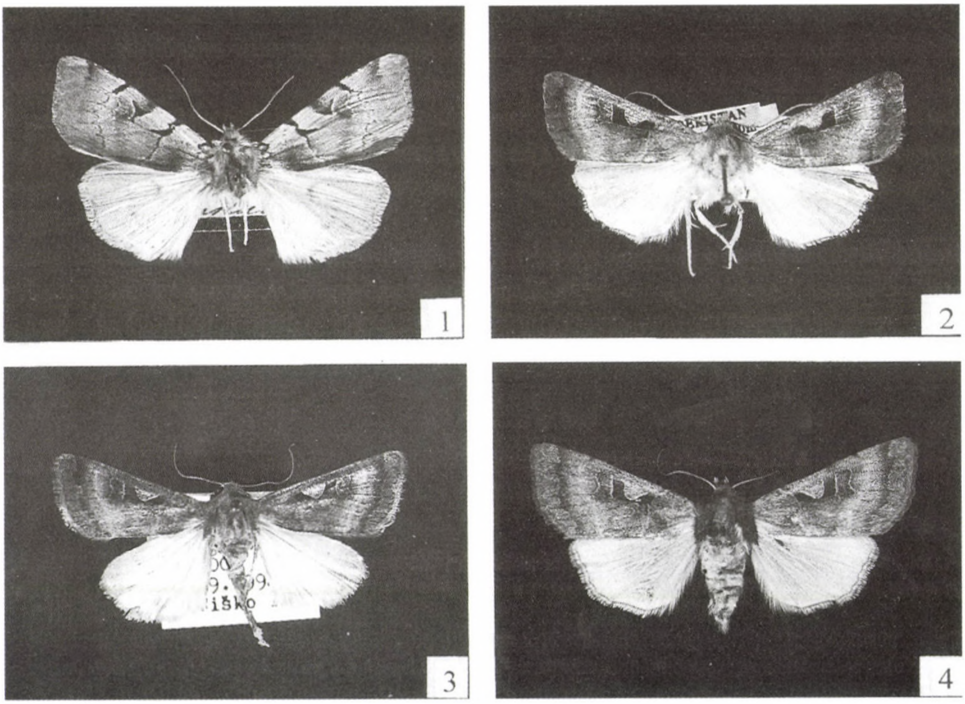
Paratypes: Uzbekistan, Chimgan: 1 female, 1-6.IX.1982, 1 male, 1 female, 1300 m, 23.IX.1991, leg. U. JÜRIVETE (coll. Zoological Museum Helsinki and Z. VARGA); 2 males, 1600 m, 20.IX.1992, leg. L. MISKÓ (coll. P. GYULAI and HNHM Budapest).

Slide Nos 4596, 4597 RONKAY (males), 4577, 4598 RONKAY (females).

Description. Wingspan 36.6-37 mm (males), 34-36 mm (females); length of forewing 16.5-18 mm (males) 16.5-17.5 mm (females). Head grey-brown, with light grey hairs on frons and around eyes; antennae of male filiform, grey. Thorax brown-grey, tegulae mixed with reddish hairs, abdomen light ochreous grey. Ground colour of forewings brown-grey with reddish suffusion, basal and marginal areas somewhat darker. Reniform large, encircled with ochreous grey and filled with dark grey-brown, orbicular broad triangular, upper part without sharp outline; filling of cell dark red-brown or blackish brown. Claviform small, obsolescent. Antemedial line double, arcuate, interrupted, with a darker patch at costa, postmedial double, oblique, subterminal an interrupted, sinuous shadow; cilia as ground colour with dark spots at base. Hindwing of males silky whitish, cilia whitish, with weak brownish marginal irroration, that of females with stronger marginal suffusion. Underside of wings pale reddish or brownish grey, marginal fields somewhat darker, shadow of reniform regularly present.

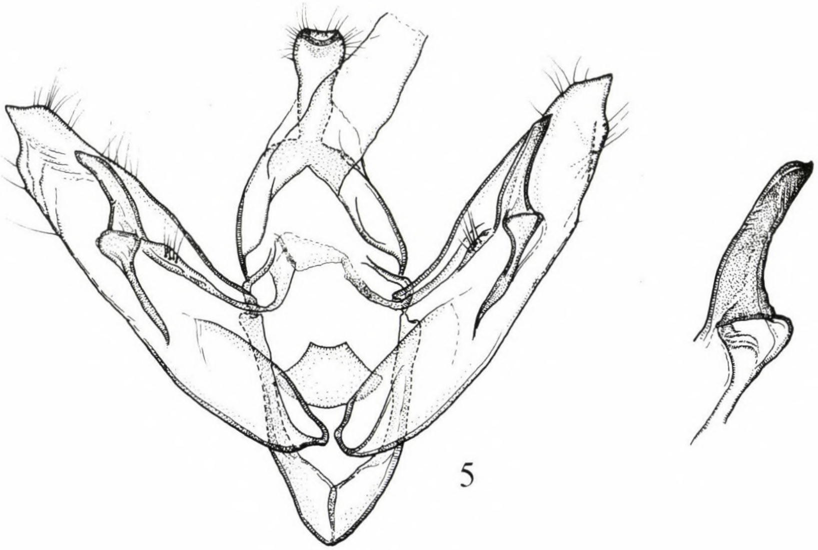
Male genitalia (Figs 7-10): uncus short, rather broad, tegumen high, narrow, fultura inferior a weak plate, vinculum relatively long, V-shaped. Valvae relatively broad, dilated at base and at medial part. Apex pointed, apical lobe short, less acute, pollex broad, triangular, weakly sclerotized, without macrotricha. Harpe strong, falcate, broad-based. Aedeagus short, broad, slightly curved. Carina sclerotized, nail-like, covered with short, strong teeth. Vesica huge, spacious, semiglobular, spinulose field very large. Basal diverticulum long, apically tapering, with a thorn-like terminal cornutus.

Female genitalia (Figs 11, 12): ovipositor weakly sclerotized, covered by fine, moderately long setae. Ostium bursae broad but short, ductus bursae long, sclerotized, laterally folded. Anterior part of ductus narrow, caudally gradually dilated. Cervix bursae large, rounded, weakly plicate; corpus bursae membranous, signa absent.



Figs 1–4. 1 = *Oligarcha coryphaea* PÜNGELER, male, Kuku-Noor; *Eugnorisma jubilans* sp. n.: 2 = paratype male, Uzbekistan, Chimgan, 3 = holotype female, Uzbekistan, Chimgan, 4 = paratype female, Uzbekistan, Chimgan

Figs 5–6. Male genitalia of *Oligarcha coryphaea* PÜNGELER, Kuku-Noor, slide No. 4904 RONKAY



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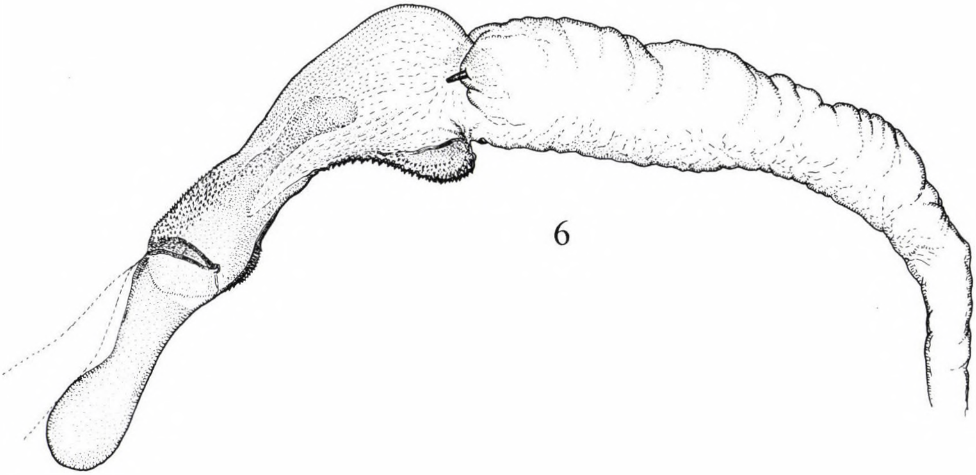

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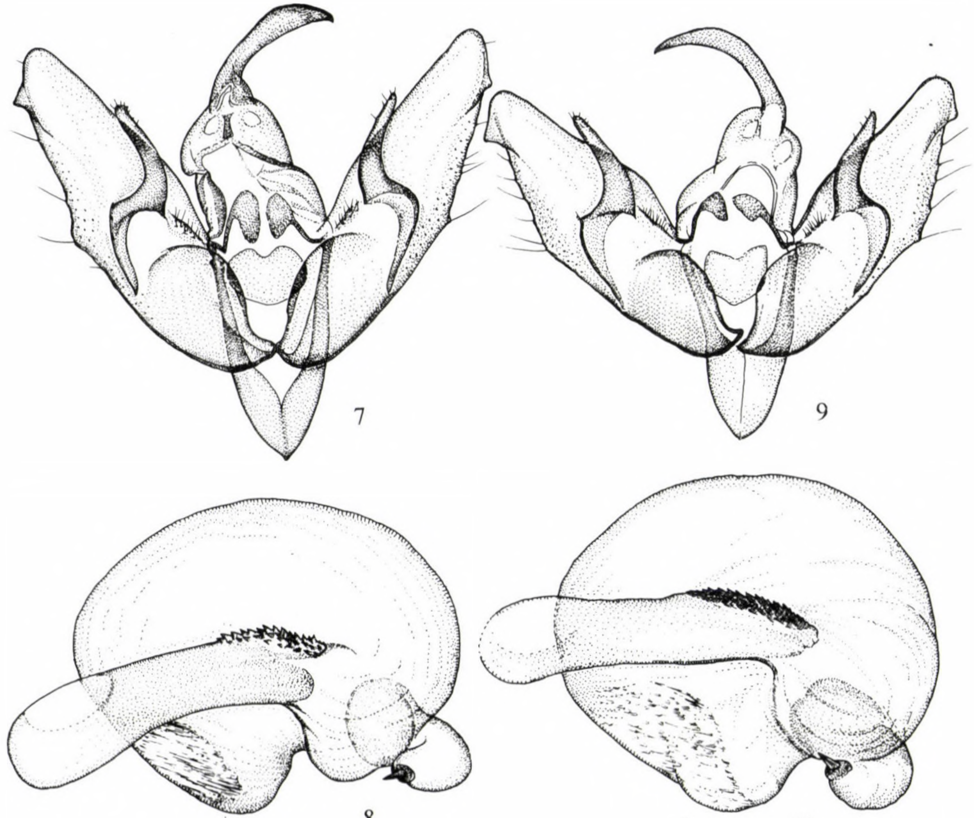
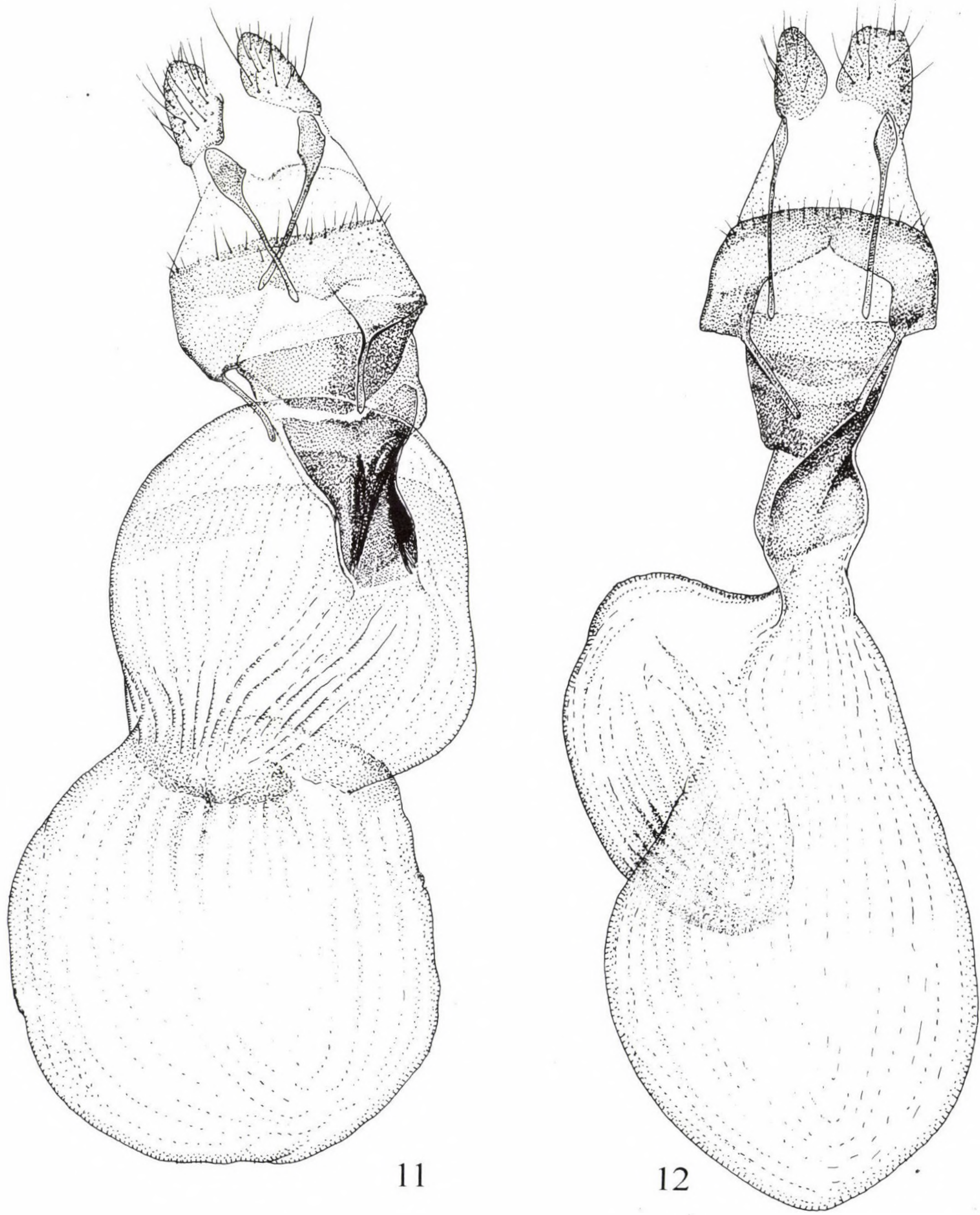
The new species differs externally from *E. deleasma* BOURSIN, 1967 and *E. gaurax* (PÜNGELER, 1900) by its brownish, not black(ish) marking of the cell and the less pure white hindwings. Its closest relative is *E. trigonica* (ALPHÉRAKY, 1872) in which reddish-brownish specimens having pale forewing pattern may often occur. The correct identification of the specimens with such coloration requires the study of the genitalia.

The genitalia of *E. jubilans* are the same type as those of the *E. trigonica* group (see the Figs 42-61, 134-137, in VARGA & RONKAY 1987), the most important differences are as follows: *E. jubilans* is the only known species of the group having no macrotricha on the pollex, the apical lobe is less pointed, the harpe is proportionally shorter and thicker than those of *E. trigonica*. The tube of aedeagus is also short, the dentation of the carina is the strongest within the group. The shape and size of the vesica is close to that of *E. trigonica*, but broader, the subbasal diverticulum is longer with the apical cornutus larger. The



Figs 7–10. Male genitalia of *Eugnorisma jubilans* sp. n. paratypes, Uzbekistan, Chimgan. 7–8 = slide 4596 RONKAY, 9–10 = slide 4597 RONKAY

Figs 11–12. Female genitalia of *Eugnorisma jubilans* sp. n., paratypes, Uzbekistan, Chimgan: 11 = slide 4577 RONKAY, 12 = slide 4598 RONKAY



ostium bursae of the new species is broader, the ductus bursae is longer and proximally significantly narrower than those of the related species.

The new species belongs to the *E. trigonica* group, showing close relationships with *E. trigonica*, *E. gaurax* and *E. deleasma*. The majority of the external and genital features fits well with those of the mentioned species though displaying some unique, derived, taxonomically important characteristics. The pollex covered with macrotricha is mentioned as a synapomorphy of the *trigonica* and *insignata* species groups (VARGA, RONKAY & YELA 1990). The absence of the macrotricha in this species cannot be regarded, however, as an evidence for some closer relationship with other species of the genus, because all the other genitalic features of both sexes are in contradiction (see the description of the new species). The configuration of the carina, the vesica and the ductus bursae, respectively, is so consistent for the whole *E. trigonica* group that this deviate feature of the newly discovered taxon cannot refute the monophyly of the species group.

The reduction of these macrotricha – and partly the sclerotization of the pollex itself – should be considered as an autapomorphy of a marginally isolated, stenochorous species.

Distribution. The new species is known only from the type locality, the north-western border of the area of the species group (and *E. trigonica*, the most widely distributed species of the group).

* * *

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GEOGRAPHICAL PATTERNS OF BIOLOGICAL DIVERSITY IN THE PALAEARCTIC REGION AND THE CARPATHIAN BASIN

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Species diversity varies spatially. It can be characterised not only by some latitudinal and longitudinal gradients but also by numerous *core areas*, i.e. by restricted territories with cumulated presence of stenochorous ("*endemic*") species.

Patterns of diversity can be explained by the spatio-temporal dynamics of the processes which i. generate diversity by speciation, ii. reduce diversity by extinction.
A major part of the core areas served as *conservation centres of forested biomes* in their regressive phases during the younger Pleistocene. The periodical expansion of the "*non-forest*" biomes during the glaciations (e.g. periglacial tundra and loess steppe) has isolated the forest refugia. On the other hand, the extension of the grassland and desert biomes was restricted by the recurrent inter- and post-glacial spread of wooded biomes.

The Carpathian Basin with a mosaic pattern of forested and open landscapes displayed very intricate dynamics of faunal types during the Quaternary period. Its geographically transitional position resulted in a conspicuous mixture of faunal elements of diverse origin and geographical history. The compartment structure of the vegetation complexes, typical for the Pannonian forest-steppe, has promoted the survival of some strictly localised, relict-like faunal elements. Especially the hilly areas of transitional climatic conditions, surrounding the Pannonian lowland are populated by numerous, biogeographically significant species and communities.

Key words: area dynamics, speciation, core areas, glacial refuges, oreal fauna, faunal types, Carpathian Basin

GENERAL CONSIDERATIONS

Area Dynamics and Speciation

Species diversity is generated by branching processes called *speciation* which can be interpreted as a partition of the genetic variation into discrete units separated by reproductive isolation. The subdivision of the formerly – at least potentially – coherent gene-pool may arise under the constraints of the niche-structure of the ecosystem, i.e. *diversity generates diversity*. On the other hand, processes of speciation are subjected to the spatio-temporal changes of the habitats in which the populations are living. Hence, the patterns of species diversity can be described in terms of the community structure and by the regularities of the geographical distribution of species and natural, monophyletic higher taxa, as well.

A general strategy of searching for repetitive patterns studied by the geographical ecology, has been formulated by MACARTHUR (1972): "The imperfection of repetitions gives us the means of making comparisons". Some basic repetitions are given in the distribution patterns of flocks of species (i.e. *faunal types*) which have essentially similar ranges with only slightly modified geographical boundaries in the individual cases.

By the overlapping of similar areas of small or moderate size, some surfaces of congruence are to be outlined which can be characterised by a cumulated presence of stenochorous ("*endemic*") species (cf. DE LATTIN 1967, MÜLLER 1974, 1977, VARGA 1975, 1977). The presence and evolutionary significance of these core areas can be corroborated by the existence of homologous structures in the subspecific division of widely dispersed, often disjunct polytypic species and also by species abundance centres of monophyletic supraspecific units, i.e. genera, subfamilies or families.

The evolutionary explanation of these core areas is based on the principle that biotic diversity is a result of events of differentiation within spatially isolated populations, accumulated over time. According to the refuge modell (BROWN 1982, CRACRAFT 1982, 1983, CRACRAFT & PRUM 1988, Haffer 1976, 1977, MÜLLER 1974 ff.) *core areas arose as the results of cyclical expansion and contraction of forested versus nonforested biomes during the Quaternary climatic fluctuations.*

The "pacemaker" of these evolutionary events was the "*antagonistic dynamics*" (DE LATTIN 1967) of the macrohabitat types which are contrasting by the strikingly different level of their primary production (cf. Table 1, cf. VARGA 1975, 1977). The periodical subdivision of formerly continuous biomes into geographically isolated refuges has generated the evolution of vicariant taxa. This "*dichopatric*" type of subdivision has succeeded several times and the relative constancy of the refuge areas, determined by the major paleogeographical features, resulted in a high probability of species conservation, which have survived or/and evolved (as neo-endemics) in these core areas. The summation of these speciation and species conservation events which took place in the core areas, are responsible for the high level of species diversity of these territories.

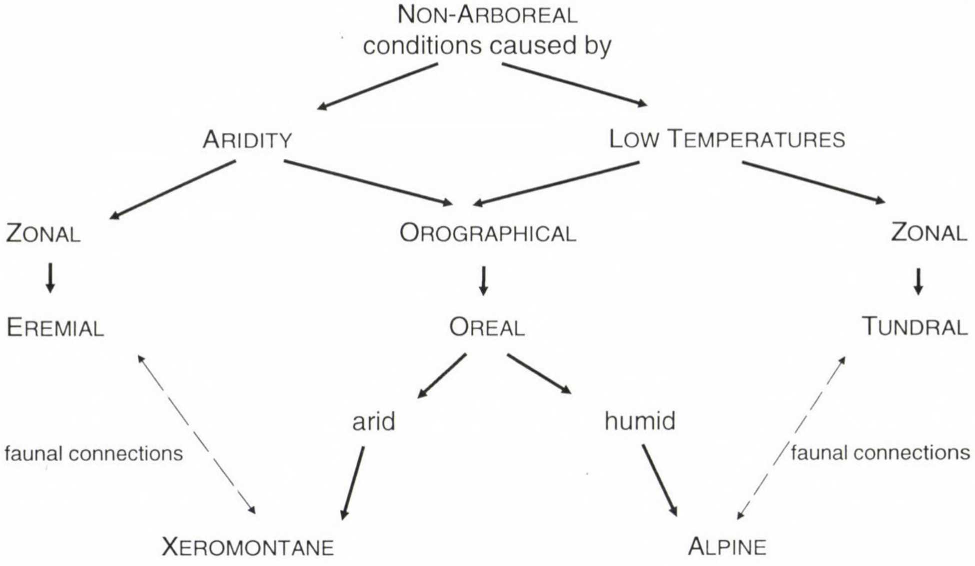
Review of the Quaternary Area Dynamics of Biomes

The general validity of these ideas on speciation and species diversity was supported by numerous surveys carried out on different continents. They have confirmed that a major part of the core areas (i.e. centres of endemism) served as conservation centres of forested biomes during their regressive phases in the course of the younger Pleistocene. Most studies, published during the last two

Table 1. Comparison of arboreal vs. non-arboreal biomes

	Arboreal	Non-arboreal
Duration of water circulation	more than 3 months	less than 3 months
Primary production in one year	moderate – high: 25-500 q/hectar	low, less than 25 q/hectar
Structure of vegetation	several layers (synusia)	only one (or two) layers
Temperature budget of the surface	like water surface	like bare rocky surface
Soil, humification, nitrification	more layers, intensive humification, mycorrhiza, intensive nitrification	immature, skeletic soils, slow and local humification

Biogeographical Review of Non-Arboreal Biomes and Faunal Types



decennia, concentrated on the elucidation of the paleogeographic history of the tropical rain forest ("*Hylaea*") biome, undoubtedly one of the most fascinating treasuries of actual biodiversity (cf. Brown 1982, 1987, Cracraft 1983, 1985, Cracraft & Prum 1988, Haffer 1974, 1976, 1977, 1987, Müller 1974, 1977, Prance 1973, 1987, Simpson & Haffer 1978 etc.). Centres of endemism in flowering plants, butterflies, reptiles and birds were outlined and compared in several studies. An essentially similar history of taxon pulse has been pointed out in the arboreal biomes of Australia, too (CRACRAFT 1982). The evolutionary significance of the – at least partial – concordance of core areas was improved also by cladistic analyses which have corroborated the general ideas on "*dichopatric*" events and explained their temporal sequence during speciation.

In the Holarctic the disjunct patterns of distribution of numerous arboreal genera are well known (cf. REINIG 1937, 1938, 1950, DE LATTIN 1953, 1956, 1967, MATJUSHKIN 1972, 1982, SCHINTLMEISTER 1989, etc.) and interpreted by the refugial model. A large number of vicariant taxa – species or subspecies depending on the rate of differentiation – demonstrates the evolutionary significance of the core areas which served as centres of dispersal ("*Ausbreitungszentren*", cf. DE LATTIN 1956, 1967) for the post-glacial re-forestation and re-population of Holarctic temperate biomes.

Although the distinction of the effects of the historical, evolutionary events from the consequences of the recent ecological factors is often difficult, if not impossible (cf. ENDLER 1982*a, b*), I think that the high level of *concordance in species richness centres* and in *species endemism centres* sufficiently corroborates the reality of such refugia (chorological centres and centres of dispersal, resp.) and therefore also the reality of *faunal types* ("*Faunenkreise*" in the German terminology) which can be outlined as basic zoogeographical units according to their consistence with the core areas (in contradiction with the opinion of HENGEVELD 1990). The chorological surveys of Palaearctic birds, butterflies, moths, dragonflies, locusts and grasshoppers etc. give us a wide foundation supporting the relevance of these ideas.

Some Biogeographical Effects of Pleistocene Glaciations in the Holarctic

In the Holarctic, the most striking feature of the late-glacial cold-dry ("kryoxerotic", cf. GRICHUK & GRICHUK 1960) phases – as opposed to the postglacial ones – was that the large open biomes of the *periglacial tundra and loess steppe were not separated from the eremic ones* by forested barriers, which allowed an extended combination in their species stands, simultaneously with the contraction of the forested biomes and refugial isolations in the distribution ranges of their inhabitants.

On the contrary, in the interglacial and postglacial phases, *the expanding forest biomes have disjointed the range of open macro-habitats* (cf. VARGA 1975, 1977, 1989). The orographically limited, azonal oreal biomes have been generally separated from the tundral zonobiomes which were forced to "creep" northwards. The steppe zonobiomes were also completely separated from the tundral ones, but only partially from the oreal habitats. In the less continental climatic belts, the forested zonobiomes have been inserted between the arctic tundral and semi-arid steppe biomes. Thus, they became completely divided by wide and manifold forested territories.

On the other hand, in the vast Central and Inner Asiatic regions the forested belts became scattered, fragmented into the regionally or locally more humid macro-slopes of the mountains. Thus, the mountain steppes and semi-deserts continuously intergrade into the xerophytic high-mountain vegetation (cf. the vegetation zonation of the ranges Pamir, some parts of Hindukush and Tienshan, Mongol and Gobi Altaj, see: AGAHANJANTS 1981, BRECKLE 1974, SIPOS and VARGA 1992, etc.). This gradient is a powerful potential of faunal mixing, too (VARGA *et al.* 1989).

Several *centres of endemism are lying in the arid-semiarid mountain belts* and the introgression of their expansive elements into the steppe zonobiome seems to be a general feature of distribution patterns in numerous genera, rich in species and typical for the arid-semiarid (*xeromontane*) mountaineous habitats of Central Asia (VARGA 1976, 1977, 1993, VARGA & RONKAY 1987, VARGA *et al.* 1989, VARGA *et al.* 1990, RONKAY 1988, RONKAY & VARGA 1990, HACKER 1992*a,b*, HACKER & RONKAY 1992, etc.).

Evolutionary Role of Aridisation in the Temperate Grassland Biomes

The faunal changes of the Palaearctic have been described up to the present mostly in terms of the fluctuation of cold, glacial and warm-temperate, interglacial or interstadial phases. Several conclusions, however, drawn from the very recent climatic changes, called the attention the processes of aridisation which can succeed in fairly different temporal dimensions. The economic and social effects of the actual aridisation of Central and Inner Asia, proceeding nowadays too, involve numerous consequences which are, unfortunately, only very incompletely realized by the "developed" countries. We know only some very rough outlines of the scenario of the general aridisation during the last thousand years which led to the complete desertification of Sahara and resulted in the decline of the famous civilisations of city-states (Samarkand, Bokhara) in Central Asia.

These processes have resulted in a decimation and marginal isolations of the Afro- (and Pan-) tropical elements in the Maghreb area and the relict-like isolations of Mediterranean elements in the old massifs of the Sahara, surrounded by deserts (pers. comm. BORHIDI 1993). These phenomena are, however, only the culmination of a long course of events, which began with the areal glaciation of the Antarctica during the Miocene and conduced to a radical decrease of the deep-sea temperature and to a global regression of the sea-level. As a consequence of the increasing continentality, extended open biomes emerged which resulted in a radical change in foraging strategy and life-history of numerous phytophagous groups, e.g. the emergence of grass-feeding Ungulates, the first large radiation of rodents, the arise of subterraneous way of life in convergent groups of rodents and *the emergence of the cutworm-type life-history of noctuid-moth caterpillars*, etc.

Some Trends of Evolution in the Oreal Biomes in the Palaearctic

By the evolution of all these non-arboreal zonobiomes and orobiomes, together with their typical *faunations*, the biogeographical counterpart of the arboreal ones has been established and the northward spread of the "*Kathaysian*" arboreal elements was forced to pass through some *filter-corridors.* Numerous elements of the monsoonic mountain forests could penetrate to the South-Siberian high-mountains (STEGMANN 1937, VARGA 1977, VARGA *et al.* 1990). Two-

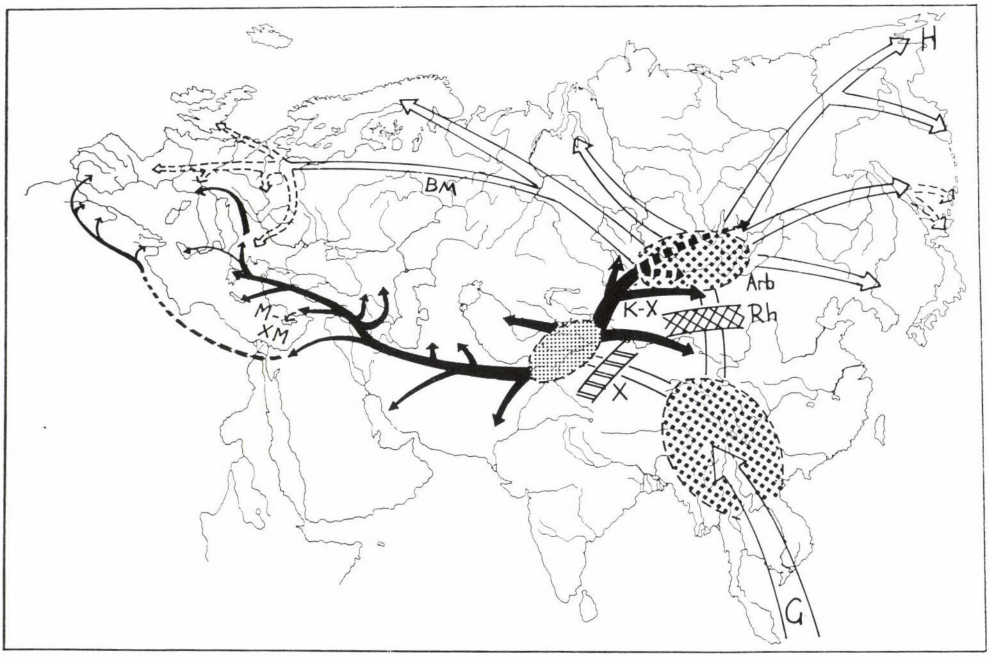


Fig. 1. General features of faunal migrations in the Palaearctic. G = Gondwanian connections, X = Xeromontane filter and main bifurcation in the Xeromontane fauna, M–XM = Mediterrane–xeromontane faunal types, K–X = Continental xeromontane faunal types, Rh = "*Rhododendron*"-filter in the Monsoonic arboreal fauna with secondary centre of diversity in Southern Siberian mountains, B–M = Boreo-montane connections, H = Holarctic connections

fold consequences of this process have been derived: the origin of Holarctic-circumboreal distribution of cold-adapted elements of the temperate forest-belts (mainly: coniferous, taiga) on the one hand, and the formation of disjunct SE-Asiatic – South-Siberian ranges after the breakdown of this corridor by aridisation of Central Asia, on the other. The importance of the Southern Siberian mountain taiga as possible *primary core area* of boreal-Holarctic Noctuidae species agrees well with new data on a *Beringian refuge*, as the most recent centre of survival and dispersal of these elements during the late-glacial and post-glacial phases (MIKKOLA *et al.* 1991).

An other part of the biota of the monsoonic orobiomes has been constrained to penetrate across the so-called "*xeromontane*" filter, because at the end of the Tertiary a progressive glaciation of the perpetually emerging Himalaya-Transhimalaya chains and Tibet plateau took place which resulted in a general climatic re-arrangement of the whole Central Asiatic region (HSÜ JEN 1981, 1984, LI JI-JUN *et al.* 1981). The Transhimalaya–Karakoram–Ladakh area and the Tienshan system became main centres of differentiation of the continental xeromontane fauna in the Palearctic. By the phylogenetic–systematic analysis of some xeromontane groups of Noctuidae it was pointed out that the *diversification of numerous genera was subdivided into two main lineages* (VARGA 1989).

Secondary centres of diversification arose in the Mediterranean semi-arid high-mountains from Atlas range to Asia Minor and also in the West-Central-Asiatic territory from the Armenian plateau through Iran and Turkmenistan to the Hindukush and Pamir ranges, where an overlap of both types of xeromontane fauna can be observed (VARGA 1976, 1977, 1989, 1992, VARGA & RONKAY 1987, 1989, VARGA *et al.* 1989, VARGA *et al.* 1990, HACKER & VARGA 1989, RONKAY & VARGA 1990, etc., Fig. 1).

AREA DYNAMICS, EVOLUTION AND DIVERSITY PATTERNS IN THE CARPATHIAN BASIN

Zones and Landscapes

It is typical for southeastern Central Europe that the large-scaled zonal settling of vegetation, characteristically developed in the vast Eastern European table-land, breaks down. In the Carpathian Basin a more or less concentric arrangement of vegetation belts is to be observed, modified by numerous climatic, orographic, hydrographic and edaphic factors. The "overall zonality" is replaced by a mosaic-like interlocking of individual landscapes. The forest-steppe, typical for the major, central lowland and hilly part of the basin, is represented here by a number of its regional variants, showing distinct geological features, edaphic properties and meso-climatic characters (cf. VARGA 1989). The forest, skirt and grassland "compartments" of each regional variant of the forest-steppe are highly interdependent and correlated. The forested belts of this district display also their local or regional features, determined by the prevailing climatic influences and also by the peculiar character of the neighbouring mountain system (Alps and Carpathians, resp., but in some cases, the mountains of the Balkan Peninsula, too). The orobiomes of the Carpathians are "archipelago"-like, regionally well-differentiated, which depends on the varied contribution of alpine, continental and balcanic influences.

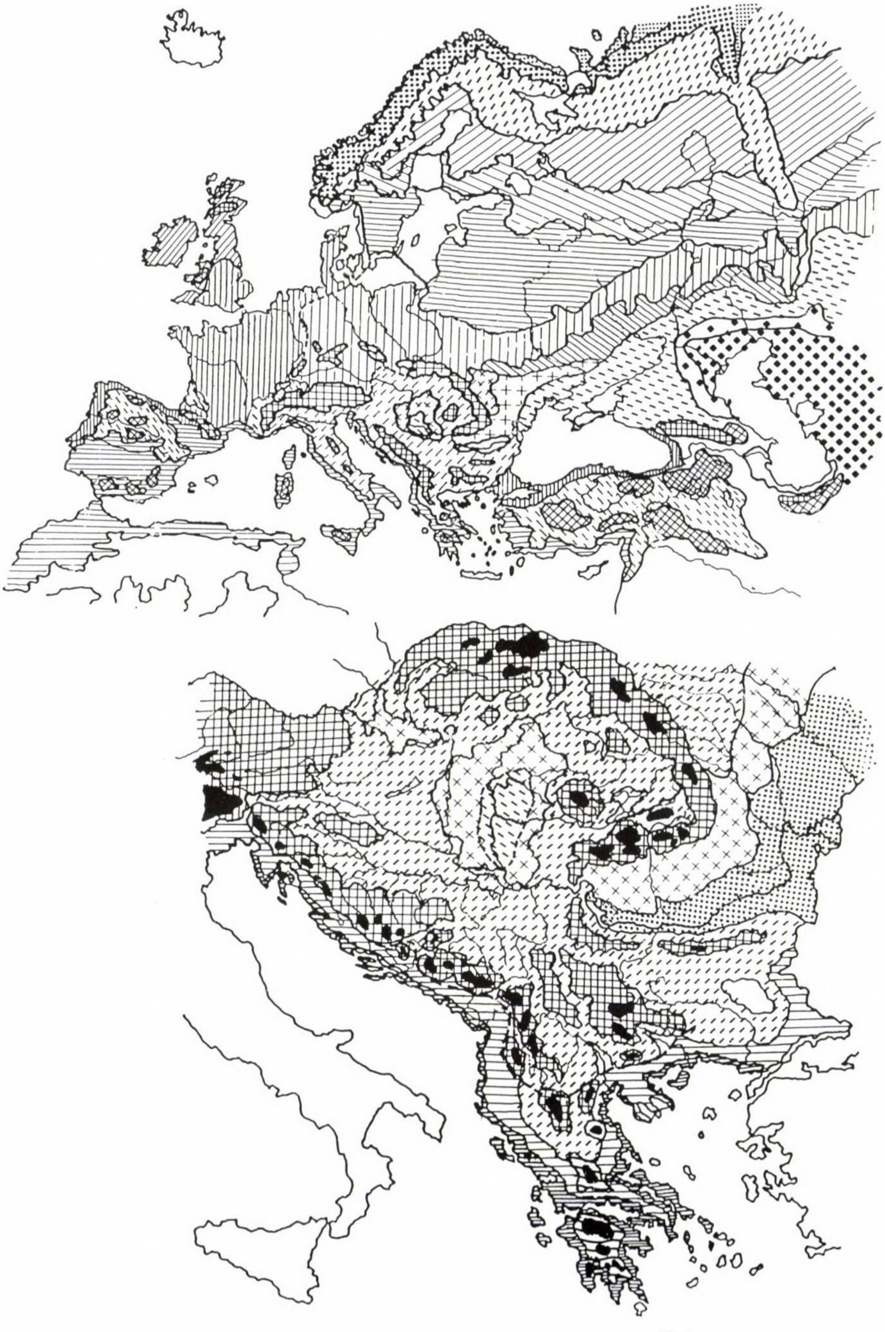
The biogeographical features of a given territory are determined by their own natural endowments and by the various influences, coming from neighbouring territories, as well. The most significant regional biogeographic influences in the Carpathian Basin are as follows.

Dispersal History of the Steppe Elements: The Forest – Steppe Dynamics

The Hungarian Middle Range occupies a central position in the Carpathian Basin not only in topographical sense. Their southern, xerothermic slopes and foothills (called "Ősmátra", cf. BORBÁS 1908, *cit.* SOÓ 1959, SOÓ 1929, 1940, 1959, ZÓLYOMI 1949, 1953, 1957, 1964, WENDELBERGER 1954, 1973, etc.) served both as refuges for thermo-xerophilous elements during several cold and cool-humid climatic phases of the Quaternary and as centres of their dispersal, as well. Thus, the thermophilous elements probably populated the Carpathian Basin not only by long-distance colonisation from remote, large glacial refuges, but also – especially after the last, late glacial and early post-glacial cold phases – from numerous meso- or microclimatically favourable sites, lying at the continuously fluctuating borderline of the Mediterranean refugial and periglacial belts. The varied and fine biostratigraphical structure of the Hungarian young Pleistocene, which is often characterised by a coexistence of forest and non-forest faunal elements (JÁNOSSY 1979, KORDOS 1977, KRETZOI 1953, 1967, 1977, etc.), provides evidences to support this view and demonstrate the transitional biogeographical character of this region during the whole time-span of the Quaternary period. New palynological data from the eastern part of the Pannonian lowland (Bátorliget) also suggest the presence of forest refuges during the last glacial period.

The cold phases of the Würm glaciation can be characterised by a simultaneous presence of tundral (*Lemmus, Dicrostonyx, Microtus gregalis, Gulo, Rangifer*), tundro-alpine (*Lagopus*), oreal (*Rupicapra, Ibex*), cold-steppe (*Lagurus, Allactaga, Cricetulus, Ochotona, Marmota*) and cold-adapted forest (*Lyrurus, Castor, Alces, Mustela erminea, Talpa*, etc.) elements. This faunal mixture sug-

Fig. 2. Breakdown of general in SE Central Europe – geographical background of faunal diversity



gests the presence of a varied vegetation of fairly high productivity which provided for large flocks of grazing Ungulates, Proboscidea and also for a great variety of rodents. The large-sized vertebrates of this faunal assembly, which need extensive open habitats, were not able to survive the climatic changes and the post-glacial reforestation here. Some of its elements, however, which could tolerate the contraction and fragmentation of their habitats, have survived in such biotopes which remained unforested due to their peculiar edaphic traits, e.g. kurgans, loess ridges, dolomite grasslands etc. Such widely dispersed cold-continental plant species as *Agropyron pectinatum, Eurotia ceratoides* and also numerous xeromontane insect species of continental character can be regarded as relicts of the extremely continental late-glacial phases (cf. VARGA 1989).

Steppe and forest-steppe species were also able to colonise suitable hilly and lowland habitats during the Boreal period and during the phases of the retreat of the humid, closed forest zonobiomes (cf. "Ősmátra"-theory, references above). The refugial character seems to be most clearly expressed in a number of dolomite and limestone territory of the Transdanubian Middle Range which are characterised by the cumulative occurrence of endemic and strictly localised species and subspecies of plants and Arthropods. Their biogeographical effect is most significant in those areas of the neighbouring lowland called "*Praematricum*" which have an immediate territorial contact, (such as the alluvial fan of the river Danube) and advantageous climatic and edaphic properties, e.g. those parts of the "Kiskunság" area in which grasslands and steppe oak forests grow on calcareous sand.

Balcanic and Mediterranean Influences in the Carpathian Basin

Significant are also the influences of the Western Balcan ("*Illyrean*") areas which have a humid sub-Mediterranean climate, equinoctial precipitation maxima and do not have usually a significant rainfall deficit in the summer period. These areas have a typical forest climate and an abundance of species which are sensitive towards a hard winter. These influences are characteristic on the south and south-western part of Transdanubia and affect also the western part of the Pannonian lowland at the lower course of Danube and the lowland near the Drava. These belts are characterised by mesophilous zonal forests of beach and hornbeam (*Fagion illyricum* and *Querco-Carpinion illyricum* zones, cf. HORVAT 1959, 1962, HORVAT *et al.* 1974) and they are rich in relict-like (Tertiary or interglacial, cf. HORVAT *l.c.*) herbaceous, often geophytic plant species and also in gallery forests which have an outstanding species diversity (e.g. *Fraxino pannonicae-Ulmetum*) and are rich in epiphytic species, too.

The influence of the Eastern Balcan territories has a double character, because these areas are transitional between a continentally influenced sub-Mediterranean and the steppe climate. These influences are present along the western border of the W Transylvanian Mountains (Bihar Mts, Mts Apuseni) and along the great rivers of the eastern part of the Pannonian lowland. The surprising occurrence of some southern elements in the NE part of the Pannonian plain (e.g. Nyírség) and in the sub-Carpathian lowland and hilly regions (MAHUNKA 1993, VARGA 1989, VARGA in FÉSÜS *et al.* 1991) can be explained by this dispersal route. Some eastern Balcanic influences reach also the Hungarian Middle Range where the relict-like occurrences of some Balcanic and Balcanic-Anatolian elements (e.g. the Noctuid moths *Asteroscopus syriacus* WARREN and *Dioszeghyana schmidtii* DIÓSZEGHY) are present, especially in the warm foothill zone where also significant sub-Mediterranean influences prevail.

The Mediterranean – mostly sub-Mediterranean and ponto-Mediterranean – influences are also significant. Some representatives of these faunal types occur as northernmost marginal isolates in different parts of the Carpathian Basin. Especially rich in such, relict-like elements are e.g. the surrounding of the "*Iron Gate*" at the lower course of Danube, the island-like hilly parts of Southern Transdanubia (Villány Hills and Mecsek Mts) and the xerothermic oak forest and scrub-forest belt of the Hungarian Middle Range with its very diverse and valuable forest-steppe communities, mostly on dolomite and limestone. The relative richness of the calcareous sandy area of Kiskunság region in Mediterranean elements can be explained by its meso-climatic character and by its territorial connection with the former area ("Praematricum"), as well. The taxonomical isolation of populations of some Mediterranean, Balkanic and Balkanic-Anatolian elements demonstrates the possibility of the existence of some local refugia in climatically favourable parts of the Carpathian Basin during the last glaciations.

Carpathic and Alpine Influences in the Carpathian Basin

The Transylvanian ("Dacian") influences occur in relation to the forested areas of the Eastern Carpathians and often transmitted by the western Transylvanian mountains. The occurrence of some Dacian elements is typical for the eastern part of the Hungarian Middle Range, especially in the higher parts of the volcanic Eperjes-Tokaj range (=Zemplén range) and in the Karst areas of Northern Hungary and Southern Slovakia. Isolated, relict-like occurrences of Dacian elements (Tettigonoidea: *Isophya modestior stysi* CEJCHAN, *Pholidoptera transsylvanica* FISCHER-WALDHEIM; Carabidae: *Carabus hampei ormayi* REITTER) have been recently discovered on the small, island-like volcanic hills of the NE (Bereg) Plain.

The influences of the Northern Carpathians are in our territory the most significant in the NE part of the Hungarian Middle Range. There is, however, a characteristic difference between the Eperjes-Tokaj volcanic chain, on the one hand and the limestone plateau of the Bükk Mts and N Hungarian Karst area, on the other. The biotic contact of the Eperjes-Tokaj range with the Carpathians is a young, obviously postglacial one and can be characterised mostly by the presence of species which are either typical for the montane forest belt of the Carpathians (e.g. numerous Gastropoda: *Bielzia coerulans* BIELZ, *Vestia gulo* BIELZ and Carabidae: *Carabus obsoletus* STURM, *C. zawadszkyi* KRAATZ, *Abax schueppeli* LETZN.) or widely dispersed in the northern part of Central Europe, having often a wide Euro-Siberian distribution. The Bükk Mts, however, displays a very interesting insular character and its Carpathian and de-Alpine elements (e.g. Gastro-

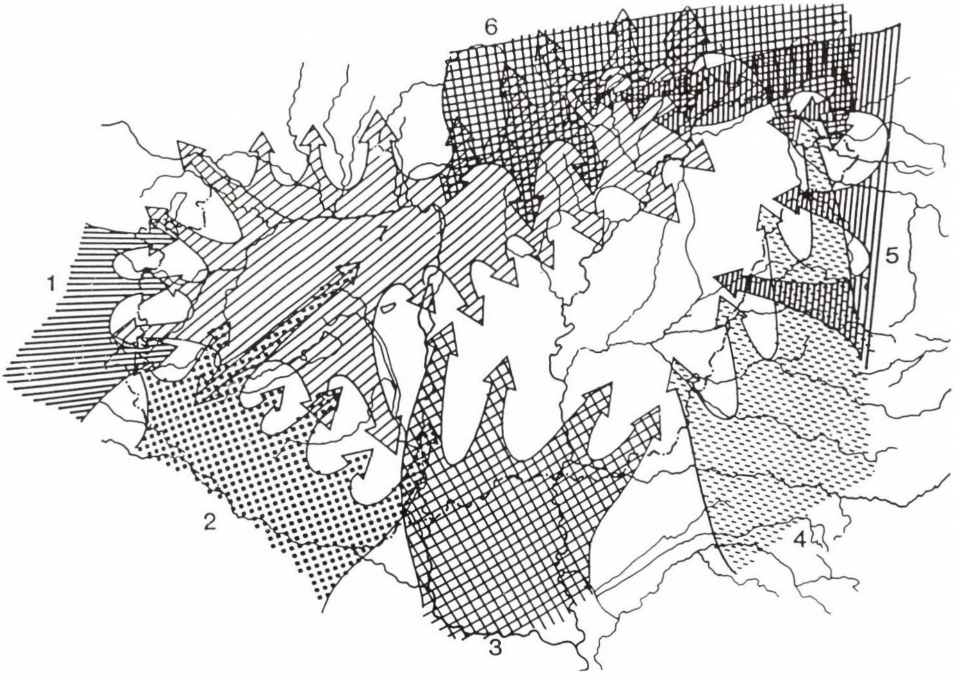


Fig. 3. Biogeographically relevant sources of faunal diversity in central part of the Carpathian Basin. 1 = Alpine–de-alpine faunal elements, 2 = Illyrian (W Balcanic) faunal elements, 3 = expansion route of some Mediterranean species along the Danube valley, 4 = Moesian (E Balcanic) faunal elements, 5 = Dacian (Transylvanian) faunal elements, 7 = Submediterranean elements expanding along the Middle Range ("Ősmátra"), NB = Xeromontane elements have only isolated relict sites

poda: *Spelaeodiscus triaria* ROSSMAESSLER, *Phenacolimax annularis* STUDER, Lepidoptera, Geometridae: *Entephria cyanata gerennae* GYULAI) are often relict-like which have no actual contacts with the populations living in the Carpathians. In the N-Hungarian Karst area the immediate area contact with the higher limestone plateaus of Slovakia is combined with the occurrence of Carpathian (Gastropoda: *Bielzia coerulans* BIELZ, *Cochlodina cerata* ROSSMAESSLER, *Trichia unidentata* DRAPARNAUD; Carabidae: *Carabus obsoletus* STURM, *C. zawadszkyi* KRAATZ, *Abax schueppeli* LETZN., *Trichotichnus laevicollis carpathicus* SCHAUBG.), boreal (Gastropoda: *Vertigo substriata* JEFFREY) and xeromontane species at surprisingly low altitudes, influenced by the special meso-climatic and geomorphological features of this area. It is also worth to mention that some influences of the Northern and Eastern Carpathians are to observed at the NE marginal areas of the Pannonian lowland, too, i.e. at the upper reaches of the river Tisza and its tributaries (e.g. the occurrence of Gastropoda: *Vitrea diaphana* STUDER, *Bielzia coerulans* BIELZ, *Balea stabilis* L. PFEIFFER, *Perforatella dibothrion* KIMAKOWICZ, *P. vicina* ROSSMAESSLER etc.).

The Alpine (mostly: eastern Alpine, "Noric") influences are typical for the mountainous areas of Western Transdanubia (Kőszeg and Sopron Mts and the N-NW part of the Bakony Mts). They are, however, not high enough and originally nearly completely forested, thus, they could not preserve a greater number of dealpine species.

Distribution of Continental Species in the Carpathian Basin

The boreal and boreo-continental influences are often combined with Carpathian and Alpine ones. The explanation of this situation is quite simple: the Carpathians have a screening effect from northern and eastern directions. Thus, the boreal elements could penetrate into the Carpathian Basin either mediated by the Carpathians or – passed round – at the eastern border of the Alps and through the "*Porta Hungarica*". As a consequence of this situation, we can observe the highest number of boreal elements in the northeastern part of the Hungarian Middle Range, on the one hand, and in the hilly-mountainous part of western Transdanubia on the other. Relict-like occurrences of boreal and boreo-continental (Siberian) species are present also in some parts of the Pannonian lowland, too, especially in the swampy-boggy areas of the northeastern part of the plain. Some small, isolated peat-bogs have preserved the relict-like ecosystems of the cool-continental early post-glacial periods.

Representatives of Mediterranean-Manchurian faunal elements with disjunct area also occur in some parts of the Carpathian Basin. The distribution of this species group is often connected with the Ponto-Caspian waterway-system and displays actually interrupted connections with eastern Asiatic vicariant, often only subspecifically differentiated taxa (e.g. *Apatura metis* FREYER, *Arytrura musculus* MÉNÉTRIES, *Rhyparioides metelkanus* LEDERER). The refuges of such faunal elements were mostly at the lower course of Danube and its tributaries. Some species of this group occur also at the lower course of Dráva and in some swampy-boggy areas of the lowland in western Transylvania and eastern Hungary.

The influences of the Ponto-Caspian steppe belts are characteristic for the Carpathian Basin. Some of their elements are recent invaders, e.g. the butterfly *Colias erate* ESPER, dispersed during the last 10-15 years in great part of the Carpathian Basin, reaching E Austria and SW Slovakia. Other members of this group need large open habitats. Hence, they are threatened by retreat and fragmentation of great, open grasslands, e.g. the great bustard, *Otis tarda* L. Numerous steppe species fluctuate at the western limit of distribution, e.g. *Glareola nordmanni* FISCHER, *Pastor roseus* L. Typical inhabitants of the grasslands of lower altitudes are: *Mustela eversmanni* LESSON, the grasshoppers *Dociostaurus brevicollis* EVERSMANN and *Gampsocleis glabra* HERBST, etc. Others are restricted to isolated sites of edaphic grasslands, e.g. *Stenobothrus eurasius* ZUBOWSKI, *Arcyptera microptera* FISCHER-WALDHEIM, *Isophya costata* BRUNNER v. W. They can be regarded as relicts from the post-glacial steppe period, corroborated in some cases also by geographical isolation and taxonomical differentiation, as well, e.g. *Vipera berus rakosiensis* MÉHELY or the Zephyr blue (*Plebejus sephirus* FRIVALDSZKY) with four isolated colonies in the Carpathian Basin: sandy grasslands near Budapest, the Tokaj Hills, the Deliblát sandy area and steppe-like habitats of the Transylvanian "Mezőség").

Patterns of Distribution in Eremic and Xeromontane Species

Eremic, mostly turano-eremic species are restricted to some semi-desert-like habitats of the lowland with extreme edaphic conditions. There are very few vertebrate representatives of this faunal type: perhaps *Sicista subtilis* PALLAS and the "Hungarian" short-toed lark, *Calandrella brachydactyla hungarica* HORVÁTH belong to this group. More abundant examples can be found in some strictly localised phytophagous insects which are often connected with special halophytic plant communities of the lowland. They are often represented by endemic Pannonian subspecies or allopatric sibling species of Turanian origin, e.g. the Noctuid moths *Saragossa porosa kenderesiensis* KOVÁCS and *Discestra dianthi hungarica* WAGNER or the Microlepidoptera: *Coleophora hungariae* GOZMÁNY, *C. klimeschiella* TOLL, *C. magyarica* BALDIZZONE, *C. peisoniella* KASY, *Holcophora statices* STAUDINGER, *Stenodes coenosana* MANN, *Scrobipalpa semadensis plantaginella* STAINTON, *Agriphila tersella hungarica* SCHMIDT, etc.

The dispersal of this species group could have originally taken place in the late glacial (*kryoxerotic*) phases on the Pannonian Lowland, with a subsequent complete isolation as a result of the post-glacial expansion of the forested belts.

Last but not least, xeromontane elements are also present in the Carpathian Basin. Their two main groups are: the *Mediterranean-xeromontane* species, represented by very few vertebrates (e.g. *Monticola saxatilis* L. or the secondarily more expanded *Phoenicurus ochrurus* GMELIN), but a larger number of species in some insect groups, e.g. Noctuidae (*Euxoa vitta* ESPER, *E. decora* DENIS & SCHIFFERMÜLLER, *E. birivia* DENIS & SCHIFFERMÜLLER, *Dichagyris candelisequa* DENIS & SCHIFFERMÜLLER, *Yigoga nigrescens* HÖFNER, *Chersotis margaritacea* VILLIERS, *Ch. fimbriola* ESPER, *Apamea platinea* TREITSCHKE, etc.) and Orthoptera (e.g. *Paracaloptenus caloptenoides* BRUNNER v. W.). The *continental xeromontane* type is represented by some members of widely distributed Asiatic mountain steppe species as *Euxoa recussa* HÜBNER, *Dichagyris musiva* HÜBNER, *Heliophobus kitti* SCHAWERDA (Noctuidae) and by some relict-like inhabitants of the rocky dolomit grasslands as *Phyllometra culminaria* EVERSMANN, *Lignyoptera fumidaria* HÜBNER (Geometridae), etc.

It seems to be very probable that numerous genera, typical for the steppe biome have a xeromontainous origin (especially *Lycaenidae: Agrodiaetus,* species groups of *Polyommatus* and *Plebeius*; Satyridae: *Chazara, Pseudochazara, Hyponephele*; Noctuidae: *Euxoa, Agrotis, Dichagyris, Yigoga, Rhyacia, Chersotis, Eugnorisma*, etc.). The same is to be supposed in the case of numerous endemic elements of the Pannonian flora (*Linum dolomiticum, Seseli leucospermum, Ferula sadleriana, Onosma tornense*, etc.). These connections give us the valuable possibility of a large, continental-scale generalisation of the "Ősmátra"-theory.

Endemic Taxa and Autochthonous Evolution in the Carpathian Basin

Core areas are usually to be characterised by several endemic taxa. The level of endemism is, as a rule, highly correlated with the geological age of the refuges in which the relict-like taxa could survive and have been evolved. The Carpathian Basin belongs, however, to the geologically youngest areas of Europe with a rather eventful paleogeographical history during the Tertiary and Quaternary periods, thus, a very high level of endemism cannot be expected here. This statement is, however, at least in this generalised form, surely misleading. For instance, in the terrestrial Gastropoda of the Carpathian Basin the contribution of the endemic species reaches more than 30%. L. SOÓS (1943) in his great monograph on the Mollusca of the Carpathian Basin wrote (p. 453): "The level of endemism in our fauna (i.e. Carpathian Basin) is so high, as it used to be only in in-

Table 2. Distribution of the endemic species and subspecies in the Carpathian Basin

	Gastropoda (Carpathian basin; Soós 1943)	Orthoptera (Carpathian basin; Kis 1980)	Diurna (only ssp.)	Noctuidae (only ssp.)
Carpathians (incl. Carpathian-Sudetian)	10			2
Northern Carpathians		0/1	9	
Eastern Carpathians	7	7/0	1	
Southern Carpathians	17	6/0	8	2
Northern + Eastern Carpathians	1			1
Eastern + Southern Carpathians	2		5	
Villány Mts				1
Mecsek Mts	1			
Pannonian Lowland	3	0/4	9	10
N Hungarian Karst	1			1
Bihar Mts	1			
Bánát Mts	15	3/0		2
Transylvanian Basin			4	1

sular faunas". Similar situation can be observed in several groups of soil arthropods, too.

On the other hand, endemic species and subspecies represent only some few (mostly less than 5) percent of the fauna in most insect groups. Their regional distribution displays some typical patterns. The bulk of endemic taxa is confined to the Eastern and Southern Carpathians and in the mountains of Bánát, e.g. in Orthoptera. The majority of their endemic species are flightless mountain-inhabiting insects, belonging to genera *Isophya, Poecilimon* and *Odontopodisma*, furthermore the relict-like species: *Zubovskia banatica* Kis, *Miramella ebneri* Galvagni, *Podismopsis transsylvanica* Ramme, *Mischtschenkotetrix transylvanicus* Bazyluk & Kis (Kis 1962*a,b,* 1965, 1980). Similarly, most endemic Coleoptera belong also to flightless genera (e.g. some Carabidae and Tenebrionidae). A high proportion of the endemic Coleoptera leads a cavernicolous way of life (e.g. many species of the genera *Duvalius, Neotrechus, Typhlotrechus, Anophthalmus, Patrobus*, etc.). They are, as a rule, closely related with congeneric, high-mountain-inhabiting petrophilous species which are also often confined to some strictly defined parts of the Carpathians (e.g. bulk of *Duvalius* species).

In the more mobile insect groups, the proportion of endemism lies rather low, e.g. in Odonata no endemic species or subspecies occur in the Carpathian Basin. Most endemic species of Lepidoptera in the Carpathian Basin belong to those

Endemic subspecies of Noctuidae in the Carpathian Basin

- Pannonicum
  - *Chersotis fimbriola fimbriola* ESP.
  - *Euxoa vitta vitta* HBN.
  - *Dioszeghyana schmidtii schmidtii* DIÓSZ.
  - *Saragossa porosa kenderesensis* KOV.
  - *Discestra dianthi hungarica* WAGN.
  - *Asteroscopus syriacus decipulae* KOV.
  - *Apamea sicula tallosi* KOV. & VARGA
  - *Cucullia mixta lorica* RONKAY & RONKAY
- N Hungarian Karst
  - *Chersotis fimbriola baloghi* HACKER & VARGA
- Villány Mts
  - *Polymixis rufocincta isolata* RONKAY & UHERKOVICH
- S Carpathians
  - *Apamea zeta sandorkovacsi* VARGA & PEREGOVITS
  - *Hadena caesia* ssp.
- Bánát
  - *Copiphana olivana deliblatica* RONKAY
- Transylvanian Basin
  - *Conisania poelli ostrogovichi* DRAUDT
- Carpathians
  - *Photedes captiuncula delattini* VARGA
  - *Apamea rubrirena rubrirena* TR.

families of "Microlepidoptera" which are, as a rule, strictly specialised to some special food-plants and – in addition – often with secondarily flightless females, e.g. some Coleophoridae, living on halophytic species in saline grasslands of the Fertő-Neusiedlersee area and of the Great Hungarian Plain, e.g. Kiskunság and Hortobágy (KASY 1965, 1981). In "Macrolepidoptera" practically all endemic taxa belong to the subspecific level. Endemic subspecies of butterflies occur mostly in the Carpathians (see: *Erebia: E. epiphron transsylvanica* REBEL, *E. pharte rodnaensis* P. GORJ et SZABÓ, *E. pandrose roberti* PESCHKE, *E. manto traianus* HORMUZAKI, *E. pronoe regalis* P. GORJ) and in some island-like, mostly calcareous mountain stocks, often obviously with Balcanic areal connections (e.g. *Erebia melas melas* HERBST, *E. melas carpathicola* P. GORJ, *E. melas runcensis* KÖNIG, *E. cassioides neleus* FREYER, *Aricia artaxerxes issekutzi* BALOGH).

Endemic subspecies of Noctuidae have evolved partly as peripheric isolates of turano-eremic species from the late-glacial, *kryoxerotic* periods, e.g. *Saragossa porosa kenderesensis* KOVÁCS and *Discestra dianthi hungarica* WAGNER, in majority, however, as thermophilous post-(inter?)glacial relicts with connections to the Balcan peninsula, Asia Minor or Southern Russia (e.g. *Chersotis fimbriola fimbriola* ESPER, *Ch. fimbriola baloghi* HACKER et VARGA, *Euxoa vitta vitta* ESPER, *E. hastifera pomazensis* KOVÁCS, *Dioszeghyana schmidtii schmidtii* DIÓSZEGHY, *Cucullia mixta lorica* RONKAY & RONKAY, *Asteroscopus syriacus decipulae* KOVÁCS, *Apamea sicula tallosi* KOVÁCS & VARGA, *Polymixis rufocincta isolata* RONKAY & UHERKOVICH). Similar connections are present also in some butterflies, e.g. *Plebeius sephirus* FRIVALDSZKY, *Melitaea telona kovacsi* VARGA.

All these data clearly demonstrate that the Carpathians, especially the Eastern and Southern ones, together with the mountains of western Transsylvania

(Mts Apuseni and Bánát) can be evaluated as *core areas of survival and autochthonous evolution* in many invertebrate groups of *limited mobility*. On the other hand, in the *mobile insect groups*, only *peripherically isolated subspecific taxa* have been evolved which display manifold biogeographic connections.

CONCLUDING REMARKS

The results of this brief survey can be summarized from several aspects. It is a conspicuous fact that the very – and artificially – limited area of Hungary could preserve a relatively high level of biodiversity. It is very remarkable, especially if we take into consideration that there are no high-mountains and littoral habitats within this area.

To offer a possible explanation of this situation we can mention the transitional state of the Carpathian Basin with the overlap of several vegetation, floristic and faunal types, the mosaic-like arrangements of "individualistic" landscapes within the basin with their peculiar features of biotic composition, the compartment-structure of the Pannonian forest-steppe communities and – last but not least – the historical backgrounds of this recent situation.

The highest level of biotic diversity is observed, on the one hand, in some marginal areas where the overlapping of different elements is the most evident, e.g. the western and southwestern parts of Transdanubia with the overlap of Pannonian, Illyrean and Alpine influences and the northeastern edges of the country with the overlap of Pannonian, Carpathian and Dacian influences. The Mediterranean influence is practically significant on the major part of the country, the boreal one, however, only at the pre-Alpine and pre-Carpathian belts. Conservation centres of relict-like species (often as endemic species or subspecies) are typical for the edaphically extreme habitats which could resist the post-glacial reforestation and could preserve – under special ecological constraints – the relict-like elements from earlier climatic periods.

An other cumulation of faunal elements took place at the lower altitudes of the Hungarian Middle Range, where the overlapping of diverse Mediterranean, e.g. holo- and ponto-Mediterranean, Balcanic and Anatolian elements has succeeded. These patterns of species diversity is well demonstrated by the composition of insect assemblies living in xerothermic oak forests.

These patterns of species diversity prescribe to us several tasks of nature conservation. We have to continue our national programme of MAB Biosphere Reserves, we have to begin our forest-reserve programme and we have to outline a "*green network*" of nature-like and semi-natural habitats which counterbalance the splitting and fragmentation of nature-like habitats and connect the isolated nature conservation areas.

In order to fulfil these tasks, we need a new approach to biology education, too. Different branches of the organismic and supra-organismic biology were often depreciated as "descriptive", old-fashioned, etc. These views are especially deteriorative for the young generation which more and more lose immediate contact with nature. Systematic biology has nearly disappeared from the university curricula in several countries and the importance of evolutionary biology is often underestimated, too.

As a consequence of this situation, some deformations are evident in the development of the ecology, too. The neglecting of the necessity of a precise identification of the material, the one-sided "only-modelling" without a solid basis of facts, the underestimation of field studies on natural populations and communities, etc. are the typical symptoms. Unfortunately, the mentioned trends are not "Hungarian specialities". Nearly the same experiences were communicated during a "Biodiversity" symposium of the Swiss Academy of Sciences, Basel 1992, by scientists and university lecturers coming from several countries.

A Hungarian entomologist, J. MAJER put the question: "Are the taxonomists threatened species?" It would be quite tragic if only by the "Disappearing Biodiversity" (JUHÁSZ-NAGY 1993) could we suddenly realise the vital importance of systematic and evolutionary studies.

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THE SPECIES OF THE GENUS SZOMBATYA PLATIA, 1986 (COLEOPTERA, ELATERIDAE: MELANOTINAE)

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The genus *Szombatya* PLATIA, 1986 originally established for *Psellis formosana* SZOMBATHY, 1910 from Taiwan is proved to be widespread from India to Indonesia and Malaysia. The genus includes seven species, five of which (*Sz. deretzi, fleutiauxi, hodgarti, malaccensis* and *merkli*) are described as new. *Melanotus minutus* SCHWARZ, 1902 is transferred to *Szombatya*. A key to species is given.

Key words: new species, *Szombatya*, Elateridae, Coleoptera, Indo-Malaya

INTRODUCTION

The genus *Szombatya* was established by PLATIA (1986) to accomodate one species, *Psellis formosana* SZOMBATHY, 1910, from Taiwan. Actually *Psellis* CANDZE is considered monobasic with a single known species, *promiscua* (ERICHSON), known from the island of Réunion. Recently, HAYEK (1990) published an important paper on the reclassification of the genera of World Melanotinae giving a detailed generic diagnosis of *Szombatya* and placing it between *Melanotus* ESCHSCHOLTZ and *Priopus* CASTELNAU. *Szombatya* is essentially separated from *Melanotus* by the pronotum lacking latero-basal incisions, from *Priopus* by the truncate apex of the posterior angles of pronotum and from both genera by the presence of two or more large punctures or pits on the ventral surface of the last visible abdominal segment.

For details on the characters of the genus we refer to HAYEK (1990) where a photograph is also given displaying the pits on the last abdominal segment. According to our observations, the following additional data are important for identification:

- in all species, a deep pit on each side of the clypeus is clearly visible, this character is also common in several species of *Melanotus* and *Priopus*;
- we confirm that the number of pits on the last abdominal segment is variable and cannot be of specific value;
- the male genitalia are quite different in the species, although two species are known only from females, the parameres have apical barbs;

- the sclerifications of the bursa copulatrix are rather similar and are formed by an unequal mass of fine and elongate spines, lacking well-defined shape.

As stated in HAYEK (1990), the genus is widespread from India to Indonesia and Malaysia. Compared with other genera of Melanotinae, specimens of *Szombatya* are rather rare in collections. Among hundreds of *Melanotus, Priopus* and *Metriaulacus* we have found only a few specimens of *Szombatya* and in some cases we have seen only one sex. The biology and habits of the species are unknown; one of the species (*S. merkli*) described below from Indonesian Borneo (Kalimantan Barat) has recently been collected at light in lowland rain forest.

List of abbreviations: BMNH – The Natural History Museum, London, United Kingdom; BPBM – Bernice P. Bishop Museum, Honolulu, Hawaii, USA; CPG – collection of G. PLATIA, Gatteo, Italy; DEI – Deutsches Entomologisches Institut, Eberswalde, Germany; MCSN – Museo Civico di Storia Naturale, Genova, Italy; MNHN – Muséum National d'Histoire Naturelle, Paris, France; HNHM – Hungarian Natural History Museum, Budapest, Hungary.

KEY TO SPECIES

1 Size smaller (length 6–7.5 mm, width 2–2.5 mm); pronotum without or only with a trace of a median longitudinal sulcus in the basal declivity 2

– Size larger (length 8–9.7 mm, width 2.5–3 mm); pronotum with a feeble, narrow median longitudinal sulcus from base to anterior half 5

2 Anterior margin of frons not depressed. Antennae longer, in male reaching the hind angles of pronotum 3

– Anterior margin of frons depressed. Antennae shorter, in male falling short of the hind angles of pronotum by about two segments **fleutiauxi** sp. n.

3 Body covered with yellow pubescence. Elytra moderately and regularly tapering from base to apex 4

– Body covered with whitish pubescence. Elytra strongly tapering from base to apex **formosana** (SZOMBATHY)

4 Pubescence sparser, less apparent. Base of pronotum abruptly sloping; pronotal punctures on the disc deeper, vaguely umbilicate **minutus** (SCHWARZ), comb. n.

– Pubescence denser and apparent. Base of pronotum gently sloping; pronotal punctures more superficial and clearly umbilicate **malaccensis** sp. n.

5 Anterior margin of frons not depressed 6

– Anterior margin of frons depressed **merkli** sp. n.

6 Antennae longer, in male attaining the hind angles of pronotum; pronotum including hind angles about 1.3 times wider than long; elytra 3.2 times longer than pronotum, scutellum as long as wide, emarginate at base **hodgarti** sp. n.

– Antennae shorter, in male falling short of the hind angles of pronotum by about 1.5 segments the hind angles of pronotum; pronotum including hind angles only 1.2 times wider than long; elytra 3 times longer than pronotum; scutellum longer than wide, without basal emargination **deretzi** sp. n.

Szombatya deretzi sp. n.
(Fig. 1)

Material examined: Holotype, male – Vietnam: Tonkin, Vallée de la Haute riv. Claire entre Hagiang et Vinh-Tuy, principalement a Bac-Quang, 1908, leg. J. DE RETZ (MNHN).

Description: Colour entirely brown ferruginous with sparse, partially erect, yellow pubescence.

Head including eyes as wide as anterior margin of pronotum. Frons convex with anterior margin arcuate, directed downwards, just protruding above clypeus; punctures coarse, superficial, strongly umbilicate, with very narrow and shiny interspaces.

Antennae short, falling short the hind angles of pronotum by 1.5 segments; segments II and III cylindrical, III a little longer than II, II and III combined together much longer than IV; IV–X serrate, longer than wide; XI ellipsoidal.

Pronotum 1.3 times wider than long, convex, strongly declivous at sides and at base, with feeble but distinct midlongitudinal sulcus from base to the middle; sides arcuate in the anterior half and narrowing toward the apex; sinuate in the posterior half near the hind angles; hind angles short, not divergent, with robust carina slightly diverging from the lateral margin; punctures moderate, feebly umbilicate; interspaces on the disc equal to or larger than puncture diameters, at sides coarser and denser.

Scutellum a little longer than wide, flat, with a rough surface and without basal emargination. Elytra 3 times longer than pronotum and 2.3 times longer than wide; sides regularly narrowed from base to apex; striae normally marked, punctured; interstriae flat with similar puncturation.

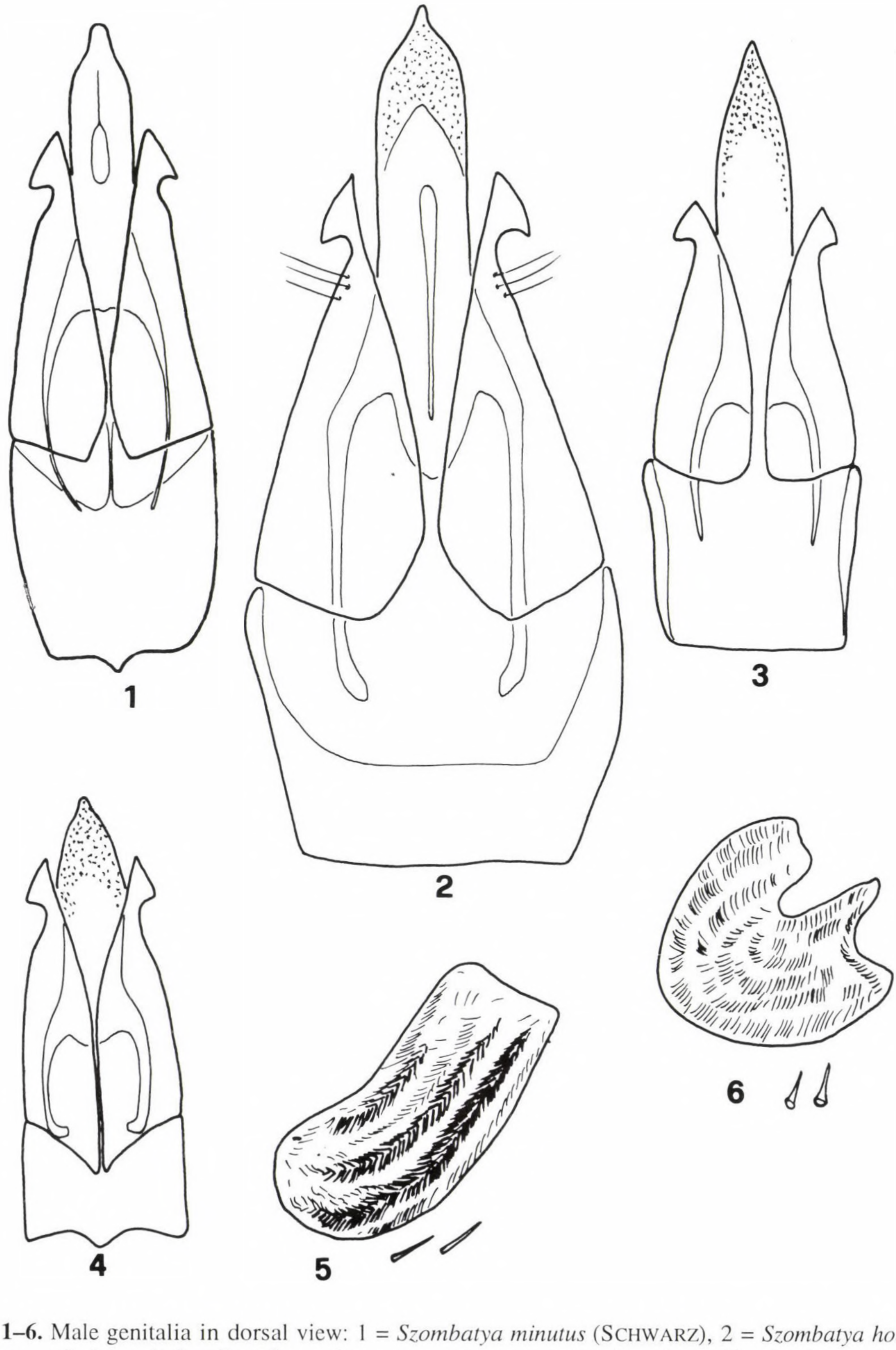
Last visible abdominal sternite with three larger pits surrounded by four very small ones.

Aedeagus as in Fig. 1 (length 1.5 mm, width 0.5 mm).

Female unknown.

Size. Length 9.7 mm; width 2.9 mm.

Derivatio nominis: The species is named after J. DE RETZ, the collector of the holotype.



Figs 1–6. Male genitalia in dorsal view: 1 = *Szombatya minutus* (SCHWARZ), 2 = *Szombatya hodgarti* sp. n. (holotype), 3 = *Szombatya deretzi* sp. n. (holotype), 4 = *Szombatya fleutiauxi* sp. n. (holotype). Sclerification of bursa copulatrix: 5 = *Szombatya malaccensis* sp. n. (holotype), 6 = *Szombatya fleutiauxi* sp. n. (paratype)

Szombatya fleutiauxi sp. n.
(Figs 4, 6)

Material examined: Holotype, male – Sarawak, Irusan, XI. 1902 (Fleutiaux coll. in MNHN); 3 paratypes (1 male and 2 females) – same data as holotype (Fleutiaux coll. in MNHN); Sarawak, Kuching, 1908, leg. J. HEWITT (BMNH); Sarawak, Belaga-D. Belaga Airport, 16. III. 1987, leg. HIERMEIER (CPG).

Description: Male. Colour entirely yellow-ferruginous with black shadings on head and at sides of body; covered with coarse and semierect yellow pubescence, longer at elytral sides.

Head including eyes as wide as the anterior margin of pronotum; frons convex, depressed near the anterior margin, which is feebly thickened, strongly arcuate, protruding above clypeus; punctures coarse, superficial, strongly umbilicate, with very short and shiny interspaces.

Antennae short, falling short the hind angles of pronotum by about 2 segments , segments II and III cylindrical, III longer than II and as long as IV; IV–X serrate, just longer than wide; XI ellipsoidal.

Pronotum about 1.3 times wider than long, convex, at base strongly declivous with trace of a mid-longitudinal sulcus; sides in the anterior half arcuate and strongly narrowing toward apex; in posterior half subparallel; hind angles truncate, not divergent, carina robust, prolonged nearly to the middle and subparallel to the lateral margin; lateral margin entire and visible in dorsal view for about 3/4 of its length; punctures coarse, deep, feebly umbilicate, with interspaces on average equal to puncture diameters on disc, at sides coarser and denser.

Scutellum as long as wide, flat, feebly emarginate at base, punctured. Elytra 3 times longer than pronotum and 2.3 times longer than wide, convex on disc; sides from base to apex gently and regularly narrowed; strie well marked and punctured; interstriae flat, densely punctured.

Last visible abdominal segment with two or three pits in the posterior half.

Aedeagus as in Fig. 4 (length 1.1 mm, width 0.4 mm).

Female. Similar to male with antennal joints from fourth to tenth more serrate. Bursa copulatrix sclerified as in Fig. 6.

Size. Length 7.4–7.5 mm; width 2.3–2.5 mm.

Derivatio nominis: The species is dedicated to E. FLEUTIAUX, one of the most outstanding workers on Elateridae.

Szombatya formosana (SZOMBATHY)

Psellis formosana SZOMBATHY, 1910: 446; MIWA, 1930: 57; 1934: 214; SCHENKLING, 1927: 265. (Type locality: Formosa.)
Szombatya formosana (SZOMBATHY): PLATIA, 1986: 2; HAYEK, 1990: 86.

Material examined: Holotype, female – Taiwan: Kosempo, VI.1908, leg. SAUTER (HNHM).

Redescription: Female. Colour entirely dark ferrugineous; covered with sparse, partially erect, whitish pubescence.

Head including eyes as wide as the anterior margin of pronotum; frons convex with anterior margin arcuate, protruding above clypeus; punctures coarse, umbilicate.

Antennae not attaining the hind angles of pronotum; segments II and III cylindrical with III a little longer than II, II and III combined together longer than IV; IV-X serrate; XI ellipsoidal.

Pronotum 1.3 times wider than long, convex; sides arcuate in the anterior half, subparallel in the posterior half; hind angles not divergent, strongly carinate with carina prolonged to the middle; punctures on the disc deep, feebly umbilicate, with interspaces equal on average to puncture diameters.

Scutellum as long as wide, flat, feebly notched mediobasally. Elytra strongly narrowed from base to apex; striae punctured, interstriae flat and with smaller punctures.

Last visible abdominal sternite with two small pits.

Size. Length 7 mm; width 2 mm.

Szombatya hodgarti sp. n.

(Fig. 2)

Material examined: Holotype, male – India: Bengal, Rangamati, Chittagong Hill Tracts, 11-16. VII. 1915, leg. R. HODGART (FLEUTIAUX coll. in MNHN); 1 paratype, male – India: Assam, Naga Hills, 4000–5000 ft., DOHERTY (FRY coll. in BMNH) (*Szombatya* sp. female in HAYEK, 1990: 86).

Description: Colour brown ferrugineous covered with coarse, sparse and partially erect, yellowish pubescence.

Head including eyes as wide as anterior margin of pronotum; frons convex, slightly depressed near anterior margin, which is arcuate and protruding above clypeus; punctures coarse, strongly umbilicate, with variable and shiny interspaces.

Antennae reaching the hind angles of pronotum; segments II and III subcylindrical, III a little longer than II, II and III combined together longer than IV; IV–X serrate, a little longer than wide; XI ellipsoidal.

Pronotum, including posterior angles, 1.2 times wider than long, convex, with feeble, narrow, mid-longitudinal sulcus from base to the anterior half; sides gently arcuate, narrowing from middle toward apex, sinuate before the hind angles; angles not divergent, with a short carina diverging from lateral margin; punctures on disc deep, simple to vaguely umbilicate, with interspaces variable, on average equal to or smaller than puncture diameters on disc; denser at sides.

Scutellum nearly as long as wide, notched at middle of base, surface slightly concave and smooth. Elytra 3.2 times longer than pronotum and 2.5 times longer than wide; sides from base to apex regularly narrowed; striae marked, strongly punctured; interstriae flat or slightly convex, with smaller punctures.

Last visible abdominal sternite with three pits in the holotype; in the paratype with a further smaller pit on each side.

Aedeagus as in Fig. 2 (length 1 mm, width 0.42 mm).

Female unknown.

Size. Length 8–8.7 mm; width 2.4–2.5 mm

Derivatio nominis: The species is named after R. HODGART, the collector of the holotype.

Szombatya malaccensis sp. n.

(Fig. 5)

Material examined: Holotype, female – Malay Pen., Pahang, King Georg V Nat'l Park, Kuala Tranggar, 15–17. XII. 1958, leg. T. C. MAA (BPBM).

Description: Colour entirely ferrugineous with black shadings at sides of body; covered with rough and dense yellow pubescence, longer at elytral sides.

Head including eyes as wide as the anterior margin of pronotum; frons convex but flattened forwards, anterior margin feebly thickened, arcuate, directed downwards, a little protruding above clypeus; punctures coarse, superficial, strongly umbilicate, with variable and very shiny interspaces.

Antennae falling short the hind angles of pronotum by about one segment; segments II and III subequal and subcylindrical, combined together a little longer than IV; IV–X serrate, a little longer than wide; XI ellipsoidal.

Pronotum including posterior angles 1.3 times wider than long; disc convex, strongly declivous at base with a trace of midlongitudinal sulcus in the basal declivity; sides in the anterior half arcuate and narrowed to the anterior margin; in the posterior half subparallel; hind angles truncate at apex, not divergent, with robust carina subparallel to the lateral margin and prolonged to the middle of pronotum; punctures coarse, feebly umbilicate, on disc with variable interspaces on average equal to puncture diameters, at sides denser.

Scutellum nearly as long as wide, feebly emarginate at the base, slightly sinuate at the sides, with surface a little depressed and smooth. Elytra 3 times longer than pronotum and 2.2 times longer than wide; sides from base to apex slightly but regularly narrowed; striae punctured; interstriae flat with rough puncturation.

Last visible abdominal segment with two, well separated pits in the posterior half.

Bursa copulatrix sclerified as in Fig. 5.

Male unknown.

Size. Length 7 mm; width 2.2 mm.

Derivatio nominis: The species is named after the Malaysian city Malacca.

Szombatya merkli sp. n.

(Fig. 7)

Material examined: Holotype, female – Indonesia: Kalimantan Barat, Gunung Palung Nat. Park, Cabang Panti research site, 1°13'S 110°7'E, lowland rain forest, at light, 18–26.VII.1993, leg. O. MERKL (HNHM). 8 paratypes, females – same data as holotype (HNHM, CPG); Sarawak, Strang River, 21.XII.1976, leg. G. DE ROUGEMONT (BMNH); Brunei: Bukit Sulang nr. Lamunin, 28.VIII-5.IX.1982, leg. STORK (BMNH); Singapore, leg. C. J. SAUNDERS (*Szombatya* sp. females in HAYEK, 1990: 86) (BMNH).

Description: Colour entirely brown-ferrugineous, covered with sparse and short, fulvous, recumbent pubescence.

Head including eyes as wide as anterior margin of pronotum; frons flat, depressed near anterior margin, which is regularly arcuate, thickened, directed upwards and projecting above the clypeus; punctures coarse, superficial, strongly umbilicate, with very short, feebly shagreened interpaces.

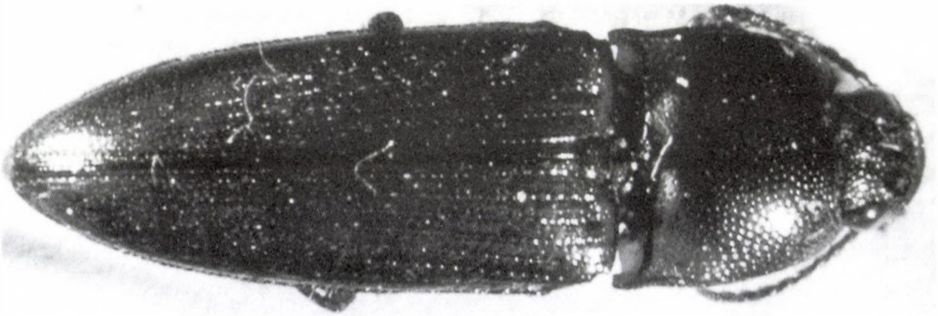


Fig. 7. *Szombatya merkli* sp. n. (paratype) (length 9.5 mm)

Antennae short, just exceeding the middle of pronotum; segments II and III subcylindrical, III a little longer than II and as long as IV; IV–X serrate, as long as wide or a little longer; XI ellipsoidal.

Pronotum 1.4 times wider than long, disc convex, abruptly declivous at base with narrow but distinct mid-longitudinal channel in the basal declivity; sides arcuate in the anterior half and narrowing toward the apex; subparallel in posterior half, slightly sinuate before the angles; hind angles truncate, not divergent, with carina prolonged to the middle of pronotum; lateral margin entire and visible in dorsal view for almost whole length; punctures coarse, deep and simple on disc, with interspaces on average narrower than puncture diameters, at sides coarser, denser and umbilicate.

Scutellum quadrangular, flat or feebly depressed, slightly emarginate at base, punctured. Elytra on average 3 times longer than pronotum and 2.1 times longer than wide; sides subparallel in the first half then gently narrowed towards apex; striae well marked, punctured; interstriae flat with smaller punctures.

Last visible abdominal sternite with three pits.

Male unknown.

Size. Length 8.3–9.7 mm; width 2.5–3 mm.

Derivatio nominis: The species is dedicated to O. MERKL, collector of the holotype.

Szombatya minutus (SCHWARZ), comb. n.

(Fig. 1)

Melanotus minutus SCHWARZ, 1902: 336; 1906–7: 189; SCHENKLING, 1927: 283. (Type locality: Sumatra.)

Material examined: Lectotype, male + 2 paralectotypes, males (here designated) – Sumatra, Soekaranda (SCHWARZ coll. in DEI). 7 specimens – Sumatra (without closer locality); Soekaranda, leg. DOHRN; Palembang; Medan, 14.VII.1920 (DEI; FLEUTIAUX coll. in MNHN; CPG); Mentawei Is., Sipora, V–VI.1894, leg. MODIGLIANI (MCSN) (as *Melanotus hapatesus* var. *minor*, in litteris).

Redescription: Female. Colour entirely ferrugineous with blackish shading at sides of body; covered with fine and sparse, partially erect yellowish pubescence.

Frons flat with anterior margin arcuate, directed downwards, feebly projecting above clypeus; punctures coarse, superficial, umbilicate, with interspaces variable and shiny.

Antennae not attaining the hind angles of pronotum, segments II and III subcylindrical, III a little longer than II, II and III together clearly longer than IV; IV–X serrate, as long as wide to a little longer; XI ellipsoidal.

Pronotum including hind angles 1.3–1.4 times wider than long, convex, abruptly sloping at base; sides in anterior half moderately arcuate and narrowed to anterior margin; in posterior half subparallel, not or feebly sinuate near the angles; hind angles sharp, not divergent, carina robust, prolonged to the middle of pronotum and subparallel to lateral margin; punctures moderate, feebly umbilicate, on disc with interspaces on average equal to puncture diameters, coarser and denser at sides.

Scutellum nearly as long as wide, flat, at base slightly emarginate, nearly smooth. Elytra 2.8–3 times longer than pronotum and 2.1–2.2 times longer than wide; sides slightly but regularly narrowed from base to apex; striae punctured, interstriae flat with smaller punctures.

Last visible abdominal sternite with two or three pits.

Aedeagus as in Fig. 1 (length 0.85 mm; width 0.3 mm).

Female. Very similar to male.

Size. Length mm 6–7 mm; width 1.8–2 mm.

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BOOK REVIEW

DORYLAIMIDA. Free-living, Predaceous and Plant-parasitic Nematodes by M. SHAMIM JAIRAJPURI and WASIM AHMAD, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1992. Distributed World-wide by: E. J. Brill Publishing Company, P.O. Box 9000, NL-2300 PA Leiden, The Netherlands. XV + 458 pp. Price: 150 NLG. ISBN 9004092293

Dorylaimids form a very important (characteristic, highly developed, various and widely distributed) group among soil and freshwater nematodes. The number of species described so far is approximately 1700 (of over 200 genera). They are represented in all the major feeding groups. A few species are economically significant as well, being plant-feeding and virus-transmitting animals. Some predator or omnivorous groups may play important role in ecological processes, which can only be proved by more intensive studies.

However, this important, diverse and complex group is not easy to approach from the taxonomic side, because, in the last few decades no up-to-date monographs have been available on the topic.

JAIRAJPURI and AHMAD attempt to bridge this gap by forming their own concept on systematics of the order Dorylaimida. The book consists of 10 chapters. In the first and second chapters the morphological features and the higher systematic groups (suborders) are outlined, while the next ones contain more detailed information on 7 superfamilies (including identification keys to genus level). The last chapter deals with the order Triplonchida, a smaller group that was also placed in the order Dorylaimida previously.

In extensive and useful reference list is provided at the end of the volume. A number of excellent drawings borrowed from many relevant authors and several SEM pictures help to understand morphological details and make reading the book more enjoyable.

The authors' efforts to systematize the available taxonomic knowledge regarding the order Dorylaimida were successfully accomplished.

Present monograph is practically the only book on the market in which one can find up-to-date comprehensive information and useful identification keys on all the groups presently placed in one of the most important free-living nematode order, the Dorylaimida. Therefore, it is a valuable aid not only for nematologists, but for everyone dealing with zoology or ecology of soil and freshwater systems.

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NEW DIOSPILINE TAXA FROM THE NEOTROPICAL REGION (HYMENOPTERA, BRACONIDAE: HELCONINAE)

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Description of *Topaldios* gen. n. with two new species: *T. apertus* sp. n. and *T. porrectus* sp. n., both originating from Argentina. Two new species of the genus *Diospilus* HALIDAY are described: *D. fulvus* sp. n. and *D. podobe* sp. n., both come from Costa Rica. The new taxa are differentiated from their nearest allies. A checklist of the diospiline species of the American Continent is compiled. With 42 original figures.

Key words: Hymenoptera, Braconidae, Helconinae, Diospilini, *Diospilus*, *Topaldios*, taxonomy, Costa Rica, Argentina

INTRODUCTION

Our knowledge of the diospiline species (Helconinae: Diospilini) in the Neotropic Region is very poor, so far only two species have been known: *Diospilus curticaudis* GAHAN from Mexico and *Austrodolops eremitae* BLANCHARD from Argentina. The diospiline species reported from the American Continent are restricted in their distribution to the Nearctic Region, see also the subsequent checklist. The American species belong to four genera, three of them (*Diospilus* HALIDAY, *Dyscoletes* HALIDAY, *Taphaeus* WESMAEL) are represented in the Palaearctic Region too, and one genus (*Vadum* MASON) was described recently from the U.S.A.

Checklist of diospiline species of the American Continent (Nearctic + Neotropical Regions)

Austrodolops BLANCHARD, 1936
    eremitae BLANCHARD, 1936 – Argentina

Diospilus HALIDAY, 1833
    curticaudis GAHAN, 1927 (*Diospilus*) – Mexico, U.S.A.
    fomitis MASON, 1968 (*Diospilus*) – Canada
    fulvus sp. n. – Costa Rica

washingtonensis ROHWER, 1917 (*Diospilus*) – U.S.A.
Dyscoletes WESTWOOD, 1840
  canadensis MASON, 1976 – Canada, U.S.A.
Taphaeus WESMAEL, 1835
  californicus (ROHWER, 1917) (*Diospilus*) **comb. n.** – U.S.A.
  neoclyti (ROHWER, 1917) (*Diospilus*) **comb. n.** – U.S.A.
  polydrosi (GAHAN, 1916) (*Diospilus*) (new comb. by Marsh 1974: 287) – U.S.A.
Vadum MASON, 1987
  volatum MASON, 1987 – U.S.A.

Diospilus fulvus sp. n.
(Figs 1–8, 19–20)

Material examined. – Holotype ♀ and 1 ♂ paratype: Costa Rica, Surrubres. – Holotype and paratype are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7649 (holotype) and 7650 (paratype).

Etymology. – The species name "fulvus" refers to the ground colour of the body.

Description of the holotype ♀. – Body 4.8 mm long. Head in dorsal view transverse (Fig. 1), 1.8 times as broad as long, eye somewhat protruding and about one-third longer than temple, latter rounded. Ocelli small, slightly elliptic and near to each other, OOL six times as long as OL. Head behind (temple + occiput) carinated, occiput weakly excavated; temporal and hypostomal carina meeting each other (Fig. 2). Eye in lateral view less high, 1.47 as high as wide, temple behind eye somewhat wider than eye and ventrally narrowing (Fig. 3). Malar space somewhat shorter than basal width of mandible. Face wide, 3.25 times as wide as high, inner margin of eyes faintly diverging ventrally. Clypeus three times as wide below as high medially, its lower margin denticulate (Fig. 4). Face dispersely subpunctate, interspaces much larger than punctures and shiny, otherwise head polished. – Antenna about as long as head + mesosoma together, with 26 antennomeres. First flagellomere twice as long as broad apically, penultimate flagellomere cubic.

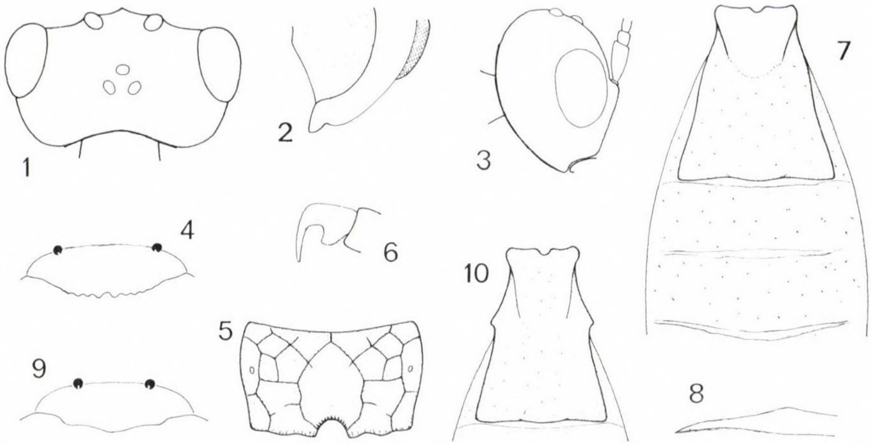
Mesosoma in lateral view 1.5 times as long as high. Notaulix deep and crenulated. Prescutellar furrow wide and with three costulae. Mesonotum margined and here crenulated. Propodeum (Fig. 5) medially with a pentagonal areola, laterally areolated, all areolae smooth. – Precoxal furrow crenulated. Mesosoma smooth and shiny. Hind femur three times as long as broad medially. Hind basitarsus slightly longer than tarsomeres 2–4. Hind claw laterally as in Fig. 6.

Fore wing about as long as body. Pterostigma (Fig. 19) 3.3 times as long as high, issuing radial vein from its middle; *r1* short, *r2* as long as *cuqu1*, *Cu2* quadratic, *r3* 2.5 times as long as *r2* and almost reaching tip of wing; redial cell (*R*) along metacarp somewhat longer than pterostigma; *d1* very short. Brachial cell (*B1*) as in Fig. 20.

Metasoma about as long as mesosoma. Tergite 1 somewhat longer than wide at hind, evenly broadening posteriorly, twice wider behind than basally, pair of carinae weak and short, extending to its basal third (Fig. 7). Third tergite behind convex, hence medially somewhat longer than second tergite (Fig. 7). Every tergite polished. Ovipositor sheath long, as long as metasoma + half mesosoma, ovipositor apically as in Fig. 8.

Ground colour of body fulvous. Ocellar field black. Mesonotum laterally brownish. Scape and pedicel blackish, flagellum black. Legs less fulvous; hind tibia apically and entire tarsus dark brown. Ovipositor sheath black. Wings fuscous fumous, pterostigma and veins brownish.

Figs 1–10. 1–8 = *Diospilus fulvus* sp. n.: 1 = head in dorsal view, 2 = hind ventral part of head, 3 = head in lateral view, 4 = clypeus, 5 = propodeum, 6 = claw, 7 = tergites 1–3, 8 = posterior end of ovipositor. 9–10 = *Diospilus fomitis* MASON: 9 = clypeus, 10 = tergite 1



Description of the ♂ paratype. – Similar to the holotype female. Body 3.8 mm long. Antenna somewhat longer than head and mesosoma combined, with 27 antennomeres, first flagellomere three times and penultimate flagellomere one-and-half times as long as broad. Propodeum laterally uneven, its areolation similar to that of female. Vein *r2* somewhat shorter than *cuqu1*. First tergite one-fifth longer than wide at hind, less broadening posteriorly. Vertex medially and posterior third of metasoma brownish.

Host unknown.

The new species, *Diospilus fulvus* sp. n., is nearest to *Diospilus fomitis* MASON, the two species are distinguished by the following features:

1 (2) Lower margin of clypeus denticulate (Fig. 4), its surface dispersely subpunctate. In dorsal view eye about one-third longer than temple (Fig. 1). Propodeum medially with a pentagonal area, its surface smooth (Fig. 5). First tergite as long as posteriorly wide, entire tergite polished, pair of rather weak carinae restricted to its basal third (Fig. 7). Ground colour of body fulvous with little brownish suffusion. ♀ : 4.8 mm and ♂ : 3.8 mm **D. fulvus** sp. n.

2 (1) Lower margin of clypeus not denticulate (Fig. 9), its surface densely punctate. In dorsal view eye slightly shorter than temple (Fig. 21). Propodeum postero-medially with a pair of anteriorly converging longitudinal carinae, its surface rugose-rugulose. First tergite (Fig. 10) 1.3 times as long as posteriorly wide, its hind half rugulose, pair of carinae extending to basal half of tergite. Ground colour of body black with brownish yellow pattern, legs straw yellow. ♀ : 3–4 mm and ♂: 2.8–3.5 mm **D. fomitis** MASON, 1968

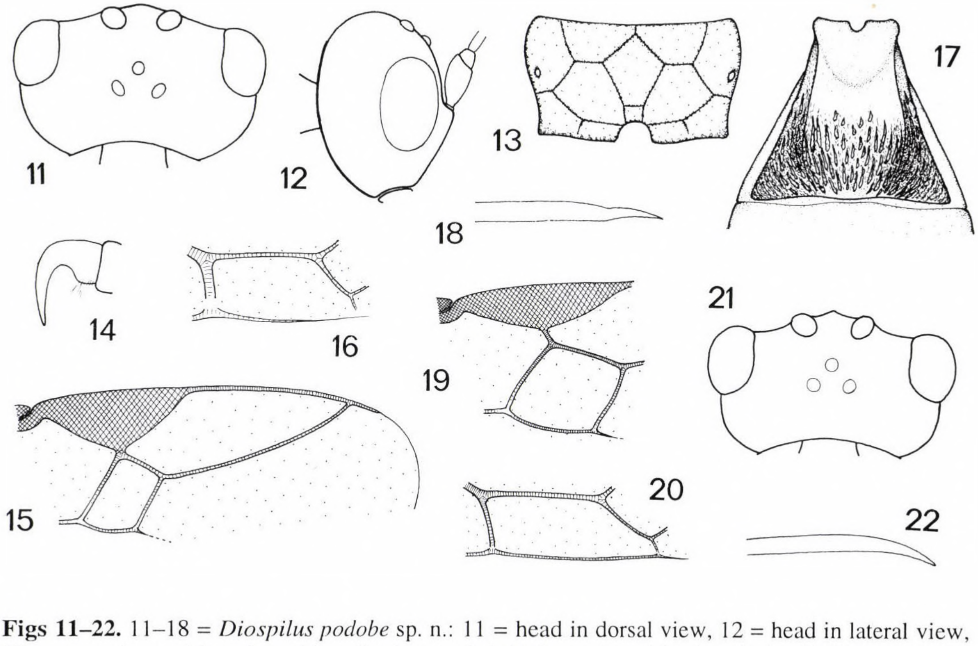
Diospilus podobe sp. n.
(Figs 11–18)

Material examined. – Holotype ♀ : Costa Rica, Surrubres. – Holotype is deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, No. Hym. Typ. 7686.

Etymology. – The species name "podobe" is a phantasy name.

Description of the ♀ holotype. Body 3.3 mm long. Head in dorsal view (Fig. 11) less transverse, 1.78 times as broad as long, eye not protruding; eye as long as temple, latter rounded. Ocelli small, fore ocellus round, hind pair of ocelli elliptic, OOL 2.6 times as long as POL. Head behind (temple + occiput) carinated, occiput excavated. Eye in lateral view less high, 1.5 times as high as wide, temple behind eye as wide as eye and ventrally evenly wide (Fig. 12). Malar space as long as basal width of mandible, close to base of mandible with median foveola. Face wide, 2.5 times as wide as high, inner margin of eye parallel. Clypeus 2.6 times as wide below as high medially, its lower margin truncate. Face and clypeus with disperse subpunctation, interspaces larger than punctures, smooth and shiny; otherwise head polished. Antenna about as long as body, with 26 antennomeres. First flagellomere 3.4 times and penultimate flagellomere 1.66 times as long as broad, flagellum attenuating distally.

Mesosoma in lateral view 1.25 times as long as high. Notaulix evenly deep and finely crenulated. Propodeum (Fig. 13) medially with a pentagonal areola, laterally areolated, along carinae uneven, otherwise areolae smooth and shiny. Precoxal furrow sigmoid, narrow and crenulated. Mesonotum, scutellum and mesopleuron dispersely hairpunctured, smooth and shiny. Hind femur



Figs 11–22. 11–18 = *Diospilus podobe* sp. n.: 11 = head in dorsal view, 12 = head in lateral view, 13 = propodeum, 14 = claw, 15 = distal part of right fore wing, 16 = brachial cell, 17 = tergite 1, 18 = posterior end of ovipositor. 19–20 = *Diospilus fulvus* sp. n.: 19 = pterostigma + second cubital cell, 20 = brachial cell. 21–22 = *Diospilus fomitis* MASON: 21 = head in dorsal view, 22 = posterior end of ovipositor

3.75 times as long as broad medially. Hind basitarsus as long as tarsomeres 2–4. Hind claw curved and narrow (Fig. 14).

Fore wing as long as body. Pterostigma (Fig. 15) 2.5 times as long as wide, issuing radial vein from its middle, *r1* very short, *r2* somewhat more than half as long as *cuqu1*, *r3* somewhat arched and approaching tip of wing; metacarp one-fifth longer than pterostigma, radial cell (*R*) along metacarp somewhat longer than pterostigma; *cuqu1* and *cuqu2* parallel, *n. rec.* antefurcal; *d1* very short. Brachial cell (*B1*) as in Fig. 16.

Metasoma somewhat shorter than mesosoma. First tergite (Fig. 17) slightly shorter than broad behind, evenly broadening posteriorly, pair of spiracles at middle, pair of keels laterally reaching hind end of tergite, hind half of tergite longitudinally striate; further tergites polished. Second and third tergites fused. Ovipositor sheath about as long as body, apical end of ovipositor straight (Fig. 18).

Ground colour of body blackish brown with rusty tint. Scape and pedicel yellow, flagellum dark brown. Palpi pale yellow. Tegula and legs yellow. Ovipositor sheath blackish brown. Wings hyaline, pterostigma and veins opaque brown.

The new species, *Diospilus podobe* sp. n., is nearest to *D. fomitis* MASON, the two species are clearly separated by the following features:

1 (2) Head in dorsal view (Fig. 11) less transverse, 1.78 times as broad as long, eye not protruding. Distal ten flagellomeres 1.4–1.6 times as long as broad. Face and clypeus disperesely subpunctate, interspaces smooth and shiny. Propodeum with a median pentagonal area, laterally areolated, surface of propodeum smooth to uneven, shiny (Fig. 13). First tergite slightly shorter than broad behind, pair of keels reaching hind end of tergite, hind half of tergite longitudinally striate (Fig. 17). Posterior end of ovipositor straight (Fig. 18). Legs yellow. ♀ : 3.3 mm **D. podobe** sp. n.

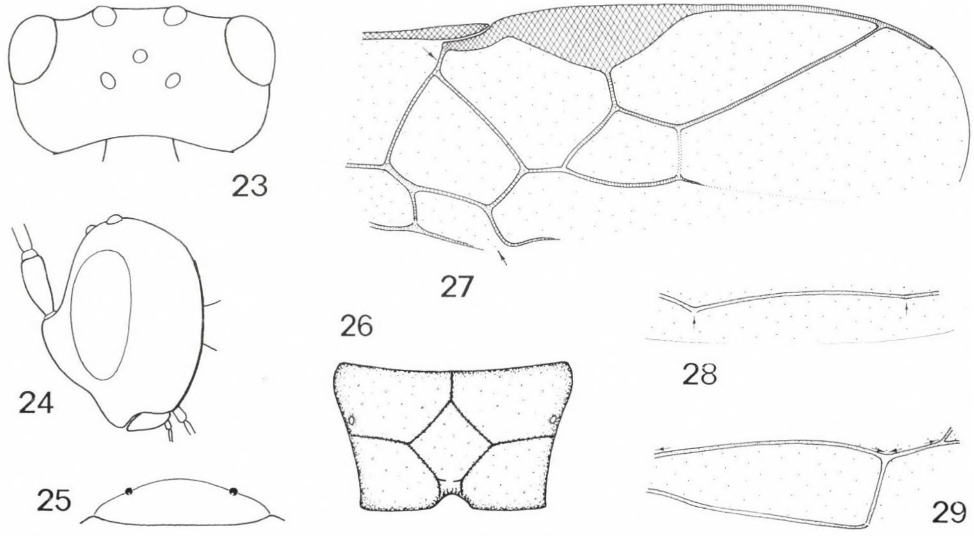
2 (1) Head in dorsal view (Fig. 21) transverse, twice as broad as long, eye protruding. Distal ten flagellomeres cubic. Face below antennal sockets and clypeus entirely aciculo-punctate. Propodeum postero-medially with a pair of weak longitudinal carinae, its surface rugose-rugulose. First tergite 1.2 times as long as broad behind, its hind half rugose, pair of keels extending to basal half of tergite. Posterior end of ovipositor somewhat downcurved (Fig. 22). Legs straw yellow. ♀ : 3–4 mm, ♂ : 2.8–3.5 mm **D. fomitis** MASON, 1968

Topaldios gen. n.
(Figs 25, 27, 28, 39)

Type species: *Topaldios apertus* sp. n. (original designation). Gender masculine.

Etymology. – The new genus is dedicated to my good colleague, Dr. GYÖRGY TOPÁL, mammalogist (Department of Zoology, Hungarian Natural History Museum) who collected, among other insects, the seven specimens (during his collecting trip to Argentina in 1961) serving for the erection of the new generic and species taxa. The suffix "dios" to the surname "Topal" suggests that the new genus is a member of the tribe Diospilini (Helconinae).

Figs 23–29. *Topaldios apertus* sp. n.: 23 = head in dorsal view, 24 = head in lateral view, 25 = clypeus, 26 = propodeum, 27 = distal part of right fore wing, upper arrow (↓) indicating petiole (or *n. bas.1*) of first discal cell, lower arrow (↑) indicating open brachial cell, 28 = submedian vein with traces of two anal veins (see arrows), 29 = *n. med.* and nervellus of hind wing, arrows indicating proportional length of *n. med.1* and *n. med.2*



Description. – Clypeus truncate (Fig. 25). First discal cell (*D1*) petiolate, i.e. vein *cu1* originating from *n. bas.* near to parastigma (Fig. 27 ↓); *n. rec.* antefurcal (Fig. 27). First and second anal veins hardly distinct (Figs 28, 39, see arrows). Precoxal suture absent. Notaulix evenly deep and crenulated. Occipital and temporal carina fully present. Temporal and hypostomal carinae meeting each other.

The new genus, *Topaldios* gen. n., seems to be the nearest to *Hellenius* TOBIAS, 1982 (Europe) considering their common generic features: a) first discal cell (*D1*) petiolate, i.e. vein *cu1* issuing from *n. bas.* near to parastigma (and not from parastigma itself, Fig. 27 ↓); b) *n. rec.* antefurcal (Fig. 27); c) precoxal suture absent. The two genera differ from each other by the following features:

1 (2) Clypeus medially tuberculiform produced. Occipital-temporal carina strong and along it finely crenulated. (Fig. 1 in TOBIAS 1982: 616). A distinct keel along inner margin of eye (Fig. 1, l.c.). Hind tibia thickened, apically as broad as hind femur (Fig. 3, l.c.). One species in Europe: Finland (*H. semiruber* HELLÉN, 1958) **Hellenius** TOBIAS, 1982*

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* VAN ACHTERBERG (1988: 24–25 and 33) has placed the genus *Hellenius* TOBIAS in the subfamily Blacinae, tribe Dyscoletini – a taxonomic reassessment waiting for confirmation and recognition. TOBIAS (1982, 1986: 150) assigned his genus (combined with *Dyscoletes) to the subfamily Helconinae, tribe Diospilini.*

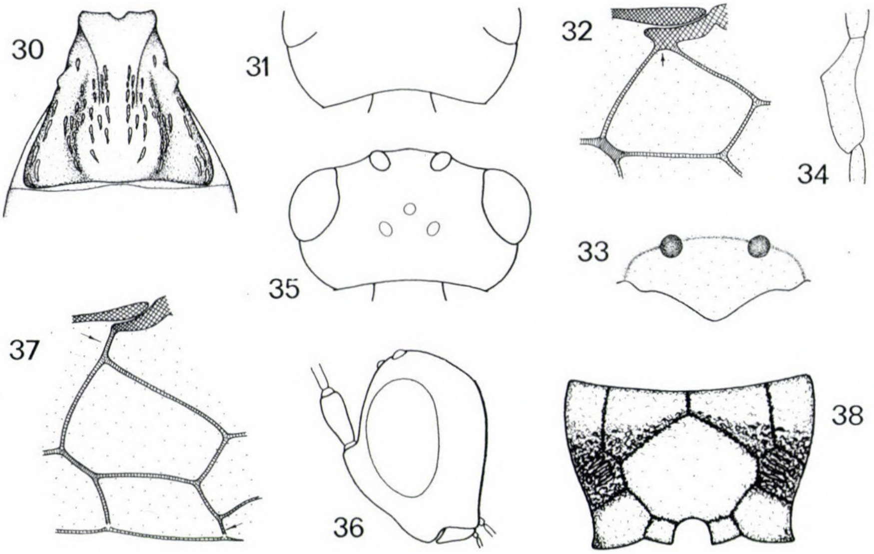
2 (1) Clypeus truncate. Occipital-temporal carina less strong and along it not crenulated. No keel along inner margin of eye. Hind tibia less thickened, apically less broad than hind femur. Two new species in South America: Argentina **Topaldios** gen. n.

From the Neotropic Region three diospiline genera have been known so far: *Aspigonus* WESMAEL, *Austrodolops* BLANCHARD and *Diospilus* HALIDAY. Subsequently a key is presented to promote the distinction of the new genus *Topaldios*:

1 (4) Veins *n. bas.* and *cu1* issuing directly from parastigma, i.e. discal cell (*D1*) not petiolate (Fig. 32 ↑). Precoxal suture present.

2 (3) Ventral margin of clypeus produced bluntly angulate (Fig. 33). Second segment of maxillary palp thickened, about twice as thick as rest of segments (Fig. 34) **Aspigonus** WESMAEL, 1835

3 (2) Ventral margin of clypeus truncate and at most either with one median denticule or tubercule, or medially denticulate (Fig. 4). Second segment of maxillary palp not thickened **Diospilus** HALIDAY, 1833



Figs 30–38. 30–31 = *Topaldios apertus* gen. et sp. n.: 30 = tergite 1, 31 = hind half of head in dorsal view. 32 = *Diospilus fulvus* sp. n.: first discal cell, arrow (↑) indicating absence of petiole. 33–34 = *Aspigonus diversicornis* WESMAEL: 33 = clypeus, 34 = second segment of maxillary palp. 35–38 = *Topaldios porrectus* gen. et sp. n.: 35 = head in dorsal view, 36 = head in lateral view, 37 = first discal and first brachial cell of fore wing, upper arrow (→) showing petiole of discal cell, lower arrow (←) showing open brachial cell, 38 = propodeum

4 (1) Vein *cu1* issuing from *n. bas.* near to parastigma, i.e. first discal cell petiolate (Fig. 37, see upper arrow).

5 (6) Outer side of first and second tibiae with 7–9 spinules as well as distal end of both tibiae with a row of spinules (Fig. 1/c in BLANCHARD 1936: 400). *N. rec.* interstitial (Fig. 1/a, l.c.) **Austrodolops** BLANCHARD, 1936*

6 (5) Outer side of first and second tibiae without spinules. *N. rec.* antefurcal **Topaldios** gen. n.

Topaldios apertus sp. n.
(Figs 23–31)*

Material examined. – Holotype ♀ : Argentina, Neuguen, San Martin de los Andes, July 1946, leg. Willink. – Paratypes (3 ♀♀ + 1 ♂): South Argentina, prov. Chubut, El Puelo, 1 ♂ : beaten from shrubby riverside vegetation near Rio Azul, 10 November 1961, leg. TOPÁL (No. 716)**; 2 ♀♀ : beaten from *Aristotelia*, *Myrcengenia*, wild-rose, *N. dombeyi* trees, and bushes in forest of inundation area of Lago Puelo, 17 November 1961, leg. TOPÁL (No. 733)**. 1 ♀ : South Argentina, prov. Rio Negro, El Bolsón, Pampa Azcona, 350 m, beaten from *Myrcengenia exsupca* tree in marsh, 29 September 1961, leg. TOPÁL (No. 580).**

Holotype ♀ and 3 ♀♀ + 1 ♂ paratypes are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7687 (holotype) and 7688–7691 (paratypes).

Etymology. The species name "apertus" refers to the distally open brachial cell of the fore wing.

Description of the holotype ♀ . – Body 3.2 mm long. Head in dorsal view (Fig. 23) transverse, twice as broad as long, eye slightly longer than temple, latter rounded, occiput hardly excavated. Ocelli rather small, fore ocellus round, hind pair of ocelli somewhat elliptic, POL = OOL. Eye in lateral view 2.1 times as high as wide, temple a bit wider than eye and evenly narrow ventrally (Fig. 24). Malar space about as long as basal width of mandible. Face twice as wide as high. Clypeus four times as wide as high, its ventral margin truncate, distance between tentorial pits twice as long as distance between tentorial pit and lowest point of eye. Face and clypeus distinctly punctate, interspaces as large as punctures and polished; vertex and temple dispersely hairpunctured, shiny. Antenna somewhat shorter than body, with 28 antennomeres. First flagellomere 2.3 times as long as broad apically, further flagellomeres becoming shorter and attenuating so that penultimate flagellomere almost twice as long as broad.

Mesosoma in lateral view 1.4 times as long as high. Pronope present. Notaulix narrow, evenly deep and crenulated. Propodeum areolated, medially with a pentagonal area, surface of areolae finely punctate and along keels uneven to rugulose (Fig. 26). Mesonotum and scutellum hair-

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* Perhaps the spinulose tibiae 1–2 indicate the necessary taxonomic rectification of the genus *Austrodolops*. Within the family Braconidae alone the genera of the subfamily Doryctinae are characterized with spinulose first and second tibiae. In the original description of *Austrodolops* the circularly depressed labrum in not mentioned which is also a subfamily feature of the doryctines, hence a re-examination of the type series is expedient to trace the proper taxonomic status of *Austrodolops*. The describer, E. E. BLANCHARD (1936), placed the genus in the tribe Diospilini.

** See also the itinary report by GY. TOPÁL (1963).

punctured, shiny; mesopleuron polished. Hind femur 3.4 times as long as broad. Pair of spurs of hind tibia equal in length, less than half as long as basitarsus. Hind basitarsus one-sixth shorter than tarsomeres 2–3.

Fore wing as long as body. Pterostigma (Fig. 27) 2.6 times as long as wide, issuing radial vein slightly distally from its middle, *r1* half as long as width of pterostigma, *r2* almost twice as long as *r1*, *r3* almost straight and approaching tip of wing, *cuqu1* longer and *cuqu2* shorter than *r2*. Metacarp one-third longer than pterostigma, along radial cell one-fifth longer than pterostigma. *d2* somewhat more than twice as long as *d1*. First discal cell (*D1*) relatively less long, its petiole (*n. bas.1* ↓) half as long as *d1*, *n. bas.2* as long as *d* (Fig. 27). *N. rec.* antefurcal. First brachial cell (or subdiscal cell, *B1*) distally open (Fig. 27 ↑). First and second anal veins almost absent (Fig. 28, see arrows). Hind wing: *n. med.1* 4.5 times as long as *n. med.2*, nervellus straight (Fig. 29, see arrows).

Metasoma as long as mesosoma. First tergite (Fig. 30) somewhat wider behind than long medially, evenly broadening posteriorly, pair of spiracles before middle of tergite, pair of basal keels subparallel and reaching middle of tergite. First tergite medially rugo-punctate, further tergites polished. Second tergite slightly longer than third tergite, both tergites transverse, further tergites more transverse. Ovipositor sheath long, about one-third shorter than body or twice as long hind tibia + basitarsus.

Body black, tegula and legs reddish yellow. Palpi pale greyish brownish. Tarsi faintly fumous. Wings hyaline, pterostigma and veins opaque brownish.

Description of the female paratypes (3 ♀♀). Similar to the holotype. Body 3.2–3.3 mm long (3.2: 1 ♀ , 3.3: 2 ♀♀). Antenna with 28 antennomeres (2 ♀♀ , 1 ♀ with damaged antenna). First tergite somewhat though distinctly broader behind than long medially. Ovipositor sheath nearly as long as body (2 ♀♀).

Description of the male paratype. – Similar to the female. Body 3.1 mm long. Temple slightly less rounded (Fig. 31). Antenna as long as body, with 28 antennomeres; first flagellomere 2.5 times and penultimate flagellomere distinctly twice as long as broad. First tergite longer than broad behind. Legs reddish yellow with brownish suffusion.

Host unknown.

The distinction of the new species from its nearest ally see at *T. porrectus* sp. n., p. 112–113.

Topaldios porrectus sp. n.
(Figs 35–42)

Material examined. – Holotype ♀ : South Argentina, prov. Chubut, El Puelo, beaten from *Aristotelia*, *Myrceugenia*, wild-rose, *N. dombeyi* trees and bushes in forest of inundation area of Lago Puelo, 11 November 1961, leg. TOPÁL (No. 733)*. 2 ♂♂ paratypes: same locality as for holotype, beaten from wild rose bushes near Lago Puelo, 17 November 1961, leg. TOPÁL (No. 732)*.

Holotype ♀ and 2 ♂♂ paratypes are deposited in the Hungarian Natural History Museum (Department of Zoology), Budapest, Hym. Typ. Nos 7692 (holotype) and 7693–7694 (paratypes).

Etymology. – The species name "porrectus" refers to the elongated form of the mesosoma.

Description of the female holotype. – Body 4.5 mm long. Head in dorsal view (Fig. 35) twice as broad as long, eye nearly as long as temple, latter rounded, occiput hardly excavated. Ocelli small, fore ocellus round, hind pair of ocelli somewhat elliptic, OOL distinctly one-fifth longer than POL. Eye in lateral view 1.7 times as high as wide, eye clearly one-third wider than

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* See also itinary report by GY. TOPÁL (1963).

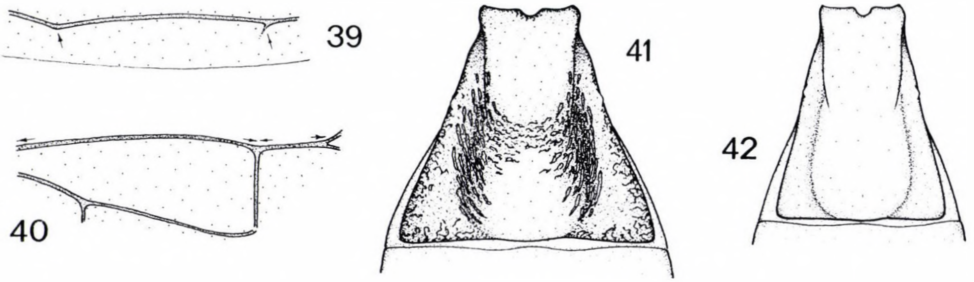
temple, latter evenly wide ventrally (Fig. 36). Malar space one-fourth as long as basal width of mandible. Face almost three times as wide as high. Clypeus 3.3 times as wide as high, its ventral margin truncate, distance between tentorial pits one-third longer than distance between tentorial pit and lowest point of eye. Face fairly densely and finely hairpunctured, interspaces shiny, clypeus with a few disperse punctures, interspaces polished. Vertex polished; occiput and temple densely hairpunctured, shiny. – Antenna about one-quarter shorter than body, with 30 antennomeres. First flagellomere distinctly 3.5 times as long as broad apically, further flagellomeres become shorter so that penultimate flagellomere cubic.

Mesosoma elongated, in lateral view twice as long as high. Pronope present medially and divided by a keel. Notaulix narrow, evenly deep and crenulated. Propodeum areolated, median areola unusually large and almost entirely polished, otherwise areolae rugose (Fig. 38). Mesonotum hairpunctured; interspaces shiny. Scutellum and mesopleuron polished. Hind femur 3.75 times as long as broad. Pair of spurs of hind tibia unequal in length, inner spur somewhat longer than outer spur and distinctly shorter than half length of basitarsus. Hind basitarsus one-fourth longer than tarsomeres 2–3 combined.

Fore wing as long as body. Pterostigma 2.6 times as long as wide, issuing radial vein distinctly distally from its middle, *r1* just longer than half width of pterostigma, *r2* almost twice as long as *r2*, *r3* straight and approaching tip of wing, *cuqu1* longer and *cuqu2* shorter than *r2*. Metacarp nearly twice as long as pterostigma. Petiole (or *n. bas.1*) long, *d1* only 1.5 times as long as *n. bas.1*; first discal cell (*D1*) relatively long, *d* 1.2 times as long as *n. bas.2* (Fig. 37). *N. rec.* antefurcal; first brachial cell (or subdiscal cell, *B1*) distally closed (Fig. 37 ↓). First and second anal veins almost absent (Fig. 39, see arrows). Hind wing: *n. med.1* four times as long as *n. med.2*, nervellus straight (Fig. 40, see arrows).

Metasoma about one-fourth shorter than mesosoma. First tergite (Fig. 41) somewhat wider behind than long medially, evenly broadening posteriorly, somewhat more than twice as broad behind as basally, pair of spiracles before middle of tergite, pair of basal keels subparallel and just reaching middle of tergite. First tergite laterally rugose longitudinally, otherwise uneven to smooth and shiny; further tergites polished. Tergites 2–3 distinctly transverse and equal in length, further tergites more transverse. Ovipositor sheath long, as long as body or distinctly three times as long as hind tibia.

Body black, tegula blackish to brown, legs reddish yellow. Palpi pale brownish. Tarsi blackish fumous. Wings hyaline, pterostigma opaque brownish, veins opaque light brownish.



Figs 39–42. *Topaldios porrectus* gen. et sp. n.: 39 = submedian vein with traces of two anal veins (see arrows), 40 = *n. med.* ↓ + nervellus of hind wing, arrows indicating proportional length of *n. med.1* and *n. med.2*, 41 = first tergite of female, 42 = first tergite of male

Description of the male paratypes (2 ♂♂). Similar to the female holotype. Body 4–4.5 mm long (4: 1 ♂, 4.5: 1 ♂). Antenna as long as body, with 31 (1 ♂) and 32 (1 ♂) antennomeres; first flagellomere three times and penultimate flagellomere twice as long as apically. Pterostigma 2.8 times (1 ♂) and 2.6 times (1 ♂) as long as wide. First tergite (Fig. 42) less broadening posteriorly, one-sixth longer medially than wide behind. Tarsi faintly fumous.

Host unknown.

The new species, *Topaldios porrectus* sp. n., is related to *T. apertus* sp. n., the two species clearly differ from each other:

1 (2) Mesosoma elongated, in lateral view twice as long as high. Eye in dorsal view nearly twice as long as temple (Fig. 35). Penultimate flagellomere of female cubic (that of male twice as long as broad). First discal cell relatively long, *d* 1.2 times as long as *n. bas.2*, petiole (or *n. bas.1*) of discal cell long, *d1* only 1.5 times as long as *n. bas.1* (Fig. 37, see upper arrow). First brachial cell distally closed (Fig. 37, see lower arrow). Median areola of propodeum unusually large, almost entirely polished, otherwise propodeum rugose (Fig. 38). Hind basitarsus long, one-fourth longer than tarsomeres 2–3 combined. ♀: 4.5 mm, ♂: 4.6 mm **T. porrectus** sp. n.

2 (1) Mesosoma not elongated, in lateral view 1.4 times as long as high. Eye in dorsal view slightly longer than temple (Fig. 23). Penultimate flagellomere of female almost as long as broad (that of male distinctly twice as long as broad). First discal cell relatively less long, *d* as long as *n. bas.2*, petiole (or *n. bas.1*) of discal cell short, *d1* twice as long as *n. bas.1* (Fig. 27, see upper arrow). First brachial cell (or subdiscal cell) distally open (Fig. 27, see lower arrow). Median areola of propodeum of usual size, areolae of propodeum finely and along keels uneven to rugulose (Fig. 26). Hind basitarsus short, one-sixth shorter than tarsomeres 2–3 combined. ♀: 3.2–3.3 mm, ♂: 3.1 mm **T. apertus** sp. n.

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A NEW SPECIES FROM THE GENUS PERIGRAPHA LEDERER, 1857 (LEPIDOPTERA, NOCTUIDAE)

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Description of *Perigrapha (Perigrapha) pamiricola* sp. n. from Tadjikistan. With 10 figures.

Key words: Noctuidae, *Perigrapha*, taxonomy, new species, Pamir Mts

The Palaearctic species of some genera of the early spring fauna have been intensely studied in the last three decades. As a result of these studies, several new species of *Perigrapha* LEDERER, 1857, were described from different regions of Asia (BOURSIN 1969, KONONENKO 1989, VARGA 1990, VARGA & RONKAY 1991, YOSHIMOTO 1993, 1994, HREBLAY 1995). The present paper contains the description of a new species from the Pamir Mountains, representing a further contribution to the knowledge of the Palaearctic *Perigrapha* species.

THE NYCTOTIMIA SPECIES GROUP

The *nyctotimia* species group is very close to the *i-cinctum* species group, differing it by the smaller size of the imagines, the claret-brown ground colour of the forewing and the characteristic shape of the orbicular-reniform-claviform complex. The basic configuration of the male genitalia is the same in the two species groups (e.g. uncus, tegumen, vinculum, harpe-ampulla complex, aedeagus, tube of vesica). The main differences are the generally smaller size of the copulatory organs, the smaller cucullus and the longer, narrower pollex in the *nyctotimia* species group.

The *nyctotimia* species group is Central Asiatic, distributed from the Kopet-Dagh throughout the Pamir to the northern Hindukush Mountains, the species of this group are completely allopatric. The known members of the species group are as follows.

Perigrapha nyctotimia BOURSIN, 1969
P. annau VARGA & RONKAY, 1991
P. pamiricola HREBLAY & KONONENKO sp. n.

Abbreviations: ZIN – Zoological Institute, Russian Academy of Sciences, St.-Petersburg; BIN – Biological Institute, Novosibirsk; HNHM – Hungarian Natural History Museum, Budapest

Perigrapha nyctotimia BOURSIN, 1969
(Fig. 7)

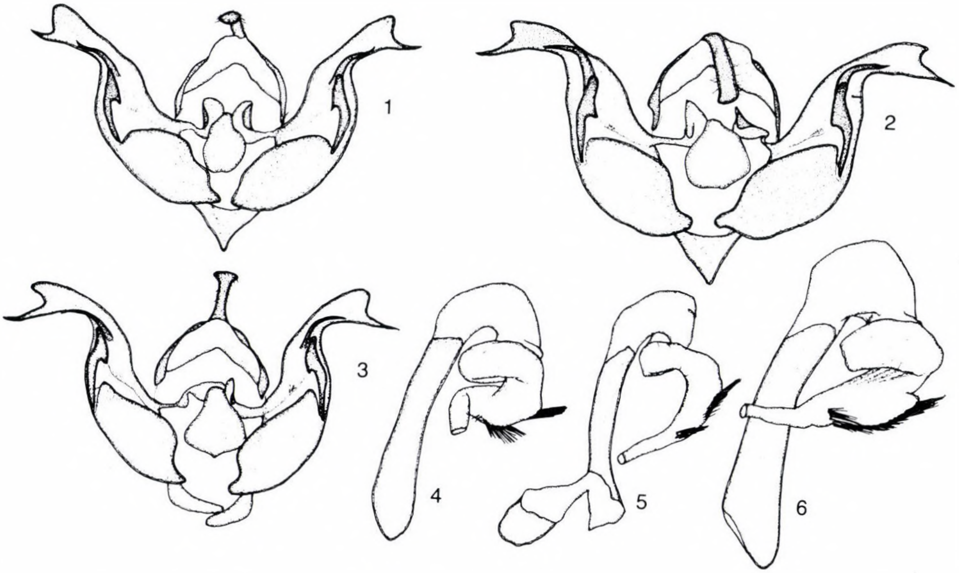
Type material examined: Holotype, male, "15. u. 18. VII. 1965, Afghanistan, Paghman, 30 km NW v. Kabul, 2500 m, Kasy & Vartian" Slide No HREBLAY: 4038, (coll. E. VARTIAN).

The description of the male genitalia can be found in HREBLAY (1995).

Perigrapha annau VARGA & RONKAY, 1991
(Figs 2, 6, 9, 10)

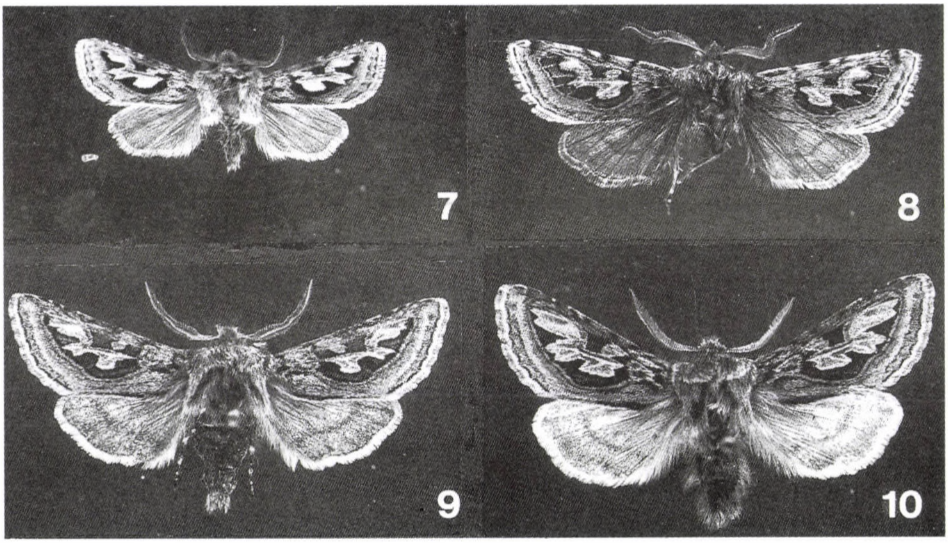
Type material examined: Holotype, "USSR, Turkmenian SSR, Kopet-Dagh Mts, Annau, 2100 m, 05. 04. 1987, leg. Dubatolov", Slide No. RONKAY: 3692, (coll. BIN).

Additional material examined: a big series from "Turkmenistan, Kopet-Dagh Mts, 6 km S of Ipay-Kala, 1600 m, 8-12. IV. 1993, 57°07'E, 38°17'N, No L86, leg. M. Hreblay, Gy. M. László and A. Podlussány", Slide Nos HREBLAY: 6633, 6634, 6635 males, 4091, 4095 females, (coll. M. HREBLAY, G. RONKAY and HNHM Budapest).



Figs 1-6. 1 = *Perigrapha pamiricola* sp. n.: holotype; 2 = *P. annau* VARGA & RONKAY; 3 = *P. pamiricola* sp. n., paratype; 4 = *P. pamiricola* sp. n., holotype; 5 = *P. pamiricola* sp. n., paratype; 6 = *P. annau* VARGA & RONKAY

Figs 7-10. 7 = *Perigrapha nyctotimia* BOURSIN, holotype; 8 = *P. pamiricola* sp. n., holotype; 9 = *P. annau* VARGA & RONKAY, holotype; 10 = *P. annau* VARGA & RONKAY, Kopet-Dagh Mts (the magnification of *P. nyctotimia* is about 10% smaller)



The characterization of the species is given in detail in the original description, the male genitalia are illustrated also in Figs 2, 6.

Perigrapha pamiricola HREBLAY & KONONENKO sp. n.
(Figs 1, 3, 4, 5, 8)

Holotype: male, Tadjikistan, "Pamir, Chorog, Hortus Botan., 2300 m, 29. IV. 65, M. L. Zaprjagaew". Slide No. HREBLAY: 6632 (coll. ZIN).

Paratype: One male with the same data. Slide No. HREBLAY: 6654 (coll. ZIN).

Diagnosis: The new species is closer to *P. annau* than to *P. nyctotimia*, being significantly larger in size and lighter in coloration than the latter species. The most important difference between *P. annau* and *P. pamiricola* lies in the shape of the orbicular-reniform-claviform complex: the outer edges of the stigmata extend to the postmedial line of *P. annau* while the outlines of the stigmata remain separated from postmedial line in *P. pamiricola*. The male genitalia of these species show the same ground plan, differing mostly by the size (the genitalia of *P. annau* are much larger) and by the structure of the field of cornuti of the vesica, which is separated into two parts in *P. pamiricola* but continuous in *P. annau*.

Description. External morphology (male): Wingspan of holotype 35 mm, length of forewing 15 mm. Antennae bipectinated with long branches, palpi dark brown, head and thorax covered by dark brown hairs. Ground colour of forewing greyish brown with light reddish tinge, basal and medial fields suffused with dark brown. Orbicular, reniform and claviform stigmata resembling in shape to the other species of *Perigrapha* s. str., none of these markings reach postmedial transverseline. Stigmata pale ochreous-grey with grey suffusion, encircled with blackish. Costal field pale greyish with three black spots. Ante- and postmedial transverselines double, joined below cell. Subterminal line darker than marginal field, dark apical spot well visible. Terminal line narrow, blackish; cilia pale greyish, somewhat lighter at base. Hindwing dark greyish, discal spot and crossline well discernible. Marginal field somewhat darker, cilia pale greyish. Underside light greyish suffused by some dark brown and grey scales, crosslines and discal spots diffuse but clearly visible.

Male genitalia: Uncus relatively narrow, distally dilated and rounded. Tegumen narrow, vinculum short, fultura inferior large, ovoid. Fultura superior wide, well sclerotized, ribbon-like. Valva relatively narrow, cucullus small, without corona but with long, slightly curved pollex. Process of harpe short, wide, rounded, ampulla narrow, long, arcuate. Sacculus long, its shape typical for the group. Aedeagus long, straight, narrow, carina not sclerotized. Vesica tubular, helical with one and half coils, medial part with small diverticulum. Terminal part of vesica bears relatively long field of cornuti separated into two distinct parts, both of them consisting of needle-like cornuti.

Female unknown.

* * *

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ON THE XYLOPOLIA SPECIES OF THE MANCHURIAN REGION (LEPIDOPTERA, NOCTUIDAE)*

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Description of a new *Xylopolia* species, *X. bellula* sp. n. (Korea) and its subspecies, *X. bellula primoryensis* ssp. n., in comparison with *X. bella, X. bella amamiensis* and *X. bella koreana* ssp. n. are given. With 24 figures and a colour plate.

Key words: Noctuidae, *Xylopolia*, taxonomy, Manchurian Region

INTRODUCTION

In spring, 1994, two, externally different *Xylopolia* species were found sympatrically in two different localities in South Korea. One of them matches well with the typical Japanese population of *X. bella* (BUTLER, 1881), since the other one shows rather strong differences in the external and genital morphology. The studies on Japanese, Korean and Russian Far Eastern materials revealed that there are two distinct species in the Manchurian region of the Palaearctic. The characterization of the two species and their subspecies with the descriptions of the new taxa are given below.

The genus *Xylopolia* SUGI, 1982

The genus was recently erected based on *Egira bella* BUTLER, 1881 (known in two subspecies) and considered as monotypical. The southern Japanese population was described earlier by KISHIDA and YOSHIMOTO (ssp. *amamiensis*; 1979). The last taxonomic work dealing with the genus was published by CHANG (1991) who described the second species, *X. fulvireniforma*, from Taiwan, which was recently found also in Nepal (YOSHIMOTO 1994).

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* Zoological Collecting by the Hungarian Natural History Museum in Korea. No. 132.

As the diagnosis of the genus is given in Japanese and no official translation of the description chapters of the *Moths of Japan* is published yet, a short characterization of the genus seems necessary.

Diagnosis. The basic structure of the male genitalia resembles to that of *Clavipalpula* STAUDINGER, 1892, having the similar configuration of most features (see Figs 20, 21, 24), except the vesica where the basal diverticulum with a cornutus, being characteristic for *Xylopolia*, is missing in *Clavipalpula*. The female genitalia of the two genera are more distinct, the apical part of bursa copulatrix of *Clavipalpula* is small, weak, without sclerotization or ribs, corpus bursae much more elongated and narrow.

Description. Palpi relatively large, third joint long, about half as long as the second one (resembling *Clavipalpula*). Head and thorax covered by hair-like scales, vertex with an erected tuft of scales. Antennae of male filiform with short setae on each segment. Thorax with well developed pro- and metathoracic tufts, latter expressively large. Patagia form shoulders. Forewing relatively narrow, elongated, apex pointed, outer margin with cilia finely crenulate. Forewing pattern shows a typical noctuid maculation and crosslines, some of the elements more or less indistinct. Abdominal coremata present.

Male genitalia (Figs 7–19). Uncus relatively long, thin, tegumen wide with brushes on peniculi. Valva elongated, apically dilated, cucullus with rather short corona but covered almost entirely with long setae. Clasper well developed but harpe reduced, absent or very small. Ampulla sclerotized, elongated, acute, slender, its distal part sometimes more dilated. Juxta heart-like, vinculum short, strong. Aedeagus moderately long, carina sclerotized, serrated or smooth. Vesica with a large basal diverticulum with single, short cornutus, sometimes with an additional small, conical, membranous diverticulum. Cornuti field situated at distal part of vesica, consisting of short and moderately long, aciculiform cornuti.

Female genitalia (Figs 22, 23). Ovipositor short, papillae anales weak, anthrum wide but short, infundibuliform. Ductus bursae tubular, variably long, with sclerotized crests or folds, cervix bursae rounded, its walls finely sclerotized, sometimes ribbed. Corpus bursae large, membranous.

SYNOPSIS OF THE GENUS

Xylopolia SUGI, 1982
  - *X. bellula* sp. n. (Korea)
  - *X. bellula primoryensis* ssp. n. (Primorye, Russian Far East)
  - *X. bella bella* (BUTLER, 1881) (*Xylomiges*; "*Lamprosticta*")
    (Yokohama, Japan)
    [= *abikonis* MATSUMURA, 1926 (*Polia*)]

X. bella koreana ssp. n. (Korea)
X. bella amamiensis (KISHIDA & YOSHIMOTO, 1980) (*Egira*)
(Amami Is., Japan)
X. fulvireniforma CHANG, 1991 (Taiwan)

Abbreviations. BMNH – The Natural History Museum, London (formerly British Museum, Natural History), CIS – Center for Insect Systematics, Chuncheon (S Korea), HNHM – Hungarian Natural History Museum, Budapest, IBP – Institute of Biology and Pedology, Far East Scientific Centre, Vladivostok, ZMU – Zoological Museum of the University, Moscow, RDAS – Division of Entomology, Agricultural Sciences Institute, Rural Development Administration, Suwon (S Korea).

SYSTEMATIC PART

Xylopolia bellula sp. n.

(Figs 1, 2, 7, 8, 22)

Holotype: male, "S Korea, Prov. Kyongsang, Mt. Palgong-san, Natural Park, 15 km N of Taegu, 700 m, No. 1668, 128°40'E, 35°59'N, 21.04.1994, leg. Peregovits, Ronkay & Vojnits". Slide No. 4824 Ronkay, deposited in coll. HNHM Budapest.

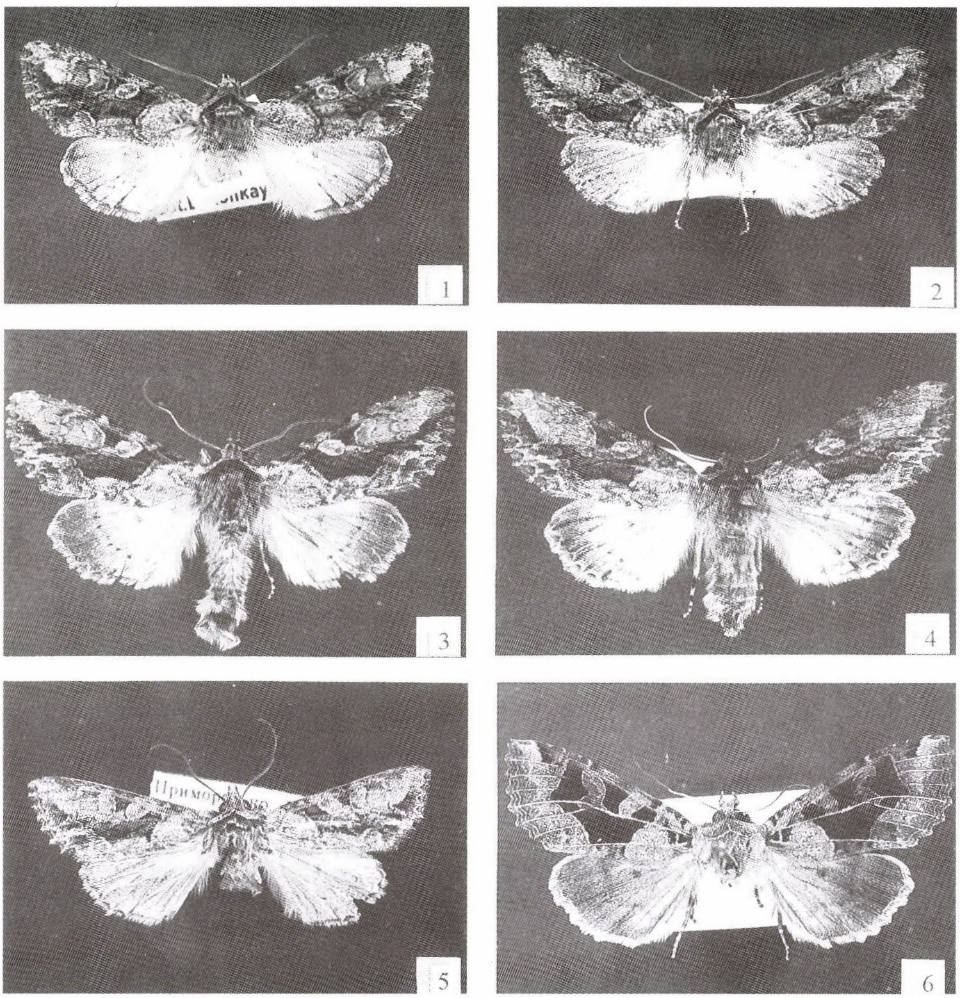
Paratype: female, "S Korea, Prov. South Kangwon, vic. of Chuncheon, Chuncheon-Dam, cca 400 m, No. 1690, 127°40'E, 37°55'N, 05.05.1994, leg. Peregovits, Ronkay & Vojnits". Slide No. 4826 Ronkay, deposited in coll. CIS Chuncheon.

Description. Wingspan 36 mm, length of fore wing 15.5-16 mm. Palpi covered with hair-like scales, second joint whitish upwards, blackish below. Frons with some white-yellowish scales and white-black stripes, erected tuft on vertex yellowish whitish, striolated with brown. Patagia yellowish brownish with brown, black and whitish striae. Thoracic crest whitish-greyish with brown tips, tegulae dark brown with whitish margins. Mesothorax brown mixed with whitish. Fore wing basal field greyish, antemedial line double, sharply defined. Stigmata sharp, orbicular grey filled with brownish, outlined with fine blackish line. Reniform large, outline blackish with whitish inner ring and brownish filling. Area between reniform and postmedial line greyish with fine red-brown tinge. Medial field dark brown, constricted at vein an_1 forming a connection between ante- and postmedial crosslines, light greyish below it, extending into tornus. Postmedial double, sinuous, medial part hardly visible. Marginal area with a subapical whitish-grey patch outside of postmedial line. Terminal field darkened, subterminal line whitish, interrupted, partly obsolete, characteristic W-shaped mark present. Terminal line a row of blackish spots, cilia brown, striated with white scales on veins. Hind wing rounded, bright whitish, discal spot present, small, pale, terminal part suffused finely with grey. Marginal field narrow, dark grey, veins with stronger dark covering, cilia whitish.

Male genitalia (Figs 7, 8). Uncus slender, tegumen wide, juxta heart-shaped, vinculum short, strongly sclerotized. Valva elongated with costa arcuate, clasper well sclerotized, harpe not expressed. Ampulla thin, long, slightly curved, with apex sharply acute. Costa strong, medial part less constricted, cucullus large, broadened, corona rather short extending proximally at middle of cucullus. Clavi less developed, bearing some weak setae at inner edges. Aedeagus small, tubular, carina smooth. Basal part of vesica with a narrow, sclerotized, serrated plate separated from carina, basal diverticulum short, with a fine, small, wide-based spine. Distal part of vesica recurved, cornuti field consists of moderately long spinules.

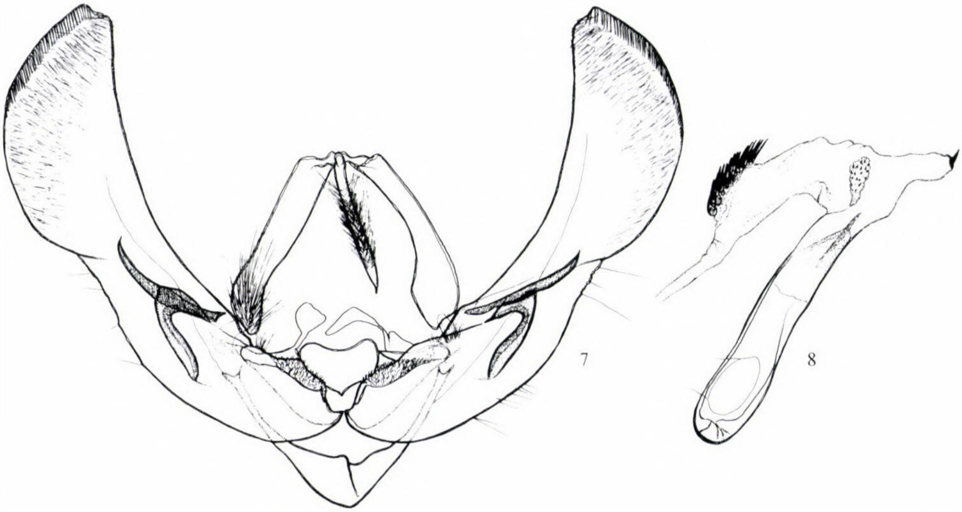
Female genitalia (Fig. 22). Ovipositor short, papillae anales weak, posterior gonapophyses twice as long as anterior ones. Anthrum wide, plate-like, posterior part of ductus bursae strongly sclerotized, tubular, anterior part membranous, ribbed, proximally dilated. Cervix bursae ribbed, with a sclerotized crest at junction of ductus bursae. Corpus bursae elliptical, membranous.

Diagnosis. The new species is similar to (the different subspecies of) *X. bella*, the main external differences are as follows: the new species is smaller (wingspan of *bellula* 36 mm, that of *bella* 36–38 mm). The tegulae and patagia are marked with whitish scales in *X. bellula*, the basal field is more sharply defined, rounded, the antemedial line is sharply double at inner margin, the col-



Figs 1-6. 1 = *Xylopolia bellula* sp. n., holotype; 2 = *X. bellula* sp. n., paratype female; 3 = *X. bella koreana* ssp. n., holotype; 4 = *X. bella koreana* ssp. n., paratype female; 5 = *X. bellula primoryensis* ssp. n., paratype male, 6 = *Clavipalpula aurariae* (OBERTHÜR), female, Korea

Figs 7–8. Male genitalia of *Xylopolia bellula* sp. n., holotype



ouration of the medial area is more uniform, the lighter patch at reniform is less vivid, mostly brownish and not reddish as in *bella*, the hind wing marginal area is lighter with more reduced grey-brownish covering.

The differences in the genitalia are more prominent in both sexes (see Figs 7–14, 16–19, 22, 23). In the male genitalia the uncus of *X. bellula* is shorter, thicker, the cucullus is broader with shorter corona. The ampulla is thinner, not extended apically, clasper is without setose extension of the reduced harpe. The aedeagus is generally smaller, the carina is not serrated, the serrated plate is separated from the carina, being smaller, narrower. The basal diverticulum is much shorter, without additional diverticulum near to it. In case of the female genitalia the anthrum of *X. bellula* is much wider, the ductus bursae is shorter, straight, its upper part is strongly sclerotized, without crests, the cervix bursae is ribbed but not sclerotized.

Xylopolia bellula primoryensis ssp. n.
(Figs 5, 15)

(MOLTRECHT, 1929: 27 (*Xylomanthis bella*); KONONENKO, 1990:24 (*Xylopolia bella*).

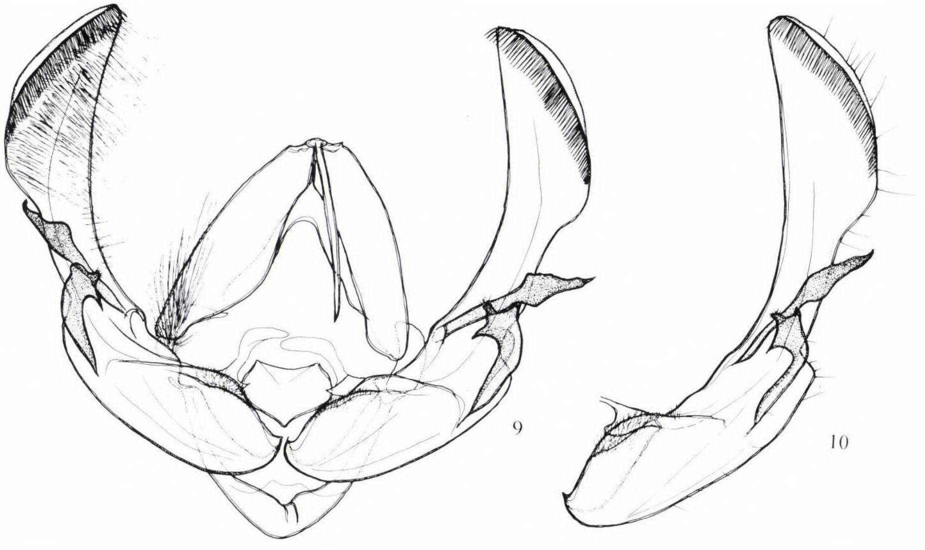
Holotype: male, S Primorye, Kedrovaja Pad reservation, 14.V. 1974, KONONENKO leg., prep. 555 IBP, coll. IBP, Vladivostok.

Paratypes: 7 males, 1 female, Gornotaezhnoe, 29, 30. IV., 15, 17, 21, 22 V. 1981 KONONENKO leg. (coll. IBP); 3 females, Pshenitsyno, 23, 24 V. 1973, CHISTJAKOV leg. (coll. IBP); 1 male, 1 female, Kedrovaja Pad, 17, 24. V. 1974, KONONENKO leg. (coll. IBP); 1 male, Kaimanovka, 7.V. 1964, TSVETAEV leg. (ZMU).

Slide Nos 554, 574, 575 (males), 573 (female) KONONENKO.

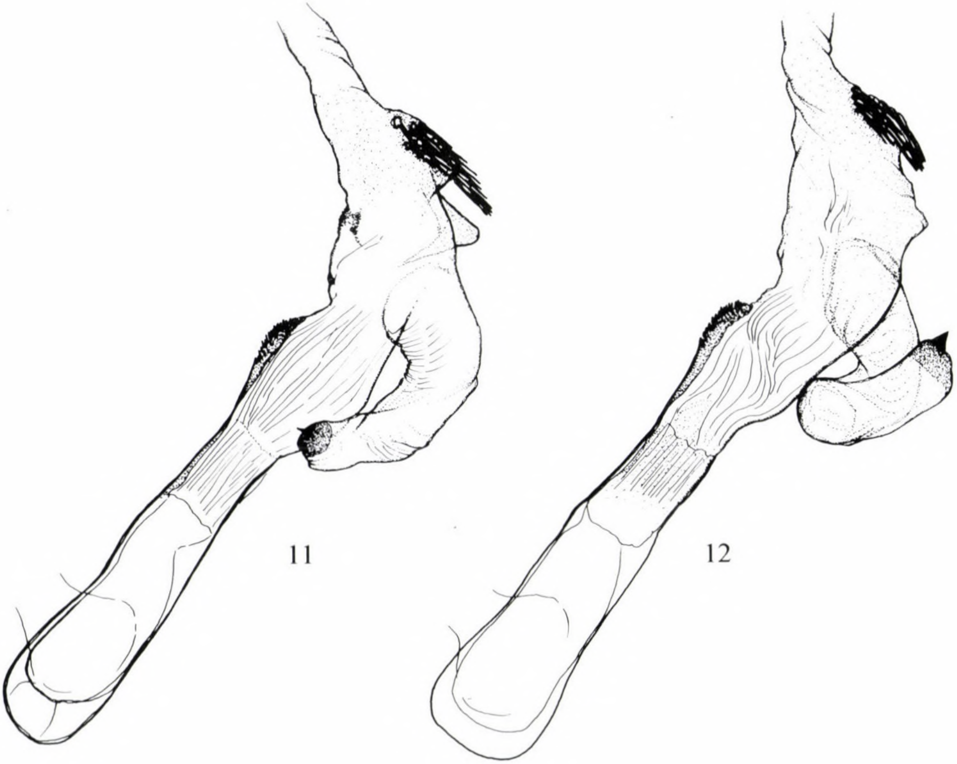
Diagnosis. This subspecies differs from *X. bellula bellula* by weaker body although the wingspan of the specimens of the two taxa are more or less the same (36 mm in *bellula bellula* while 34–37 mm in case of *bellula primoryensis*). The main external difference appears in the paler, lighter colouration of *X. bellula primoryensis*, without reddish-brown tint in orbicular reniform area. The male genitalia differ from those of *X. b. bellula* by somewhat smaller size and narrower valva, being constricted in medial part between clasper and cucullus. The vesica of *X. b. primoryensis* has the basal diverticulum narrower with the cornutus weaker, the dentated plate is narrower, the cornuti of the distal cornuti field are thinner. The female genitalia show no significant differences.

Distribution. The species is distributed in the Manchurian region from the Korean Peninsula to the south part of Russian Far East. The two populations seem as distinct by the known locality data and the morphology of the specimens, the northern one, *X. bellula primoryensis*, occurs in the south part of Primorye, the southern, nominotypic *X. bellula bellula* is known from the middle of the Korean Peninsula. The two related Manchurian species, *X. bella* and *X. bellula*, occur sympatrically and often syntopically in the medium high altitudes in South Korea.



Figs 9–10. Male genitalia of *Xylopolia bella koreana* ssp. n., paratypes

Figs 11–12. Aedeagi of *Xylopolia bella koreana* ssp. n., paratypes



Xylopolia bella (BUTLER, 1881)
(Fig. 16)

Xylomiges bella, BUTLER, 1881: 175.

Type material examined: holotype, female (undissected), Japan (coll. BMNH).

Additional material examined: Japan: a long series in the BMNH collection from Japan, matching well with the type of *X. bella*; 6 males, Akagi Mt., Gunma Pref. 18-20.IV.1993, KONONENKO leg.; 1 female, Mt. Takao, Tokyo, 20.IV.1968, KISHIDA leg.; 1 male, Aikawa, Kanagawa Pref., 12.IV.1975, KISHIDA leg.; 1 female, Kiyose, Tokyo-to, 10.IV.1957, EBATO leg., Toshiya Ebato Collection Bequest 1987 (NSMT); 1 male, Mt. Takao, Tokyo-to, 16.IV. 1960, T. EBATO leg., Toshiya Ebato Collection Bequest 1987 (NSMT).

Slide Nos: 579 KONONENKO (male), 578 KONONENKO (female)

The species is described in details by HAMPSON (1905), WARREN in SEITZ (1910) and illustrated by BUTLER (1881), WARREN (*op. cit.*), SUGI (1982), etc. The male genitalia are published by SUGI (1958) and are illustrated in Fig. 16.

The detailed comparison of *X. bella* with *X. bellula* sp. n. is given in the diagnosis of the new species.

Xylopolia bella koreana ssp. n.

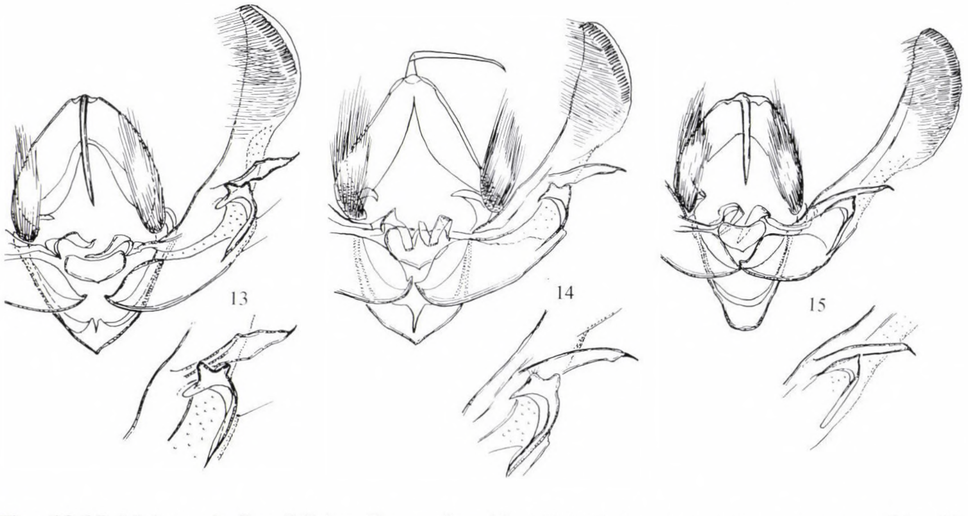
(Figs 3, 4, 9-13, 18, 19, 23)

Holotype: male, "S Korea, Prov. Cheju, Mt. Halla-san, 3 km S from Songpanak, 630-650 m, 126°36'E, 33°22'N, 29.04.1994, No. 1684, leg. L. Peregovits, L. Ronkay and A. Vojnits". Deposited in coll. HNHM.

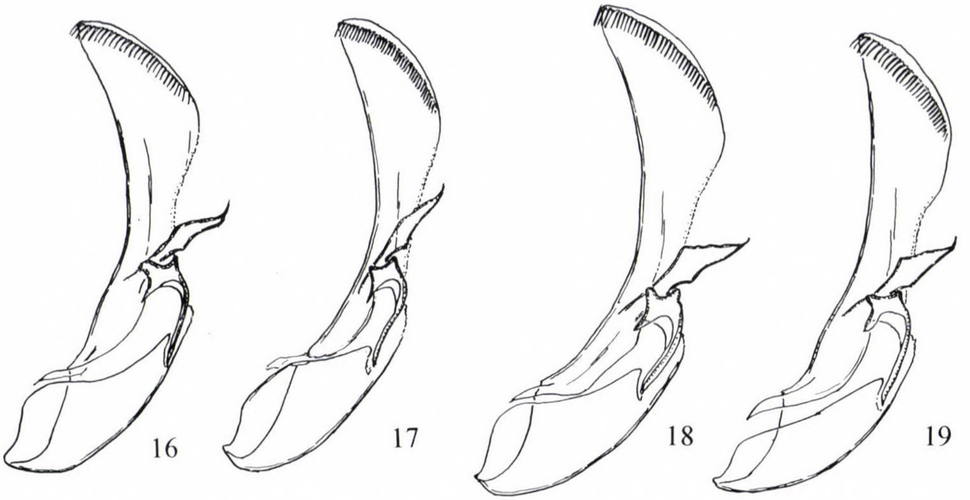
Paratypes: Korea S.: 2 males, Suwon, Mt. Tae hua, 30.IV.1994, AHN leg.; 8 males, 3 females, Mt. Mudeung, 1.IV., 6.V., 14.V., 17.V.1994, KONONENKO leg.; a series of 19 specimens from the following localities: Prov. Kyongsang, Mt. Palgong-san, Natural Park, 15 km N of Taegu, 700 m, 128°40'E, 35°59'N, 21.04.1994, No. 1668; Prov. Kyongsang, Mts Pohyonsan, at the forest experimental station, between Wolmae and Pohyon-sa, 6-800 m, 129°00'E, 36°09'N, 23-24.04.1994, Nos 1672, 1677; Prov. Cheju, Mt. Halla-san, Yongshil route, 1050 m, edge of the Halla-san National Park, 126°30'E, 33°21'N, 27, 30.04.1994, Nos 1680, 1686; Prov. Cheju, Mt. Halla-san, 3 km S from Songpanak, 630-650 m, 126°36'E, 33°22'N, 29.04.1994, No. 1684, all specimens are collected by L. PEREGOVITS, L. RONKAY and A. VOJNITS (coll. HNHN, CIS, RDAS, M. HREBLAY & G. RONKAY).

Slide Nos 552, 553, 581, 582 KONONENKO, 4822, 4823, 5070, 5071 RONKAY (males); 580 KONONENKO, 4825 RONKAY (females).

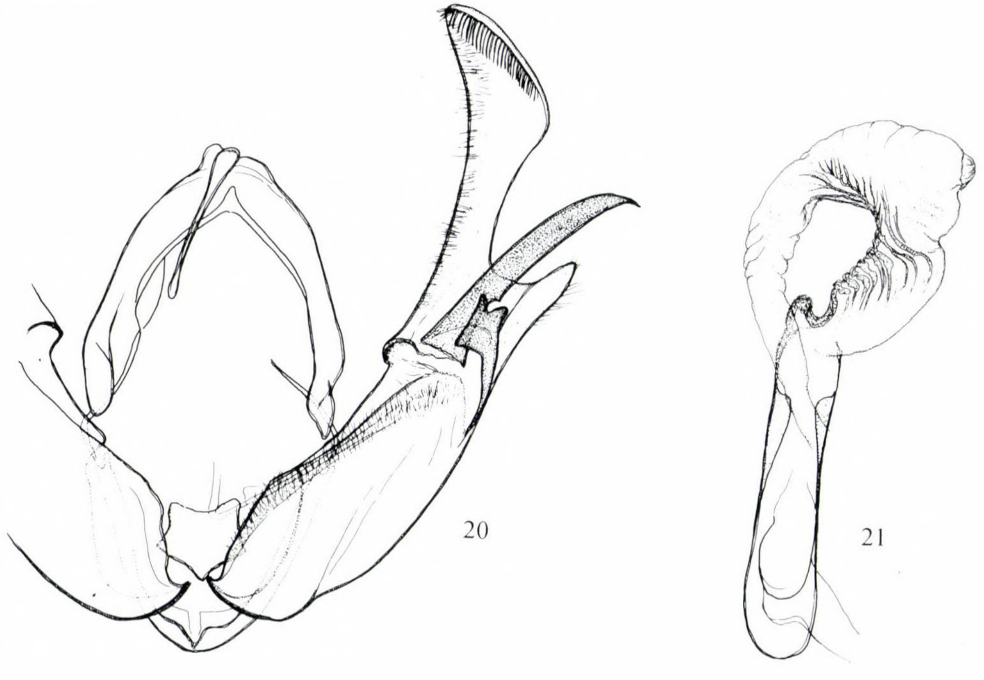
Diagnosis. The population inhabiting the southern territories of the Korean Peninsula differs from the nominotypic subspecies by its darker colouration and the shape of the ampulla which is broader, much more trapezoidal in the ssp. *koreana* (see Figs 9, 10, 13, 18, 19).



Figs 13-15. Male genitalia of *Xylopolia* species. 13 = *X. bella koreana* ssp. n., paratype; 14 = *X. bella amamiensis* (KISHIDA & YOSHIMOTO), Japan, Amami-Oshima; 15 = *X. bellula primoryensis* ssp. n., paratype



Figs 16-19. Valvae of *Xylopolia* species. 16 = *X. bella* (BUTLER), Japan, 17 = *X. bella amamiensis* (KISHIDA & YOSHIMOTO), paratype, Japan, Amami-Oshima, 18, 19 = *X. bella koreana* ssp. n., paratypes



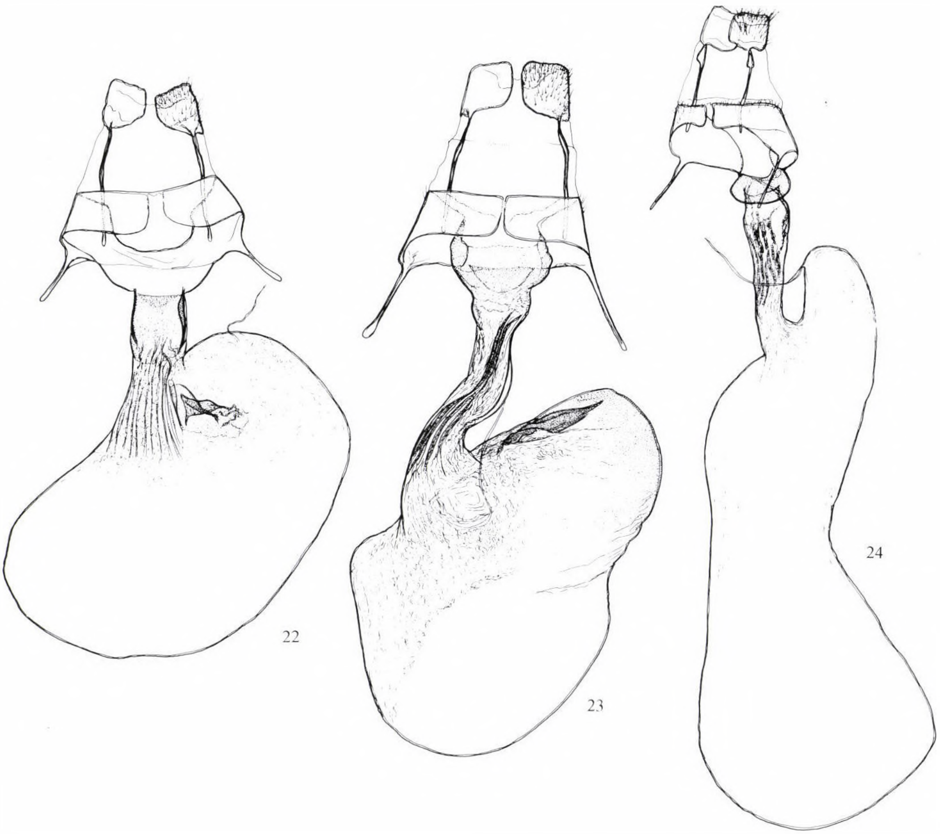
Figs 20–21. Male genitalia of *Clavipalpula aurariae* (OBERTHÜR), Korea

Xylopolia bella amamiensis (KISHIDA et YOSHIMOTO, 1980) (Figs 14, 17)

Egira bella ssp. *amamiensis* KISHIDA et YOSHIMOTO, 1980: 321.

Material examined: 1 male paratype, Japan, Asato naze City, Amami-Oshima Is., 16.III.1975, coll. Y. Fujimaki/Paratype; 2 males, 1 female, Japan, Ryukyus, Amami-Oshima Is., Sumiyou-gawa River 240 m, 13-14.I.(January) 1991, M. OWADA leg. (coll. NSMT).
Slide Nos: 577 IBP, 2154, 2155 NSMT (males).

Diagnosis. The external morphology of the species is given in the original description, the taxon is depicted by KISHIDA & YOSHIMOTO (1979) and SUGI (1982). The genitalia of *X. bella bella* and *X. bella amamiensis*, in contradiction



Figs 22–24. Female genitalia of 22 = *Xylopolia bellula* sp. n., paratype; 23 = *X. bella koreana* ssp. n., paratype, 24 = *Clavipalpula aurariae* (OBERTHÜR), Korea

with the rather large external differences, show no significant differences (see figures). The wingspan matches well with that of the nominotypic subspecies (expanse 36–39 mm).

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The Fauna of the Bükk National Park

VOLUME I

Edited by
S. MAHUNKA and L. ZOMBORI

The seventh part of the series "Natural History of the National Parks of Hungary" comprises a collection of papers written by thirty-seven Hungarian and foreign experts. This is the first volume which discusses a large share of the scientifically elaborated material deriving from the territory of the Bükk National Park (North Hungary).

The book opens with a preface written by Dr. J. Tardy, deputy secretary of state, who gives his "Reflections on nature conservation in Hungary, 1993", followed by an editorial Introduction having a detailed list of all the larger administrative and also minor locality names, some of which are amply shown in a map. The volume proper is divided into two sections: Mollusca and Arthropoda. The latter, by far the biggest section, is a collection of scientifically highly valuable contributions on the following groups of animals: Mallophaga (4 pp), Heteroptera (4 pp), Homoptera (8 pp), Coleoptera (80 pp), Lepidoptera (162 pp), Diptera (82 pp), Siphonaptera (6 pp), Hymenoptera (42 pp), Acari (5 pp). The book closes with an Index to Authors.

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Acta Zoologica Academiae Scientiarum Hungaricae 41(2), pp. 131–136, 1995

A NEW GENUS OF ORIBATID MITE FROM ASCENSION ISLAND (ACARI: ORIBATIDA)

M. LUXTON

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Cordylobates is established as a new genus of oribatid mite, with *fragilis* as the sole species, from lava fields on Ascension Island in the Atlantic Ocean.

Key words: mite, Ascension Island, Oribatida, Ceratozetoidea, terrestrial

INTRODUCTION

PHILIP and MYRTLE ASHMOLE collected many interesting invertebrates from a number of barren lava and cave sites on Ascension Island in 1990. A number of these were oribatid mites, including species of *Lucoppia*, of *Incabates*, and of *Lasiobelba.* The most striking of these taxa proved to be a new genus of ceratozetoid mite which is here described.

The new genus is similar in general appearance to *Humerobates* SELLNICK, 1928 and *Baloghobates* HAMMER, 1967. It differs from both these genera by virtue of its long lamellar cusps and the fact that the genal teeth are fused to the rostrum (i.e. there is no genal indentation). In common with *Baloghobates* (but unlike *Humerobates*) there is no evidence of prolamellae between the anterior extremities of the lamellae and the rostrum. The most conspicuous features of the new genus are the integumental mounds between the cusps and anterodorsally on the notogaster. These mounds are more shallow on the male which is also smaller than the female.

The familial position of the new genus is problematic since it is so closely related both to *Humerobates* (Humerobatidae) and *Baloghobates* (currently placed in the Ceratozetidae). BALOGH and BALOGH (1992) have recently synonymised *Baloghobates* and *Africoribates* a step which seems premature before the systematic position of *Baloghobates* is more closely appraised. The validity of assigning *Humerobates* to a separate family may also need to be reassessed. In the meantime, and perhaps temporarily, the new genus may be accommodated in the family Ceratozetidae.

TAXONOMY

Cordylobates gen. n.

Type species: *Cordylobates fragilis* sp. n.

Diagnosis. Rostrum furrowed medially with lateral ridges; translamella represented by a very faint line; cusps long (1/3 the length of lamellae) and with a conspicuous mound between them; tutorium conspicuous, terminating in a flattened, curved ridge; sensilli short, clavate; pteromorphae moveable and deflected ventrally; notogaster with a fingerprint-like sculpture and mounded anterodorsally; notochaetae number 10 pairs, largely conspicuous and faintly setose; areae porosae number 4 pairs, somewhat irregular in outline; epimeral setal formula 3–1–4–1; genital setae number 6 pairs, aggenital setae 1 pair, anal setae 2 pairs, adanal setae 3 pairs; pore close to anal field and adanal in position; preanal sclerite long and conspicuous; legs tridactylous, genua I and II each with a sharply pointed projection ventrodistally.

Etymology. "Cordylus" is Greek for "bump" or "swelling" and refers to the distinctive mounds found between the cusps and anterodorsally on the notogaster.

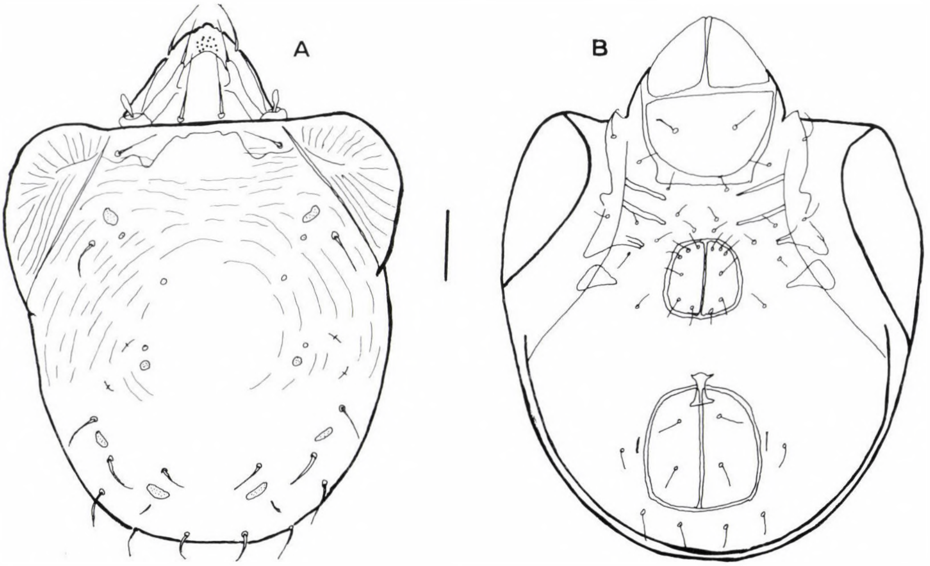
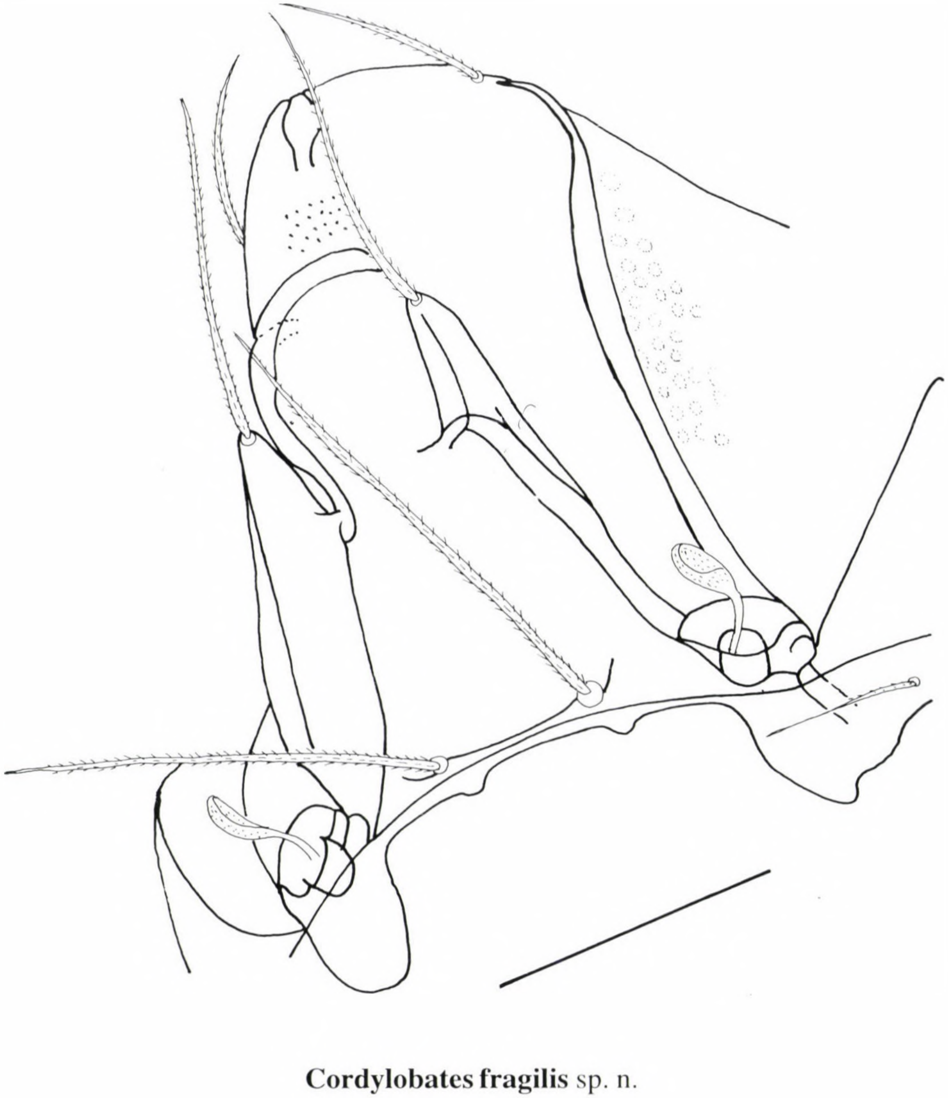


Fig. 1. *Cordylobates fragilis* gen. n., sp. n., general facies: A = dorsal view, B = ventral view (scale bar: 100 μm)

Fig. 2. *Cordylobates fragilis* gen. n., sp. n.: oblique view of prodorsum of holotype (scale bar: 100 μm)



Cordylobates fragilis sp. n.
(Figs 1–4)

Dimensions. Mean length of females 1047 μm (range 920–1130) (n=3); mean length of males 768 μm (range 700–850) (n=5).

Prodorsum. Smooth or lightly granulate in places, granules more dense in region between prodorsal protuberance and rostrum, some areolar patches laterally; rostrum somewhat furrowed medially with lateral ridges on each side of furrow; genal teeth fused with rostrum (i.e. no genal indentation); rostral setae inserted laterally, curved inwardly, extending beyond the rostrum and finely setose along their whole length. Surface of prodorsum conspicuously bulging between the lamellar cusps, the bulge rising to a peak anteriorly from the translamellar region. Lamellae extending from the bothridial region for 2/3 the length of the prodorsum; cusps prominent and about 1/3 the length of lamellae; lamellar setae extending just beyond rostrum and finely setose; translamella represented by a very faint line which becomes conspicuously thick at its attachment to the cuspal bases; no prolamellae between lamellae and rostrum. Interlamellar setae long, conspicuous and finely setose, extending just beyond the cuspal tips and inserted just anterior of the anterior edge of the notogaster. Tutoria conspicuous, terminating in a flattened, curved ridge just posterior of the bases of the rostral setae. Bothridia shallow cups situated just anterior of the anterior edge of the notogaster; sensilli short, pedicel and capitulum about equal in length, capitulum clavate, membranous and covered in small setulae.

Notogaster. Pteromorphae typically humerobatid in relative size and shape, deflected ventrally, moveable and striated. Hysterosoma globular with a fingerprint-like striation on the notogastral integument and a bulge anteromedially. Notochaetae fine, generally conspicuous, slightly setose and numbering 10 pairs. Areae porosae number 4 pairs, somewhat irregular in outline.

Venter. Genital setae fine, slightly setose and numbering 6 pairs distributed 3–1–2 (on one male paratype there are 7 setae on one genital shield). Aggenital, anal and adanal setae similar in form to genital and numbering, 1, 2 and 3 pairs respectively. Pore close to frame of anal field and adanal in position. Apodemata typically humerobatid; epimeral setal formula 3–1–4–1. Long preanal sclerite present.

Appendages. Legs tridactylous, all claws equivalent in size and often minutely denticulate dorsally. Trochantera and femora III and IV each with a ventral carina; genua I and II each with a

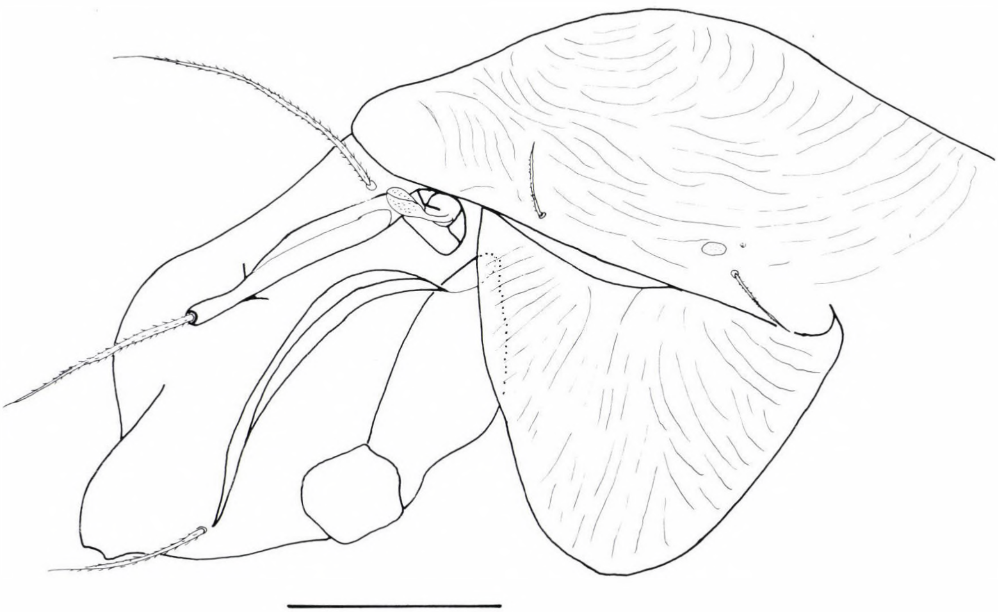
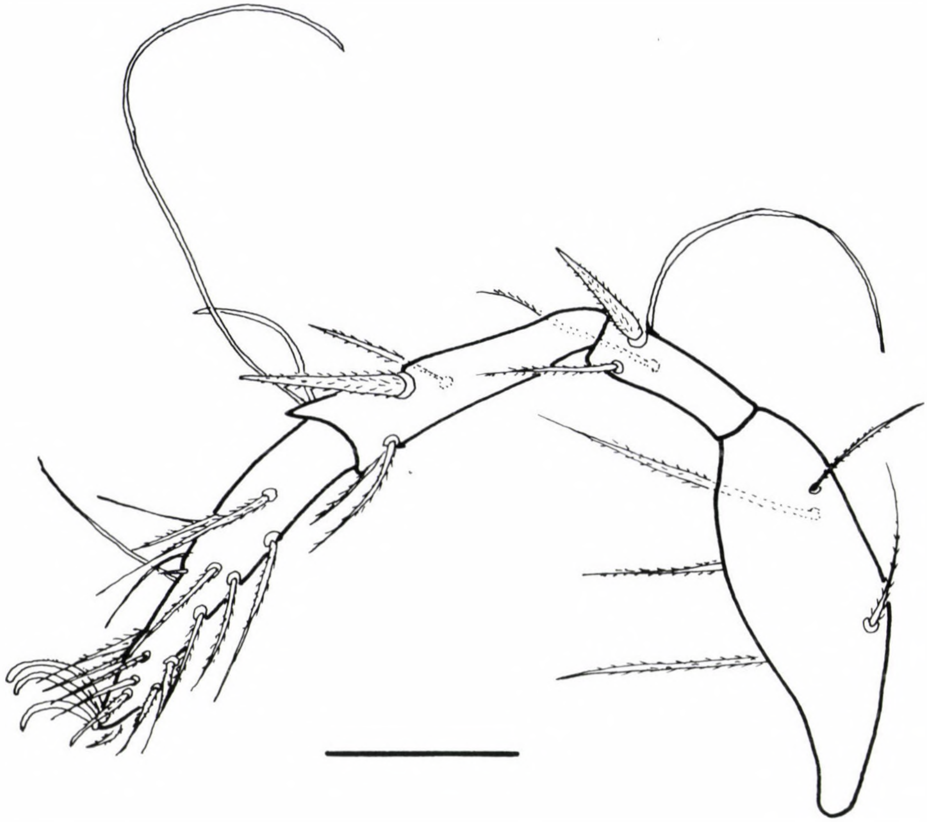


Fig. 3. *Cordylobates fragilis* gen. n., sp. n.: lateral view of proterosoma of female (scale bar: 100 μm)

Fig. 4. *Cordylobates fragilis* gen. n., sp. n.: leg I (scale bar: 50 µm)



sharply pointed projection ventrodistally; genua and tibiae of legs I, II and III each with an especially broad, dagger-like, blunt, setose seta laterally (similar setae of tibiae are narrower and with somewhat filamentous tips). Ovipositor terminating in 3 elongate lobes each bearing 4 setae.

Material examined. On lava outcrops near Packer's Hole, Lava Lake, and Letterbox (with sparse growths of lichen, grass tufts and algae), Ascension Island. Collected between 18th and 30th March 1990 by PHILIP and MYRTLE ASHMOLE, University of Edinburgh. Holotype male (from Packer's Hole), 3 paratype males and 2 paratype females at the Natural History Museum, London; 1 paratype male and 1 paratype female in the Canadian National Collection, Centre for Land and Biological Resources Research, Ottawa, Canada.

Etymology. The specific epithet refers to the apparent extreme fragility of the specimens as well as to that of their precarious habitat.

Remarks. Several of the specimens have masses of amorphous material in their guts which might be the remains of lichen. However, their diet also seems to be composed of pollen which has presumably been serendipitously blown onto their otherwise rather barren habitat.

Acknowledgements. I am most grateful to PHILIP and MYRTLE ASHMOLE, who collected the specimens, for allowing me to study them, and to Dr VALERIE BEHAN-PELLETIER for her advice on the identity of the genus.

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NEW ORIBATIDS (ACARI: ORIBATIDA) FROM THAILAND*

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Four oribatid species are described as new to science from Thailand. Two of them belong to the family Lohmanniidae, while the other two to the Galumnidae. With 14 original figures.

Key words: Acari, Oribatida, taxonomy, new species, Thailand

In 1994 we made extensive collectings in various regions of Thailand in order to secure soil, litter, moss and other samples (MAHUNKA & MAHUNKA-PAPP 1994). The elaboration of oribatids has already begun. For the time being I am publishing those taxa which have either taxonomic or zoogeographic significance. The work is an integral part of a research programme aimed to investigate the relationship existing between the fauna of East Africa and the Oriental Region.

This time I present the description of two new species belonging to the family of Lohmanniidae and two to Galumnidae. Especially interesting are those relegable to Lohmanniidae, since the genus *Paulianacarus* is found both in the Ethiopian and the Oriental Regions clearly demonstrating the connection that had existed in prehistorical times.

The aims and methods applied have been discussed in my previous papers (e.g. MAHUNKA 1995).

Abbreviations: HNHM = deposited in the Hungarian Natural History Museum, Budapest; MHNG = deposited in the Museum d'Histoire Naturelle, Genève.

LOHMANNIIDAE BERLESE, 1916

Annectacarus krachan sp. n.
(Figs 1–2)

Measurements. – Length of body: 471–499 μm, width of body: 241–263 μm.

Prodorsum: Rostral apex conical, with a sharply pointed apex. All five pairs of notogastral setae long, well pilose. Sensillus with 18–20 very long branches, having small spicules opposite the branches.

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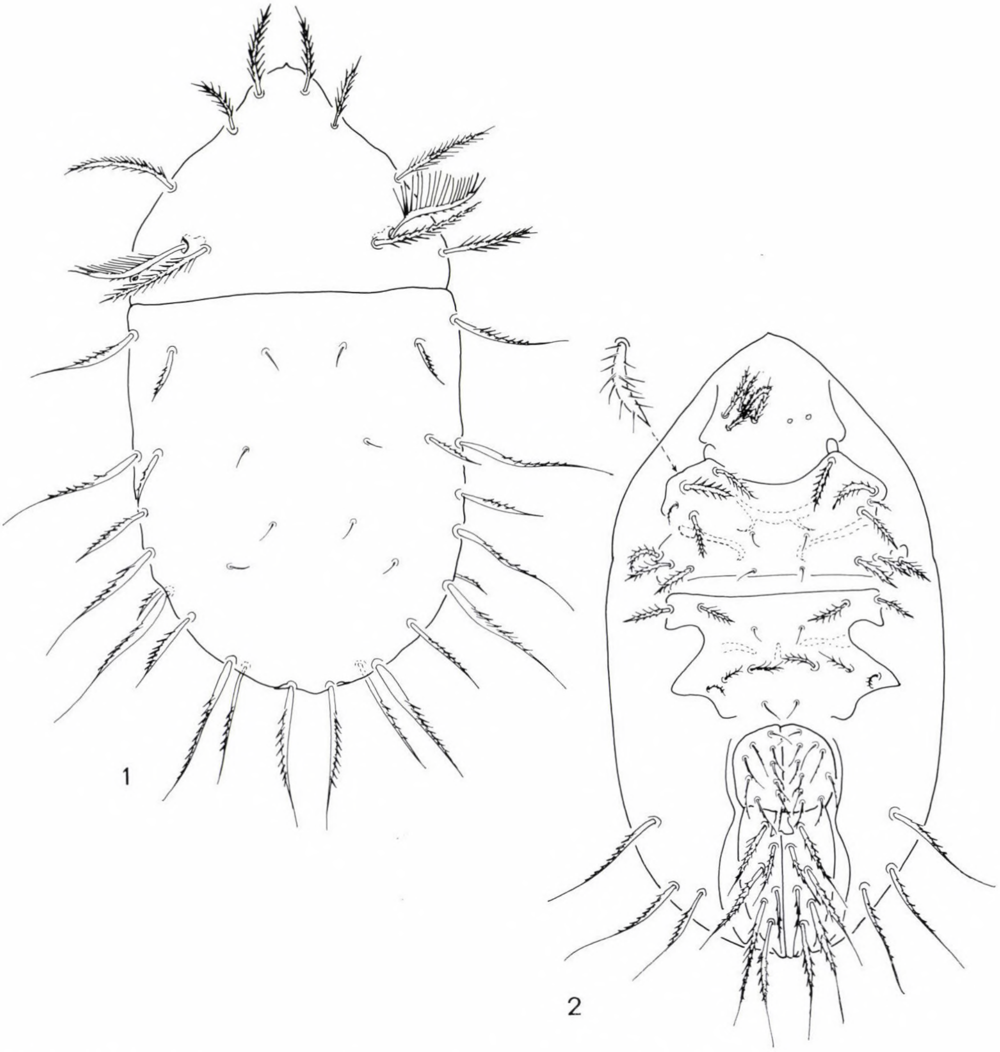
* This work was supported by the Hungarian National Scientific Research Fund (OTKA, No. T–16729)



Figs 1–2. *Annectacarus krachan* sp. n.: 1 = body in dorsal aspect, 2 = body in ventral aspect

Notogaster: No transverse bands were observable. Among the setae great differences exist, setae c_1, d_1, e_1 and h_1 very short, simple. Some of the others (e.g. c_2, d_2, etc.) sword-shaped, marginal setae with a very long flagellate end (Fig. 1). All setae unilaterally ciliate.

Ventral regions: Subcapitulum with 6–7 setae, sometimes in asymmetric position. All slightly dilated. Epimeral neotrichy present, epimeral setal formula: 5 – 4 – 3 – 4. Some of the setae simple and short (*1a*, *2a*, *3a* and *4c*), the others digitiform or tubuliform; all bearing long spines (Fig. 2). Genital plates undivied, with 10 pairs of simple, thin but ciliate genital setae. Six pairs arising medially, while four pairs laterally. Preanal plate narrow. Anal and adanal plates fused, with 4+2 long, setiform, well-ciliate setae. Anal setae shorter than the adanal ones.

Legs: monodactyle.

Material examined: Thailand, Kaeng Krachan (Phetchaburi), Kaeng Krachan National Park, Camp. 9. II. 1994. – Berlese sample from root system and from debris of a decaying palm. Leg. S. MAHUNKA & L. MAHUNKA-PAPP. Holotype (1517-HO-1995) and 5 paratypes deposited in the HNHM, 1 paratype in the MHNG

Derivatio nominis: named after the Kaeng Krachan National Park where the new species was collected.

Paulianacarus rugolosus sp. n.

(Figs 3–5)

Measurements. – Length of body: 653–764 µm, width of body: 305–376 µm.

Prodorsum: Anterior margin of rostrum slightly excavated, with two lateral teeth or weakly waved medially. Prodorsal surface finely rugulose. All five pairs of prodrosal setae very short, mostly smooth. Sensillus setiform, thin, without branches, only unilaterally spinose or ciliate.

Notogaster: Its sculpture, especially on the posterior part similar to the prodorsal one. Some porose area also present in irregular position. Transverse bands present only on the anterior half of notogaster, but only the first one is continuous, the next three are interrupted medially (Fig. 3). All notogastral setae setiform, short or minute, hardly observable.

Ventral sides (Fig. 4): Four pairs of subcapitular setae present, simple. No epimeral neotrichy, epimeral setal formula: 3 – 1 – 3 – 4. Excepting setae *4d* all setae short and simple, the latter one well thickened, with thick spines (Fig. 5). Genital plates undivided, with 9(!) pairs of minute genital setae, 6 pairs among them arising by the median margin and 3 pairs laterally. Anal and adanal plates fused, a short crista observable on the distal part

Legs: monodactyle and stout. Femora I–IV with a ventral ridge.

Material examined: Thailand, Kaeng Krachan (Phetchaburi), Kaeng Krachan National Park, Camp. 9. II. 1994. – Berlese sample from root system and from debris of a decaying palm. Leg. S. MAHUNKA & L. MAHUNKA-PAPP. Holotype (1518 HO-1995) and 6 paratypes from the same sample. Holotype and 5 paratypes in HNHM, 1 paratype in MHNG.

Remarks: On the basis of its peculiar features the new species is difficult to classify into any of the known genera of the family Lohmanniidae. However, the form of the anogenital region resembles the genus *Paulianacarus* BALOGH, 1960, although the species of the latter have 10 pairs of genital setae, and their surface is quite different.

Derivatio nominis: Named after the peculiar sculpture of the dorsal regions.

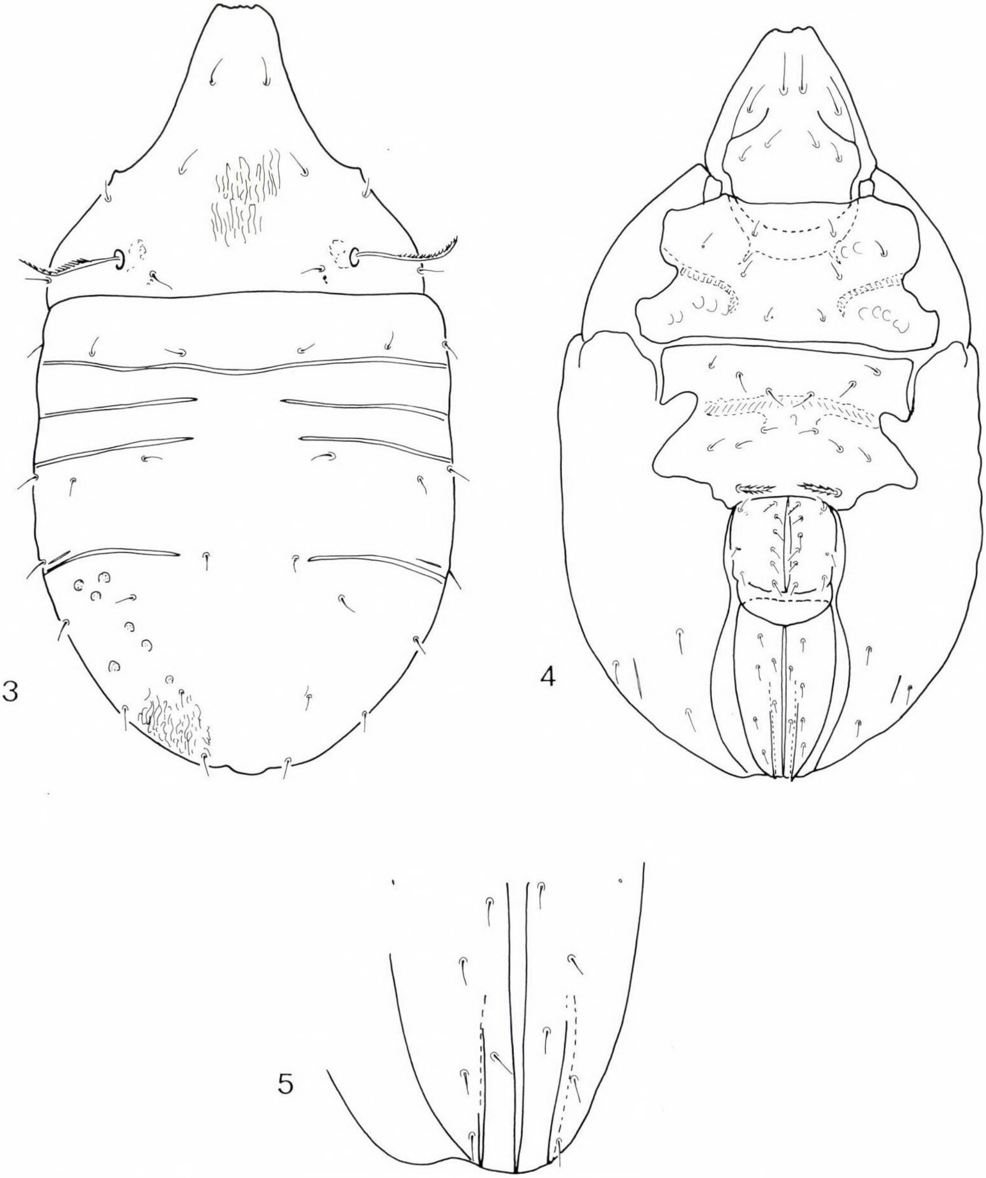
GALUMNIDAE JACOB, 1925

Allogalumna gedaii sp. n.

(Figs 6–9)

Measurements. – Length of body: 449–505 µm, width of body: 312–346 µm.

Dorsal side (Fig. 6): Rostrum with sharply pointed median apex. Its surface covered with fine and small pustules, laterally similar rugae also observable. Lamellar line absent, sublamellar one thin, but discernible (Fig. 9). Rostral setae slightly longer and thicker than the lamellar ones, interlamellar setae minute, hardly visible. Rostral setae slightly roughened. Sensillus comparatively long, directed mostly outwards, its clavate head well spiculate. Dorsosejugal suture well developed, flatly arched anteriorly. Pteromorphae with characteristic sculpture, it is similar to the prodorsal



Figs 3–5. *Paulianacarus rugulosus* sp. n.: 3 = body in dorsal aspect, 4 = body in ventral aspect, 5 = posterior part of the ano-adanal plates

Figs 6–9. *Allogalumna gedaii* sp. n.: 6 = body in dorsal aspect, 7: solenidial group of leg I, 8 = body in ventral aspect, 9 = dorsosejugal region and sensillus

ones. Lateral outline of pteromorphae deeply excavated. Three pairs of large and rounded porose areae (areae porosae A_1 often divided in two parts) and ten pairs of notogastral alveoli well observable, lyrifissures *im* located conspicuously near to areae porosae A_1 (Fig. 6). Lyrifissures *ih* and *ips* visible near to each other, in front of the alveoli of setae p_3. Median pori absent.

Ventral side (Fig. 8): Shape of apodemes and epimeral borders without any peculiar characters, but the epimeral setae are comparatively long, well observable. Epimeral setal formula: 2 – 1 – 3 – 2. Circumpedal carina well developed, but not reaching to the lateral margin of the ventral plates, narrowing before it. Anogenital setation typical for the genus; 2 pairs of genital setae arising on the anterior margin of the genital plates. Lyrifissure *iad* in adanal position. A large, bean-shaped postanal porose area present.

Legs: tridactylous. Seta *l'* on femur I thick, much larger than seta *l''*. Tibia of leg I with a longitudinal crest, solenidial group of leg I as shown in Fig. 7.

Material examined: Thailand, Sri Racha (Chon Buri) water reservoir 110 km S of Bangkok. 30. I. 1994. – Berlese sample from wet mossy soil, near to the bank of the reservoire. Leg. S. MAHUNKA & L. MAHUNKA-PAPP. 6 paratypes from the same sample. Holotype (1519-HO-1995) and 5 paratypes in HNHM, 1 paratype: in MHNG.

Remarks: The new species is well characterised by the shape of the rostrum, the sensillus and the characteristic sculpture of the prodorsum and pteromorphae. On the basis of this feature combination it is distinguishable from all heretofore known *Allogalumna* GRANDJEAN, 1936 species.

I dedicate the new species to my friend Dr. ISTVÁN GEDAI (Budapest), the Director General of the Hungarian National Museum.

Galumna varia sp. n.

(Figs 10–14)

Measurements. – Length of body: 548–592 μm, width of body: 427–466 μm. An other specimen: length: 476–537 μm, width: 362–395 μm.

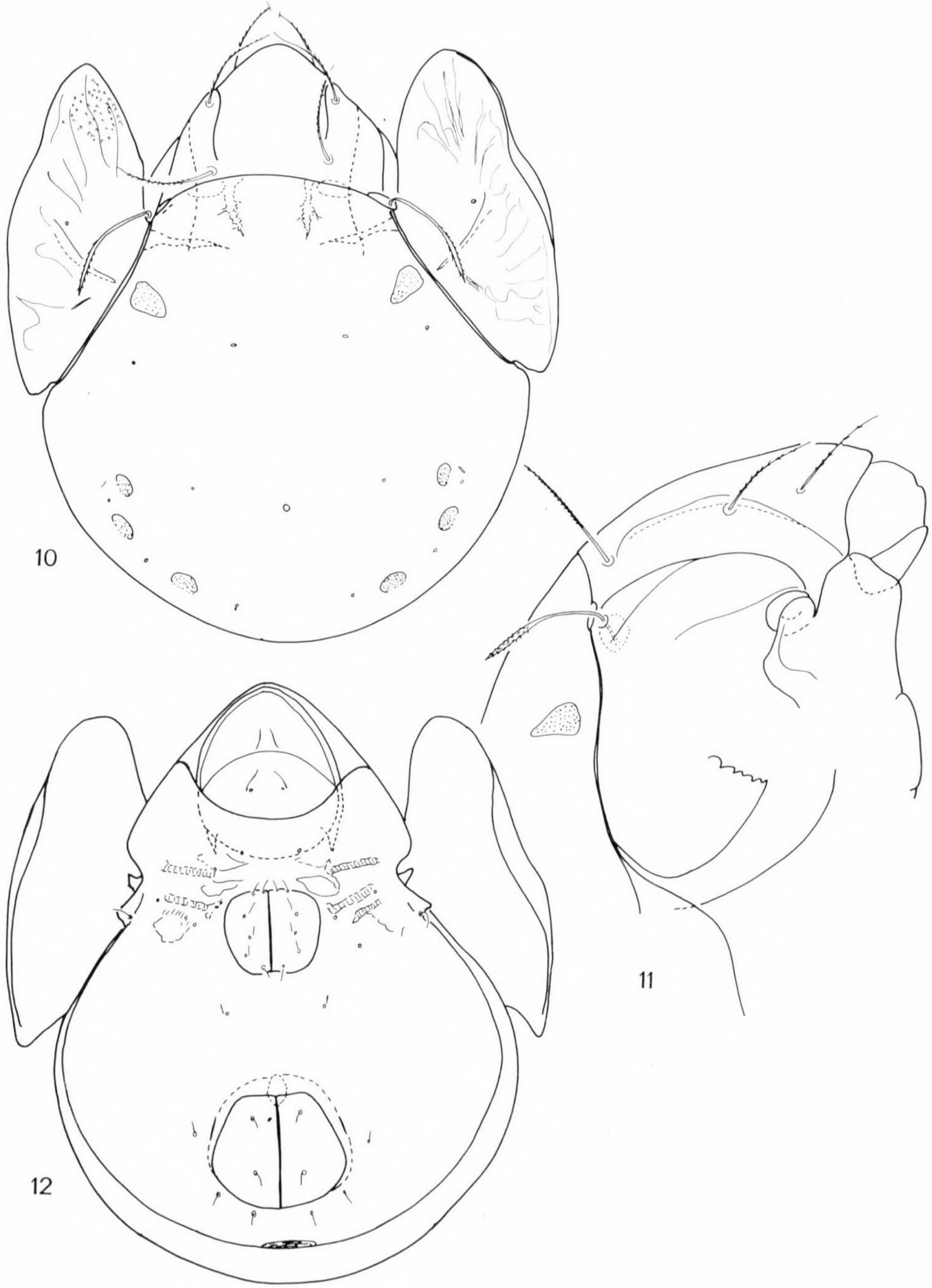
Prodorsum: Rostrum wide, rounded in dorsal aspect. Lamellar and sublamellar lines well developed, lamellar ones conspicuously strong (Fig. 11). All three pairs of median setae of prodorsum long. Interlamellar one acute, distinctly pilose, lamellar and rostral ones simple setiform and weakly pilose. No essential difference among their length. Sensillus long, directed backwards, with a lanceolate head, its form slightly varying: simple lanceolate or asymmetrically lanceolate. Both forms well pilose. Areae porosae dorsosejugales large.

Notogaster (Figs 10, 13): Dorsosejugal suture well developed. Pteromorphae often covered by small granules. Four pairs of areae porosae present, *Aa* elongated, gradually dilated laterally. Its form strongly varying. The other 3 pairs of porose areae nearly round, no greater difference among them. On the notogastral surface ten pairs of setal allveoli and an unpaired median porus present, it is present on both sexes. Lyrifissures *im* located very near to the porose areae A_1.

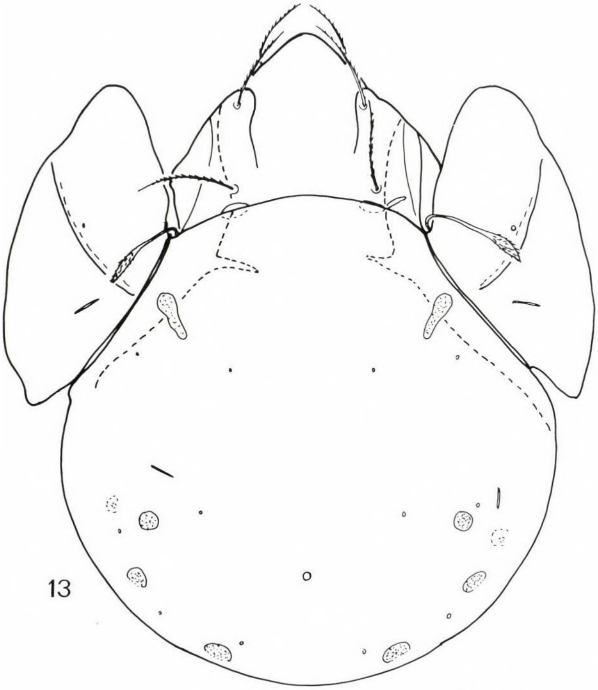
Ventral regions (Figs 12, 14): Coxisternal region with some irregular spots, epimeral setae simple. The position of the setae on the genital plates varying. Postanal porose area very long but narrow.

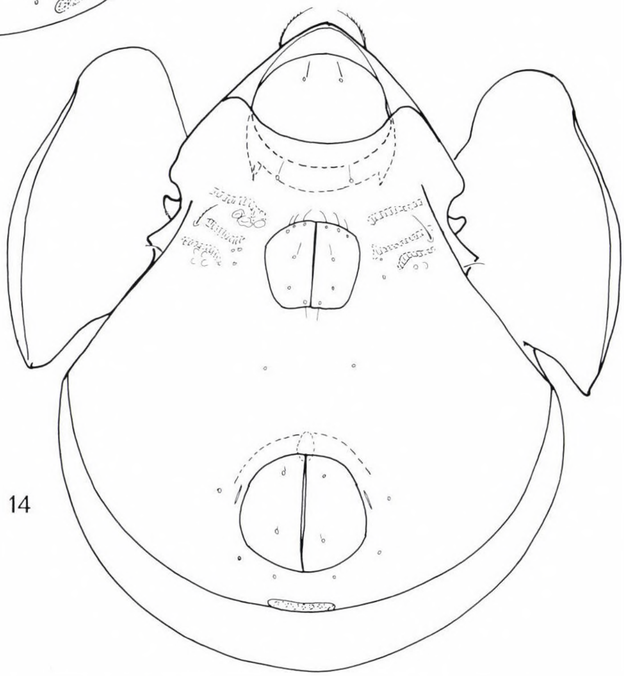
Legs: tridactylous.

Material examined: Thailand, Sri Racha (Chon Buri) Buddhist temple and monastery about 20 km S from the water reservoir. 30. I. 1994. – Berlese sample from fern stocks and roots, near to a bank of a creek. Leg. S. MAHUNKA & L. MAHUNKA-PAPP. 6 paratypes from the same sample. Holotype (1520-HO-1995) and 5 paratypes in HNHM, 1 paratype: in MHNG.



Figs 10–12. *Galumna varia* sp. n. (holotype): 10 = body in dorsal aspect, 11 = prodorsum in lateral aspect, 12: body in ventral aspect





Figs 13–14. *Galumna varia* sp. n. (paratype): 13 = body in dorsal aspect, 14 = body in ventral aspect

Remarks: I am not quite sure that all these forms belong to one species. But the forms of the sensillus and the form of the porose area *Aa* are highly varying in all the specimens. The holotype is identical with the specimen shown in Figs. 10–12.

Derivatio nominis: Referring the variability of the species.

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SHORT COMMUNICATION

Acta Zoologica Academiae Scientiarum Hungaricae 41(2), pp. 147–149, 1995

MORPHOLOGICAL AND ENZYME POLYMORPHISM STUDIES ON THE SAME DROSOPHILA SPECIMENS: A SIMPLE COLLECTING METHOD

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A collecting method is presented which produces drosophilid specimens available for both morphological and enzyme polymorphism studies.

Key words: sampling method, *Drosophila*, morphology, enzyme polymorphism

The study of genetic variation in natural populations is a paramount task of population genetics. In the most promising works, the level of polymorphism of many phenotypic traits is investigated in parallel. Inferences drawn by authors who analysed exclusively either morphological variation or enzyme polymorphism in a population may be misleading. In many papers, as a matter of fact, marked differences were reported between the pattern of variation for allozymes and morphological traits (JAIN *et al.* 1980, GILES 1984). In contrast, other works demonstrated parallelism in the amount of variation both at the allozymic and morphometric levels (CESARONI *et al.* 1989, BIJLSMA *et al.* 1991). Thus, a particular attention should be paid to study all possible aspects of variation in a given population. *Drosophila* species, however, have rather small body size giving rise to methodological problems in that kind of complex investigations. Hence, it is of interest to find appropriate methods for collecting *Drosophila* species when studying their variability.

Our method for baiting and capturing drosophilids is well known (cf. e.g. BÄCHLI 1972). Fermenting apple bait (smashed apple of various kinds with some sugar added and fermented in lukewarm water for more than a week) was put on 40×40 cm square plastic sheets within a 10 m range of the creeks. The distance of one collecting point to another was at least 10 m, bait was put down at 15 to 18 places (4 to 5 deciliters to each) to gain one sample. Exposure time was usually half an hour. Drosophilids were sweep netted several times for a period up to 24 hours by a Diptera net (conical with slightly rounded end) (cf. PAPP 1992).

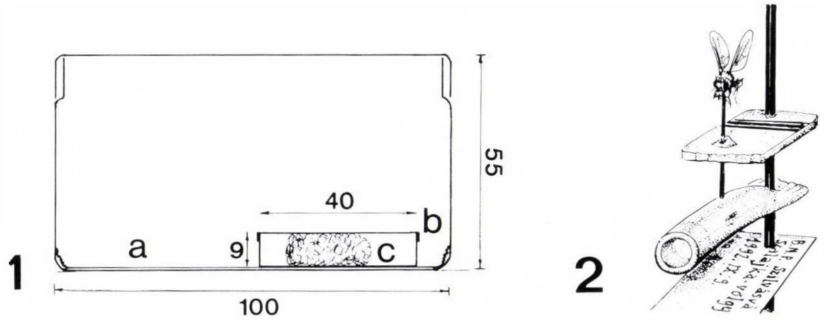
Apical part of the net with captured flies kept closed by hand was turned inside out into blown-up cylindrical plastic bags under permanent shaking (one bag per one collecting "run"). These bags contained tissue paper ribbons of ca 25×41 cm bundled with white thread at one end. Fastened plastic bags were carried to a sheltered place where a microscope was on a table. There a swab of cotton soaked with in chloroform/ethyl ether was put into the loosen mouth of the bag until flies fell down. Flies were narcotized but not killed this way.

The bunches of tissue paper ribbons were shaken inside the bag in order remove flies adhered to them. Flies, fallen down to the bottom of bag, were very carefully turned out into a "narcotizing chamber" (Fig. 1). Removal of or placing the lid to the small petri dish with chloroform/ethyl ether is enough to keep flies narcotized without killing them.

Identifications were made under a microscope. An amplification of 25 to 40 times under natural light is usually enough to identify most of the Central European drosophilids; if a higher (e.g. 100 times) magnifying is unavoidable, a generator for cool light is needed. Flies are held and transfered by their mid or hind tarsus with a pair of pin-pointed Leonhard's pincers. (Selected flies other than drosophilids collected and stored in normal vials for museum collection purposes.)

Named drosophilid flies were put into labelled Wasserman vials and freezed in refrigerator and kept frozen until laboratory manipulations, or, cooled in a refrigerator and carried in portable icebox to freezer.

In the laboratory flies were left to melt one by one, their abdomen is removed (most of the insect enzymes are localized in the abdomen) and used for



Figs 1-2. 1 = narcotizing chamber (a: tissue paper, b: small petri dish with lid, c: cotton with chloroform/ethyl ether); 2 = *Drosophila* specimen with genitalia in glycerine in Andersson's microvial

enzyme polymorphism studies (see e.g. KENYERES *et al.* 1995). The genitalia of males or postabdominal (mostly membraneous) segments of females with the egg-guides are removed from abdomen and put directly into an Andersson's microvial (ANDERSSON 1972, 1976) under the minutia-pinned body of the specimen (Fig. 2). All the cephalic, thoracic and wing structures are left intact and studiable by all these manipulations. In any case of bias about the identity of specimens, genitalia are prepared with sodium-hydroxide, etc. of the usual method of genitalia preparation for microscopic studies of high amplification. In case of common species genitalia preparations can/may be omitted.

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CONSERVATIONAL ASPECTS OF BIRD–VEGETATION RELATIONSHIPS IN RIPARIAN FORESTS ALONG THE RIVER DANUBE: A MULTIVARIATE STUDY

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Vegetational structure and bird communities were sampled in willow (*Salix*), poplar (*Populus*), and mixed riparian forests along the River Danube, in the Szigetköz region, N Hungary. Multivariate ordination methods were applied to show bird-vegetation relationships: the principal component analysis (PCA) for deriving vegetational components, the canonical variate analysis (CVA) to evaluate separation of the forest types based both on the birds and the vegetational structure, and multivariate plexus analysis (MPA) to show relationships between a set of individual bird species and vegetational components. The willow forest seems to be a threatened habitat type in the Szigetköz region because of the construction of the Bős–Gabcikovo hydroelectric power station on the Danube. The willow forest has the most unique bird community in the area, whereas the fast growing hybrid poplar forests have a bird community with greater species abundances than that of a typical temperate deciduous forest. The importance of methodological issues in wildlife-habitat ordination is also discussed.

Key words: bird community, multivariate analysis, bird–vegetation relationships, riparian habitat, habitat alterations, River Danube

INTRODUCTION

The Hungarian Natural History Museum started an intensive study of the riparian forests along the River Danube in the Szigetköz region in Northern Hungary in 1989, just after the construction of the Bős–Gabcikovo hydroelectric power station has started. The aim of the project was to set up an inventory for wildlife, and to reveal the most unique components of it. The main goal was to monitor the impact of changes of habitats on the flora and fauna, and to predict their possible changes in a short or a long term. Wildlife–habitat relationships also got into the focus of interest to understand the mechanisms underlaying the changes of the biota.

Bird communities in the forests of this region have already been studied by Waliczky (1992), who compared the avian communities of three main types of habitat: willow forest (*Salicetum albae–fragilis*), poplar forest (*Populus* sp.), and hardwood forest (*Quercetum roboris* and *Querceto–Ulmetum hungaricum*). Báldi & Kisbenedek (1994) and Báldi & Moskát (1994) investigated the edge effect in poplar forests. WALICZKY *et al.* (1991) and MOSKÁT *et al.* (1993) studied the habitat selection of a characteristic species, the Icterine Warbler (*Hippolais icterina*) in the region. An overall description of the avifauna of the Szigetköz area was given by BÁLDI *et al.* (1995). Other studies concerning the changes of the bird fauna caused by the alteration of the water regulation system are still being continued.

The present study wanted to give a detailed insight into the bird–vegetation relationships in the riparian areas of the flood plain, comparing three typical riparian forest types (willow, poplar, and mixed forests). Since we expect important changes in the woodland habitats affected by the new reservoir and hydroelectric power station by altering the water regulation system in the area only in the next 10–20 years, this study could also be regarded as a snap shot of the present state of wildlife–habitat relationships.

STUDY AREA AND METHODS

The study was conducted during 1994 in the Szigetköz region along the River Danube in Northern Hungary (48°00'–47°40'N, 17°15'–17°45'E). This area is an inland delta of the River Danube, composed of hundreds of small islands, surrounded with side-branches and dead-branches. The unique composition of different terrestrial, aquatic, and semi-aquatic habitats has given rise to a high diversity of wildlife.

The original vegetation in the flood area was *Salicetum albae–fragilis*, and *Fraxino pannonicae–Ulmetum* (SIMON 1992), but most of these forests were replaced in this century by plantations of fast growing hybrid poplars (*Populus* spp.).

In the present study, we selected the two most typical forest types in the flood plain of the river: the forests of the willow (*Salix alba*), and the poplar (*Populus deltoides* × *Populus nigra*) (Fig. 1). The willow forests occupied the lower, wetter sites in the region, and they occurred in small fragments, generally surrounded by poplar plantations. Mixed forests of willow and poplar were also studied. In all of the forest types, a well-developed shrub layer was found (e.g., *Cornus sanguinea, Euonymus europaeus, Viburnum opulus, Sambucus nigra*). We designated sites as "willow forest" where the proportion of the willow trees was greater than 80%. Poplar sites were identified where the proportion of poplar species was at least 80%. All other sites were identified as willow–poplar mixed forest.

Fourteen variables of the vegetational structure were measured by visual estimation at each site, following the guidelines of JAMES & SHUGART (1970) in a 25 m radius around the centre of each sampling circle: tree height (m), shrub

Fig. 1. Typical habitat types in the Szigetköz riparian area: (a) channels and dead branches of the River Danube form a braided channel system, (b) willow forest stand in the flood plain, (c) mixed forest of willow and poplar, (d) poplar forest without bush layer, (e) poplar forest with a well developed bush layer, and (f) poplar forest with a dense bush layer

height (m), canopy cover (%), shrub cover (%), average trunk diameter at breast height (cm), average closest tree distance (m), proportion of poplar trees (%), proportion of willow trees (%), proportion of alder trees (%), proportion of other tree species (%), number of tree species, foliage cover of the understory foliage layer (%), height of the understory foliage layer (m), and average trunk diameter at breast height of the trees forming the understory foliage layer (cm). During the fieldwork to avoid personal variability both in bird census and in vegetation measurements, bird data were gathered by C. MOSKÁT, and vegetation data were measured by T. FUISZ.

Along the river 46 sampling points were selected between the villages Dunakiliti and Vámosszabadi. The double-visit fixed-radius point count method was used to count birds at a site (MOSKÁT 1987). This technique was originally introduced as a variant of the the I.P.A. point-count method. The I.P.A. technique (BLONDEL *et al.* 1970) counts birds within hearing distance at the same sites twice during the breeding season, and calibrates the highest values for a species at a site to a corresponding, more accurate territory mapping result by the application of a conversion coefficient. WALANKIEWICZ (1977) argued against the "hazardous" conversion coefficient, and the need of territory mapping makes this calibration laborious. For these reasons, the fixed-radius variant of this technique (MOSKÁT 1987) was developed. The first counts were carried out in the middle of April, and the second counts were done in May, in a 100 m radius around each sampling point. Time spent at one point was 10 minutes. The greater count from the two visits was chosen as a representative value for a bird species at a given site. Woodpeckers, pigeons and passerine bird species were registered during the census, following the general guidelines for bird censuses (e.g. PINOWSKI & WILLIAMSON 1974). Because they are not adequately surveyed using these methods, we did not count raptors, owls, etc., or the non-territorial Cuckoo (*Cuculus canorus*). The accuracy of the fixed-radius variant of the I.P.A. method was over 70% for the total density of birds tested against values derived from the territory mapping method in a mature beech (*Fagus silvatica*) forest (MOSKÁT 1987). For analysis we selected those bird species from which at least 7 pairs were counted at a site.

For statistical analysis, principal component analysis (PCA), correspondence analysis (CA), and canonical variate analysis (CVA) were performed using the computer program SYN-TAX (PODANI 1993). Multivariate plexus analysis (MPA) (MOSKÁT 1991) was also applied, which is a multistep procedure, where some of the steps can be chosen relatively freely from the set of other ordination techniques. In this application PCA was applied to derive vegetation components, and Kendall's rank correlations were computed for bird species and vegetation component data. The plexus diagram was constructed using a non-metric multidimensional scaling (NM-MDS) analysis applying the program by ORLÓCI &

Table 1. Number of pairs of bird species (in brackets) in willow (*Salix*), poplar (*Populus*) and mixed (*Salix-Populus*) riparian forests along the River Danube in the Szigetköz region, N. Hungary (April-May 1994, counted by the double-visit fixed-radius point count technique). (Selected species for further analysis signed by asterisk.)

Bird species	Forest (area)		
	willow (18.84 ha)	mixed (43.96 ha)	poplar (81.64 ha)
Columba palumbus	1	3	1
Streptopelia turtur	3	3	3
Jynx torquilla	1	0	2
Dryocopus martius	0	0	1
*Dendrocopos major**	1	6	13
Dendrocopos medius	1	0	2
Dendrocopos minor	1	1	3
*Oriolus oriolus**	2	11	16
Garrulus glandarius	2	3	1
Corvus corone	0	2	2
Aegithalos caudatus	0	2	2
Parus palustris	0	0	2
Parus montanus	0	2	2
*Parus caeruleus**	2	12	27
*Parus major**	2	13	27
*Remiz pendulinus**	4	6	3
*Sitta europaea**	0	9	13
Certhia brachydactyla	0	4	8
Certhia familiaris	0	0	2
*Troglodytes troglodytes**	2	8	15
*Erithacus rubecula**	2	10	20
*Luscinia megarchynchos**	1	7	3
*Turdus merula**	2	10	23
*Turdus philomelos**	3	9	16
*Locustella fluviatilis**	5	1	5
*Hippolais icterina**	2	6	6
*Sylvia atricapilla**	19	57	91
*Phylloscopus trochilus**	0	4	3
*Phylloscopus collybita**	5	21	35
*Phylloscopus sibilatrix**	0	5	9
*Ficedula albicollis**	0	4	4

Table 1 continued

Bird species	Forest (area)		
	willow (18.84 ha)	mixed (43.96 ha)	poplar (81.64 ha)
*Muscicapa striata**	2	3	5
*Prunella modularis**	5	6	11
Anthus trivialis	0	0	2
*Sturnus vulgaris**	3	21	39
Passer montanus	0	0	5
*Fringilla coelebs**	13	33	64
Serinus serinus	0	1	2
Carduelis chloris	0	0	1
Carduelis carduelis	0	0	4
*Coccothraustes coccothraustes**	2	5	7
Emberiza citrinella	0	2	3

KENKEL (1985). Rarefaction values were calculated by the program RAREFRAC (LUDWIG & REYNOLDS 1988). For other calculations the computer programs SPSS/PC+ (NORUSIS 1986), and NUCOSA (TÓTHMÉRÉSZ 1993, 1994) were applied.

RESULTS

During point counts 42 bird species were recorded (Table 1). Rare species in low abundance were omitted from the analyses, and hence only the most abundant 23 species were retained for analysis (Table 1).

The willow forest showed the lowest species richness, total density and Shannon's diversity values. Species richness, total density and diversity were

Table 2. Community structure parameters of forest bird communities in willow (*Salix*), poplar (*Populus*) and mixed (*Salix-Populus*) forest sites (Szigetköz region, April-May 1994)

	Forest (area)		
	willow (18.84 ha)	mixed (43.96 ha)	poplar (81.64 ha)
Species richness	25	33	42
Expected number of species based on rarefaction	25	28	29
Total density	45.65	65.97	61.61
Shannon's diversity	2.79	3.00	3.03

Table 3. Component loadings of vegetation variables obtained by principal component analysis (riparian forest habitats, Szigetköz region, 1994)

Variables	Principal components		
	V1	V2	V3
Tree height	0.919	–0.186	–0.018
Bush height	0.197	0.507	–0.624
Tree foliage cover	–0.268	–0.058	0.724
Bush cover	0.154	0.797	–0.075
Tree trunk diameter	0.863	0.012	–0.055
Tree trunk distance	0.642	–0.491	–0.250
Proportion of poplar	0.902	–0.159	–0.040
Proportion of willow	–0.925	0.091	–0.033
Proportion of alder	0.181	0.642	0.055
Proportion of other tree species	0.497	0.169	0.705
Number of tree species	0.627	0.422	0.317
Eigenvalues	4.478	1.823	1.589
Variance explained (%)	41	16	14

highest in the poplar forest, and the willow–poplar mixed forest showed an intermediate state in community structure parameters (Table 2). Significance tests of the Shannon's diversity between pairs of habitats showed significant difference ($P<0.05$) only in the comparasion of willow and poplar forests.

Principal component analysis of the vegetation variables was carried out for the 14 vegetational variables, and for a subset of these variables, dropping the last three variables (nos. 13, 14, and 15) reflecting to the understory foliage layer (Table 3) because the understory varied between sites, and we had difficulties measuring it. Sometimes it was not distinguishable from the forest canopy foliage layer, or from the shrub layer. Its variety was hardly characterized by the measurements applied, so after PCA and some preliminary ordination analysis by other similar multivariate methods (correspondence analysis, principal coordinate analysis) we deleted the variables for the understory foliage layer. (Only the canonical variate analysis was performed on the full 14-variable data set, but it also supported this decision, see below!) The PCA based on 11 vegetational variables showed a well-identifiable pattern. We selected 3 components, representing 72% of the total variance. The first component (V1) was identified as a willow–poplar component, changing from willow (–) to poplar (+) along the axis. E.g., a high negative relationship of a bird species with V1 reflects the association of the bird species with the stands where the willow trees were dominant. The second component (V2) pertained to shrubs, where (–) values meant no or undeveloped

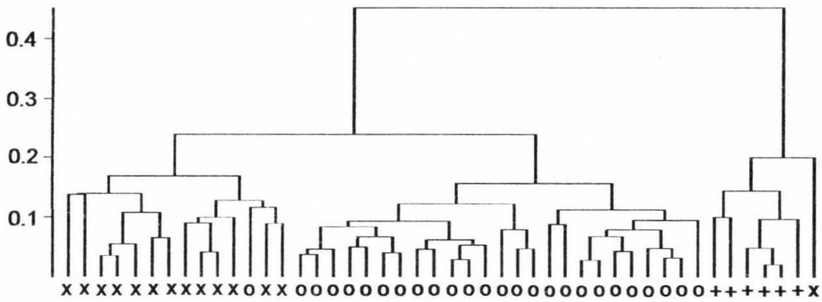

Fig. 2. Cluster analysis of sampling points based on vegetation measurements in willow (+), poplar (o) and mixed (x) riparian forests in the Szigetköz region, N. Hungary, in 1994

shrub layer, and (+) values represented a well-developed shrub layer. The third component (V3) pertained to degree of habitat closure, where (–) values represented the open character, and (+) values the closed vegetational structure. It mostly refers to the canopy. Generally, a well-developed bush layer occurs when the canopy is open, but bushes are very scarce when the canopy is closed.

Because PCA showed the first principal component as the willow–poplar contribution (vegetation variables 7 and 8 on Table 3), we divided the sampling points into three groups according to their poplar and willow percent values (see Study area and methods). The validity of this categorization was supported by the agglomerative cluster analysis (Fig. 2).

Canonical variate analysis of these three categories showed a high order separation of sites based both on bird species present and on vegetational variables (Fig. 3). Separation was somewhat better when 11 vegetational variables were analyzed (Fig. 3*b*) than based on bird data (Fig. 3*a*), and much better than based on the 14 vegetational variables including the understory foliage layer (Fig. 3*c*).

When bird species abundances were analyzed together with vegetation components in the multivariate plexus analysis, 10 bird species showed significant relationships with the vegetational components (Table 4, Fig. 4). The Penduline Tit (*Remiz pendulinus*) showed a high-level ($P<0.001$) negative relationship, and the Blackbird (*Turdus merula*) a positive ($P<0.01$) relationship with the first vegetation component (V1). This showed that the Penduline Tit preferred willow forests. The Blackbird usually feeds on the ground, so does not prefer the lower and wetter sites, which are temporarily covered by water, where the willow stands occur. The Spotted Flycatcher (*Muscicapa striata*) also showed a low-level ($P<0.05$) negative, and the Starling (*Sturnus vulgaris*) a low-level ($P<0.05$) positive relationship with V1. The Blue Tit (*Parus caeruleus*) showed a positive ($P<0.01$) relationship with V2, and two other species, the Robin (*Erithacus rube-*

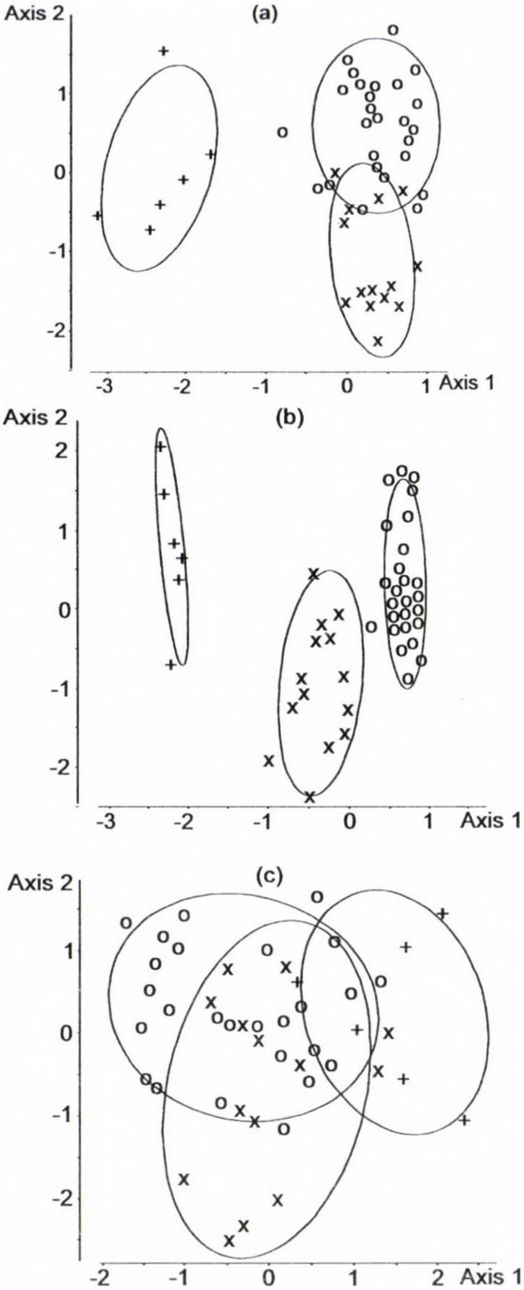

Fig. 3. Canonical variate analysis of sampling points based on (a) abundance values of 23 bird species, (b) 11 vegetation variables, and (c) 14 vegetation variables, in willow, poplar, and mixed riparian forests in the Szigetköz region, N. Hungary, in 1994. (Probability ellipses were calculated at the probability level of 5%, so 95% of points in the respective cluster are expected to be included within the ellipse

Table 4. Significant rank correlations (Kendall's tau-b) between bird species and vegetation components derived from principal component analysis (* P<0.05, ** P<0.01, *** P<0.001)

Bird species	Vegetation components		
	V1	V2	V3
Dendrocopos major			–0.210*
Parus caeruleus		0.310**	
Remiz pendulinus	–0.398***		
Erithacus rubecula		0.255*	
Luscinia megarchynchos			–0.379***
Turdus merula	0.324**		
Hippolais icterina			–0.225*
Phylloscopus collybita		0.203*	
Prunella modularis	–0.249*		
Sturnus vulgaris	0.251*		–0.221*

cula) and the Chiffchaff (*Phylloscopus collybita)* also showed a positive, but low-level (P<0.05) relationship with this component. These cases indicated preference for shrubs. The Great Spotted Woodpecker (*Dendrocopos major*), the Icterine Warbler showed low-level negative (P<0.05), the Starling (*Sturnus vulgaris*) low-level positive, and the Nightingale (*Luscinia megarchynchos*) high-level negative relationships with the third vegetation component (V3). This means some avoidence of the closed forests stands.

DISCUSSION

Bird–habitat relationships and conservation biological problems in willow–poplar riparian forests of the Szigetköz region

In the Szigetköz project, conservation biologists are interested in the following main question: How does the construction of the Bős–Gabcikovo hydroelectric power station affect the flora and fauna of the region? Formerly most of the water flowed in the main branch of the river, but now flows through the new reservoir in the Slovakian part of the area, which caused a catastrophic decrease of the water level in the main branch, and consequently, in the side branches, too. Parallel with these changes the water table is also expected to decrease in the region. These problems do not affect the lower zone of the region, because the water from the new reservoir comes back to the main channel here. To predict the exact decrease of the water table in the region seems to be a very difficult task, because it may vary locally, but generally the area is becoming drier. This process may effect the structure and composition of the riparian habitats, but this

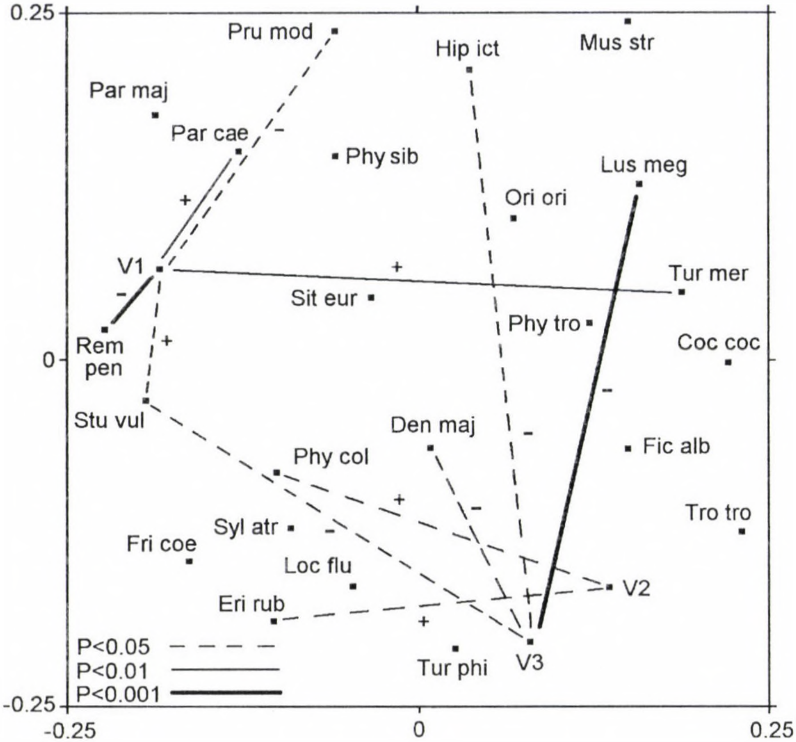

Fig. 4. Plexus diagram of bird species and vegetation components in willow–poplar riparian forests in the Szigetköz region, N. Hungary, in 1994. (Meaning of vegetation components from the negative pole of the axis towards to the positive pole: V1= willow–poplar contribution, V2= bush component (from low to high cover), V3= openness–closeness gradient (see RESULTS for explanation of the vegetation components); Codes for bird species: Den maj= *Dendrocopos major*, Ori ori= *Oriolus oriolus*, Par cae= *Parus caeruleus*, Par maj= *Parus major*, Rem pen= *Remiz pendulinus*, Sit eur= *Sitta europaea*, Tro tro= *Troglodytes troglodytes*, Eri rub= *Erithacus rubecula*, Lus meg= *Luscinia megarchynchos*, Tur mer= *Turdus merula*, Tur phi= *Turdus philomelos*, Loc flu= *Locustella fluviatilis*, Hip ict= *Hippolais icterina*, Syl att= *Sylvia atricapilla*, Phy tro= *Phylloscopus trochilus*, Phy coll= *Phylloscopus collybita*, Phy sib= *Phylloscopus sibilatrix*, Fic alb= *Ficedula albicollis*, Mus stri= *Muscicapa striata*, Pru mod= *Prunella modularis*, Stu vul= *Sturnus vulgaris*, Fri coe= *Fringilla coelebs*, Coc coc= *Coccothraustes coccothraustes*)

could not be an abrupt change, but a slow process in the terrestrial habitats, unlike in the aquatic and semi-aquatic habitats.

Riparian habitats in the Szigetköz region have a rich avifauna both in species number and abundance, but most of the bird species can be found in the Hungarian forests everywhere in the country. The most unique and highly threatened habitat is probably the willow forest in the region. The decrease in the water-table will force forest management to change this type of forest to another type. The present study found that the bird community in the willow forest is separated in structure from the bird communities of the poplar and mixed forests. Among the individual bird species the most threatened one is the Penduline Tit. The presence of this species in riparian forests is a unique feature of forest bird communities in Central Europe. Another species, the Icterine Warbler, is a common migrant, but a relatively rare breeding species in the country. However, in the Szigetköz region this species has a high breeding population. Comparative analysis of the habitat selection characteristics between the migrant and the breeding populations of the Icterine Warbler (MOSKÁT *et al.* 1993) showed that both populations select sites according to habitat structure, not by tree species. Therefore relevant changes in the habitat structure in the Danubian riparian forests may influence the population of the Icterine Warbler. In Hungary the Willow Tit (*Parus montanus*) is a very rare breeding species, but it has an important population in the Szigetköz region. It was not included in the analysis because of low numbers, but we found it in all types of riparian forests. The riparian forests of the Szigetköz region once had nearly the only significant Hungarian population of the Dunnock (*Prunella modularis*), but in the last two decades it has become a relatively common breeding species in most of Hungary. The multivariate plexus analysis showed some relationship between the Dunnock and the willow stands. The plexus diagram reflects some similarity with the Icterine Warbler and the Wood Warbler (*Phylloscopus sibilatrix*) in their position in the structure.

The usefulness of multivariate ordinations in wildlife–habitat research

What can wildlife ecologists gain from multivariate wildlife–habitat analysis? Generally, it gives insights into the wildlife–habitat context. It is a multidimensional problem, so human thinking has trouble with it. There is almost no other way to get insight into complex structures of wildlife and habitat data besides the multivariate statistical procedures, but of course, they must be applied carefully. Practically, the application of some closely related techniques is advisable (MOSKÁT & FUISZ 1995). One analysis may give a false solution, but similar results obtained by different ordination techniques may strengthen acceptability. In comparison of the results obtained by several different multivariate methods one has to consider their special characteristics.

Multivariate statistical analyses seem to be popular among ecologists to indicate the structure of bird communities with respect to habitat (see references e.g. in WIENS 1989, and MOSKÁT 1991). Although authors may select from a great pool of methods, most methods exhibit difficulties when bird–habitat relationships are the focus of interest (MOSKÁT 1991). The problem that the casual ordination methods perform an analysis on a two-dimensional data matrix, (e.g. vegetational structure or bird species abundances in the form of a [sites] x [species] -type data matrix), but when there are data on birds and on the habitat structure, the data set is more complex. Multivariate plexus analysis seems to be successful in overcoming this problem (MOSKÁT 1991, MOSKÁT & WALICZKY 1992).

In the present study principal component analysis was applied to identify main vegetational components. Although PCA is not a robust technique (e.g. GAUCH 1982), generally it can be applied when the data refer to a short ecological gradient (GAUCH 1982). The interpretation of the results is generally easy, more so than with any of the similar methods (e.g. correspondence analysis, metric multidimensional scaling or principal coordinate analysis and polar ordination). In this study, some of these alternative techniques were also tried, but they did not give better insight into the vegetation structure.

Canonical variate analysis, a variant of the discriminant analysis group looks like especially advisable when subsets of the data set can be constructed (e.g., samples from willow, poplar and mixed forests). Although discriminant analysis is sensitive for a number of objects in groups, like Morrison (1984) suggested at least 35 objects in a group, in this study it gave clear distinction among the groups. For this reason we regarded it as an acceptable result, even if some of the group numbers were low (6 for the willow sites, 14 for the poplar sites, and 26 for the mixed sites).

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ON THE MORPHOLOGY AND TAXONOMY OF THE ASIAN LEECHES (HIRUDINEA: ERPOBDELLIDAE, SALIFIDAE)

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Erpobdelliformes from the two families Erpobdellidae and Salifidae from Japan, China and Nepal are described. *Erpobdella testacea* is recorded from China. The Japanese *Erpobdella octoculata* is an overlooked separate species. This leech is placed into another genus under the name *Dina japonica* (new combination). *Barbronia weberi*, *B. weberi formosana* and *B. assiuti* differ slightly by their form and geographical isolation. Based on new material from the terra typica (Japan, Honshu), *Odontobdella blanchardi* is reinvestigated. Consequently, one different species has to be separated: *O. polaneci* sp. n. from Japan (Shikoku). A new leech *Sinobdella kinzelbachi*, the type-species of *Sinobdella* gen. n., from China can be distinguished from all other Asian Salifidae by the stylets and asymmetrical stylet pockets.

Key words: Hirudinea, Erpobdellidae, Salifidae, Sinobdella gen. n., Asia

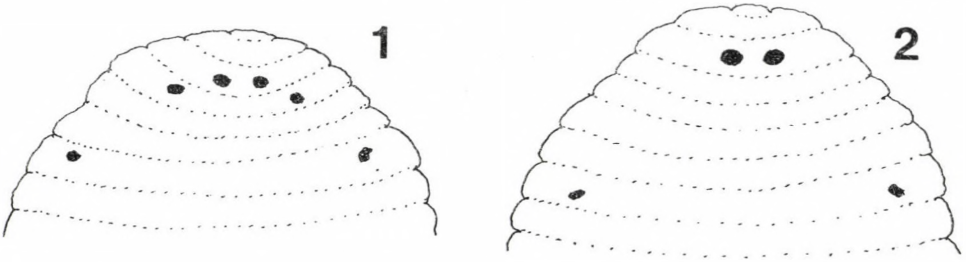
INTRODUCTION

Although widely distributed, the family Salifidae is still inadequately described. Salifids occupy similar microhabitats as most holarctic Erpobdellidae and thus have in parallel developed similar forms, annulation types and other morphological structures. It appears that a number of typical ecological niches of west-palaearctic Erpobdellidae are occupied by analogous members of Asian salifids. Only a small transitional zone is known, where the two families occur sympatrically.

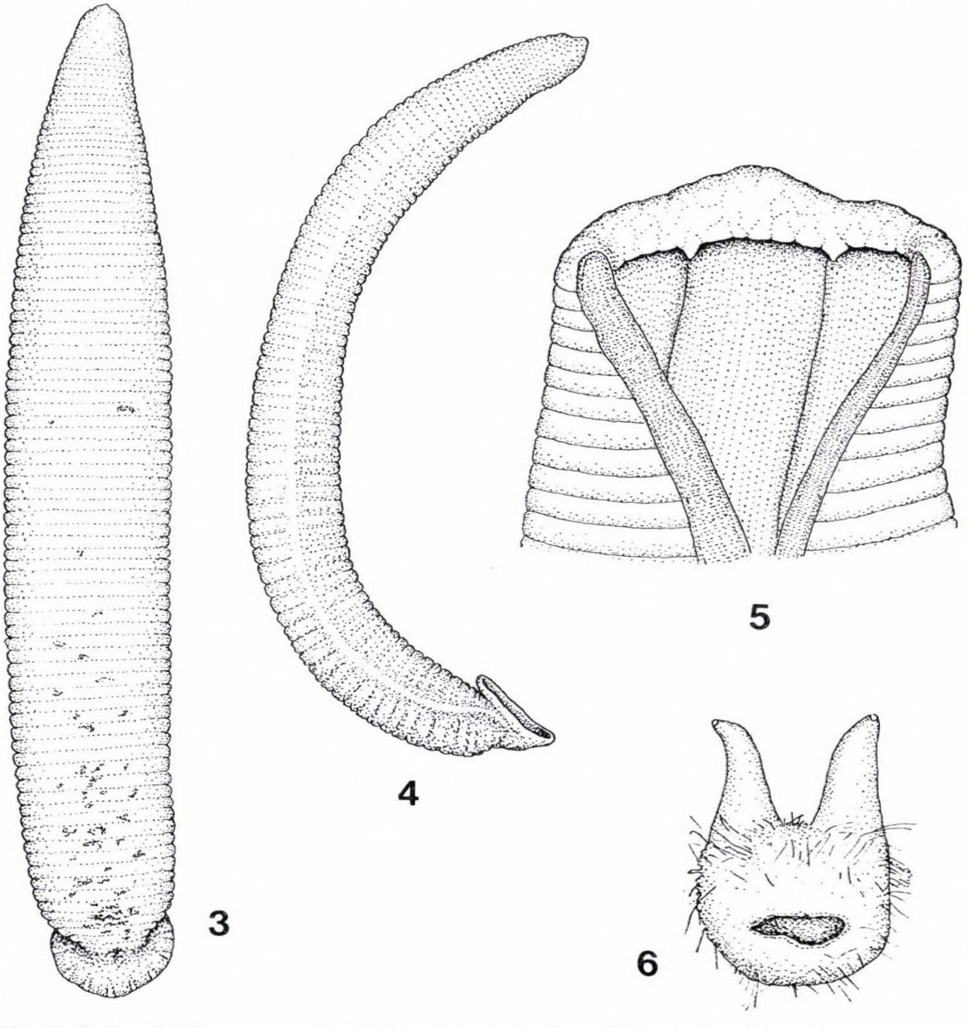
The aim of this paper is to present more detailed data on the morphology and anatomy of the Erpobdelliformes. Salifidae can be distinguished from Erpobdellidae by the presence of pharyngeal stylets. It is also possible to recognize Salifidae and Erpobdellidae by their number and position of eyes (Figs 1–2).

MATERIAL AND METHODS

Leeches were collected qualitatively by hand from the following countries. Nepal: November 1993, leg. W. GRAF, U. GRASSER, O. MOOG, H. NESEMANN, S. SHARMA; February 1994, leg. S. SHARMA & H. NESEMANN, China: August 1992, leg. R. & W. KINZELBACH, Japan: October 1994, leg. K. POLANEC & H.



Figs 1–2. Typical position of eyes in Erpobdelliformes: 1 = Erpobdellidae, *Dina japonica*, 2 = Salifidae, *Barbronia weberi formosana*



Figs 3–6. *Erpobdella testacea*: 3 = habitus dorsal, 4 = lateral, 5 = oral sucker with pharynx and pseudognaths, sectioned, ventral, 6 = atrium ventral (China, Dong Hu)

NESEMANN. Additional material from the Nile river in Egypt, collected by A. S. MOUSTAVA in 1984–1988, was studied. All species were sectioned for the investigation of the pharynx, pseudognaths, stylets and the male genital system. The stylets of Salifidae were made visible by a special decomposition. The pharynx of the leeches was dissected. The material was placed in water (4°C) for ten days. After this time, the pharyngeal tissue and the stylet pocket are lost (Figs 59–62).

DESCRIPTION OF TAXA FOUND IN SOUTH AND EAST ASIA

Family Erpobdellidae BLANCHARD, 1894

Erpobdelliformes with numerous grape-like vesicles of testes, strepsilaematous pharynx without stylets. Eight eyes of similar size (reduced in some species).

Species of this genus, e.g. *E. octoculata* and *E. testacea* are often included in faunal lists of Kashmir and Japan. These records are doubtful owing to confusion with *Dina* spp. Therefore, more certain records are needed to complete the knowledge of the eastern distribution limit of the common west-palaearctic leeches.

Erpobdella testacea (SAVIGNY, 1822)

(Figs 3–6)

Material: People's Republic of China, Wuhan, Wuhan part, Geological University campus, shore of Lake Dong Hu on the peninsula N of the campus, 3–7. 8. 1992, leg. R. & W. KINZELBACH.

This well known leech (SOÓS 1968, LUKIN 1976, SAWYER 1986) occurs in the west-palaearctic region and is also listed for the fauna of Japan (Oka 1926, 1935, SAWYER 1986). The material described here is the southernmost record of. *E. testacea*. The specimens (Figs 3–6) resemble the European forms in the position of the genital pores (male gonopore in the furrow XII b1/b2, female in XII/XIII). The identification is based on the atrial cornua, which have the typical angle of 60°, instead of 90° as in *E. nigricollis* (BRANDES, 1900). In contrast to the European forms, some specimens from Lake Don Hu have a reduced irregular dark pattern on the dorsal surface, which is restricted to the postclitellar region.

Ecology: This erpobdellid species was found to be associated with Salifidae in the shallow water of the littoral in Lake Dong Hu.

Dina japonica (PAWLOWSKI, 1962) (Figs 7–15)

Herpobdella atomaria: OKA, 1910 – Annotationes Zoologiae Japonenses, Vol VII: 177, Tokyo.

Herpobdella octoculata var. *atomaria:* OKA, 1924 – Mem. Asiat. Soc. Bengal, Vol. VI: 175.

Herpobdella lineata: OKA, 1929 – Proceedings of the Imperial Academy (of Japan), Vol V: 278–279, Fig. A, Tokyo.

Herpobdella octoculata: OKA, 1929 – Proceedings of the Imperial Academy (of Japan), Vol V: 279, Fig. B, Tokyo.

Erpobdella octoculata ssp. *japonica:* PAWLOWSKI, 1962 – Zeszyty Naukowe Uniwersytetu Lodzkiego Nauk Matematycno–Rrzyrodnicze, Seria II, zeszyt 12: 131–132, Lodz.

Material: Japan, Honshu: Kamo Gawa in Kyoto, 22. 10. 1994; stream N of Otsu (tributary of Lake Biwa), 23. 10. 1994; Katsura Gawa in Arashiyama, 31. 10. 1994; Hozu Gawa (middle reach of Katsura Gawa) in the narrow valley near Hozukyo, 2. 11. 1994; all leg. K. POLANEC & H. NESEMANN.

Description (Figs 7–15): Small to medium-sized leeches up to 33 mm as preserved specimens. Living adults reach a total body length up to 55 mm. The postclitellar region bears small rounded keels. Head typically with six (eight) equal eyes in Erpobdellid pattern. The pharynx has three small pseudognaths. Gonopores separated by 2.5 annuli. Male genital porus on annulus XII b2, female in the furrow XII b5/b6. Annulation of the mid-body somites: One somite comprises five annuli, b1, b2, a2 and b5 are of the same size, b6 is distinctly widened and rarely subdivided. Colour of the living animals is dark brown, reddish brown or yellowish brown always with one pair of dark longitudinal paramedian stripes. Eleven to fourteen light spots arranged transversally on each annulus. The ground colour varies and the dark pigmentation on the dorsum may sometimes be reduced (see Figs 7–15).

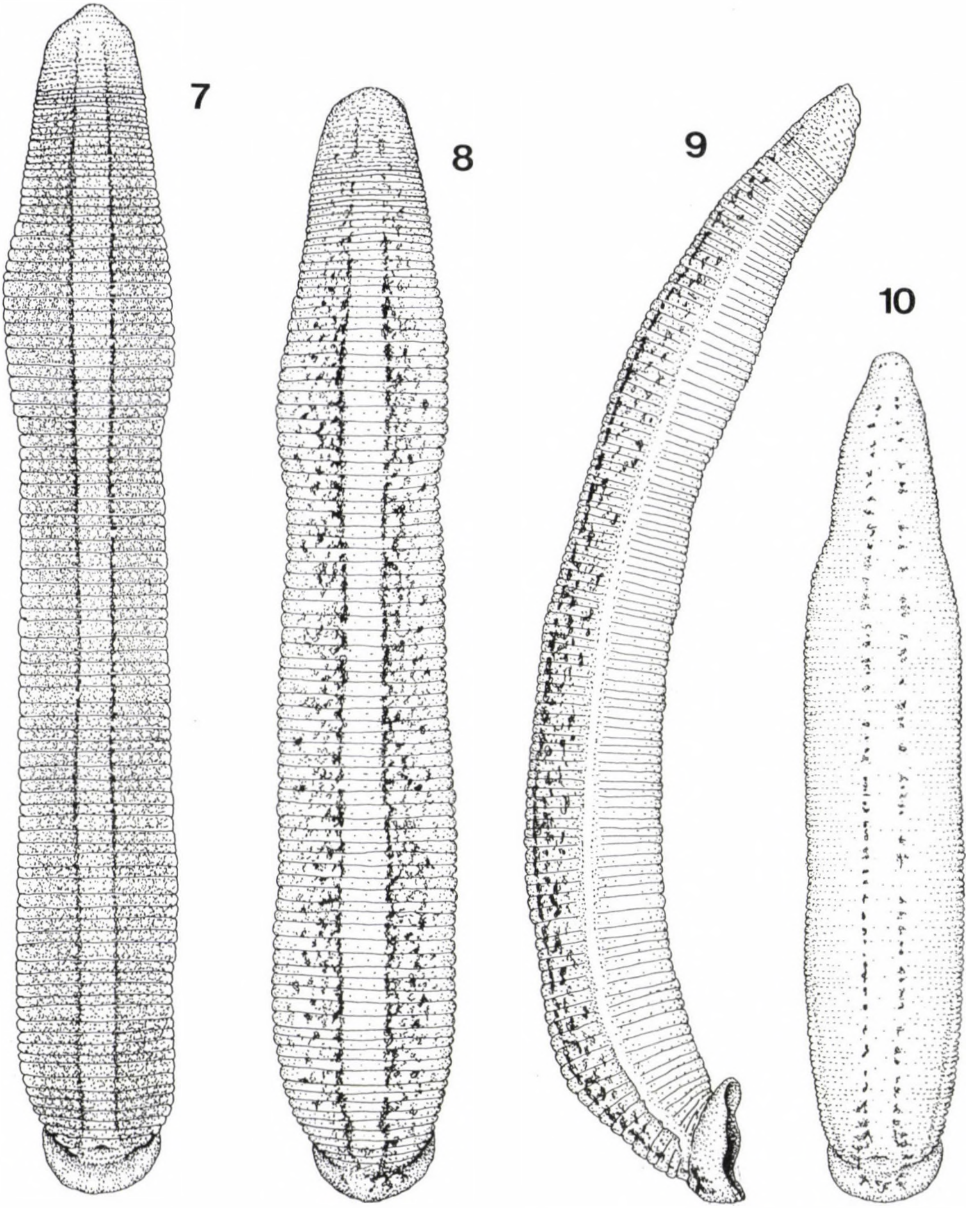
Ecology: This aquatic leech species inhabits fast flowing rivers and streams with stony, gravelly and sandy bottom. It was found in lenitic zones near the bank. The leech seems to prefer rheophilic habitats.

Notes: *D. japonica* was mistakenly placed under the genera and species *E. octoculata* or *D. lineata*, because of its external habit and the pair of paramedian stripes. Living specimens are very similar to the European *Erpobdella vilnensis* (LISKIEWICZ, 1925) due to their colour and microhabitats. As shown in the figures and in OKA (1929: Figs A, B), it is a member of the genus *Dina* with widened annulus b6.

Family Salifidae JOHANSSON, 1909

Erpobdelliformes with a few vesicular testes, strepsilaematous pharynx and three pairs of needle-shaped stylets.

Eyes variable four to eight on the head, further accessory eyes are present in the genus *Salifa*. In all of the studied material, the first pair is always large and close together. This can be recognized in living adult specimens by looking at the head thorough a magnifying glass.



Figs 7–10. *Dina japonica*: habitus dorsal and lateral of different coloured forms, juvenile-adult

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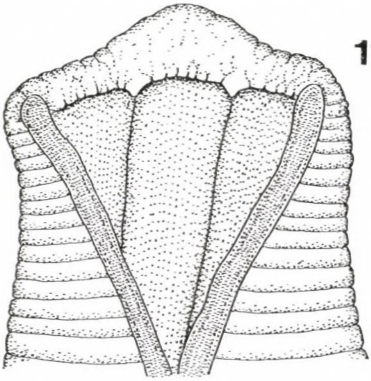

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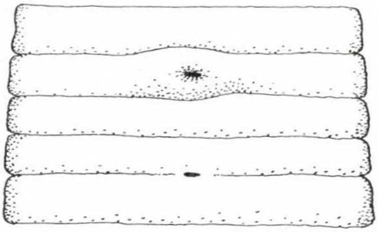

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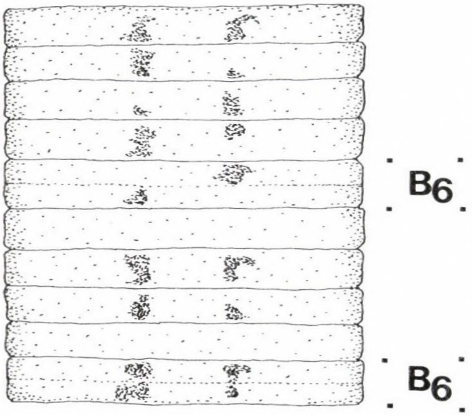

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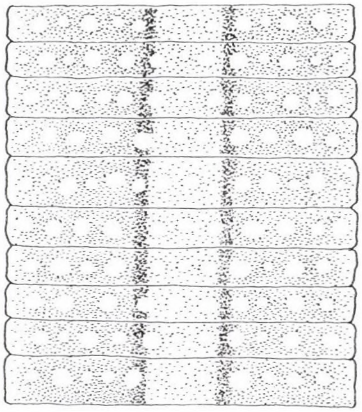
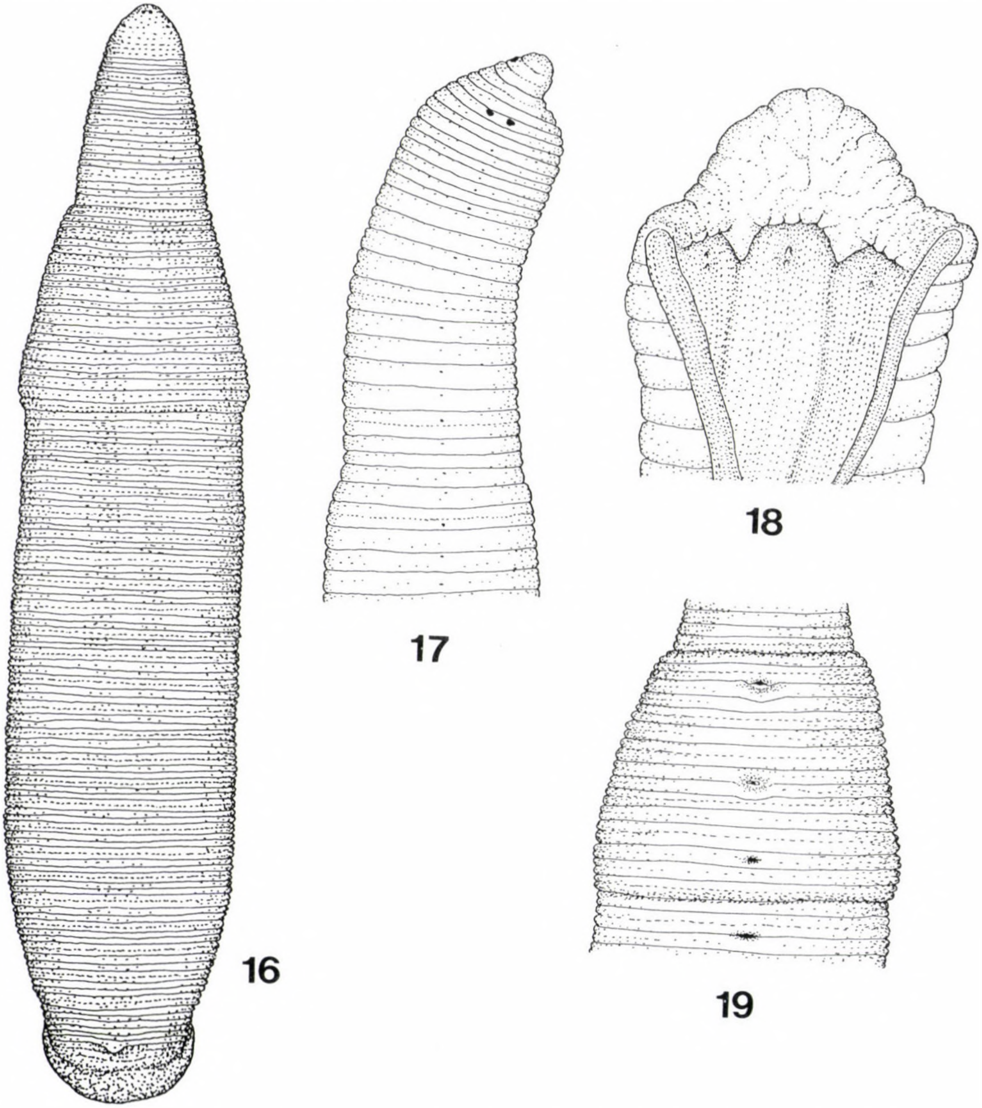


Figs 11–15. *Dina japonica*: 11 = oral sucker with pharynx and pseudognaths, sectioned, ventral, 12 = somitee XII ventral with male and female gonopores; 13-15 = two somitees of the postclitellar region of different coloured forms, annulus b6 slightly widened (Japan, Honshu, Hozu Gawa and Katsura Gawa)

Barbronia JOHANSSON, 1918

Description: Salifidae, accessory copulatory pits on venter at somites X/XI and XIII/XIV, six small pharyngeal stylets, arranged in symmetrical pairs, stylet pockets in one row, three pairs of stylets show in cranial direction, somites of the postclitellar region heteronomiously annulated, annulus b6 *Dina*-like widened and subdivided.



Figs 16–19. *Barbronia assiuti*: 16 = habitus dorsal, 17 = head and preclitellar region with eyes, lateral, 18 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 19 = clitellum ventral with male and female gonopores and accessory copulatory pits (Egypt, Nile floodplain, Quena)

The *Barbronia weberi*-complex

The taxonomy of the genus *Barbronia* seems to be unclear even today (HUSSEIN & EL-SHIMY 1982, JOHANSSON 1918, RICHARDSON 1970, SAWYER 1986). Within this genus externally two groups of species can be distinguished.

I. Species with one pair of dark paramedian stripes on the dorsum. Australia and New Caledonia: *B. rouxi* JOHANSSON, 1918 and *B. arcana* (RICHARDSON, 1970)

II. Species without paramedian stripes, the dorsal surface of the body is unicoloured. Lower Nile in Egypt, South and East Asia: *B. assiuti* HUSSEIN & EL-SHIMY, 1982 and *B. weberi* (BLANCHARD, 1897).

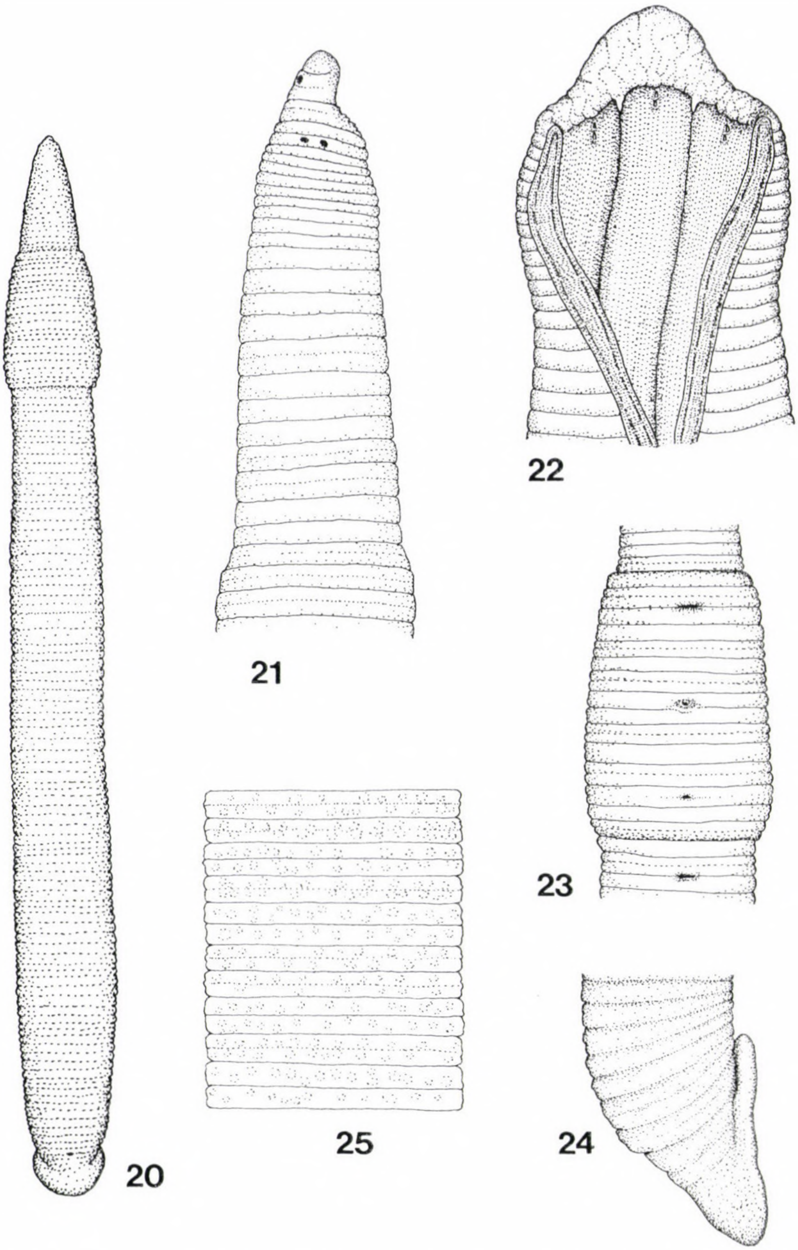
Leeches of the genus *Barbronia* were often confused with other genera and several doubtful subspecies are described. Therefore, the hitherto known taxa of the Asian region are characterised and compared with the single African species. Further material and detailed studies of the internal organization are needed.

The description of the species *B. assiuti* was based on a general mistake of the annulation in the preclitellar and clitellar region. According to the original description, *B. assiuti* should differ from *B. weberi* by the postion of the clitellum and the genital pores. In the investigated material from Africa (Figs 16–19) and Asia (Figs 20–30), the clitellum and the genital pores are exactly in the same position. Therefore no important differences exist between the described taxa *assiuti, weberi* and *formosana.*

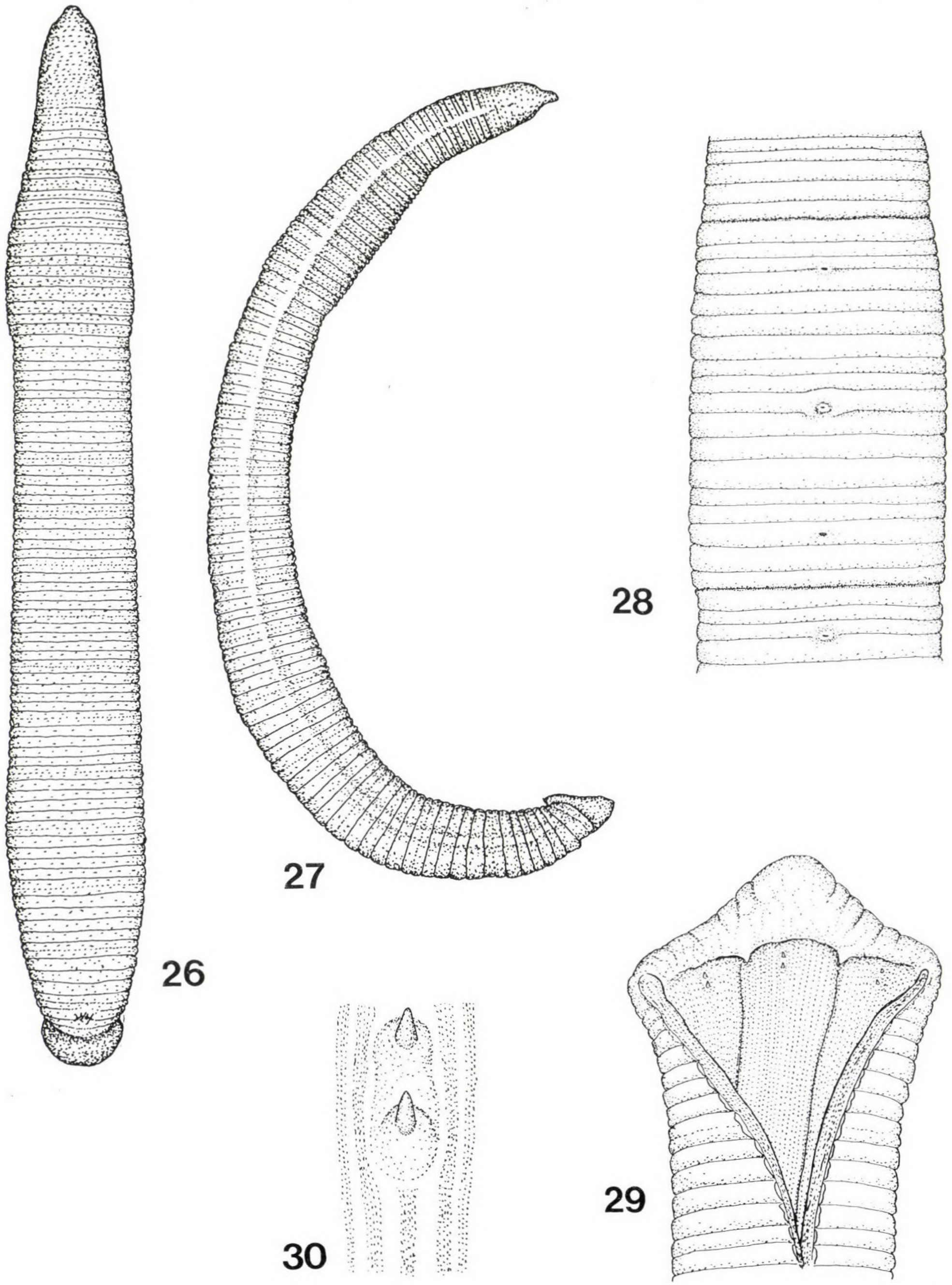
Barbronia weberi (BLANCHARD, 1897)
(Figs 20–25)

Material: People's Republic of China: Wuhan, Wuhan part, Geological University campus, shore of Lake Dong Hu on the peninsula N of the campus, 3–7. 8. 1992, leg. R. & W. KINZELBACH; Nepal: numerous collections from various water bodies, see NESEMANN & SHARMA (in. prep.). The material studied here was collected from Western Zone, Phewa-Tal effluent near Pokhara, 21. 2. 1994, leg. S. SHARMA & H. NESEMANN.

This taxon is well known (Figs 20–25). Good descriptions are given by MOORE (1924), HARDING & MOORE (1927) and HUSSEIN & EL-SHIMY (1982). Small to medium-sized elongated and cylindrical leeches reaching a total body length of 50 mm in living adults and 35 mm in preserved specimens. Living specimens are light red to redbrown. Six eyes in typical salifid position. The single Chinese specimen fully agrees with the material from Nepal in the external morphological features.



Figs 20–25. *Barbronia weberi*: 20 = habitus dorsal, 21 = head and preclitellar region with eyes, lateral, 22 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 23 = clitellum ventral with male and female gonopores and accessory copulatory pits, 24 = caudal sucker lateral, 25 = two somitees of the postclitellar region with annulation and papillae, dorsal (Nepal, Phewa Tal effluent, Pokhara)



Figs 26–30. *Barbronia weberi formosana*: 26 = habitus dorsal, 27 = lateral, 28 = clitellum ventral with male and female gonopores and accessory copulatory pits, 29 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 30 = one pair of stylets with stylet pockets (Japan, Honshu, tributary of Biwa lake, Otsu)

Barbronia weberi formosana (OKA, 1929)
(Figs 26–30)

Herpobdella formosana: OKA, 1929 – Proceedings of the Imperial Academy (of Japan), Vol V: 280–281, Fig. C, Tokyo.

Herpobdella formosana: OKA, 1930 – Proceedings of the Imperial Academy (of Japan), Vol VI: 279–281, Figs. A–D, Tokyo.

Barbronia weberi: OKA, 1935 – Proceedings of the Imperial Academy (of Japan), Vol XI: 240, Tokyo.

Barbronia weberi ssp. *formosana:* PAWLOWSKI, 1962 – Zeszyty Naukowe Uniwersytetu Lodzkiego Nauk Matematycno-Rrzyrodnicze, Seria II, zeszyt 12: 132, 136, Lodz.

Barbronia weberi formosana: SAWYER, – 1986 Leech Biology and Behaviour, Vol. II: 746, Oxford.

Material: Japan, Honshu, Littoral of Biwa-Ko (Uji-Gawa) near Otsu, 23. 10. 1994; stream (tributary of Lake Biwa) N of Otsu, 23. 10. 1994; Katsura Gawa in Arashiyama, 31. 10. 1994; all leg. K. POLANEC & H. NESEMANN.

The Japanese specimens (Figs 26–30) differ slightly from the Nepalese and Chinese *B. weberi*. The form of the body is generally shorter (length up to 33 mm) and thicker. The head region is larger compared with the body length and width. Six eyes in typical *Erpobdella*-like pattern. Living animals are unicoloured dark red to brownish and always darker than *B. weberi*. Therefore, these leeches are regarded to be a subspecies, as proposed by SAWYER (1986).

Odontobdella OKA, 1926

Odontobdella: OKA, 1926 – Annotationes Zoologicae Japonenses, Vol. X: 248, Figs. 8–10, 15.

Type species: *Scaptobdella blanchardi* OKA, 1910

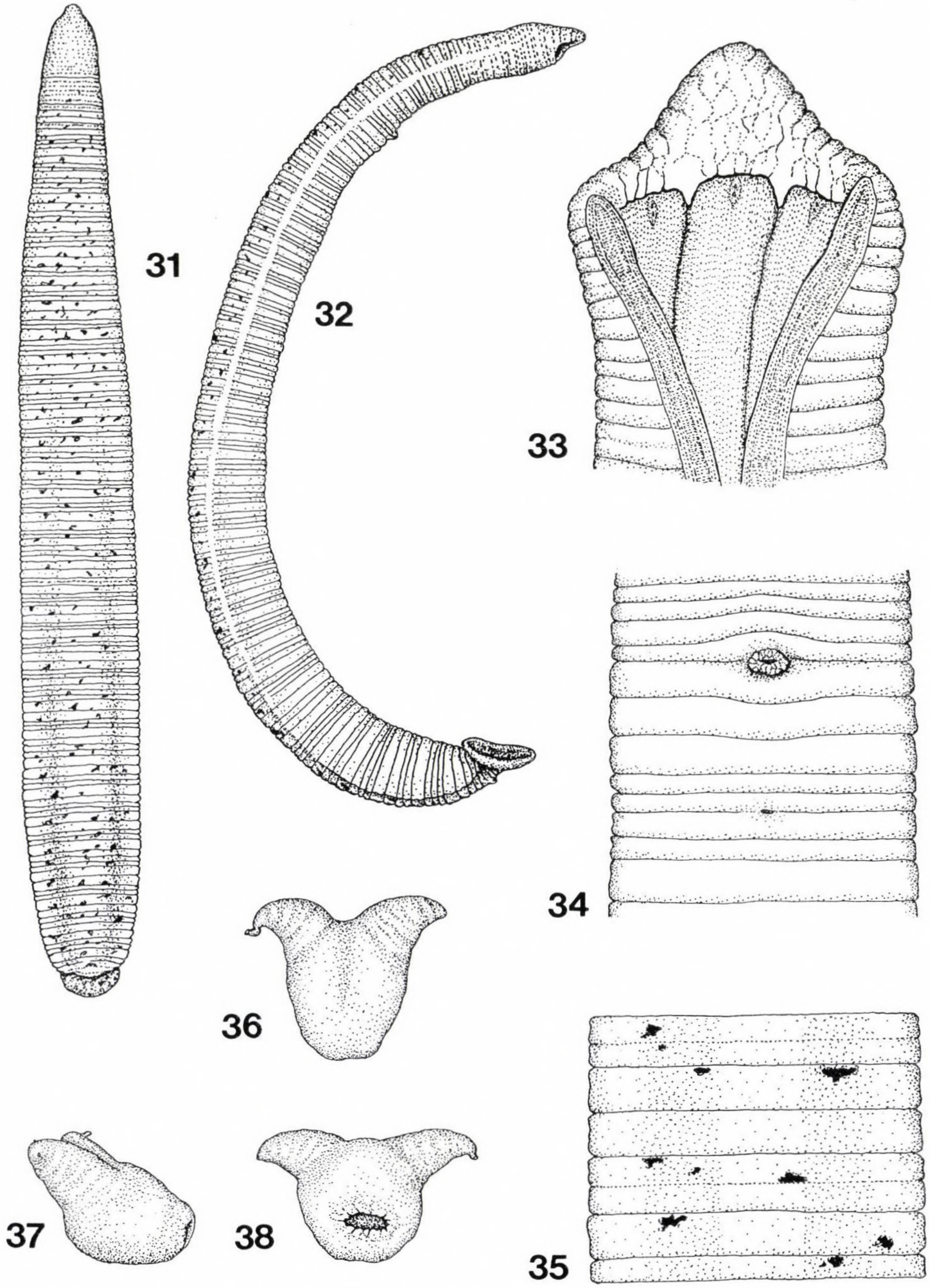
Description: Salifidae, six large pharyngeal stylets, arranged in symmetrical pairs, stylet pockets united in one row, somites of the postclitellar region heteronomiously annulated typically with seven/nine unequal annuli (five/seven narrow and three/two wide). Annulus b6 widened and heteronomiously subdivided into one large (c11) and one narrow (c12) ring.

Odontobdella blanchardi (OKA, 1910)
(Figs 31–38, 39–44, 60)

Scaptobdella blanchardi: OKA, 1910 – Annotationes Zoologicae Japonenses, Vol. VII: 179.

Odontobdella blanchardi: OKA, 1926 – Annotationes Zoologicae Japonenses, Vol. X: 248–251, Figs. 8–10, 15.

Odontobdella blanchardi: SAWYER, 1986 – Leech Biology and Behaviour, Vol. II: 696, Oxford.



Figs 31–38. *Odontobdella blanchardi*: 31 = habitus dorsal, 32 = lateral, 33 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 34 = male and female gonopores on somite XII, ventral, 35 = one somite of the postclitellar region with annulation and colour, dorsal, 36 = atrium dorsal, 37 = lateral, 38 = ventral (Japan, Honshu, Hozu Gawa)

Material: Japan, Honshu: Biwa-Ko (effluent), Uji Gawa near Otsu, 23. 10. 1994; stream (tributary of Lake Biwa) N of Otsu, 23. 10. 1994; Katsura Gawa in Arashiyama, 31. 10. 1994; Hozu Gawa (middle reach of Katsura Gawa) in the narrow valley near Hozukyo, 2. 11. 1994; stream (left tribatary of Hozu Gawa) near Hozukyo, 2. 11. 1994; all leg. K. POLANEC & H. NESEMANN.

Description (Figs 31–44): Medium-sized to very large leeches (according to SAWYER 1986) up to 280 mm in length. In the populations investigated here, adults reach a total body length of 80 mm (53 mm as preserved specimens). The anterior part of the body is cylindrical, the posterior part is dorsoventrally flattened and bears blunt lateral keels in the last third of the postclitellar region. Annulation formula of the mid-body somites: b1 (c1+c2), b2, a2, c9, c10, c11 (d22+d23), c12. Genitals pores separated by 4–5 annuli, depending on the ontogenetic annulation type. Male gonopore in the furrow XI/XII (XI c12/XIIb1), female is in XII c10/c11. In some specimens from Lake Biwa the female gonopore is not exactly located in the furrow but placed caudally next to the annulation furrow on XIIc11. Pharnynx with three large triangular pseudognaths. Three pairs of stylets shown in cranial direction. Atrium very large with horn-shaped cornua, which turn laterally. Colour of the living specimens is dark red brown or nearly black, the dorsal surface is always darker than the ventral. In preserved specimens, an irregulary spotted pattern is always visible. Sometimes leeches with uncoloured body were found in the littoral zone of Lake Biwa.

Ecology: The semiaquatic to aquatic leech *O. blanchardi* was found in the eulittoral of rivers and streams of Honshu, where it occurs in gravel and under stones outside of the water or near to the water line. In Lake Biwa, this species inhabits the shallow regions of the littoral, where it was found in aquatic habitats. *O. blanchardi* is the Japanese counterpart to the European semiaquatic *Trocheta* species, e.g. *T. pseudodina* NESEMANN, 1990, *T. cylindrica* ÖRLEY, 1886, and *T. riparia* NESEMANN, 1993.

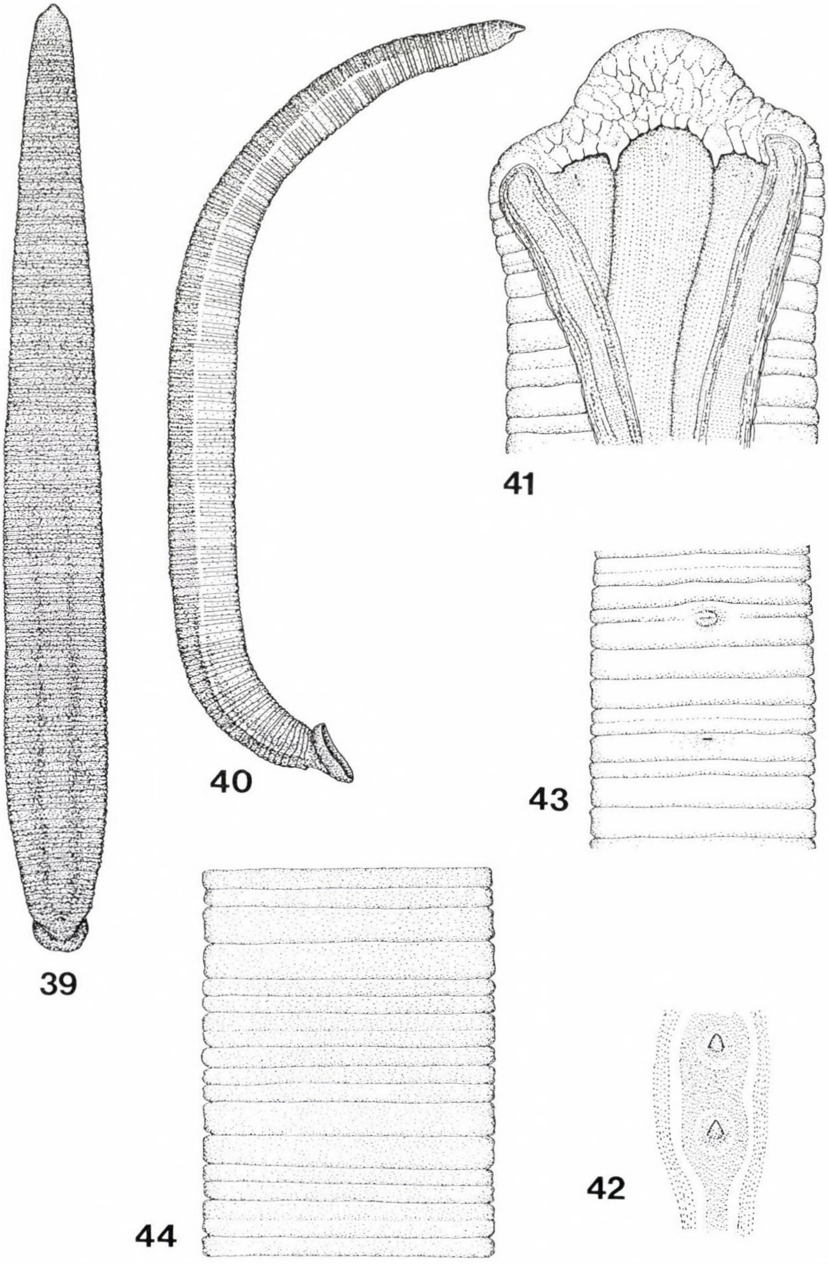
Odontobdella polaneci sp. n.
(Figs 45–51, 59)

Holotype: Japan, Shikoku: Shimanto River upstream of Nakamura. 26. 10. 1994, 22 mm body length, leg. K. POLANEC & H. NESEMANN; deposited in the Hungarian Natural History Museum, Budapest.

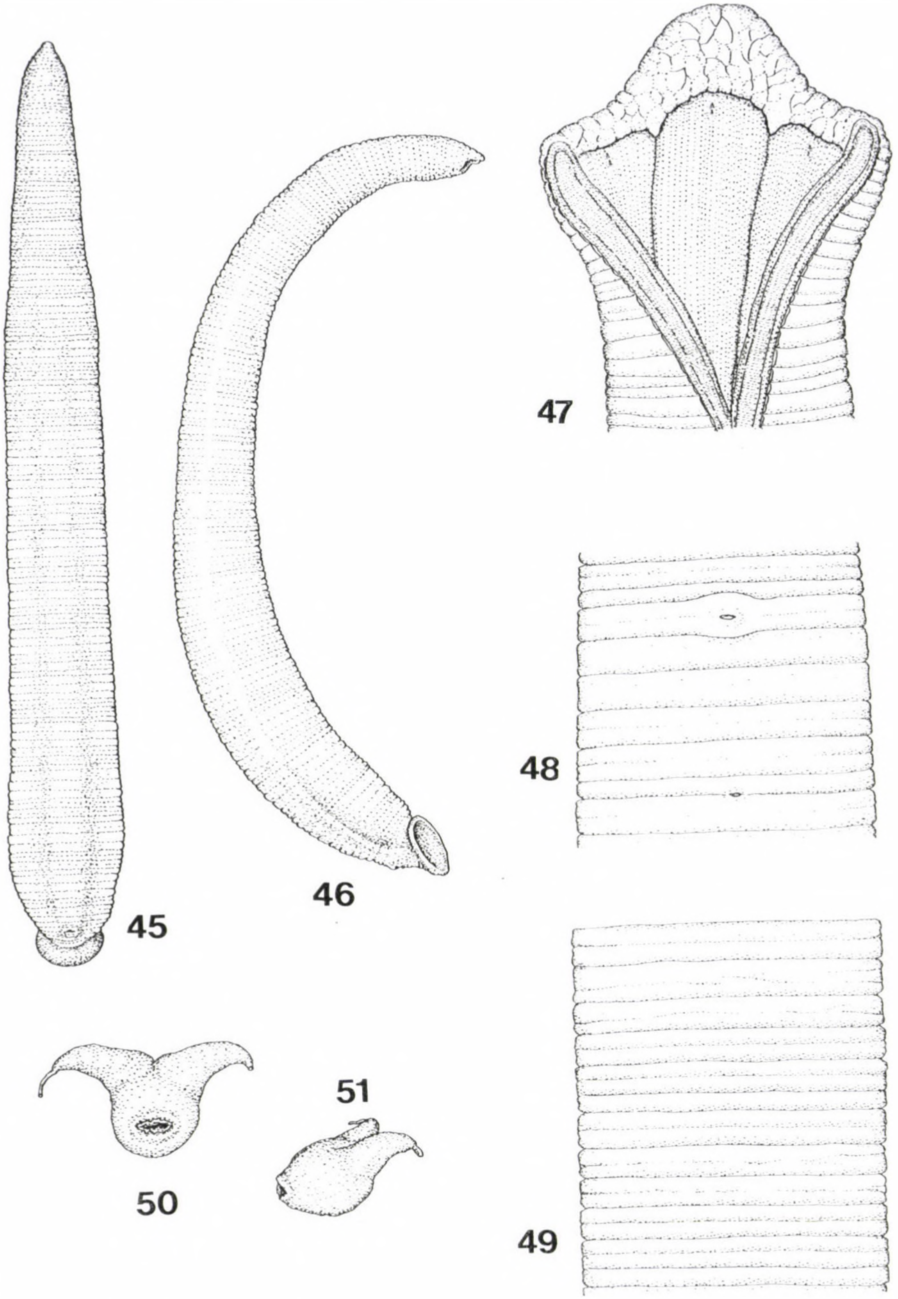
Paratypes: Japan, Shikoku: Niyodo Gawa (lower region) near to the bridge of the road nr. 56, 25. 10. 1994; Shimanto upstream of Nakamura, 26. 10. 1994; Ushiro Gawa upstream of Nakamura, 26. 10. 1994; Shimanto near the camping place 17 km upstream of Nakamura, 27. 10. 1994; Kuroso Gawa near Minshukusenba, 27. 10. 1994; Yoshino Gawa upstream of Ekawasaki, 28. 10. 1994; Shimanto 3 km upstream of Ekawasaki, 28. 10. 1994; Shimanto (narrow valley) 8 km upstream of Ekawasaki, 29. 10. 1994; all. leg. K. POLANEC & H. NESEMANN. Sixteen specimens from the same collection with 9–23 mm body length, five paratypes deposited in the Hungarian Natural History Museum, Budapest; five paratypes deposited in the Senckenberg Museum, Frankfurt, further material in the author's collection, Vienna.

Derivatio nominis: The species is named in honour to Dipl.–Ing. K. POLANEC, who found it for the first time in the upper region of the Shimanto River during his investigation of the benthic fauna.

Description (Figs 45–51): Small leeches up to 30–50 mm in length (36 mm as preserved specimens). The anterior part of the body is cylindrical, the posterior part is flattened dorsoventrally and bears blunt lateral keels in the last third of the postclitellar region. Annulation formula of the midbody somites: b1 (c1+c2), b2, a2, c9, c10, c11 (d22+d23), c12. Genital pores separated by 5,5–



Figs 39–44. *Odontobdella blanchardi*: 39 = habitus dorsal, 40 = lateral, 41 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 42 = one pair of stylets with stylet pockets, 43 = male and female gonopores on somite XII, ventral, 42 = two somites of the postclitellar region with annulation and colour, dorsal (Japan, Honshu, tributary of Biwa lake, Otsu)



Figs 45–51. *Odontobdella polaneci* sp. n.: 45 = habitus dorsal, 46 = lateral, 47 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 48 = male and female gonopores on somite XII, ventral, 49 = two somitees of the postclitellar region with annulation and colour, dorsal, 50 = atrium ventral, 51 = lateral (Japan, Shikoku, Shimanto river)

6 annuli, depending on the ontogenetic annulation type. Male gonopore on XII b1 (XII c1/c2), female's in the furrow XII/XIII (XII c12/XIII b1). Pharynx with three triangular pseudognaths. Three pairs of stylets shown in cranial direction. Atrium medium-sized with more slender cornua than in *O. blanchardi*. Colour of the living specimens is white to light grey. Large adults are light reddish sometimes pinkish. There is neither dark pigmentation nor pattern. Preserved specimens have white or pale grey colour.

Ecology: The aquatic or phreatic leech *O. polaneci* sp. n. was found in fast flowing parts of unpolluted rivers and streams of Shikoku. It prefers gravelly or stony bottomed riffles with higher flow velocity (0.9–1.2 m/s). The burrowing leeches were found in the substrate from 0.1–0.2 m depth.

O. polaneci sp. n. differs by its form, colour and microhabitat from *O. blanchardi*. The species can be easily distinguished from *O. blanchardi* by the position of the genital pores. *O. polaneci* is the Japanese vicariant of the European *Trocheta bykowskii* GEDROYC, 1913.

Sinobdella gen. n.
(Figs 52–58, 62)

Type species: *Sinobdella kinzelbachi* sp. n.

Description: Salifidae, six very large pharyngeal stylets, arranged in asymmetrical pairs, stylet pockets separated, somites of the postclitellar region heteronomiously annulated typically with nine unequal annuli (seven narrow and two wide).

Gender: feminine.

Derivatio nominis: The genus names indicates their occurrence in China.

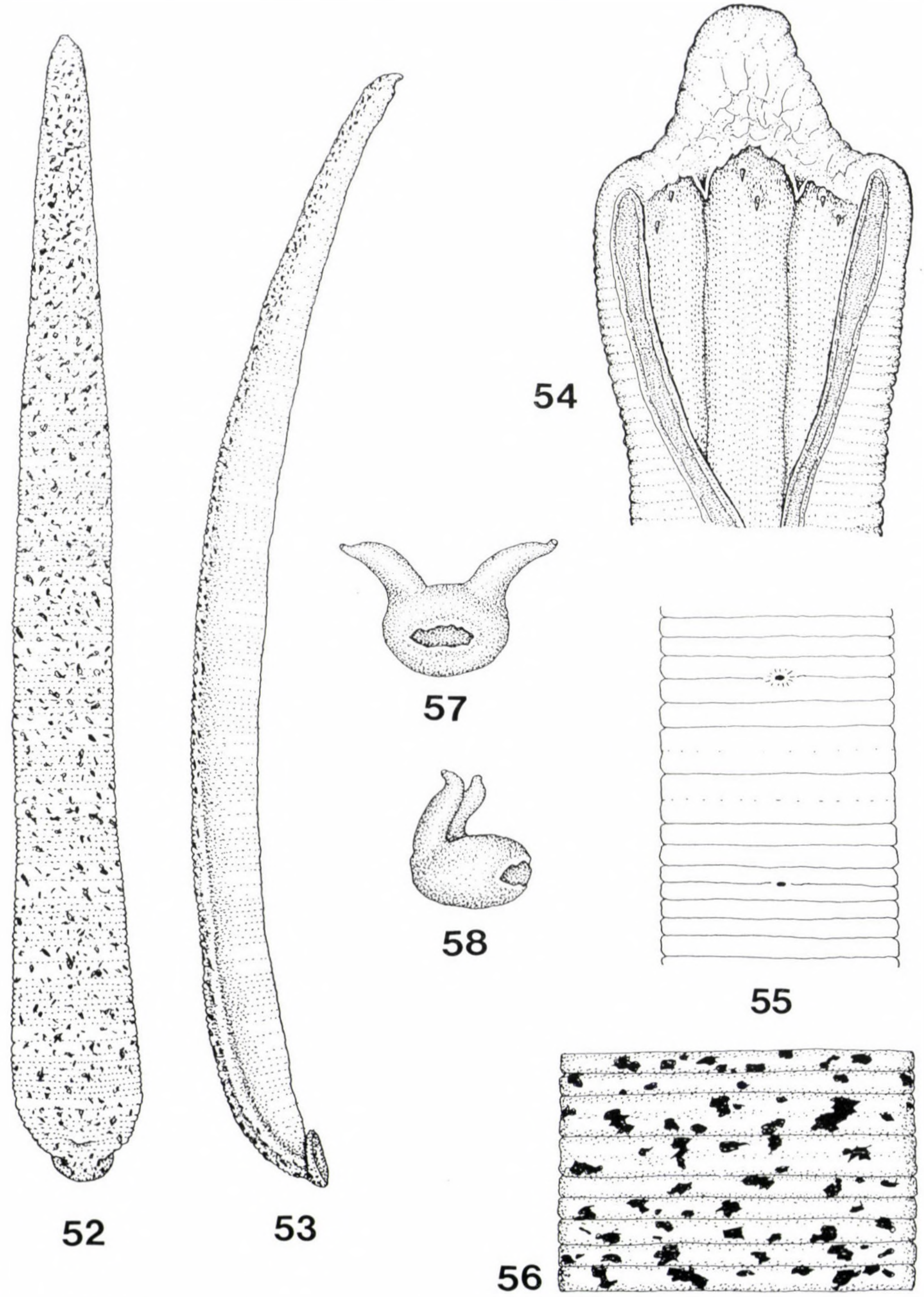
Sinobdella kinzelbachi sp. n.

Holotype: People's Republic of China, Wuhan, Wuhan part, Geological University campus, shore of Lake Dong Hu on the peninsula N of the campus. 3–7. 8. 1992, 44 mm body length, leg. R. & W. KINZELBACH. It is deposited in the Hungarian Natural History Museum, Budapest.

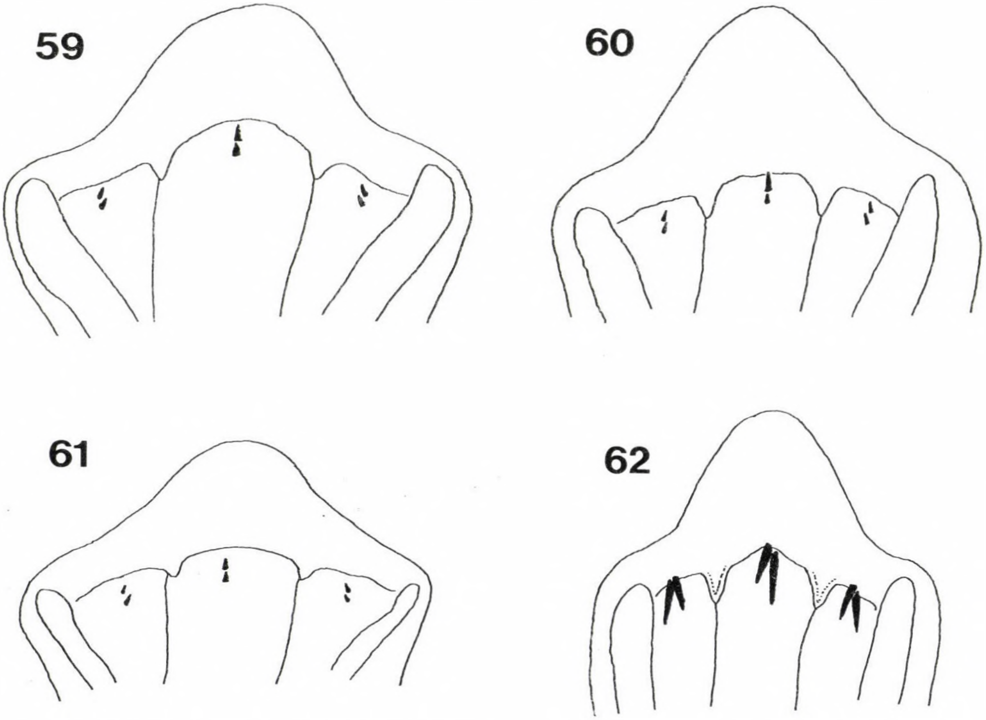
Paratypes: Five specimens, 28–45 mm body length, from the same collection, one paratype with sectioned pharynx deposited in the Hungarian Natural History Museum, Budapest; two paratypes with sectioned pharynx deposited in the Senckenberg Museum, Frankfurt, further material in the authors collection, Vienna.

Derivatio nominis: The species is named in honour to Prof. Dr. R. KINZELBACH, who took benthic samples in China.

Description (Figs 52–58): Medium-sized leeches up to 70 mm length (45 mm as preserved specimens). The anterior part of the body is cylindrical, the posterior part is dorsoventrally flattened and bears blunt lateral keels in the last third of the postclitellar region. Annulation formula of the mid-body somites: c1, c2, b2, a2, c9, c10, d22, d23, c12. Genital pores separated by 7 annuli. Male gonopore in the furrow XI/XII (XI c12/XIIc1), female is in XII d22/d23. Pharynx with three small leaf-shaped and concave pseudognaths. Three pairs of stylets shown in caudal direction. Colour of



Figs 52–58. *Sinobdella kinzelbachi* gen. n. et sp. n.: 52 = habitus dorsal, 53 = lateral, 54 = oral sucker with pharynx, stylets and pseudognaths, sectioned, ventral, 55 = male and female gonopores on somite XII, ventral, 56 = one somite of the postclitellar region with annulation and colour, dorsal, 57 = atrium dorsal, 58 = lateral (China, Dung Hu)



Figs 59–62. Position of pharyngeal stylets of Salifidae. They were made visible by a special decomposition. 59 = *Odontobdella polaneci* sp. n., 60 = *O. blanchardi*, 61 = *Barbronia weberi formosana*, 62 = *Sinobdella kinzelbachi* gen. et sp. n.

the living specimens dark red brown. Preserved specimens always with an irregulary spotted pattern.

Ecology: The aquatic leeches were collected from stony substrate of the littoral zone of Lake Dong Hu.

S. kinzelbachi sp. n. is extremely similar to *O. blanchardi* due to its superficial morphology and pigmentation pattern. It can be distinguished only by the position of the female gonopore. The pseudognaths and the position of the unusually enlarged stylets are unique within the family Salifidae. *S. kinzelbachi* sp. n. is the Chinese counterpart of the Japanese *O. blanchardi*. Both leech species occur in similar habitats (association of aquatic communities) in lakes.

Notes: Asiatic records of leeches of the genera *Odontobdella* and *Trocheta* in the literature (OKA 1922, MOORE 1924, OKA 1935, PAWLOWSKI 1973) are doubtful, because there is no information given about their pharynx (Figs 59–62). The genus *Odontobdella* is not monotypic as published by SAWYER (1986). The taxon *Trocheta quadrioculata*, described by OKA (1922: 530–534), is a member of the family Salifidae from Burma. It might belong either to the genus *Odontobdella* or to *Sinobdella*. Leeches named *Scaptobdella blanchardi* from China, published by Moore (1924: 371–372) may be members of *Sinobdella*.

* * *

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SEVEN NEW GENERA OF THE NEOTROPICAL LAUXANIIDAE (DIPTERA)

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Seven new genera of the Neotropical Lauxaniidae are described; all the type-species are also new and described here: *Bacilloflagellomera* gen. n. (type-species *B. pectinicornis* sp. n.), *Baliopteridion* gen. n. (type-species *B. brevitarsus* sp. n.), *Gibbolauxania* gen. n. (type-species *G. elegans* sp. n.), *Minilauxania* gen. n. (type-species *M. bulbifacies* sp. n.), *Paraphysoclypeus* gen. n. (type-species *P. nigropleura* sp. n.), *Pseudominettia* gen. n. (type-species *P. platypeza* sp. n.), *Tauridion* gen. n. (type-species *T. shewelli* sp. n.). With 37 original figures.

Key words: Lauxaniidae, new genera, taxonomy, morphology, Neotropical region

INTRODUCTION

The species of the family Lauxaniidae (Sapromyzidae) are among the least known groups of the Neotropical Diptera. Actually the last comprehensive work about them is HENDEL's (1925) paper. MALLOCH (1933) described one new genus and numerous new species from various parts of South America (not only from Patagonia and South Chile). BROADHEAD (1989) recorded three genera and 75 species (mostly new) from Panama.

Although such important works like STUCKENBERG's (1971) on the Old World genera where he overviewed also the Neotropical genera, SHEWELL's (1987) key for the Nearctic genera, MILLER's papers on the ecology of the North American lauxaniids and particularly his summary of the ecological data of all lauxaniids (MILLER 1977), all the catalogues of the other regions (e.g. PAPP 1984) are significant contributions to the knowledge of the World Lauxaniidae, this knowledge was left much unbalanced for the detriment of the Neotropical species.

A true turning point in the survey of the Neotropical Lauxaniidae was, when the junior author produced her PhD thesis on the Neotropical genera of Lauxaniidae. G. E. SHEWELL and she have prepared also the catalogue of the Neotropical taxa (published shortly). There are numerous other undescribed gen-

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era in the possession of the junior author, who will describe them in the near future. In this paper only those new genera are described which are represented in the collection of the Department of Zoology, HNHM, Budapest. Some of the new taxa had been labelled as "n." or "new" by Dr GUY E. SHEWELL when they were on loan to him.

Below all the label data of the types are given, i.e. in cases where only the locality is printed, the date and the collector's name are not on the label. We must notice that the type of *Paraphysoclypeus nigropleura* and several other specimens from Peru, etc. were freshly pinned after having been captured at the collection places but were labelled in the Department of Zoology, HNHM in the years of Dr. K. KERTÉSZ's curatorial since they bear labels printed here. Since KERTÉSZ's collection notes perished in fire in 1956, we cannot find any further details pertaining these circumstances.

The type specimens are deposited in three institutions: in the Museu de Zoologia, Universidade de Sao Paulo (MZSP), in the Diptera Collection of the Department of Zoology, Hungarian Natural History Museum, Budapest (HNHM); some paratypes are in the Zoological Institute, Lund University, Sweden.

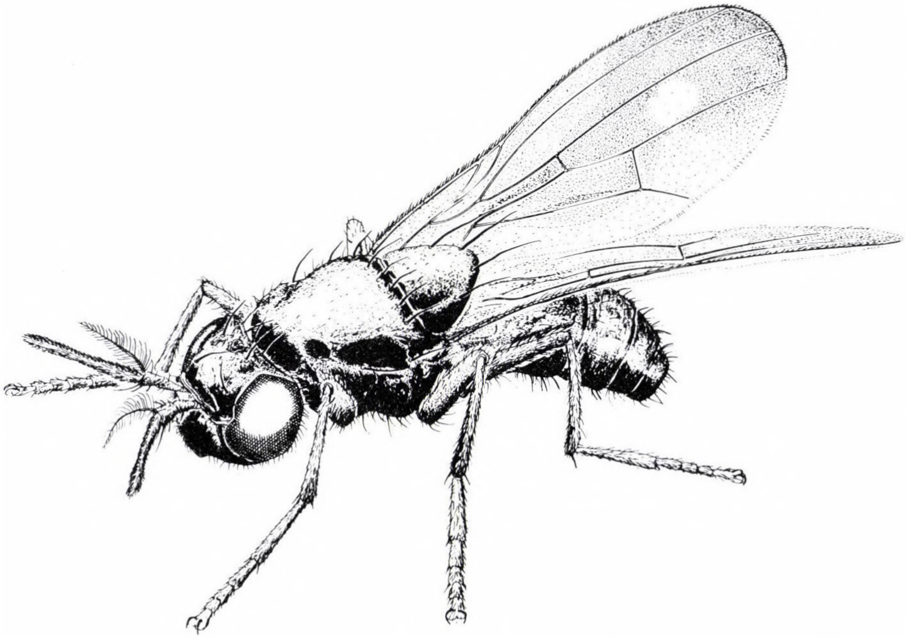


Fig. 1. *Bacilloflagellomera pectinicornis* sp. n., paratype male, habitus in subdorsal view

Bacilloflagellomera gen. nov.
(Fig. 1)

Medium-sized, slender bodied dark flies, with long antennae; body length 2.8 to 5.0 mm, wing length 2.9–4.5 mm.

Body blackish brown, legs brown with tibiae and tarsi yellow or whitish ventrally. Wings clouded chiefly in medial and apical parts.

Head: Frons rectangular, wider than long, with a spot on the anterolateral part. Face convex, smooth and shining; buccal margin wide; parafacials narrow. Eye bare oval, excised above the level of lunule, much narrowed ventrally.

Frontal chaetotaxy: 2 *ors* (anterior one 2/3 of posterior), anterior *ors* reclinate but apex inclinate, *vte* pair 2/3 *vti*, ocellars reduced to a thin hair or even indiscernible; postverticals convergent, crossing though somewhat reduced; 2 rows of genal bristles; supravibrissal (parafacial) hairs present up to the middle of face; a strong postocular row of bristles.

Antenna: scape longer than pedicel, ventrally with long setae; pedicel with a wreath of apical and subapical setae and with a strong dorsal seta; flagellomere slender, at least twelve times as long as its width at base, with rather long apical pubescence. Arista much shorter than flagellomere, white, plumose or rather pectinate though dorsal rays longer.

Thorax: Mesonotum not strongly arched anteriorly (as in *Asilostoma*), slightly convex, scutellum flat.

Thoracic chaetotaxy: 0–1 (reduced) pprn, 2 np, 1 weak prsut, 2 sa(spal), 1 pa, no ia, 0+2 dc, 1 prsc, 2 sc, 1 anepst, 1 strong kepst bristle pairs, caudal 2/3 of anepisternum setose. Acrostichals very short in 8 rows, intraalar microchaetae disordered, notopleural area bare.

Legs with dorsal preapicals on all tibiae but strong only on mid tibia, males without sex-brushes on mid and hind metatarsi, but with a short spur at distal end of hind tibia ventrally.

Wing sapromyziform, coloured (Fig. 1). Apex of subcostal vein arcuately upcurved; small black spines on costa diminishing in size and lost about halfway between apices of R2+3 and R4+5. Basal and anal cells small, latter with concave distal border, anal vein thick but very short, axial vein present as a thick vein shadow but almost reaching wing margin.

Abdominal tergites with medium long marginal bristles.

Type-species: *Bacilloflagellomera pectinicornis* sp. n.

Gender: feminine.

Derivatio nominis: named after its bacilliform first flagellomere.

Notes: This new genus is closely related to *Lauxaniella* MALLOCH, 1924 but the latter one is without wing pattern, nor with longer dorsal setae on flagellomere. In all species of *Lauxaniella* known to us, flagellomere is much shorter than in *Bacilloflagellomera and their anterior orbital seta reclinate. Male genitalia are much different (see below). The new genus is close also to Asilostoma* HENDEL, 1925 but in the latter one the face is narrower and prominently protruded, the arista is longer than flagellomere and the mesonotum is strongly arched anteriorly.

Bacilloflagellomera pectinicornis sp. n.
(Figs 1, 2–7)

Holotype male (HNHM): Peru, Vilcanota.

Paratype: 1 male (HNHM): Peru, Vilcanota – "Lauxaniella n.sp." Det. SHEWELL, 1978.

Body length: 4.37–4.60 mm, wing length: 4.08–4.50 mm, wing width 1.46–1.59 mm.

Thorax and abdomen dull grey. Anterior fronto-orbital pair reclinate but slightly inclinate. Length of scape, pedicel and flagellomere 0.24, 0.21 and 1.24(!) mm. Both scape and pedicel with long bristle-like setae. Arista only 0.76 mm long with rather long dorsal and ventral rays: some of the dorsal rays longer than 0.25 mm, its ventral rays shorter but as long as 0.14 mm. Fore tarsi white, legs otherwise yellowish, only femora dark basally and medially. Most of the wing darkened (brown) with a round lighter spot centrally in the r4+5 radial cell.

Male preabdomen with 6 segments as usual but no "protandrium" developed. Male genitalia symmetrical (Fig. 3). Ventral part of hypandrium with a short but wide lamellar projection (Fig. 5). Subepandrial sclerite (Figs 3–4) well developed with a pair of lateral and one medial caudal projections. Surstylus (Figs 2–4) wide and long, mediobasally with a medially directed, comparatively long process, its setae mainly medial. Phallapodeme rather long rod-like, phallus (Figs 6–7) with a pair of large lateral processes, ventrally open with numerous pointed teeth around ventral opening.

Female unknown.

There are possibly several undescribed species relegable to this new genus. For example in the collection of the HNHM there is a smaller undescribed species with darker fore tarsi ("pilicornis") from Suriname.

Baliopteridion gen. nov.
(Fig. 8)

A peculiar small flies, body length around 3.5 mm.

Body blackish brown, legs mainly brown. Frontofacial angle nearly 90°. Frontoorbital spots present. A shallow or deep transversal depression on the anterior part of frons. Eye strongly narrowed ventrally. Wing spotted, *rm* crossvein distally to middle of the wing and 2/3 of the length of *dm-cu*. 0+2–3 dorsocentral pairs. All tibiae with dorsal preapicals but weaker on fore tibia.

Head: Frons longer than wide with a shallow or strong transverse depression near to anterior margin; lateral velvety fronto-orbital spots present. Face short with narrow buccal margin, slightly convex in profile. Parafacial and cheek narrow. Eye large oval, higher than long, strongly narrowed ventraly. Scape almost the same length of pedicel. Flagellomere with medium long cilia, much thicker at base (0.147 mm) than distally to aristal base (0.115 mm), apex tapering, length of flagellomere 0.33 mm. Arista obviously of 2 segments, distal one extremely broadened (*not* thickened since this basal part flattened) in basal 1/3, arista densely plumose: longest dorsal rays 0.24 mm, while longest ventral rays only 0.12 mm (measured on *B. brevitarsus* paratype). Palpi extremely slender and as long as proboscis.

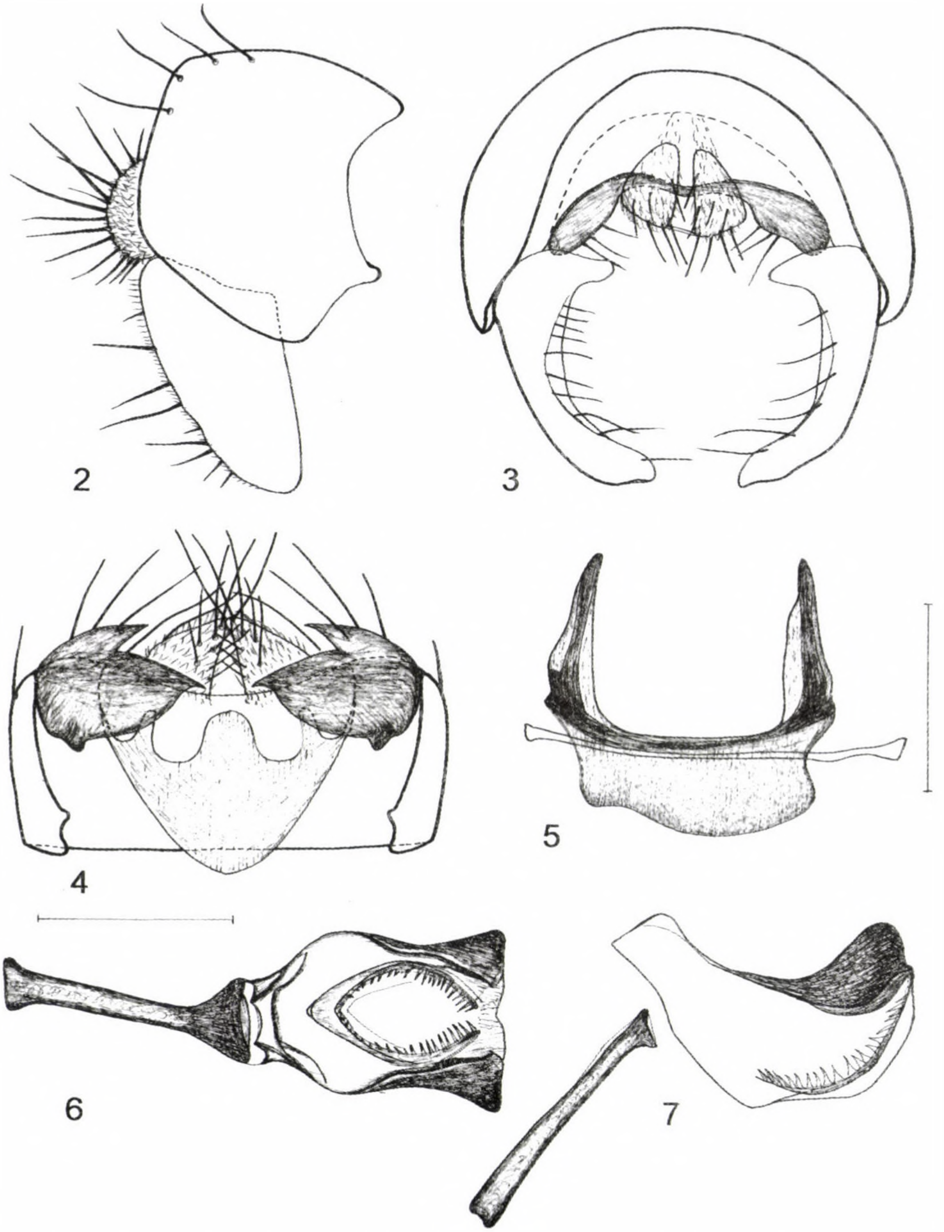
Frontal chaetotaxy: 2 *ors* reclinate, anterior pair of 2/3 length of posterior one, posterior pair placed slightly anteriorly to fore ocellus, both *vte* and *vti* present, *oc* thin and divergent; postocellar bristles of medium length but only slightly convergent; usually with a strong postocular row of bristles. One very weak row of parafacials, 1 genal bristle only.

Thorax greyish brown 2 medial vittae, all covered by greyish microtomentum. Mesonotum not strongly arched anteriorly, scutellum convex.

Thoracic chaetotaxy: 1 pprn, 2 npl, 1 short prst, 1 spal, 2 pal, 0 ia, 0+3 dc (anterior pair much shorter and far from suture), 1 prsc, 2 sc (apical divergent), 1 weak prepst, 1 anepst, 1 kepst bristle pairs. Anepimeron bare. Acrostichals medium long in 6 rows.

Legs brown but fore coxa and apices of all femora yellowish, fore tibia and fore 3 basal tarsomeres yellowish white. Fore and hind tibia laterally compressed. Dorsal preapicals on all tibiae, weaker on fore tibia. No male sexbrushes.

Wing (Fig. 8) brownish with numerous hyaline spots and with apex hyaline. Costa sapromyziform. R2+3, R4+5 and M sighly undulate. Both crossveins placed distally to middle of wing; *rm* 2/3 of the length of *dm-cu*, the latter curved. Anal vein short, axial vein well developed.



Figs 2–7. *Bacilloflagellomera pectinicornis* sp. n. paratype male, genitalia: 2 = epandrium, cercus and surstylus laterally, 3 = epandrium, cerci, surstyli and subepandrial sclerite (shaded) in caudal view, 4 = same, ventral view, 5 = hypadrium in ventral view, 6 = phallus and phallapodeme in ventral view, 7 = same, laterally. Scales: 0.2 mm for all

Abdomen shining black, finely greyish microtomentose.

Male terminalia: Epandrium small, no protandrium (Fig. 9), surstylus small, free, not fused with epandrium, cerci also small. Subepandrial sclerite distinct but short (Fig. 10). Hypandrium with a wide medial (cranial) projection (Fig. 13). Between basiphallus and hypandrium a flat, apically widely forked sclerotized structure (Fig. 13), which is best interpreted as sagittaly fused gonostyli. Phallus medium long with large ventral opening, whose leteral margin with some sharp small teeth and phallus in this cavity with a pair of lateral and 3 pairs of interior pointed sclerotized blades. Phallapodeme rod-like.

Type-species: *Baliopteridion brevitarsus* sp. n.

Gender: neutral.

Notes: This new genus could be placed near to *Xeniconeura* SHEWELL by the shape of the head and the general structure of male terminalia. However, it differs from *Xeniconeura* by its spotted wings with long *rm* crossvein and it has no extra crossveins.

Fig. 8. *Baliopteridion brevitarsus* sp. n., holotype, habitus in lateral view (supplementary figure showing the flagellomere of the paratype)

This peculiar new genus is described on a single species only but there are other undescribed species: the junior author has found seven specimens of another *Baliopteridion* with dark brown fore tibiae from Peru (in the material of the Lund University), which has a strong transversal depression in the frons unlike the type-species.

Baliopteridion brevitarsus sp. n.

(Figs 8, 9–13)

Holotype male (HNHM): "Iguapo, Peru" [handwritten].

Paratypes: 1 male (HNHM, glued with all its ventral part and legs to a card): Bras, Manaos, Molnár, 1930. – [on the reverse side] "1931. II. 20."; males (Lund Univ., MZSP, HNHM): Ecuador: Napo, Lumbaqui, 10–11. III. 1983, leg. H. Huggert.

Measurements of the holotype in mm: body length 3.62, wing length 3.58, wing width 1.55.

Frons anteriorly with a slight transverse depression only. Pedicel with 4 long apical bristles ventrally and 1 long dorsal seta. Flagellomere yellowish; arista with long dorsal and ventral rays as given above. Postocellars nearly parallel.

Fore tibiae white. Tarsomeres 2–5 on all tarsi strongly shortened: fore basitarsus as long as, mid and hind basitarsus longer than tarsomeres 2–5 combined. Claws much reduced, only 0.05–0.06 mm.

Small black spines on costa on a section of 3/5 distance between apices of R2+3 and R4+5.

Male terminalia: Dorsal bridge of the epandrium extremely short (Fig. 9), surstyli and cerci small, though the latter higher (Fig. 10). Phallus with a conspicuous medial apical process dorsally (Figs 9, 11), its sclerotized shield with the complicated structures (4 pairs of pointed blades, etc., Fig. 12) are probably the derivatives of gonopods.

Female unknown.

Gibbolauxania gen. nov.

(Fig. 14)

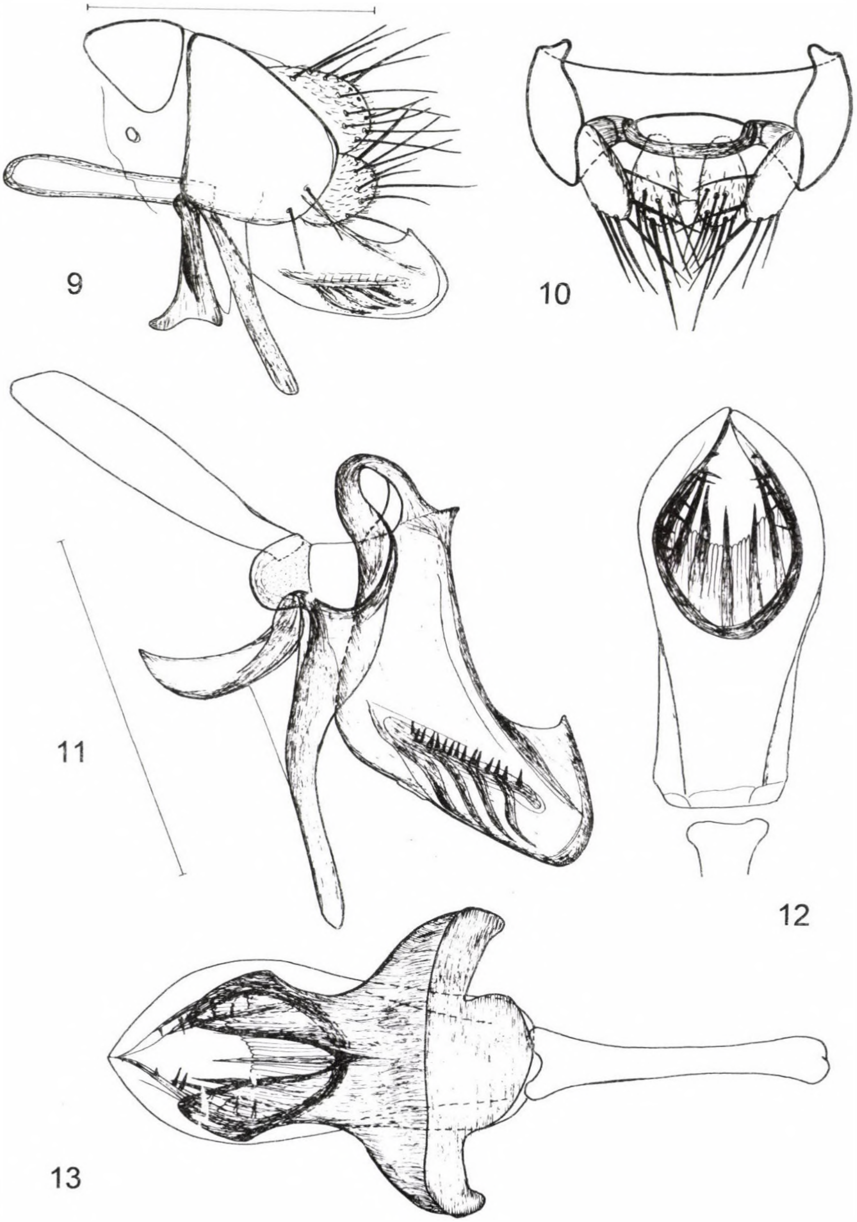
Small nice flies, body length about 3 mm.

Body rather slender, thorax and head yellowish brown to dark brown, abdomen shining dark brown, legs whitish yellow to yellow, wing hyaline. Large fronto-orbital spots present. Eye strongly narrowed ventrally. 0+2 dorsocentral pairs, presuturals and prescutellars reduced or absent.

Head: Upper occiput concave. Frons slightly wider than long, in profile slightly convex with anterior edge bulging over antennal bases; a pair of large black velvety spot anteriorly (Fig. 34), covering also base of anterior orbital bristle. Face shorter than frons, with narrow buccal margin, almost straight in profile. Parafacial and cheek normal. Eye strongly narrowed ventrally, about as long as high. Pedicel longer than scape, pedicel with long apical bristles ventrally; flagellomere long oval, apex tapered with long (up to 0.04 mm) pubescence (cilia). Arista densely plumose, dorsal basal rays longer; arista thickened in its basal sixth. Palpi very slender.

Frontal chaetotaxy: 2 *ors* reclinate, anterior pair with apex inclinate, in length 1/2 of posterior one, *vte* pair 2/3 of length of *vti*, no *oc* but microscopic hairs instead; postocellar bristles weak, short, convergent; usually with a strong postocular row of bristles. Tiny parafacials in 1 row, 2 rows of stronger genal bristles.

Thorax: Mesonotum strongly arched anteriorly, darker than pleura, scutellum flat. Pleura with greyish or yellowish tomentum.



Figs 9–13. *Baliopteridion brevitarsus* sp. n. paratype male, genitalia: 9 = postabdomen in lateral view, 10 = epandrium, cerci, surstyli and subepandrial sclerite (shaded) in ventral view, 11 = phallic complex with hypandrium, lateral view, 12 = phallus in ventral view, 13 = hypandrium with its cranial process, phallus and phallapodeme in ventral view. Scales: 0.2 mm for Figs 9–10 and for Figs 11–13, respectively

Thoracic chaetotaxy: 1 short pprn, 2 npl, 1 short prst, 1 spal, 2 pal, 0 ia, 0+2 dc (anterior pair closer to suture than posterior one to scutellum), 1 reduced prsc (or no prsc in some undescribed species), 2 sc (apical divergent), 1 very weak prepst, 1 anepst, 1 kepst bristle pairs. Anepimeron bare. Acrostichals minute in 6 less arranged rows.

Legs whitish yellow or yellow, dorsal preapicals on all tibiae (though hind one very weak). No male sexbrushes.

Wing (Fig. 14) hyaline or brownish hyaline. Costa sapromyziform, small black spines on costa on a section of 3/5 distance between apices of R2+3 and R4+5 . Anal vein very short, axial vein well developed.

Abdomen shining brown with yellowish microtomentum. Male pregenital tergite and epandrium yellow.

Epandrium rather small. Surstyli small simple and free, i.e. not fused with epandrium. Gonostyli rather long digitiform, apical half ventrally placed (Fig.). Aedeagus boat-shaped (open ventrally), phallapodeme small.

Type-species: *Gibbolauxania elegans* sp. n.

Gender: feminine (as *Lauxania*).

Notes: This genus is close to *Siphonophysa* HENDEL, having in common the face narrow and frons with large anterior lateral spots, pedicel with long apical hairs and arista plumose. It differs from *Siphonophysa* by the absence of any depression in the anterior part of frons, eye extremely narrowed ventrally, notum strongly arched anteriorly and by the presence of both short *prst and prsc* bristle pairs (no *prst* in *Siphonophysa* but *prsc* normal there). The male terminalia are

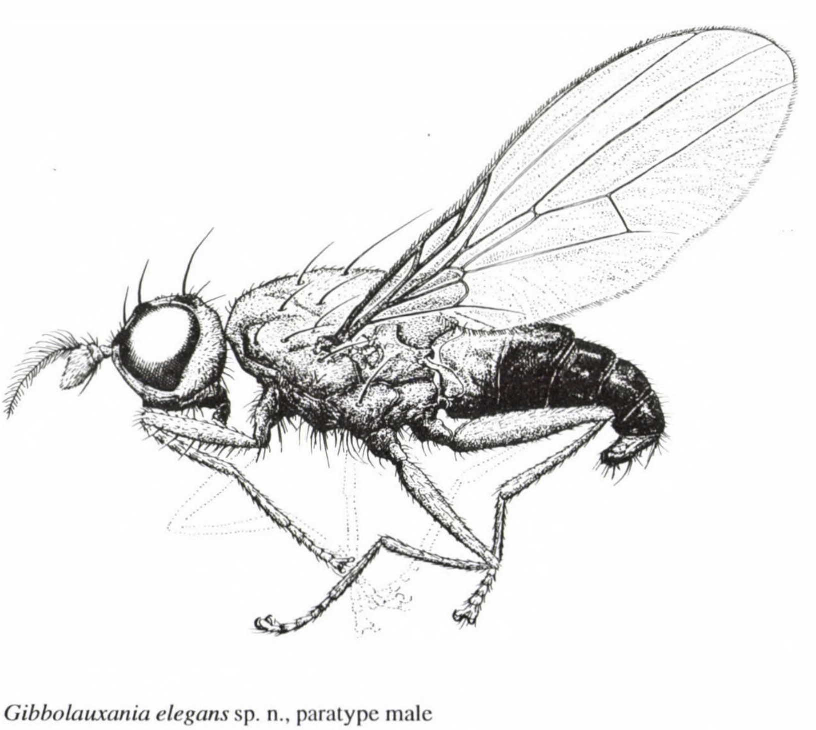


Fig. 14. *Gibbolauxania elegans* sp. n., paratype male

also distinctive: epandrium, surstylus and phallapodeme all small (they are very large in *Siphonophysa*), surstylus without a ventromedial tooth.

There is also another undescribed species of *Gibbolauxania* in the possession of the junior author.

Gibbolauxania elegans sp. n.

(Figs 14, 15–16)

Holotype male (HNHM): Peru, Vilcanota.

Paratypes: 1 male (HNHM): ibid., "N. genus" Det. SHEWELL, 1978) (much defected: left wing broken and lost, right wing together with mid legs and right hind leg glued on a label under the specimen); 1 male (MZSP): Brasil, Rio de Janeiro, Angra dos Reis, Jussaral.

Measurements in mm: body length 3.13 (holotype, not precisely measurable owing to downcurved abdomen), 2.83–3.08 (paratypes), wing length 3.00 (holotype), 2.83–3.00 (paratypes), wing width 1.15 (holotype), 1.09–1.17 (paratypes).

Upper occiput concave with a pair of large shining brown spots laterally, which cover partly also vertex.

Legs whitish yellow with apices of all femora brownish.

Wing (Fig. 14) hyaline but hind crossvein brown clouded.

Male pregenital tergite and epandrium yellow. Male preabdomen with 6 segments, sterna small and weakly sclerotized.

Male genitalia symmetrical, pregenital tergite smaller than in *Siphonophysa* species. Surstylus small with rounded apex without a ventromedial tooth but with long setae. Cerci small. Hypandrium rather broad. Gonostyli (Figs 15, 16) with long digitiform, ventrally placed apical half, the latter bears a short ventral setula. Aedeagus (Fig. 15) with short setulae (teeth) around opening and with 3 extremely long setiform processes in its cavity. Phallapodeme short thin, rod-like.

Female not known.

Minilauxania gen. nov.

(Fig. 17)

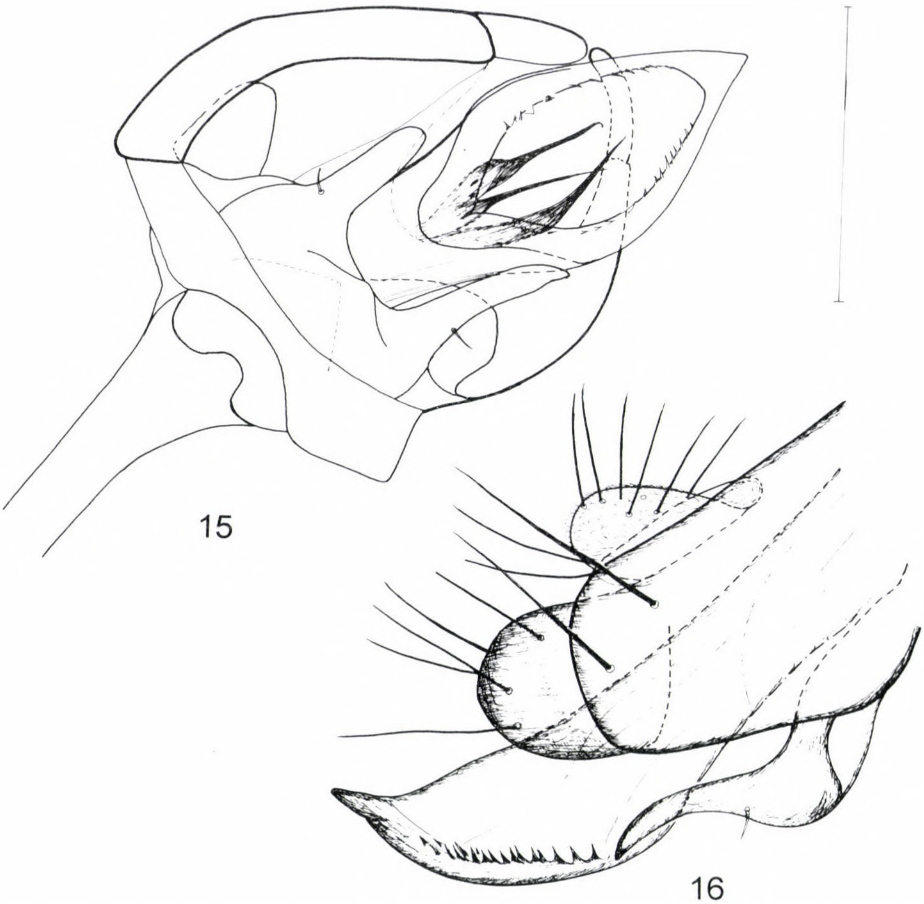
Very small flies, body length only 2 to 2.8 mm, so these are among the smallest lauxaniids.

Body black with flagellomere and most of the legs yellow. Wing light brownish hyaline. Frons convex. Face shining, narrow and strongly protruding. Outer verticals, prescutellars and presuturals may be absent. Posteroventral margin of eye strongly concave. Mesonotum arched anteriorly. 0+2 dorsocentrals. No prescutellars or presuturals.

Head: Frons wider than long, in profile convex with anterior part in the same plane as the face. Face shining, narrow and protruding. Parafacial and cheek narrow. Eye oval, higher than long, posteroventral border strongly concave. Pedicel longer than scape, flagellomere oval with rounded apex; arista plumose with longer dorsal rays.

Frontal chaetotaxy: 2 *ors* reclinate, anterior pair only 1/3 of posterior one and much thinner, *vte* absent, *vti* very long, *oc* very small and divergent. Parafacials weak but their row continued up to the dorsal 3/4 of face; genal bristles in 2 rows; one postocular row of sparse but medium long bristles.

Thorax: Mesonotum strongly arched anteriorly, scutellum slightly convex. Pleura with greyish microtomentum on anepisternum and on dorsal part of katepistenum. Thoracic chaetotaxy:



Figs 15–16. *Gibbolauxania elegans* sp. n., paratype male, genitalia: 15 = ventrally, 16 = laterally (dorsal part of epandrium omitted). Scale: 0.2 mm

1 pprn, 2 npl, 0–1 prst, 2 spal, 1 pal, 0 ia, 0+2 dc, 0–1 prsc, 2 sc, 1 weak prepst, 1 anepst, 1 kepst bristle pairs. Acrostichals in 2 rows, 3 irregular rows of intraalar microchaetae.

Legs brown or yellow with fore and mid coxae, apical half of fore femur dark brown. Fore tarsus elongated. Normal dorsal preapical on mid tibia only, dorsal preapical on fore tibia rather weak and not discernible on hind tibia. No male sexbrushes.

Wing (Fig. 17). Small black spines on costa on 2/5 to 1/2 section of distance between apices of R2+3 and R4+5. Basal and anal cells extremely small, latter with strongly concave distal border, anal vein very short, axial vein not developed.

Abdomen shining black or brown with yellowish tomentum.

Male genitalia (Figs 18–21) small, symmetrical. Surstyli completely fused with epandrium, hypandrium with a ventral pair of very long digitiform processes, gonostyli small, aedeagus of a very intricate form (see more below).

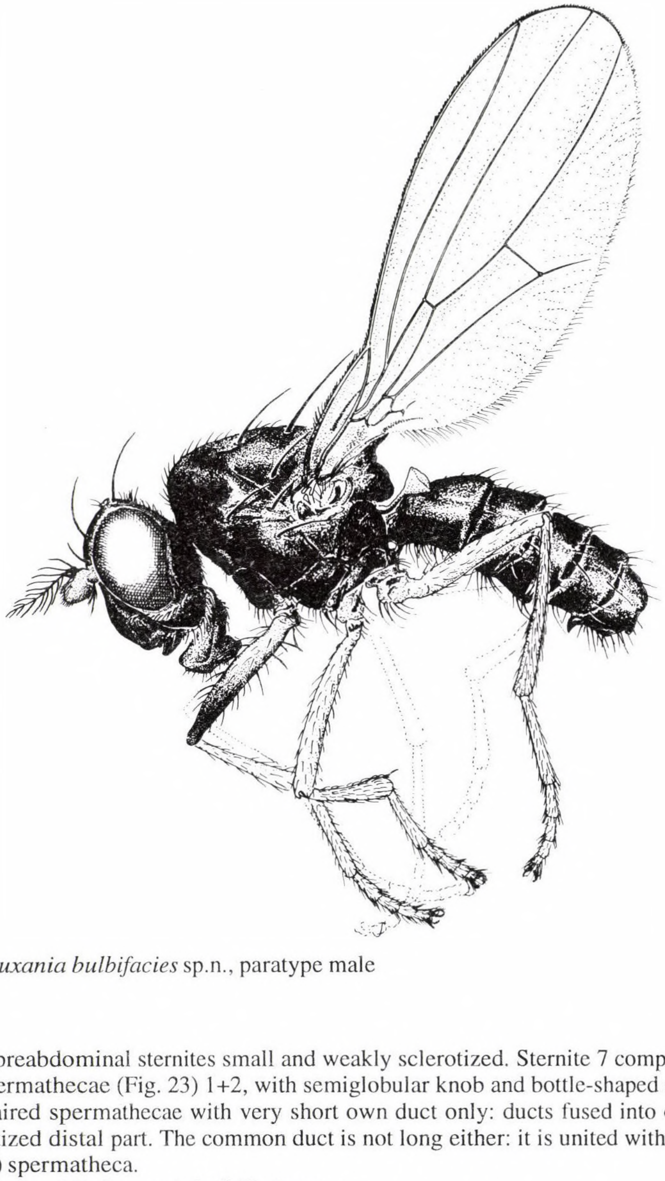


Fig. 17. *Minilauxania bulbifacies* sp.n., paratype male

Female preabdominal sternites small and weakly sclerotized. Sternite 7 comparatively large. Cerci short. Spermathecae (Fig. 23) 1+2, with semiglobular knob and bottle-shaped sclerotized distal part. The paired spermathecae with very short own duct only: ducts fused into one shortly behind the sclerotized distal part. The common duct is not long either: it is united with the duct of the third (unpaired) spermatheca.

Type-species: *Minilauxania bulbifacies* sp. n.

Gender: feminine (like *Lauxania*).

Notes: *Minilauxania* is the smallest among the related genera. The male genital structures define its generic status: its phallus with numerous ventral and some dorsal apical teeth, its hypandrium with its ventral pair of very long digitiform processes, etc. make its unique status clear among its related genera.

The junior author has found other two undescribed species relegable to this new genus. The characterisation of the genus was made being aware of their features.

Minilauxania bulbifacies sp. n.

(Figs 17, 18–23)

Holotype male (HNHM): Costa Rica, Suiza de Turrialba (pinned on a cactus spine). Paratypes: 8 males, 4 females (HNHM, 1 male and 1 female in UNESP): same (but on the reverse side of the label: "1921. IV. 17." or "1921. V. 1./2./5/8./18." [handwritten]

Measurements in mm: body length 2.04 (holotype), 2.05–2.31 (paratypes), wing length 2.39 (holotype), 2.58–2.82 (paratypes), wing width 0.85 (holotype), 0.91–1.00 (paratypes).

Face shining, buccal margin narrow and strongly protruding with a deep transverse depression near the base of antennae. Outer vertical bristles absent.

Prst and prsc bristles absent.

Legs yellow with fore and mid coxae, apical half of fore femur dark brown, fore tibia and tarsi white.

Wings light brown, veins darker brown. Subcostal vein only slightly (i.e. not arcuately) curved apically, costal vein curved at the conjointment with *Sc.*

Abdomen slender. Abdominal terga with grey microtomentum dorsally.

Male preabdomen with 6 segments, terga with medium long marginal bristles. Sterna rather narrow. Pregenital tergum small and symmetrical.

Male genitalia (Figs 18–21) small, symmetrical. Surstyli rather long, completely fused with epandrium, with very long setae. Hypandrium with a ventral pair of very long digitiform processes, which reach apical 4/5 of aedeagus. Gonostyli small, without any bristle. Aedeagus strongly narrowed caudally with a blunt apex, ventrally with numerous long thick and curved (and mostly pointed) spines but apically also with dorsal spines (Fig. 18). Not only a short phallapodeme but also a small ejaculatory apodeme present. Subanal plate comparatively large.

Female tergite 7 large (Fig. 22), tergite 8 small with 3 pairs of bristles only. Sternites 7 and 8 form an interesting embracing structure. Spermathecae as above.

Paraphysoclypeus gen. nov.

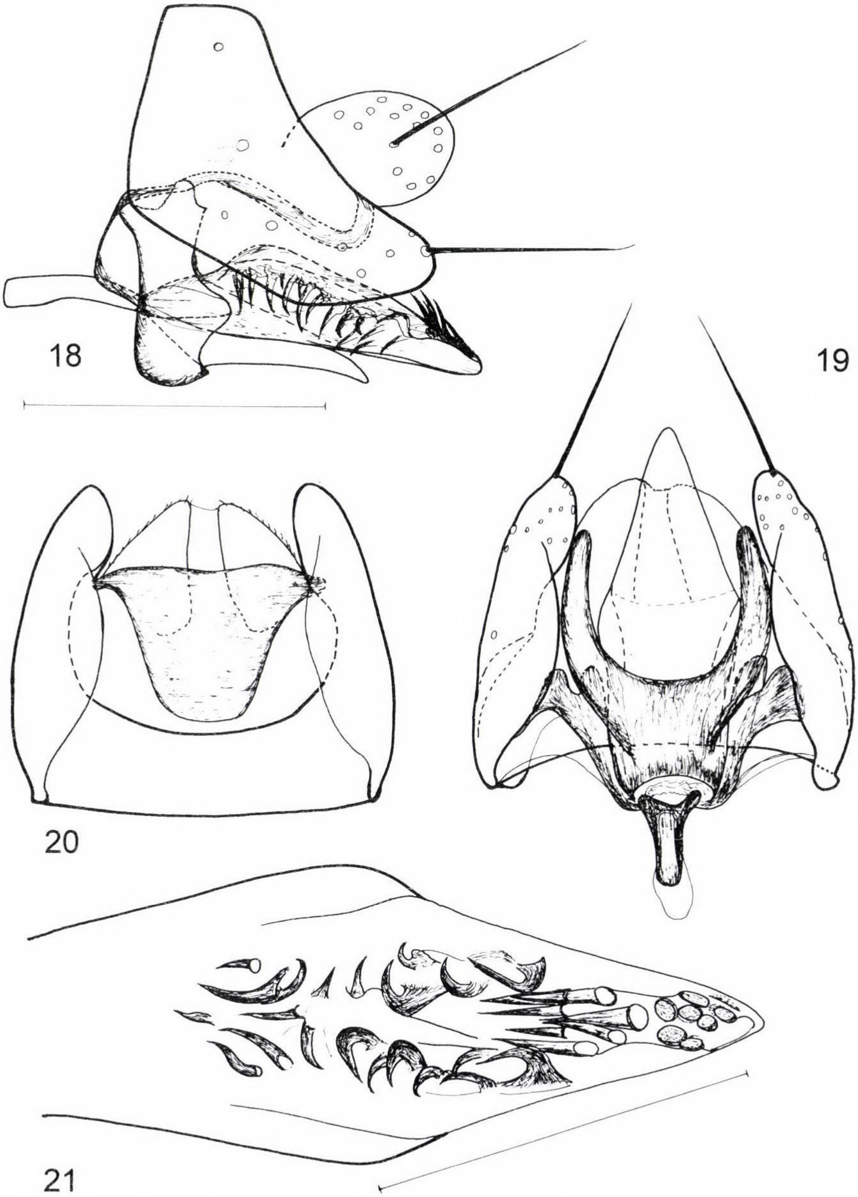
(Fig. 24)

Small flies, body length about 3.0 mm.

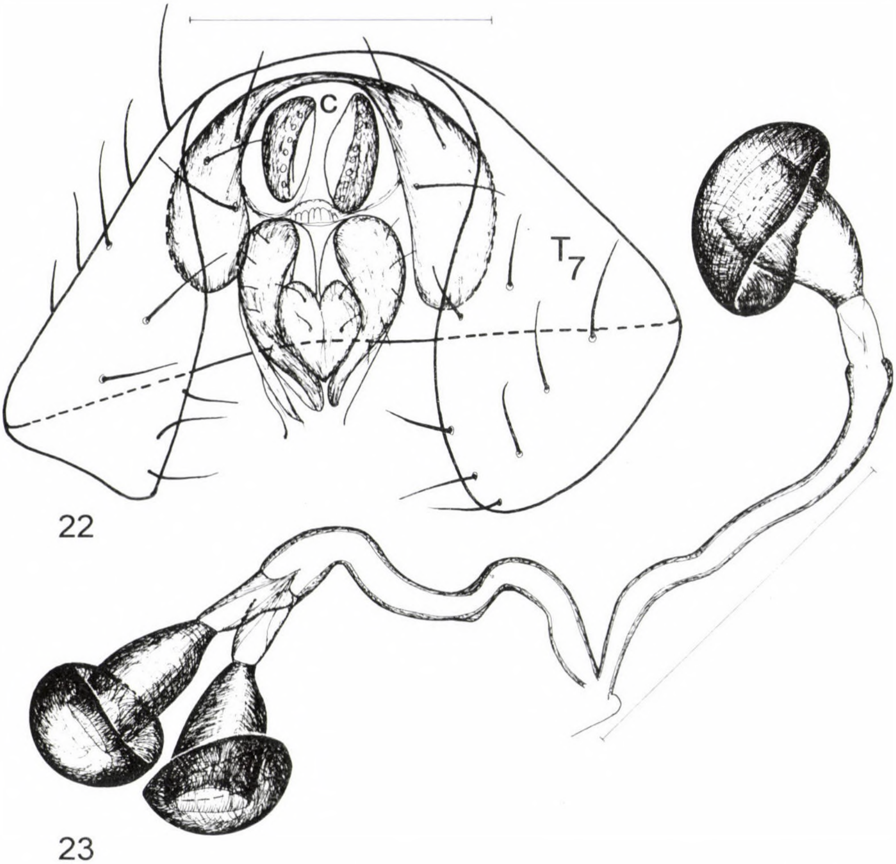
Body shining, head brownish yellow, mesonotum darker; pleura and legs blackish brown; abdomen black; wing brownish hyaline. Face extremely high and bulging (Fig. 35); mesonotum strongly arched anteriorly; 0+2 dorsocentrals; fore and mid tibiae with strong dorsal preapicals but there is only a weak hair instead of dorsal seta on hind tibia.

Head: Frons wider than long (Fig. 35), slightly convex in profile but anterior part almost in the plane of face. Face with widened buccal margin, extremely high and bulging. Parafacials and cheeks narrow. Eye higher than long, posterior edge concave. Antennae with pedicel longer than scape; flagellomere long oval, apex rounded. Arista with cilia not longer than 0.038 mm.

Frontal chaetotaxy: 2 reclinate *ors*, but apex of anterior *ors* slighly inclinate and of 2/3 length of the posterior one, *oc* very short and divergent, *vte* of a 2/3 length of *vti*, *poc* cruciate; 1 row of postocular bristles but occiput with some hairs. Tiny parafacials and 2 rows of comparatively weak genal bristles.



Figs 18–21. *Minilauxania bulbifacies* sp.n., paratype male, genitalia: 18 = epandrium and genitalia in lateral view (most of the long setae omitted), 19 = same, ventral view, 20 = subepandrial sclerite, 21 = phallus in ventral view. Scales: 0.1 mm for Fig. 21, 0.2 mm for Figs 18–20



Figs 22–23. *Minilauxania bulbifacies* sp.n., paratype female, 22= female postabdomen in ventral view, 23 = spermathecae (T7: tergite 7, c: cercus). Scales: 0.1 mm for Fig. 23, 0.2 mm for Fig. 22

Thorax: Mesonotum strongly arched anteriorlly, scutellum slightly convex. Thoracic chaetotaxy: 1 *pprn*, 2 *n*p, 1 *prst*, 1 long *sal*, 2 *pal*, no *ia*, 0+2 *dc* (anterior one very far from suture, posterior *dc* very long), 0 *prsc*, 2 *sc* (apicals divergent), 1 *prepst*, 1 *anepst*, 1 *kepst* bristle pairs; anepimeron bare. Acrostichals not enlarged in 6 well-ordered rows, ca. 5 rows rows of intraalar microchaetae.

Legs simple (see more below).

Wings (Fig. 24) narrow with sapromyziform costa. Basal and anal cells very small, latter with strongly concave distal border, anal vein rather short, axial vein well developed.

Abdomen oval, tergites smooth and shining.

Type-species: *Paraphysoclypeus nigropleura* sp. n.

Gender: masculine.

Notes: This new genus is close to *Physoclypeus* HENDEL, 1908. The distinctive characters are summarized in a short key:

1(2) A pair of strong *prsc*. 0–1 presutural *dc*, anterior postsutural one close to suture. Strong and long dorsal preapical seta on hind tibia. Face less high *Physoclypeus* HENDEL

2(1) No *prsc* bristles. No presutural *dc*, anterior postsutural one far caudally from suture. A weak hair instead of dorsal preapical seta on hind tibia. Face extremely high and bulging *Paraphysoclypeus* gen. n.

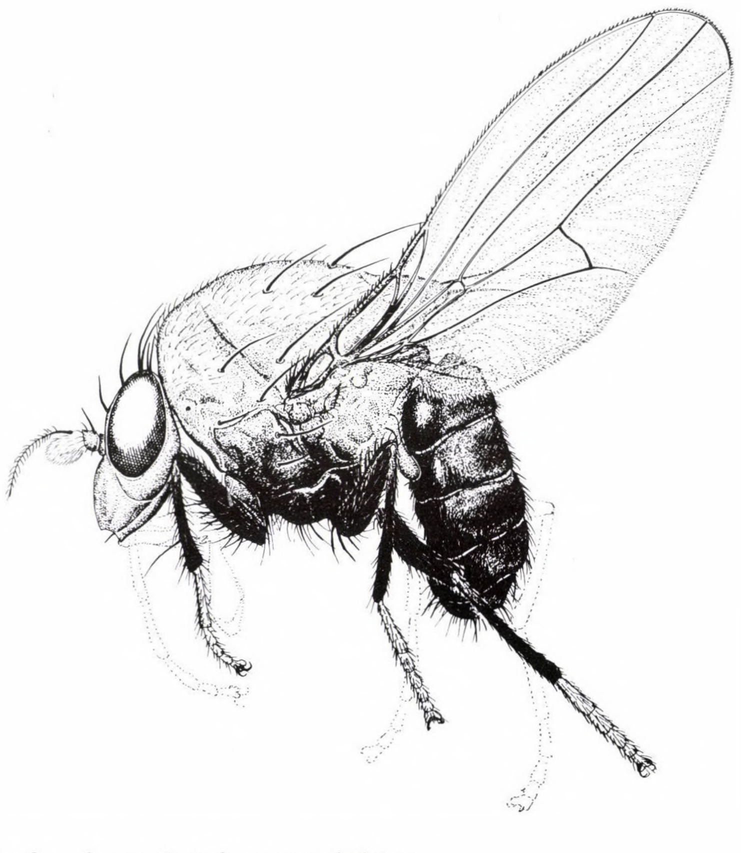


Fig. 24. *Paraphysoclypeus nigropleura* sp. n., holotype

Paraphysoclypeus nigropleura sp. n.
(Figs 24, 35)

Holotype female: Peru, Callanga (HNHM).

Body length: 2.96 mm (not precisely measurable owing to the downcurved abdomen).

Most of the intraalar and the whole supraalar areas are free of microchaetae.

Wing length 3.17 mm, wing width 1.12 mm. A dark diffuse spot around the apex of subcostal vein; small black spines on costa on 3/5 of the distance between apices of R2+3 and R4+5.

Male not known.

Female's seventh tergum comparatively large. Cerci short with short stiff hairs.

Etymology. This new species is named after it black thoracic pleura (noun), cf. MALLOCH (1933): 360.

Pseudominettia gen. nov.
(Fig. 25)

Dark medium-sized robust flies, body length 5.86–6.41 mm.

Body dark reddish brown with yellowish wings. Arista plumose. Dorsocentrals arranged in 0+3 pairs, a small intraalar present. Fore and hind tibiae and tarsi laterally compressed. All tibiae with dorsal preapicals.

Head: Frons sightly longer than wide, in profile convex with a shallow transverse depression close to antennal bases. Face straight in profile, slighty convex with deeper depression close to base of antennae. Parafacial and cheek not narrow. Eye big oval, higher than long, strongly narroved ventrally. Pedicel longer than scape and with long apical setae; flagellomere elongated, 2.5 times as long as broad with round apex and with long dorsal pubescence, arista short plumose.

Frontal chaetotaxy: 2 *ors* reclinate, anterior pair 2/3 length of posterior, verticals very long, *vte* 2/3 length of *vti*, *oc* short and divergent; postocellar bristles long and convergent; a strong postocular row of bristles but all occiput with short setae. Parafacials with 1 row of very short hairs, 2 rows of genal bristles.

Thorax: Mesonotum arched, scutellum slightly convex with an apical longitudinal sulcus. Thoracic chaetotaxy: 1 pprn, 2 npl, 1 prst, 1 spal, 2 pal, 1 short ia, 0+3 dc, 1 very long prsc, 2 sc (apical divergent), 1 prepst, 1 anepst, 2 kepst (anterior one 1/2 of posterior) bristle pairs. Anepimeron bare. Acrostichals not enlarged in 10 rows, dense intraalar microchaetae but prescutellar, postalar, supraalar areas are free of microchaetae.

Legs: fore and hind tibiae and tarsi laterally compressed. All tibiae with dorsal preapicals. No male sexbrushes.

Wing (Fig. 25) yellowish hyaline. Costa sapromyziform: small black spines on a 1/2 section of the distance between apices of R2+3 and R4+5. Veins without bristles. Basal and anal cells comparatively small; anal vein medium long and very thick; axial vein well developed. Veins R4+5 and M converging towards apex.

Abdomen rather short, oval, terga dorsally with greyish tomentum.

Male genitalia (Figs 26–31) characterized by a long, apically forked and cranially directed procTs of hypandrium. Surstyli fused with epandrium, gonostyli very short, aedeagus navicular, cavity with extremely long flat processes. A small but well sclerotized ejaculatory apodeme also present.

Type-species: *Pseudominettia platypeza* sp. n.

Gender: feminine (as *Minettia*).

Notes: This new genus is superficially resembling the large genus *Minettia*, particularly so for their intraalar bristle. However, the male genitalia of this new genus are so unique that we do not think it would be related to *Minettia.*

Pseudominettia platypeza sp. n.
(Figs 25, 26–31)

Holotype male (HNHM): Theresopolis, Brasil – "Genus? (sp. nr Laux. argyrostoma Wd." Det. SHEWELL, 1978.

Paratypes: 1 male (HNHM): same (left wing broken, flagellomeres and some tarsomeres lost); 1 male (MZSP): Brasil, Rio de Janeiro, Itatiaia, 800 m – "Genus? n.sp. nr argyrostoma WD" Det. SHEWELL, 1963.

Measurements in mm: body length 5.86 (holotype), 6.41 (paratype), wing length 5.93 and 6.62, wing width 2.29 and 2.58.

Head bristles very long and thick, e.g. *vti* 1.10 mm from base to tip. Notal microchaetae dense, 10 rows of acrostichals, etc.; almost all anepisternum covered with setae.

Hind tibia with a short but thick ventral spur. Hind basitarsus longer than other tarsomeres combined, extremely compressed laterally with ca 18 transverse combs of smal stiff black setulae.

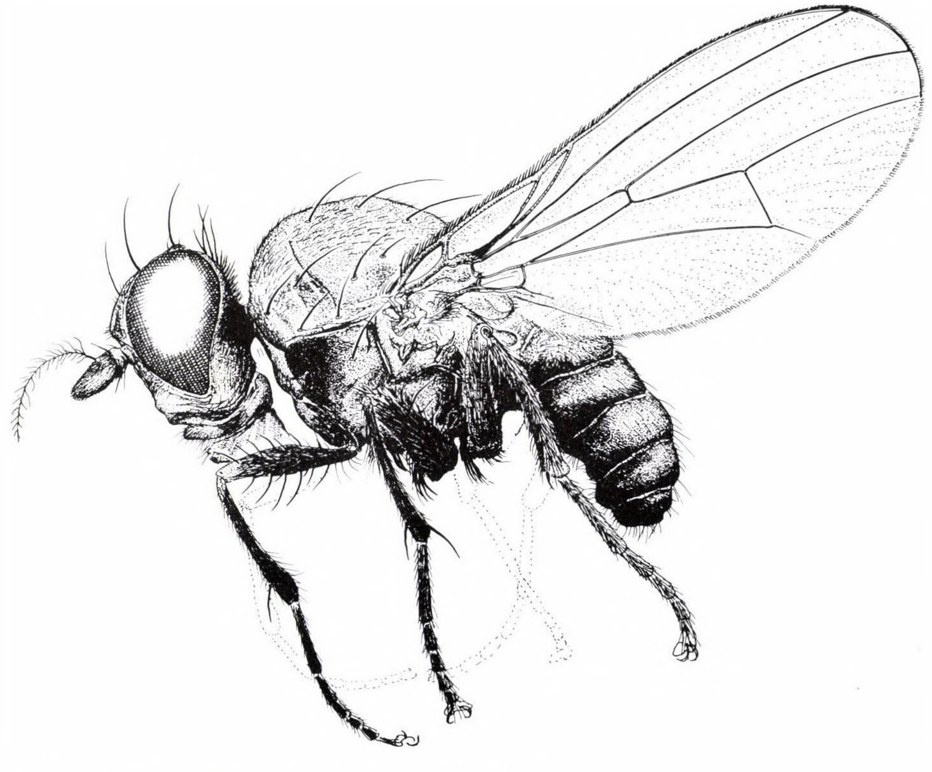
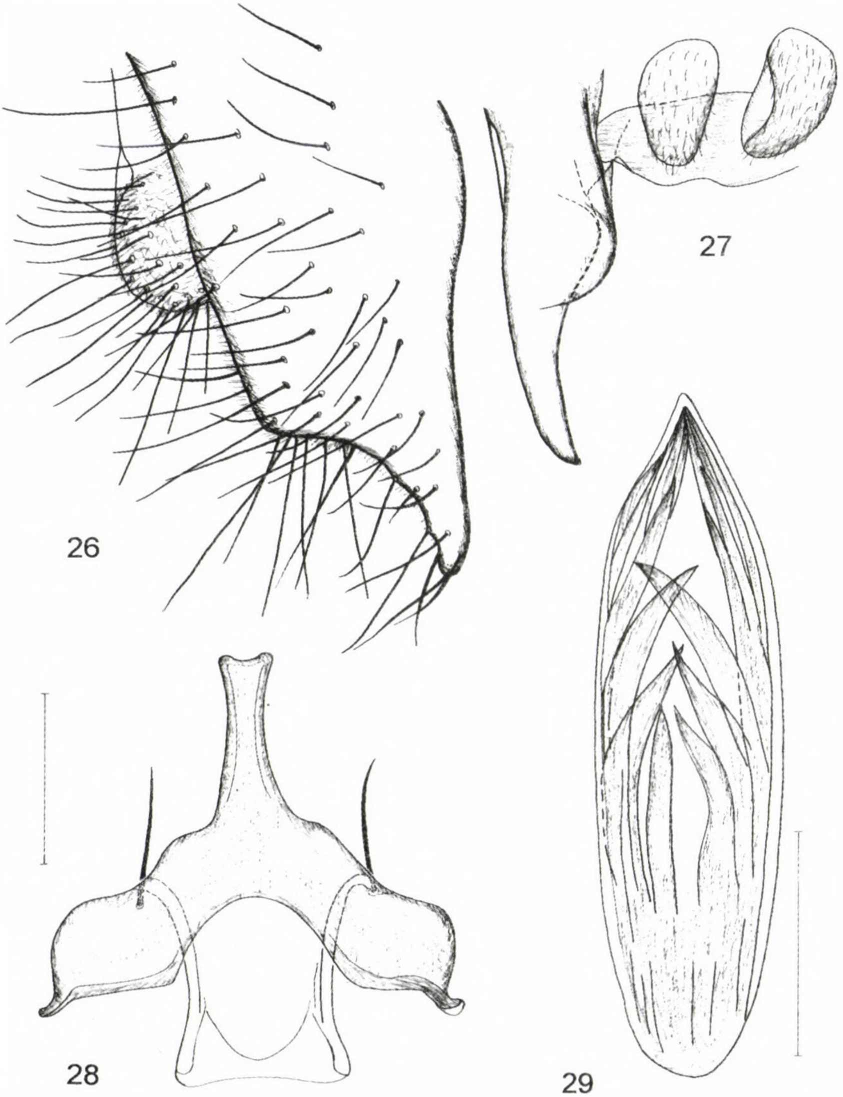


Fig. 25. *Pseudominettia platypeza* sp. n., paratype male

Wing yellowish (brownish) hyaline, veins light brown, anterior margin between apex of R1 and R4+5 brownish. Subcostal vein arcuately bent up to costa. Axial vein very long, almost reaching wing margin.

Abdomen comparatively short. Male preabdomen with 6 robust segments, pregenital tergite symmetrical as well as the whole genitalia. Male sternites wide, rather large and well sclerotized. Pregenital sternite not modified.

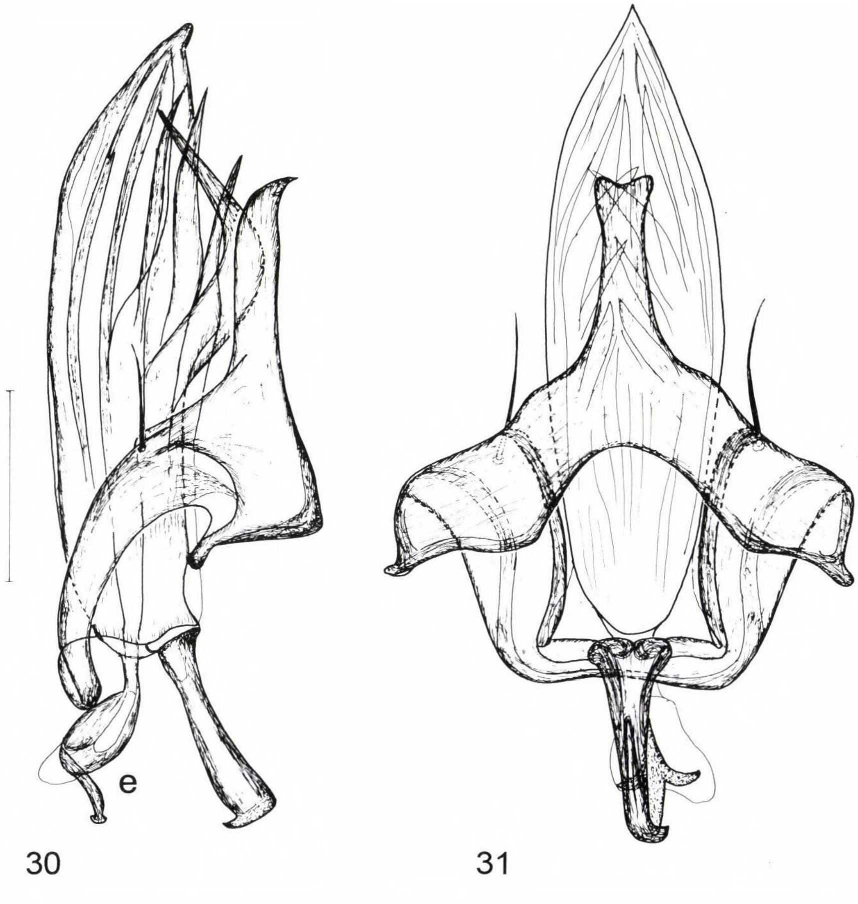


Figs 26–29. *Pseudominettia platypeza* sp. n., paratype male, genitalia: 26 = right surstylus and cercus in lateral view, 27 = left surstylus, cerci and subepandrial sclerite in caudal view, 28 = hypandrium in ventral view, 29 = phallus in ventral view. Scales: 0.2 mm for Figs 26–28 and 29, respectively

Male genitalia: Surstylus long and strongly tapering apically (Fig. 26). Cerci short Figs 26–27), normal with long bristles and with an extremely long bristle apically. Hypandrium Y-shaped (Fig. 28): arms with a long, apically forked and cranially directed process. Gonostyli (Fig. 31) very short, phallus (Figs 29, 30) boat-shaped, cavity lined dorsaly with 6 pairs of extremely long flat processes.

Female not known.

The enigmatic species *Lauxania argyrostoma* WIEDEMANN, 1830 (whose female holotype was studied by the junior author in the Naturhistorisches Museum, Vienna) may also belong to this new genus.



Figs 30–31. *Pseudominettia platypeza* sp. n., paratype male, genitalia: 30 = phallic complex with hypandrium in ventral view, 31 = same, laterally (e: ejaculatory apodeme). Scale: 0.2 mm

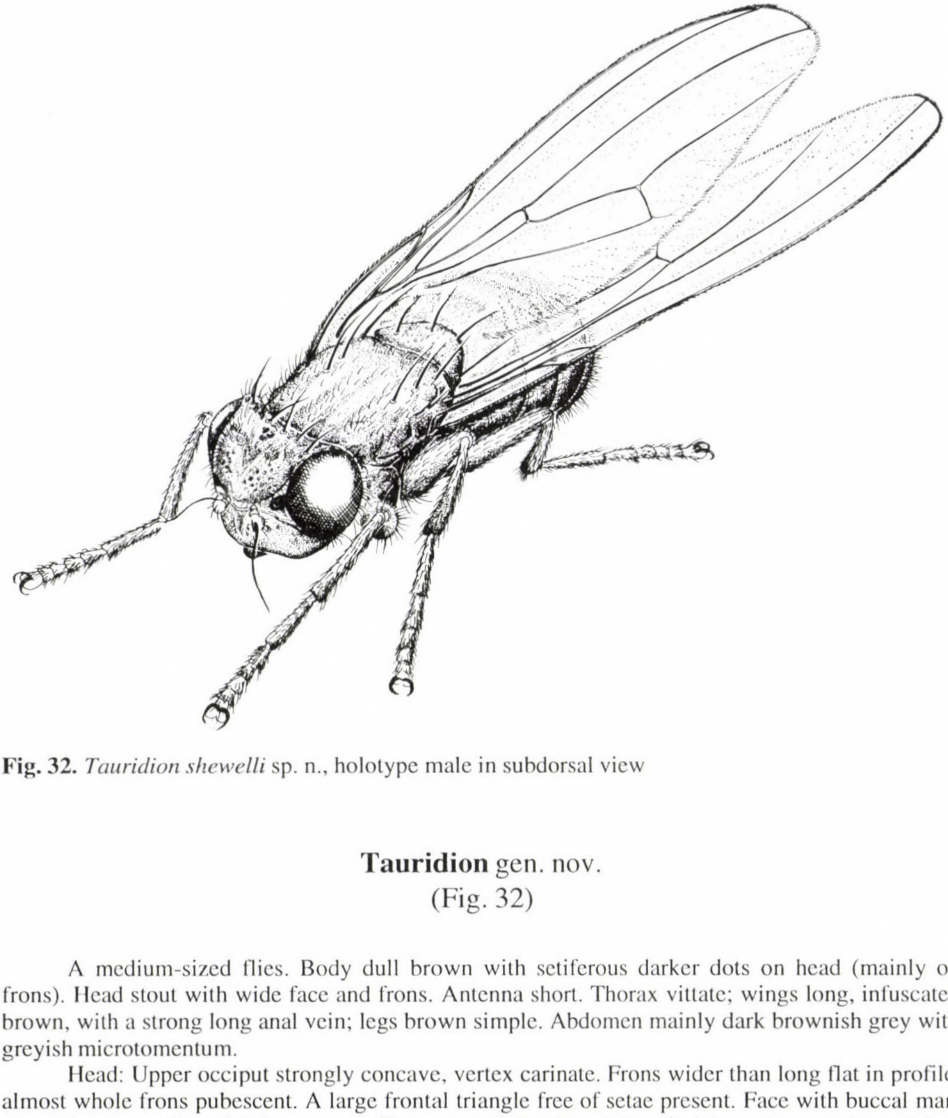


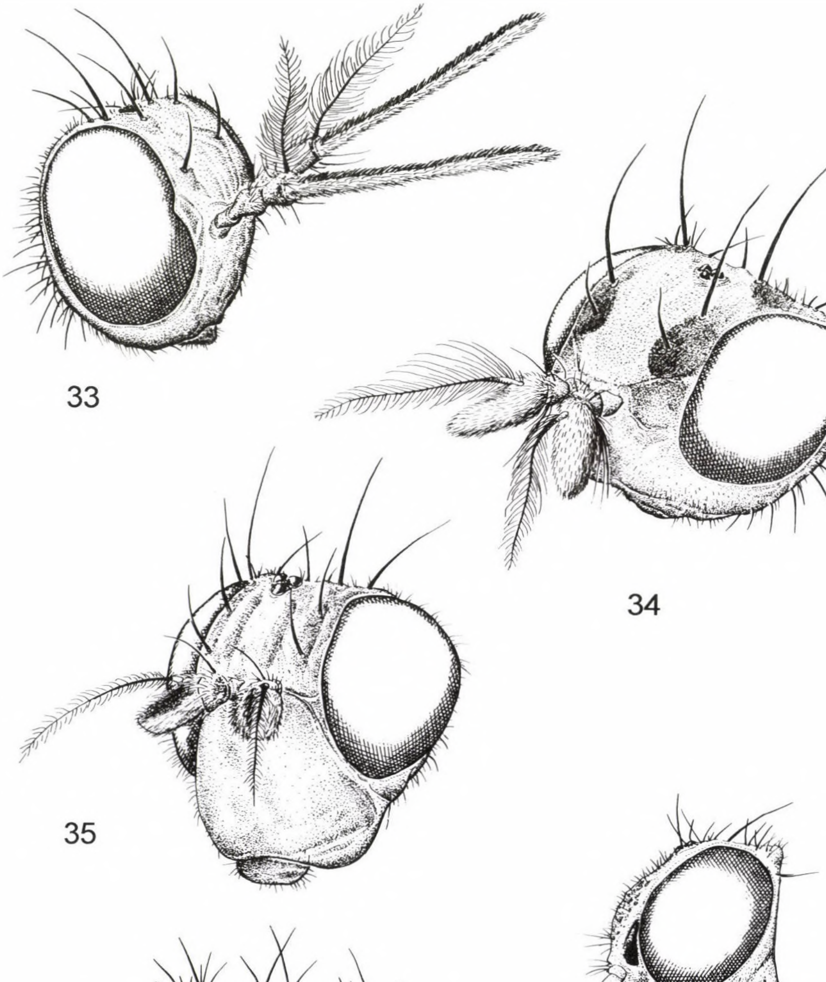
Fig. 32. *Tauridion shewelli* sp. n., holotype male in subdorsal view

Tauridion gen. nov.
(Fig. 32)

A medium-sized flies. Body dull brown with setiferous darker dots on head (mainly on frons). Head stout with wide face and frons. Antenna short. Thorax vittate; wings long, infuscated brown, with a strong long anal vein; legs brown simple. Abdomen mainly dark brownish grey with greyish microtomentum.

Head: Upper occiput strongly concave, vertex carinate. Frons wider than long flat in profile, almost whole frons pubescent. A large frontal triangle free of setae present. Face with buccal margin wider, in profile slightly convex. Clypeus well developed. Parafacials and gena widened (enlarged). Eye small, almost rounded, slightly longer than high. Pedicel longer than scape; flagellomere oval; arista with short (0.02 mm) cilia only. Antennal distance double length of flagellomere.

Frontal chaetotaxy: 2 *ors*, posterior one in the line of fore ocellus, *vte* and *vti* present but not long, ocellars small and directed outwards; postoculars (postverticals) strong, apices crossing. Postocular setulae in 2 rows. Supravibrissals in 2 rows, genal bristles in 3 rows.



Figs 33–37. Heads. 33 = *Bacilloflagellomera pectinicornis* sp. n.; 34 = *Gibbolauxania elegans* sp. n.; 35 = *Paraphysoclypeus nigropleura* sp. n.; 36–37. *Tauridion shewelli* sp. n., holotype: 36 = cranial view, 37 = lateral view

Thorax: Mesonotum slightly arched anteriorly, scutellum flat. Mesonotum with thick microtomentum;

Thoracic chaetotaxy: 1 pprn, 2 npl, 1 weak prst, 1 sal, 2 pal, no ia, 0+3 dc, 1 prsc, 2 sc, apicals divergent; ca. 4 irregular rows of acrostichals, 3 rows of intraalar microchaetae; 1 prepst, 1 anepst, 2 kepst pairs; 1 hair on anepimeron.

Legs brown with a median yellowish ring on all tibiae. All tibiae with dorsal preapicals. Fore tarsus longer than others. No male sexbrushes.

Wing (Fig.) with sapromyziform costa. Anal vein very long and thick; axial vein well discernible as a long darker line.

Abdominal terga 2–6 dark brownish grey dorsally (yellowish basally), with diffuse light grey colour laterally. Terga with some enlarge marginal setae laterally only.

Type-species: *Tauridion shewelli* sp. n.

Gender: neutral.

Derivatio nominis: named after the shape of the head ("like a small bull").

Notes: We were unable to find a close relative of *Tauridion* among the known genera. It seems to come near to a new genus from Brazil (RJ, MG and SP states) to be described by V. C. SILVA in a forthcoming paper. They have in common: frons flat, wide and pubescent (microtomentose); antennae far from each other with flagellomere short and arista pubescent; ocellar bristles directed outwards; 0+3 *dc*; very long fore tarsus and anal vein strong and long. *Tauridion* differs from that genus by its face not tuberculate; absence of velvety dark spots on the face and parafacials; eye higher than long; clypeus large but not protruding; fore femur and tibia not very long and by the presence of a weak *prst.*

Tauridion shewelli sp. n.
(Figs 32, 36–37)

Holotype male (HNHM): Peru, Vilcanota – "N. genus" Det. SHEWELL, 1979.

Body length: 5.52 mm (not precisely measurable owing to the curved position of abdomen).

Face, cheeks and genae microtomentose with marble pattern of brownish grey and light grey. Lateral margins of frons anteriorly with small spots. Clypeus comparatively large, U-shaped, palpi bacilliform without long setae but on apex ventrally. Proboscis extremely large.

Mesonotum greyish brown with greyish vittae; scutellum dark brown with greyish edges. Pleura greyish with some darker areas.

Wing rather long, brown with costal margin and apical half darker and with veins somewhat darker, length 6.90 mm, wing width 2.04 mm. Subcostal vein curved along a wide arch into costa. Small black spines on costa diminishing in size and reaching 1/3 of distance between apices of R2+3 and R4+5. Halteres wax yellow.

Male preabdomen with large segments, epandrium seems symmetrical, large with long ventral bristles, cerci small and hairy. Male genitalia not studied.

Female not known.

We dedicate this new species to Dr GUY E. SHEWELL (retired from the Biosystematic Research Centre, Agriculture Canada, Ottawa), for his invaluable contributions to the knowledge of the lauxaniid taxa and also for his recognizing of some of the above genera as new.

* * *

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NEOTROPICAL POLYOMMATINE DIVERSITY AND AFFINITIES. I. RELATIONSHIPS OF THE HIGHER TAXA (LEPIDOPTERA: LYCAENIDAE)

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In light of recent publications increasing known species diversity among Neotropical Polyommatini by some 75%, the admixture and affinities of higher categories comprising the Tribe are reexamined. Included data falsify two old generalities concerning the Neotropical polyommatine fauna: low diversity and principally Holarctic origins. Historical circumstances previously impeding accurate assessment of this fauna are reviewed. Polyommatine higher categories of FIEDLER 1991 (after ELIOT 1973, e.g. the polyommatine "Sections") are reconfigured according to current knowledge. ELIOT's *Polyommatus* Section was polyphyletic and is reformed to include, in the Neotropics, only *Pseudolucia, Plebejus, Paralycaeides* and *Madeleinea.* Of the redefined Sections, two (totalling eight genera) are entirely Neotropical with three (*Eldoradina, Itylos, Nabokovia*) clearly having arisen from lowland Neotropical ancestral assemblages (two with significant Caribbean elements). Of the others, one Section (*Leptotes* and allies) occurring in the Neotropical Realm (as *Leptotes*) has African and oceanic affinities; two sections (*Lycaenopsis* and allies, *Polyommatus* and allies) each contain an autochthonous South American infratribe with sister taxa either in the Holarctic or Holartic/Oriental Realms. Both autochthonous South American infratribes of these Sections (*Pseudolucia* assemblage, an undescribed *Lycaenopsina* assemblage) contain elements reflecting a vicariance between south Andean and austral elements and a montane southeast Brazilian entity. Only the genera *Paralycaeides* and *Madeleinea* show sister genus relations principally with the Holarctic (e.g. with *Plebejus*). These data suggest a greater antiquity for Neotropical Polyommatini than previously assumed. Synoptic species lists of all the Sections occurring in the Neotropical Realm are addended.

Key words: Andes, Patagonia, biogeography, disjucnt distribution, diversity, sampling error, Polyommatiti, sections

INTRODUCTION

This paper discusses what is currently known of diversity and taxonomic/biogeographic affinities among the higher categories of New World tropical Polyommatini ("blue butterflies"), in light of a recent surge in published research on the Neotropical diversity of this group. The paper assembles data pertinent to questions concerning the ancestry of Neotropical blue butterflies. Recently, it was demonstrated that high Andean and austral South American lycaenids of the polyommatine sister group ("hairstreak butterflies", Tribe Eumaeini sensu ELIOT

1973) are primarily of lowland Neotropical ancestry, not of Holarctic origin as had been traditionally assumed. The question of whether this is also true for various components of the polyommatine fauna in the Neotropical Realm (particularly high montane and austral elements) can only be answered in the context of many new species recently described from Latin America by the present, and other, authors. Eventually, a formal biogeographic paper must be worked out, thus present work is to be seen as provisional.

In this paper we consider diversity and relationships among Neotropical members of various higher taxa (sections, genera and species groups). Amid the recent proliferation of species names for Neotropical Polyommatini at least the higher taxa have gained some taxonomic stability (summarized most recently from the work of the present authors by BRIDGES 1994). Later, when various species level taxa now "in press" or "in preparation" are available, we will explore phylogenetic relationships indicated by various species and sister groups. Even with substantial recent elaboration of polyommatine species from Latin America, sampling error and incomplete distributional data remain a problem. Consequently, some time is required for recent seminal taxomomic work to be more fully developed at the local level by Latin American taxonomists and others.

The present paper demonstrates that, contrary to the historical view of "low diversity" and primarily "Holarctic origins" for the Neotropical polyommatine fauna, (1) diversity is much higher (approximately 75% more species since 1990) and (2) affinities of higher taxa including these species reflect a mixture of autochthonous Latin American groups and elements of various more farflung assemblages not limited simply to the Holarctic Realm. At present, the authors are not primarily biogeographers of the New World Polyommatini but engaged in extensive alpha taxonomic work concerning this group. Since workers concerned primarily with biogeography and/or the biogeography of Lepidoptera, may wish to evaluate new data on Neotropical Polyommatini within various frameworks of biogeographical analysis, our primary goals here are to (1) update published synopses of diversity, (2) integrate recently described taxa into various higher categories proposed within the Polyommatini (following on ELIOT 1973, FIEDLER 1991, etc.), and (3) note apparent taxonomic and geographical affinities among Neotropical members of these higher categories. We welcome all efforts by other workers to use or expand on these data within their own biogeographic discipline.

HISTORICAL REVIEW

A classic example of "erroneous generality" in science has been the historical view of diversity and origins attributed to Neotropical members of the lycaenid subfamily Polyommatini (or "blue" butterflies). A seminal study by VLADI-

MIR NABOKOV (1945*a*) summarized knowledge from the early "classical" works of Lepidopterology, which had elaborated various species obtained by Europeans in the nineteenth century (BUTLER 1881, WEYMER 1890, STAUDINGER 1894, etc.). However, after NABOKOV, there was a virtual fifty year hiatus during which little to nothing was done to further elaborate Neotropical Polyommatini. Curiously, it was also during this time that generally accepted notions characterizing the New World polyommatine fauna as one of "low diversity" and "Holarctic ancestry" appear to have had their origin.

Part of this problem is traceable to the "culture" of international lepidopterology wherein "common usage" (an "everybody knows" undercurrent) often takes informal root from discussion and correspondence among scientists long before being published (or questioned) in the formal scientific literature. Accordingly, when analysts like DESCIMON (1986) or LARSEN (1992) published faunal synopses trumpeting old and traditional views, it most likely because the best they could do was "ask around" and repeat the most general (albeit unstudied) views available among their contemporaries. For instance, DESCIMON (1986), who was actually quite courageous for summarizing the biogeography and affinities of high Andean butterflies from the little published data then available, noted simultaneously that many groups for which he reported low diversity, or supposed Holarctic origin, were poorly known and required far more investigation. As DESCIMON recorded, the junior author of the present paper was one of his many sources for various data then unelaborated or unpublished. However, even these data, which DESCIMON called "novel" in his acknowledgements, were inevitably viewed through the "tinted glasses" of the time. In retrospect, one of the misfortunes of publication deadlines and subsequent change is that, only five years later, the complexion of available data appears vastly different. Had DESCIMON known in 1986 what he knows today his synopsis might have taken a very different tack (DESCIMON *pers. comm.* to JOHNSON, Villefranche-sur-Mer, France, 1995). Nonetheless, however, as ARTHUR M. SHAPIRO (1991, 1992 [1994]) observed, DESCIMON's 1986 paper inevitably became the baseline study for subsequent elaborations of biogeogeography concerning the Latin American Lycaenidae and other butterflies.

FALSIFICATION OF THE NOTIONS OF LOW DIVERSITY AND PURELY HOLARCTIC ORIGINS

Methodological Factors

Interestingly, falsification of erroneous notions concerning the diversity and origins of Neotropical blue butterfies did not arise initially from sophisticated research. For many years, curators at numerous international museums knew that collections were replete with unnamed Latin American Polyommatinae. Oddly, however, this knowledge appears to have never filtered into the formal literature. A post-1990 surge in descriptions of New World tropical Polyommatini resulted primarily because two workers, the senior author and EMILIO BALLETTO (University of Turin, Italy) finally began describing the many entities that had languished in European museums for nearly one hundred years. This new complexion concerning diversity, as noted in more detail below, inevitably set the stage for a varied view of the origin and affinities of this large and complex fauna.

Falsification of the overall view of Holartic origins required only basic morphological work which, aside from the synoptic work of NABOKOV (1945*a*), simply had not been done. Workers after NABOKOV either did not do any additional morphological study or did not have sufficient knowledge of morphology to recognize the significance of NABOKOV's work in relation to the Holarctic and Old World tropical faunas. NABOKOV wrote at a time when a view of northern origins for southern tropical faunas dominated biogeography – the so-called "Sherwin-Williams effect" (from a well-known commercial paint advertisement of the 1940's and 50's which showed paint running across a globe from north to south). Accordingly, NABOKOV (1945*a*: 44f.) inevitably interpreted the small fauna then known among Neotropical blues in this fashion – that of a northern fauna migrating southward by various hypothetical corridors.

Another factor influencing the misinterpretation of affinities, although quite a simple one, was that traditional methods in Lepidoptera taxonomy at the time of NABOKOV seldom included looking beyond limited features of males of species. NABOKOV, in his morphological figures, was among the first to note apparently informative taxonomic characters in females. However, from his cursory samples, he was not able to elaborate any generalities concerning these. Modern research balances reference to male and female structures in evaluating relationships and this has opened an entire new data set for consideration of the Polyommatini.

As noted by SHAPIRO (1991, 1992 [1994]) who, as a biogeographer of the butterfly family Pieridae in the New World tropics, first began to "track" modern progress on elaborating Neotropical Lycaenidae, first clues to autochthonous origins of high Andean and austral faunas in South America came from work by the junior author on the sister group of polyommatine lycaenids – "hairstreak butterflies" of the New World lycaenid tribe Eumaeini. Many of these latter butterflies are sympatric and synchronic with Neotropical blue butterflies. JOHNSON (1990, 1992*a*,*b*, and thereafter in numerous shorter papers, singularly or with co-authors), showed that Neotropical "elfin butterflies", cryptic and often tailless Eumaeini occurring in the high Andes and austral South America, share all their basic morphological features with, and thus were most likely derived from, the lowland Neotropical hairstreak fauna. The cryptic and tailless wing habitus of Old and New World elfins, earlier noted by such workers as BROWN (1942) and GILLHAM (1956) as reason to consider them even congeneric, appear to have resulted simply from an environmentally selected convergence. JOHNSON noted high Andean and austral elfins having vicariates only as far north as montane Costa Rica (JOHNSON 1992*a*) while high montane and other Palaearctic elfins (JOHNSON 1992*b*) showed New World sister groups southward only to Guatemala.

Among other Neotropical Eumaeini, JOHNSON and coworkers (JOHNSON *et al.* 1991 and 1992) and SHAPIRO (1992 [1994]) noted that members of the worldwide infratribe Strymonina shared a rather simple morphological ground plan throughout their Old and New World distribution and that Latin American elements of this clade included a mix of purely autochthonous groups (by autapomorphy) and other assemblages sharing synapomorphies with outlying elements of Strymonina representing more farflung New and Old World distributions.

This led SHAPIRO (1992 [1994]) to ask what other groups of high Andean and austral Neotropical butterflies might prove to have origins more complex than suggested by the traditional view of Holarctic origins. The recent surge of research on Neotropical blue butterflies was quite in its infancy at the time of SHAPIRO's writing. Thus, in this paper we will explore in more detail what we now know of relationships among the higher categories that have previously been proposed by various workers among the New World polyommatine butterflies.

Sampling Error Factors

In hindsight, it is apparent that poorly known groups of Neotropical organisms, like the Eumaeini and Polyommatini lycaenids, have had their actual diversity masked by a combination of factors, some historical and some methodological. Three historical categories of sample sources appear to account for the currently known diversity. Only one was available to those forming the previously prevalent historical views concerning diversity and biogeogaphy in the Polyommatini. In addition, it is possible to envision a fourth future source of significant additions to Neotropical diversity not generally available to workers at the present time. We review these sources below.

Source 1: Taxonomic names available from the classic seminal works of the Nineteenth Century (BUTLER 1881, WEYMER 1890, STAUDINGER 1894, etc.) as summarized in the classical synthetic works (GODMAN and SALVIN 1879–1901, DRAUDT in SEITZ 1919 and 1921). These formed the basis for the seminal generic work by NABOKOV (1945*a*) and most of the biogeographic or synoptic work done prior to 1990. Many workers, looking solely to the old classic works (particularly the color guide of A. SEITZ, 1921) wrongly assumed the included taxa represented most of the actual diversity. This was a view so prevalent that subsequent workers further refined these limited nomenclatures, reducing them synonymically based mostly on external comparisons and seldom with reference to type specimens (see for instance CLENCH 1944, 1946, 1963 [1964] or GILLHAM 1956).

Source 2: Taxonomic names from recent elaborations of voluminous old museum material, the latter either "unidentified" in curated collections or unsorted and unprepared in "unaccessioned" museum backlogs. This second source, often including material as old as from Source 1, contributed most of the new names in Lycaenidae since the mid-1980's (to an extent earlier with workers like S. NICOLAY in the 1970's). Unsorted backlog is particularly vast at many museums because, without available names, such specimens are rarely placed with curated material (regarding blues see BÁLINT 1993*a*,*b*, BALLETTO 1993, BÁLINT and JOHNSON 1993*a*,*b*, 1995*a*,*b*,*c*).

Source 3: Taxonomic names from studies of recent material, mostly made available from Latin American sources once a rudimentary taxonomy for Neotropical lycaenids was in place. Numerous Latin American lepidopterists (professional and amateur), along with biodiversity surveys entrusted with the study of various Latin American parks and preserves, have referred substantial material to lycaenid taxonomists once it was known that avenues for study of these samples were available. This material has figured prominently in the most recent taxonomic additions to the Neotropical fauna (regarding blues see BÁLINT and LAMAS 1994, BÁLINT and JOHNSON 1995*d*,*e*).

A general overview of lycaenid species numbers to date suggests that each of the three sources listed above has accounted for about one third of currently described taxa. In the Polyommatini a rather exponential amount of material from Source 3 became available after 1990 because the junior author had assembled diverse samples of Polyommatini from lycaenid collectors who did not discriminate blues from hairsteaks in material forwarded for study. These became available for eventual analysis by BÁLINT and coworkers and, in the case of Chile, accounted for most of the many new species recently described from that country.

One can envision an expansive **4th Source** for future additions to Neotropical lycaenid diversity: work of Latin American biologists and, particularly, that of investigators interested in butterfly life histories and ecology. Exemplary in the Polyommatini are studies "in press" and "in preparation" by the Israeli Lepidopterist DUBI BENYAMINI currently working in Chile. Mr. BENYAMINI has added over half a dozen new species of blues (and also Eumaeini) as a result of an original intent to study the life histories and habitats of known Andean and austral butterflies. One can envision expansion of this kind of activity, and species numbers as a result, as Latin American biologists gain momentum in taxonomic work on their own faunas.

HIGHER CATEGORIES OF POLYOMMATINI

NABOKOV*'s (1945a) Seminal Work on Neotropical Genera*

NABOKOV (1945*a*), in his seminal work on the taxonomy of Neotropical blue butterflies, established the admixture of genera that survives, fairly much intact, to the present day. Since modern workers have scrutinized this taxonomy to a great degree, NABOKOV's work can be judged as generally successful at the generic level. Although not without recent experiment by taxonomists seeking to arbitrarily split certain groups NABOKOV described as genera (see BALLETTO 1993 versus BÁLINT 1993*a,b*, 1995), the overall monophyly of NABOKOV's various groups appears sound. One of his genera, *Cyclargus*, was synonymized in a popular fieldguide (RILEY 1975) based solely on comparisons of wing pattern. However, morphological reassessment has since reinstated it (JOHNSON and MATUSIK 1992, SMITH *et al.* 1994, JOHNSON and BÁLINT 1995). In another case, certain species not available to NABOKOV but mentioned in his footnotes as perhaps belonging to his genus *Parachilades* have been demonstrated to comprise a separate monophyletic genus *Eldoradina* [= *Polytheclus* BÁLINT and JOHNSON] (BALLETTO 1993, BÁLINT and JOHNSON 1993*b*, 1994*a*, BÁLINT 1993*a,b*). Thus generic stability has remained much intact in the Neotropical Polyommatini, even though species numbers have risen dramatically.

Higher "Sectional" Classifications of Worldwide Polyommatini

Various higher classifications, proposing taxonomic "Sections" or other groups among worldwide Polyommatini, have appeared (CLENCH 1955, STEMPFFER 1967, ELIOT 1973, FIEDLER 1991). Where appropriate, these included Neotropical elements treated by NABOKOV (1945*a*). Hitherto, however, there has been no integration of the new genera and many new species described since about 1990.

A higher classification inclusive of all worldwide elements of the Polyommatini was first proposed by ELIOT (1973). ELIOT outlined, in some detail, how certain regional aspects of his scheme agreed or differed from those of CLENCH and STEMPFFER. ELIOT's work was awarded the Jordan Medal by international lepidopterists and, although stated as a "tentative" effort, has since become the international standard. SIBITANI (1974) and HIROWATARI (1993) adapted aspects of ELIOT's system to faunas of their study regions. FIEDLER (1991), in a worldwide survey of myrmecophily in the Polyommatini adapted the system (based on personal communications with ELIOT [FIEDLER 1991: 42]) and suggested several minor changes.

Major informational additions to this scheme (or data base) derive from recent descriptions of new genera and many new species by BALLETTO, BÁLINT, JOHNSON, and (most recently) BENYAMINI. These recent studies are the basis of changes introduced by us here. These recent studies have particular moment because, contrasting the work of ELIOT (particularly in the case of BÁLINT, JOHNSON and BENYAMINI) they have included reference to characters of the female as well as the tergal morphology of both sexes. In addition, these latter recent studies have paid strict attention to type specimens (an opportunity afforded not only by the European/American location of coworkers but cooperation from Latin American workers, like GERARDO LAMAS, in locating Latin American type material).

Based on consideration of these new data and, principally, the system of ELIOT (1973) as revised by FIEDLER (1991), we reassess monophyly among the Neotropical fauna and integrate these data into the various worldwide Sections of the Polyommatini. For simplicity we use (with initial capital letter) the biogeographic divisions of BROWN (1993). We addend an updated checklist to all the sections of the Neotropical Polyommatini grouped according to the higher categories outlined below.

TRIBE POLYOMMATINI

The Tribe Polyommatini is subdivided into four subtribes, Candaliditi (mostly Australian in occurrence), Lycaenesthiti (mostly African in occurrence), Niphanditi (mostly Oriental in occurrence) and Polyommatiti (previously seen as mostly Palaearctic in occurrence) (see SCOTT and WRIGHT 1990: 203; FIEDLER 1991: 41 and 43). FIEDLER (1991) did not indicate any autochthonous or primarily Neotropical polyommatine lycaenid genera, thus suggesting that the lycaenid fauna of the New World was dominated mostly by Eumaeini lycaenids ["hairstreak butterflies"] (FIEDLER 1991: 42 and 110–111).

Polyommatiti was divided by FIEDLER into twelve sections (FIEDLER 1991: Tab. 3.). We review these below, first in regard to changes required in Section composition; then we present a revised list of higher Polyommatiti categories now documented to occur in the Neotropical fauna. According to our new information, representatives of this subtribe, previously suggested as an entity principally having considerable diversity in the northern hemisphere, is also remarkably diversified in the oreal biomes of the Neotropical Realm.

SECTION COMPOSITIONS IN LIGHT OF NEW DATA ON NEOTROPICAL POLYOMMATITI

Sections Cupidopsis, Uranothauma, Leptotes and Euchrysops

These were formally considered primarily African in distribution but, as we have shown in our synopsis of Neotropical *Leptotes*, the section is Pantropical in distribution, well represented in the Neotropical insular regions, continental lowlands, and montane biotas (BÁLINT and JOHNSON 1995*b*).

Sections Nacaduba, Jamides and Lycaenopsis

These were previously considered essentially Oriental entities. The triad does contain strong Oriental components (cf. ELIOT and KAWAZOÉ 1983, HIROWATARI 1992) but the third Section is represented in the Neotropical region by two species belonging to two distinct genera (BÁLINT and JOHNSON 1995*b*).

Sections Castalius and Zizeeria

These were listed as Palaeotropical in the work of FIEDLER. Only the *Zizeeria* Section is represented by several genera, all of them having low diversity in that region.

Glaucopsyche Section

This Section has traditionally been considered typical of the Holarctic. Our studies, however, has suggested that the sister group is in the Neotropical region – the recently proposed *Itylos* Section (sensu BÁLINT and JOHNSON 1994*b*) including *Itylos* and *Hemiargus* (see subsequent treatment "*Itylos* Section" below).

Itylos Section

The *Itylos* Section contains genera originally placed by ELIOT in his *Polyommatus* Section. Female genital structures, including heavily sclerotized henia and large bilobed fibula, support synapomorphy with the Holarctic *Glaucopsyche* Section. However, despite the presence of this characteristic, we do not consider the *Itylos* Section and *Glaucopsyche* Section synonymous. They not only have unique characters (see NABOKOV 1945*a*: 54–57) but the presence of the genital sagum in *Hemiargus* could suggest affinity to the *Polyommatus* Section or, if lost in *Nabokovia* (as a reversal), to this latter autochthonous South American genus.

Polyommatus Section: Polyphyly of the ELIOT*'s Original Section*

FIEDLER's treatment of this Section (as typifying the Palaearctic region) was hampered by ELIOT's *Polyommatus* Section being polyphyletic (the original tentative arrengement of ELIOT lumped all the genera discussed by NABOKOV

1945*a* into this Section). The bulk of changes required by new data on Neotropical Polyommatini concern problems with ELIOT's *Polyommatus* Section, problems traceable mostly to the sampling error that previously characterized the region. We consider ELIOT's *Polyommatus* Section "polyphyletic" (sensu NELSON 1971) because the Neotropical elements misplaced therein have actual sister relations to more than one other monophyletic group of Polyommatini: *Itylos* and *Hemiargus* form a separate monophyletic group which is sister to the *Glaucopsyche* Section (cf. MATTONI 1977 and 1981); other genera are either (1) autochthonous South American groups with some characters of unclear affinity relative to other Polyommatiti (perhaps amongst the most primitive of *Polyommatus*) or (2) part of a cluster at best evaluated as an autochthonous Neotropical sister of the *Polyommatus* Section.

Genera Excluded from the Polyommatus Section

The Neotropical genera *Itylos, Hemiargus, Pseudochrysops, Cyclargus, Nabokovia, Echinargus* and the very recently discovered genus *Eldoradina* (=*Polythecluss*) can be excluded from ELIOT's characterization of the *Polyommatus* section based the following two characters not compatible with ELIOT's definition of the Section (see also BÁLINT and JOHNSON 1993*b*, 1994,*a,b*; JOHNSON and BÁLINT 1995). (1) valve short with strong sclerotized apical formations and (2) penis large with heavily sclerotized Chapman's process.

As noted heretofore, of these excluded genera, *Itylos* and *Hemiargus* form a group which looks to be the apparent sister of the *Glaucopsyche* Section. Of the remaining genera, *Nabokovia and Eldoradina* (referred to by us as the "Thecline [Theclinae]-like taxa" [BÁLINT and JOHNSON 1993*b*, 1994*a*]) are autochthonous high Andean entities. Some characters of these taxa are not readily traceable to any polyommatine ground plan and are more likely primitive than derived. For instance, in *Nabokovia* (at present including *N. faga*, a widely distributed Transandean species and two taxa with restricted distribution, see below), along with presence of a unique tubelike female genitalia, males have apparently lost both the genital sagum and blue structural color. The latter is a phenomenon connected to thermoregulation and may be traced to ancestry in a much colder period (cf. CLENCH 1966). Below, we group *Nabokovia* and *Eldoradina* as basal taxa of a purely Neotropical infratribe also including *Cyclargus*, *Pseudochrysops* and *Echinargus*. This is based on the following characters: (1) quadrant shaped male genital valva; (2) conspicuous costal rostellum of valvae; (3) female genital ductus bursae stumpy but eversible with plain and quadrant shaped fibula. Of these characters 1 and 3 are most clearly synapomorphic.

The evertable ductus bursae of the female genitalia and the presence of the heavily sclerotized male genital sagum suggest that the sister group of this cluster of purely Neotropical taxa is a reformed *Polyommatus* Section which we elaborate below.

Reformed Polyommatus Section

The *Polyommatus* Section can be convincingly reformed as an entity with two subgroups. One (which should be called as "infratribe Polyommatina" if we could present a cladistic analysis) is primarily Palaearctic including the very diverse genera [or subgenera] *Plebejus* and *Polyommatus*. Both weakly penetrate the Nearctic region. Two Neotropical genera (both thoroughly discussed by NABOKOV 1945*a*), *Paralycaeides* and *Madeleinea* (misidentified by NABOKOV as "*Itylos*") belong to this Polyommatina lineage. These two genera represent the sole Neotropical genera with clear, primarily Holarctic, affinities. The other subgroup, which we call the "Pseudolucina" is comprised of the diverse, purely Neotropical, genus *Pseudolucia*. We group *Pseudolucia* with the reformed *Polyommatus* Section based on (1) female genital henia showing simple rounded and sclerotized formations with (2) long, slender and eversible ductus bursae.

The presence of a sagum in certain *Pseudolucia* taxa suggests phylogenetic connection to the other, entirely Neotropical, polyommatine sections outlined just above. It has been lost in other (probably modern) members of this diverse group.

HIGHER POLYOMMATITI CATEGORIES AND THEIR DIVERSITY IN THE NEOTROPICAL REALM

In the following list we enumerate the composition of polyommatine Sections now known to occur in the Neotropical Realm; a full checklist of the Neotropical polyommatine fauna is presented. Species are listed in phylogenetic order. Taxa on subspecies level are not indicated.

Abbreviations (cf. DESCIMON 1986, Table 20–3): Mex = southern USA, Mexico; CA = Central America; W-Ind = West Indies; AM = Amazonas Basin; E-Bra = Coastal Cordilleras, Brazil; Ga = Galapagos Islands; Pa = Pacific coast of continental South America; SNSM = Sierra Nevada de Santa Marta; CM = Cordillera de Mérida; Col = Colombian Cordilleras; EC = Ecuadorian Andes; N-Pe = northern Peru north to Abra de Porculla and south to Callejón de Huaylas; C-Pe = central Peru from Cordilleras Negra and Blanca to left side of Río Apurímac; S-Pe = southern Peru; Bol = Andean region of Bolivia; Arg = Andean region of Argentina; Chi = northern and central Chile; Pat = Patagonia (SW Argentina south from Río Negro) and southern Chile; TdF = Tierra del Fuego (north).

Leptotes Section

Leptotes SCUDDER, *1876*

The genus is Holotropical in distribution with about thirty species (BRIDGES 1994); it extends slightly into the temperate region of North America (two species) and Europe (one species). In the high Andean, austral and lowland regions of South America is it represented by ten species of three species groups (BÁLINT and JOHNSON 1995*b*).

Diversity

Leptotes callanga (DYAR, 1913) – C-Pe, S-Pe, Bol.
Leptotes sp. n. – C-Pe, S-Pe.
Leptotes marina (REAKIRT, 1868) – Mex, CA.
Leptotes perkinsae KAYE, 1931 – W-Ind.
Leptotes idealus JOHNSON and MATUSIK, 1988 – W-Ind.
Leptotes trigemmatus (BUTLER, 1881) – Pa.
Leptotes andicola (GODMAN and SALVIN, 1881) – Col, Ec, N-Pe.
Leptotes sp. n. – Col.
Leptotes sp. n. – Pa in Colombia.
Leptotes parrhasioides (WALLENGREN, 1860) – Ga.
Leptotes cassius (CRAMER, [1775]) – from Mex to Arg, not in Pa.
Leptotes bathyllos TESSMANN, 1928 – AM.
Leptotes hedgesi SCHWARTZ and JOHNSON, 1992 – W-Ind.

Zizeeria Section

Zizina CHAPMAN, *1910*

The genus is mainly African and Oriental, extending into the Palaearctic region as *Pseudozizeeria maha* (KOLLAR [1844]), a common butterfly of the Korean Peninsula and Nepal (unpublished data from recent expeditions of the Hungarian Natural History Museum) and represented in the Australian region by *Zizina oxleyi* (FELDER and FELDER, 1865) and *Z. labradus* (GODART, [1824]) (NEW 1993: 16). *Z. oxleyi* has also been recorded from several parts of Central and South America but such specimens are suspected as not authentic pending modern confirmation (G. LAMAS, *pers. comm.*, BÁLINT 1993*b*).

Zizula CHAPMAN, *1910*

The genus, with two species, is Holotropical. *Z. cyna* is widely distributed both in North and South America, and penetrates deeply into temperate regions of both the northern and southern hemisphere.

Brephidium SCUDDER, *1876*

The distribution of the genus is discontinuous, suggesting several relict occurrences: Namibian zone in South Africa, Sonoran zone in the Nearctic, and, in the Neotropical region records from the Florida Keys, Central America and the Antilles. A record by DE BROS (1993, p. 161: "Brephidium exilis Bsd., det. BALLETTO, For [Val Fortalezza] Tal zwischen Pazifikküste und dem Quellgebiet des Val Santa, 1000 m ü. M., 8.VII.1979") has been revised by BÁLINT as *Hemiargus ramon* following genitalic dissection (gen. prep. No. 485). Therefore the occurrence of the taxon is not confirmed on the South American continent.

Diversity

Zizina oxleyi (FELDER & FELDER, 1865) – CA(?), Chi(?).
Zizula cyna (EDWARDS, 1881) – from Mex to Pat.
Brephidium exilis (BOISDUVAL, 1852) – Mex, CA.

Cupido Section

Everes HÜBNER, *[1819]*

The genus is mainly Palaearctic but also extends into the Oriental, the Australian and Nearctic regions (total species number according to BRIDGES 1994: 11). One widely distributed Nearctic species has invaded southward into the the northern part of the Neotropical region.

Diversity

Everes comyntas (GODART, [1824]) – Mex, CA.

Lycaenopsis Section

Celastrina TUTT, *1906*

This genus with its 15 species (BRIDGES 1988, II.22–23) is mainly Holarctic but also extends into the Oriental region (ELIOT and KAWAZOÉ 1983: 209–258). One subspecies of a Nearctic species (ELIOT and KAWAZOÉ 1983:

222) ranges southward to Mexico and a further, endemic subspecies exists in Central America.

Gen. n. (see EBERT 1969, BÁLINT and JOHNSON 1995*g*)

The genus is monotypic, restricted to the southeastern mountains of Brazil.

Diversity

Celastrina argiolus (LINNAEUS, 1883) – Mex, CA.
"Lycaena" cogina (SCHAUS, 1902) – E-Bra.

Itylos Section

Hemiargus HÜBNER, [1819]

The genus is endemic to Latin America with four historically recognized species. *H. hanno* is widely distributed in the Caribbean region, Central America and lowland South America. *H. ceraunus* occurs in North America, deeply penetrating into the temperate region. *H. ramon* is restricted to the western slope of the high Andes. *H. bogotanus*, another Andean species, is sympatric and synchronic with *H. hanno* in certain mountain habitats of Colombia but otherwise more typical of higher Neotropical elevations (JOHNSON and BÁLINT 1995).

Itylos DRAUDT, 1921

The genus is a strict high Andean endemic with five described species; most of them are restricted to high Andean Peru (BÁLINT and JOHNSON 1994*b* , BÁLINT and LAMAS 1994). The oldest described species, *I. titicaca*, has the widest range.

Diversity

Hemiargus hanno (STOLL, 1790) – Mex, CA, W-Ind, AM, E-Bra, SNSM, CM, Col.
Hemiargus ramon (DOGNIN, 1887) – Pa, EC, N-Pe, C-Pe, S-Pe, Chi.
Hemiargus bogotanus (DRAUDT, 1921) – CM, Col.
Itylos titicaca (WEYMER, 1890) – N-Pe, C-Pe, S-Pe, Bol, Arg, Chi.
Itylos sp.n. – C-Pe.
Itylos pasco BÁLINT & LAMAS, 1993 – C-Pe.
Itylos pnin BÁLINT, 1993 – C-Pe.
Itylos fumosus (BALLETTO, 1993) – C-Pe.
Itylos mashenka (BÁLINT, 1993) – C-Pe.

Glaucopsyche Section

Philotes SCUDDER, *1876*

The genus is diversified both in the Nearctic and Palaearctic region (D'ABRERA 1993). Some workers (cf. MATTONI 1977) splits the entity into several genera. One species widely distributed in North America and one species endemic for the Sonoran region weakly extend into the northern part of the Neotropical Realm.

Diversity

Philotes sonorensis (FELDER & FELDER, [1865]) – Mex.
Philotes battoides (BEHR, 1867) – Mex.

Nabokovia Section

Cyclargus NABOKOV, 1945

The genus contains eight species endemic to the Caribbean region. One species, *C. thomasi* also occurs in the Florida Keys as well as Central America (BÁLINT 1995*b*).

Pseudochrysops NABOKOV, 1945

The genus was described as monotypic, restricted to Haiti. Additional populations of closely related taxa have since been found on several other Caribbean islands and very recent revision suggests the several island endemics are best considered allopatric species (JOHNSON and BÁLINT 1995).

Echinargus NABOKOV, 1945

The genus is Transamerican having three taxa. One, *E. isola*, is a well-known species widespread in North and Central America and vagrant as far south as Venezuela (BÁLINT 1995*b*). *E. huntingtoni* is widely distributed in the Caribbean region and adjacent coastal areas of Central and South America. A little known high Andean entity, *E. martha*, was historically misinterpreted for many years (cf. BRIDGES 1988:I.215 and BÁLINT 1993*a*: 16 – both overlooked NABOKOV 1945*b*). It has since been found to typify high montane Ecuador and Peru (JOHNSON and BÁLINT 1995).

Nabokovia HEMMING, 1960

The genus is a high Andean endemic composed of three species. One is widely distributed, the other recently described and known only from the Coquimbo region of Central Chile, an area well known for its endemic biota (BÁLINT and JOHNSON 1993*b*, 1994*a*). The third one is still undescribed and exclusively known from the Cuzco region (BÁLINT and LAMAS, *in prep.*)

Eldoradina BALLETTO, 1993

A high Andean endemic genus comprised of two sister species. *E. cyanea* is known from high elevations of the western Andean region; *E. sylphis*, known from only five specimens, occurs at the edge of the altiplano of south-central Peru (BÁLINT 1995*b*, BÁLINT and LAMAS *in prep.*).

Diversity

Cyclargus ammon (LUCAS, 1857) – W-Ind.
Cyclargus erembis NABOKOV, 1948 – W-Ind.
Cyclargus thomasi (CLENCH, 1941) – W-Ind.
Cyclargus bahamensis (CLENCH,, 1943) – W-Ind.
Cyclargus dominica (MÖSCHLER,1886) – W-Ind.
Cyclargus kathleena JOHNSON & MATUSIK, 1992 – W-Ind.
Cyclargus sorpresus JOHNSON & MATUSIK, 1992 – W-Ind.
Pseudochrysops bornoi (COMSTOCK & HUNTINGTON, 1943) – W-Ind.
Echinargus isola (REAKIRT, [1867]) – Mex, CA, CM, Col.
Echinargus martha (DOGNIN, 1887) – Ec, N-Pe, C-Pe, S-Pe, Bol.
Echinargus huntingtoni RINDGE & COMSTOCK, 1953 – CA, Col.
Nabokovia faga (DOGNIN, 1887) – Ec, N-Pe, C-Pe, S-Pe, Bol, Arg, Chi.
Nabokovia ada BÁLINT & JOHNSON, 1993 – Chi.
Nabokovia sp. n. – S-Pe.
Eldoradina cyanea (BALLETTO, 1993) – N-Pe, C-Pe.-Ind.
Eldoradina sylphis (DRAUDT, 1921) –C-Pe, S-Pe.

Polyommatus Section

Pseudolucia NABOKOV, 1945

Generally endemic to the southern high Andean region and austral South America but with a vicariant isolate in southeastern Brazil. Our recent investigations documented a vast austral diversity for this genus. The latter may be traceable to ancient vicarisms of habitat, ecology and foodplant biology since, today, relatively small geographic regions support large numbers of sympatric and synchronic species (BÁLINT and JOHNSON 1993*a*, 1995*c*,*d*). New species are still frequently discovered (BENYAMINI, *pers. comm.*).

Plebejus KLUK, 1802

The genus, minutiously splitted by the Europen tradition (see most recently TUZOV 1993) is widely distributed and very diverse in the Holarctic. The most common North American species weakly extends into the northern part of the Neotropical Realm.

Madeleinea BÁLINT, 1993

Endemic to the high Andean region (from montane Colombia to the Salta region of Argentina). Three species groups include more than fifteen total species (BÁLINT 1993*a*, BÁLINT and JOHNSON 1995*a*) and new species are frequently discovered (BÁLINT and LAMAS, *in. prep.*).

Paralycaeides NABOKOV, 1945

The taxon is endemic to the high Andean region (Peru, eastern Bolivia, northwestern Argentina and northeastern Chile). Two species groups of four species are recognized. One species (*P. vapa*) is widely distributed, occurring southward to the Catamarca region of Argentina (BÁLINT 1993*a*, BÁLINT and JOHNSON 1995*f*).

Diversity

Pseudolucia collina (PHILIPPI, 1859) – Chi.
Pseudolucia sp.n. – Chi (coast).
Pseudolucia charlotte BÁLINT & JOHNSON, 1993 – Arg., Chi., Pat.
Pseudolucia vera BÁLINT & JOHNSON, 1993 – Pat.
Pseudolucia chilenis (BLANCHARD, 1852) – Chi.
Pseudolucia parana BÁLINT, 1993 – E-Bra.
Pseudolucia lyrnessa (HEWITSON, 1874) – Chi.
Pseudolucia sp.n. – Arg (Mendoza).
Pseudolucia sp.n.– Arg (Salta).
Pseudolucia sp. n. – Pat.
Pseudolucia lanin BÁLINT & JOHNSON, 1993 – Pat.
Pseudolucia patago (MABILLE, 1899) – Tdf.
Pseudolucia grata (KÖHLER, 1934) – Pat.
Pseudolucia plumbea (BUTLER, 1881) – Chi.
Pseudolucia hazeorum BÁLINT & JOHNSON, 1993 – Chi.
Pseudolucia sp. n. – Chi.
Pseudolucia sp. n. – Pat.
Pseudolucia annamaria BÁLINT & JOHNSON, 1993 – Chi.
Pseudolucia clarea BÁLINT & JOHNSON, 1993 – Chi.
Pseudolucia scintilla (BALLETTO, 1993) – Chi.
Pseudolucia andina (BARTLETT-CALVERT, 1894) – Chi.

Pseudolucia sp.n. – Chi.
Pseudolucia sp. n. – Chi.
Pseudolucia sp.n. – Pat.
Pseudolucia sp.n. – Tdf.
Pseudolucia argentina (BALLETTO, 1993) – Arg, Chi.
Pseudolucia sp.n. – Arg.
Pseudolucia sibylla (KIRBY, 1871) – Chi.
Pseudolucia penai BÁLINT & JOHNSON, 1993 – Chi.
Pseudolucia oligocyanea (URETA, 1956) – Chi.
Plebejus acmon (WESTWOOD, [1852]) – Mex.
Madeleinea lolita BÁLINT, 1993 – N-Pe.
Madeleinea huascarana BÁLINT & LAMAS, 1994 – N-Pe.
Madeleiena sp. n. – C-Pe.
Madeleinea pacis (DRAUDT, 1921) – C-Pe, S-Pe, Bol, Chi.
Madeleinea cobaltana BÁLINT & LAMAS, 1994 – C-Pe.
Madeleinea sp. n. – C-Pe.
Madeleinea pelorias (WEYMER, 1890) – S-Pe, Chi.
Madeleinea ludicra (WEYMER, 1890) – S-Pe, Chi.
Madeleinea moza (STAUDINGER, 1894)– Bol, Arg, Chi.
Madeleinea sp.n. – C-Pe.
Madeleinea koa (DRUCE, 1896) – Ec, N-Pe, C-Pe.
Madeleinea nodo BÁLINT & JOHNSON, 1995 – Col, Ec.
Madeleinea carolityla BÁLINT & JOHNSON, 1995 – Ec.
Madeleinea vocoban BÁLINT & JOHNSON, 1995 – Ec.
Madeleinea odon BÁLINT & JOHNSON, 1995 – Ec.
Madeleinea sp. n. – C-Pe.
Paralycaeides shade BÁLINT, 1993 – C-Pe.
Paralycaeides inconspicua (DRAUDT, 1921) – C-Pe, S-Pe.
Paralycaeides hazelea BÁLINT & JOHNSON, 1995 – S-Pe.
Paralycaeides vapa (STAUDINGER, 1894) – S-Pe, Bol, Arg, Chi.

DISTRIBUTIONAL PATTERNS

Considering the information above, two Sections of Polyommatiti (the *Itylos* Section and *Nabokovia* Section) prove entirely Neotropical. Another, the mainly Holarctic *Polyommatus* Section has only the genus *Plebejus* in the Holarctic [perhaps the ancient one?], reminiscent of the "camelid scenario" noted by (SHAPIRO 1991: 195) in his commentaries on the Pieridae.

The *Itylos* Section contains two taxa: *Hemiargus* and *Itylos*. Within *Hemiargus, H. hanno* is one of the most common lycaenid butterflies in the New

World tropical lowlands. Its ancestral population appears to have vicariated into two regionally prominent allopatric Andean species (*H. bogotanus*, Colombia; *H. ramon*, western Andes) probably as a result of the Andean uplift. Similarly, the sister genus *Itylos* is entirely high Andean with one widely distributed, and four stenochorous species. Species of this genus lack the genital sagum, thus suggesting that both the distribution and the apparent character reversal are apomorphic. If true, *Itylos* represents another autochthonous high Andean lycaenid clade (along with numerous Eumaeini hairstreak lineages demonstrated to date) evolved from the lowland Neotropical fauna, not an ancestry from the north.

The *Cupido, Lycaenopsis* and *Glaucopsyche* Sections are very weakly represented in the Neotropical Realm with the location of their elements suggesting relatively recent incurrence from the north. This is consistent with numerous lineages of the Eumaeini which, particularly in recent studies from Colombia (MUS. NAT. HIST. COLOMBIA 1995) have major elements in Central America and sometimes Mexico along with northern South American occurrences in Colombia near the Panamanian isthmus. Colombian elements of many of these lineages appear to have been overlooked before due to sampling error or simply lack of taxonomic study. In addition, *Lycaenopsis* is also represented by an additional genus in southeastern Brazil, suggesting remarkable antiquity (BÁLINT and JOHNSON 1995*g*) – a situation paralleled in polyommatines by the genus *Pseudolucia* (see below).

Two Palaeotropical Sections are represented in the Neotropics and their African affinities are conspicuous. Now that *Leptotes* has been studied in detail (BÁLINT and JOHNSON 1995*b*), its Neotropical diversity is comparable to that of the other biogeographic regions. In addition, as had been noted by workers as early as CLENCH (1963 [1964]) all the Neotropical species groups appeared closely related to African congeners (BÁLINT and JOHNSON 1995*b*). By comparison, the *Zizeeria* Section shows far less representation in the Neotropical Realm. Its genus *Brephidium* is morphologically so close to African [monotypic] *Oraidium* and they are perhaps best considered synonyms (BÁLINT, unpublished). The genus *Zizula* is not greatly informative since its wide distribution is generally regarded as a result of dispersal (see ROBBINS and SMALL 1981). Neotropical records of *Zizeera oxleyi* (all rather old) would be of great geographic curiosity; however, these are widely regarded as mislabelled specimens (BÁLINT 1993*b*).

The *Nabokovia* Section offers other example of polyommatine lineages originating from the lowland Neotropics and successfully invading the high Andes. The Section is readily subdivided as two infratribes: *Pseudochrysopsina* and *Nabokovina*. The former one is strictly Caribbean while the latter group is continental. Characters suggest the Caribbean assemblage is the older lineage, retaining a restricted insular distribution. *Echinargus*, which appears to be an ecological generalist, has the widest range in the Section, well adapted to both temperate and tropical lowlands as well as the high Andes. In this latter region, it is sympatric with the autochthonous genera *Nabokovia* and *Eldoradina*.

The biogeographic histories of *Eldoradina* and *Nabokovia* are still the least clear. It appears probable that they represent the same lineage, but the significant differences in many of their unique characters suggest the possibility of undiscovered or extinct sisters. The view that *Eldoradina* and *Nabokovia* are probably from the same ancestry gains support by their both appearing to be the sister group of *Echinargus*.

The *Polyommatus* Section is by far the most diverse polyommatine entity (see above) in the Neotropics suggesting that its many species are among the most successful in oreal habitats. Both the genera *Madeleinea* and *Pseudolucia* are particularly diverse in relatively small geographic regions with large numbers of sympatric and synchronic taxa (particularly among *Pseudolucia* in the austral region). The presence in *Pseudolucia* of the distinctive austral entity *P. chilensis*, with its southeastern Brazilian sister *P. parana*, suggests an ancient element. This species couplet is probably the plesiotype of the *Pseudolucia* clade, thus explaining the numerous isolated characters (*e.g.* synplesiomorphies) which, if not viewed in a cladistic context, might otherwise be thought to exclude it from the clade.

Of all the Neotropical polyommatines, the genera *Paralycaeides* and *Madeleinea* appear to be the two South American entities showing a distinctive northern affinity (to the widely distributed and diverse northern genus *Plebejus*). This makes the *Polyommatus* Section ancient enough to have both trans-Panamanian affinities as well as auctochtonous South American elements. This appears to parallel the situation in the widespread Eumaeini infratribe Strymonina, (wherein, within an overall multi-generic worldwide clade, South America has produced several autochthonous lineages). Given the African affinities of *Leptotes* Section, the relations of *Paralycaeides* and *Madeleinea* are not at all surprising and the fruit of future cladistic comparisons (once all terminal taxa are available and can be viewed purely as trees of sister taxa), should be one of great interest here.

SUMMARY

We have documented that, contrary to traditional views in lepidopterology, only a very low percentage of the Neotropical polyommatine fauna appears descendant from elements of the Nearctic or Holarctic biota.

High Andean components of the Neotropical Polyommatiti (*Nabokovia*, *Eldoradina* and *Itylos*) are distinctive autochtonous South American entities with their apparent sister taxa also restricted to the Neotropical fauna (in two cases groups prominent in the Caribbean region). Although these sister group relations occur within the Neotropical Realm, the degrees of distinction between assemblages are remarkable, sister relations among higher taxa being discernable but each group also showing outstanding unique characters. If a cladistic analysis will be available other major elements of the Neotropical fauna (like *Pseudolucia* and a still undescribed genus – BÁLINT and JOHNSON 1995*g*) will show northward affinities at the infratribal level and only two genera, *Paralycaeides* and *Madeleinea* will have a sister relationship northward within their infratribe.

Of the two possible explanations for these data: that the Neotropical oreal biota is far older than once presumed, or that divergence of these lineages has been faster than in other parts of the world, surely the first is most parsimonious, as well as most palatable. Elements of this view: antiquity of the high Andean fauna, antiquity of the Caribbean fauna, and the reality of African connections, have an all too familiar "ring" among entomologists who in recent years have studied various groups in a cladistic and vicariant context.

An older-than-previously-assumed Polyommatini is favored by lowland Neotropical affinities of the autochthonous high Andean and austral South American genera, suggesting they reflect the Andean uplift. It is also favored by the new evidence concerning genera of more farflung affinities: *Pseudolucia* as the likely sister group of Nearctic members of the *Polyommatus* Section and appearance of a southeast Brazilian endemic in the *Lycaenopsis* Section (BÁLINT and JOHNSON 1995*g*). Elements of these sister relationships do not fit the traditional view of recent north/south species level affinities. Rather, *Pseudolucia* is rich in sympatric and synchronic species across the southern high Andes and austral South America (including a basal furcation with unique austral and montane south Brazilian sister taxa). North/south sister relations among the polyommatines are among the higher taxa not between species, as most often characterized the comparisons of north/south congeneric "sisters" in the past (e.g. BROWN 1942, GILLHAM 1956, DESCIMON 1986).

This possibility of older relations offers a rich context in which to comprehend African, Caribbean, oceanic island, and trans-Panamanian affinities reflected among the higher categories of Polyommatini. Although, this view still needs a more comprehensive development, it should not, hereafter, be considered new or novel. The Caribbean butterfly fauna has already been queried as to its antiquity (MILLER and MILLER 1989) as have the faunas of the high Andes and austral regions (SHAPIRO 1991, 1992 [1994]). New data and discussion concerning the Neotropical Polyommatiti, such as put forward in the present paper, at least point the way toward understanding of the Neotropical fauna in an accurate context of diversity.

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ON THE TAXONOMY OF THE GENERA HIMALISTRA HACKER & RONKAY, 1993, AND ESTAGROTIS NYE, 1975 (LEPIDOPTERA, NOCTUIDAE)*

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New taxa of the genera *Himalistra* (*H. dimorpha* sp. n. and *H. simillima* sp. n. from Nepal) and *Estagrotis* (*E. benescripta* sp. n., W Nepal; *E. benescripta rai* ssp. n., E Nepal; *E. gemina* sp. n., Tibet and *E. canescens tibetana* ssp. n., Tibet) are described. With 49 figures.

Key words: new species, *Himalistra, Estagrotis*, Xylenini, Noctuidae, Himalayan region

INTRODUCTION

The third part of the series on the taxonomy and zoogeography of the *Himalistra–Estagrotis* generic complex contains the results of the further investigations on the new material collected by five different expeditions between September 1994 and May 1995 in Nepal and Tibet and the historical specimens preserved in the collection of The Natural History Museum, London (BMNH).

The newly discovered *Himalistra* species were captured in the springtime, together with the overwintering specimens of *Himalistra hackeri* HREBLAY & RONKAY, 1995 but no overwintering *Estagrotis* imagines or the members of the *Himalistra propria* species-group were found although the type localities of these taxa had repeatedly been visited during this year and the mid-March was the very early spring in those localities, indeed. One of the possible explanations would be that the overwintering strategies of the species-groups within these genera are different, but further field work is required to confirm this statement.

The descriptions of the new taxa and the description of the formerly unpublished female of *Himalistra hackeri* HREBLAY & RONKAY, 1995 are given hereunder.

Abbreviations: BMNH – The Natural History Museum (formerly British Museum, Natural History), London; HNHM – Hungarian Natural History Museum, Budapest.

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* Part III.

NEW SPECIES OF THE GENUS HIMALISTRA HACKER & RONKAY, 1993

Himalistra dimorpha HREBLAY & RONKAY sp. n.

(Figs 1–5, 25–33)

Holotype: Male, "Nepal, Ganesh Himal, 2 km E of Yurekharka, 3000 m, 5. IV. 1995, 85°15'E, 28°10'N, leg. M. HREBLAY & L. NÉMETH". Slide No. 7489 HREBLAY (coll. M. HREBLAY, Érd, Hungary, deposited in coll. HNHM Budapest).

Paratypes: Nepal, Ganesh Himal: 6 males, 18 females with the same data as the holotype; 2 males, 23 females, 1 km SE of Somdang, 3300 m, 7. IV. 1995, 85°13'E, 28°11'N; 3 females, 3 km SE of Somdang 3450 m, 6. IV. 1995, 85°13'E, 28°11'N; 1 female, 1 km E of Gadrang 2520 m, 3–4. IV. 1995, leg. M. HREBLAY & L. NÉMETH; 2 males, 7 km W Godlang, 2950 m, 85°14'E, 28°10'N, 18. III. 1995, leg. GY. M. LÁSZLÓ and G. RONKAY; 2 females, Gothan, 3100 m, 85°12'E, 28°09'N, 9–10. V. 1995; 1 female, Khurpudanda Pass NO slope, 36–3700 m, 85°12'E, 28°10.5'N, 12–16. V. 1995, leg. GY. FÁBIÁN and L. RONKAY; 1 female, Yurekharka, 3400–3500 m, 85°12,5'E, 28°10'N, 11.V.1995, leg. GY. FÁBIÁN and L. RONKAY. Nepal, Annapurna Himal: 1 male, 1 km E of Ghorepani, 2900 m, 21–22. III. 1995, 83°42'E, 28°24'N, leg. M. HREBLAY & L. NÉMETH (the specimens are deposited in the collections of the collectors and the HNHM Budapest).

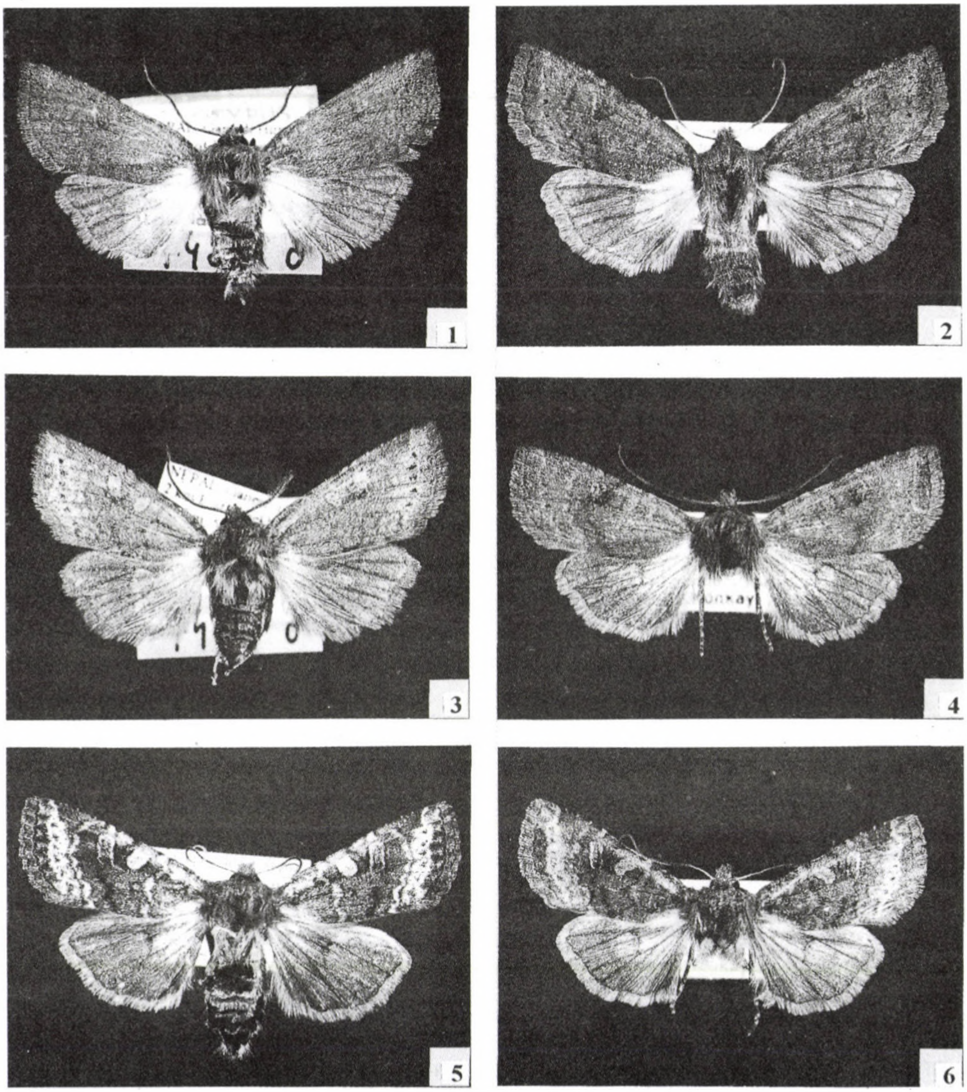
Slide Nos: 7380, 7421, 7491, 7493, 7497, 7603 HREBLAY, 5193, 5194 RONKAY (males), 7415, 7416, 7431, 7433, 7488, 7494, 7602 HREBLAY, 206, 5209 RONKAY (females).

Diagnosis: The species is characteristically dimorphic, like *H. hackeri* HREBLAY & RONKAY, 1995, and some *Conistra (Dasycampa) species*, e.g. *erythrocephala* ([DENIS & SCHIFFERMÜLLER], 1775). The "glabroid" forms are easily recognizable by their very contrasty ochreous-whitish pattern on dark red-brown or chestnut-brown ground colour, the specimens of the pale form are similar to the light specimens of *H. obscura* HREBLAY & PLANTE, 1995, but their hind wing is much paler, more translucent, the fore wings are more ochreous or brownish and the pattern is more indistinct. The pale form of *H. dimorpha* sp. n. is similar also to *H. simillima* sp.n., their differences are discussed in the diagnosis of the latter new taxon.

The male genitalia show conspicuous differences as compared with all species of the genus, appearing as a "composition of features" of their relatives (see Figs; HACKER & RONKAY 1993; HREBLAY *et al.* 1995) The uncus is *obscura*- or *hackeri*-like, the fultura is most similar to that of *fusca* HACKER & RONKAY, 1993. The shape of valva and costal plate resemble those of the *H. propria–rubida–aristata* – line or a bit to *obscura*, the harpe-complex is *aristata*– or *rubida*-like. The aedeagus and the vesica shows closer similarity to *obscura* but the basal diverticulum is longer, this diverticulum and distal part of the basal area of the main tube are almost spineless and the posterior half of the vesica is more tubular, more reclinate.

The female genitalia of *dimorpha* display affinity with *extera* and *hackeri* (see Figs 31–39 and HACKER & RONKAY 1993, Fig. 25d) by the presence of a sclerotized plate in the intersegmental zone of the ovipositor, but this plate is small, round, the ostial plate is much broader, shorter, the ductus bursae is longer, the cervix bursae is larger and their sclerotization is stronger than those of the two relatives.

Description: Wingspan 36–38 mm (males), 36–39 mm (females), length of fore wing 15–17 mm. Head, thorax and fore wing variably dark ochreous- or red-brown, irrorated with dark brown scales; fore wings of males more elongated with apex more acute. Pale form (including the holotype): fore wing more or less unicolorous, wing pattern often obsolete, crosslines double, sinuous, darker brown filled with ochreous brown or with ground colour, subterminal line regularly defined



Figs 1–6. 1–5 = *Himalistra dimorpha* sp. n.: 1 = holotype male, 2 – 5 = paratype females. 6 = *Himalistra* sp., female, Ganesh Himal

by small, darker brown or blackish, spot-like arrowheads. Orbicular stigma usually less visible, small, rounded, reniforn high, narrow, encircled with darker brown, filled, at least at lower half, with grey. Terminal line fine, greyish, defined with ochreous; cilia most often unicolorous. Hind wing pale, slightly translucent grey-brown, veins darker, shadows of discal spot and transverse line also recognizable. Well-marked ("glabroid") form: fore wing colouration and pattern resembling strongly *Conistra erythrocephala* ([DENIS & SCHIFFERMÜLLER], 1775) f. *glabra*, usually dark reddish-brown or chestnut-brown, elements of pattern sharp, subterminal line, fillings of ante- and postmedial crosslines and stigmata ochreous-whitish, inner area of marginal field also often suffused with ochreous-whitish. Underside of both forms pale ochreous grey, intensity of darker grey suffusion in fore wing inner area variable, much stronger in glabroid form. Transverse line and discal spot more or less visible on both wings, paler in light form, rather conspicuous in darker specimens.

Male genitalia (Figs 25–30): Uncus strong, short, broad, with strong dorsal crest and long apical hook. Tegumen low, broadly triangular, penicular lobes small. Fultura inferior large, sclerotized, with strong, broad apical arms and with small, erected, tongue-shaped process at middle. Vinculum short, rounded. Valva slender, elliptical, cucullus rounded, sacculus short, clavus reduced. Harpe relatively strong, bifurcate, dorsal arm longer, with flattened, rounded apical part, ventral arm short, slender, spiniform. Costal plate heavily sclerotized, discally broadened, with numerous small, marginal spines of variable shape and size. Aedeagus short cylindrical, ventral extension of carina rounded. Vesica broad, tubular, subbasal diverticulum short, bearing a minute cornutus. Basal and proximo-lateral parts of vesica covered with numerous relatively long spinules, being shorter ventrally. Ventral side of vesica armed with a small cornuti field at middle only, consisting of small, fine spinules. Terminal part has a distinct, small field of fine spiculi.

Female genitalia (Figs 31–33): ovipositor short, apophyses weak; intersegmental area with a small, rounded, sclerotized lamina on ventral side. Ostium bursae well sclerotized, ventral lamina a flattened plate, dorsal lamina broad, short, quadrangular. Ductus bursae broad, cervix bursae rounded, spacious, inner surfaces with short crests and folds. Corpus bursae membranous, sacculiform.

Distribution: Central Nepal.

Himalistra simillima HREBLAY & RONKAY, sp. n.
(Figs 7–12, 37–39)

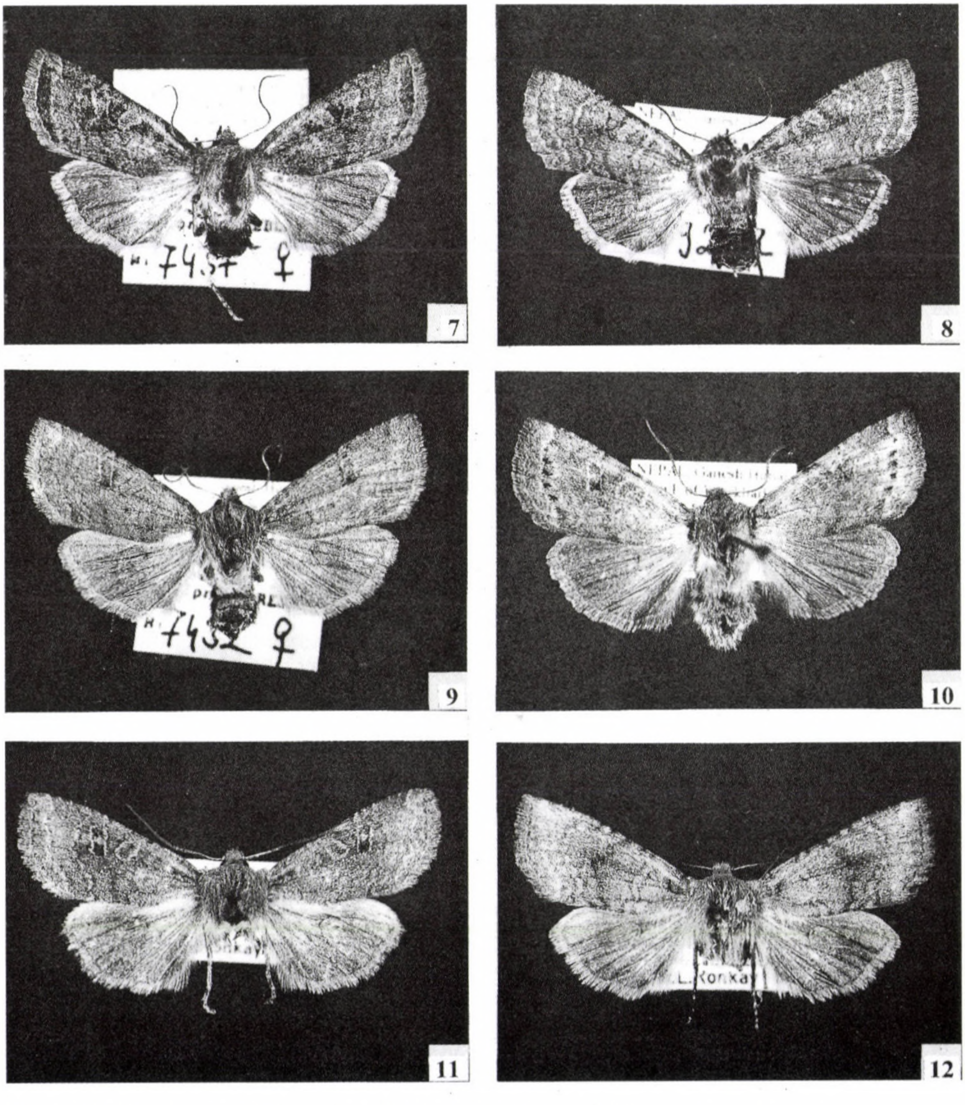
Holotype: female, "Nepal, Ganesh Himal, 1 km SE of Somdang 3300 m, 7. IV. 1995, 85°13'E, 28°11'N, leg. Márton Hreblay & Lajos Németh". Slide No. 7487 HREBLAY (coll. M. HREBLAY, Érd, Hungary, deposited in coll. HNHM Budapest).

Paratypes: Nepal, Ganesh Himal: 2 females from the same locality and data as the holotype; 5 females, 2 km E of Yurekharka, 3000 m, 5. IV. 1995, 85°15'E, 28°10'N; 1 female 3 km SE of Somdang 3450 m, 6. IV. 1995, 85°13'E, 28°11'N). Nepal, Annapurna Himal: 1 female, 1 km E of Ghorepani, 2900 m, 83°42'E, 28°24'N, 21–22. III. 1995, leg. M. HREBLAY & L. NÉMETH; 1 female, Ghorepani, 2800 m, 83°42.5'E, 28°23.5'N, 2–3. IV. 1995; 1 female, Deorali, 3150 m, 83°43'E, 28°23.5'N, 4. IV. 1995, leg. GY. M. LÁSZLÓ and G. RONKAY. The specimens are deposited in the collections of the collectors and the HNHM Budapest.

Slide Nos 7432, 7438, 7465, 7487, 7492 HREBLAY, 5196, 5197 RONKAY.

Diagnosis: The new species is a member of the *carnea* (HAMPSON, 1907) – *obscura* HREBLAY & PLANTE, 1995 lineage, externally similar also to the pale forms of *H. dimorpha* sp. n. The correct identification of the specimens belonging to this line requires the study of the genitalia. The three species of the species-group differ in the shape and size of the ventral extension of ostium bursae (see HACKER & RONKAY 1993; HREBLAY *et al.* 1995, Table 2. and Fig. 28), *H.*

simillima sp. n. has the smallest (shortest and most slender), apically more angular extension. The shape of cervix bursae shows also differences, as the new species has the cervix rounded, not conical or subconical as in *H. carnea* and *H. obscura*. The specimens of *H. simillima* sp. are easily distinguishable from the members of the *extera–hackeri–dimorpha* line by the lack of the sclerotized plate of



Figs 7–12. *Himalistra simillima* sp. n.: 7 = holotype female, 8–12 = paratype females

the intersegmental area of the ovipositor and the much larger, flattened ventral extension of the ostial ring (see Figs 31–39).

Description: Wingspan 33–35 mm (holotype 34 mm), length of fore wing 15 mm. Head and thorax ochreous brown, darker than ground colour of fore wing. Fore wing rather short triangular with apex acute, ground colour almost unicolorous, light ochreous- or reddish brown. Wing pattern less sharp, crosslines sinuous, double, usually diffuse, darker brown filled with ochreous, medial line often appears as a dark grey-brown shadow. Subterminal a more or less continuous, waved, ochreous line, defined by some pale (sometimes stronger) arrowheads. Orbicular and reniform stigmata well discernible, former large, rounded or slightly oblique, incompletely encircled with dark brown (and often with ochreous), latter large, with more or less parallel margins, encircled with fine ochreous and brownish lines, filled with plumbeous grey, at least at lower half. Terminal line fine, brown, defined with ochreous, cilia regularly unicolorous. Hind wing dark grey-brown, veins even darker. Transverse line and discal spot absent or weak, terminal line dark brown, cilia orange-ochreous. Underside of wings ochreous-whitish, intensely irrorated with darker grey. Veins covered with brown, transverse lines diffuse but visible, discal spots small, dark with lighter centres.

Female genitalia (Figs 37–39): Ovipositor short, gonapophyses weak. Ostium bursae well sclerotized, ventral lamina a bell-like plate, dorsal lamina broad, short, elliptical. Ductus and cervix bursae broad, inner surfaces with short crests and folds. Corpus bursae membranous, spacious, sacculiform.

Distribution: Central Nepal.

The female of *Himalistra hackeri* HREBLAY & RONKAY, 1995

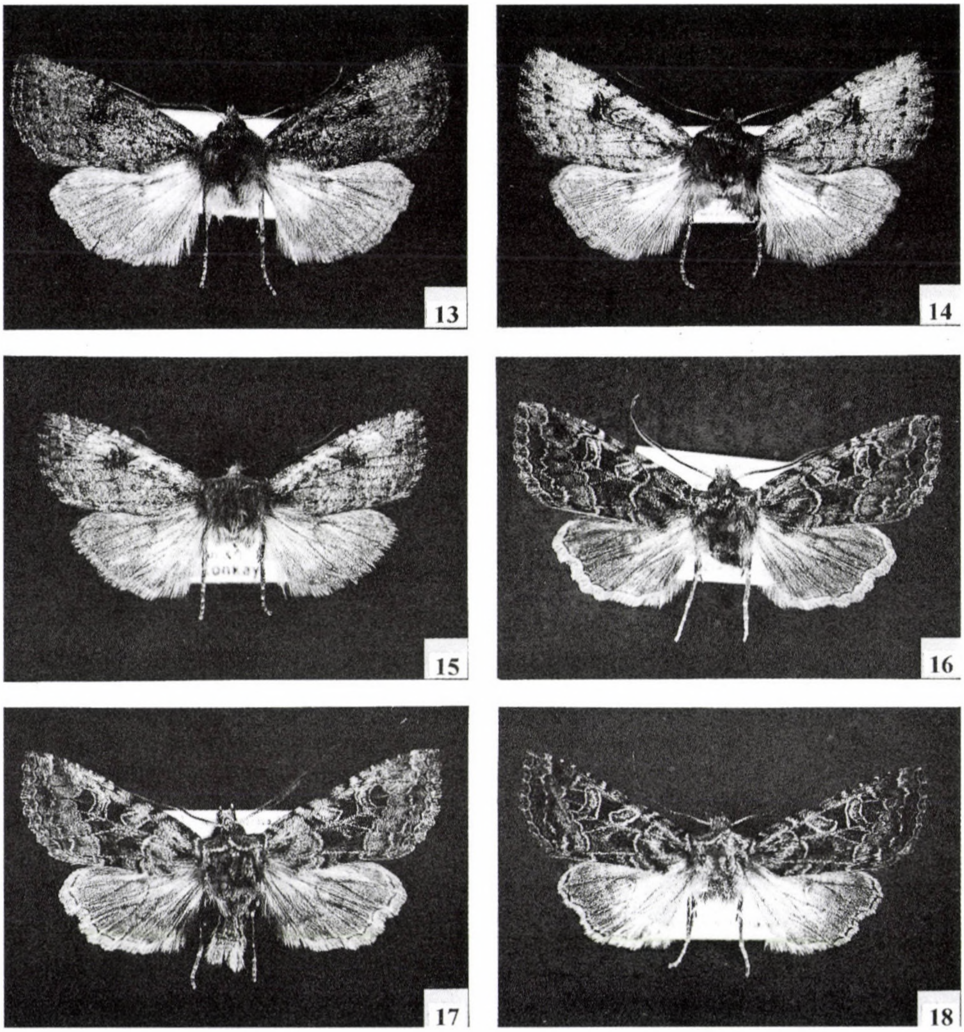
Material examined: a large series of about 200 specimens from the following localities from Nepal: Ganesh Himal: 1 km SE of Somdang, 3300 m, 7. IV. 1995, 85°13'E, 28°11'N; 3 km SE of Somdang 3450 m, 6. IV. 1995, 85°13'E, 28°11'N; 1 km E of Gadrang 2520 m, 3–4. IV. 1995; 7 km W Godlang, 2950 m, 85°14'E, 28°10'N, 18. III. 1995; Gothan, 3100 m, 85°12'E, 28°09'N, 9–10. V. 1995; Khurpudanda Pass NO slope, 36–3700 m, 85°12'E, 28°10.5'N, 12–16. V. 1995; Yurekharka, 3400 m. Annapurna Himal, 1 km E of Ghorepani, 2900 m, 21–22. III. 1995, 83°42'E, 28°24'N; Ghorepani, 2800 m, 83°42.5'E, 28°23.5'N, 2–3. IV. 1995; Deorali, 3150 m, 83°43'E, 28°23.5'N, 4. IV. 1995. The specimens were collected by GY. FÁBIÁN, M. HREBLAY, GY. M. LÁSZLÓ, L. NÉMETH, G. RONKAY and L. RONKAY, and are deposited in the collections of the collectors and the HNHM.

The species was described by two male specimens collected in the late September, last year. The new expeditions found the overwintering specimens of both sexes in relatively large numbers. It can be stated that the species shows no conspicuous sexual dimorphism but the apex of fore wing is less acute in the females. The two colour forms appear in both the males and the females, the light, more vividly coloured form was more frequent in the females.

The study of the female genitalia revealed the close relationships between *H. extera* and *H. hackeri*, they can be considered as allopatric siblings. The female genitalia of *hackeri* are illustrated in Figs 34, 35, those of *extera* in HACKER and RONKAY (1993). They differ in the shape and size of the intersegmental plate (smaller, weaker in *hackeri*) and the ostial plate (broader, shorter in *hackeri*). In addition, there is a folded, narrow extension on the proximal part of the ostial ring originating from the ventral plate of the anterior papillae anales.

Female genitalia (Figs 34–35): Ovipositor short, apophyses weak. Sclerotized intersegmental lamina small, rounded. Ostium bursae well sclerotized, ventral lamina a flattened plate, dorsal lamina broad, elliptical. Ductus bursae broad, inner surfaces with short crests and folds. Cervix bursae relatively small, rounded, inner surface granular. Corpus bursae membranous, sacculiform.

It is worth mentioning that another undescribed species was discovered in the Ganesh Himal, belonging to this species-group (Fig. 6.). As the species is rep-



Figs 13–18. 13–15 = *Himalistra hackeri* HREBLAY & RONKAY, Ganesh Himal: 13 = male, 14–15 = females. 16–17 = *Estagrotis benescripta* sp. n., 16 = holotype male, 17 = paratype male. 18 = *Estagrotis benescripta* ssp.?, female, Nepal, Langtang

resented by a single female only, we desist to describe it in the hope to get additional material from the autumnal period.

THE GENUS ESTAGROTIS NYE, 1975

The genus *Estagrotis* represents the sister genus of *Himalistra.* The five known species belong to three different lineages which are often surprisingly dissimilar externally but the genitalia of the related species are very close. The two related genera show a rather different picture in their speciation and biogeography as most members of the genus *Estagrotis* have a larger area and the externally conspicuously different – and by eyes easily separable – populations display high conformity in the genital morphology, no allopatric species-pairs are known. On the other hand, the lineages have partly overlapping distribution. Oppositely, the genus *Himalistra* contains several lineages showing strict allopatric speciation and only two species (the type species, *H. eriophora* (PÜNGELER, 1901) and *H. fusca* HACKER & RONKAY, 1993) have larger distribution and geographic subspecies.

CHECKLIST

cuprea (MOORE, 1867)
benescripta HREBLAY & RONKAY, sp. n. (W Nepal)
benescripta rai HREBLAY & RONKAY ssp. n. (E Nepal)
canescens HACKER & RONKAY, 1993
canescens tibetana HREBLAY & RONKAY, ssp. n. (Tibet)
plantei HACKER & RONKAY, 1993
gemina HREBLAY & RONKAY, sp. n. (Tibet)

DESCRIPTIONS OF THE NEW TAXA

Estagrotis benescripta HREBLAY & RONKAY, sp. n.
(Figs 16, 17, 40, 43)

Holotype: Male, "NEPAL, Annapurna Himal, near Deorali, 3100 m, 83°43'E, 28°24'N, 5–6. X. 1994, leg. CSORBA & RONKAY". Slide No. 5021 RONKAY, deposited in coll. HNHM Budapest.

Paratypes: Nepal, Annapurna Himal: 11 males from the same locality and from 2 km E Ghorepani, 2900 m, 83°43'E, 28°24'N, 7. X. 1994, leg. G. CSORBA & L. RONKAY. (coll. HNHM Budapest and G. RONKAY).

Slide No. 5020 RONKAY.

Diagnosis: The species shows closer relationships, in spite of their completely different external appearance, with *E. cuprea.* The colouration and wing pattern of the species is unique within the generic complex but the male genitalia show surprisingly great similarity with those of the type species of the genus. The specific differences lie in the shape of the fultura inferior (pentagonal with larger apical process in *benescripta*) and the harpe (the outer extension of it is straight in *benescripta*) and the cornuti fields of the vesica (more extensive in *benescripta*).

Description: Wingspan 35–38 mm (holotype 38 mm), length of fore wing 16–18 mm. Head and thorax dark chocolate- or chestnut-brown, palpi laterally dark brown, frons, vertex, collar and tegulae marked with fine whitish and blackish-brown lines and hairs. Antennae of male finely bipectinate with long cilia. Abdomen rather short, slender, abdominal coremata and dorsal crest absent. Fore wing elongated, narrow triangular with apex acute, outer margin with cilia finely crenulate. Ground colour smooth, shining chocolate-brown with intensive, light red-brown suffusion and a fine cupreous iridescence; basal and costal parts irrorated with rosy-white scales. Wing pattern sharp, subbasal, ante- and postmedial lines fine, double, sinuous, dark brown filled with rosy-white or light red-brown, medial line a narrow, diffuse stripe. Subterminal line whitish grey, fine, sinuous, defined by red-brown on inner and grey on outer side. Orbicular and reniform stigmata large, encircled with whitish and blackish-brown lines and filled with ground colour, claviform a big, rounded spot, filled with dark brown. Terminal line blackish brown, defined with rosy-ochreous, cilia spotted with ochreous. Hind wing shining fuscous, veins and marginal suffusion darker, transverse line and shadow of discal spot more or less visible. Terminal line dark grey, cilia orange-brown. Underside of wings glossy ochreous-grey, irrorated with brownish grey and light red-brown, inner area of fore wing suffused with darker grey. Transverse lines and discal spots clearly visible, latter dark grey with whitish centres.

Male genitalia (Figs 40, 43): Uncus strong, long, apically hooked. Tegumen high, narrow, penicular lobes small, rounded, densely setose; vinculum short, V-shaped. Fultura inferior pentagonal, apical process rounded, knot-like. Valva elongated, cucullus large, apically slightly rounded, corona absent. Sacculus short, clavus reduced. Harpe strong, inner (dorsal) extension short, broad, rounded, outer (ventral) extension long, flattened, apically rounded. Aedeagus short, cylindrical, ventro-lateral extension of carina strong, rounded. Vesica tubular, distally tapering and recurved dorso-laterally, armed with three fields of cornuti. Ventral field narrow, consists of small, thick spinules, dorso-lateral field broader, spiculi thicker, stronger at base and becoming finer distally, terminal field forms a more or less rounded zone of fine, longer, hair-like spiculi.

Distribution: The species has a relatively large but sporadic area along the main chain of the southern Himalaya from the Annapurna region to the Taplejung area close to Sikkim. Three externally different populations are recognized, which are considered as different geographic races. The species occurs along the timber line, at the border zone of the upper *Rhododendron*- and *Rhododendron*-coniferous mixed forests and the subalpine meadows of dense, higher growth.

Estagrotis benescripta rai HREBLAY & RONKAY, ssp. n.

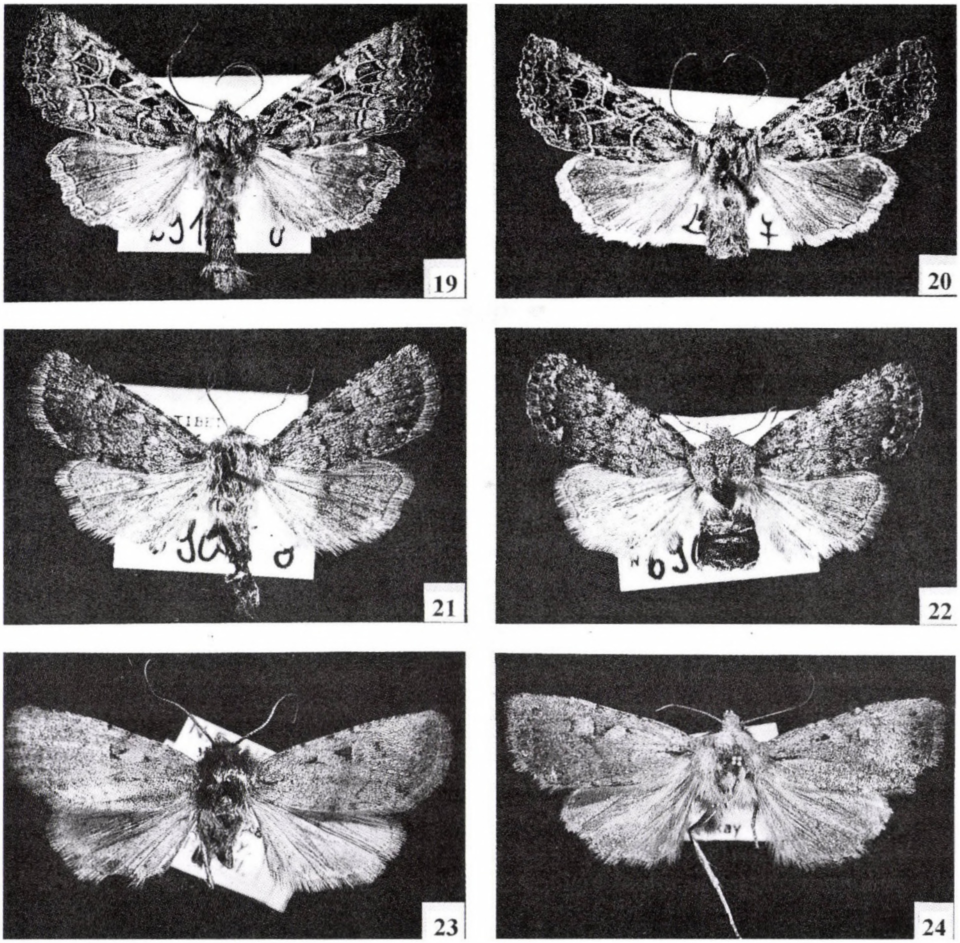
(Figs 19, 20, 41, 44, 47)

Holotype: Male, "Nepal, Taplejung area, Mt. Phathibhara, 3155 m, 13–14. X. 1994, leg. MÁRTON HREBLAY & TIBOR CSŐVÁRI; slide No. HREBLAY: 6919 (coll. Márton HREBLAY, Érd, Hungary, deposited in coll. HNHM Budapest).

Paratypes: 3 males, 1 female, with the data as the holotype (coll. M. HREBLAY, Érd and J. PLANTE, Martigny, Switzerland).

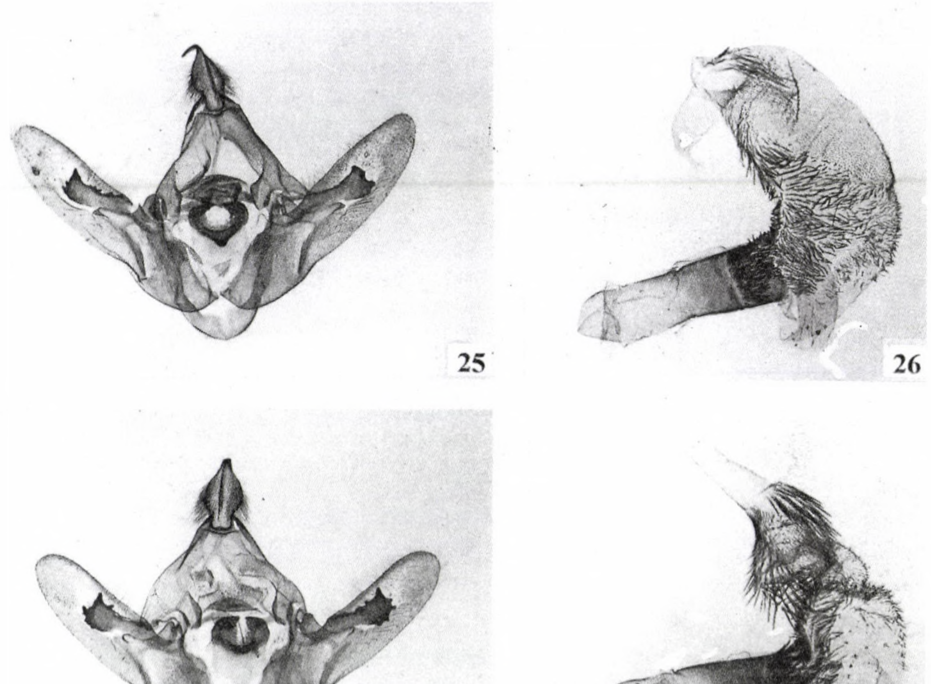
Slide No. 6920 HREBLAY (female).

Diagnosis: the western and eastern races of the species differ conspicuously in the intensity of the fore wing pattern and the shade of colouration of both wings, the shape of the fore wing is also a bit different. The eastern subspecies (ssp. *rai* ssp. n.) has the fore wings somewhat shorter and broader, the ground colour is less shining and smooth, darker brown, without the characteristic red-

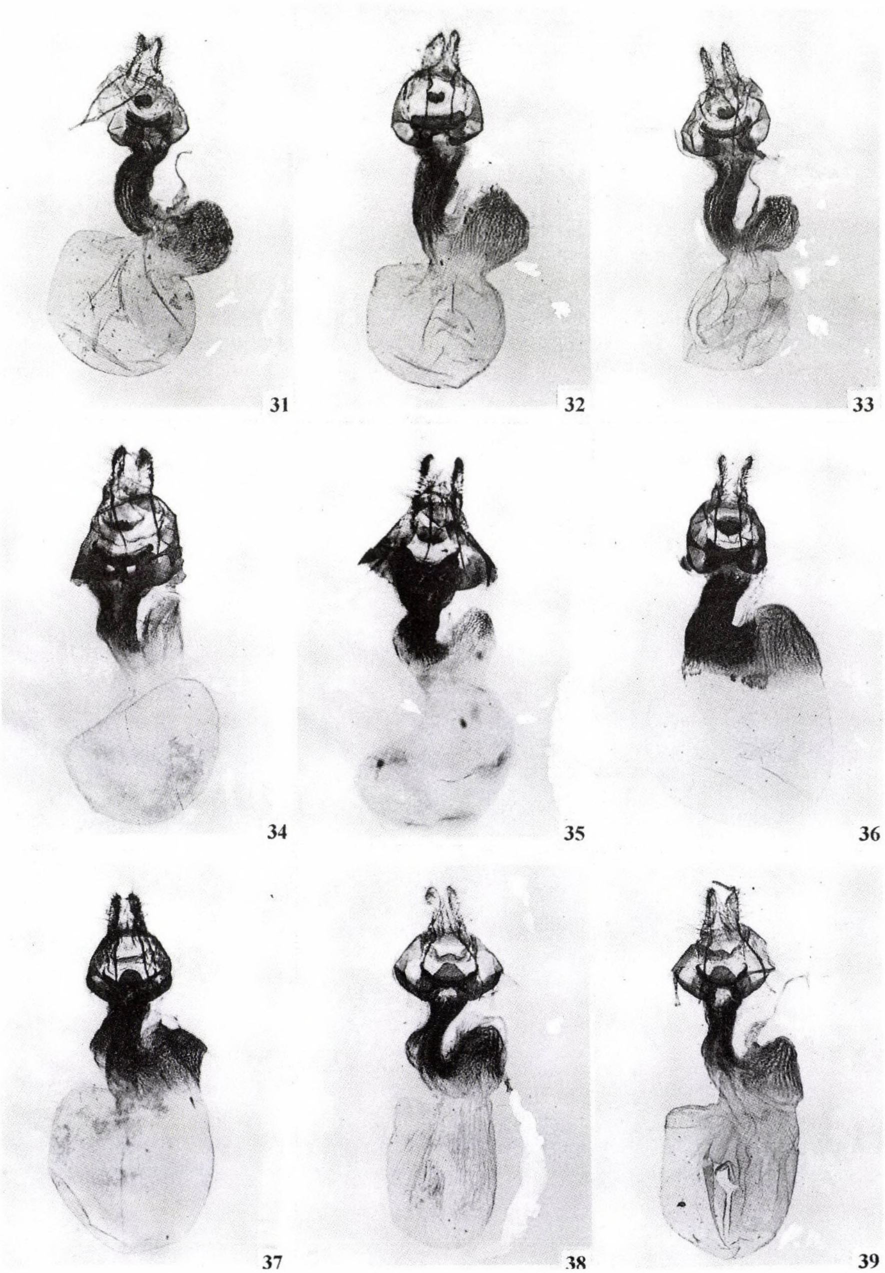


Figs 19–24. 19–20 = *Estagrotis benescripta rai* ssp. n.: 19 = holotype male, 20 = paratype female. 21–23 = *Estagrotis canescens tibetana* ssp. n.: 21 = holotype male, 22–23 = paratype females. 24 = *Estagrotis gemina* sp. n., holotype female

brownish suffusion of the nominotypical subspecies. The fore wing pattern is more contrasty, the intensity of the whitish irroration and filling is much stronger, the subterminal line is regularly interrupted, more sinuous. The hind wing is dar-



Figs 25–30. Male genitalia of *Himalistra dimorpha* sp. n., 25–26 = holotype, 27–30 = paratypes

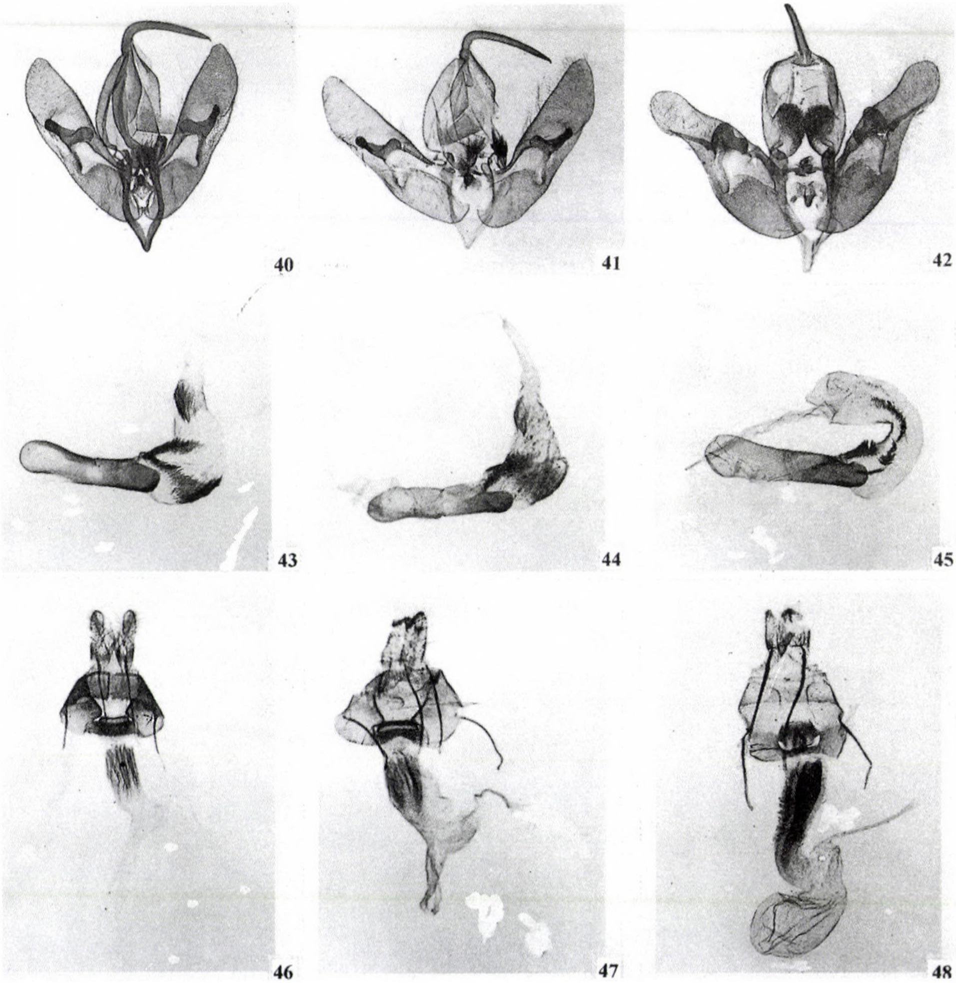


Figs 31–39. Female genitalia of *Himalistra* species. 31–33 = *H. dimorpha* sp. n., paratypes. 34–35 = *H. hackeri* HREBLAY & RONKAY. 36 = *H.* sp., Ganesh Himal. 37–39 = *H. simillima* sp. n., paratypes

ker brown, the cilia are more brownish, not orange; the underside of both wings also have a darker shade.

On the contrary, the genitalia of both sexes show no specific differences, therefore the two taxa are considered here as geographic subspecies.

Here to mention that a single female specimen of the species was collected in the Langtang area (3 km SE Syabru, 2820 m, 85°21'E, 28°07'N, 27.IX.1994, leg. G. CSORBA & L. RONKAY, slide No. 5056 RONKAY), the appearance of which is more close to *E. benescripta rai* ssp. n., only the ground colour is ligh-



Figs 40–48. Genitalia of *Estagrotis* species. 40, 43 = *E. benescripta* sp. n., holotype male; 46 = *E. benescripta* ssp.?, female, Nepal, Langtang; 41, 44 = *E. benescripta rai* ssp. n., holotype male, 47 = same, paratype female; 42, 45 = *E. canescens tibetana* ssp. n., holotype male, 48 = same, paratype female

ter, a bit more reddish (Figs 18, 46). Because of the lack of further material, the subspecific identity of this population has not been determined yet.

As the type series of the nominotypical *E. benescripta* consists of males only, the description of the female genitalia of the species is given here.

Female genitalia (Fig. 47): Ovipositor short, apophyses long, weak. Ostium bursae well sclerotized, ventral lamina a flattened plate, dorsal lamina broad but short. Ductus bursae slender, inner surfaces finely scobinate, with some fine crests. Cervix bursae very small, membranous, corpus bursae membranous, long, narrow.

Estagrotis canescens tibetana HREBLAY & RONKAY, sp. n.

(Figs 21–23, 42, 45, 48)

Holotype: Male, "CHINA, TIBET, 50 km N of Nyalam, 86°00'E, 28°13'N, 4250 m, 29. IX. 1994, Leg. MÁRTON HREBLAY & TIBOR CSŐVÁRI slide No. HREBLAY: 6905 (coll. M. HREBLAY, Érd deposited in coll. HNHM Budapest).

Paratypes: Tibet: 1 female, with the same data as the holotype (coll. J. PLANTE, Martigny); 3 males, 2 females, Phari, 14.300', 6–14. IV. 1924, leg. Major R. W. G. HINGSTON, 19. IX. 1928, leg. F. M. BAILEY (coll. BMNH). India: 1 male, NE India, Kala, 14.500', 15. IX. 1928, leg. F. M. BAILEY (BMNH).

Slide Nos 4445, 4447, 4451, 4452 RONKAY (males) 6906 HREBLAY, 4449, 4450 RONKAY (females).

Diagnosis: The new subspecies differs from the typical population of *E. canescens* HACKER & RONKAY, 1993, by its shorter, somewhat broader fore wings and more brownish fore wings, smaller stigmata and less darkened hind wings.

The male genitalia show no significant differences as compared with the holotype of *E. canescens*, especially the configuration of the vesica is the same, the clasping apparatus shows considerable individual variation. The female genitalia of the species are described below and illustrated for the first time in Fig. 48.

Female genitalia: ovipositor short, weak, gonapophyses moderately long. Ostium bursae sclerotized, dorsal lamina a subrectangular plate with crests around a small, rounded, proximo-medial protuberance; ventral lamina reduced to a narrow ribbon. Ductus bursae elongated, folded, inner surface finely scobinate, outer surface partly gelatinous. Cervix bursae small, conical, rugulose, corpus bursae semiglobular, membranous.

Distribution: the species is known from two rather remote areas of the southern Himalayan region, from Himachal Pradesh (India) and from southern Tibet (China).

Estagrotis gemina HREBLAY & RONKAY sp. n.

(Figs 24, 49)

Holotype: Female, "S.E. Tibet, Tsangpo valley, Nyima La, 14.000', 21.VI.1924, F. Kingdon Ward", slide No.4444 RONKAY, deposited in coll. BMNH, London.

Diagnosis: The new species is a sibling of *E. plantei* HACKER & RONKAY, 1993, differing from it mostly by some characters of the female genitalia. Externally *E. gemina* has less intensive reddish-brown shining, broader, more rounded orbicular stigma and less developed arrowheads but, as these characteristics may have a considerable variation in *E. plantei*, they cannot serve as diagnostic features.

In the configuration of the female genitalia the ventral plate of the anterior papillae anales is narrower in *E. gemina* forming right angles at lateral extremities while it is much broader and proximally rounded, marginally strongly sclerotized in *E. plantei*. The ductus bursae of *E. gemina* is narrower, without membranous neck, the ostium bursae is also narrower. The shape of the last sternite is also different: The medial incision is narrower but deeper, more V-shaped in *E. gemina* with the apical sclerotized extensions stronger, more elongated and pointed (see Figs 49 and HACKER & RONKAY 1993, Fig. 28b).

Description: Wingspan 37 mm, length of fore wing 17 mm. Head, thorax and fore wing light brown, antennae of female filiform, rather thick, ciliate. Fore wing rather broad, apically rounded, outer margin arcuate. Wing pattern obsolescent, streak of submedian fold strong, blackish, darkest marking of wing. Crosslines pale, greyish, slightly sinuous. Stigmata encircled with blackish brown and filled with ochreous brown, orbicular relatively large, elliptical, reniform narrower; filling of cell somewhat darker between stigmata. Subterminal line obsolete, defined with some small, less visible arrowheads; terminal line brown, cilia somewhat lighter. Hind wing unicolorous, cupreous brown, discal spot and crossline absent, cilia pale reddish-brown. Underside of wings light red-brownish, inner area of fore wing suffused with darker brown, crosslines and discal spot of hind wing slightly visible.

Female genitalia (Fig. 49): Ovipositor and gonapophyses moderately long, strong, ventral plate of anterior papillae anales strong, subrectangular. Ostium bursae sclerotized, rounded, convex, ductus bursae rather narrow, flattened, completely scobinate. Cervix bursae small, rugulose, corpus bursae elliptical, membranous.

Distribution: The species is known from the type locality only.

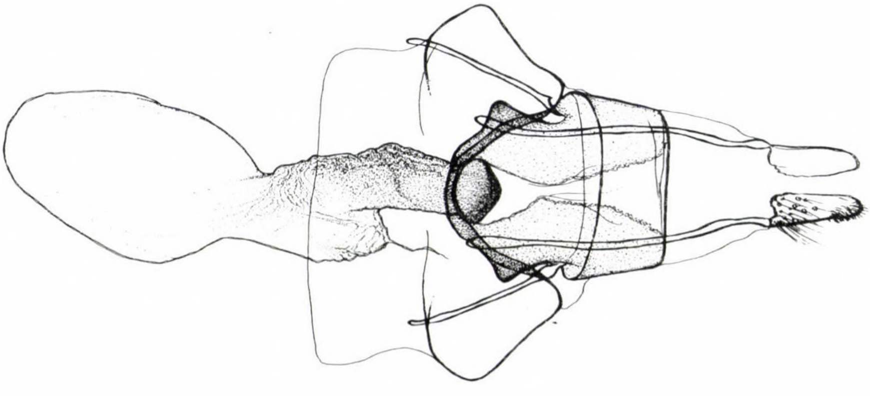


Fig. 49. Female genitalia of *Estagrotis gemina* sp. n., holotype

* * *

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TAXONOMIC STUDIES ON THE GENUS PSEUDOHADENA ALPHÉRAKY, 1889. PART V. THE REVISION OF THE GENUS PSEUDOHADENA S. STR.

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The genus *Pseudohadena* s. str. is revised, the subgenus *Pseudohadena* (the *P. armata* species-group) is re-defined. *Pseudopseustis* and *Jaxartia* are considered as subgenera of *Pseudohadena*; two new genera, *Graphantha* gen. n. (with two subgenera, *Graphantha* for the *laciniosa*-group and *Dysgraphhadena* subgen. n. for the *commoda*-group) and *Eremohadena* for the *siri*-group are established. Four new species, *P. phasmidia* sp. n. (Kashmir), *P. obsoleta* sp. n. (Kashmir), *P. arenacea* sp. n. (Kazakhstan) and *P. (J.) deserticola* sp. n. (Turkmenistan) and a new subspecies, *P. (J.) evanida psammoxantha* ssp. n. are described. With 41 figures and a table.

Key words: *Pseudohadena*, revision, new genera, subgenera, new species

INTRODUCTION

In a recent paper dealing with the infrageneric grouping of the species of *Pseudohadena* ALPHÉRAKY, 1889 s.l. (RONKAY & VARGA 1993) a systematic list of the genus was published. The results of the studies on the new materials of some species-groups of *Pseudohadena* and *Pseudopseustis* HAMPSON, 1910, from Central Asia, originating especially from the very successful expedition of GY. FÁBIÁN and Mr. GY. M. LÁSZLÓ in Kazakhstan, September–October, 1994, produced important arguments for modifying our former view on the taxonomy and phylogeny of the *Pseudohadena* genus-group. The present paper contains, besides the descriptions of four new species from Kashmir, Kazakhstan and Turkmenistan, the redescription of the genus *Pseudohadena*, the diagnoses of its species-groups, some of which are separated on subgeneric level and the characterizations of some poorly known species, with the illustrations of several, formerly unpublished genitalia.

The re-definition of *Pseudohadena* mentioned above, has resulted in, on the other hand, the splitting of the formerly uniform genus into a few distinct genera. Two of them, *Eremohadena* gen. n. for the *siri*-group and *Graphantha* gen. n. for the *laciniosa*- and the *commoda*-groups are described in the last chapter. The characterization of these taxa was partly given in the previous parts of the series (RONKAY & VARGA 1989, pp. 339–342, *laciniosa*-group; RONKAY & VARGA 1993, p. 215), and summarized in the descriptions of the newly described supraspecific units; the taxonomic interpretation of the remaining species-groups will be given in the next paper dealing with the *Pseudohadena*-complex. The check lists of the taxa belonging to the genera *Pseudohadena*, *Eremohadena* and *Graphantha* are given separately for each group.

Abbreviations: BIN – Biological Institute, Russian Academy of Sciences, Novosibirsk; BMNH – The Natural History Museum (formerly British Museum, Natural History), London; HNHM – Hungarian Natural History Museum, Budapest; ZIN – Zoological Institute, Russian Academy of Sciences, St. Petersburg; ZMHU – Museum für Naturkunde, Humboldt-Universität, Berlin.

TAXONOMY

The most important statement is that the hitherto poorly known *armata* species-group (containing further three closely related and one relatively remote species, three of them are undescribed) shows much closer relationships with the members of the "genus" *Pseudopseustis* sensu VARGA & RONKAY, 1991, than it was considered earlier. Moreover, *"Pseudopseustis" argyllostigma* VARGA & RONKAY, 1991, proved to be a sister species of *Pseudohadena armata*. The detailed analysis of the external and genital morphology, and some features of the bionomics and distribution patterns of the species groups of *Pseudohadena* sensu lato led to the separation of a branch within the formerly common genus, containing the subgenera *Pseudohadena, Pseudopseustis, (Jaxartia)*, and the *siri*-, *commoda*- and *laciniosa*-groups. These supraspecific units form a complex of genera which can be considered to include the genus *Pseudohadena* s. str. (with three subgenera) and its sister-groups. The sister groups are interpreted here as two distinct genera, *Eremohadena* gen. n. as the sister group of *Pseudohadena* s. str., and *Graphantha* gen. n. (with two subgenera), as the sister group of the *Pseudohadena–Eremohadena* line.

REDESCRIPTION OF THE GENUS PSEUDOHADENA ALPHÉRAKY, 1889

Type species: *Hadena armata* ALPHÉRAKY, 1887

The three subgenera of the genus are rather compact, the distinctive features are easily recognizable.

Description: External morphology (Figs 1–14). Medium-sized or relatively large species with rather strong body and elongated fore wings with apex pointed or acute. Head small, eyes large, rounded, palpi short, porrect with very short third joint. Antenna of male ciliate or finely or strongly bipectinate, that of female filiform. Pubescence of thorax dense, thick, long, tegulae usually less distinct, although they might be defined with different colours. Abdomen long, slender, dorsal crest and basal abdominal coremata absent. Fore leg with variably long inner claw on tibia, first joint of tarsus with special armature of 4–5 very strong, often curved spines laterally (and, in *Jaxartia*, 1–2 additional ones medially at distal end).

Male genitalia (Figs 21–38): Uncus variably long, slender or flattened with apex rounded or finely spatulate; tegumen wide with penicular lobes smaller or larger, regularly hairy. Fultura inferior a strong subtriangular or cordiform plate, apical process smaller, rounded or very long, acute; vinculum sclerotized, widely V-shaped. Valvae regularly elongated and narrow, subapically usually dilated; costa often with small triangular lobe at apical third. Cucullus triangular or rounded, with apex slightly or strongly pointed or acute; corona mostly present, weaker or stronger, but, extraordinarily, may be lacking. Sacculus short or somewhat longer, densely setose, pulvillus small, weak or larger, sclerotized, erected lobe. Harpe thick, variably long, most often flattened. Medial part regularly curved, sometimes dilated, apical part tapering with rounded apex, pointed or even acute or slightly dilated with rounded apex. Costal plate sclerotized, its extension ("digitus") either fine, long, pollex-like, or broader, triangular with pointed or acute tip, or reduced to a small peak. Aedeagus cylindrical, carina with short laminae and often with dentate, sclerotized ventral or ventro-lateral bar. Vesica tubular, membranous, without cornuti but with stronger scobination and with rather small, membranous diverticula at terminal (and often also in medial) third (*Pseudohadena* s. str.) or medial and terminal parts bearing small or larger, spineless diverticula and armed with a medium-sized, fine or larger, more robust terminal cornutus (*Jaxartia*), this terminal cornutus may be lacking (*Pseudopseustis*).

Female genitalia (Figs 15, 17–20, 39): Ovipositor relatively long, weak, papillae anales might be narrow, arcuate, or broader, setose and less hairy or densely hairy, less or not setose. Ostium bursae sclerotized, calyculate or quadrangular. Ductus bursae moderately long, tubular, membranous, with fine granulation and longitudinal wrinkles and with large, lateral emergence or a small sclerotized area at its caudal end, a sclerotized lateral plate at anterior third may also be present (subg. *Pseudohadena*) or long, sometimes very long, bearing long, sclerotized crests, mostly on lateral surface (*Jaxartia*). Cervix bursae small, conical or rounded, membranous or finely sclerotized and rugulose (subg. *Pseudohadena*) or with small or large, sclerotized subapical plate (*Jaxartia*). Corpus bursae membranous, elliptical or elongated-sacculiform, with four ribbon-like, more or less equal or strongly inequal signa (subg. *Pseudohadena*) or smaller, semiglobular, without signa or spacious, semiglobular-ovoid, with three short, broad signa (*Jaxartia*).

Bionomics: An eremic genus, the species are typical of lowland desert and semi-desert habitats, but occur also at the foothills of xerothermic mountainous chains, dry, hot inland basins, gorges and deep valleys; a single species is known from the southern edges of the S Siberian steppe region. All species of the genus are, as far as is known, univoltine, the adults of most taxa being on the wing in the late autumn and only of *P. armata* there are a few records from the earlier periods of the year. The adults are excellent, strong flyers and are attracted strongly to artificial light. The early stages are usually unknown, the caterpillars of most species probably feed on various larger xerophilous plants (e.g. *Haloxylon, Salsola*, *Artemisia* etc.). They stay and pupate, most probably, deep in the soil and the freshly emerged imagines use their special armature of fore legs for digging out themselves.

Distribution: The area of the genus covers a large part of the eremic regions from NW Africa (*Pseudopseustis*) throughout the Near East, southern Mesopotamia, the northern part of the historical Armenia (Azerbaijan), the Kara-Kum and the Kizyl-Kum to eastern Kazakhstan, and to SW Siberia. On the other hand, the species themselves are rather stenochorous, the only species having comparatively wide areas being *P. armata* and *P. (J.) striolata*.

Remarks: The differences in the genitalia of the species, in spite of their external dissimilarity, are often slight. The genitalia of several species are described and illustrated here for the first time.

CHECKLIST

Genus **Pseudohadena** ALPHÉRAKY, 1889
  Subg. **Pseudohadena** ALPHÉRAKY, 1889
    arenacea-group
      arenacea sp. n.
    armata-group
      phasmidia sp. n.
      armata (ALPHÉRAKY, 1887)
      argyllostigma (VARGA & RONKAY, 1991), comb. n.
      obsoleta sp. n.

  Subg. **Jaxartia** PÜNGELER, 1914, stat. rev.
    elinguis-group
      striolata (FILIPJEV, 1949), comb. n.
      elinguis (PÜNGELER, 1914), comb. n.
    evanida-group
      evanida evanida PÜNGELER, 1914, comb. n.
      evanida psammoxantha ssp. n. (Kazakhstan)
      deserticola sp. n. (Turkmenistan)
      cymatodes (BOURSIN, 1954), comb. n.
      pseudamoena (BOURSIN, 1943), comb. n.
    jordana-group
      jordana (STAUDINGER, 1900), comb. n.

  Subg. **Pseudopseustis** HAMPSON, 1910, stat. rev.
      tellieri (LUCAS, 1907), comb. n.

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SUBGENUS PSEUDOHADENA ALPHÉRAKY, 1889

Diagnosis: The subgenus *Pseudohadena* (the *armata*-group) differs from *Jaxartia* and *Pseudopseustis* by its ciliate (or very shortly bipectinate) male antenna, the armature of the basitarsus of consisting of 4–5 huge, strong, more or less curved spines arranged in a single row. The male antenna is widely bipectinate in the other subgenera, the only exception is *P.(Jaxartia) jordana* where the antennae of the male are shortly bipectinate, but the branches are even longer than in any species of the subgenus *Pseudohadena*. The basitarsi of the forelegs of *Jaxartia* are armed with one or two additional, strong medial spines, while the spines of *Pseudopseustis* are straight, arranged into a single row.

In the male genitalia of the *armata*-group, the apical process of fultura inferior is very high, strong, the harpe is short, flattened, its apical part is usually broader, subtriangular, the costal extension is long, narrow, spine-like. The vesica has a subbasal diverticulum but the terminal cornutus is lacking. The fultura inferior of *Jaxartia* is a deltoid plate with small, less separated apical process, the harpe is longer, more curved, its apical part is often dilated but not triangular, the costal extension is much broader, often weaker, usually broadly triangular; the ventral margin of the valva has a more or less expressed subapical dilatation. The subbasal diverticulum of the vesica is lacking but the terminal cornutus is present, most often strong, long. The male genitalia of *Pseudopseustis* is close in type to those of *Jaxartia* but the subapical dilatation of the valva is reduced and the terminal cornutus is lacking.

The main configuration of the female genitalia of the subgenus *Pseudohadena* shows close similarity with that of the members of the genus *Eremohadena* gen. n., the ostium bursae bears a sclerotized plate, the ductus and the cervix bursae are regularly membranous, the corpus bursae is saccate, bearing four variably long, ribbon-like signa. The female genitalia of *Pseudohadena* and *Jaxartia* are rather dissimilar, the *ductus bursae in Jaxartia* is bearing long, sclerotized crests, the cervix is with weaker or very strong sclerotization, the signa are either completely lacking (*elinguis*-group) or forming three variably large, rounded patches (*evanida*-group).

The genital configuration of *Pseudohadena (P.) arenacea* and the other species of the subgenus are strongly dissimilar, displaying closer relationships with the genus *Eremohadena (E. coluteae)*, its generic placement is rather tentative, based mainly on the external appearance and the armature of the basitarsus.

Description: External morphology (Figs 1–6; VARGA and RONKAY 1991, Plate 2, Figs 25, 26): Head rather large, frons smooth, palpi short, antennae of males ciliate or finely bipectinate. Pubescence of thorax dense, collar and tegulae less distinct. Fore leg with four very large, curved (and sometimes with 1–3 much smaller) spines on outer side of first segment of tarsus. Fore wing rather high triangular with apex pointed or acute, ground colour light ochreous- or slate-grey irrorated variably strongly with darker brown or with whitish-grey. Wing pattern either obsolescent or, most often, rather sharp, crosslines and stigmata dark brown defined with whitish.

Male genitalia (Figs 21–28): Uncus long and slender, tegumen wide with large penicular lobes. Fultura inferior strong subtriangular plate with long or very long apical processus; vinculum sclerotized, widely V-shaped. Valvae regularly elongated and narrow, costa often with small triangular lobe at apical third. Cucullus triangular with slightly or strongly pointed apex, corona either normally developed, rather weak, or completely reduced. Sacculus narrow, long, setose, harpe thick and large, medially curved, sometimes dilated, apical part tapering with apex rounded, pointed or even acute. Costal plate sclerotized, its extension ("digitus") either fine, long, pollex–like, or broader, shorter triangular, or reduced to small peak. Aedeagus cylindrical, vesica membranous, without cornuti but with rather small, membranous diverticula at terminal (and often also in medial) third.

Female genitalia (Fig.15): Ovipositor relatively long, papillae anales narrow and arcuate, gonapophyses long and strong. Ostium bursae sclerotized, calycular, ductus bursae tubular, membranous, with fine granulation and longitudinal wrinkles and large, lateral emergence or small sclerotized area at its caudal end; a sclerotized lateral plate at anterior third may also be present. Cervix bursae small, conical or rounded, membranous or finely sclerotized and rugulose. Corpus bursae membranous, elliptical or elongated-sacculiform, with four ribbon-like, more or less equal or strongly unequal signa.

The *arenacea* species-group

Diagnosis: The only species belonging to this group differs from all the other members of the genus *Pseudohadena* by its finely bipectinated antenna and shortened valvae, the completely lacking corona and the distally erected, thick, not flattened, acute harpe.

Pseudohadena arenacea sp. n.

(Figs 1, 2, 21, 22)

Holotype: male, "Kazakhstan, Prov. Almaty, 22 km N of Masak, 600 m, 78° 27'E, 43°46'N, 27.IX.1994, leg. GY. FÁBIÁN & GY. M. LÁSZLÓ", coll. GY. FÁBIÁN, Budapest, deposited in HNHM Budapest.

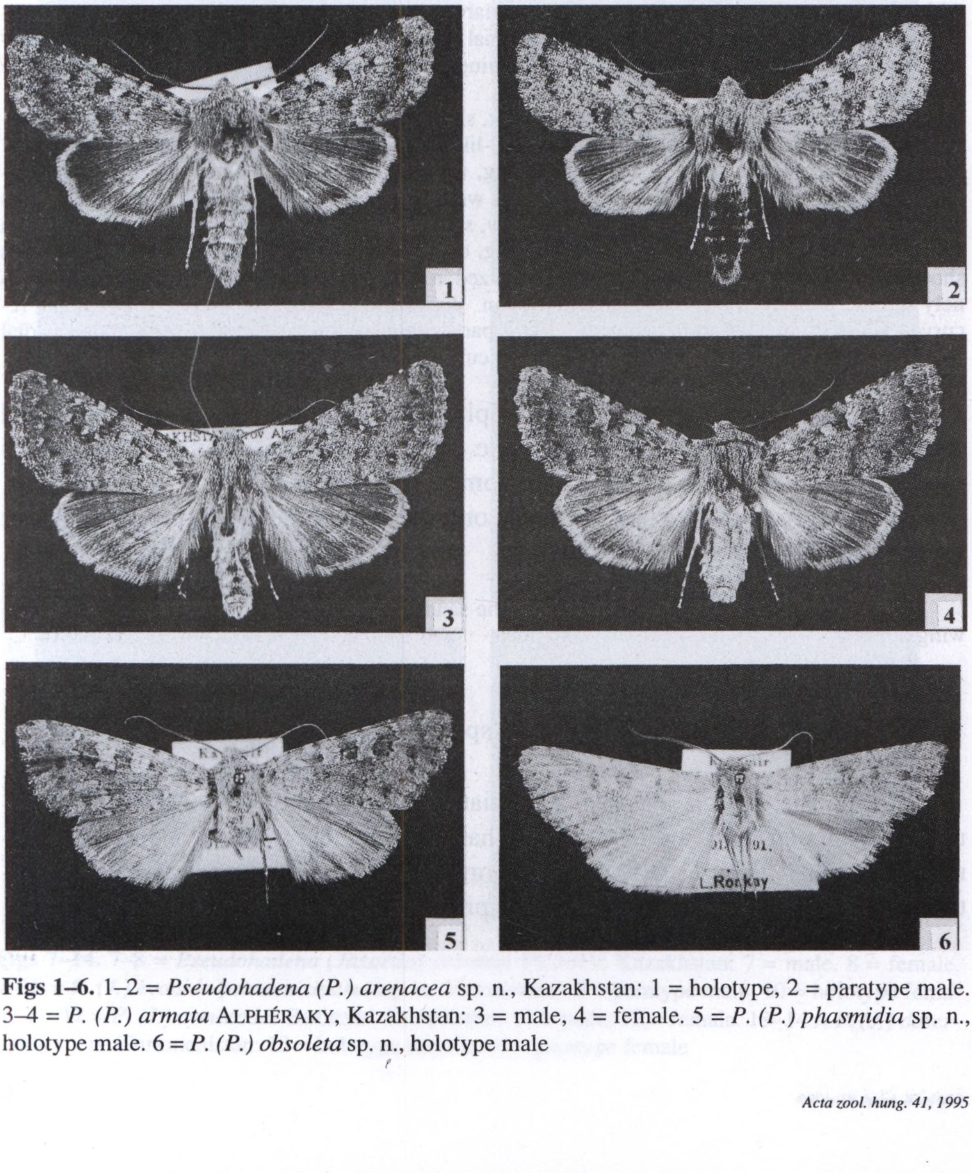
Paratypes: 14 males, from the same locality and data, coll. HNHM Budapest, GY. FÁBIÁN, G. RONKAY & Z. VARGA.

Slide No. 4937 RONKAY.

Diagnosis: The new species is similar to the well-marked members of the *armata*-group but smaller, fore wing pattern more indistinct, the male antennae with longer pectination. The male genitalia of *P. arenacea* show significant differences as compared with those of the taxa of the *armata*-group (see Figs 21 22, 23–28): the apical process of fultura inferior is shorter, broader, the valvae are shorter, the harpe and the costal lobe are situated much more distally, the harpe is longer, acute, less flattened. The ventral lobe of carina is stronger, smaller, the three medial diverticula are situated closer to each other than those of the species of the *armata*-group.

On the other hand, the genital capsula of *arenacea* displays surprising similarity to *Eremohadena coluteae* BIENERT (see Figs 21, 22 and RONKAY & VARGA 1993, Figs 15, 16): in spite of very large external differences the main features of the genital capsula (shape of fultura inferior, valva and cucullus, shape and position of harpe and costal lobe) agree well in the two species. The specific differences are easily recognizable, lying in the shape and size of the uncus, the shape and length of the valva, harpe and costal lobe and the details of the configuration of the vesica.

Description: Wingspan 34–37 mm, length of fore wing 15–17 mm. Head and thorax sand brown, mixed with some darker grey, tip of collar, tegulae and some areas of fore wing intensely ir-



Figs 1–6. 1–2 = *Pseudohadena (P.) arenacea* sp. n., Kazakhstan: 1 = holotype, 2 = paratype male. 3–4 = *P. (P.) armata* ALPHÉRAKY, Kazakhstan: 3 = male, 4 = female. 5 = *P. (P.) phasmidia* sp. n., holotype male. 6 = *P. (P.) obsoleta* sp. n., holotype male

rorate with whitish grey. Palpi very short, not extending to tip of frons, frons with short, dark brown, lateral lines at eyes. Antennae finely bipectinate with short, weak branches of cilia. Thorax robust, its pubescence dense, long, tegulae and thoracic tufts rather indistinct. Basitarsi of fore legs with 4–5 very strong, curved spines in a row. Abdomen long, slender. Fore wing elongated, rather narrow with apex pointed. Ground colour light sand brown, intensely suffused with whitish grey, this suffusion may cover larger parts of wing. Elements of wing pattern less distinct, ante- and postmedial crosslines broad, double, sinuous, darker brown, filled with whitish grey. Medial line diffuse, dark brown stripe, forming strong dark patch between stigmata. Subterminal line interrupted, waved, brown stripe, defined with weak, small, often diffuse arrowheads. Orbicular and reniform stigmata well visible, encircled partly with dark brown and filled with whitish grey, reniform with grey-brownish centre. Claviform obsolete or defined as darker brownish patch. Terminal line a row of blackish brown spots, cilia pale grey-brown, spotted with whitish grey. Hind wing whitish, almost entirely covered with dark fuscous, transverse line partly discernible as fine, sinuous line. Marginal suffusion broad, dark brown; cilia pure white. Underside of wings milky white, irrorate with brown, inner area of fore wing suffused variably with brownish grey. Shadow of transverse line more or less visible on both wings, subterminal line also may represented as darker stripe. Discal spots small, fine, dark brown, that of fore wing with whitish centre; cilia whitish, that of fore wing weakly chequered.

Male genitalia (Figs 21, 22): Uncus weak, slender, tegumen low, broad, penicular lobes rounded, small, less hairy. Fultura inferior shield-like, broadly deltoid, apical process short, wide. Valvae relatively short, apically slightly tapering, with apex acute; corona lacking. Sacculus elongated, densely setose, clavus reduced; pulvillus well developed, densely setose. Harpe strong, its base long, flattened, erected part situated distally, strong, horn-like, acute, slightly S-shaped. Costa strongly sclerotized, costal lobe short but strong, cuneiform, originating close to apex. Aedeagus short, almost straight, carina with strong, sclerotized, rounded lobe ventrally, extension of carina finely serrate, prolonged into short, cristate ribbon. Vesica broadly tubular, everted forward and recurved ventrally, medial third scobinate. Basal part with large ventro-lateral diverticulum, medial part with three smaller, strongly scobinate diverticula.

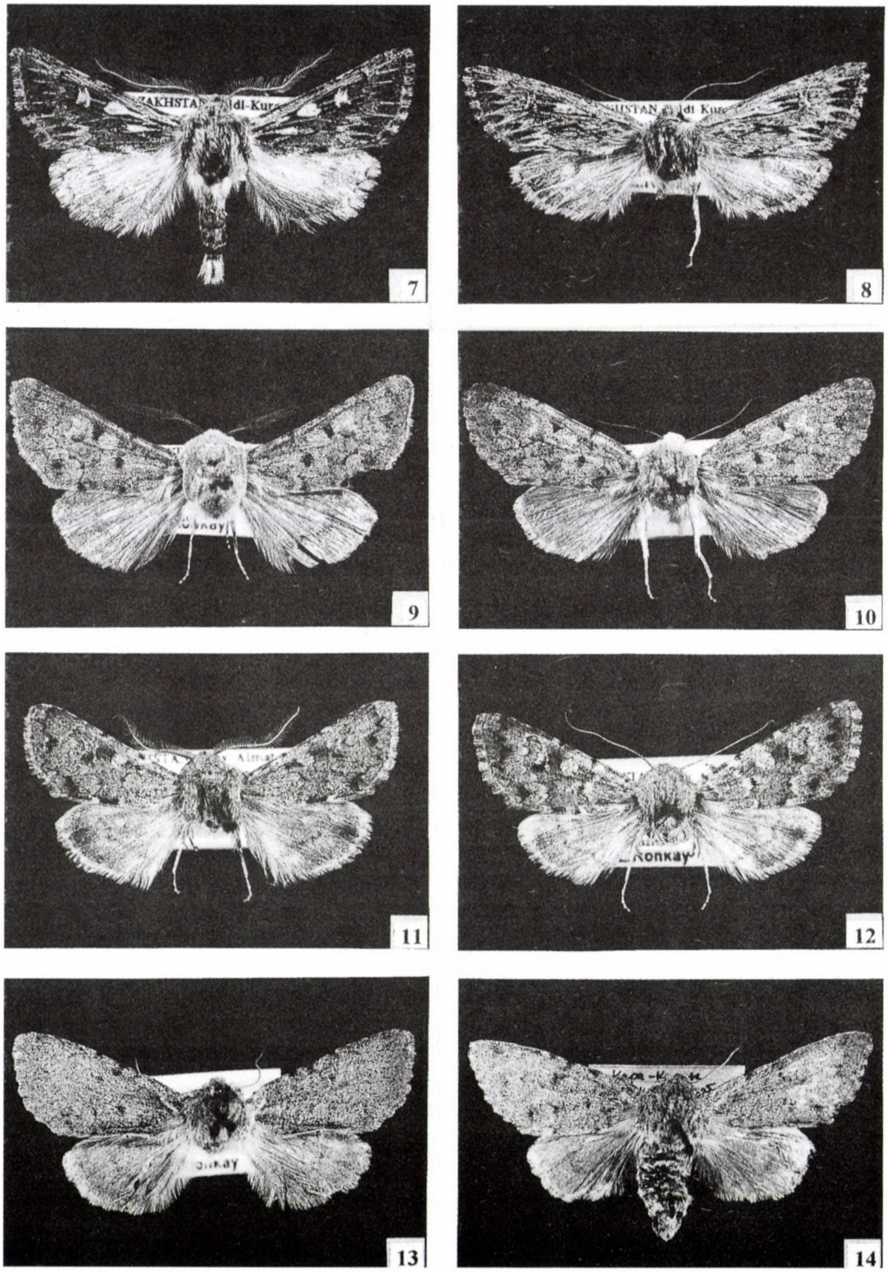
Bionomics: Early stages and foodplant are unknown. The freshly emerged imagines were captured in the very late autumnal period, together with *P. (J.) cymatodes, evanida* and *striolata*, and some *Dasypolia* spp., etc.

Distribution: the species is known only from the type-locality, a semi-desert area in southern Kazakhstan.

Etymology: the specific name refers to the sandy ochreous-greyish colouration of the forewings.

The *armata* species-group

Diagnosis: The male antenna is ciliate, not pectinate as in the *arenacea*-group, the penicular lobes are larger, more hairy, the valva is more elongated, the corona is well-developed but relatively short and the harpe is flattened, apically rounded or slightly pointed, situated more proximally.



Figs 7–14. 7–8 = *Pseudohadena (Jaxartia) striolata* Filipjev, Kazakhstan: 7 = male, 8 = female. 9–10 = *P. (J.) evanida psammoxantha* ssp. n., Kazakhstan: 9 = paratype male, 10 = holotype female. 11–12 = *P. (J.) cymatodes* Boursin, Kazakhstan: 11 = male, 12 = female. 13–14 = *P. (J.) deserticola* sp. n., Turkmenistan: 13 = holotype female, 14 = paratype female

Pseudohadena phasmidia sp. n.

(Figs 5, 25, 26)

Holotype: male, (India), Kashmir, Nubro valley. The specimen was dissected by TAMS, the genitalia were mounted and everted by L. RONKAY, slide No. 4438; deposited in coll. BM (NH).

Diagnosis: The diagnostic features of the four, closely related species of the species-group are given in Table 1.

Description: Wingspan 39 mm, length of fore wing 17 mm. Head, thorax and fore wing ochreous slate grey, mixed with some brownish, tufts of vertex, collar and tegulae less marked, sides of palpi pale. Antenna of male finely ciliate. Fore wing rather broadly triangular with apex pointed, cilia slightly crenulate. Wing pattern rather sharp, ante- and postmedial lines strongly sinuous, double, dark brown, defined with whitish, subterminal interrupted, a row of short, indistinct arrowheads defined with whitish spots outsides. Medial field darkened, more sand-brownish, orbicular and reniform stigmata large, former quadrangular, latter elliptical, both incompletely encircled with dark brown and filled with whitish grey scales, reniform with some darker grey scales at lower third; claviform small, short. Terminal line a row of dark brown spots, cilia whitish grey, variegated with darker brown. Hind wing whitish, suffused with light brown, veins covered by brownish scales. Discal spot obsolete, crossline barely visible, pale. Marginal area widely covered by darker brown, cilia whitish. Underside of wings whitish with slight brownish irroration, crossline and discal spot pale but present on both wings.

Male genitalia (Figs 25, 26): Uncus relatively long, slender, tegumen high, penicular lobes rather small. Fultura inferior strong, its basal plate smaller, more or less triangular, apical extension very long, strong, thick. Valva elongated, costal lobe at apical third small, rounded, apex less pointed, corona weak, short. Sacculus short, clavus small, stronger, setose protuberance, costal lobe strong, broad, extension of digitus very long, reaching ventral margin. Harpe strong, thick, medially angled, apical part tapering with apex more or less pointed. Aedeagus broadly tubular, ventral part of carina forming stronger plate. Vesica tubular, upturned dorsally, finely scobinate, bearing some sclerotized crests on dorsal surface. Medial part with rather small, rounded ventral diverticulum, terminal part with conical dorsal (inner) and smaller, rounded outer diverticulum.

Bionomics: Early stages and foodplant are unknown.
Distribution: the species is known from the type locality only.

Pseudohadena armata (ALPHÉRAKY, 1887)

(Figs 3, 4, 15, 23, 24)

Hadena armata ALPHÉRAKY, 1887:170.

Type material examined: Holotype male, "Kara-Kumy" (ZIN, St. Petersburg). Additional material. (?China): 1 female, "fl. Honton, VIII" (ZIN St. Petersburg). Uzbekistan: 4 males, 1 female, Kizyl-Kum, Ayakguzhumdi, leg. Falkovich (ZIN St. Petersburg). Kazakhstan: a series of 129 specimens, Prov. Almaty, 22 km N Masak, 600 m, 78°27'E, 43°46'N, 27.09.1994, leg. GY. FÁBIÁN & GY. M. LÁSZLÓ; 2 males, Prov. Taldikurgan, Kumkala desert, 15 km W Aktau Mt., 500 m, 79°07'E, 43°56'N, 06.10.1994, leg. GY. FÁBIÁN & GY. M. LÁSZLÓ (coll. HNHM, GY. FÁBIÁN, G. RONKAY & Z. VARGA).

Slide Nos 4940, 4968, 4969 RONKAY (males), 5179 RONKAY (female).

Diagnosis: see Table 1.

Bionomics: The life history of the species is rather poorly known. An eremic species preferring, according to the new observations, the semi-desert-like habitats of the region where xerophilous trees and bushes and scattered patches of some herbs (e.g. *Artemisia*) can also be found. The flight period starts at the late summer period, but freshly emerged specimens were also collected in Kazakhstan in the very late autumnal period. It appears as a typical member of this season, one of the most frequent noctuid species of that time. The species was once reared from larva feeding on *Artemisia*.

Distribution: The area of the species extends, by the scarce data, from the Kara-Kum to Dzhungaria, along the northern foothills of the Tien Shan massif.

Pseudohadena argyllostigma (VARGA & RONKAY, 1991), **comb. n.**

Pseudopseustis argyllostigma VARGA & RONKAY, 1991: 288.

Type material examined: holotype male, two paratype females; Russia, West Siberia, vic. of the lake Krotovaia Lyaga, 13 km W of Karasuk, 8–9.IX.1981, leg. V. V. DUBATOLOV, coll. BIN Novosibirsk and HNHM Budapest.

Slide Nos 3693 RONKAY (male), 3680, 3744 RONKAY (females).

Diagnosis: See Table 1. Here we should mention that the diagnosis of the species in the original description was incomplete as *argyllostigma* had not been compared with its closest relative, *P. armata*, but with the taxa of the subgenus *Jaxartia* (there as "*Pseudopseustis*". Therefore, some of the statements made there are not really relevant (e.g. that the pectination of the male antenna is much shorter than those of the related species; that the lack of the terminal cornutus is unique within the genus, etc.).

Bionomics: Early stages and foodplant are unknown. The imagines were found in the autumnal period, together with *Oxytrypia orbiculosa* (ESPER, 1799), *Staurophora celsia* (LINNAEUS, 1758), etc.

Distribution: the species occurs in the southern steppe region of the West Siberian plain.

Pseudohadena obsoleta sp. n.

(Figs 6, 27, 28)

Holotype: male, (India), Kashmir, Nubro valley. The specimen was dissected by TAMS, the genitalia have been mounted and everted by L. RONKAY, slide No. 4437; deposited in coll. BMNH.

Diagnosis: The new species is the largest member of the *P. armata* species-group, differing externally from all close relatives by its longest fore wings and lighter coloration with obsolete dark pattern. The detailed comparison of the species of the *armata*-group is given in Table 1.

Description: Wingspan 42 mm, length of fore wing 19 mm. Head, thorax and fore wings light slate grey, with some whitish ochreous hue, tegulae mixed with some sandy-brown hairs but no other dark markings in pubescence of body. Fore wings long triangular with more or less acute apical part, cilia slightly crenulate. Wing pattern pale, obsolescent, crosslines poorly visible, shadow-like. Orbicular and reniform stigmata large, more or less angular, outlines diffuse, represented by some darker brown scales at margins and between stigmata, their fillings lighter than ground colour; claviform lacking. Subterminal marked with some whitish spots, irregular patch between medial veins. Terminal line a row of fine dark spots, cilia whitish ochreous, spotted with light brown. Hind wing shiny whitish, with a few brownish scales on veins and pale brownish marginal suffusion. Discal spot and crossline absent, cilia pure white. Underside of wings milky whitish, irrorate sparsely with pale brown scales. Crosslines absent, discal spots present but indistinct on both wings.

Male genitalia (Figs 27, 28): Uncus relatively short, tegumen wide with large penicular lobes; fultura inferior deltoid with rather short, narrow apical extension. Valva relatively narrow, elongated, apical part tapering with finely pointed apex, corona weak. Costal lobe broad, extension of digitus reduced to tiny peak. Harpe strong, regularly curved, medially slightly constricted, apical end rounded, densely setose. Aedeagus broadly tubular, almost straight, vesica tubular, dorso-laterally upturned. Basal part with some stronger, sclerotized crests on dorsal surface, distal third with scobinate, conical diverticulum close to ductus ejaculatorius.

Bionomics: Early stages and foodplant are unknown.

Distribution: the species was found at the type-locality only.

Table 1. Identification table of the *Pseudohadena* s. str. species

Character	*phasmidia*	*armata*	*argyllostigma*	*obsoleta*
Size (mm)	39	36–39	38–40	42
fore wing shape	broadly triangular	broadly triangular	broadly triangular	narrow, elongated triangular
fore wing ground colour	ochreous slate-grey	light sandbrown to dark ochreous grey	light ochreous brown or ochreous grey	light slate-grey
dark fore wing pattern	sharp, crosslines continuous	less conspicuous, crosslines more or less continuous	more or less distinct, crosslines almost continuous	indistinct, crosslines poorly visible, diffuse
stigmata	well-marked, relatively large, defined with light ochreous-whitish	distinct, rather small, defined with whitish	well-marked, relatively large, defined with whitish-ochreous	indistinct, large, partly filled with ligth ochreous
hind wing colouration	whitish grey suffused with dark brown	whitish-grey suffused with dark brown	whitish, marginal suffusion strong but inner area rather light	whitish with a pale brownish marginal suffusion

Table 1. continued

Character	*phasmidia*	*armata*	*argyllostigma*	*obsoleta*
uncus	long, slender	long, slender	long, slender	relatively short
fultura inferior	deltoidal with broad basal plate	deltoidal with smaller, lower basal plate	deltoidal with broad basal plate	deltoidal with large, subrectangular basal plate
apical process of fultura	long	long	very long	short
cucullus	rather broad, tapering	narrower, strongly tapering	broad, rounded	broad, slightly tapering
harpe	thick, flattened, distal part dilated with apex acute	thick, flattened, distal part strongly dilated with apex acute	rather thick, flattened, distally slightly dilated with apex rounded	narrow, arcuate with apex rounded
process of costal plate ("digitus")	strong, long	strong, very long	short, rather wide triangular	reduced to a tiny peak
larger terminal diverticulum in vesica	rather short, conical	long, broad at base, strongly tapering and acute distally	long, tubular with apex acute	short, broad, conical
posterior end of ductus bursae	–	membranous, with a rugose, small, semiglobular appendage	with some sclerotized crests but without appendage	–
anterior end of ductus bursae	–	with a sclerotized lateral plate	membranous	–
cervix bursae	–	semiglobular, slightly sclerotized	conical, membranous	–
corpus bursae	–	elliptical-ovoid	long, sacculiform	–
signa	–	long, strong, almost equal	weak, short, strongly inequal	–

Subgenus *Jaxartia* PÜNGELER, 1914, **stat. rev.**

Type species: *Jaxartia elinguis* PÜNGELER, 1914, by original designation.

Diagnosis: The detailed comparison of the three subgenera of the genus is given under the diagnosis of the subgenus *Pseudohadena.* The additional, medial spine(s) of the fore leg basitarsus, the strong sclerotization of the cervix bursae (*evanida*-group) and the configuration of the signa (completely lacking in the *elinguis*-group, three rounded, large patches in the *evanida*-group) is unique within the generic complex (the signa of *Dysgraphhadena* are much smaller, less patch-like, most often only two signa are present).

Description: External morphology (Figs 7–14): Medium-sized or large species with often strong body. Frons smooth, palpi short, antennae of males strongly bipectinate (except in *jordana* which has shortly bipectinate antennae), those of females filiform with fine cilia only. Fore leg with large inner claw on tibia, basitarsus with a row of four (five) very large, often curved spines outside and additional one or two large spines inside at distal end of segment. Pubescence of head and thorax long, dense, collar and tegulae less distinct. Abdomen elongated, less hairy, dorsal crest and abdominal coremata absent. Fore wings narrow, elongated with apex pointed or acute, wing pattern variable, noctuid maculation might be complete or almost fully deleted.

Male genitalia (Figs 29–38): Uncus relatively short, flattened with apex rounded or finely spatulate. Tegumen wide, low, penicular lobes small, hairy. Fultura inferior cordiform or deltoid with apical process small, rounded. Valva elongated, narrow, subapically often dilated, cucullus and corona well developed, apex pointed or acute. Sacculus very short, rounded, densely setose, pulvillus sclerotized, harpe variably long, flattened, usually curved and apically dilated with apex rounded or finely pointed. Costal plate strongly sclerotized, its extension ("digitus") usually triangular, large, acute. Aedeagus cylindrical, carina with short laminae and often with dentated, sclerotized ventral or ventro-lateral bar. Vesica tubular, everted forward and recurved ventro-laterally, walls scobinate, mainly in medial and terminal parts. Basal part often spacious, medial and terminal parts bearing small or larger, spineless diverticula, armed with medium-sized and fine or larger and more robust terminal cornutus.

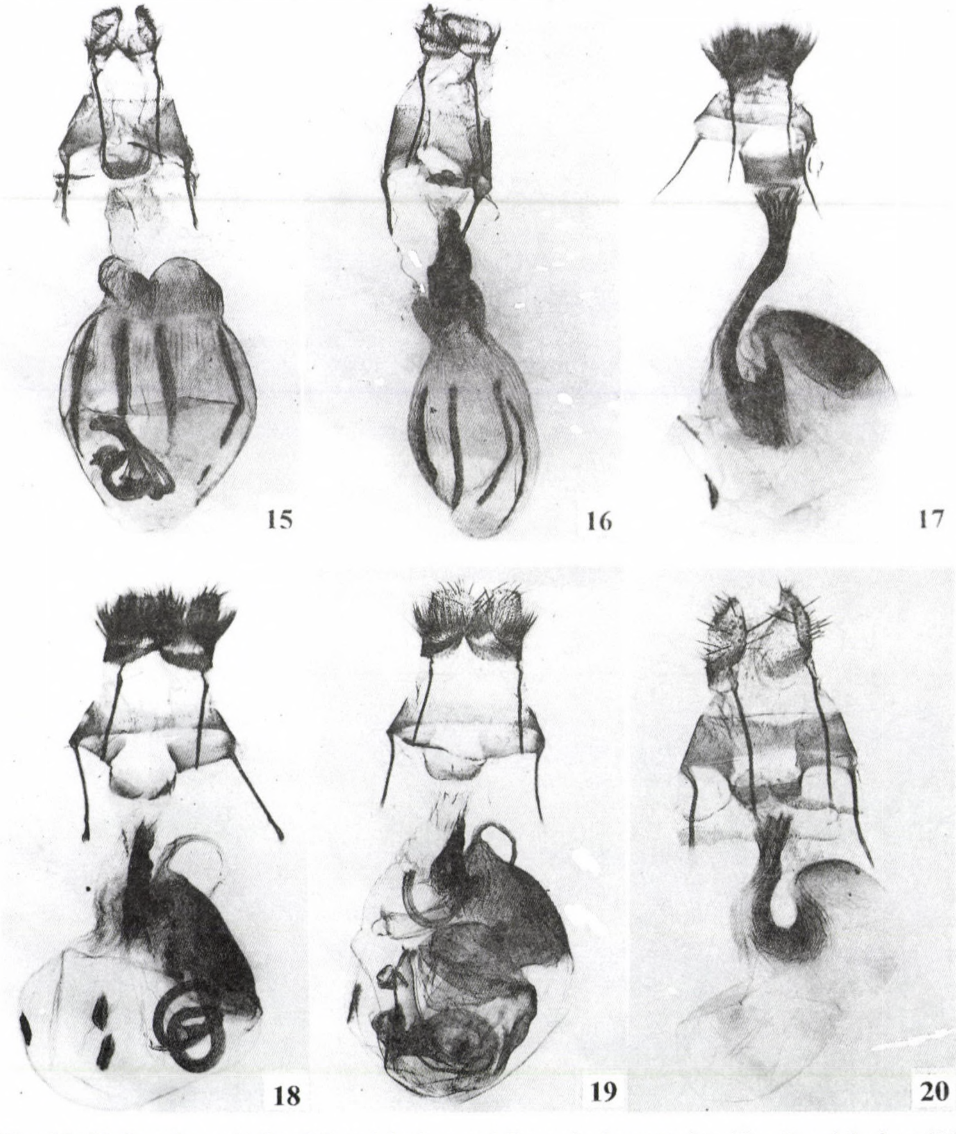
Female genitalia (Figs 17–20, 39): Ovipositor rather weak, papillae anales either setose and less hairy or densely hairy, less or not setose. Ostium bursae sclerotized, broad, quadrangular or calyculate, ductus bursae moderately or very long, membranous with long, sclerotized crests, mostly in lateral surface. Cervix bursae weakly sclerotized or with small or large, sclerotized subapical plate. Corpus bursae smaller, semiglobular, without signa or spacious, semiglobular-ovoid, with three short, broad signa.

Bionomics: An eremic group, comprising characteristically late autumnal species. They inhabit desert and semi-desert biotopes in the large desert ranges of the Near East, Arabia and Central Asia, in inland basins and at the foothills of the Tien Shan mountains; the overwhelming majority of the data originates from the lowland territories. The flight period is September–November, depending on the locality. The adults are attracted strongly to artificial light. The early stages are regularly unknown, the caterpillars of *P. (J.) elinguis* were found in Turkmenistan at the roots of larger desert plants (*Haloxylon, Salsola*, etc.), often very deep in the soil (DARICHEVA, pers. comm.).

Distribution: The species of the subgenus are distributed in a relatively narrow zone from Palestine to Kazakhstan, along the large Eurasian mountains (Ararat, Elburs, Kopet-Dagh, Tien Shan).

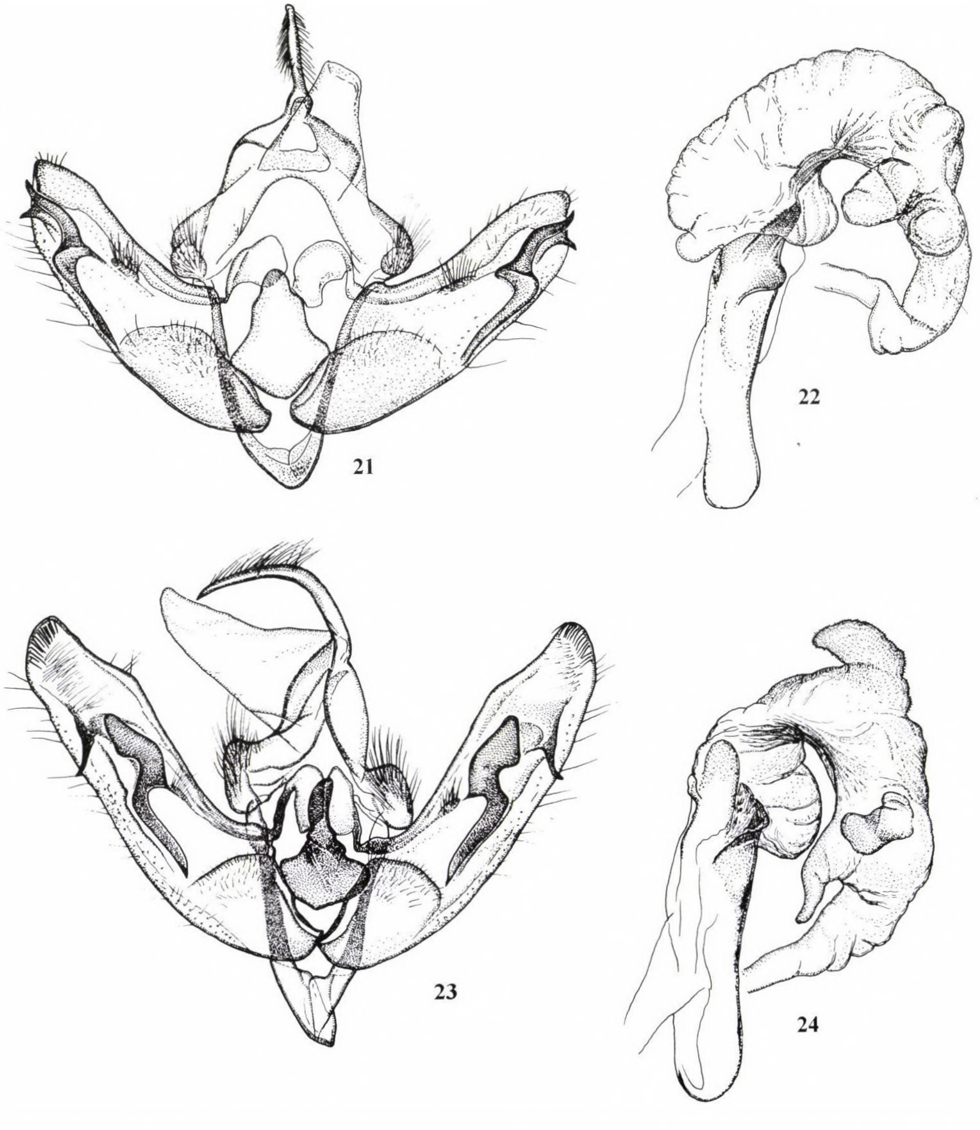
The *elinguis* species-group

Diagnosis: the members of the *elinguis* species-group differ externally from those of the *evanida* and the *jordana* groups by their narrower, more elongated and acute fore wings, the pectination of the male antennae is significantly longer than that of *jordana*. In the male genitalia, the valva is more elongated, the subapical dilatation is weaker or lacking, the cucullus is higher triangular with more pointed apex and longer corona. The costal plate is rather small, its extension is shorter than in the other species of the subgenus *Jaxartia*. The vesica is rather simple, the medial diverticulum is lacking, the terminal one(s) is (are) small, semiglobular. The female genitalia show conspicuous differences comparing with



Figs 15–20. Female genitalia of *Pseudohadena* and *Eremohadena* species. 15 = *Pseudohadena (P.) armata* ALPHÉRAKY, Kazakhstan; 16 = *Eremohadena coluteae* BIENERT, Kirghisia; 17 = *Pseudohadena (Jaxartia) cymatodes* BOURSIN, Kazakhstan; 18 = *P. (J.) evanida psammoxantha* ssp. n., holotype, Kazakhstan; 19 = *P. (J.) deserticola* sp. n., holotype, Turkmenistan; 20 = *P. (J.) striolata* FILIPJEV, Kazakhstan

those of the *evanida*-group as the papillae anales are setose and less hairy, the cervix bursae is membranous or with a small subapical plate and the corpus bursae is small, semiglobular, the signa are completely lacking.



Figs 21–24. Male genitalia of *Pseudohadena* species. 21–22 = *P. (P.) arenacea* sp. n., paratype, Kazakhstan; 23–24 = *P. (P.) armata* ALPHÉRAKY, Kazakhstan

Pseudohadena (Jaxartia) striolata (FILIPJEV, 1949), **comb. n.**
(Figs 7, 8, 20, 29–32)

Jaxarthia [sic] *striolata* FILIPJEV, 1949: 248.

Type material examined: 4 male syntypes, Turkmenistan, Repetek (ZIN St. Petersburg). Additional material examined: Turkmenistan: further 14 specimens from the type-locality. Kazakhstan: 50 specimens, Prov. Taldikurgan, Kumkala desert, 15 km W Aktau Mt., 500 m, 79°07'E, 43°56'N, 06.10.1994, leg. GY. FÁBIÁN & GY. M. LÁSZLÓ (coll. HNHM, GY. FÁBIÁN and G. RONKAY).

Slide Nos 4021, 4022 RONKAY (males), 5180 RONKAY (female).

Diagnosis: The species shows a rather considerable external variation, the genitalia differences between the two sibling species, *elinguis* and *striolata* are slight but constant (see Figs 29–34, and VARGA & RONKAY 1991, Figs 71, 74). The most conspicuous differences in the males are the shape of fultura inferior, its apical part being shorter, broader in *striolata*, and the shape of the harpe which is thicker, medially strongly curved, apically dilated in *striolata*, but narrower, longer, regularly arcuate in *elinguis*. The female genitalia of the two species are also very similar, differing in the strength of sclerotization of ductus bursae and the cervical part of bursa copulatrix which is more intensive in *striolata* (Figs 20, 39). The moth and the genitalia of both sexes are illustrated here for the first time.

Bionomics: A late autumnal species, a member of the very last aspect of the year. Its flight period is in September–November, depending on the climate of the actual locality. The species inhabits semi-desert and desert habitats, mostly in sandy ground.

Distribution: The species was described from the Kara-Kum desert (type-locality: Repetek, Turkmenistan), later it was discovered in other localities in Turkmenistan and in Kazakhstan, at the northern foothills of the Tien-Shan massif.

Pseudohadena (Jaxartia) elinguis (PÜNGELER, 1914)
(Figs 33, 34, 39)

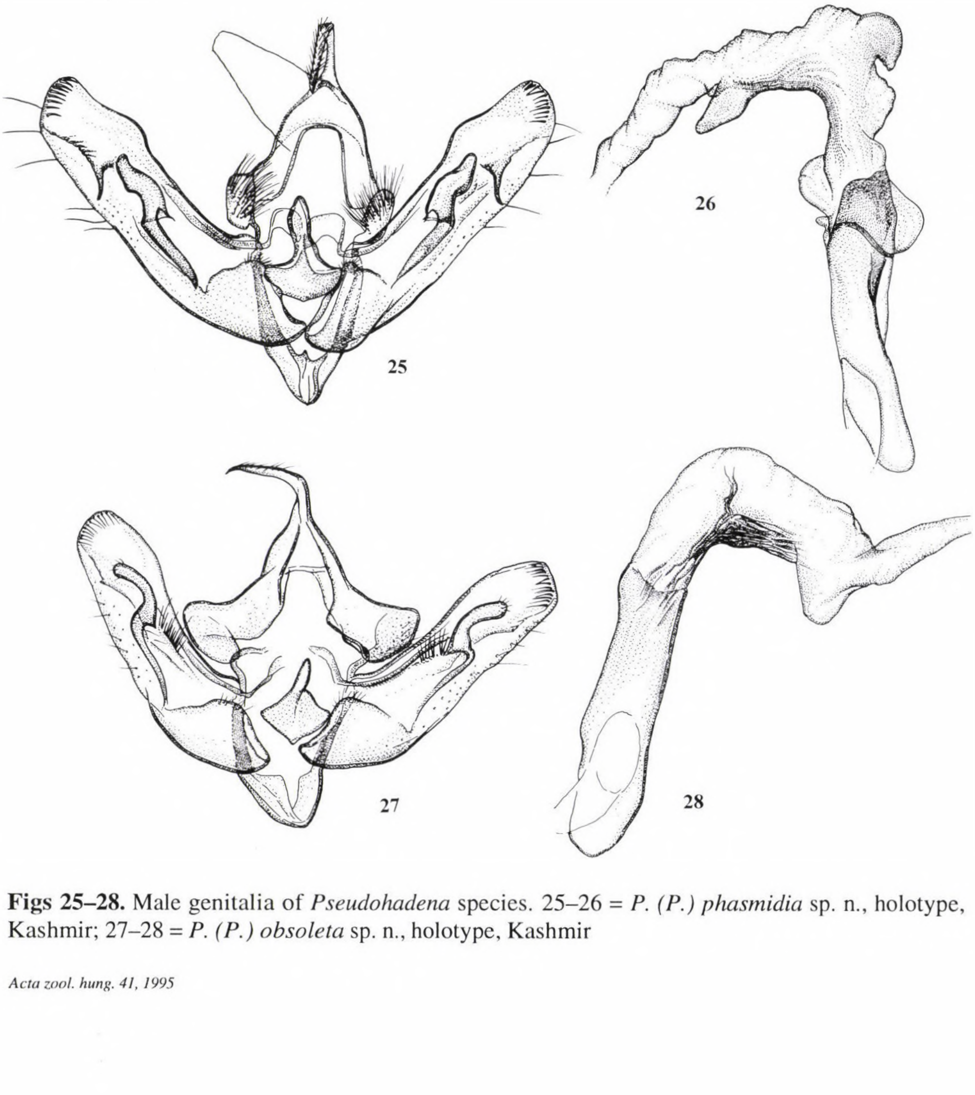
Jaxartia elinguis PÜNGELER, 1914: 44.

Type material examined: Holotype male and paratypes of both sexes, (Kazakhstan) Syr-Darya, Baigacum (coll. PÜNGELER, ZMHU Berlin). Additional material examined: Turkmenistan: males and females from the following localities: Repetek (ZIN St. Petersburg); Kara-Kum desert, 100 m, 42 km N of Ashkhabad, 58°33'E, 38°21'N, 11.XI.1991, leg. M. HREBLAY and G. RONKAY; Repetek 29–31.X.1971, leg. P. BEGOV; 1 male, Kara-Kum desert, 54 km N Ashkhabad, 1 km N Bakhardok, 31.X.–1.XI. 1990, leg. V.V. DUBATOLOV (BIN Novosibirsk); a series of specimens from various places of the Kara-Kum desert in coll. Zool. Inst. Ashkhabad.

Slide Nos 3579, 4121 RONKAY (males), 3580 RONKAY (female).

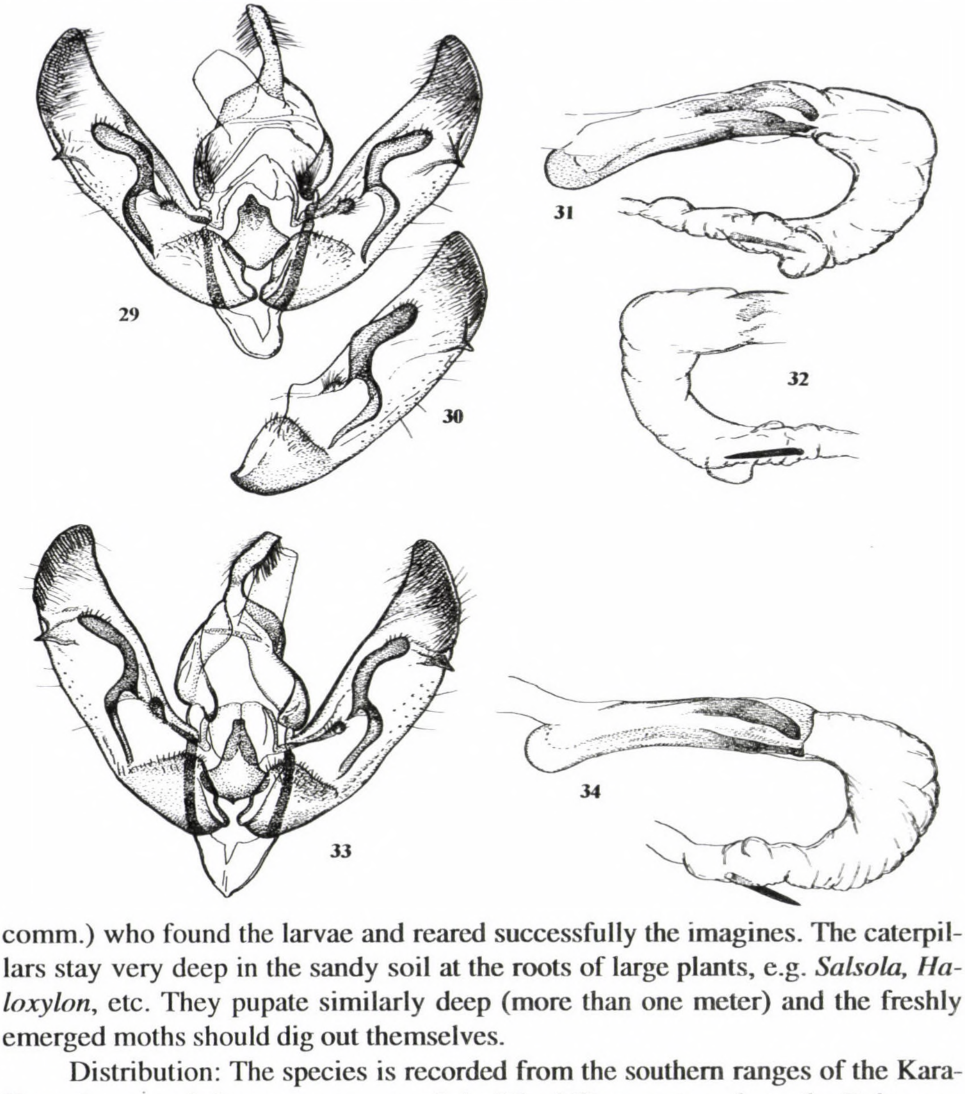
Diagnosis: An externally strongly variable species, ground colour varying from light sand-grey to dark chocolate- or blackish brown. Wing pattern regularly more simple than that of *striolata*, reduced often to the orbicular and reniform stigmata, the subterminal line is never as sharply defined and sinuous as in its sibling. The comparison of the genitalia of the two species is given under the preceding taxon, the genitalia of *elinguis* are illustrated in Figs 33, 34, 39, and in VARGA & RONKAY 1991, Figs 71, 74.

Bionomics: A late autumnal species, habitat preference and flight period similar to those of *P. (J.) striolata*; they occur regularly sympatrically and syntopically in the Kara-Kum area. The early stages were studied by DARICHEVA (pers.



Figs 25–28. Male genitalia of *Pseudohadena* species. 25–26 = *P. (P.) phasmidia* sp. n., holotype, Kashmir; 27–28 = *P. (P.) obsoleta* sp. n., holotype, Kashmir

Figs 29–34. Male genitalia of *Pseudohadena (Jaxartia)* species. 29–32 = *P. (J.) striolata* FILIPJEV, 29, 31, 32 = Turkmenistan, 30 = Kazakhstan; 33–34 = *P. (J.) elinguis* PÜNGELER, Turkmenistan

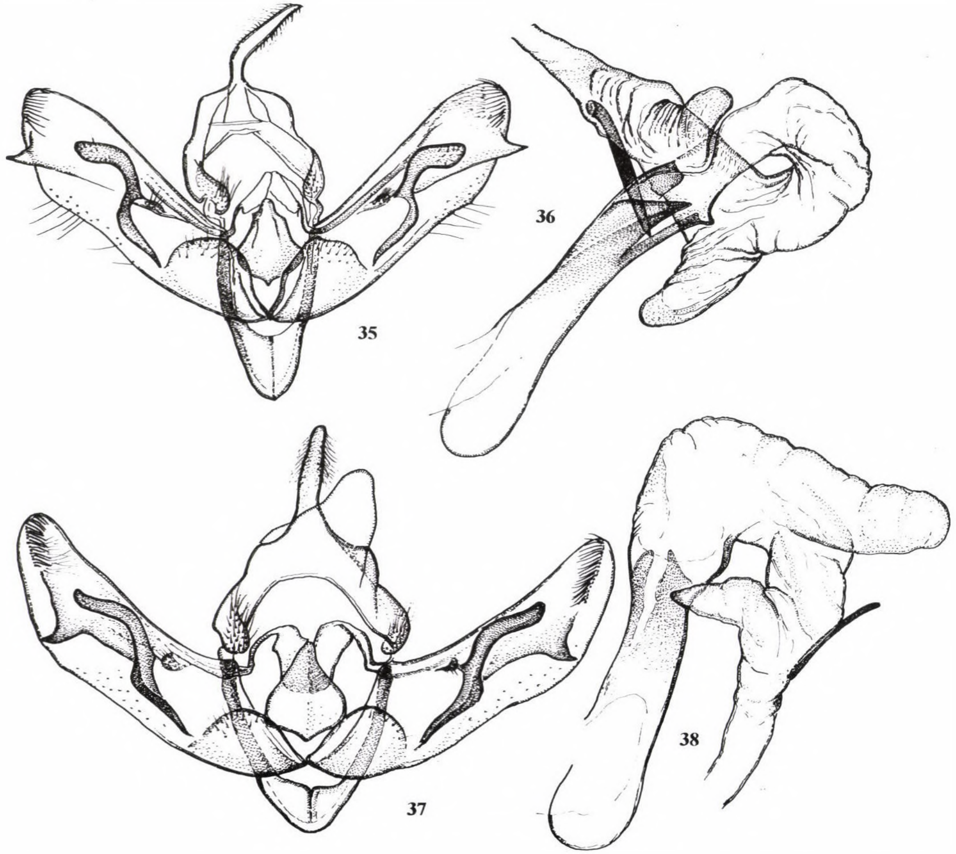


comm.) who found the larvae and reared successfully the imagines. The caterpillars stay very deep in the sandy soil at the roots of large plants, e.g. *Salsola, Haloxylon*, etc. They pupate similarly deep (more than one meter) and the freshly emerged moths should dig out themselves.

Distribution: The species is recorded from the southern ranges of the Kara-Kum desert and the western parts of the Kizyl-Kum eastwards to the Baigacum area (type locality).

The *evanida* species-group

Diagnosis: Fore wings less elongated than in the *elinguis*-group and the wing pattern is most often more reduced. The antenna of the male is very strongly bipectinate, the pectination is much longer than in case of the *jordana*-group. In the male genitalia the valva has stronger subapical dilatation, shorter cucullus and corona, larger costal plate and broader, stronger costal extension than in the other two species-groups; the vesica is more complex, the medial diverticulum is present, the terminal cornutus is larger, stronger. In the female genitalia the papillae anales are densely hairy, not or less setose as in the *elinguis*-group, the cervix bursae is with large sclerotized plate, the corpus bursae is larger, more spacious, semiglobular-ovoid, bearing three short, broad signa.



Figs 35–38. Male genitalia of *Pseudohadena (Jaxartia)* species. 35–36 = *P. (J.) cymatodes* BOURSIN, Kazakhstan; 37–38 = *P. (J.) evanida psammoxantha* ssp. n., paratype, Kazakhstan

Pseudohadena (Jaxartia) evanida PÜNGELER, 1914 **comb. n.**

Pseudohadena evanida PÜNGELER, 1914: 44.

Type material examined: Holotype and paratype females (designated by PÜNGELER as Type and Cotype), (Kazakhstan), Syr-Darya, Baigacum, KOZHANCHIKOV (coll. PÜNGELER, ZMHU Berlin). Additional material examined: Kazakhstan: 2 females, from the same locality, coll. ZIN St. Petersburg.

Diagnosis: The comparison of *evanida* with its closest relative, *P. (J.) deserticola* sp. n. is given under the latter species. The other related species having the same size and wing shape, *P. (J.) pseudamoena*, differs from *evanida* by much lighter ground colour, less defined noctuid pattern and several details of the male genitalia as *evanida* has significantly narrower, apically less dilated harpe, narrower costal plate with shorter costal extension, the subapical dilatation is weaker and the apical process of the fultura is much broader but shorter.

Remarks. The species was incorrectly transferred into *Mervia* DARICHEVA, 1961 by RONKAY & VARGA (1993). The external similarity (fore wing shape, colouration and wing pattern) of *evanida* with M. *kuznetzovi* DARICHEVA, 1961, seems superficial, as the frons of *Mervia* has a strong, corneous plate with a central protuberance, and the antennae of the females are slightly serrate. In the female genitalia, *Mervia* shows a much more simplified structure of ductus and corpus bursae with very slight sclerotization only, and the ovipositor of *Mervia* is significantly stronger with longer apophyses.

The description of the genitalia of both sexes of *P. (J.) evanida* is given under the description of the eastern subspecies, *psammoxantha* ssp. n.

Bionomics: A late autumnal species, the few known specimens were collected at the beginning of September. No additional data for its life history are known.

Distribution: The nominate subspecies is known from the type locality only.

Pseudohadena (Jaxartia) evanida psammoxantha ssp. n.

(Figs 9, 10, 18, 37, 38)

Holotype: female, Kazakhstan, Prov. Taldikurgan, Kumkala desert, 15 km W Aktau Mt., 500 m, 79°07'E, 43°56'N, 06.10.1994, leg.: GY. FÁBIÁN & GY. M. LÁSZLÓ, slide No. 5182 RONKAY (coll. GY. FÁBIÁN, deposited in coll. HNHM Budapest).

Paratypes: 20 specimens, from the same locality (coll. HNHM, GY. FÁBIÁN and G. RONKAY).

Slide No. 4982 RONKAY (male).

Diagnosis: The new subspecies differs from the nominate subspecies by its much more ochreous fore wing with sharper, more granulose noctuid pattern.

Male genitalia (Figs 37, 38): Uncus rather short, flattened with apex rounded, tegumen wide, relatively low. Fultura inferior deltoidal, vinculum short, strong. Valva long, narrow, slightly dilated at distal third, cucullus long, triangular with apex pointed; corona weak. Sacculus short, rounded. setose, pulvillus small, pointed, sclerotized. Harpe long, slender, arcuate, apex finely pointed. Costal plate strong, rather narrow, its extension strong, broadly triangular with tip just reaching ventral margin. Aedeagus cylindrical, relatively short, thick, carina with two short laminae and ventro-lateral, dentate bar. Vesica broadly tubular, everted forward and recurved ventro-laterally; medial and distal parts strongly scobinate. Medial diverticulum large, digitiform, terminal one shorter, conical, terminal cornutus long, fine, slightly arcuate with apex rounded.

Female genitalia (Fig.18): Ovipositor short, broad, weak, papillae anales densely hairy, apical edges armed with short, strong setae; apophyses slender, rather short. Ostium bursae broad, short, ventral sclerotized lamina forming narrow half-ring. Ductus bursae moderately long, slightly twisted, membranous with fine wrinkles and long, sclerotized, cristate lateral lamina running to cervix bursae. Cervix bursae small, conical, finely sclerotized and wrinkled, apical part of corpus bursae with large, sclerotized plate laterally. Corpus bursae elliptical, big, with three equal, broad and relatively long signa.

Bionomics: The eastern subspecies was collected in late autumn, in a semi-desert region northward from the Tien Shan chain; the moths are attracted well to artificial light. Early stages and foodplant are unknown.

Distribution: The taxon is recorded from the type locality only.

Etymology: The specific name refers to the ochreous suffusion of the fore wing.

Pseudohadena (Jaxartia) deserticola sp. n.

(Figs 13, 14, 19)

Holotype: female, Turkmenistan, Kara-Kum desert, 100 m, 42 km N of Ashkhabad, 58°33'E, 38°21'N, 10.X.1991, leg. A. PODLUSSÁNY, L. RONKAY and Z. VARGA, Slide No. 5200 RONKAY. (coll. HNHM Budapest).

Paratype: 1 female, Turkmenistan, Kara-Kum desert, 54 km N Ashkhabad, 1 km N Bakhardok, 31.X.1990, leg. V. V. DUBATOLOV. (coll. BIN Novosibirsk)

Diagnosis: The new species differs from the other members of the subgenus by its unicolorous, pale orange-brownish, almost patternless fore wing. Its closest relative is *P. (J.) evanida*, the two species show, besides the external differences, easily recognizable ones in the female genitalia (see Figs 18–19): the ductus bursae and its lateral, sclerotized crests are significantly longer and stronger in *evanida*, the apical sclerotization of corpus bursae is also more intensive in *evanida*. The corpus bursae is more globular in *deserticola*, the signa are unequal – two short, broad and a long, narrow while the corpus bursae is more elliptical in *evanida* and the signa are almost equal, relatively long, broad.

Description: Wingspan 39–40 mm, length of fore wing 18–19 mm. Head, thorax and fore wing pale orange-brownish, irrorate with a few dark brown hairs and scales, abdomen more greyish, less hairy. Fore wing narrow, elongated with apex more or less acute. Wing pattern very indistinct, ante- and postmedial crosslines represented by darker costal patches and some diffuse, somewhat darker spots, subterminal line lacking. Orbicular and reniform stigmata slightly discernible by cleaner, more ochreous filling, their outlines practically missing. Claviform spot diffuse, small, darker patch, being darkest element of wing pattern. Terminal line deleted, cilia finely striolate with dark brown. Hind wing pale, shining ochreous brown, transverse line and narrow marginal suffusion somewhat darker, discal spot absent; cilia pale orange-brownish. Underside of wings almost patternless, whitish-ochreous, irrorate with grey. Fore wing discal spot represented by whitish patch with more greyish centre, pale shadow of transverse line on hind wing also recognizable.

Female genitalia (Fig. 19): Ovipositor short, broad, papillae anales densely hairy, with stronger, short, apical setae; apophyses rather short, weak. Ostium bursae broad but short, membranous, ventral lamina flattened, relatively short, sclerotized. Ductus bursae short, caudally tapering, membranous with fine wrinkles, with a sclerotized, somewhat folded lateral lamina running to cervix bursae. Cervix bursae small, conical, finely sclerotized and wrinkled, apical part of corpus bursae with large, sclerotized plate laterally. Corpus bursae globular, spacious, with three signa, one of them rather long, narrow, other two about half as long but much broader.

Bionomics: Early stages and foodplant(s) are unknown. The two type specimens were found in the late autumnal period.

Distribution: The species is known only from the southern region of the Kara-Kum desert.

Etymology: The species is named after its eremic habitat.

Pseudohadena (Jaxartia) cymatodes (BOURSIN, 1954)
(Figs 11, 12, 17, 35, 36)

Pseudopseustis cymatodes BOURSIN, 1954: 185.

Type material examined: holotype male, Russia, Ural, Emba and the photo of its genitalia (BOURSIN 1954, plate 14, fig. 6). Additional material examined: Kazakhstan: 1 male, 2 females, Prov. Almaty, Syugeti Mt., 8 km NW Kok-Pek, 1000 m, 78°37'E, 43°32'N, 08.10.1994, leg.: GY. FÁBIÁN & GY. M. LÁSZLÓ; 6 males, Prov. Taldikurgan, Kumkala desert, 15 km W Aktau Mt., 500 m, 79°07'E, 43°56'N, 06.10.1994, leg.: GY. FÁBIÁN & GY. M. LÁSZLÓ (coll. HNHM, GY. FÁBIÁN and G. RONKAY).

Slide Nos: 4981 RONKAY (male), 5181 RONKAY (female)

Diagnosis: The smallest species of the subgenus (wingspan 30–35 mm) with relatively sharply defined, sinuous crosslines and stigmata. The male genitalia differ from those of the related taxa by its much more distally situated process of costal lobe ("digitus"), relatively short, apically strongly dilated harpe and the very large, strong terminal cornutus of the vesica; the most characteristic specific feature of the female genitalia is the very long, sclerotized ductus bursae.

Male genitalia (Figs 35, 36): Uncus relatively short, tegumen weak, fultura inferior cordiform with broader apical part. Valva elongated, dilated at distal third, cucullus rounded, corona weak. Sacculus short, densely setose, clavus reduced. Pulvillus sclerotized, subtriangular lobe, harpe rather short, strong, flattened, medially curved and apically dilated with setose distal third. Costal lobe large, its extension ("digitus") strong, long, acute, situated subapically. Aedeagus cylindrical, carina with two cuneiform laminae. Vesica tubular, extending forward and recurved ventro-laterally, its walls finely scobinate basally, much stronger in medial and distal parts. Medial third with long, subconical diverticulum, distal third with somewhat shorter diverticulum and with long, robust, pointed terminal cornutus.

Female genitalia (Fig. 17): Ovipositor short, weak, papillae anales densely hairy, without stronger apical setae. Ostium bursae broad, ventral plate sclerotized, rather quadrangular. Ductus bursae very long, tubular, with long, sclerotized crests running laterally from ostium to apical part of corpus bursae. Cervix bursae small, membranous, apical part of corpus bursae with large sclerotization, mostly on ventro-lateral surface. Main part of corpus bursae elliptical-semiglobular, membranous, with three inequal (one long, narrow, ribbon-like, second medium-long, broader, third short) signa.

Bionomics: A poorly known species from semi-desert habitats in Kazakhstan, possibly dry, hot steppes at the type locality. The imagines of the newly discovered population are on the wing in late autumn; early stages and foodplant are unknown.

Distribution: The species is recorded from two remote localities from the eastern edge of the eastern European plain and from SE Kazakhstan. Its area possibly extends through the semi-desert and dry steppe ranges of south-eastern Kazakhstan towards Uzbekistan and N Turkmenistan to the southern foothills of the Ural Mts.

The *jordana* species-group

Diagnosis: The species-group contains only one species which differs from all other members of the subgenus by its significantly shorter pectination of the male antenna and its much longer corona.

Pseudohadena (Jaxartia) jordana (STAUDINGER, 1900)

Orthosia jordana STAUDINGER, 1900: 376.

Type material examined: 2 male syntypes, [Jordan]: Palestine, Jordan valley, leg. PAULUS, coll. STAUDINGER, ZMHU Berlin. Additional material: 1 male, "Iraq" (coll. HNHM); the photo of the male genitalia published by BOURSIN (1954, Fig. 5).

Subgenus *Pseudopseustis* HAMPSON, 1910, **stat. rev.**

Type species: *Taeniocampa tellieri* LUCAS, 1907: 196.

Diagnosis: A monotypic subgenus, resembling externally to the species of *Jaxartia* by its widely bipectinated antenna of the male and the similarly robust body with dense pubescence of the thorax. The two subgenera differ in the armature of the fore legs (*Pseudopseustis* has no additional strong spine medially which is always present in *Jaxartia*) and some details of the male genitalia (the valva of *Pseudopseustis* has almost parallel margins, without subapical dilatation and the terminal cornutus of the vesica is lacking; in addition, the cucullus is more rounded and the penicular lobes of the tegumen are larger).

Eremohadena gen. n.

Type species: *Mamestra siri* ERSHOV, 1874: 41.

Description: External morphology (Figs 1–6, 9–12 in Plates I–II, RONKAY and VARGA 1993): Large species with strong body and elongated, narrow fore wings. Eyes large, frons smooth, collar and tegulae distinct, usually defined by different colour. Antennae of both sexes long, filiform, ciliate. Fore legs with rather small inner claw on tibia and row of 4–6 very long, strong, straight or slightly curved spines on outer side of basitarsus. Abdomen long, robust, dorsal crest and abdominal coremata lacking. Fore wing elongated, narrow with apex pointed, outer margin often slightly crenulate. Wing pattern regularly sharp, noctuid maculation typical, usually complete, only claviform sometimes reduced.

Male genitalia (Figs 1–16 in RONKAY and VARGA 1993): Valvae elongated with long, slender, arcuate harpe. Cucullus small, more or less triangular, often flattened, bearing a corona consisting of few but strong setae (except in *coluteae*). Costal lobe ("digitus") small, rounded or forming long, acute process. Aedeagus with carina bearing two slightly divergent, firm bars fixing basal coiling of everted vesica. Vesica tubular, distally amplified, its basal part coiled with 360, medial part covered densely with minute spicula, bearing lateral diverticula and slightly sclerotized crest, terminal part with small, flattened terminal cornutus.

Female genitalia (Figs 16, 40 and 40, 42–46 in RONKAY and VARGA 1993): Ovipositor moderately long, rather weak, finely setose. Ostium bursae large, membranous with sclerotized lamellae, ductus bursae variably long and rugulose, in some species with long and strongly sclerotized, sinuous ribbon and/or small, membranous, proximo-lateral appendage. Cervix bursae large, often wrinkled and/or sclerotized, corpus bursae elliptical or ovoid, with four long, ribbon-like signa.

Bionomics: A xeromontane-eremic group inhabiting lowland and montane deserts, semi-deserts and dry, hot short-grass steppes. The species are usually local but may appear in great individual numbers, especially in the lowland desert ranges (e.g. *siri* in the Kara-Kum area). The species are regularly univoltine with a longer or shorter period of aestivation. They appear in the late spring and are on the wing, after the aestivation, to the very end of the autumn. The early stages and foodplants are most often unknown, *E. siri* was found as polyphagous in the Turkmenian desert territories (DARICHEVA, pers. comm.)

Distribution: From Spain and the Maghreb countries to Mongolia and to Chinese Turkestan. The species regularly have a sympatric (and syntopic) occurrence in the Middle East and in Central Asia, sometimes five species may occur within a small area. On the other hand, some of the taxa of the *siri*-line show allopatric speciation (*siri–roseotinctoides–roseonitens*) in the western range of distribution of the genus; only one species is recorded from the Maghreb area and from Europe (*roseonitens*).

Remarks: A rather homogeneous genus containing nine species of two species-groups (see the Checklist bellow; the species *E. roseonitens* (OBERTHÜR, 1887) was incorrectly placed into the *P. chenopodiphaga*-group by RONKAY and VARGA (1993). The female genitalia of *E. oxybela* and *E. coluteae* are illustrated for the first time in Figs 16 and 40.

Gender: feminine.

Etymology: The members of the genus are *"Hadena"*-like (in old sense) noctuids living in eremic habitats.

Genus **Eremohadena** RONKAY, VARGA & FÁBIÁN
Type-species: *Mamestra siri* ERSHOV, 1874

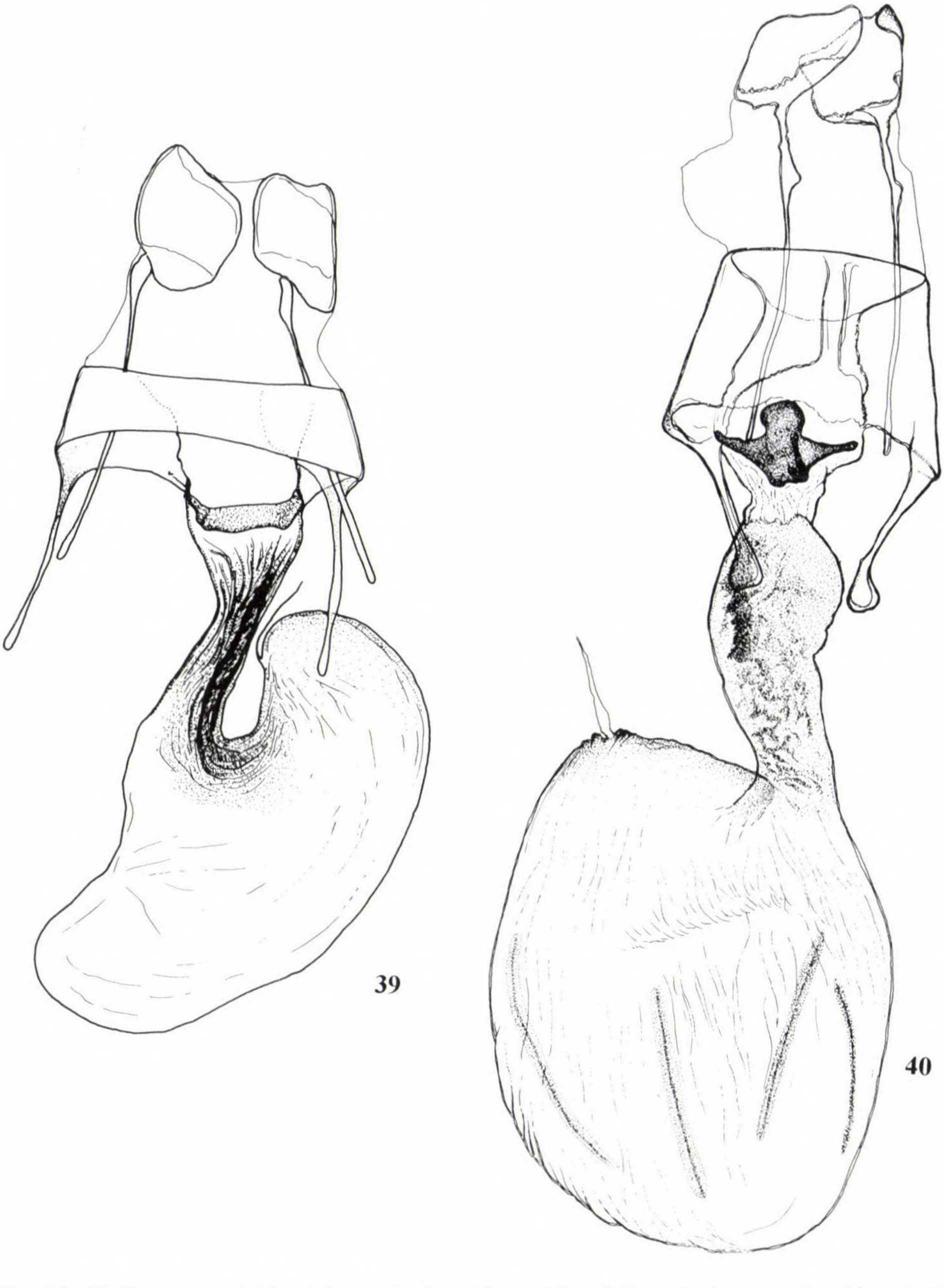
- *arvicola*-group
  - *arvicola arvicola* (CHRISTOPH, 1887), comb. n.
  - *arvicola rhodostola* (BOURSIN, 1962), comb. n.
  - *arvicola korshunovi* (RONKAY & VARGA, 1993), comb. n.
- *siri*-group
  - *siri* (ERSHOV, 1874), comb. n.
  - *roseotinctoides* (POOLE, 1989), comb. n.
  - *orias* (RONKAY & VARGA, 1993), comb. n.
  - *roseonitens* (OBERTHÜR, 1887), comb. n.
  - *adscripta* (PÜNGELER, 1914), comb. n.
  - *pugnax* (ALPHÉRAKY, 1892), comb. n.
  - *oxybela* (BOURSIN, 1963), comb. n.
  - *coluteae* (BIENERT, 1869), comb. n.

Graphantha gen. n.

Type species: *Chloantha laciniosa* CHRISTOPH, 1887: 77.

Description: External morphology (Figs 1–9 in Plate, RONKAY and VARGA 1989): Body relatively short, slender or rather robust. Eyes large, antennae of both sexes filiform, ciliate. Pubescence of head and thorax distinct, collar, tegulae and metathorax well marked; abdominal coremata present, dorsal crest reduced. Fore leg with rather strong inner claw on tibia, typical tarsal "armature" absent, represented by a row of five weak, short, straight spines. Fore wing variably long, triangular with apex pointed or finely acute, wing pattern either very sharp, distinct (subg. *Graphantha*) or much finer, less intensive (subg. *Dysgraphhadena*).

Male genitalia (see BOURSIN 1970, Figs 93, 94; RONKAY & VARGA 1989, Figs 1–15): Uncus short, slender or rather strong. Tegumen high, wide, penicular lobes large, densely hairy. Fultura



Figs 39–40. Female genitalia of *Pseudohadena (Jaxartia)* and *Eremohadena* species. 39 = *P. (J.) elinguis* PÜNGELER, paratype, Syr-Darya, by VARGA & RONKAY, 1991; 40 = *Eremohadena oxybela* BOURSIN, Kirghisia

inferior strong, deltoid or weaker, narrower plate. Valva elongated, narrow with apex pointed or acute, cucullus and corona reduced. Costal plate ("digitus") strong, forming acute, spiniform or flattened, cuneiform process or broad subapical lamina with short, rounded, erected lobe. Harpe reversible, strong, cylindrical or flattened, apically slightly or strongly dilated. Aedeagus cylindrical, carina with small, dentated plate. Vesica tubular, reclinate, finely scobinate; armature of vesica consisting of large, homogeneous field of small, fine spiculi ("macrotricha") or with three bundles of stronger spinules covering small, semiglobular diverticula or with thicker but short spiculi at basal part of vesica and finely scobinate medial part but with rather strong, spine-like terminal cornutus.

Female genitalia (see RONKAY & VARGA 1989, Figs 16–18): Ovipositor short, broad, papillae anales densely hairy; apophyses short. Ostium bursae calyculate or with sclerotized plate connecting to ductus bursae with a membranous neck. Ductus bursae granulosely sclerotized, tubular, flattened, relatively long, bearing some stronger crests, anterior part with sclerotized, cristated plate running often to cervix bursae. Cervix bursae rugulose, membranous or with small, sclerotized plate, corpus bursae elliptical-ovoid, membranous, bearing four long, ribbon-like or two (three) small, rounded signa.

Bionomics: the genus comprises xerophilous species imhabiting hilly and montane semi-deserts, xerothermic montane grasslands, mostly in middle elevations altitudes. The species are usually infrequent, some of the taxa are known by very few examples only. The adults are nocturnal animals, attracted well to artificial light. Their flight period is relatively long, the moths are on the wing in the whole midsummer period, displaying no aestivation. The early stages and foodplants are unknown.

Distribution: Xeromontane group with a rather wide distribution along the xerothermic mountain system from Central Asia and Mongolia to the Iberian peninsula. The phyletic lineages of the two subgenera show a more or less clear allopatric speciation; the members of the different lineages are often have sympatric (and syntopic) occurrence in the eastern parts of Asia where the genus displays a significantly larger diversity. The species number of *Graphantha* is decreasing from Central Asia towards Asia Minor where only one species occurs from both subgenera, and only one species is recorded from the Near East (*idumaea*) and one from Europe (*commoda*).

Remarks: The specific differences in the genitalia are regularly slight within the phyletic lines and are regularly more recognizable in the females.

Etymology: the generic name refers to the strongly, beautifully marked fore wings of the species.

Subgenus **Graphantha**

Diagnosis: The two subgenera of the genus differ externally in the strength of the body (stronger, more robust in *Graphantha*), the intensity of the forewing pattern (that of *Graphantha* is characteristically sharp, distinct. In the male genitalia, *Graphantha* has much stronger, deltoid fultura inferior with strong apical process, the costal plate of the valva ("digitus") is strong, forming an acute, spine-like or flattened, cuneiform process, appearing in two, rather dissimilar forms. The harpe is curved stick-like, apically slightly dilated. The armature of vesica is either a large, homogeneous field of small, fine spiculi ("macrotricha") or separated into three bundles of stronger spinules covering small, semiglobular diverticula; the terminal cornutus is missing. The fultura inferior of *Dysgraphhadena* is weak, narrow plate, the costal plate is much broader, flattened, bearing a small, rounded, erected lobe only; the harpe is characteristically "mushroom-shaped". The armature of vesica is more simple, the basal area of vesica is covered with thicker but short spiculi, but the terminal cornutus is present, rather strong. The female genitalia of the two subgenera are similar in type but the sclerotization of the ostium and ductus bursae show differences and the configuration of the signa are very different as *Graphantha* has four long, ribbon-like signa while the corpus bursae of *Dysgraphhadena* is armed with two or three small, rounded signa.

Description: External morphology: Body rather robust. Fore wing elongated triangular with apex pointed or finely acute, wing pattern characteristically very sharp, distinct.

Male genitalia (RONKAY & VARGA 1989, Figs 1–15): Uncus short, slender, fultura inferior strong, deltoidal. Costal plate of valva ("digitus") strong, forming an acute, spine-like or flattened, cuneiform process, appearing in two, rather dissimilar forms. Harpe reversible, strong, apically slightly dilated. Armature of vesica consists of large, homogeneous field of small, fine spiculi ("macrotricha") or with three bundles of stronger spinules covering small, semiglobular diverticula.

Female genitalia (see RONKAY & VARGA 1989, Figs 16–18): Ostium and ductus bursae granulosely sclerotized, former calyculate, latter tubular, flattened, relatively long. Cervix bursae rugulose, membranous, corpus bursae elliptical-ovoid, membranous, bearing four long, ribbon-like signa.

Distribution: from Turkey to Mongolia and to Chinese Turkestan.

Dysgraphhadena subgen. n.

Type species: *Rhiza commoda* STAUDINGER, 1889: 44.

Description: External morphology: Body and wings rather weak, body slender, fore wing pattern fine, less intensive.

Male genitalia (BOURSIN 1970, Figs 93, 94, VARGA 1984): Uncus short, relatively strong, fultura inferior weak, narrow plate. Costal plate of valva ("digitus") forms a strong, flattened plate with small, rounded, erected lobe. Harpe reversible, flattened, apically strongly dilated ("mushroom-shaped"). Basal area of vesica covered with thicker but short spiculi, finely scobinate at medial part, terminal cornutus present, rather strong.

Female genitalia: Ostium bursae with a sclerotized plate connecting to ductus bursae with a membranous neck. Anterior part of ductus bursae with a sclerotized, cristated plate running often to cervix bursae longer, stronger. Cervix bursae with a small, sclerotized plate, corpus bursae elliptical-ovoid, membranous, bearing two (rarely three) small, rounded signa.

Distribution: From Spain to Mongolia and the north-western Himalayas.

Remarks: The taxonomic interpretation of the western Palaearctic taxa is somewhat dubious, especially as the differences in the genitalia of the known species are regularly slight. It is not impossible that *idumaea* is only a geographic subspecies of *commoda* while the material of the Spanish "*commoda*" population is not yet satisfactory for a detailed "microtaxonomic" analysis.

Etymology: the species of the subgenus are *"Hadena"*-like (in old sense) moths with less sharply defined, often obsolescent markings.

Genus **Graphantha** RONKAY, VARGA & FÁBIÁN
Type-species: *Chloantha laciniosa* CHRISTOPH, 1887

Subg. **Graphantha**
laciniosa-group
- *laciniosa laciniosa* (CHRISTOPH, 1887), comb. n.
- *laciniosa hethitica* (RONKAY & VARGA, 1989), comb. n.
- *laciniosa odontographa* (RONKAY & VARGA, 1989), comb. n.
- *calligrapha* (RONKAY & VARGA, 1989), comb. n.

gnorima-group
- *gnorima gnorima* (PÜNGELER, 1906), comb. n.
- *gnorima hololampra* (RONKAY & VARGA, 1989), comb. n.
- *gnorima peregovitsi* (RONKAY & VARGA, 1989), comb. n.

Subg. **Dysgraphhadena** RONKAY, VARGA & FÁBIÁN
Type species: *Rhiza commoda* STAUDINGER, 1889
- *sergia* (PÜNGELER, 1901), comb. n.
- *commoda* (STAUDINGER, 1889), comb. n.
- *idumaea* (PÜNGELER, 1901), comb. n.
- *schlumbergeri* (PÜNGELER, 1905), comb. n.
- *stenoptera* (BOURSIN, 1970), comb. n.

* * *

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A NEW SUBSPECIES OF THE HORSESHOE BAT RHINOLOPHUS MACROTIS FROM PAKISTAN (CHIROPTERA, RHINOLOPHIDAE)

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The description of a population of the Indomalayan species *Rhinolophus macrotis* from Pakistan, as a new subspecies *R. m. topali* is given. The new taxon is characterized by its colour, the measurements of the anterior noseleaf and the position of the lower premolars.

Key words: Mammalia, Rhinolophidae, *Rhinolophus macrotis*, Pakistan, taxonomy

Rhinolophus macrotis BLYTH, 1844 (Big-eared Horseshoe bat) was described from Nepal (restricted to Kathmandu Valley, see SCULLY 1887, p. 234) on the basis of two specimens collected by HODGSON. Subsequently ANDERSEN (1907) named a new subspecies, *R. macrotis dohrni*, from Soekaranda in northwestern Sumatra which he differentiated on the basis of its broader horseshoe; broader ears; longer tibia and larger skull. *R. macrotis siamensis* GYLDENSTOLPE (1917) from Doi Par Sakang in north-western Thailand was distinguished by its smaller size, the length of the forearm measuring 36.1 mm "against a minimum of 41 mm in *macrotis* and 42.7 mm in *macrotis dohrni*"; the horseshoe was also narrower. ANDERSEN (1905*a*) had previously described a new species, *R. hirsutus*, from Guimaras in the Central Philippine Islands which he considered to be allied to *R. macrotis* but with considerably larger ears and tail. ALLEN (1923) named *R. episcopus* from Wanshien, Sichuan Province, China and included it within the *macrotis* group. It was larger than *R. macrotis macrotis* with a forearm length of 47.5 mm and "with a peculiar terminal noseleaf, which is rounded rather than pointed". ALLEN (1923) also named a lowland race *R. episcopus caldwelli*, from a single specimen collected from Yuki, Fukien Province, China. This was similar to the nominate form but smaller (forearm 43 mm) and more brightly coloured. OSGOOD (1932) referred specimens from northern Vietnam to *R. episcopus caldwelli* and *R. macrotis siamensis*. This claim that the two taxa are sympatric in Tonkin District was subsequently rejected by CORBET and HILL (1992). TATE and ARCHBOLD (1939) listed *macrotis* and *episcopus* as separate species; both were included in the *macrotis* group. Later, TATE (1943) included *episcopus* as a synonym of *R. macrotis*. He listed six subspecies, four of which, *macrotis*, *dohrni*, *episcopus*, and *caldwelli* "are very much alike and perhaps only doubtfully separable". *R. macrotis siamensis* was considered "sharply smaller" and *R. macrotis hirsutus* "a larger race, with longer tail". ELLERMAN and MORRISON-SCOTT (1951) listed four subspecies of *R. macrotis* for the Palaearctic and Indian region; *macrotis*, *siamensis*, *episcopus* and *caldwelli*. More recently, CORBET and HILL (1992) and KOOPMAN (1993) included *caldwelli*, *dohrni*, *episcopus*, *hirsutus* and *siamensis* as synonynms of *R. macrotis*. In consequence, the range of this species is currently considered to extend from India (Uttar Pradesh, West Bengal and Meghalaya [BMNH, HNHM and LAL 1976]) and Nepal (BMNH, HNHM) eastwards to southern China (ALLEN 1938), Thailand (LEKAGUL and MCNEELY 1977), Vietnam (OSGOOD 1932 and HNHM), Malaysia (LORD MEDWAY 1969 and HNHM), Sumatra (ANDERSEN 1907) and the Philippines (HEANEY *et al.* 1987). It is poorly represented in zoological collections and appears to be uncommon throughout its range.

The five specimens of *R. macrotis*, presented to the Harrison Zoological Museum by Mrs. NORA PENDLETON are the first known from Pakistan, and now are deposited in the Harrison Zoological Museum (HZM) and in the Hungarian Natural History Museum (HNHM).

Rhinolophus macrotis topali ssp. n.

Type material: holotype, adult female, Kakul Phosphate Mine, Abbotabad, Pakistan. Collected 24 October 1985, by Mrs. NORA PENDLETON. In spirit, skull extracted (HZM 5.16522).

Paratypes: four adult females, from the same locality and date as the holotype. Three in spirit, skulls extracted (HZM 3.16520; HZM 4.16521; HNHM 15297), one prepared skin and skull (HZM 1.16518).

Etymology: The new subspecies is named after Dr. GYÖRGY TOPÁL, Keeper of Mammals of the Hungarian Natural History Museum Budapest, in honour of his contribution to the knowledge of the Southeast Asian bats.

Comparative material: *R. macrotis macrotis* Nepal: The Natural History Museum, London [NHM] 45.1.8.416 [holotype], NHM 78.286, HNHM 15297; Uttar Pradesh: NHM 79.11.21.143–144; West Bengal: HNHM 92.89.1; Assam: HNHM 92.90.1. *R. macrotis siamensis* Thailand: NHM 78.2313. *R. macrotis dohrni* Sumatra: NHM 6.12.1.22 [holotype], NHM 7.1.9.1; Malaysia: NHM 67.1595, NHM 67.1598–1599. *R. macrotis* cf. *episcopus* Vietnam HNHM 15514–15518.

Measurements: The standard external museum measurements were taken from the spirit specimens prior to preparation, the other external and cranial measurements of the type series (Table 1) and the comparative material (Table 2) were taken by digimatic caliper with 0.01 mm accuracy. The abbreviations used in this paper along with explanations are as follows:

HEADBODY–head and body length; FOREARM–length of forearm; TAIL–tail length; EAR–length of ear conch; HSHOEW–greatest width of anterior noseleaf; MET3L–length of the metacarpal of the third finger; MET4L–length of the metacarpal of the fourth finger; MET5L–length of the metacarpal of the fifth finger; SBASL–basilar length of skull from frontal edge of palate to the foremost part of ventral incision between condyles; STOTL–total length of skull, from front of canines to occiput; UCM3L–crown length of upper C–M3; UCP4L–crown length of upper C–P4; UM1M3L–crown length of upper M1–M3; PALATALL–length of palatal bridge; UCCW–width of rostrum between outer margins of crown of canines; UM3M3W–width of rostrum between outer crowns of M3; KNOBW–width of nasal knob; INTORBW–width of interorbital constriction; ZYGOMATW–width of skull between zygomata; MASTOIDW–mastoid width of skull; BRAINCH–height of braincase, from glenoid fossa to top with sagittal crest; KNOBH–height of nasal knob, from palate to top; MANDIBL–length of mandible, between hindermost portion of articular process and anteriormost edge of I1 alveolus; LCM3L–crown length of lower C–M3; LCP4L–crown length of lower C–P4; LM1M3L–crown length of lower M1–M3; PCORH–height of coronoid process, between its top and the sinus on ventral profile of mandibular body.

Table 1. External and cranial measurements (in mm) of the type series of *Rhinolophus macrotis topali*

NUMBER	5.16522	3.16520	4.16521	15297	1.16518
HEADBODY	41.51	–	43.1	42.51	42.7
FOREARM	45.8	45.4	44.7	44.7	46.2
TAIL	19	19	18	21	18
EAR	23.2	23.8	23.8	24.5	22.7
HSHOEW	8.69	8.89	9.29	9.68	–
MET3L	–	31.45	32.57	32.09	31.96
MET4L	–	32.56	32.83	33.26	32.39
MET5L	–	32.96	33.62	31.99	32.56
SBASL	11.8	11.81	11.69	11.83	11.93
STOTL	18.15	18.32	18.01	18.23	18.07
UCM3L	6.66	6.68	6.48	6.57	6.57
UCP4L	2.85	2.92	2.76	2.76	2.88
UM1M3L	4.12	4.13	4.07	4.09	4.11
PALATALL	3.56	3.58	3.62	–	3.72
UCCW	4.06	4.12	4.05	4.1	4.01
UM3M3W	5.95	6.21	6.03	6.06	6.06
KNOBW	4.75	4.75	4.66	4.74	4.69
INTORBW	2.51	2.63	2.17	2.41	2.42
ZYGOMATW	8.11	8.3	8.2	8.23	8.28
MASTOIDW	8.8	8.9	8.79	8.78	8.73
BRAINCH	–	5.39	5.34	5.28	5.87
KNOBH	–	3.39	3.25	–	3.21
MANDIBL	11.77	11.86	11.51	11.92	11.47
LCM3L	6.94	6.93	6.8	6.76	6.75
LCP4L	2.54	2.6	2.48	2.47	2.44
LM1M3L	4.5	4.44	4.41	4.36	4.39
PCORH	2.31	2.28	2.17	2.27	2.36

Table 2. Means of the external and cranial measurements (in mm) of the various subspecies of - *Rhinolophus macrotis*

	macrotis	*caldwelli*	*siamensis*	*dohrni*
No. of cases	6	6	1	5
HEADBODY	44.81	44.19	–	48.31
FOREARM	42.79	44.45	–	43.82
TAIL	21.34	18.45	–	20.05
EAR	21.90	23.82	–	23.86
HSHOEW	7.57	7.51	–	9.37
MET3L	30.50	31.70	–	31.48
MET4L	31.71	33.05	–	32.75
MET5L	31.93	32.91	–	32.12
SBASL	11.50	12.14	–	11.92
STOTL	17.78	18.33	–	18.19
UCM3L	6.44	6.58	–	6.68
UCP4L	2.81	2.82	2.43	3.00
UM1M3L	3.95	4.01	3.45	3.91
PALATALL	3.68	3.65	3.04	3.42
UCCW	3.85	4.02	3.82	4.02
UM3M3W	5.77	5.92	5.29	5.81
KNOBW	4.67	4.92	4.00	4.94
INTORBW	2.40	2.48	–	2.58
ZYGOMATW	8.14	8.11	–	8.32
MASTOIDW	8.66	8.92	7.87	8.81
BRAINCH	5.24	5.25	–	5.14
KNOBH	3.24	3.14	2.96	3.43
MANDIBL	11.19	11.60	9.94	11.83
LCM3L	6.64	6.80	5.89	6.90
LCP4L	2.42	2.55	2.26	2.75
LM1M3L	4.32	4.35	3.87	4.26
PCORH	2.15	2.24	1.96	2.29

Diagnosis: A medium-sized subspecies of *Rhinolophus macrotis*. It differs from all the other subspecies by its very pale colouration, with almost white underparts. The anterior noseleaf very broad (8.69–9.68 mm). *Rhinolophus macrotis topali* is further distinguished by having extremely small second lower premolar (P_3), its tip not reaching the cingula of the P_2 and P_4, and in every cases totally extruded from the toothrow.

Description: Small-medium sized (forearm 44.7–46.2 mm) bat. The noseleaves typical for the species; anterior noseleaf covering the muzzle, secondary noseleaf present, well-visible. The connecting process rounded, originating below the apex of the sella. Sella long, tongue-shaped, thickly covered with short pale-yellowish hairs; its upper part curving downwards (Figs 1–2).

Pelage (based on the prepared skin of HZM 1.16518) from dorsal aspect: hairs in mid-dorsal region measure approximately 5.2 mm; those on the flanks and neck are longer; they are very fine in texture. Hair bases pale, almost white, tips to hairs darker, mid-buffy brown; darkest on nape of neck, shoulders and mid-dorsal region. Pale hairs present on base of ears. From ventral aspect the hairs shorter, 4.8 mm in mid-ventral region; longer on flanks and outer aspects of the throat. Hair bases white; tips pale grey, this gives a generally very pale impression.

The membranes uniform, dark brown; very short, pale hairs present on the outer border of interfemoral membrane.

The metacarpals subequal, besides the shortest third metacarpal, the fifth only slightly longer than fourth.

Fig. 1. Face of *Rhinolophus macrotis topali* (holotype)

The skull narrow, the mastoid width exceeding the zygomatic width. The sagittal crest low, poorly developed. Beside the anterior median swellings of the nasal knob, the lateral ones also well inflated. Palatal length more than twice as long as the maxillary toothrow (C–M3).

The first upper premolar small but has a distinct cusp, and in the toothrow. The lower P_3 rudimentary, always extruded from the toothrow; in one case (HZM 1.16518) it displaced lingually in the right toothrow. The P_2 and P_4 usually in contact (Fig. 3).

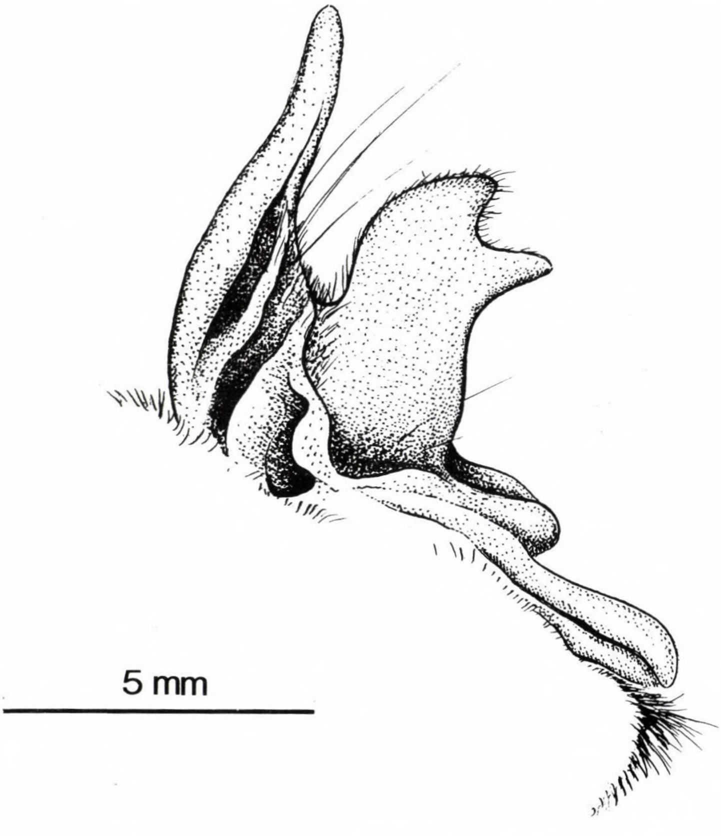

Fig. 2. Lateral view of noseleaves of *Rhinolophus macrotis topali* (paratype, HNHM 15297)

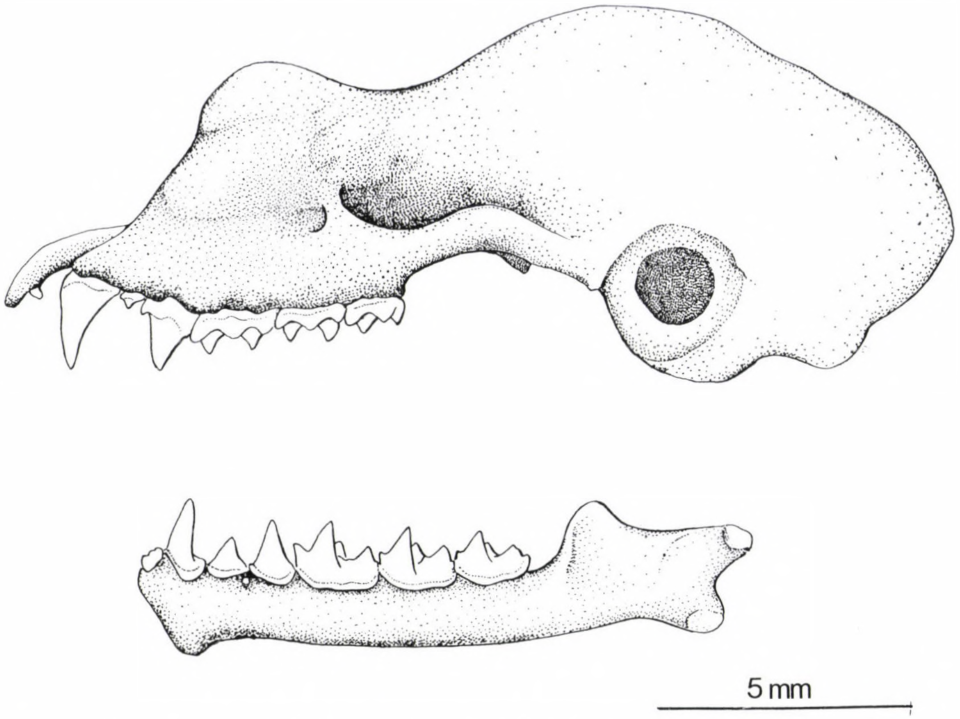

Fig. 3. Left lateral view of skull and mandible of the *Rhinolophus macrotis topali* (holotype)

DISCUSSION

The new subspecies *Rhinolophus macrotis topali* is characterized by the following character combinations: colour pattern, wide horseshoe (8.69–9.68 mm against 6.8–8.0 mm of the other subspecies) and rudimentary lower middle (P_3) premolars. These features differentiate it from all the other subspecies of *R. macrotis* except *dohrni*, which has a similarly wide anterior noseleaf (8.63–9.98 mm, respectively). However, in *dohrni* the lower middle premolar is well developed and situated in the toothrow.

The *philippinensis* group (which includes *R. macrotis*, see BOGDANOWICZ 1992, BOGDANOWICZ and OWEN 1992) has several primitive characters, including the wing structure with subequal metacarpals, long palatal bridge and P_3 often situated in the toothrow (ANDERSEN 1905*b*, 1905*c*, 1907). According to ANDERSEN (1907), *R. macrotis* is an example of "a type of low level of evolution, which has no closer relative, than the primitive forms of the *Rh. philippinensis* group" whilst TATE (1943) considered it to "represent the basic type of the *philippinensis* group". According to WOLOSZYN (1987) the position and size of the lower premolars are useful characters in determining microevolutionary trends. In his studies of recent and fossil material of the *ferrumequinum* group, he noted that the process involves mainly the reduction in length of the lower premolar row. It is therefore of interest to note that *R. macrotis caldwelli* from southern China and north Vietnam has a relatively large lower middle premolar (P3) situated within the toothrow and as such can be regarded as a primitive form.

Recent phylogenetic studies suggest that the center of evolutionary origin of the rhinolophids is Southeast Asia (BOGDANOWICZ and OWEN 1992). The *philippinensis* group is thought to be one of the most primitive groups within the Rhinolophidae. It apparently originated in the area encompassing south China, north Vietnam, Laos and north Thailand since several species within the group (*R. rex*, *R. paradoxolophus*, *R. marshalli*) are endemic to this region (KOOPMAN 1989). In consequence the taxon *caldwelli* can be regarded as one of the most primitive of all rhinolophids. In contrast, the new subspecies *R. macrotis topali*, because of the displaced position and reduced size of P3 is a more specialized form within the species. This explanation fits well with the phylogenetic-Hennigian theory of zoosystematics which states that primitive forms are found in or near the centre of origin and advanced ones at the periphery (UDVARDY 1983). This could help explain the presence of the derived characters in the geographically marginal population of *R. macrotis* in Pakistan.

* * *

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or

MCALPINE, J. F. (1981) Morphology and terminology, adults, pp. 9-63. *In* MCALPINE *et al.* (eds) *Manual of Nearctic Diptera*, vol. 1. Agriculture Canada, Ottawa.

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TWO NEW ORIBATID (ACARI: ORIBATIDA) SPECIES FROM THE CANOPY OF TROPICAL DRY FOREST IN MEXICO

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Description of two new oribatid species: *Eremella matildebellae* sp. n. and *Micreremus rafaelius* sp. n. from Mexico are described. With 6 original figures.

Key words: Acari, Oribatida, new species, canopy, Mexico

INTRODUCTION

The investigation of the oribatid fauna inhabiting the trunk of trees and higher up the canopy level has developed rapidly in the last few years. The staff members of the museum in Karlsruhe (Germany) had made great strides in this direction (for further literature see WUNDERLE 1992), and the collectings made by other researchers in Central and South America (e.g. PALACIOS-VARGAS 1982, PAOLETTI *et al.* 1990, BEHAN-PELLETIER *et al.* 1993). Our investigations were also concentrated to explore the fauna of the canopy level.

This contribution officially belongs to the project "Biodiversity of Mexican Mites" in the collaboration agreement between CONACYT (Mexico) and OMFB (Hungary). Biological specimens were obtained through the project "Efectos del uso de la selva baja caducifolia" (IN-2078/91) DGAPA-UNAM, Mexico, in charge of the junior author.

MATERIAL AND METHODS

Study area is located at the Biological Station of Chamela in Jalisco Coast, 75 miles north of Manzanillo-Puerto Vallarta highway. It is a very seasonal region, with concentrated rainfall from July till September, and with temperatures around 28 and 32°C, where the dominating vegetation is a mixture of tropical deciduous forest and a tropical subdeciduous forest.

The samples were taken in a hydrological basin system during the months of August and September, 1992; May, July and November, 1993, February and September, 1994. An area of 100 m^2 was delimited in each case, and with the help of 50 funnels of 0.5 m in diameter. Some the 30% of the area was sampled. The insecticide of pyrethrine was applied with a fogging machine between 4 and 6 in the morning. Four hours later, the funnels were washed with ethyl (96%) alcohol to collect the arthropods and they were sorted and counted into large groups.

The total number organisms collected was 1.098,248 among them, the most abundant groups were Collembola (1,044,030), Acari (13,691), Hymenoptera (9,850), Aranea (7,333), Diptera (4,920) and Coleoptera (3,872). Detailed information of the techniques and results of the first group may be found in the work of PALACIOS-VARGAS and GÓMEZ-ANAYA (1993).

The great majority of the mite material belongs to the order of Oribatida, relegable into numberous families and genera. The elaboration of the material will of course consume a longer period of time, thus partial results will be published from time to time. In the present contribution we discuss two species belonging to the families of Eremellidae BALOGH, 1961 and Micreremidae GRANDJEAN, 1954, respectively. Both species proved to be new to science. The types are deposited in the Arachnological Collection of the Hungarian Natural History Museum.

Eremella matildebellae sp. n.

(Figs 1–3)

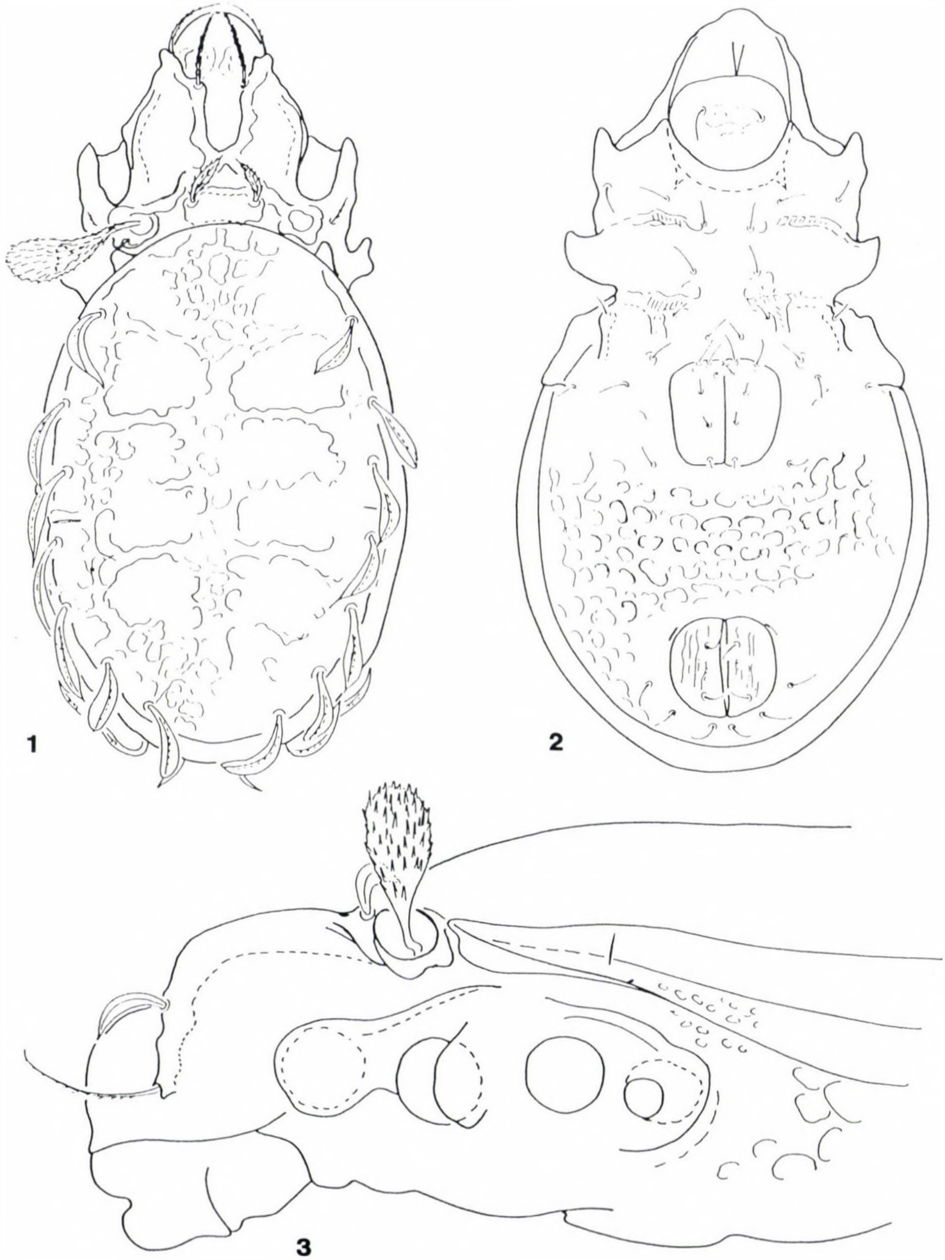
Measurements. – Length of body: 213–258 µm, width of body: 110–132 µm.

Prodorsum: Rostrum widely rounded. Prodorsal surface with strong and long costulae originating from the bothridium, running medially wherein connected by a transcostula and followed also longitudinal crests they are a U-shaped formation. They reach to the rostral margin. Rostral setae comparatively thin, arising near to the distal end of the costulae (Fig. 3). A transversal crest with some other ones compose a brick-shaped design, on which phylliform interbothridial setae are sitting. Bothridium well sclerotized with 2 or 3 large lateral tubercles, sensillus very large with a dilated, flabellate head. A pair of tubercles in humeral position opposite the bothridium. Its surface spinose. Exobothridial setae simple.

Notogaster: Whole surface ornamented by large alveoli, a longitudinal and three pairs of strong crests present (Fig. 1). The surface divided by them shows approximately four pairs of fields, which are partly smooth in their median parts. Ten pairs of phylliform notogastral setae present, all bearing a median and marginal veil and V-shaped in cross section. Setae (*p*) in posteromarginal position smaller than the others.

Ventral side (Fig. 2): Mentum ornamented by some irregular, mostly transversal wrinkles. In the epimeral region some large spots visible. Apodemes and epimeral borders hardly observable, *ap. 2.* and *ap. sej.* partly visible. Epimeral setal formula 3–1–3–3, all setae thin and fine, some of them (e.g. *3c, 4a*) arising on small tubercles or laths. Ventral plate ornamented by large and partly connected alveoli, surface of genital plates smooth, but on the anal plates longitudinal crests observable.

Figs 1–3. *Eremella matildebellae* sp. n.: 1 = body in dorsal aspect, 2 = body in ventral aspect, 3 = podosoma in lateral aspect



Anogenital setal formula: 6–1–2–3. Genital, aggenital and anal setae simple and smooth, the adanal ones orignating conspicuously posteriorly, slightly thickened.

Legs: All legs tridactylous. The surface of the joints of legs ornamented also by a rough sculpture; it consists mostly of parallel wrinkles and large alveoli.

Material examined: holotype (1521–HO–1995): México: Jalisco State: Chamela Biological Station.

Remarks: The new species is well ranging into the genus *Eremella* BERLESE, 1913 and it stands nearest to the type species of this genus (*E. induta* BERLESE, 1913). The new species is distinguished from the latter by the notogastral surface and the elongated notogastral setae.

It is the first locality datum of this genus in the Nearctis, however, MARSHALL *et al.* (1987) noted the occurrence of one species, without detailed specification.

Etymology: The new species is named in honour of Prof. MATILDE MORENO BELLO, for her contribution to the academic and scientific plans of the Faculty of Sciences, UNAM, México.

Micreremus rafaelius sp. n.

(Figs 4–6)

Measurements. – Length of body: 230 µm, width of body: 123 µm.

Integument: A thick cerotegument layer present. It covers nearly the whole body surface and also the legs. It consists of large granules on the notogaster and the legs, much smaller ones observable on the prodorsum and the ventral regions. The sculpture of the integument hardly observable, nearly smooth.

Prodorsum: Rostral part of prodorsum large, wide, with a widely rounded rostral apex. Rostral setae setiform, with strong spines basally. Their distal part smooth. They arise comparatively near to each other on a small tubercle of the prodorsal surface. They are connected by fine lines. Costula absent, a pair of short lines observable in the lamellar region originating from the bothridium. In the median part of the prodorsum a pair of rounded spots (porose area *Al*?) observable, they are well framed. Interlamellar and lamellar setae dilated with strong and long spines, feather like or plumose. Exobothridial setae thinnest of all, finely ciliate. Sensillus large, its head distinctly spinose or spiculate. One pair of characteristic spots in the interbotridial region (Fig. 4).

Notogaster: Dorsosejugal suture waved, a continuous arch absent, partly indistinct. Three (?) pairs of round porose areae present. Thirteen pairs of spinose, partly dilated notogastral setae present. Setae *c2* shortest of all. Setae *p2* and *p3* visible only in ventral view. Five pairs of lyrifissures present, among them *ia* placed laterally on the shoulder, *ih* and *ips* along the lateral margin of the notogaster, *ip* near to seta *p2*, observable only in ventral view (Fig. 4).

Lateral part of podosoma: Some strong wrinkles in the sejugal region. Porose areae humearales (*Ah)* and the lyrifissure *ia* are well observable. Pedotecta 1 rounded, normally developed, pedotecta 2-3 small (Fig. 6).

Ventral side (Fig. 5): Mentum with transversal wrinkles. Epimeral surface with polygonal sculpture, inner part of ventral plate ornamented by irregular cerotegument granules. Epimeral setal formula: 3–1–3(?)–3, all setae simple, setiform, but not short. Anogenital setal formula: 4–1–2–3. Genital, and aggenital setae short, anal and adanal setae longer than the preceding ones. Among the latter ones setae *ad1* thickened and well spinose, like notogastral setae.

Figs 4–6. *Micreremus rafaelius* sp. n.: 4 = body in dorsal aspect, 5 = body in ventral aspect, 6 = podosoma in lateral aspect

Legs: All legs tridactylous. Owing to the one specimen (only the holotype is known) it was not possible to make an intensive examination.

Material examined: holotype (1522–HO–1995): México: Jalisco State: Chamela Biological Station.

Remarks: The new species is well ranging to the genus *Micreremus* BERLESE, 1908, however, the form of the prodorsal and notogastral setae are unique in this relation. This genus was mentioned in MARSHALL *et al.* (1987) from North America as unpublished data.

Etymology: This species is the named in honour of Dr. RAFAEL PEREZ PASCUAL, Principal at the Faculty of Sciences, UNAM, Mexico, for developing new plans and structures (both academic and building) for the Faculty.

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THREE NEW TARDIGRADE SPECIES FROM HUNGARY*

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The author describes three new tardigrade species from Hungary: *Apodibius richardi* sp. n. from sandy soil, *Diphascon (Diphascon) iharosi* sp. n. from moss on soil and *Hexapodibius reginae* sp. n. from compost.

Key words: Tardigrada, new species, Hungary

INTRODUCTION

The phylum Tardigrada contains about 750 described species (KINCHIN 1995) of cosmopolitan microscopic invertebrates found in diverse habitats within terrestrial, freshwater and marine environments (MCINNES 1994). The last Hungarian tardigrade list (IHAROS 1985) presented 101 species. The last new species found in Hungary was reported 25 years ago (IHAROS 1970).

Between 1990 and 1994 within the framework of my ecotoxicological – bioindicational research, I examined samples of mosses, lichens, soils and composts in order to determine the presence and frequency of tardigrades. In the course of this work I discovered three tardigrade species new for the science.

TAXONOMY

Apodibius richardi sp. n.

(Fig. 1, Tables 1–2)

Nine specimens were extracted (9th June, 1994) from a sandy soil sample (Őrbottyán, Hungary) collected by the author.

Holotype: Length 136 µm, body is white, cuticle smooth. Eye spots are absent. Buccal tube is smooth and narrow (1.56 µm) with well-developed apophyses. Pharynx is oval with two wide macroplacoids, microplacoid is absent. The first macroplacoid is twice longer than the second one. The fourth pair of legs is reduced. Legs are smooth without claws (Fig. 1). Measurements of the holotype and paratypes are given in Table 1. No eggs were found in the sample. The new species occurred together with the species of *Hexapodibius bindae* PILATO, 1982 and *Macrobiotus pseudohufelandi* IHAROS, 1966.

---

* This paper is dedicated to my mentor, P. Prof. Dr. GYULA IHAROS O. Praem. in celebrating his 85th birthday and in memory of my father JÓZSEF VARGHA (1910–1995).

Table 1. The measurements of *Apodibius richardi* sp. n. in µm

	Holotype	Holotype and 8 paratypes (n = 9)		
		minimum	maximum	$\bar{x}$
Body length	136	100	136	117
Buccal tube length	20.28	17.16	20.28	19.24
Buccal tube width	1.56	1.56	1.56	1.56
Tube length to the stylet support	15.60	12.48	15.60	14.21
Pharynx length	18.72	12.48	18.72	16.64
Pharynx width	14.04	9.36	14.04	12.65
Macroplacoid I.	3.12	3.12	3.12	3.12
Macroplacoid II.	1.56	1.56	1.56	1.56
Macroplacoid row	6.24	5.46	7.02	6.24
pt buccal tube width	7.69	7.69	9.09	8.14
pt macroplacoid I.	15.38	15.38	18.18	16.29
pt macroplacoid II.	7.69	7.69	9.09	8.14
pt macroplacoid row	30.77	26.92	36.36	32.58
pt stylet support	76.92	69.23	76.92	74.00
Buccal tube : body length ratio (%)	14.94	13.42	18.06	16.50
Pharynx length : width ratio	1.33:1	1.25:1	1.38:1	1.32:1

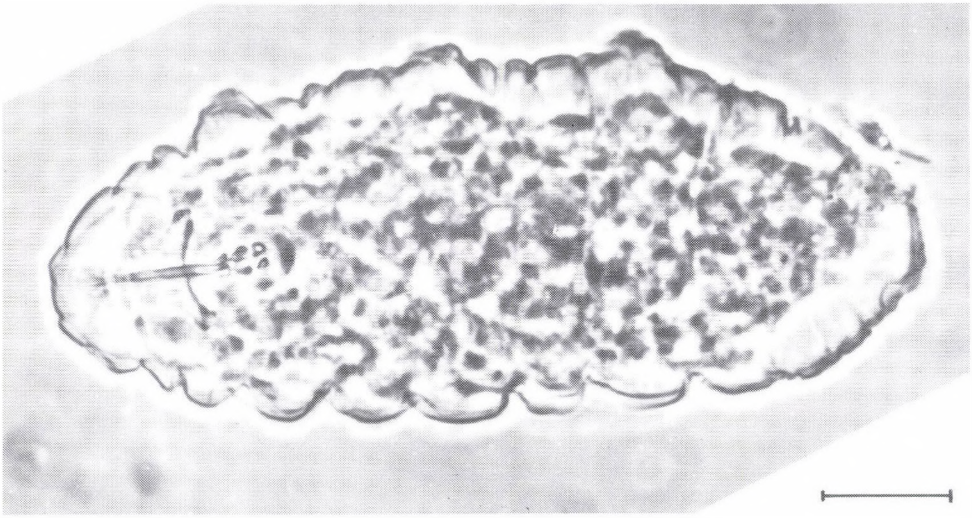
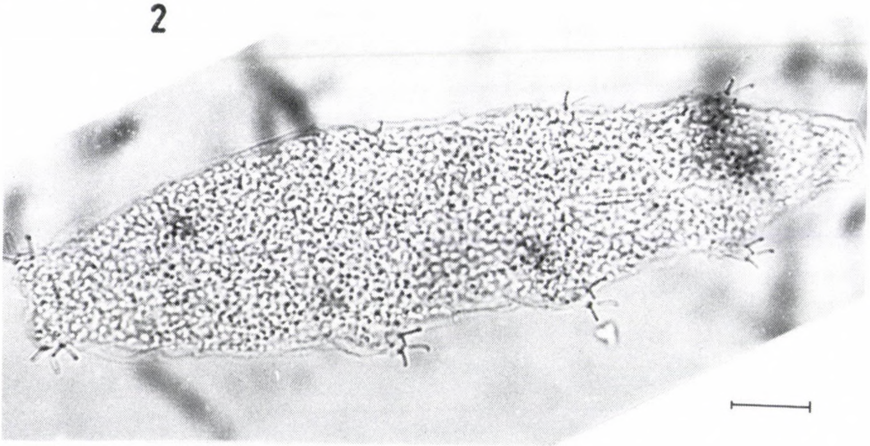


Fig. 1. Habitus and buccal apparatus of *Apodibius richardi* sp. n. Scale: 20 µm

The new species differs from *Apodibius nuntius* BINDA, 1984 and *A. serventyi* MORGAN et NICHOLLS, 1986 in the number of macroplacoids. The differences between *Apodibius richardi* sp. n. and the similar *A. confusus* DASTYCH, 1983 are that *A. richardi* sp. n. has a smaller body length, narrower buccal tube, shorter macroplacoids, the ratios of tube length:body length, tube length:stylet support, and pharynx length:width are greater and the new species has no eye spots. Data of the measurements and the pt values (the ratio of the length of the given organ and the buccal tube) are in Table 2.

2



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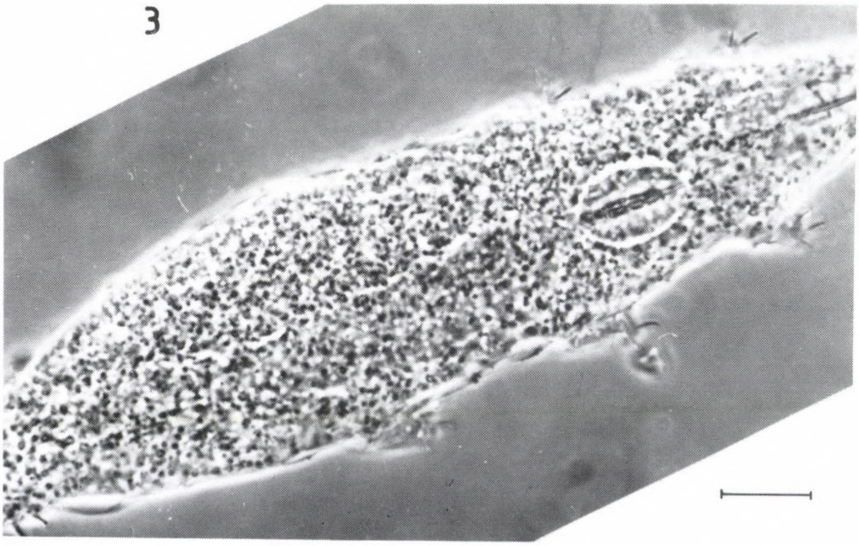


Figs 2–3. *Diphascon (Diphascon) iharosi* sp.n.: 2 = habitus and cuticle, 3 = cuticle and pharyngeal bulb. Scale: 20 μm

Table 2. Comparison of some data of *Apodibius confusus* (data from DASTYCH (1983)) and *Apodibius richardi* sp. n. [µm]

	A. confusus (n = 3) $\bar{x}$	*A. richardi* (n = 9) $\bar{x}$
Body length	290	117
Buccal tube length	37.7	19.2
Buccal tube width	4.3	1.6
Pharynx length	30.3	16.6
Pharynx width	26.3	12.7
Macroplacoid I.	6.5	3.1
Macroplacoid II.	3.7	1.6
Macroplacoid row	?	6.2
pt buccal tube width	11.41	8.14
pt macroplacoid I.	17.24	16.29
pt macroplacoid II.	9.81	8.14
pt stylet support	70.28*	74.00
pt macroplacoid row	?	32.58
Buccal tube : body length ratio (%)	13	17
Pharynx length : width ratio	1.15:1	1.32:1

* Data from BINDA (1984)

Table 3. The measurements of *Diphascon (D.) iharosi* sp. n. in µm

	Holotype	Paratype 1	Paratype 2	$\bar{x}$
Body length	182	216	163	187
Mouth/buccal tube length	14.82	17.94	14.04	15.60
Pharyngeal tube length	35.15	36.66	29.64	33.82
Buccopharyngeal tube length	49.97	54.60	43.68	49.42
Tube length to the stylet support	9.36	10.14	8.58	9.36
Mouth tube width	1.25	1.25	1.25	1.25
Pharynx length	24.96	24.96	20.28	23.40
Pharynx width	14.82	14.82	14.04	14.56
Macroplacoid I.	2.34	2.40	2.34	2.36
Macroplacoid II.	2.34	2.65	1.87	2.29
Macroplacoid III.	4.68	4.68	3.12	4.16
Macroplacoid row	12.48	12.48	10.92	11.96
Outer claw of the fourth pair of leg	8.58	7.80	7.80	8.06

Table 4. Comparison of the length ratios and pt values of *Diphascon (D.) iharosi* sp. n. and related species (Data from DASTYCH (1984), PILATO (1987) and PILATO and BINDA (1983))

Length ratios / pt values	*D. pingue*		*D. mirabilis*	*D. greveni*	*D. iharosi* sp.n.
	A	B			
	$\bar{x}$(min.–max.)	$\bar{x}$(min.–max.)	$\bar{x}$(min.–max.)	$\bar{x}$(min.–max.)	$\bar{x}$(min.–max.)
Buccopharyngeal tube : macroplacoid row ratio	6.6 (4.8–8.2)	4.0 (3.4–4.5)	3.4 (3.0–4.0)	4.3 (3.9–5.0)	4.1 (4.0–4.4)
Buccopharyngeal tube : pharynx length ratio	2.3 (1.9–3.0)	1.8 (1.7–2.2)	1.9 (1.7–2.1)	2.2 (2.0–2.4)	2.1 (2.0–2.2)
Mouth tube : macroplacoid row ratio	2.6 (2.2–3.4)	1.7 (1.5–2.0)	1.2 (1.1–1.6)	1.4 (1.3–1.8)	1.3 (1.2–1.4)
Pharynx length : macroplacoid row ratio	2.7 (2.2–3.2)	2.0 (1.7–2.3)	1.7 (1.6–2.0)	1.8 (1.7–2.2)	2.0 (1.9–2.0)
Body length : pharynx length ratio	8.8 (6.2–10.5)	6.6 (5.3–8.7)	7.1 (5.1–9.1)	8.4 (5.6–10.5)	8.0 (7.3–8.7)
Pharynx length : width ratio	1.2 (1.1–1.5)	1.3 (1.2–1.5)	1.6 (1.5–2.3)	1.5 (1.3–1.8)	1.6 (1.4–1.7)
pt buccal tube : bucco pharyngeal tube	35.4 (33.2–36.5)		34.5 (33.8–35.2)	33.0 (30.5–33.3)	31.6 (29.7–32.9)
pt pharyngeal tube : buccopharyngeal tube	64.6 (63.5–66.8)		65.5 (64.8–66.2)	67.0 (66.7–69.5)	68.4 (67.1–70.3)
pt stylet support : buccal tube	61.3 (59.7–64.0)		64.1 (62.3–64.8)	71.2 (70.6–71.6)	60.0 (56.5–63.2)

Derivatio nominis: The new species is named after my son Richárd.

The holotype (No. 2551–596) is deposited in the Hungarian Natural History Museum, Budapest, Hungary. The 8 paratypes (Nos 2561–596, 2562–596, 2564–596, 2571–596, 2572–596, 2573–596, 2574–596, 2580–596) are in the author's collection.

Diphascon (Diphascon) iharosi sp. n.

(Figs 2–5, Tables 3–5)

Three specimens were extracted from moss sample collected on soil (December, 1992, Szarvaskő, Hungary) by JÁNOS VARGA.

Holotype: Length 182 µm, cuticle is covered with small (1–1.5 µm) granules (Fig. 2). Eye spots are absent. Buccopharyngeal tube is 49.97 µm long, the diameter is 1.25 µm. Mouth/buccal tube length is 14.82 µm, and pharyngeal tube length 35.15 µm. Between the mouth and the pharyngeal tube a drop-shaped thickening is present. Pharynx is oval (length:width ratio 1.7:1) having well-developed apophyses, and three macroplacoids of which the third is the longest. There are small microplacoids and larger septulum (Fig. 3). The claws (Figs 4–5) are open from their base, the outer claws are only slightly larger than the inner ones on the first, second and third legs. There are no cuticular bars. Small spines are on the bases of the outer claws of the fourth pair of legs. Measurements are presented in Table 3. Eggs were not found. *Diphascon (Diphascon) iharosi* sp. n. occurred together with the species *Pseudechiniscus suillus* (EHRENBERG, 1853), *Macrobiotus harmsworthi* J. MURRAY, 1907, *M. hufelandi* SCHULTZE, 1833, *Isohypsibius bakonyiensis* (IHAROS, 1964), *I. pappi* (IHAROS, 1966), *Diphascon (Diphascon) pingue* (MARCUS, 1936) and *D. (Adropion) prorsirostre* THULIN, 1928.

The new species is similar to *Diphascon (Diphascon) pingue* (MARCUS, 1936), *D. (D.) mirabilis* DASTYCH, 1984 and *D. (Adropion) greveni* DASTYCH, 1984. The differences are given in the Table 4 (pt values and ratios of some organs) and in the Table 5 (presence or absence of some organs).

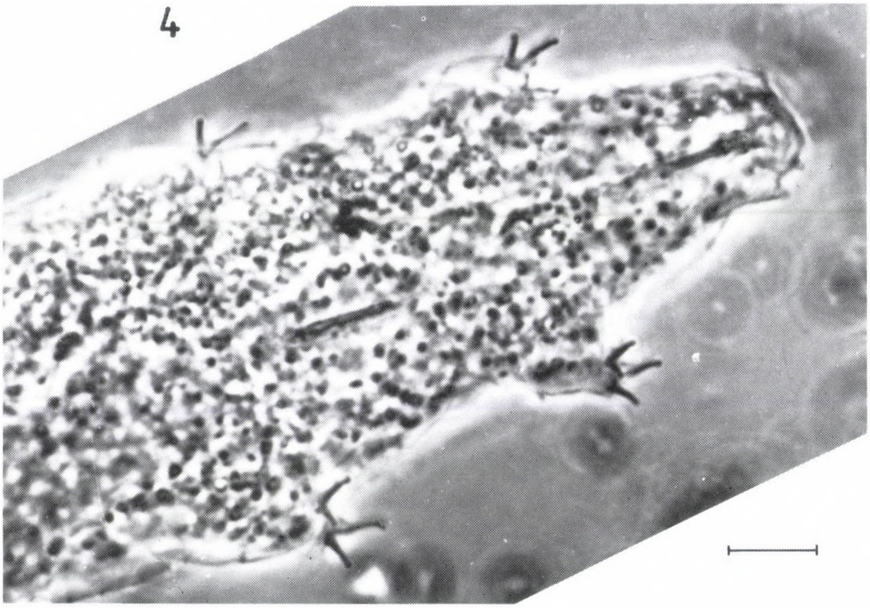
Table 5. Comparison of the presence or absence of some organs of *Diphascon (D.) iharosi* sp. n. and related species (Data from DASTYCH (1984))

	D. pingue	*D. mirabilis*	*D. greveni*	*D. iharosi* sp. n.
Granulated cuticle	–	+	–	+
Drop-shaped thickening between mouth and pharyngeal tube	+	+	–	+
Pseudoseptulum	–	+	–	–
Cuticular bars on the first, second and third pair of legs	–	+	+	–
Spines on the bases of the inner and outer claws of the first, second and third pair of legs	–	–	+	–
Spines on the bases of the inner claws of the fourth pair of legs	–	–	+	–
Spines on the bases of the outer claws of the fourth pair of legs	–	+	+	+

Derivatio nominis: I dedicate the new species to Prof. Dr. GYULA IHAROS.

The holotype (No. 1198–384–1664) is deposited in the Hungarian Natural History Museum, Budapest, Hungary. Two paratypes (Nos 1199–384–1665, 1200–384–1667) are in the author's collection.

4



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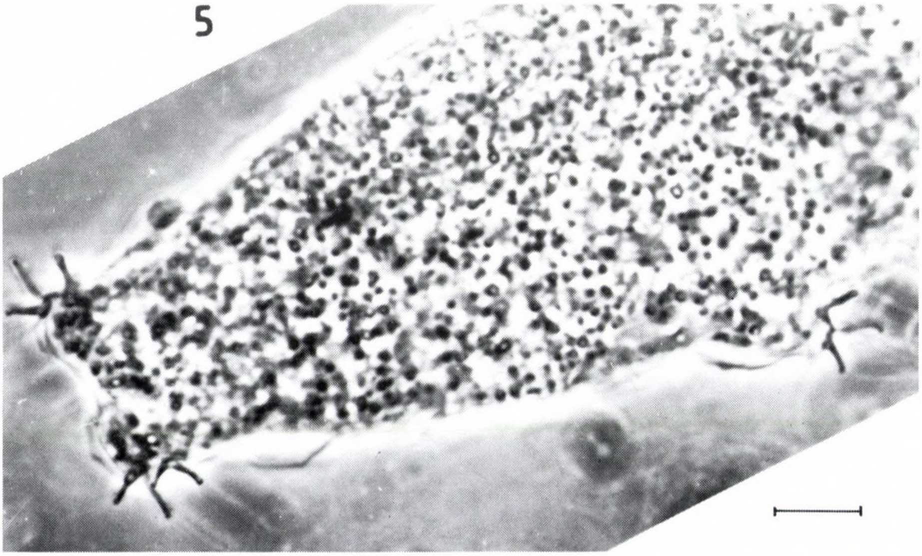


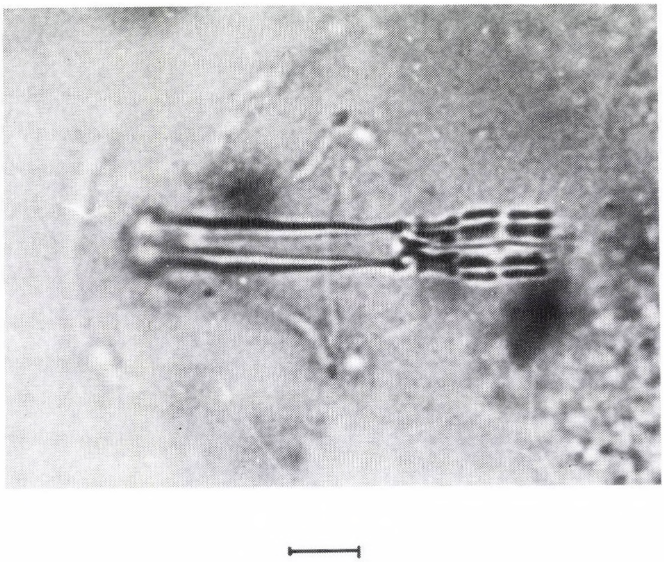
Figs 4–5. *Diphascon (Diphascon) iharosi* sp.n.: 4 = claws on the first and second leg pairs, 5 = claws on the third and fourth leg pairs. Scale: 10 μm

Hexapodibius reginae sp. n.
(Figs 6–10, Tables 6–8)

One specimen from compost (Szeged, Hungary). The compost was 7 months old and contained: waste from poultry, fatty mud, cattle manure and straw. The sample was collected (26th February, 1992) by Mrs VERONIKA MICSIK.

Holotype: Body is white with a length of 374 µm, cuticle is smooth. Eye spots are absent. Mouth opening is anterio–ventral without lamellae. Mouth tube is wide having a buccal lamina. Pharynx is oval with small apophyses and three macroplacoids. The third macroplacoid is the lon-

6



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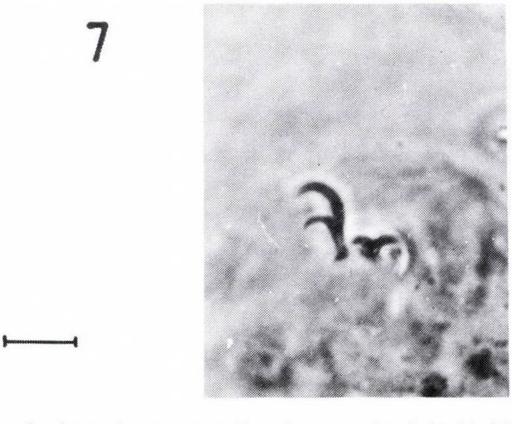


Figs 6–7. *Hexapodibius reginae* sp.n.: 6 = buccal apparatus, 7 = claws on the right third leg. Scale: 10 µm

Table 6. The measurements and pt values of the *Hexapodibius reginae* sp. n. in μm

		pt values
Body length	374	
Buccal tube length	34.32	
Buccal tube width	4.68	13.64
Buccal tube length to the stylet support	24.96	72.73
Pharynx length	40.63	
Pharynx width	31.25	
Pharynx length : width ratio	1.30:1	
Macroplacoid I.	5.66	16.49
Macroplacoid II.	5.11	14.89
Macroplacoid III.	6.24	18.18
Macroplacoid row	18.72	54.55
Pharynx length : macroplacoid row ratio	2.17:1	
External claw on the left first leg	12.48	36.36
Internal claw on the left first leg	7.02	20.45
External claw on the right first leg	immeasurable	
Internal claw on the right first leg	immeasurable	
External claw on the left second leg	6.24	18.18
Internal claw on the left second leg	5.46	15.91
External claw on the right second leg	immeasurable	
Internal claw on the right second leg	immeasurable	
External claw on the left third leg	9.36	27.27
Internal claw on the left third leg	7.80	22.73
External claw on the right third leg	12.10	35.26
Internal claw on the right third leg	6.24	18.18

gest and the second is the shortest. No microplacoid is present (Fig. 6). Claws are strongly developed on the first, second and third legs. There are no claws on the reduced last pair of legs. The sequence of claw branches is 2–1–2–1. The external claws are larger than the internal ones, the claw branches are strongly curved. The secondary branches are shorter than the primary ones (Figs 7–10). Lunulae are lacking. Measurements are given in Table 6. Eggs were not found in the sample. Only one specimen of this species was recovered from the sample, and there was no other tardigrade species/specimen.

The new species is similar to *Hexapodibius micronyx* PILATO, 1969, *Hex. pseudomicronyx* ROBOTTI, 1972, *Hex. bindae* PILATO, 1982 and *Hex. boothi* DASTYCH et MCINNES, 1994. The exact data of the important differences at the

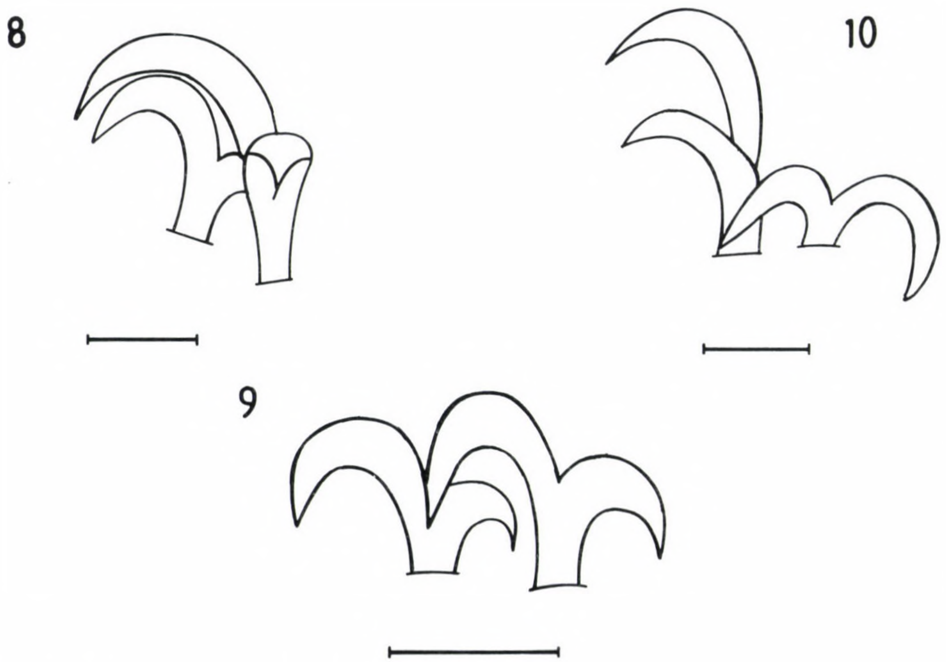
Table 7. Pt values (min. and max. values are in parenthesis) and ratios of *Hexapodibius reginae* sp. n. and related species (Data from DASTYCH (1988), DASTYCH and MCINNES (1994), MANICARDI and BERTOLANI (1987) and PILATO (1969, 1982)

	Hex. bindae	*Hex. boothi*	*Hex. micronyx*	*Hex. pseudomicronyx*	*Hex. reginae* sp. n.	
pt tube width	9.91 (8.40–11.85)	9.43	16.25 (14.47–17.84)	9.13 (8.54–9.75)	13.64	
pt stylet support	73.12 (71.00–74.11)	75.47	79.51 (78.66–80.48)	76.88 (74.35–79.51)	72.73	
pt macroplacoid I.	11.70 (10.72–12.59)	4.53	14.30 (12.30–16.00)		16.49	
pt macroplacoid II.	10.32 (10.00–10.70)	6.42	13.11 (11.43–14.84)		14.89	
pt macroplacoid III.	12.31 (11.80–12.74)	8.68	15.24 (13.20–16.48)		18.18	
pt macroplacoid row	37.85 (35.70–40.30)	30.19	47.36 (43.80–49.75)	39.04 (36.36–41.97)	54.55	
pt claw on the first leg	9.98 (9.86–10.22)	16.98	13.80 (12.78–15.10)	20.15 (17.94–21.89)	36.36	20.45
pt claw on the second leg	10.57 (10.14–10.83)	18.87	14.84 (13.81–16.50)	20.39 (17.98–22.14)	18.18	15.91
pt claw on the third leg	10.01 (9.33–11.55)	19.43	14.87 (14.22–15.81)	19.76 (17.95–20.71)	35.26	18.18
					27.27	22.73
pharynx length : width ratio	1.43:1	1.26:1	1.25–1.35 : 1		1.30 :1	
pharynx length : macroplacoid row length ratio	2.19:1	2.75:1	2.2–2.4 : 1 (1.6 : 1)	2.3–2.8 : 1	2.17:1	

Table 8. Differences between the pt values of BI = *Hex. bindae*, BO = *Hex. boothi*, MI = *Hex. micronyx*, PM = *Hex. pseudomicronyx*, RE = *Hex. reginae* sp. n.

		BI	BO	MI	PM
pt stylet support	RE < BO, MI, PM RE = BI	=	+	+	+
pt tube wide	RE < MI RE > BI, BO, PM	–	–	+	–
pt macroplacoid row	RE > BI, BO, MI, PM	–	–	–	–
pt macroplacoid I.	RE > BI, BO, (MI), PM RE = MI	–	–	=(–)	–
pt macroplacoid II.	RE > BI, BO, (MI), PM RE = MI	–	–	=(–)	–
pt macroplacoid III.	RE > BI, BO, MI, PM	–	–	–	–
pt claw on the first leg	RE > BI, BO, MI, PM	–	–	–	–
pt claw on the second leg	RE > BI, MI RE = BO, PM	–	=	–	=
pt claw on the third leg	RE > BI, BO, MI, PM	–	–	–	–
pharynx leng : width ratio	RE < BI RE = BO, MI	+	=	=	?
pharynx length : macroplacoid row ratio	RE < BO, MI, PM RE = BI	=	+	+ (–?)	+

+ : the value larger, – : the value smaller than at *Hex. reginae* sp. n. = : the value near similar to *Hex. reginae* sp. n.



Figs 8–10. *Hexapodibius reginae* sp.n.: 8 = claws on the left first leg, 9 = claws on the left second leg, 10 = claws on the right third leg. Scale: 5 μm

pt values and ratios are given in Tables 7 and 8. In general *Hexapodibius reginae* sp. n. has a wider mouth tube, larger pt values at the macroplacoids, the macroplacoid row and the claws and smaller pt value at the insertion point of the stylet support.

Derivatio nominis: The new species is named after my daughter Regina.

The holotype (No. 301–143–432) is deposited in the Hungarian Natural History Museum, Budapest, Hungary.

* * *

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The oribatid species described by Berlese (Acari)

MAHUNKA, S. and L. MAHUNKA-PAPP

The authors had the opportunity for years to study the Oribatid species described by Berlese currently deposited in the Istituto Sperimentale per la Zoologia Agraria at Florence. The results of this series of studies are summarized in this volume.

The volume begins with an essay-like Introduction heavily relying on subjective opinions discussing the general questions of Oribatology. The following section lists Berlese's species placed in the modern system helping the specialists with morphological notes and many drawings; here also the condition of the specimens is discussed and lectotypes are designated.

The third, large section is the catalogue proper, wherein all the species are listed in the systematic order together with their combination and synonymic names. Here one may find all the literature data, usually missing from ordinary works, with reference to Description and Taxonomy, Distribution, with special emphasis on Catalogues whose references are partly unreliable. Where it was deemed necessary further information are added under the heading of Remarks. The volume closes with a very detailed list of literature.

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GEOGRAPHICAL SEGREGATION OF SCALE-INSECTS (HOMOPTERA: COCCOIDEA) ON FRUIT TREES AND THE ROLE OF HOST PLANT RANGES

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Most of the surveyed 21 scale-insect species was found only in a narrow zone of the wide studied geographic region (Central and Eastern Europe). The host plant resource is underexploited in the greatest part of the region.

On the base of frequency, density and the differences in microhabitat specialisation, the scale-insects may be divided to armoured and soft scale guilds, where the latter is represented by lower frequency and density.

The members of the armoured scale (Diaspididae) guild may further be divided into four geographical subguilds, as Eurosiberian, Middle- and South-European, invader and Mediterranean on the base of size of distribution, the northern limit of distribution, the frequency and the density in samples.

The total host plant range had no effect on the total size of distribution of the studied species. It was determined mostly by abiotic factors, and in the case of certain host plants, in a smaller part of distribution range, by factors determining the dynamics of the populations.

Key words: Homoptera, Diaspididae, Coccidae, zoogeography, guilds, host plants

INTRODUCTION

The distribution of host plants is normally wider than the distribution of insects living on them (PIELOU 1974, STRONG *et al.* 1984). This relation can be complicated in polyphagous species, which are subject to the dynamic phenomena, e. g. change in the host plant preference of insects in their regions of distribution (JERMY 1984). Environmental factors (resource concentration, habitat favourability, disturbance intensity, etc) have been identified as major selection pressures in the evolution of the insect-host plant relationships (LATTIN 1993, NOVOTNY 1995). The interspecific competition is considered to be of major ecological importance (DENNO *et al.* 1995), but by other authors its role was challenged repeatedly (JERMY 1985, KOZÁR 1987, INBAR and WOOL 1995). A well-defined relationship between the size of distribution and density in several species was reported earlier (HANSKI 1982, BROWN 1984, GASTON and LAWTON 1988). According to IWAO (1959) there are changes in host plant ranges in connections with density (outbreak, polyphagy). In the temperate region, the size of distribution of insects is often limited by species tolerance of winter temperatures and by the sum of effective temperature necessary for the development of one generation. For example *Q. perniciosus* needs 770 degree-days above 7.3°C (HUBA 1970), which sets the northern limit of the species distribution to 48-50° of northern latitude. Present distribution may be shifted in the future by the observed increase of the temperature in the region (KOZÁR 1992). In the case of polyphagous insect species the cumulative distribution range of all host plant species can affect the size of distribution (BROWN 1984).

In the present paper the following questions were studied:

- the relationship between the distribution of host plants and that of the scale-insect species living on them;
- the division of host plant resource along the geographic axis by scale insects;
- the relationship between the size of distribution of scale-insects, their frequency and density, and the total host plant number;
- the relationship between the northern limit of distribution of scale-insects and their frequency.

MATERIAL AND METHODS

For this analysis, I used the data collected by KOZÁR and KONSTANTINOVA (1981*a, b*) in the orchards of six Eastern and Southern European countries in 1976 (former Czechoslovakia, Greece, Hungary, Poland, Turkey, and former USSR).

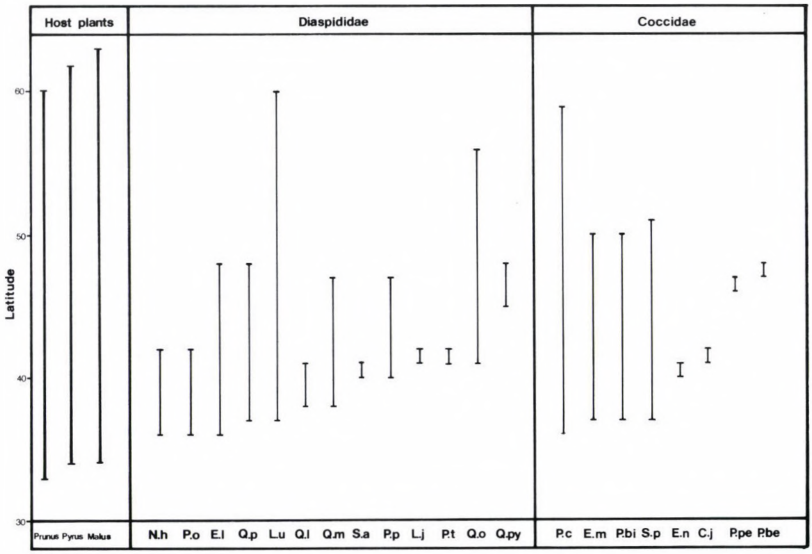

Fig. 1. The latitudinal range of the distribution of 21 scale-insect species, and their main host plant genera (abbreviations are from Table 1)

Table 1. Some parameters on the distribution and host plant ranges of scale-insect species. A = Abbreviations, B = Frequency in the samples in %, C = Mean density in the samples, D = Distribution size in the studied region in %, E = Northern limit of distribution, F = Number of total host-plant genera

Scale-insect species	A	B	C	D	E	F
Epidiaspis leperii (SIGNORET, 1869)	E.1	9.3	0.15	24	48	17
Lepidosaphes ulmi (LINNAEUS, 1758)	L.u	21.5	0.23	80	60	85
Quadraspidiotus ostreaeformis (CURTIS, 1843)	Q.o	13.1	0.14	44	56	41
Quadraspidiotus perniciosus (COMSTOCK, 1881)	Q.p	24.4	0.40	36	48	238
Quadraspidiotus pyri (LICHTENSTEIN, 1881)	Q.py	1.3	0.01	5	48	–
Quadraspidiotus marani ZAHRADNIK, 1952	Q.m	3.2	0.03	14	47	5
Quadraspidiotus lenticularis LINDINGER, 1912	Q.l	0.1	0.001	2	41	–
Parlatoria oleae (COLVÉE, 1880)	P.o	4.4	0.06	15	42	81
Parlatoria theae (COCKERELL, 1896)	P.t	0.3	0.002	2	42	–
Pseudaulacaspis pentagona (TARGIONI-TOZZETTI, 1886)	P.p	3.1	0.06	8	47	121
Suturaspis archangelskayae (LINDINGER, 1929)	S.a	0.1	0.001	1	41	–
Lopholeucaspis japonica (COCKERELL, 1897)	L.j	0.8	0.01	2	42	–
Nilotaspis halli (GREEN, 1923)	N.h	1.0	0.01	10	42	9
Eulecanium mali BORCHSENIUS, 1957	E.m	1.4	0.01	20	50	–
Eulecanium nocivum BORCHSENIUS, 1953	E.n	0.03	0.0003	1	41	–
Parthenolecanium corni (BOUCHÉ, 1844)	P.c	10.1	0.11	72	59	–
Parthenolecanium persicae (FABRICIUS, 1776)	P.pe	0.03	0.0003	1	47	–
Parthenolecanium betulae (LINNAEUS, 1758)	P.be	0.1	0.001	1	48	–
Parthenolecanium bituberculatum (TARGIONI-TOZZETTI, 1868)	P.bi	1.3	0.01	8	50	–
Sphaerolecanium prunastri (FONSCOLOMBE, 1834)	S.p	2.3	0.04	18	51	–
Ceroplastes japonicus GREEN, 1921	C.j	0.1	0.0003	1	42	–

Six species of fruit trees were sampled (apple, cherry, pear, peach, plum, and sourcherry), a total of 3169 samples. The sampling places and the methods for analysis were described in details by KOZÁR and VIKTORIN (1978), KOZÁR and KONSTANTINOVA (1981*a, b*), and KOZÁR (1987). The limits of distribution of the scale-insect species (Fig. 1) were taken from our records (KOZÁR and KONSTANTINOVA 1981*a, b*, KOZÁR 1990). Host plant distribution data (Fig. 1) are based on the work of HORA (1981). The size of the distribution of the scale-insect species was given in percentage related to the total region studied. The frequency means the percentage of the infested samples. The density means the average density of insects in the samples (Table 1). The total host plant genus numbers of the most important species discussed here were taken from the World Catalogue of BORCHSENIUS (1966).

To compare the relationships between different parameters regression and covariance analyses were used by Statistica for Windows programme. The PCA was assessed and classified by the modified cluster method of SNEATH and SOKAL, used by SZÉCSI and DOBROVOLSZKY (1984).

RESULTS

The latitudinal range of distribution of the 21 scale-insect species studied was much more restricted than that of their main host plants (Fig. 1). Most of the scale-insect species were found only in a narrow zone within the host plant distribution range, often in the central, or southern parts of the region studied.

The size of the distribution, the frequency and the density of scale-insects showed a strong linear relationship (Figs 2, 3), both the frequency and the density of the more widely distributed species were higher in our samples. However, the armoured and soft scale species were noticeably separated. The frequency and density of soft scale species (Coccidae) were significantly less, than those of the armoured species (Diaspididae). This difference between two families was significant, shown by covariance analysis (F=6.32, p<5%).

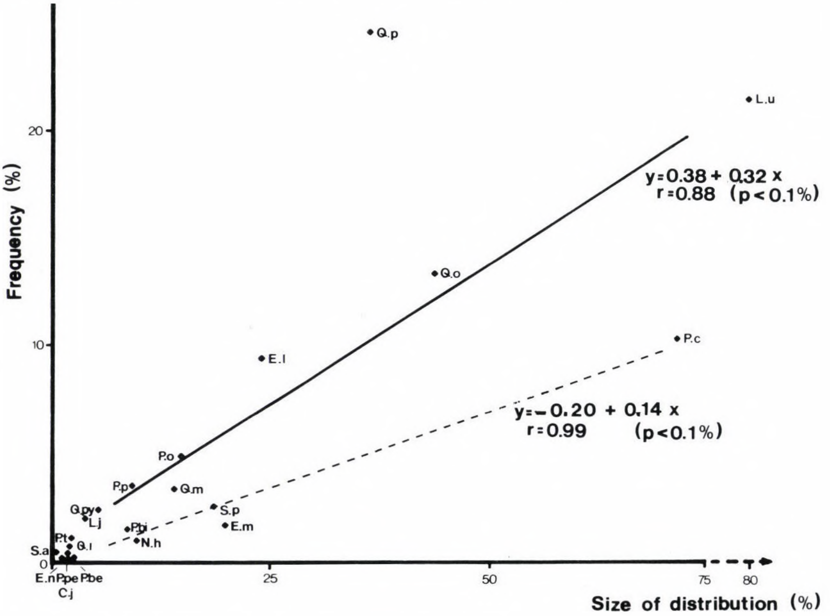

Fig. 2. The relationship between the size of the distribution of scale-insects and their frequency in the samples

In analysing the relationship of the frequency with the northern limit of the distribution of the species (Fig. 4), we found that four separate groups may be distinguished. The first group comprises the widely distributed Eurosiberian species, the second the Middle– and South–European, the third the Mediterranean species. The fourth contained the invader *Q. perniciosus*.

The relationships between the size of distribution and the host plant range, and between the frequency and the host plant range were not significant.

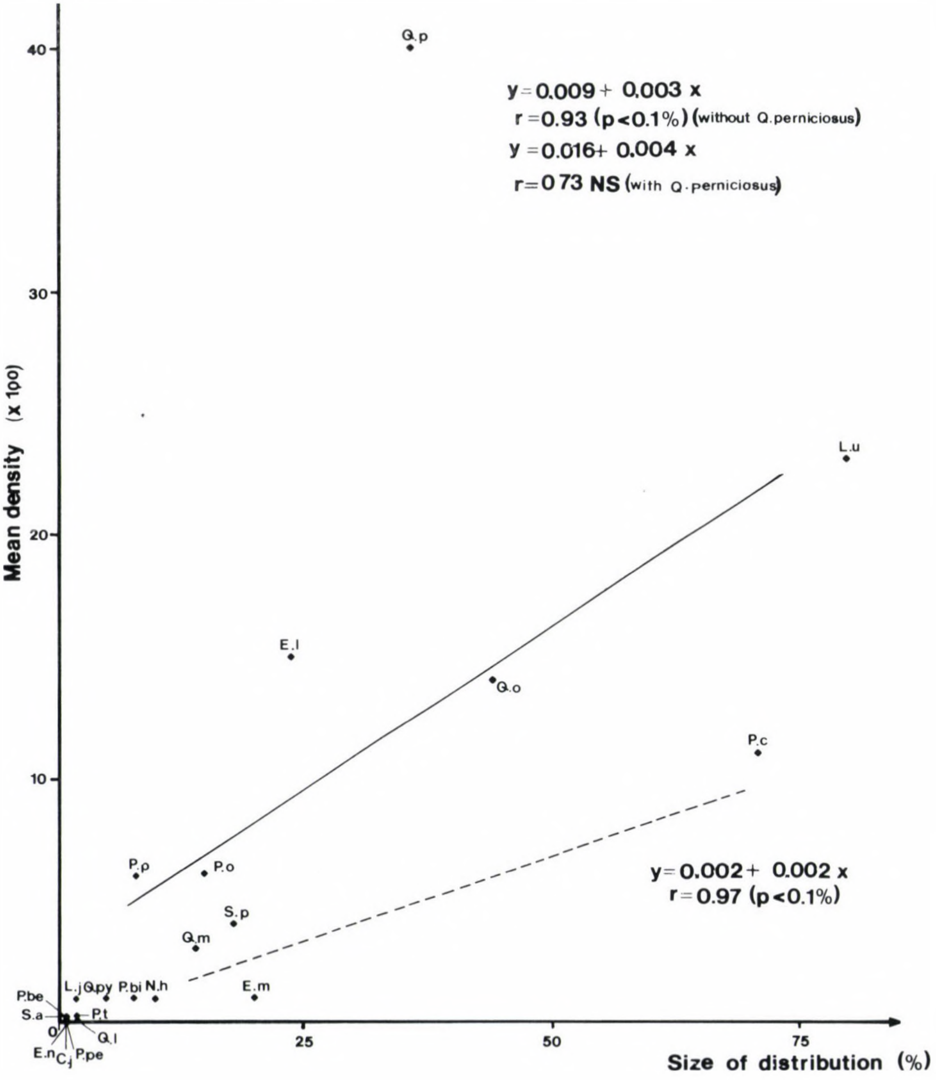

Fig. 3. The relationship between the size of the distribution of scale-insects and their density

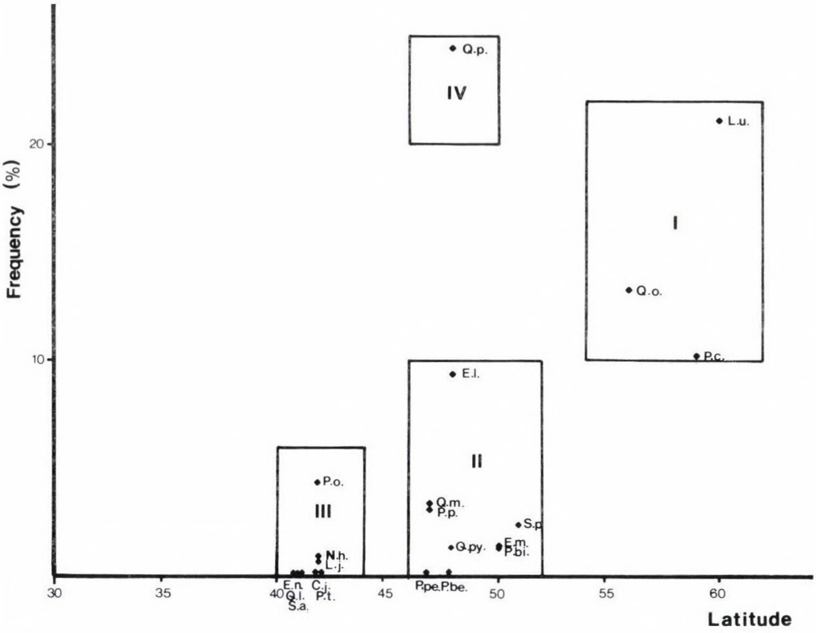

Fig. 4. The relationship between the frequency of scale insects and the northern limit of distribution of these species

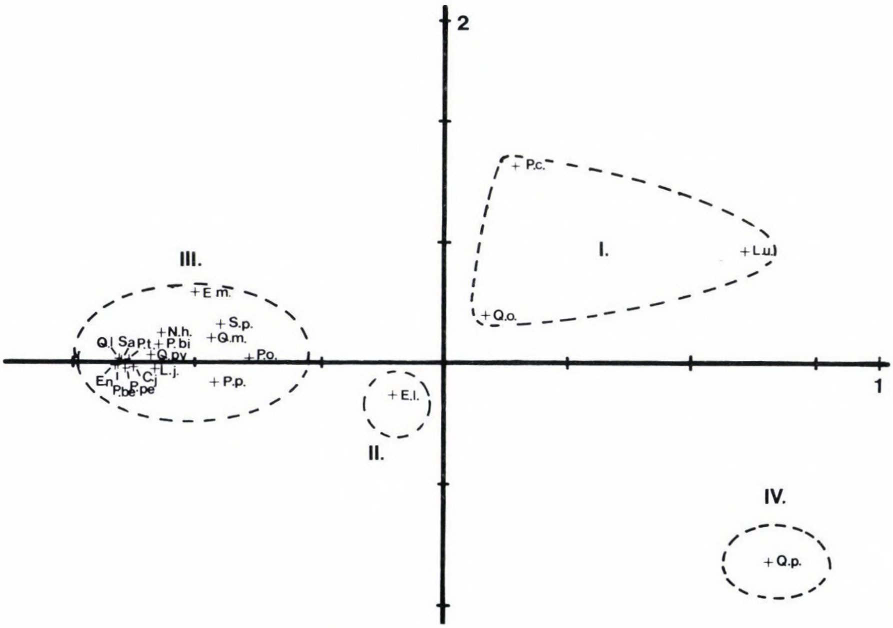

Fig. 5. The relationship between the density, frequency and size of the distribution of studied scale-insect species

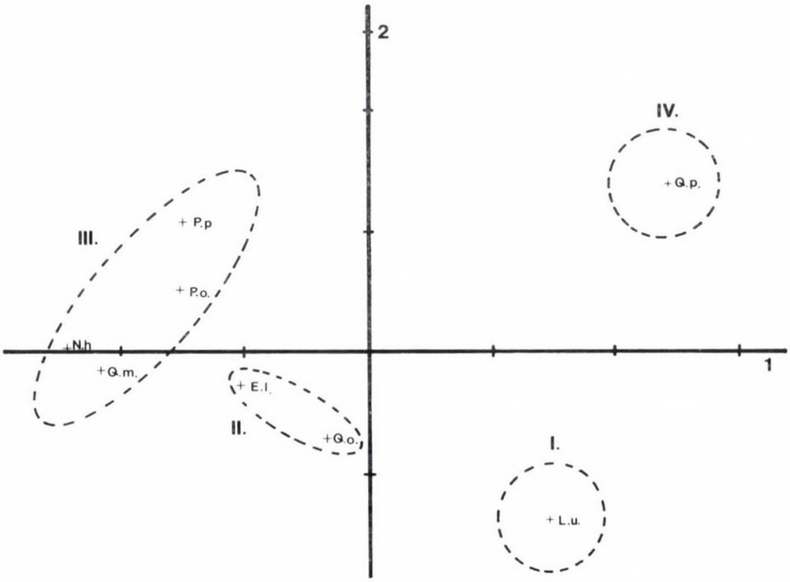

Fig. 6. The relationship between the density, frequency, size of the distribution of studied scale-insect species, including the host plant genus numbers

Studying the frequency, density and distribution size of the scale-insects by PCA, we again found four groups of the species (Fig. 5). The 1st and 4th groups were the same, but from the Middle–, and South European group some species were moved to the group of the Mediterranean species.

In the case of the armoured pest species we included in the analysis the total (world-wide) host plant genus number also and we found again that the species readily divided into four groups, only *Q. ostreaeformis* was moved from first group to the second (Fig. 6). After the linearization of the data, the species showed an increasing trend that may be interpreted with the size of their distribution and frequency, which has not changed by host plant range.

The relationship between the host plant distribution range, polyphagy and frequency shows a special feature in the case of some species. *L. ulmi* was found in the best part of the region studied, only on apple. In the central part of the region (between 49–50 of the northern latitude) it was found on pear and plum, too (KOZÁR 1990), and the density here was also higher.

DISCUSSION

The number of species, frequency and the density was very different within the region studied. It seems that host plant resource is underexploited by scale-insects in the greatest part of the region. This finding is in accordance with earlier conclusions of JERMY (1984) and KOZÁR (1987, 1989). Our data also showed, that generalisations on insect–host plant relationships, in studies restricted to small regions, has a much restricted value, which was shown by BROWN (1984). The species number can show tenfold difference inside of the distribution range of the host plants. Similar data were shown by KARBAN and RICKLEFS (1983). Our data are in accordance with the statement of FUTUYMA and GOULD (1979), and with CRAWLEY (1983), who had questioned the possibility of the use of species packing, host area, patch size or resource concentration hypotheses.

According to our investigations, the distribution of scale-insect species was more restricted than the distribution of their main host plants. We conclude that the presence and the density of host plants are of secondary importance in determining the distribution of the oligo- and polyphagous scale-insects studied. Scale-insects have the widest distribution on the most favourable host plants, with the highest density in the central part of its distribution. In this place they will occupy other plants, too. The change in the host plant range within the distribution range, is called ecological polyphagy (GILBERT 1979), or regional polyphagy (STRONG *et al.* 1984). This phenomenon is well-known and documented in the entomological literature (SCHWERDTFEGER 1963). In this special case, the regional polyphagy overlapped with the outbreak polyphagy. This part of the studied territory could be considered as an outbreak host plant range expanding zone, which is in accordance with the data of IWAO (1959). This fact demonstrates that it is a potential outbreak centre, which in some cases can overlap with the species formation centre. The formation centre and the outbreak centre represent a very good adaptation of that zone, but it is not obligatory. For example the supposed region of origin for *Q. perniciosus* is the Far East (DANZIG 1980), but this region is unsuitable for mass outbreaks, because of its harsh climatic conditions. The lower frequency of soft scale species could be related to their more effective biotic regulation, too. The parasitoid community of this group is more complex, and more specialised, which reflects a longer evolutionary history of these interactions (SUGONYAEV 1984). High rates of parasitisation (30–60%, or more) are often found. The parasitoid community of the members of the armoured scale species is less complex and specialised, which points to a younger phylogenetic relationship (ROSEN & DEBACH 1979). The rate of parasitisation is usually low, falling within the range of 10–20% (YASNOSH 1975).

On the base of the segregation of the armoured and soft scales, by frequency and density (Figs 2, 3), and by microhabitat specialisation (KOZÁR 1989), and by other biological peculiarities, they could be considered as separate guilds. These groups use special parts of plants, by special means, and by this they differ from other sucking insects (aphids, mites, etc). These guilds coincide with taxonomic groups (ADAMS 1985), but they are true resource-based guilds, sensu

JAKSIC (1981). The members of these guilds can utilise the abundant food resource base, without needing to face competition (KOZÁR 1987).

The scale-insect species with higher northern latitude limit are capable to occupy the southern regions, too, because of this their frequency is much higher in the samples. The southern latitude border showed much smaller variation of this group on the studied plants (Figs 1, 4).

The members of the armoured scale guild divide host plant food resource along the geographic axis, and form four groups (Figs 5, 6), which may be considered as geographic subguilds. The geographic subguilds contain only a part of faunal components (VARGA 1963) of different origin having different ecological requirements. These components divide this host plant resource among several groups in the studied region. Part of the species follows the principle of habitat change (BEY-BIENKO 1967).

The role of the host plant range in the size of the distribution in the case of scale-insect species studied here seems to be negligible. The size of the distribution in most of the species of this group is determined also by abiotic and evolutionary factors (UDVARDY 1983, REPASKY 1991).

* * *

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THE GENUS BASANUS LACORDAIRE (COLEOPTERA: TENEBRIONIDAE) IN CONTINENTAL SOUTH-EASTERN ASIA*

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The species of the genus *Basanus* Lacordaire from continental south-eastern Asia are revised. *Basanus manangensis* sp.n. from Nepal and *Basanus soppongensis* sp.n. from Thailand are described. The genus and species characters are discussed. A key for all species of that region is provided and a species-list of the genus is added.

Key words: Coleoptera, Tenebrionidae, *Basanus*, new species, key, continental SE Asia

INTRODUCTION

The genus *Basanus* LACORDAIRE, 1859 contains about 25 nominal species distributed in continental south-eastern Asia, the Ussuri region, Korea, Japan and adjacent islands, Taiwan, the Philippines, the Sunda islands and New Guinea. The taxonomic status of many species, in particular those described by PIC, is doubtful. In addition, a few variation and/or subspecific names are introduced. The only existing comprehensive study of the genus has been published by GEBIEN (1925). Further species were added by single descriptions of different authors (see species list). I decided to present new findings in the Nepal Himalayas and in Thailand not without revising at least the species from continental south-eastern Asia. Genus and species characters are still "weak" and allow only the recognition of morphospecies.

GENERIC CHARACTERS

As yet not a single synapomorphic character of the genus is known. This holds true for nearly all genera of the Diaperini (and other Tenebrionidae). GEBIEN (1925) considered the following peculiarities to be characteristic for the genus: the relatively broad antennal segments, the flat and broad prosternal process and the elytra with distinctly excavated lateral margin near the tip. At least the last character occurs also in other genera, so in *Scaphidema* REDTENBACHER,

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* Contribution to Tenebrionidae, no. 14. For no. 13 see: *Ent. Bl.* 92, 1996.

1849 and *Spiloscapha* BATES, 1873. Further studies are necessary to realize a phylogenetical genus characterization with synapomorphic characters.

All species of the genus have the head, pronotum and elytral intervals with sporadic and short erect setation; ventral side with longer and erect setation; eyes somewhat excavated only at the anterior margin; antenna with segment 2 short, segment 3 elongate and segments 4–11 broad and symmetrical, not increasing towards the tip and without club; pronotum with 2 slight basal impressions and with a distinctly separated lateral margin; sutural interval of the elytra somewhat or distinctly convex, all other intervals flat; elytral lateral margin excavated just before the tip, epipleuron narrowed in that region; prosternal process flat and broad; metacoxae broadly separated by the process of the first abdominal sternite; abdominal sternites with weak lateral impressions; alae fully developed; legs without peculiarities; aedeagus simple with a weakly arenate basal tube and triangular joined parameres; no external sexual dimorphism. All these common characters are omitted from the following species descriptions.

SPECIES CHARACTERS

The species are quite uniform. GEBIEN (1925) separated the species mostly by the colour pattern of the dorsal side. In general, this seems to be a weak argumentation, but in this genus the colour pattern is quite constant and without distinct variation. The shape of the aedeagus is helpful in separating some species with similar outfit, but in other species this shape is without distinct differences. The punctation of the head, the pronotum and the elytra is helpful for taxonomic separation. The body shape and size are used as further characters. All these characters must be judged in combination for separating at least morphospecies.

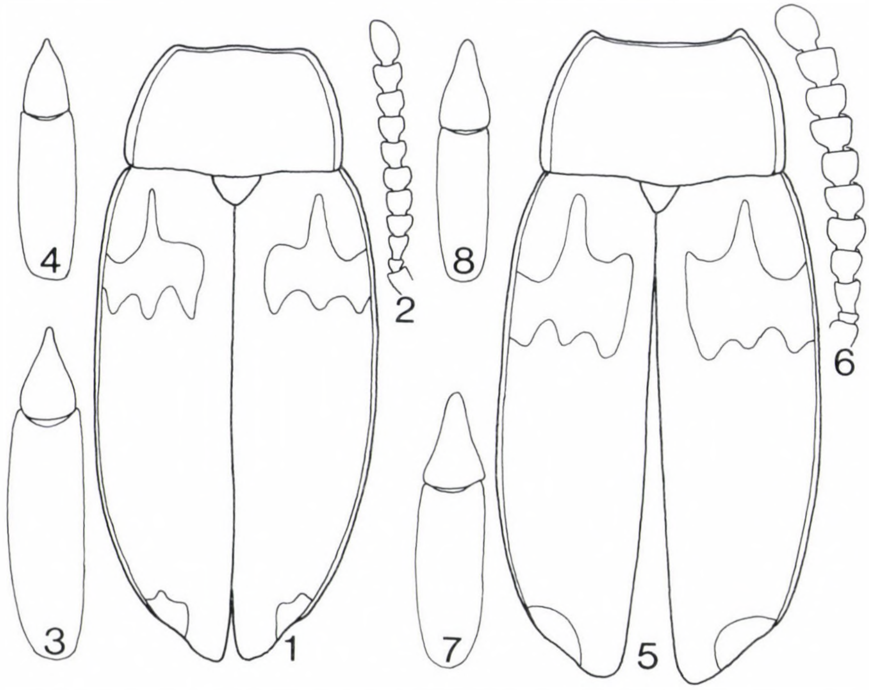
Basanus erotyloides LEWIS, 1891
(Figs 1–4)

Basanus erotyloides var. *annamitus* GEBIEN, 1925, syn. n.
Basanus presuturalis PIC, 1928, a questionable synonymy.

Material: Japan, Omogokel, Iyo, 28.VII.1952 leg. T. ISHIHARA, 1 ex. HNHM. Japan, Ehime, Ishizuchi N. Park, Mt. Ishizuchi, 13.–14.VIII.1980 leg. C. BESUCHET, 2 ex. MHNG, 1 ex. SMNS. China, Fujian (=Fukien in German), Kuatun, 27.40 N/117.40 E, 2300 m, III./IV.1938 leg. J. KLAPPERICH, 2 ex. HNHM.

Description. Body shape and colour pattern on elytra as in Fig. 1, abdominal sternites ferrugineous, length 8.8 mm. Head with coarse punctation, distance of punctures 0.5–1.0 times longer than diameter of punctures. Antenna shown in Fig. 2. Pronotum with smaller and sparser punctation than head, distance of punctures 1.0–3.0 times longer than diameter of punctures, some punctures distinctly bigger than the others; anterior margin bordered also in the middle, posterior margin

Figs 1–8. 1–4 = *Basanus erotyloides*, male from Japan 1 = dorsal view, 2 = antenna, 3 = aedeagus. 4 = aedeagus., male from Fujian; 5–8. *Basanus javanus*, male from Java 5 = dorsal view, 6 = antenna, 7 = aedeagus. 8 = aedeagus, male from Vietnam. Scales as in Figs 9–17



unbordered. Elytra with only 5–7 indistinct rows of punctures, external rows dissolved; intervals flat except the sutural interval being somewhat convex in its posterior third; intervals with distinct punctation, punctures only somewhat smaller than the punctures of the rows. Aedeagus as shown in Figs 3–4.

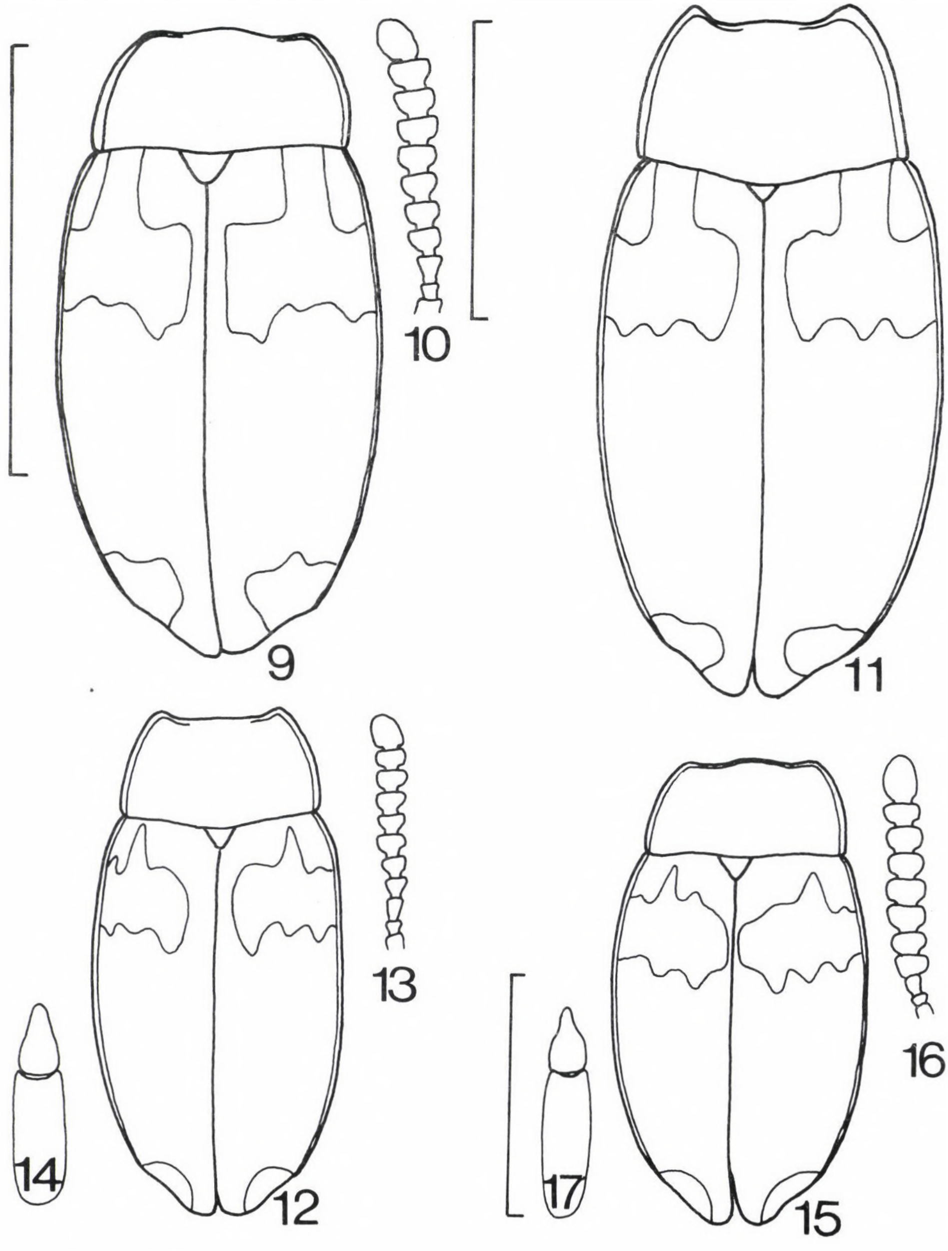
Remarks. The specimens from China show no distinct differences compared to the Japanese records, thus, I consider them as conspecific. GEBIEN (1925) described *annamitus* from Annam as a variation of *erotyloides*, differing only by the colouration of the ventral side. In the collection HNHM, the late Dr. Z. KASZAB has labelled *presuturalis* PIC, 1928 from Laos as a synonym of *erotyloides*, this synonymization has obviously not been published.

Distribution: Japan (locus typicus), southern China and Indochina.

Basanus flaviventris BLAIR, 1937
(Figs 9–10)

Material: Bengal, Kalimpong, Samsingh, 1800 ft., IV.1934 leg. BALWANT SINGH, 1 female syntype BMNH.

Figs 9–17. *Basanus flaviventris*, female syntype from Darjeeling. 9 = dorsal view, 10 = antenna, 11 = *B. himalayanus*, dorsal view, female holotype from Assam. 12–14 = *B. manangensis* sp. n., male holotype from Nepal. 12 = dorsal view, 13 = antenna, 14 = aedeagus. 15–17 = *B. soppongensis* sp. n., male holotype from Thailand, 15 = dorsal view, 16 = antenna, 17 = aedeagus.. Scales: Dorsal view 4 mm, antenna 2 mm, aedeagus 1 mm



Description. Body shape and colour pattern on elytra as in Fig. 9, abdominal sternites ferrugineous, length 6.0 mm. Head with coarse punctation, distance of punctures 0.5–1.0 times longer than diameter of punctures. Antenna as in Fig. 10. Pronotum with smaller and sparser punctation than head, distance of punctures 1.0–3.0 times longer than diameter of punctures, all punctures of about the same size; anterior margin unbordered in the middle, posterior margin unbordered. Elytra with only 5–6 indistinct rows of punctures, external rows dissolved; intervals flat except the sutural interval being distinctly convex in its posterior third; intervals with distinct punctation, punctures only somewhat smaller than the punctures of the rows. Aedeagus unknown, only female available.

Distribution: Known only from the type locality in Darjeeling.

Basanus himalayanus KASZAB, 1965
(Fig. 11)

Material: India, Assam, Warongpang, 5000 ft., 19.III.1961 leg. F. SCHMID, female holotype HNHM.

Description. Body shape and colour pattern on elytra as in Fig. 11, abdominal sternites ferrugineous, length 7.0 mm. Head with coarse punctation, distance of punctures 0.5–1.0 times longer than diameter of punctures. Antenna broken. Pronotum with smaller and sparser punctation than head, distance of punctures 1.0–3.0 times longer than diameter of punctures, all punctures of about the same size, a medial longitudinal patch on pronotum without punctation; anterior margin unbordered in the middle, posterior margin unbordered. Elytra with only 7 distinct rows of punctures, external rows dissolved; intervals flat except the sutural interval being distinctly convex in its posterior third; intervals with distinct punctation, punctures distinctly smaller than the punctures of the rows. Aedeagus unknown; only female available.

Distribution: Known only from the type locality in Assam.

Basanus javanus CHEVROLAT, 1878
(Figs 5–8)

Basanus tonkineus PIC, 1917, syn. n.

Material: Java occ., M Salak, 1 ex. HNHM. N Vietnam, Tam-Dao, 200 m, 23.III.1962 leg. KABAKOV, 1 ex. HNHM.

Description. Body shape and colour pattern on elytra as in Fig. 5, abdominal sternites black or dark brown, length 9.0 mm. Head with coarse punctation, distance of punctures 0.5–1.0 times longer than diameter of punctures. Antenna as in Fig. 6. Pronotum with smaller and sparser punctation than head, distance of punctures 1.0–3.0 times longer than diameter of punctures, very few punctures distinctly bigger than the majority; anterior margin bordered also in the middle, posterior margin unbordered. Elytra with only 3–5 indistinct rows of punctures, external rows dissolved; intervals flat except the sutural interval being somewhat convex in its posterior third; intervals with distinct punctation, punctures of the same size as the punctures of the rows. Aedeagus shown in Figs 7–8.

Remarks. The available male from Vietnam shows no distinct differences from the male from Java, in particular in the aedeagus, so I have no doubt in assigning both to the same species. The name *tonkineus* PIC, 1917 from Tonkin has no taxonomic justification, neither as a valid species nor as a subspecies or variation.

Distribution: Java (locus typicus), Borneo (GEBIEN 1925) and Indochina.

Basanus manangensis sp. n.
(Figs 12–14)

Holotype (male): Nepal, Manang Distr., forest W Bagarchap, 2200 m, 21.IX.1983 leg. I. LÖBL & A. SMETANA, MHNG. Paratypes: same data as holotype, 1 ex. MHNG, 1 ex. SMNS.

Description. Body shape and colour pattern on elytra as in Fig. 12, abdominal sternites dark brown, length 5.2–5.5 mm. Head with fine punctation, distance of punctures 1.0–4.0 times longer than diameter of punctures, head between eyes with distinct small impression. Antenna as in Fig. 13. Pronotum with same punctation as head, distance of punctures 1.0–4.0 times longer than diameter of punctures, all punctures of about the same size; anterior margin unbordered in the middle, posterior margin unbordered. Elytra with only 7 distinct rows of punctures, external rows dissolved; intervals flat except the sutural interval being slightly convex in its posterior third; intervals with distinct punctation, punctures distinctly smaller than the punctures of the rows. Aedeagus as shown in Fig. 14.

Distribution: known only from the type locality in central Nepal.

Basanus soppongensis sp. n.
(Figs 15–17)

Holotype (male): Thailand, Soppong, 19.29 N/98.18 E, 750 m, 13.V.1993 leg. L. BOCÁK, SMNS.

Description. Body shape and colour pattern on elytra as in Fig. 15, abdominal sternites dark brown, length 5.1 mm. Head with coarse punctation, distance of punctures 0.5–2.0 times longer than diameter of punctures. Antenna as in Fig. 16. Pronotum with smaller and sparser punctation than head, distance of punctures 2.0–4.0 times longer than diameter of punctures, all punctures of about the same size; anterior margin bordered also in the middle, posterior margin unbordered. Elytra with only 7 distinct rows of punctures, external rows dissolved; intervals flat except the sutural interval being slightly convex in its posterior third; intervals with distinct punctation, punctures distinctly smaller than the punctures of the rows. Aedeagus as shown in Fig. 17.

Distribution: Known only from the type locality in northern Thailand.

KEY OF THE SPECIES FROM CONTINENTAL SE ASIA
(without the Ussuri region and Korea)

1 Anterior ferrugineous spot on elytron with a broad prolongation reaching the base of elytron (Figs 9, 11) 2

– Anterior ferrugineous spot on elytron with a narrow prolongation not reaching the base of elytron (Figs 1, 5, 12, 15) 3

2 Elytron with 7 distinct rows of punctures, punctures of the intervals distinctly smaller than the punctures of the rows; a medial longitudinal patch on the pronotum without punctation; body length 7 mm; aedeagus unknown *himalayanus*

– Elytron with 5–6 indistinct rows of punctures, punctures of the intervals only somewhat smaller than the punctures of the rows or of the same size ; pronotum without distinct unpunctured patch; body length 6 mm; aedeagus unknown *flaviventris*

3 Body length 7–9 mm 4

– Body length 5–5.5 mm 5

4 Abdominal sternites black or dark brown; antennal segments broader (Fig. 6); parameres (Figs 7–8) *javanus*

– Abdominal sternites ferrugineous; antennal segments narrower (Fig. 2); parameres (Figs 3–4) *erotyloides*

5 Head with fine punctation, between eyes with distinct small impression; antennal segments narrower (Fig. 13); anterior margin of pronotum unbordered in the middle; parameres (Fig. 14) *manangensis* sp. n.

– Head with coarse punctation, between eyes without impression; antennal segments broader (Fig. 16); anterior margin of pronotum bordered also in the middle; parameres (Fig. 17) *soppongensis* sp. n.

SPECIES-LIST OF THE GENUS BASANUS
(without subspecific taxa and without doubtful taxa described by PIC)

amamianus CHUJO, 1966 – Ryu Kyu
erotyloides LEWIS, 1891 – Japan, China, Indochina
flaviventris BLAIR, 1937 – Darjeeling
formosanus MASUMOTO, 1982 – Taiwan
fruhstorferi GEBIEN, 1940 – Sulawesi
fukudai NAKANE, 1968 – Iooclav Isl.
helluo GEBIEN, 1925 – Philippines

himalayanus KASZAB, 1965 – Assam
javanus CHEVROLAT, 1878 – Java, Borneo, Indochina
longior GEBIEN, 1925 – Sumatra
manangensis SCHAWALLER, 1995 – Nepal
misellus GEBIEN, 1925 – Philippines
philippinensis GEBIEN, 1925 – Philippines
pictus GEBIEN, 1925 – Sundas
soppongensis SCHAWALLER, 1995 – Thailand
sumatrensis GEBIEN, 1925 – Sumatra
tsushimensis CHUJO, 1963 – Tshushima, Ussuri region

* * *

Abbreviations: BMNH – British Museum of Natural History, London; HNHM – Hungarian Natural History Museum, Budapest; MHNG – Muséum d'Histoire Naturelle, Genève; SMNS – Staatliches Museum für Naturkunde, Stuttgart.

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THREE NEW SCELIONINAE (HYMENOPTERA, SCELIONIDAE) SPECIES FROM THE NEOTROPICAL REGION

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Three new species, *Mirotelenomus ildiae* sp. n., *Odontacolus flavissimus* sp. n., and *Odontacolus szaboi* sp. n. are described from Central and South America. *Mirotelenomus ildiae* is the first Neotropical species of the genus. Line drawings illustrate each species. A key is provided to the Neotropical species of *Odontacolus* KIEFFER.

Key words: Hymenoptera, Scelionidae, *Mirotelenomus, Odontacolus,* taxonomy, new species

The genera discussed in the present paper were treated – and sometimes mistreated – by numerous authors. The genus *Mirotelenomus* was originally described by DODD (1913*b*) for the Australian *Mirotelenomus abnormis*. DODD described several other species of *Mirotelenomus* in two other genera: *Hadronotus* FOERSTER (synonym of *Gryon* HALIDAY) and *Telenomoides* DODD (synonym of *Gryon* HALIDAY). Later he himself recognized the proper limits of the genus and transferred the other species to the genus *Mirotelenomus* (DODD 1926). These limits were not accepted by KOZLOV, whose two new species, *M. artus* and *M. latus*, do not share the generic characters with the other species of the genus (especially wing venation and cephalic characters) (KOZLOV 1963, 1970). Currently these two species are classified in the genus *Gryon* (JOHNSON 1992). MASNER (1976) specified the limits of the genus and listed the important characters (e.g position of ocelli, shape of head and mesosoma, fore wing venation). These characters should be sufficient for the proper identification of the genus.

The genus *Odontacolus* was described by KIEFFER (1910), later DODD (1914*b*), GIRAULT (1917) and SZABÓ (1966) described additional species. The characters of DODD's genus *Ceratobaeoides* proved to be insufficient for recognizing it as a different genus, so it was synonymized with *Odontacolus* by AUSTIN (1981). The only Neotropical species was described by SZABÓ. His description contains some mistakes. In his paper his new species has bare eyes (the pilosity of eyes is a generic character, all the species I have seen had pilose eyes) and bidentate mandibles (tridentate in *Odontacolus*, but mandibles are curved dorsoventrally and median tooth is the largest, so the lower tooth often concealed behind the median tooth, especially when the mandibles are closed), but otherwise the species is an *Odontacolus* with all the proper characteristic features (wing venation, shape of head, propodeal spines, etc.). I decided to keep the species in the genus *Odontacolus*, until a more sufficient examination.

The present paper is based on specimens from the unidentified Scelioninae collection of the USNM. In the text the following abbreviations are used: USNM = United States National Museum of Natural History, Smithsonian Institution, Washington, D.C., USDA = United States Department of Agriculture, Washington, D.C., Sc = scape, Ped = pedicel, A1–A10 = flagellar segments 1–10, LOL = distance between median and lateral ocelli, OOL = oculo-ocellar distance, POL = distance between lateral ocelli, T1–T6 = metasomal tergites 1–6, L = length , W = width, H = height.

Labels on specimens bear some – now – incorrect data, since today "British West Indies", as now Dominica is an independent country.

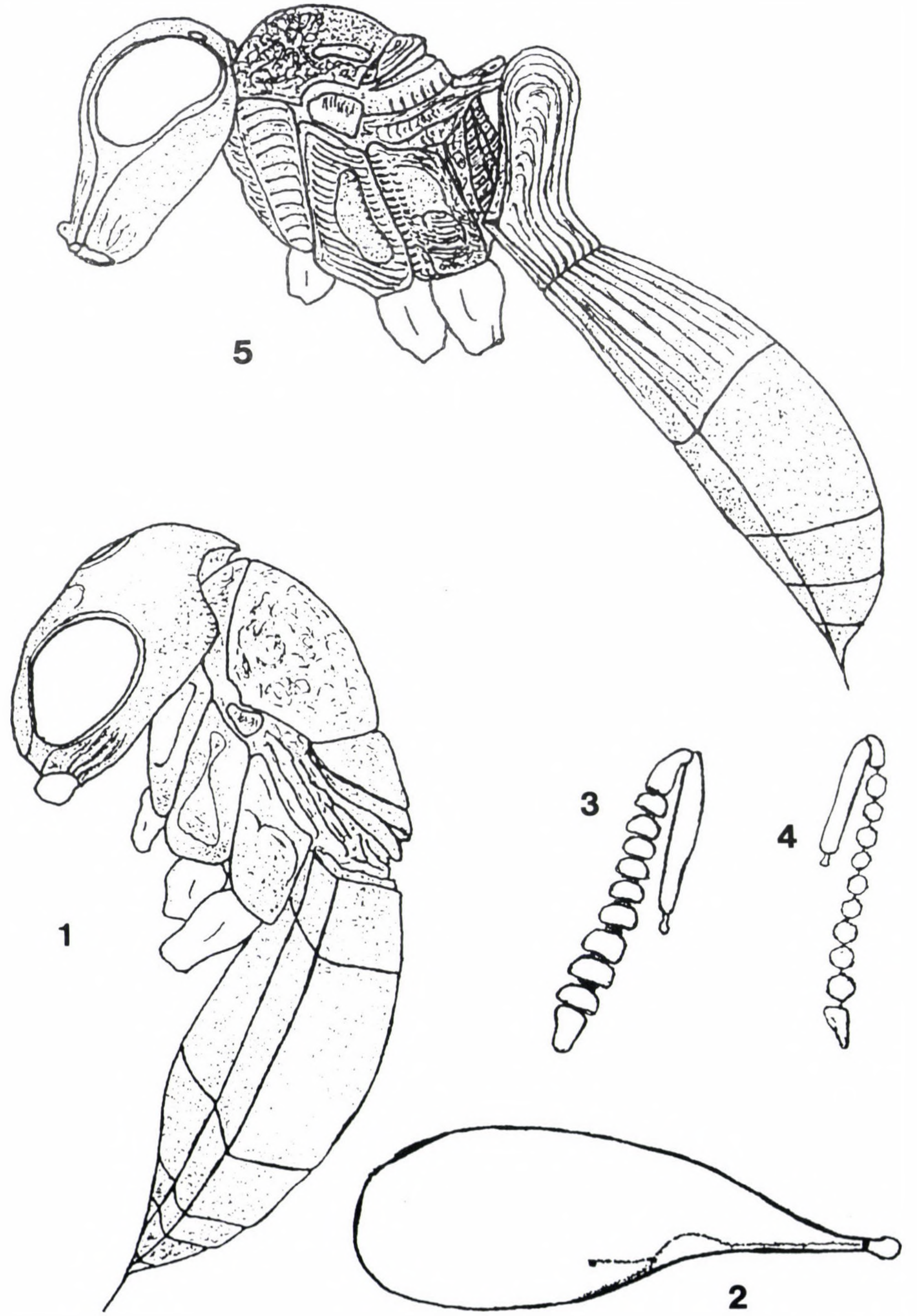
Mirotelenomus ildiae sp. n.

(Figs 1–4)

Holotype, female deposited in the USNM. Dominica, British West Indies, Pt. Mulatre. September 15, 1965. Collector: D. L. JACKSON. Bredin-Archbold-Smithsonian Biological Survey, Dominica. Paratype, male in USNM. Dominica, British West Indies, S. Chiltern, August 18-19, 1965. Collector: D. L. JACKSON. Bredin-Archbold-Smithsonian Biological Survey, Dominica.

Female (Fig. 1). Length: 0.8 mm. Colour: Head blackish brown. Radicle yellow, scape, pedicel yellowish brown, A1 light brown, colour deepens toward apex. Mesosoma brown, dorsal surface of thorax slightly darker than pleura, metasoma brown rusty, colour deepens toward apex, where it is dark brown. Legs yellow. Mandibles bright yellow. Wings fumate. Head: thin, from dorsal view strongly transverse (L/W = 3:17). Eyes relatively small, with scattered hairs, head with dense, white, decumbent hairs. Lower frons above antennal insertion with shallow, completely smooth depression. Frons and most of head finely reticulate-rugulose. Ocelli small, hardly visible, they form a triangle, lateral ocelli far from eyes. Base of mandibles are connected with eye margins by a shallow, wide furrow. Mandibles bright yellow, upper tooth much longer than lower one. Clypeus brown, broad, its corners protruding. Vertex concave, occipital carina close to top of head, prominent. Antenna (Fig. 3): colour of antenna deepens toward apex from light yellow (radicle) to dark brown (A10). Flagellar segments except for A10 transverse, scape, pedicel long, scape more than five times longer than its maximum width, pedicel almost 2.5 times as long as wide. Segment L/W are the following: Sc =35:6.4, Ped = 11.4:4.7, A1 = 3.2:6.4, A2 = 3.6:6.5, A3 = 3.6:6.8, A4 = 4.3:7.1, A5 = 4.6:7.4, A6 = 5.2:7.8, A7 = 5.5:8.2, A8 = 5.5:9.1, A9 = 5.3:10.2, A10 = 10.3:8.5. Mesosoma: dorsal part very flat, mesoscutum, scutellum and metanotum from lateral view almost in one line. Sculpture of dorsal mesosoma delicate, cutaneous. Mesoscutum pubescent, with rather dense, decumbent hairs, latter on scutellum longer and more sparse. Metanotum expanded to a flat triangular plate, being acute at its end. Propodeum flat, lateral hind corners acute, sculpture of propodeum delicate. Notaulix absent. Pleura lighter than dorsal part of mesosoma, rust coloured, sculpture delicate, pleura almost smooth, dorsal part of mesopleura with 3–4 stronger longitudinal striae. Legs predominantly yellow, with meso- and metacoxae darker. Legs stout, short, especially pro-, mesotibiae and tarsi. Tibial spur formula: 1-1-1. Wings: short, but reaching apex of abdomen, fumate, with long marginal cilia. Fore wing (Fig. 2): submarginal vein downcurved just before meeting marginal vein, latter very short, point-like. Stigmal vein well developed. Postmarginal vein well developed, longer than stigmal vein. Hind wings with complete submarginal vein, which thickened just before reaching frenal hooks. Metasoma: short, rather flat and broadly sessile. Sculpture of metasoma very fine, cutaneous, tergites and sternites with rather dense, decumbent hairs. T1 L/W = 9:29, T2 L/W = 17:31, T3 L/W = 10:28, T4 L/W = 6:23, T5 L/W = 2:18, T6 L/W = 1:5. Male: similar to female, except antenna (Fig. 4), which is more filiform, flagellar segments cubical

Figs 1–5. *Mirotelenomus ildiae* sp. n., 1 = lateral view, 2 = forewing, 3 = antenna, 4 = *M. ildiae* sp. n. male, antenna; 5 = *Odontacolus flavissimus* sp. n., female, lateral view



or slightly elongate, scape more slender. Metasoma yellowish brown, T4–T6 brown, T6 almost completely retracted, hardly visible. Legs longer.

Host unknown.

Etymology: Named in honour of my wife, Ildikó Bartha, in recognition of her constant help and patience in my study.

This is the first species described from the Neotropical region. It differs from the other species of the genus on account of its sculpture of thorax, and the pattern of its abdominal segments. In addition I have seen (in USNM) undescribed species from Central and South America and there are undescribed species from the Ethiopian region as well (Masner 1976).

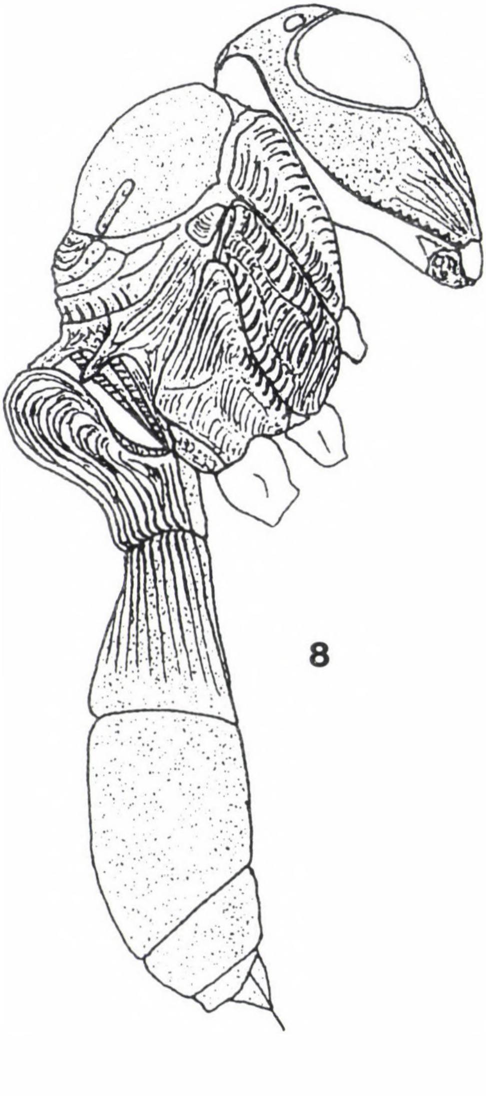
Odontacolus flavissimus sp. n.

(Figs 5–7)

Holotype, female deposited in USNM. Peru, Dept. Loreto, Explornapo Camp on Rio Sucusari, 2 km upstream from Rio Napo (160 km NE Iquitos). June 24–July 20, 1990. Collectors: Menke & Awertschenko.

Length: 1.8 mm. Colour: Head light, whitish yellow, Ped, A1–A5 and club brown. Mesosoma yellow, dorsal part of mesosoma a little bit darker than pleura. Legs yellow, coxae almost white. Metasoma yellow, dorsal part of horn on T1 brown, posterior parts of T2 and T3 just before the following tergite brown. T4–T6 yellow, posterior parts of tergites a bit darker. Head: (Fig. 7) H/L = 24:10, W/H = 25:24. Head transverse and almost triangular, buccal region large, eyes relatively large, distinctly pilose. Ocelli wide apart, but in form of a triangle, lateral ocelli touching eye-margins. Frons almost smooth, only with microscopical punctures, not shiny. Frontal depression hardly visible, but present, very shallow. A fine median carina extending from median ocellus to antennal insertion. A fine ocular carina present around eyes, continuing in a shallow and wide furrow, which connects eyes with base of mandibles. Malar region with fine longitudinal striae. Sculpture of temples, genae and vertex similar to frons, but punctures on vertex stronger. Head with small, whitish, decumbent hairs. Clypeus flat, slightly protruding. Mandibles tridentate, but lower tooth concealed behind middle one, latter is the largest and strongest all. Antenna (Fig. 6): scape long and slender, somewhat widened in the middle, pedicel pyriform, A1 cubical, A2–A5 transverse. A6 the widest segment, almost as long as scape. Antenna with short and dense decumbent hairs. Thorax (Fig. 5): about as high as wide, shorter than metasoma. Colour of mesosoma yellow, pleura slightly lighter than dorsal part. Mesoscutum reticulate-rugulose anteriorly and laterally. This sculpture almost completely obliterated on median lobe just in front of scuto-scutellar suture. Notaulix absent on anterior part of mesoscutum, but present on posterior part. Notaulix on posterior part deep and wide, with punctate sculpture inside. Mesoscutum with dense, decumbent and semidecumbent hairs. Scutellum striate-rugulose on dorsal part, on posterior sloping part smooth. Scutellum with stronger semidecumbent hairs. Metanotum smooth, but in front of propodeum with a row of foveolae. Propodeum bispinose, spines diverging in dorsal view. Propodeum under spines striate, but with a smooth, deep median part. Propleura striated. Anterior, posterior and ventro-lateral parts of mesopleura striated, median depression almost smooth, with delicate sculpture. Anterior part of metapleura striated, sculpture of median depression similar to that of mesopleura. Wings: fore wings about three and a half times as long as broad. Submarginal vein long and running close to wing margin. Marginal vein short and stout. Stigmal vein long. Marginal and stigmal veins thickened, dark brown. Postmarginal vein longer than stigmal one, its apex hardly visible, light yellow. Fore wings with long marginal cilia. Wings hyaline, but fore wing with a brown band running from stigmal vein to hind margin of wing. Hind wings with long marginal cilia and with three bending hooklets. Submarginal vein of hind wings complete and thickened at point of reaching bending

Figs 6–9. *Odontacolus flavissimus* sp. n., female 6 = antenna, 7 = head, frontal view; *O. szaboi* sp. n., female, 8 = lateral view, 9 = antenna



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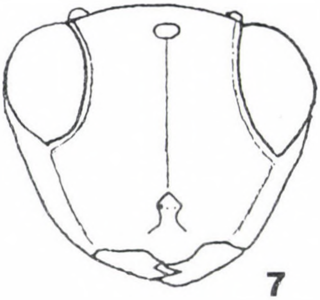

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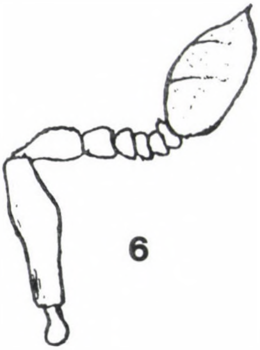

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hooklets. Legs long, light yellow, coxae almost white. Metasoma long, longer than head and mesosoma combined. First tergite with a slender hornlet, striate, hornlet striate, but anterolateral part reticulate with longitudinal elements. Anterolateral part of hornlet extended to an almost transparent, striate membrane of unknown function. (Interesting that the hornlet completely fits between the propodeal spines, and there is a deep channel in the median part of propodeum. The lateral membranes seem to close this channel.) Second tergite striate throughout with stronger median striae than lateral ones. Third tergite finely punctate, its sculpture delicate. Sculpture of fourth to sixth tergites similar to that of third one. Metasomal measurements: T1 L/W = 14:15, T2 L/W = 35:30, T3 L/W = 34:40, T4 L/W = 11:36, T5 L/W = 5:19, T6 L/W = 6:13.

Male: unknown.

Host unknown.

Etymology: The species name refers to its coloration.

Odontacolus szaboi sp. n.

(Figs 8, 9)

Holotype, female deposited in USNM. From flower stems of *Starchytapneta* sp., St. Augustine, Trinidad, British West Indies, February 27, 1954. Collector: F. D. BENNETT - 298 54-3257. Paratype, male in USNM. Same data as holotype.

Female (Fig. 8). Length: 1.6 mm. Colours: The whole body including antennae, legs, medium brown, rust coloured. Wings hyaline. Head. L/W = 12:26, H/W = 23:26. Head large, triangular, with relatively large eyes and with large buccal region. Eyes hairy with short and scattered, erect hairs. Ocelli form a triangle, lateral ocelli touching eye-margins. Frons finely punctate, sculpture on lower frons delicate, but a very fine median carina originating from antennal insertion traceable. Malar region finely striate. Sculpture of vertex similar to that of frons, but punctures larger. Frons and vertex with semidecumbent, decumbent hairs. Genae large, with relatively strong striae near bases of mandibles. Occipital carina present, carina on genal region with small foveolae. Eye margins close to occipital carina. Mandibles tridentate, median tooth is the largest one, mandible brown. Antenna (Fig. 9): scape long and slender, pedicel long, pyriform, about three and a half times as long as its maximum width. A1 and A2 small, cubic. A3, A4 and A5 larger, about as long as wide. A6 large, almost as long as scape, wider than all of the preceding segments, almost three times as long as wide. Antenna with short hairs. Mesosoma about as wide and as long as high (L/H = 25:24). Dorsal part of mesosoma a bit darker than pleura. Mesoscutum finely reticulate, its sculpture delicate. Notaulix present on posterior half of mesoscutum. Notaulix deep, well indicated with an abrupt anterior edge. Scutellum small, semicircular, its upper part reticulate, striate. Pleura striate, depression on mesopleura with finer striate. Propodeum bispinose, spines laterally striate-reticulated. Otherwise propodeum striate, but between spines reticulate-striate. Wings: Fore wings hyaline, marginal vein running close to wing margin. Stigmal vein and marginal vein thickened, their colour light brown. Marginal vein very short. Postmarginal vein long, longer than stigmal vein, but hardly visible, almost transparent. Hind wings with three bending hooklets. Submarginal vein thickened just before reaching bending hooklets. Legs light brown, coxae brown, a little bit darker than tibiae and tarsi. Metasoma. Measurements: T1 L/W = 13:18, T2 L/W = 33:41, T3 L/W = 34:42, T4 L/W = 6:32, T5 L/W = 3:20, T6 L/W = 6:11. Metasoma brown, long, longer than head and mesosoma combined. First tergite with a large hornlet, lattter stout, not so slender. Tergite including hornlet striate throughout, with median striae stronger than lateral ones. Structures of hornlet and posterior part of propodeum similar to those of *Odontacolus flavissimus* sp. n. Second tergite large, striated, striate finer on posterior part of tergite and almost completely obliterated in front of third tergite. Third tergite is the widest and the longest one. Its sculpture reticulate-cutaneous, delicate. Sculpture of T4, T5 and T6 similar to that of T3, but generally finer. Metasoma with small, decumbent hairs.

Male. Generally similar to female, except for sexual differences and a much smaller hornlet. Male antenna more slender.

Host unknown, type specimens were caught in flower stems of *Starchytapneta* sp.

Etymology. The species is named after Dr. L. SZABÓ, my teacher and colleague for his help in my study.

KEY TO THE NEOTROPICAL SPECIES OF ODONTACOLUS KIEFFER

1 Fore wings without a distinct brown band, hyaline or fumate throughout, mesoscutum finely reticulate-punctate throughout 2

– Fore wings with a distinct brown band, depression of mesopleura almost smooth, with delicate sculpture, mesoscutum reticulate-rugulose on anteromedian and lateral parts, smooth on posterior part. Light yellow species. Body length 1.8 mm *Odontacolus flavissimus* sp. n.

2 Black, wings fumate throughout, hind wings with two bending hooklets, abdominal tergite T2 striate in the middle, smooth and shining laterally. Body length 1 mm. *Odontacolus macroceps* SZABÓ

- Brown, wings hyaline, hind wings with three bending hooklets, abdominal tergite T2 striate equally in the middle and lateral parts on anterior part of tergite, but striae almost completely absent on posterior part of tergite. Genal part of head with relatively strong striae, malar region finely striate. Body length 1.6 mm *Odontacolus szaboi* sp. n.

These three new species represent the first step of a more complete taxonomical revision of the Neotropical species of some genera of the subfamily Scelioninae. The presently described Neotropical taxa are only a small fraction of the total. The vast undetermined material of the USMN collections still contains numerous undescribed taxa. The present paper tries to be an initiative step on a long path of research in the taxonomy of the Neotropical Scelioninae.

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SYSTEMATIC POSITION AND GENERIC STATUS OF LYCAENA COGINA SCHAUS, 1902: AN ENDEMIC NEOTROPICAL LYCAENOPSINA (LEPIDOPTERA, LYCAENIDAE)

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Elkalyce, gen. n., is proposed for the polyommatine lycaenid butterfly originally described as *Lycaena cogina* SCHAUS. This species, endemic to SE Brazil, has long been considered a member of the genera *Everes* or *Leptotes*, from which, however, it is quite distinct. The new genus belongs to the Lycaenopsina infratribe of the *Lycaenopsis* Section erected by ELIOT. The taxonomic history of *Lycaena cogina* is discussed.

Key words: Brazil, *Celastrina*, Lycaenposina, Neotropics, Polyommatini

INTRODUCTION

Our review of higher taxonomic categories in the Neotropical Polyommatini has required study of the identity and status of several unusual South American species which show very restricted distributions (BÁLINT and JOHNSON 1995). Previously, the senior author clarified the identity of *Lycaena griqua* (SCHAUS, 1902: 407), replacing the unavailable homonym *griqua* with *parana* BÁLINT and placing this species in *Pseudolucia* NABOKOV, 1945 (BÁLINT 1993: 17). On the same page as the description of *L. griqua*, SCHAUS also described *Lycaena cogina*, both species reported only from Castro, Paraná, Brazil. *L. cogina* was represented only by its holotype, a male numbered as Type #5920 in the National Museum of Natural History (USNM), Washington D. C. (COMSTOCK and HUNTINGTON 1958-1964 [1959]: 190; BRIDGES 1994: VIII.113; G. LAMAS, pers. comm.). Hitherto the systematic position of *L. cogina* has not been clarified (see EBERT 1969, BROWN 1993 and Discussion) and, as a result, its unique systematic position in the *Lycaenopsis* Section has gone unrecognized (ELIOT and KAWAZOÉ 1983). Although the significance of *L. cogina* in the South American fauna has been mentioned as recently as 1993, no one appears to have taken the fundamental step to study its morphology with regard to overall placement in the Polyommatini.

Our study of *Lycaena cogina*, from recently located additional material listed below, indicates it represents a unique Neotropical endemic infratribe in the *Lycaenopsis* Section (sensu ELIOT 1973, FIEDLER 1991, BÁLINT and JOHNSON herein) and, as such, is of obvious generic worth, both taxonomically and biogeographically.

In the following description we apply the format and terminology of ELIOT and KAWAZOÉ (1983).

Elkalyce BÁLINT and JOHNSON, gen. n.

(Figs 1-5)

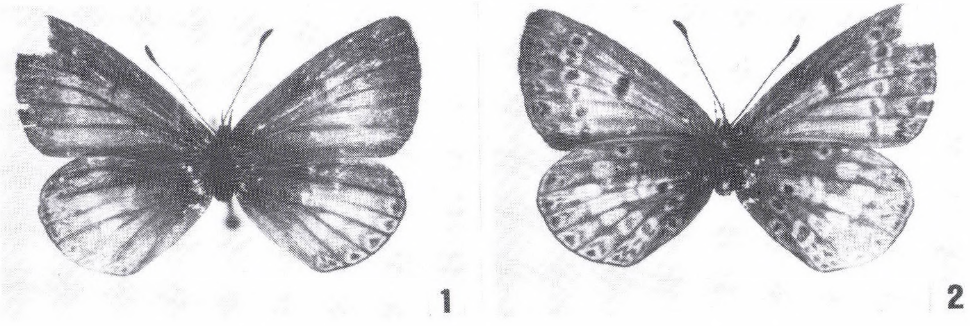
Type species: *Lycaena cogina* SCHAUS, 1902

Diagnosis. Eyes large, glabrous. Antennae slightly shorter than the forewing cell; club with patch of white scales. Second segment of the palpi long and naked. Forewing cell extending approximately to midwing; vein Sc ending before cell apex, veins R1 and Sc approximate but distinct. Male genitalia with sociuncus cupola-shaped in dorsal and lateral view, gnathos with articulating brachia, vinculum very broad with sclerotized edges, valva with large costal process and an additional membranous apical process with long setae; juxta extreamily large and V-shaped connected strongly to the valva apical edge, phallus straight in dorsal view but curved in lateral view with biapical (but bulbous) caecum and long, deeply divided Chapman's process. Male dorsal forewings with broad black borders and with veins and basal area are strongly suffused by dark scales extending along the costa to the wing base. Males without androconial marks. Hindwing similar to forewing but with marginal arrowhead-like markings and antemarginal spots in each cell. Pattern of hindwing venter typical polyommatine (cf. ELIOT and KAWAZOÉ 1983, figs 434-485). Female unknown.

Material examined. 2 males, labelled as "Brasilia, Sao Paulo, Campos de Jordao, 1600 m, 26.I.1966., leg. H. Ebert; Staatssammlung, München"; gen. prep. BÁLINT, No. 543.

Distribution and diversity. Confined to the Neotropical Realm (known only from Paraná, Brazil at present) and monotypic at present.

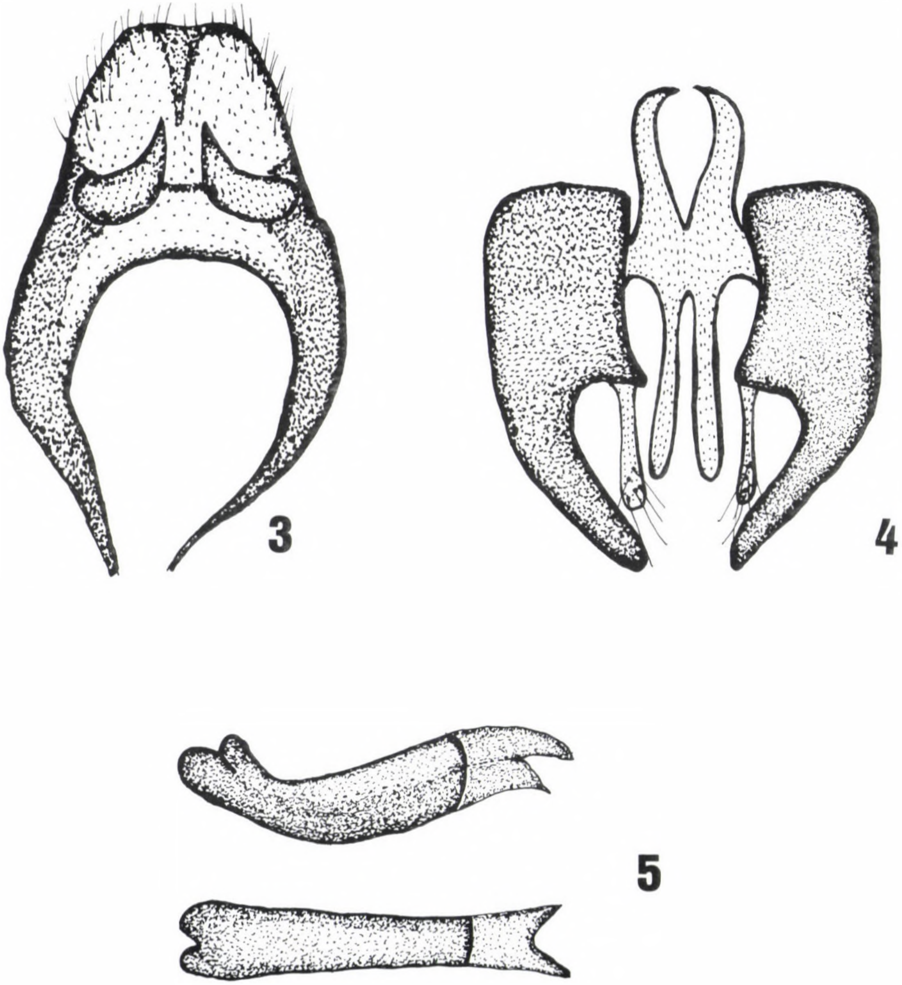
Etymology. An arbitrary combination of syllables, gender feminine, comprises three elements: "El" = ELIOT, "Ka" = KAWAZOÉ and "Lyce" = *Lycaenopsis*.



Figs 1–2. *Elkalyce cogina* (SCHAUS), male, Brasilia, São Paolo, Campos de Jordao, 1600 m, 26.I.66 (ZSBS) 1 = dorsal, 2 = ventral view

DISCUSSION

Most significant to the morphology of *L. cogina* is its membership in the *Lycaenopsis* Section, and of taxa therein, its comprising a unique Neotropical member. *L. cogina* shares the following characters with the *Lycaenopsis* Section: (1) Hindwing tailess; male genitalia with uncus lobes produced; vinculum with a pronounced subtriangular extension directed cephalad; caecum more or less developed, suprazonal portion short.



Figs 3–5. Male genital structures of *Elkalyce cogina* (SCHAUS). 3 = uncus, gnathos, tegumen and vinculum, 4 = valva and juxta, 5 = aedeagus in lateral and ventral aspect

The morphology of *Elkalyce* possess some unique features amongst *Lycaenopsis* polyommatine lycaenids: (1) the juxta is remarkable well developed with large anal lobes, (2) the valva possess an anal membranous lobe and (3) the penis has a short but conspicuous, biapical suprazonal element (=Chapman's process). These characteristics suggest that the most probable sister group of *Elkalyce* is not *Celastrina*, but *Oreolyce* (cf. ELIOT and KAWAZOÉ 1983, figs of *Oreolyce* and *Celastrina*), a view which invites corroboration from the as-yet-unknown structures of the female.

L. cogina was not figured by DRAUDT (1921: 817) and only a cursory repetition of the original description was given. The species was listed as *Lycaena (Rusticus) cogina* – a strange combination (cf. type species of *Rusticus* HÜBNER, [1806]: *Papilio argus* LINNAEUS, 1758).

COMSTOCK and HUNTINGTON (1958-1964 [1959]: 190) simply repeated the binomen of the type description while HAYWARD (1973: 165), perhaps relying on his visits to BMNH, erroneously placed *cogina* in *Leptotes* SCUDDER. HAYWARD (1973) also recorded specimens from Misiones Province, Argentina. These were not located by the junior author at Instituto Miguel Lillo, Tucumán, in 1991 but perhaps are worth looking for in uncurated HAYWARD material still held at the BMNH. EBERT (1969), who studied the butterflies of eastern Brazil from an ecological aspect, recorded the taxon as a very rare species, flying in February, April and May. He did not repeat the original combination but indicated that the taxon was not convincingly classified ("[Gen. ign.] *cogina*", EBERT 1969: 41). BROWN (1993: 52, table 2) published a cumulative list of Neotropical polyommatines. He cited EBERT but also called attention to the distinctness of *cogina*, noting that it suggested separate generic status among the "*Everes* section" (BROWN 1993, Table 2, note 3). However, he figured it as '*Everes*' *cogina* (BROWN 1993 op. cit., fig. 1/20).

In 1993 the senior author located two male specimens of "*Lycaena cogina*" in the butterfly collection of the "Zoologische Staatssammlung des Bayerischen Staates", Munich, Germany (ZSBS). The specimens were curated by the late Dr. WALTER FORSTER, a well known lycaenidologist, as "*Lycaenopsis cogina*", a placement uncannily "close" in light of its morphology.

In 1994 the senior author corresponded with the late CHARLES A. BRIDGES who was preparing his recently revised catalogue (BRIDGES 1994). Among many questions regarding central Asian and high Andean polyommatines, Mr. BRIDGES also asked the senior author about the placement of *Lycaena cogina*. With dissected specimens of *L. cogina* in hand, the senior author was able to inform BRIDGES that *cogina* was a lycaenopsine and, pending publication concerning its unique generic worth, best placed tentatively either in "*Lycaenopsis*" or the Neotropical lycaenopsine genus "*Celastrina*". BRIDGES' response (in litt. to BÁLINT, 23 November, 1994 and reflected subsequently in his publication 1994: VIII 113,

IX. 63) was "you say, that *Lycaena cogina* SCHAUS, 1902 is a *Lycaenopsis*. But that genus is Indoaustralian, while *cogina* is Neotropical. How can that be?". With this apparently in mind, BRIDGES followed HAYWARD, placing *cogina* (again incorrectly) in *Leptotes*. As with BROWN's placement of *cogina* with *Everes*, this reflects a problem first pointed out by JOHNSON and QUINTER (1982[1983]) – many lepidopterists tend to look only to genera from their immediate biogeographic realm or hemisphere when trying to classify poorly known entities.

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NEW SPECIES OF DASYPOLIA GUENÉE, 1852 (S. L.) FROM THE HIMALAYAN REGION (LEPIDOPTERA, NOCTUIDAE, XYLENINI)

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Descriptions of 15 new species of *Dasypolia* GUENÉE, 1852 from the Pakistani, Chinese (Tibetan) and Nepalese Himalayas are given. With 78 figures.

Key words: taxonomy, *Dasypolia*, new species, Himalayan region

INTRODUCTION

The exploration of the late autumnal and early spring Noctuidae fauna of the Himalayan region started in the second half of the last century but was mainly restricted to some small areas of the British Empire (e.g. Kashmir, some parts of the Indus valley, Assam, Sikkim, etc.). This work continued into the first part of this century, often in connection with geographic and/or mountaineering expeditions. The collections resulting from these expeditions are of vital importance, but, when compared to the vast material from the late spring, summer and early autumnal periods, only a few taxa and specimens were obtained.

Our knowledge of the Himalayan species of the genus *Dasypolia* GUENÉE, 1852 s.l., is even more limited. The members of the genus are representatives of the late autumnal aspect and overwintering specimens are usually on the wing only at the very beginning of the vegetation period, therefore very few records of *Dasypolia* s.l. species were published until recently. These data refer to species belonging to the subgenera *Dasythorax* STAUDINGER, 1889, *Dasymixis* RONKAY & VARGA, 1990 and *Sinipolia* RONKAY & ZILLI, 1993, these groups being the characteristic elements of the Himalayan region (HAMPSON, 1894, 1906; KAPUR, 1962; RONKAY & VARGA, 1990; RONKAY & ZILLI, 1993).

The first comprehensive paper on Himalayan *Dasypolia* species was published by HACKER & PEKS in 1993 in which seven new species and a new subspecies were described. This work gives a much better picture of the incredibly rich *Dasypolia* s.l. fauna of the Himalayan–Sino–Tibetan region, and serves as a reference for the comparison of the *Dasypolia* species of different regions of the Himalayan chain and the southern and south-eastern edges of the Tibetan plateau.

This paper contains the results of five expeditions made in North Pakistan, Nepal and southern Tibet during the years 1993–1995. Fifteen new species were discovered. Two of them are known only from Pakistan, a further two have also been recorded from the material collected by Japanese expeditions to Nepal (YOSHIMOTO 1995).

Specimens of the *Dasypolia* species were collected in the late autumnal and early spring periods, usually in cold or frosty weather (e.g. at the beginning of October, at an altitude of 4600–4850 m on the Tibetan plateau). It seems that they represent the very last emergence of the year and, in some cases only 6–7 *Dasypolia* species came to light.

The exploration of the *Dasypolia* fauna of this area is far from finished but some preliminary conclusions can be made. It seems that the deep N-W river valleys represent the major zoogeographic barriers for the non-arboreal species of the genus, promoting the allopatric speciation in these large, separated massifs. Therefore the taxa of the various species-groups differ in the north-western (Ladakh, Kashmir), the south-western (Uttar Pradesh, Himachal Pradesh), the central (Central Nepal) and the eastern (Sikkim) regions. This isolation pattern might be the main reason for the great species richness of the Himalayan–Sino–Tibetan region. As the *Dasypolia* s.l. species formerly described from this region were collected in the western and the eastern ranges, the rate of the newly discovered taxa appears surprisingly high.

According to the new distribution data the main chain of the Himalayas does not represent an obligatory barrier for the high montane *Dasypolia* species (e.g. *D. vargai* RONKAY & PLANTE and *D. bicolor* sp. n. are recorded from both the northern Tibetan and the southern Indian and/or Nepalese side). On the other hand, a large part of the Himalayan *Dasypolia* species were found only on the Tibetan plateau.

In the case of those species which inhabit the medium high elevations it is often only the largest, widest river valleys (Kali Gandaki, Arun) that appear to be the isolating factor. A few species that were found in the medium high forested zones may also occur over a larger area in Nepal, from the Annapurna Himal to the Everest region (e.g. *D. ursina* sp. n. and *D. picurka* sp. n.).

Our knowledge of the genus *Dasypolia*, and indeed the whole of tribe Xylenini of this vast area, is still rather scanty. Further discoveries of new taxa are highly predictable. The continued exploration of these regions would seem to be very fruitful from both a taxonomic and zoogeographic point of view.

CHECKLIST

- Genus *Dasypolia* GUENÉE, 1952
  - Subgenus *Dasypolia* GUENÉE, 1952
    - *templi*-group
      - *templi* (THUNBERG, 1792)
      - *fibigeri* HACKER & MOBERG, 1988
    - *ferdinandi*-group
      - *ferdinandi* RÜHL, 1892
      - *ferdinandi haroldi* RUNGS, 1950
      - *ferdinandi libanotica* DRAUDT, 1933
      - *dichroa* RONKAY & VARGA, 1985
      - *transcaucasica* RONKAY & VARGA, 1985
      - *afghana* BOURSIN, 1967
    - *obsoleta*-group
      - *obsoleta* HREBLAY & RONKAY, sp. n.
    - *exprimata*-group
      - *altissima* HACKER & MOBERG, 1988
      - *exprimata* STAUDINGER, 1896
      - *shugnana* VARGA, 1982
      - *simillima* HACKER & PEKS, 1993
      - *fugitiva* HACKER & PEKS, 1993
      - *psathyra* BOURSIN, 1967
      - *flavitincta* HREBLAY & RONKAY, sp. n.
      - *unicata* HREBLAY & RONKAY, sp. n.
    - *akbar*-group
      - *akbar* BOURSIN, 1968
      - *melancholica* HACKER & PEKS, 1993
    - *vargai*-group
      - *vargai* RONKAY & PLANTE, 1992
      - *monogramma* HREBLAY & RONKAY, sp n.
    - *fani*-group
      - *fani* STAUDINGER, 1892
      - *lama* STAUDINGER, 1897
      - *episcopalis* BOURSIN, 1967
      - *minuta* RONKAY, VARGA & BEHOUNEK, 1990
      - *gerbillus* ALPHÉRAKY, 1892
      - *leptographa* HREBLAY & RONKAY, sp. n.
      - *tsheringi* HREBLAY & RONKAY, sp. n.
    - *fraterna*-group
      - *fraterna* BANG-HAAS, 1907

- *atrox*-group
  - *peksi* HACKER, 1993
  - *rufatrox* HREBLAY & RONKAY, sp. n.
  - *atrox* HACKER & PEKS, 1993
  - *ursina* HREBLAY & RONKAY, sp. n.
  - *bicolor* HREBLAY & RONKAY, sp. n.
- Subgenus *Tschetwerikovia* BUNDEL, 1966
  - *rjabovi* BUNDEL, 1966
  - *eberti* BOURSIN, 1967
  - *eberti eucraspeda* BOURSIN, 1967
- Subgenus ?
  - *confusa* HREBLAY & RONKAY, sp. n.
- Subgenus ?
  - *conistroides* HREBLAY & RONKAY, sp. n.
  - *picurka* HREBLAY & RONKAY, sp. n.
- Subgenus *Dasythorax* STAUDINGER, 1889
  - *polianus* (STAUDINGER, 1889)
  - *anartinus* (PÜNGELER, 1901)
  - *pygmaea* HREBLAY & RONKAY, sp. n.
  - *monotona* GYULAI & RONKAY, 1995
- Subgenus ?
  - *nivalis* HREBLAY & RONKAY, sp. n.
- Subgenus *Dasymixis* RONKAY & VARGA, 1990
  - *diva* RONKAY & VARGA, 1990
  - *leucocera* HAMPSON, 1894
  - *magnifica* HACKER & PEKS, 1993
  - *orogena* HREBLAY & RONKAY, sp. n.
- Subgenus ?
  - *yeti* HACKER & PEKS, 1993
- Subgenus *Cteïpolia* STAUDINGER, 1896
  - *sacelli* (STAUDINGER, 1896)
  - *isotima* (PÜNGELER, 1914)
  - *vera* RONKAY & SZABÓKY, 1995
  - *gansoni* RONKAY & NEKRASOV, 1995
  - *mimetica* RONKAY, 1995
  - *tertia* RONKAY & NEKRASOV, 1995
- Subgenus *Sinipolia* RONKAY & ZILLI, 1993
  - *acrophila* (HAMPSON, 1906)
  - *vignai* RONKAY & ZILLI, 1993
  - *honeyi* RONKAY & ZILLI, 1993
  - *lithophila* (KAPUR, 1962)

Abbreviations. BM(NH) – The Natural History Museum, London (formerly British Museum, Natural History), HNHM – Hungarian Natural History Museum, Budapest.

Remarks. As a result of two parallel expeditions to Nepal in October 1995, specimens of five *Dasypolia* species were collected. The material contains, besides two, previously unknown species, additional specimens of *D. ursina* sp. n., *D. picurka* sp. n. and *D. orogena* sp. n., described in the taxonomic part of this paper. These specimens of the three species mentioned above are listed as paratypes, the descriptions of the males of *D. picurka* sp. n. and *D. orogena* sp. n. will be given in the next paper dealing with the Himalayan *Dasypolia* fauna.

TAXONOMY

Dasypolia (Dasypolia) obsoleta sp. n.

(Figs 1–2, 33–34, 63)

Holotype: male, "China, Tibet: 4 km S of Karru–Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. Hreblay et T. Csővári", slide No. 6884 HREBLAY (coll. J. PLANTE, Martigny).*

Paratypes: China, Tibet: 10 males, 7 females, 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994; 4 males, 4 km SE of Karru-Ochen Tso, 85°54'E, 28°30'N, 4850 m, 2.X.1994; 1 male, 1 female, 1 km S of Paiku Tso, 85°37'E, 28°43'N, 4550 m, 1. X. 1994; 1 female, 1 km S of Nyalam, 86°00'E, 28°13'N, 3700 m, 3. X. 1994; 9 males, 1 female, 50 km N of Nyalam, 85°56'E, 28°07'N, 3700 m, 3. X. 1994, leg. M. HREBLAY and T. CSŐVÁRI (coll. T. CSŐVÁRI, M. HREBLAY and J. PLANTE).

Slide Nos 6863, 6868, 6869, 6891, 6903 HREBLAY (males), 6885, 6904 HREBLAY (females).

Diagnosis: The new species resembles specimens of some populations of *D. ferdinandi* (s.l.) but the forewings are usually broader and the ground colour is more ochreous. The male genitalia of *D. obsoleta* is very characteristic and easily distinguishable from any known members of the *ferdinandi*-group by its relatively short, broad valva, less developed, tiny costal process and the reversed L-shaped, short, thick harpe. The female genitalia of *D. obsoleta* differ from those of related taxa by its broad but short ostium bursae, rather short ductus bursae which is sclerotized only in its proximal half and the pocket of the ductus bursae is situated laterally, large, rounded.

Description: wingspan 30–55 mm, length of forewing 15–27 mm. Head, thorax and forewing variable from pale ochreous-grey to dark greenish-grey, pubescence of body mixed with ochreous and dark grey-brown hairs, forewing irrorated with yellowish and darker grey and brownish scales; abdomen somewhat lighter ochreous grey. Forewing narrow, elongate, with apex rounded. Wing pattern more or less diffuse, often obsolescent; ante- and postmedial lines wide, diffuse, simple, sinuous, darker grey, defined with broader, ochreous-grey stripes, medial line regular-

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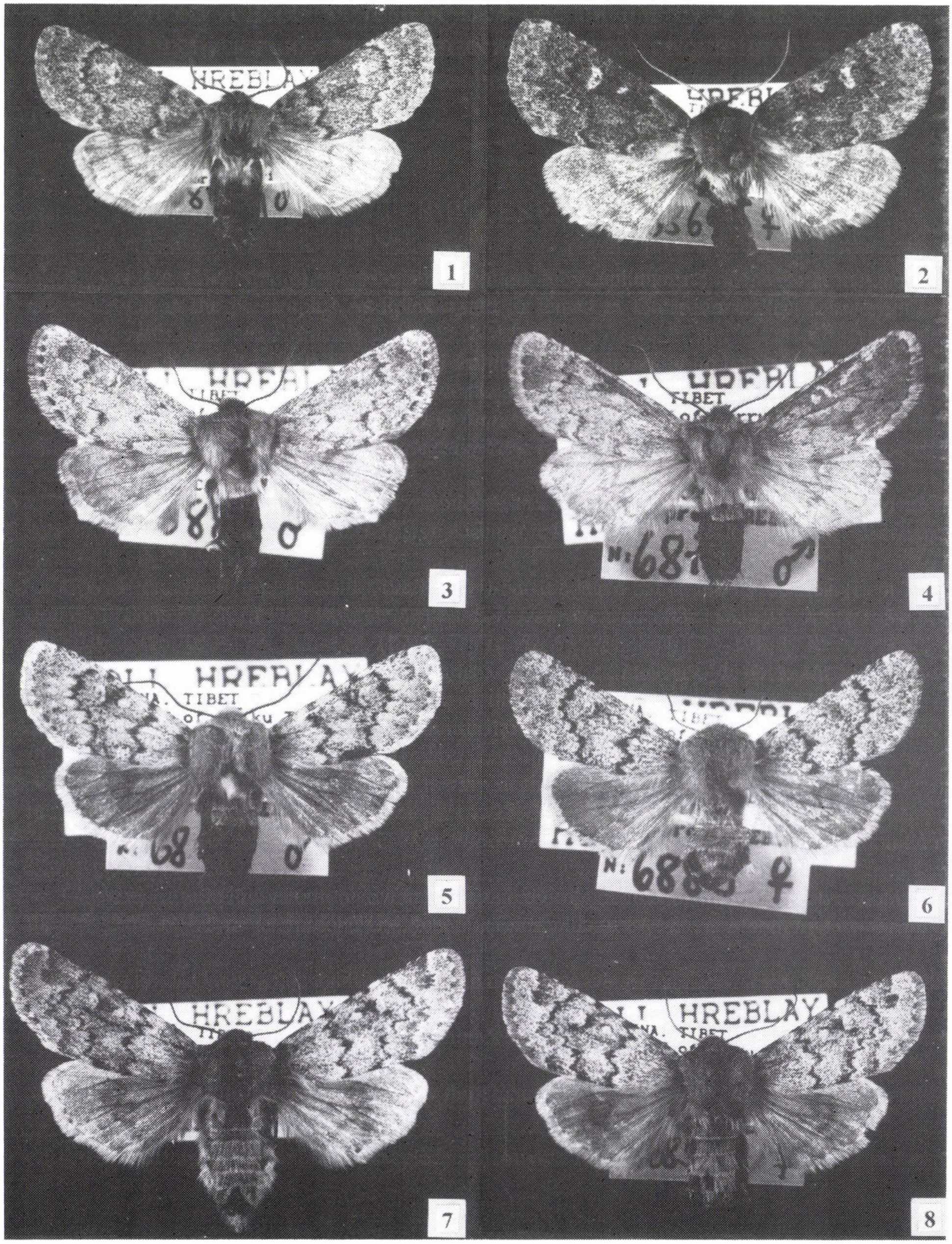
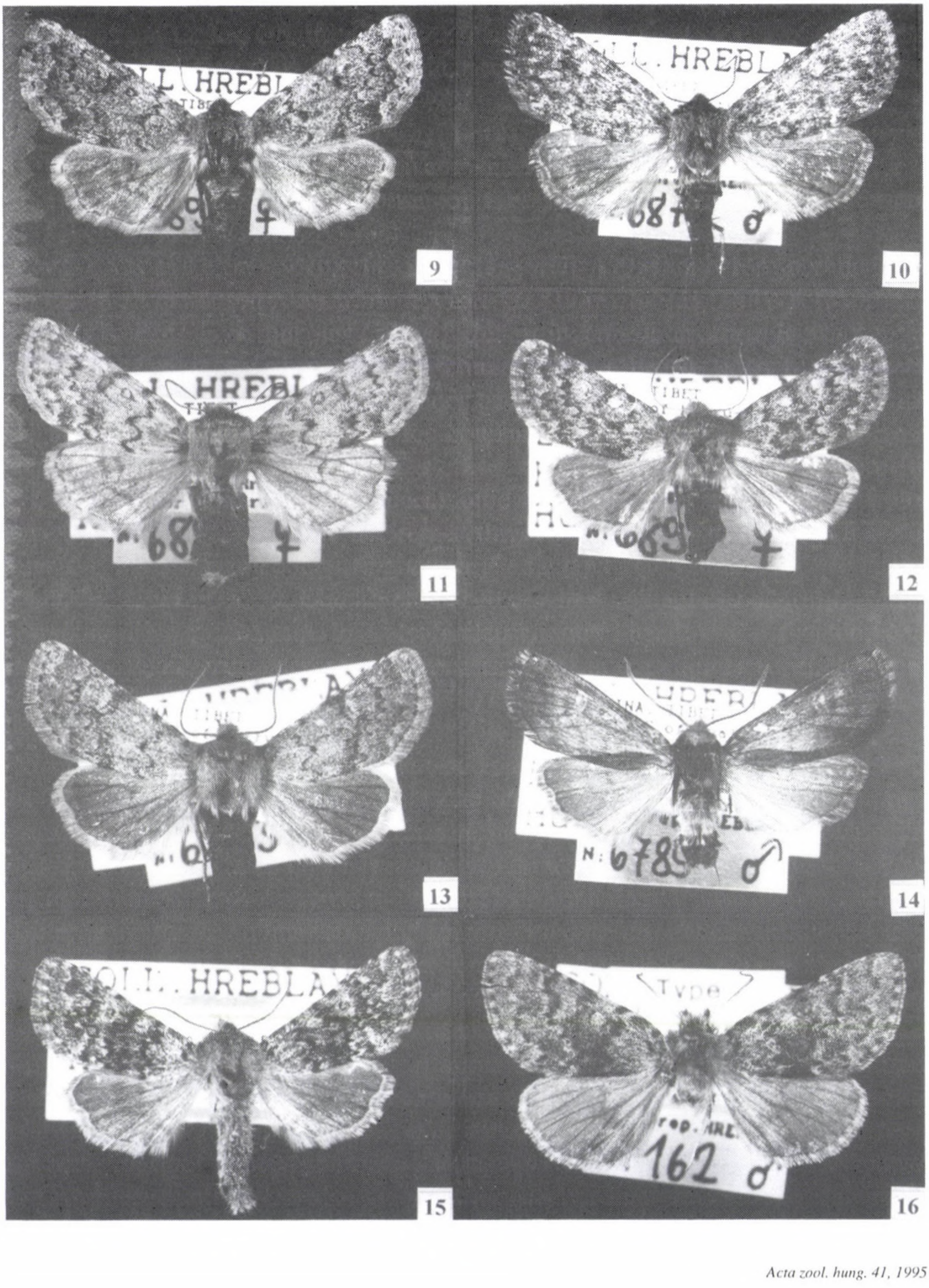
* The collection of J. PLANTE is bequeathed to the Natural History Museum of Genève, by the agreement of the two partners.

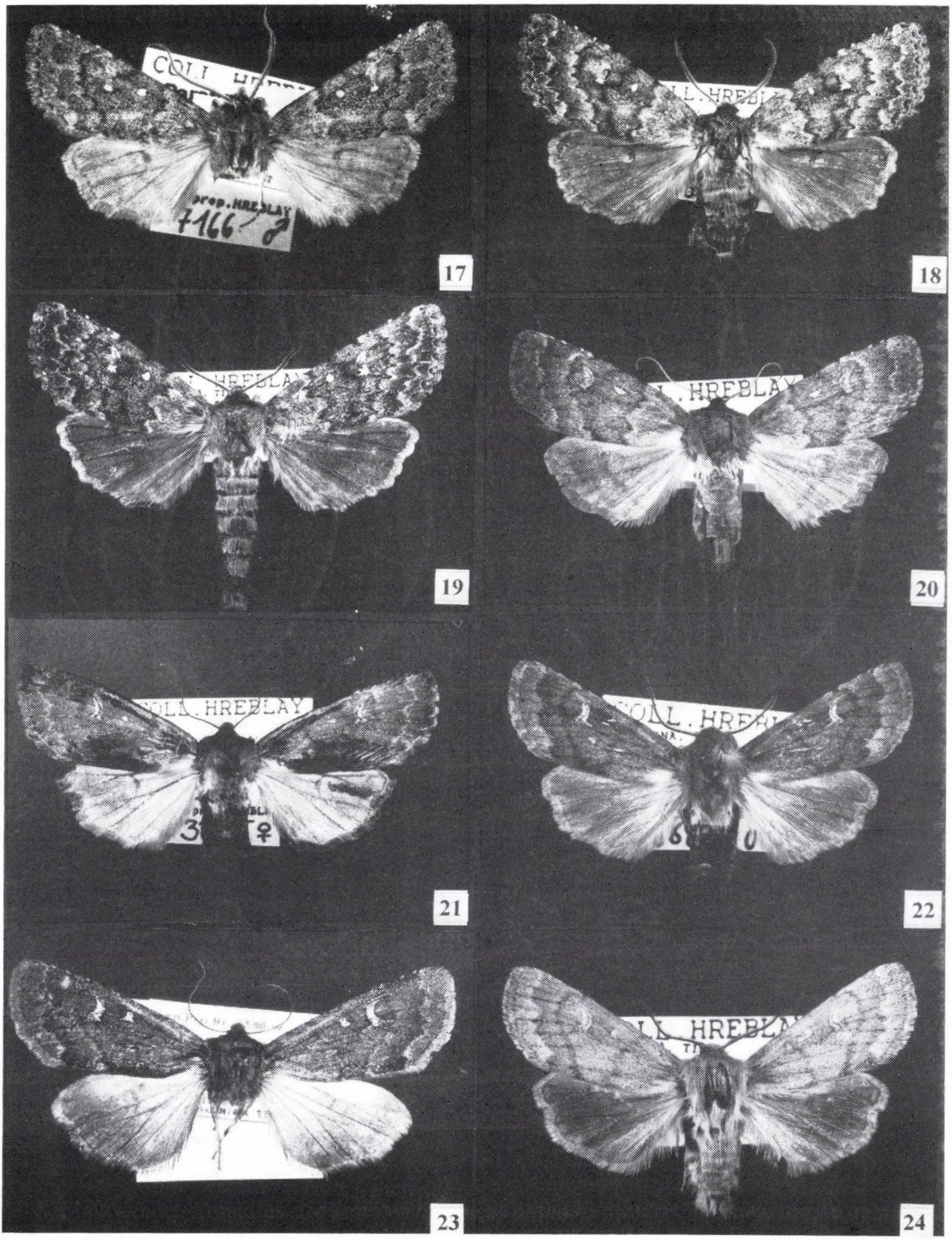
Figs 1–8. 1 = *Dasypolia obsoleta* sp. n., holotype male; 2 = *D. obsoleta* sp. n., paratype female; 3 = *D. flavitincta* sp. n., holotype male; 4 = *D. flavitincta* sp. n., paratype male; 5 = *D. monogramma* sp. n., holotype male; 6 = *D. monogramma* sp. n., paratype female; 7 = *D. vargai* RONKAY & PLANTE, male, China, Tibet; 8 = *D. vargai* RONKAY & PLANTE, female, China, Tibet



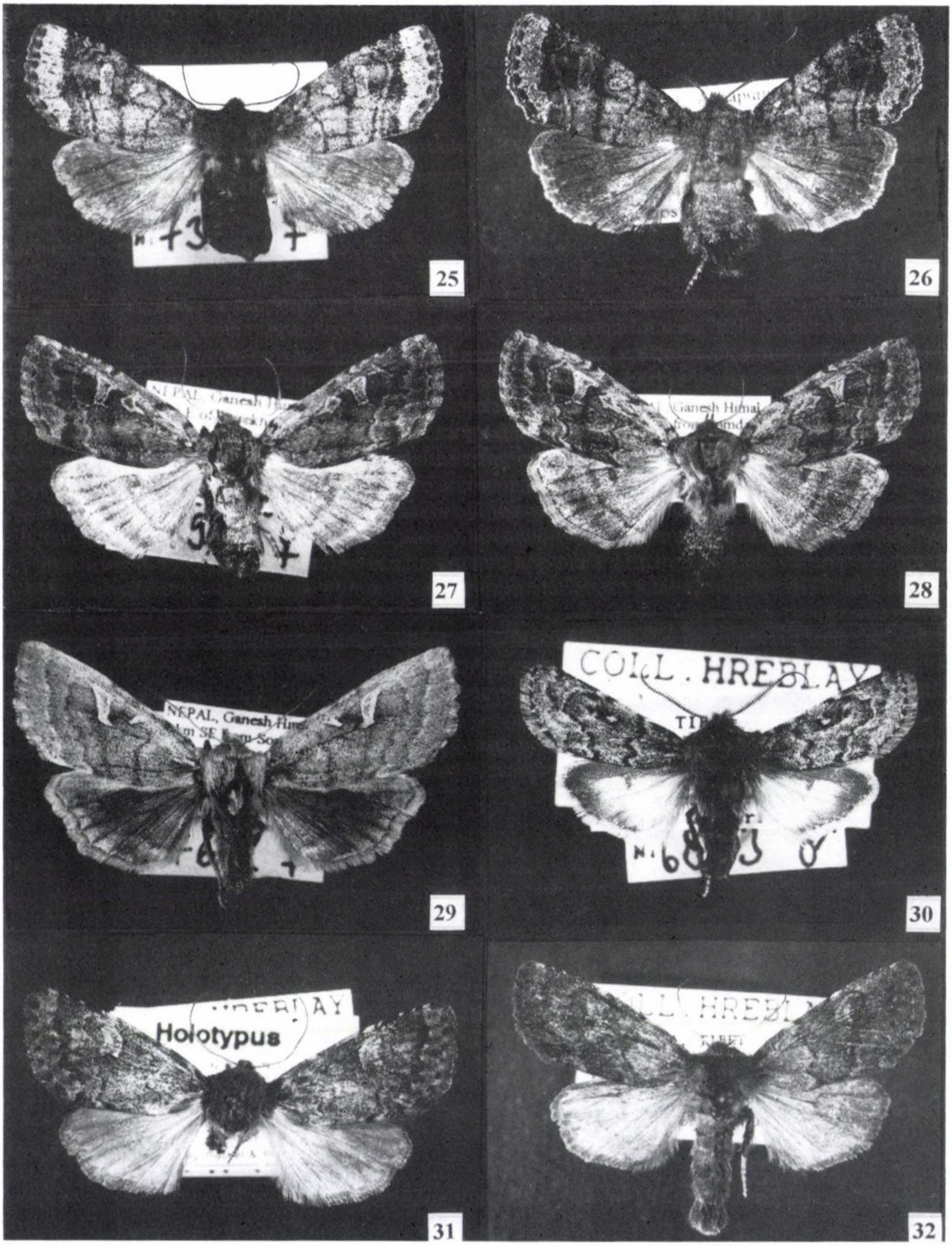
Figs 9–16. 9 = *Dasypolia leptographa* sp. n., holotype female; 10 = *D. confusa* sp. n., holotype male; 11 = *D. tsheringi* sp. n., paratype male; 12 = *D. tsheringi* sp. n., paratype female; 13 = *Dasypolia tsheringi* sp. n., holotype female; 14 = *D. unicata* sp. n., holotype male; 15 = *D. (Dasythorax) pygmaea* sp. n., holotype female; 16 = *D. (Dasythorax) anartinus* PÜNGELER, holotype male, Aksu



Figs 17–24. 17 = *Dasypolia atrox* HACKER & PEKS, paratype male, India, Himachal Pradesh; 18 = *D. ursina* sp. n., paratype male; 19 = *D. ursina* sp. n., paratype male; 20 = *D. rufatrox* sp. n., holotype female; 21 = *D. rufatrox* sp. n., paratype female; 22 = *D. bicolor* sp. n., holotype male; 23 = *D. bicolor* sp. n., paratype female; 24 = *D. bicolor* sp. n., paratype male



Figs 25–32. 25 = *Dasypolia (s. l.) picurka* sp. n., holotype female; 26 = *D. (s. l.) picurka* sp. n., paratype female; 27 = *D. (s. l.) conistroides* sp. n., paratype female; 28 = *D. (s. l.) conistroides* sp. n., holotype female; 29 = *D. (Dasymixis) orogena* sp. n., holotype female; 30 = *Dasypolia (s. l) nivalis* sp. n., holotype male; 31 = *D. (s. l) yeti* HACKER & PEKS, holotype female; 32 = *D. (s. l.) yeti* HACKER & PEKS, male, China, Tibet



ly deleted. Orbicular absent or a small ochreous spot, reniform represented by a yellowish annulus with darker central spot. Subterminal line obsolete or very pale, waved, ochreous, defined variably strongly with darker grey spots and patches. Terminal line poorly visible as a row of pale brownish spots, cilia as ground colour. Hindwing pale, shining ochreous, irrorated with darker grey, marginal area somewhat darker; discal spot represented by a small, pale spot, transverse line a diffuse, broad stripe. Terminal line brown, cilia yellowish.

Male genitalia (Figs 33–34): Uncus short, relatively narrow, apically slightly dilated and rounded ("lapathiform"), tegumen very low, broad, penicular lobes minute, hairy; vinculum short, thick, V-shaped. Fultura inferior shield-like, broad, lateral arms relatively short, slender, medial process thick, more or less inflated, with less pointed apex. Valva short, arcuate, apically tapering, cucullus relatively broad, rounded, without corona. Sacculus short, clavus small, prominent, setose. Costal plate large, its process ("pollex") small, weak, less expressed. Harpe strong, moderately long, curved at base in right angle, distally tapering with apex finely rounded. Aedeagus cylindrical, ventral edge of carina sclerotized, lateral bars short, broad, dorsal sclerotized plate arcuate, strongly serrated. Vesica tubular, recurved dorsally; broad at base, slightly dilated at middle, with two small, finger-like diverticula.

Female genitalia (Fig. 63): Ovipositor and gonapophyses short. Ostium bursae wide, short, more or less quadrangular, both surfaces sclerotized, lateral edges relatively strong. Ductus bursae tubular, flattened, rather short and narrow; posterior part more or less membranous, anterior half with inequal, granulose sclerotization on both surfaces. Lateral pocket regularly strong, long, half-moon-shaped. Cervix bursae small, rugulose, corpus bursae a spacious, membranous sac.

Bionomics: The species was found at both medium high and high altitudes.
Distribution: China: SW Tibet.

Dasypolia (Dasypolia) flavitincta sp. n.

(Figs 3–4, 35–36)

Holotype: male, "China, Tibet: 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. Hreblay et T. Csővári", slide No. 6881 HREBLAY (coll. HREBLAY, Érd, Hungary; deposited in the Hungarian Natural History Museum, Budapest.)

Paratype: China, Tibet: 1 male, 4 km SE of Karru-Ochen Tso, 85°54'E, 28°30'N, 4850 m, 2.X.1994, leg. M. HREBLAY et T. CSŐVÁRI (coll. HREBLAY).
Slide No. 6871 HREBLAY (male)

Diagnosis: The new species is rather distant from other species of the genus. It is similar in external appearance to *D. vargai* and *D. monogramma* but differs from them by its ochreous-orange ground colour and significantly paler forewing pattern. The clasping apparatus of *D. flavitincta* most closely resembles that of *D. templi* by its shape of valva, cucullus and harpe but the other features are strongly dissimilar. The configuration of the fultura superior is unique within the genus, as the two parts fused into a large, more or less dragon-shaped (subdeltoidal) plate.

Description: wingspan 31–33 mm, length of forewing 15–15.5 mm. Head, thorax and forewing orange-ochreous mixed a few brown scales. Forewing narrow, elongate, with apex rounded. Wing pattern rather diffuse, ante- and postmedial lines more or less continuous, simple, sinuous, dark brown, medial line almost deleted. Orbicular and reniform stigmata poorly visible, orange-yellowish without darker outlines but with a few darker scales in centre of reniform. Subterminal line also indistinct, yellowish, sinuous, defined by an interrupted, diffuse, dark greyish stripe. Terminal line consisting of a row of black-brownish spots, cilia bright ochreous with somewhat darker outer half. Hindwing shining ochreous-whitish, suffused with pale brownish. Veins covered with brown scales, marginal area broad, darker grey-brown. Discal spot arcuate, pale grey-brown with whitish centre, transverse line shadow-like, diffuse, broad, waved. Terminal line reddish brown, cilia pure yellow.

Male genitalia (Figs 35–36): Uncus slender, relatively long, tegumen short, broad, penicular lobes rounded, scarcely hairy; vinculum moderately long, V-shaped. Fultura inferior rounded pentagonal, medial process thin, long; fultura superior fused into a large, deltoidal, sclerotized lamina. Valva elongate, more or less straight, apically tapering with cucullus small, narrow, apex rounded. Sacculus short, triangular, clavus conical, densely setose. Costal plate large, strong, costal process broadly triangular, overreaching ventral margin. Harpe long, slender, almost straight, apically tapering, somewhat curved laterally. Aedeagus cylindrical, ventral extension of carina strong, dorsal plate small, rounded, covered with small teeth. Vesica tubular, membranous, without granulation, dilated at middle and recurved dorsally; diverticula absent.

Bionomics: The species was found on the Tibetan plateau at very high altitude.

Distribution: China: SW Tibet.

Dasypolia (Dasypolia) unicata sp. n.

(Figs 14, 37–38)

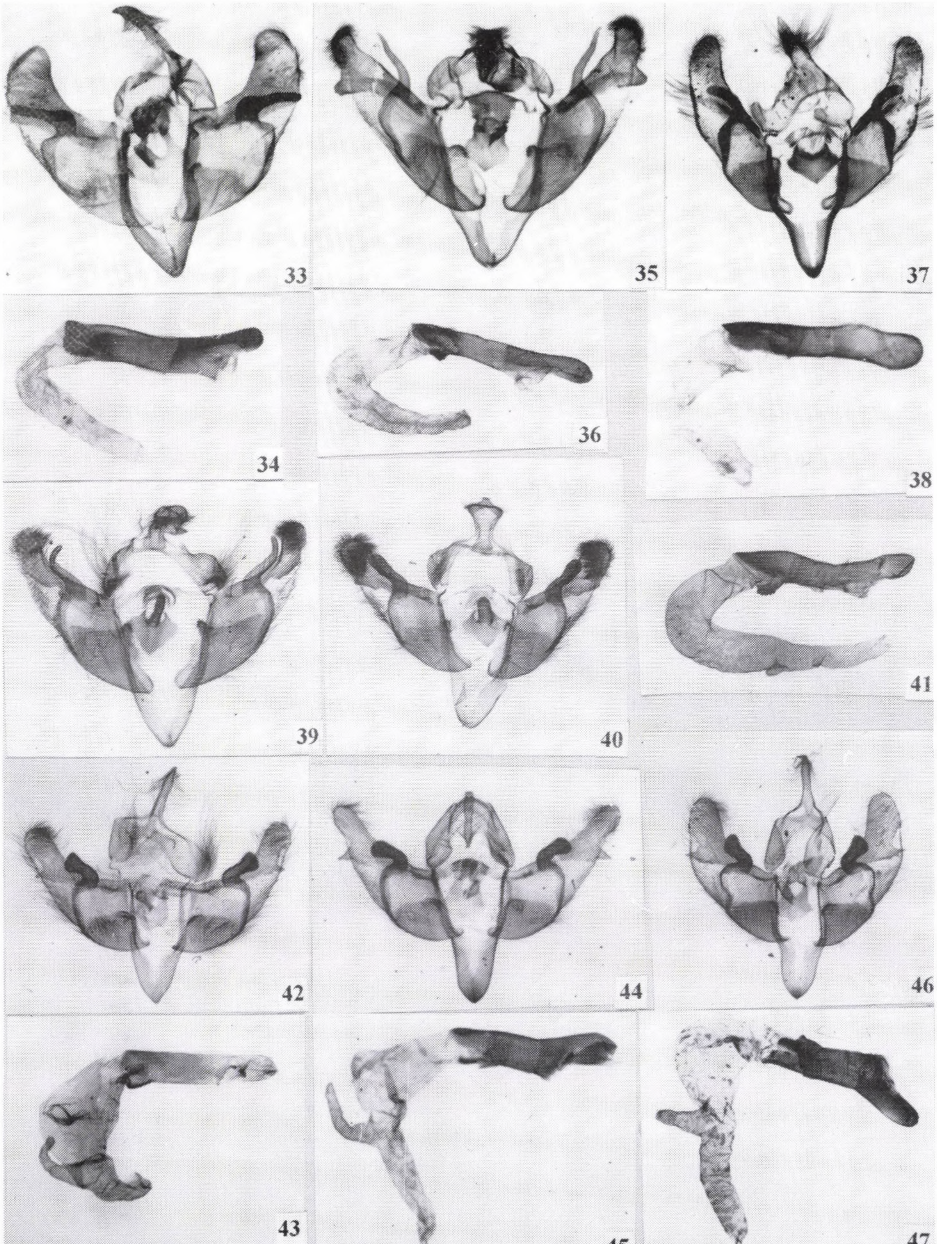
Holotype: male, "China, Tibet, 1 km S of Nyalam, 85°56'E, 28°07'N, 3700 m, 3. X. 1994, leg. Márton Hreblay et Tibor Csővári", Slide No. 6785 HREBLAY (coll. PLANTE).

Diagnosis: The species resembles *D. akbar* and *D. melancholica* in habitus, but their genitalia are strongly different. The male genital capsula of *D. unicata* is similar to that of *D. bicolor* but significantly smaller, less strongly sclerotized, its harpe is thinner, the carina is less developed, more simple.

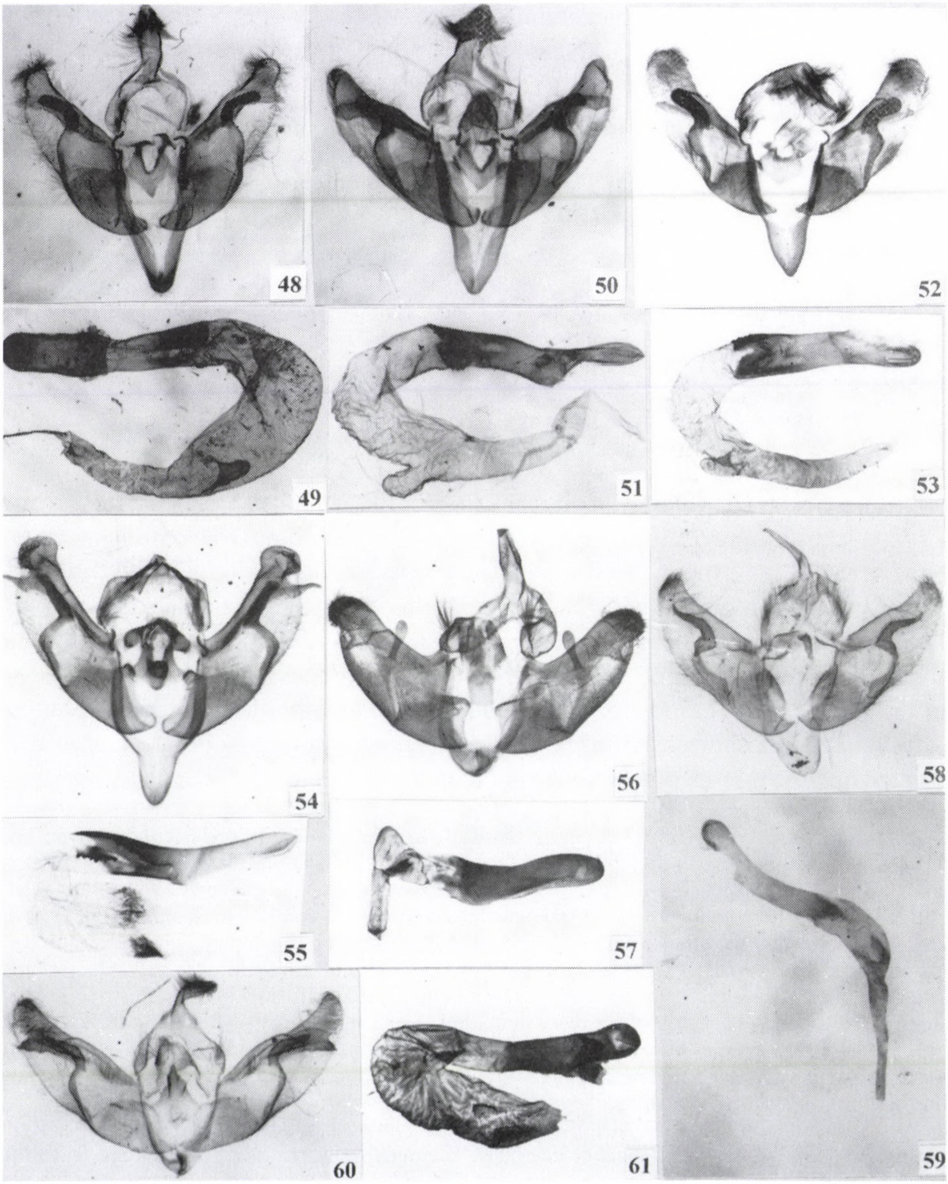
Description: wingspan 29 mm, length of forewing 14 mm. Head, thorax and forewing dark olive-grey mixed with ochreous hairs and scales; abdomen somewhat lighter ochreous grey. Forewing narrow, elongate, with apex slightly pointed. Ante- and postmedial lines diffuse, simple, sinuous, darker grey, defined with broader, ochreous-grey stripes, medial line a poorly visible, darker shadow. Orbicular and reniform stigmata well discernible, small, encircled with darker grey, filled with ochreous-whitish, reniform with darker centre. Subterminal line a rather indistinct, sinuous, ochreous line, defined with a broad, dark inner zone. Terminal line continuous, brown, cilia as ground colour. Hindwing almost unicolorous, olive-brown, marginal area somewhat darker; discal spot represented by a small, pale comma. Terminal line brown, cilia olive-greyish with yellowish base.

Male genitalia (Figs 37–38): Uncus short, moderately sclerotized, bill-like, apex with a small, semiglobular appendage. Tegumen low, broad, penicular lobes elongate, less hairy. Fultura inferior a broad, pentagonal shield with deep apical incision, medial process absent; vinculum long, strong, V-shaped. Valva slender, arcuate, slightly tapering to apex, cucullus relatively long, apex rounded; corona reduced. Sacculus short, triangular, clavus rounded, densely setose. Costal plate rather weak, costal process less sclerotized, acute, apex overreaching ventral margin. Harpe slender, strongly curved at middle, with apex rounded. Aedeagus cylindrical, dorsal plate of carina

Figs 33–47. Male genitalia of *Dasypolia* species. 33–34 = *D. obsoleta* sp. n., holotype; 35–36 = *D. flavitincta* sp. n., holotype; 37–38 = *D. unicata* sp. n., holotype; 39 = *D. vargai* RONKAY & PLANTE, China, Tibet; 40–41 = *D. monogramma* sp. n., holotype; 42–47 = *D. tseringi* sp. n., paratypes



Figs 48–61. Male genitalia of *Dasypolia* species. 48–49 = *D. atrox* Hacker & Peks, paratype; 50–51 = *D. ursina* sp. n., paratype; 52–53 = *D. bicolor* sp. n., holotype; 54–55 = *D. (s. l.) confusa* sp. n., holotype; 56–57 = *D. (s. l) nivalis* sp. n., holotype; 58–59 = *D. (s. l) yeti* Hacker & Peks, China, Tibet; 60–61 = *D. (Dasythorax) anartinus* Püngeler, holotype male



strong, acute, with a few large sclerotized teeth. Vesica tubular, recurved ventro-laterally, basal third broad, medial part finely granulose, distal part with fine, very short hairs and a small terminal diverticulum.

Bionomics: The unique holotype was collected at medium high altitude, in a deep stream valley. The vegetation of the western slope is dry, xerothermic steppes, the opposite slope is covered with shrubby, mixed forest remnants.

Distribution: China: SW Tibet.

Dasypolia (Dasypolia) monogramma sp. n.

(Figs 5, 6, 40, 41, 64)

Holotype: male, "China, Tibet, 1 km S of Paiku Tso, 85°37'E, 28°43'N, 4550 m, 1. X. 1994, leg. Márton Hreblay et Tibor Csővári", slide No. 6861 HREBLAY (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest).

Paratypes: China, Tibet: 2 males, with the same data as holotype; 1 male, 1 female, 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. HREBLAY et T. CSŐVÁRI (coll. T. CSŐVÁRI, M. HREBLAY and J. PLANTE).

Slide Nos 6860, 6890 HREBLAY (males), 6889 HREBLAY (female).

Diagnosis: *D. monogramma* and *D. vargai* RONKAY & PLANTE, 1992, form a sympatric sibling species pair. The new species is smaller (*monogramma* 30–33 mm, *vargai* 32–42 mm), the forewing pattern is stronger, sharper, and the hindwing is darker, more unicolorous grey-brown. The male genitalia of *D. monogramma* differ from those of *D. vargai* by the different form of the uncus, the shorter, thicker harpe, and the shorter but thicker process of the fultura inferior. In the females, the ovipositor of *D. monogramma* is smaller, the dorsal plate of ostium bursae is shorter, the neck between ostium and ductus bursae is less constricted and the ductus bursae is shorter than in *D. vargai*.

Description: Wingspan 30–33 mm, length of forewing 14–15 mm. Head, thorax and forewing ashy grey, mixed with dark grey, brown and ochreous hairs and scales, medial and marginal areas of forewing suffused with some ochreous. Forewing narrow, elongate, with apex finely pointed. Wing pattern sharply defined, ante- and postmedial lines continuous, simple, sinuous, dark grey-brown, medial line almost deleted. Orbicular and reniform stigmata partly encircled with dark brown, filled with ground colour and some yellowish, centre of reniform dark grey. Subterminal line less distinct, yellowish, sinuous, defined by an interrupted, diffuse, dark greyish stripe at inner side. Terminal line consisting of a row of small but strong black-brownish spots, cilia light ashy grey mixed with ochreous scales. Hindwing shining, almost unicolorous, dark brownish grey, marginal area somewhat darker. Discal spot and transverse line poorly visible, shadow-like. Terminal line brown, cilia ochreous-brownish.

Male genitalia (Figs 40–41): Uncus moderately long, medially strongly dilated, apically tapered, terminating in a small, anchor-like plate. Tegumen short, penicular lobes broad, vinculum more or less U-shaped. Fultura inferior cordiform with short, slender lateral extensions, medial process thick, inflated, rather long. Valva elongate, slightly arcuate, apically tapered; cucullus long with apex rounded, corona reduced. Sacculus short, clavus small, prominent, densely setose. Costal plate strongly sclerotized, costal process reduced to a small peak or a larger lobe without pointed extension, its apex usually overreaching ventral margin. Harpe thick, curved at base, then almost straight, with apex rounded. Aedeagus cylindrical, ventral extension of carina strong, long, beak-shaped, dorsal plate large, prominent, serrated. Vesica tubular, recurved dorsally, its walls membranous, without stronger granulation, terminal part with a small, digitiform diverticulum.

Female genitalia (Fig. 64): Ovipositor moderately long, apophyses long, thin. Ostium bursae semiglobular, with short, more or less equal, rounded triangular sclerotization on both surfaces. Ductus bursae long, tubular, flattened, narrower than ostium, ventral surface with a variably strongly sclerotized, granulose plate. Cervix bursae elongate, narrow, corpus bursae small, membranous.

Bionomics: The species was found on the Tibetan plateau at very high altitude. The vegetation of the collecting site is a mosaic of variably closed grasslands.

Distribution: China: SW Tibet.

Dasypolia (Dasypolia) vargai RONKAY & PLANTE, 1992

(Figs 7–8, 39, 65)

Type material examined: holotype female, 2 paratype males, Nepal, Langtang, Kyangjin Gompa, 3900 m, 6–9.X.1983, leg. J. PLANTE (coll. HNHM and PLANTE).

Slide Nos: 972 PLANTE (male), 3609 RONKAY (female).

Additional material examined: China, Tibet: 5 males, 4 females, 1 km S of Paiku Tso, 85°37'E, 28°43'N, 4550 m, 1. X. 1994; 1 male, 2 females, 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. HREBLAY and T. CSŐVÁRI (coll. T. CSŐVÁRI, M. HREBLAY and J. PLANTE).

Slide Nos 6855, 6857, 6859, 6880 HREBLAY (males), 6856, 6858 HREBLAY (females).

Dasypolia (Dasypolia) leptographa sp. n.

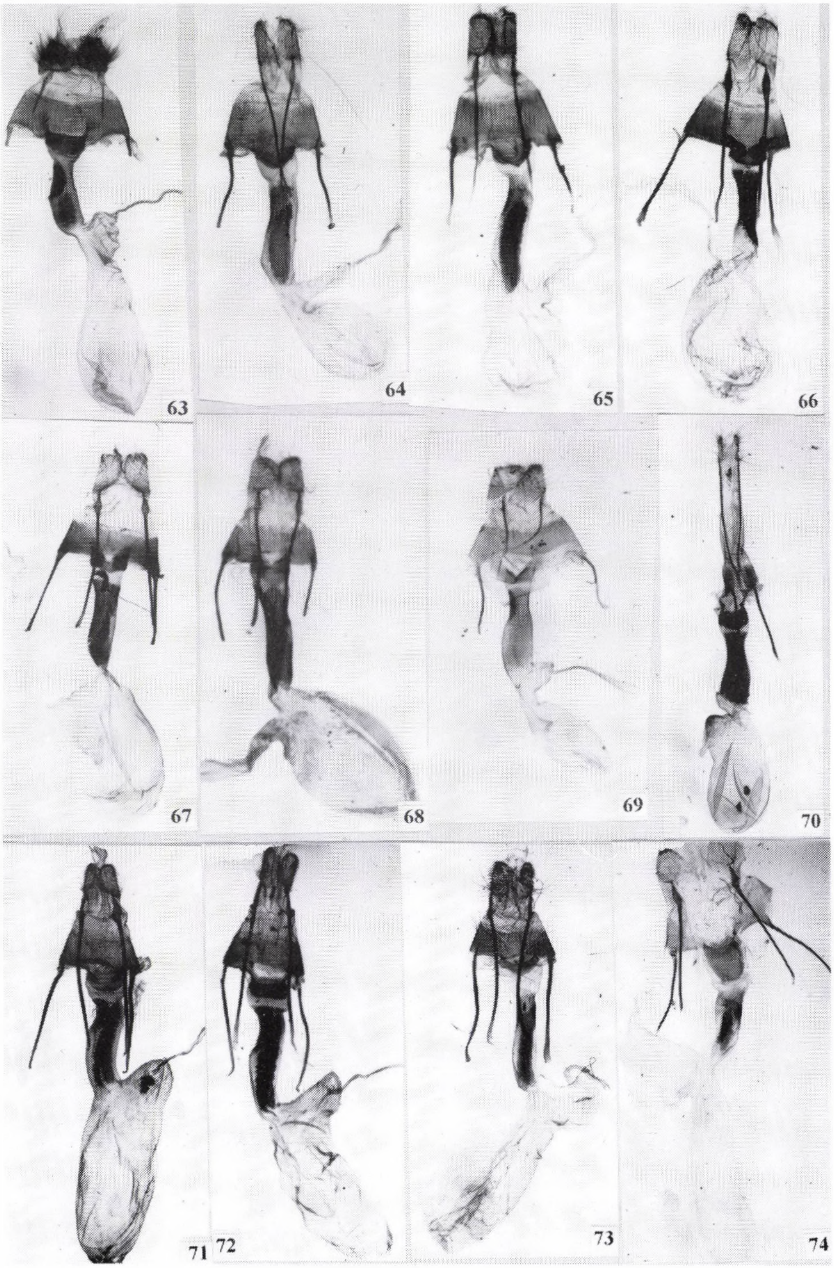
(Figs 9, 66)

Holotype: female, "China, Tibet: 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. Hreblay et T. Csővári", slide No. 6892 HREBLAY (coll. J. PLANTE, Martigny).

Diagnosis: The new species is close to *D. gerbillus* ALPHÉRAKY and *D. tseringi* but significantly larger in size with broader wings and sharper crosslines. The female genitalia differ from those of its two relatives by the shorter sclerotization of the ductus bursae and the somewhat larger, stronger sclerotized part of ostium bursae.

Description: Wingspan 37 mm, length of forewing 17 mm. Head, thorax and forewing light ochreous-olive mixed greyish hairs and scales. Forewing rather short, broad, with apex pointed. Wing pattern distinct, ante- and postmedial lines sharply defined, simple, sinuous, dark brown, medial line a very pale shadow running close to postmedial below cell. Orbicular and reniform stigmata well discernible, orbicular fully, reniform incompletely encircled with dark brown. Subterminal line obsolescent, sinuous, ochreous, defined with a broad, dark brownish inner zone. Terminal line well defined, consisting of blackish triangles, cilia somewhat lighter than ground colour. Hindwing pale, shining ochreous grey, irrorated with grey-brown, veins covered with brownish scales. Margi-

Figs 63–74. Female genitalia of *Dasypolia* species. 63 = *D. obsoleta* sp. n., paratype; 64 = *D. monogramma* sp. n., paratype; 65 = *D. vargai* RONKAY & PLANTE, China, Tibet; 66 = *D. leptographa* sp. n., holotype; 67 = *D. tseringi* sp. n., holotype; 68 = *D. tseringi* sp. n., paratype; 69 = *D. (Dasythorax) pygmaea* sp. n., holotype; 70 = *D. (Dasymixis) orogena* sp. n., holotype; 71 = *D. atrox* HACKER & PEKS, paratype; 72 = *D. ursina* sp. n., paratype; 73 = *D. rufatrox* sp. n., paratype; 74 = *D. bicolor* sp. n. paratype



nal suffusion darker grey, discal spot arcuate, dark grey with whitish centre, transverse line diffuse, sinuous. Terminal line dark brown, cilia light ochreous-greyish.

Female genitalia (Fig. 66): Ovipositor long, apophyses long, slender, strong. Ostium bursae sclerotized, dorsal surface calyculate, granulose, ventral surface quadrangular with deep caudal incision. Ductus bursae medium long, shorter than ovipositor, narrow tubular, without lateral pocket, ventral side with strong, granulose sclerotization. Cervix bursae less distinct, rugose, corpus bursae elliptical, membranous.

Bionomics: The unique holotype was collected on the Tibetan plateau.
Distribution: China: SW Tibet.

Dasypolia (Dasypolia) tseringi sp. n.

(Figs 11–13, 42–47, 67, 68)

Holotype: female, "China, Tibet: 4 km SE of Karru-Ochen Tso, 85°54'E, 28°30'N, 4850 m, 2.X.1994, leg. M. Hreblay et T. Csővári", slide No. 6876 HREBLAY (coll. J. PLANTE, Martigny).

Paratypes: 8 males, 10 females, China, Tibet: 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994; 4 males, 2 females, 4 km SE of Karru-Ochen Tso, 85°54'E, 28°30'N, 4850 m, 2.X.1994; 1 male, 1 km S of Paiku Tso, 85°37'E, 28°43'N, 4550 m, 1. X. 1994, leg. M. HREBLAY and T. CSŐVÁRI; coll. T. CSŐVÁRI, M. HREBLAY and J. PLANTE.

Slide Nos 6862, 6872, 6873, 6875, 6877, 6878, 6888, 6893, 6895, 6899, 6901 HREBLAY (males), 6874, 6882, 6894, 6896, 6897, 6898, 6900, 6902 HREBLAY (females).

Diagnosis: The new species is closely related to *D. lama*, *D. fani* and *D. leptographa* but smaller, the colouration of the body and the forewing is more ochreous. The comparison of *D. leptographa* and *D. tseringi* is given under the precceding species; the wing pattern of *D. tseringi* is more defined and the pectination of the male antennae is shorter and finer than those of *D. lama* and *D. fani*. *D. tseringi* also resembles *D. flavitincta*, but the latter has the forewings bright ochreous-orange with a more obsolete pattern and the genitalia of the males are strongly different.

The male genitalia of *D. tseringi* are close to *D. fani* and *D. lama* but the costal process is more acute with strongly serrated edges, the clavus is smaller, the harpe and the medial process of fultura inferior are shorter.

The female genitalia of the members of the *fani*-group are very similar, the specific differences are often slight. The ostium bursae of *D. tseringi* is narrower than those of *D. lama* and *D. fani* and the ductus bursae is shorter with narrower, longer lateral pocket.

Description: wingspan 27–33 mm, length of forewing 12–16 mm. Colouration of head, thorax and forewing variable, most often ochreous- or olive-grey with a few brown scales. Forewing narrow, elongate, with apex rounded. Wing pattern sharply defined, ante- and postmedial lines more or less continuous, simple, sinuous, dark brown, medial line a less visible, broad, diffuse stripe. Orbicular and reniform stigmata small, encircled partly or completely with dark brown and filled with ground colour. Subterminal line less distinct, ochreous, strongly sinuous, defined by an interrupted, diffuse, dark red-brown or greyish-brown stripe. Terminal line consisting of a row of black-brownish spots, cilia as ground colour, spotted with darker grey. Hindwing shining ochreous, suffused strongly with pale grey-brown. Veins covered with brown scales, marginal area broad, darker grey-brown. Discal spot and transverse line small, most often diffuse. Terminal line dark brown, cilia ochreous, sometimes with a darker brownish line.

Male genitalia (Figs 42–47): uncus slender, moderately long, tegumen low, narrow, penicular lobes rounded, hairy. Fultura inferior subdeltoidal with deep medial incision and strong, medium-long, apically dilated ("drum-stick-like") medial process; vinculum long, strong, V-shaped. Valva rather short, broad at base, apically strongly tapered, cucullus narrow with apex rounded. Sacculus short, low, clavus a granulose-setose, wrinkled surface. Costal plate strong, costal process long, acute triangular, with serrated edges. Harpe strong, flattened, curved at medial third in right angle, apically dilated and more or less rounded. Aedeagus short, cylindrical, dorsal plate of carina elongate, bar-like, strongly serrated. Vesica tubular, basal half broadened, inflated, distal half tapering, recurved dorso-laterally. Medial third finely granulose, with a variably long, narrow diverticulum.

Female genitalia (Fig. 67, 68): Ovipositor moderately long, gonapophyses long. Ostium bursae more or less calyculate, ventral plate quadrangular with rather deep medial incision, dorsal plate subtriangular-cordiform, often truncated anteriorly. Ductus bursae variably long, slender, flattened, dorsal and ventral surfaces inequally sclerotized. Lateral pocket elongate, narrow, less sclerotized. Cervix bursae small, wrinkles, corpus bursae an ovoid-elliptical, membranous sac.

Bionomics: The species was found only on the Tibetan plateau and was the most frequent encountered *Dasypolia* species.

Distribution: China: SW Tibet.

Remarks: the external and genital morphological characters show a rather wide range of variation; specimens at the extreme ends of this variation have not been separated as distinct taxa but the type series may contain more than one species.

Dasypolia (Dasypolia) ursina sp. n.

(Figs 18, 19, 50, 51, 72)

Holotype: female, "Nepal, Ganesh Himal, 36–3700 m, Khurpudanda Pass, NO slope, 85°12'E, 28°10,5'N, 13–16. V. 1995, leg. Gy. Fábián & L. Ronkay", slide No. 5281 RONKAY, deposited in coll. HNHM Budapest.

Paratypes: Nepal, Ganesh Himal: 1 female with the same data as holotype; 1 male, Khurpudanda Pass, 85°13'E, 28°11'N, 3650 m, 20. IX. 1994, leg. M. HREBLAY and T. CSŐVÁRI; 71 males, 4 females from the same site, 22. X. 1995, leg. M. HREBLAY and L. BÓDI; 24 males, 4 females, Khurpudanda Pass, W slope, 3700 m, 18–19. X. 1995, leg. M. FIBIGER, S. KOVÁCS, L. PEREGOVITS and L. RONKAY; 2 females, 2 km E of Yurekharka, 3000 m, 85°15'E, 28°10'N, 5. IV. 1995, leg. HREBLAY and NÉMETH; 2 males from the same site, 21. X. 1995, leg. M. HREBLAY and L. BÓDI; 1 female, Yurekharka, 3450 m, 85°15'E, 28°10'N, 11.V.1995, leg. GY. FÁBIÁN & L. RONKAY; 1 female from the same site, 17. X. 1995, leg. M. FIBIGER, S. KOVÁCS, L. PEREGOVITS and L. RONKAY; 2 females, 1 km SE of Somdang, 3300 m, 85°13'E, 28°11'N, 7.IV.1995, leg. HREBLAY and NÉMETH; 2 males, 1 female from the same site, 24. X. 1995, leg. M. HREBLAY and L. BÓDI; 6 females, 3 km SE of Somdang, 3450 m, 85°13'E, 28°11'N, 6.IV.1995, leg. HREBLAY and NÉMETH; 7 males, 1 female from the same site, 23. X. 1995, leg. M. HREBLAY and L. BÓDI. Khumbu Himal: 1 female, Sagarmatha, Everest View Hotel, 3880 m, 17–20.V.1993, leg. T. HARUTA. China, Tibet: 3 males, 1 km S of Nyalam, 85°56'E, 28°07'N, 3700 m, 3. X. 1994; 1 male, 8 km S of Nyalam, 85°57'E, 28°07'N, 3220 m, 4. X. 1994, leg. M. HREBLAY and T. CSŐVÁRI (coll. HNHM Budapest,

T. CSŐVÁRI, Budapest, GY. FÁBIÁN, Budapest, M. FIBIGER, Sorø, M. HREBLAY, Érd, S. KOVÁCS, Szeged, J. PLANTE, Martigny and G. RONKAY, Budapest).

Slide Nos: 6707, 6781, 8299 HREBLAY (males), 8222, 8223 HREBLAY (females).

Diagnosis: a large, robust species, closely related to *D. atrox* HACKER, 1993 (Fig. 17), but the forewing pattern more sharply defined and the hindwing is darker, more unicolorous. The differences in the male genitalia are relatively small, *D. ursina* sp. n. has the uncus and the costal process ("pollex") somewhat broader, the sclerotized plate of carina is stronger, longer and the terminal diverticulum of the vesica is broader, larger, situated more proximally (see Figs 48–51). The female genitalia of *D. ursina* differ from those of *D. atrox* by the shape of the sclerotized part of ostium bursae which is shorter, broader, more ribbon-like in *ursina* and narrower but longer, more quadratic in *atrox*; the lateral pocket of the ductus bursae is somewhat larger in *ursina* (Figs 71, 72).

Description: wingspan 53–65 mm, length of forewing 25–29 mm. Head and thorax olive-grey with some ochreous hairs, antennae of male rather strong, shortly bipectinate, abdomen long, flattened, somewhat lighter ochreous grey. Forewing broadly triangular with apex rounded. Ground colour variably dark olive-grey, irrorated with lighter grey and ochreous, median area, inner half of marginal field and inner margin regularly suffused with dark brown. Wing pattern dark brownish, not very sharply defined, ante- and postmedial crosslines simple, sinuous, defined by broad, light stripes, medial line a diffuse, interrupted shadow. Orbicular and reniform stigmata more or less sharply defined, former small, rounded, latter narrow, long, arcuate, both filled with white; claviform absent. Subterminal line waved, whitish-ochreous, terminal line a row of black-brownish spots. Cilia dark olive-grey with a dark brown inner line. Hindwing dark olive-brownish, discal spot short, narrow, with whitish centre, transverse line diffuse or obsolescent. Terminal line brown, cilia olive-grey with yellowish base.

Male genitalia (Figs 50–51): Uncus strong, broad, rather short. Tegumen moderately high, penicular lobes small, hairy, vinculum long, thick, V-shaped. Fultura inferior broadly cordiform or shield-like with a very deep apical incision; medial process absent. Valva large, wide at base, distally tapering, cucullus short, rounded, without corona. Costal margin strongly sclerotized, costal plate with a broad, lobate, less pointed process overreaching ventral margin. Sacculus short, clavus rounded, densely setose. Aedeagus cylindrical, ventral extension of carina sclerotized, dorso-lateral plate large, very strong, serrated. Vesica tubular, recurved dorso-laterally, its walls membranous with fine scobination, subterminal diverticulum relatively large.

Female genitalia (Fig. 72): Ovipositor moderately long, gonapophyses long, slender. Ostium bursae rounded, somewhat broader than ductus bursae, ventral surface with two short, sclerotized patches, dorsal surface with a large, almost quadrangular plate extending from anthrum to middle of ostium. Ductus bursae long, tubular, flattened, with long, broad, ribbon-like sclerotization on both sides. Lateral pocket large, sclerotized. Cervix bursae rather small, conical, corpus bursae large, sacculiform.

Bionomics: The species occurs at medium high altitudes along and above the timber line in the Nepalese Himalaya and in SW Tibet.

Distribution: Central Nepal and SW Tibet.

Remarks: This species was published as *Dasypolia atrox*, and illustrated in colour by YOSHIMOTO (1995: Plate 112, Fig. 15).

Dasypolia (Dasypolia) rufatrox sp. n.
(Figs 20, 21, 73)

Holotype: female, "N-Pakistan, 5 km E of Chorit, 2400 m, 35°14'N, 74°46'E, 2.VI.1992, leg. M. Hreblay & G. Csorba" (coll. J. PLANTE, Martigny).

Paratype: female, N-Pakistan, 5 km S of Rattu, 2550 m, 35°06'N, 74°48'E, 3–4.VI.1992, leg. M. HREBLAY & G. CSORBA (coll. M. HREBLAY).

Slide No. 3365 HREBLAY.

Diagnosis: this species resembles a large, reddish *D. templi* but the outlines of the orbicular and reniform stigmata are sharper and the filling is whitish as in *D. atrox* and *D. ursina. D. rufatrox* is also similar to *D. bicolor* sp. n. but its crosslines are more sinuous, the subterminal line is lighter, more whitish and the hindwing is lighter with a more distinct transverse line. The female genitalia of *D. rufatrox* are close to those of *D. atrox* and *D. ursina* but the ovipositor is considerably shorter, the sclerotized ring of the ostium bursae and the whole ductus bursae are significantly narrower and the lateral pocket is completely reduced.

Description: wingspan 46–55 mm, length of forewing 22–26 mm. Head, and thorax light reddish brown, pubescence of abdomen somewhat lighter ochreous. Forewing narrow, elongate with apex rounded, ground colour light reddish brown irrorated with ochreous, veins partly covered with darker brown scales. Ante- and postmedial crosslines diffuse, sinuous, dark red-brown, defined with ochreous stripes; medial line a pale, broad, brownish shadow. Orbicular and reniform stigmata encircled with dark brown and filled with whitish-ochre, orbicular small, more or less rounded, reniform narrow, lunulate. Subterminal whitish-ochreous, sinuous, defined with darker red-brown fields on both sides. Terminal line obsolete, cilia as ground colour. Hindwing pale ochreous-brown irrorated with darker brown, veins darker, discal spot and transverse line diffuse but visible; marginal suffusion broad, brownish. Terminal line dark brown, cilia ochreous-brownish with a fine yellowish basal line.

Female genitalia (Fig. 73): Ovipositor rather short, gonapophyses long, strong. Ostium calyculate, sclerotized plates narrow, arcuate, forming a complete ring. Ductus bursae long, narrow, with elongate, granulose, sclerotized ribbons on both surfaces; lateral pocket reduced. Cervix bursae elongate-conical, corpus bursae long, eliiptical-saccate.

Bionomics: The collecting sites of the two specimens collected are stream valleys with steep slopes, vegetated with mosaics of grasslands, shrubs and bushes and with a few trees.

Distribution: North Pakistan, the north-western edge of the Himalayan chain (at the north side of the Nanga Parbat massif).

Dasypolia (Dasypolia) bicolor sp. n.
(Figs 22–24, 52, 53, 74)

Holotype: male, "China, Tibet: 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. Hreblay et T. Csővári", slide No. 6886 HREBLAY (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest).

Paratypes: China, Tibet: 1 male, 1 female, 4 km SE of Karru-Ochen Tso, 85°54'E, 28°30'N, 4850 m, 2.X.1994, leg. M. HREBLAY et T. CSŐVÁRI; 2 males, 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX. 1994, leg. M. HREBLAY et T. CSŐVÁRI (coll. M. HREBLAY, Érd, J. PLANTE, Martigny). Nepal, Khumbu Himal: 4 females, Sagarmatha, Everest View Hotel, 3880 m, 17–20.V.1993, leg. T. HARUTA (coll. H. YOSHIMOTO, Tokyo).

Slide Nos 6865, 6887 HREBLAY (males), 5190 BEHOUNEK, 6866 HREBLAY (females).

Diagnosis: A characteristically dimorphic species, the reddish or brownish form of which is similar to *D. rufatrox*, the distinctive features of which are discussed above; the external appearance of the yellowish form is unique within the genus. The male genitalia differ from those of *D. atrox* and *D. ursina* by the different shape of valva and cucullus (less tapering distally, cucullus longer, broader, more rounded), the shorter but broader harpe, the less expressed, more triangular costal process, the significantly smaller apical incision of the fultura, and the narrower, smaller, less dentated dorsal plate of the carina. The female of *D. bicolor* has the ovipositor shorter, the sclerotization of ostium bursae significantly larger and the ductus bursae shorter than those of the two related taxa, the lateral pocket of the ductus bursae is also reduced.

Description: wingspan 40–49 mm, length of forewing 17–23 mm. Pubescence of body and ground colour of forewing shining, unicolorous ochreous-yellowish or rufous brown, elements of wing pattern rather indistinct. Ante- and postmedial crosslines simple, less sinuous, diffuse, pale ochreous- or reddish brown. Orbicular and reniform stigmata whitish, latter with darker central line, darker outlines absent or very pale brownish (orbicular sometimes divided into two small spots). Subterminal line a diffuse, waved, light ochreous stripe, defined regularly with a darker inner zone. Subterminal line fine, continuous, dark grey, cilia as ground colour. Hindwing ochreous, suffused with darker brown. Veins covered with darker scales, discal spot short, white-centred, transverse line deleted, marginal suffusion broad, darker brownish. Terminal line ochreous-brown, cilia yellowish.

Male genitalia (Figs 52, 53): Uncus short, broad, strongly tapering. Tegumen low, wide, penicular lobes small, rounded, lobate. Fultura inferior cordiform with rather small apical incision, vinculum long, strong, V-shaped. Valva elongate, relatively wide, apically less tapering, cucullus wide, rounded, corona absent. Sacculus short, clavus less prominent, rounded, densely setose. Costa strong, costal process narrow triangular with apex reaching ventral margin. Harpe strong, finely curved, apically slightly dilated with apex rounded. Aedeagus cylindrical, ventral part of carina strongly sclerotized. Dorsal plate of carina narrow, armed with a few teeth. Vesica tubular, recurved ventro-laterally, broader at basal third, distal half narrower, finely scobinate, bearing a small diverticulum terminad.

Female genitalia (Fig. 74): Ovipositor rather short, apophyses long, strong. Ostium large, cup-shaped, ventral surface with a narrow, arcuate plate, dorsal surface almost fully sclerotized. Ductus bursae relatively long, narrow, flattened, with rather short, broad, granulose, sclerotized laminae on both sides. Cervix bursae large, semiglobular-conical, corpus bursae a long, narrow sac.

Bionomics: The Tibetan specimens were found on the high plateaeu while the only known female from eastern Nepal was collected at a relatively low elevation.

Distribution: China: SW Tibet; E Nepal.

Remarks: The species was first published by YOSHIMOTO (1995) as an unidentified *Dasypolia* sp. from the Everest Range, and illustrated in colour on Plate 112, Figs 12, 13.

Dasypolia (s. l.) confusa sp. n.

(Figs 10, 54, 55)

Holotype: male, "China, Tibet: 4 km SE of Karru-Ochen Tso, 85°54'E, 28°30'N, 4850 m, 2.X.1994, leg. M. Hreblay et T. Csővári", slide No. 6870 HREBLAY (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest).

Diagnosis: The new species is similar in external appearance to several *Dasypolia* s. str. species (e.g. the *exprimata*- or the *fani*-lines) but the dark elements of the forewing pattern are more diffuse or indistinct. The male genitalia of *D. confusa* are easily distinguished from any other known *Dasypolia* species by the presence of numerous tiny spiculi in the vesica, arranged into two rounded spinulose fields at the terminal third of the vesica and the short, sclerotized cucullus bearing a triangular, sclerotized subapical lobe. In addition, the short, straight harpe, the very long, strong, acute costal process are also good distinctive features.

Description: wingspan 33 mm, length of forewing 15 mm. Head and thorax dark olive-grey mixed with dark brown and ochreous hairs, abdomen slightly lighter, more ochreous. Forewing relatively short, broad, with apex finely pointed. Ground colour dark olive-grey, strongly irrorated with ochreous and dark grey-brown. Wing pattern indistinct, dark crosslines diffuse, interrupted, strongly sinuous, stigmata represented by diffuse, lighter patches without darker outlines. Marginal area relatively dark, subterminal line interrupted, waved, consisting of diffuse ochreous spots and patches. Terminal line also indistinct, represented by a few tiny blackish dots, cilia olive-grey mixed with ochreous. Hind wing ochreous-whitish, suffused strongly with olive-brown, marginal area broad, dark; discal spot and transverse line obsolescent. Terminal line brown, cilia olive-greyish with ochreous base.

Male genitalia (Figs 54, 55): Uncus narrow (its apex broken in the holotype), tegumen moderately low, broad, penicular lobes narrow, long, hairy; vinculum strong, V-shaped. Fultura inferior deltoidal with deep, narrow apical incision, medial process short, thick, inflated, with apex rounded. Valva elongate, slightly arcuate, cucullus short, rounded, sclerotized, without corona but with a triangular, sclerotized lobe. Sacculus short, clavus small, prominent, densely setose. Costa strongly sclerotized, costal process very long, acute. Harpe thick, straight, stick-like with apex rounded. Aedeagus cylindrical, ventral plate of carina strong, long, dorso-lateral plate long, bar-like, strongly dentate. Vesica tubular, recurved dorso-laterally. Medial and terminal parts finely scobinate, dilated, bearing a large, semiglobular diverticulum and two fields of small, spiculiform, partly fasciculate cornuti.

Bionomics: The species was found on the Tibetan plateau at very high altitude.

Distribution: China: SW Tibet.

Dasypolia (s. l.) picurka sp. n.
(Figs 25, 26, 77)

Holotype: female, "Nepal, Annapurna region, 1 km E from Gorepani, 2900 m, 21–22. III. 1995, 83°42'E, 28°24'N, leg. Márton Hreblay & Lajos Németh" (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest). Slide No. 7393 HREBLAY.

Paratypes: Nepal, Annapurna Himal: 2 females, with the data as the holotype; 1 female, Sudame, 1250 m, 17.III.1995, 83°45'E, 28°20'N, leg. M. HREBLAY & L. NÉMETH ; 4 females, Nangethanti, Ghorepani, Deorali, IV.1995, leg. GY. M. LÁSZLÓ and G. RONKAY. Nepal, Ganesh Himal: 2 females, 1 km SE from Somdang, 3300 m, 7. IV. 1995, 85°13'E, 28°11'N; 2 males from the same site, 24. X. 1995, leg. M. HREBLAY and L. BÓDI; 2 females, 3 km SE from Somdang, 3450 m, 6. IV. 1995, 85°13'E, 28°11'N; 1 female, 2 km E of Yurekharka, 3000 m, 5.IV.1995, 85°15'E, 28°10'N; 1 female, 2 km E Thangjet, 2165 m, 1.IV.1995, 85°19'E, 28°11'N, leg M. HREBLAY and L. NÉMETH; 1 male, Khurpudanda Pass, W slope, 3700 m, 18–19. X. 1995, leg. M. FIBIGER, S. KOVÁCS, L. PEREGOVITS and L. RONKAY (coll. HNHM Budapest, M. HREBLAY, Érd, L. NÉMETH, Tapolca and G. RONKAY, Budapest).

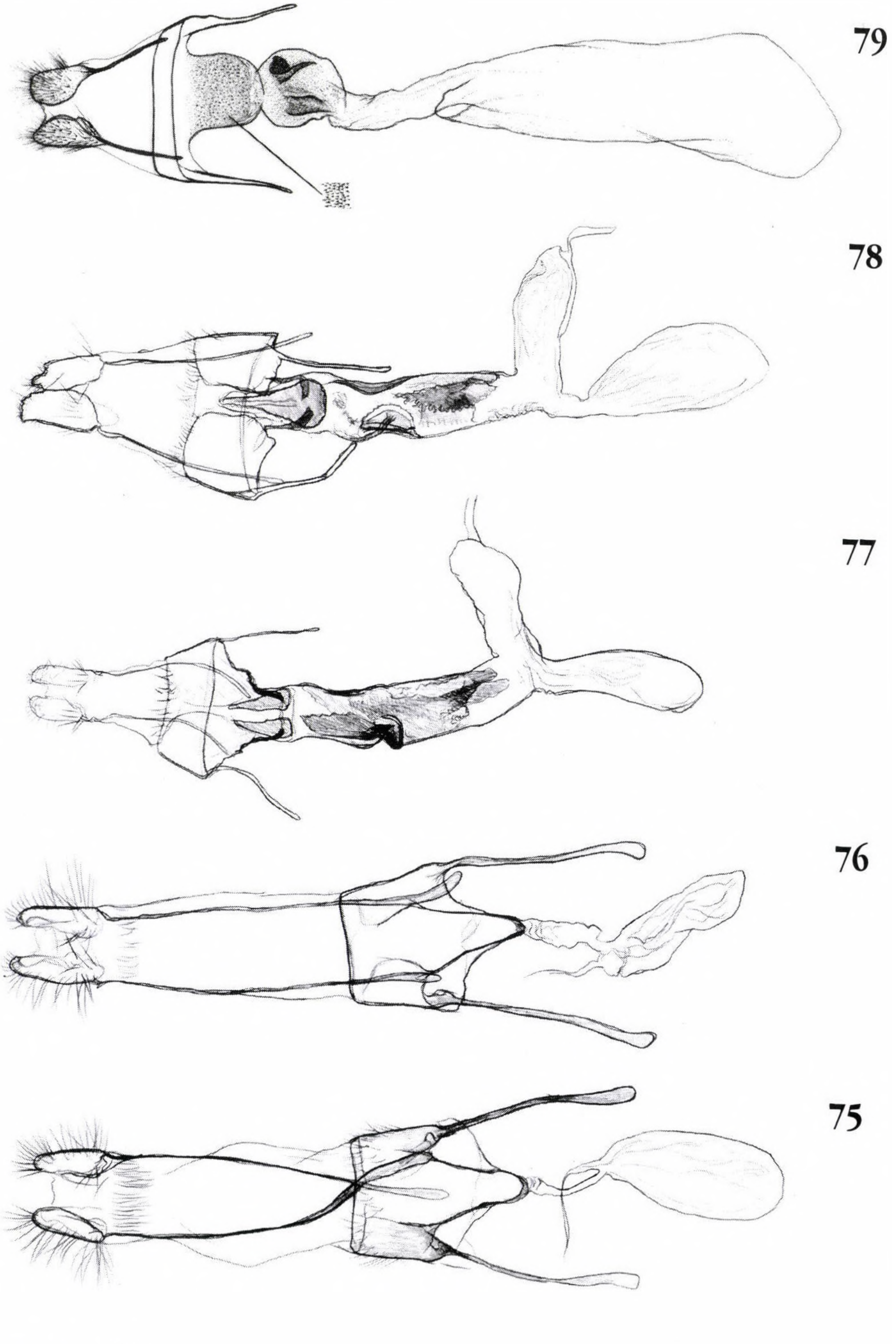
Slide Nos 8287, 8288 HREBLAY, 5364 RONKAY (males), 7455 HREBLAY, 5158 RONKAY (females).

Diagnosis: *D. picurka* and *D. conistroides* form a distinct species group within the genus, being rather remote from any other taxa of *Dasypolia*. The taxonomic position of this lineage is still unclear, especially as no males of the two species are known. These two species are easily separable by their external and genital features, the most conspicuous differences are as follows: *D. picurka* is smaller, its crosslines are almost straight, the outlines of the stigmata are usually dark, the whitish rings are less sharply defined, the marginal zone is very unicolorous, the hindwings are darker with less discernible discal spot and transverse line. The female genitalia of *D. picurka* and *D. conistroides* are surprisingly similar but the latter species has broader ovipositor, shorter ductus bursae and more pocket-like lateral appendage situated closer to ostium bursae.

Description: wingspan 29–32 mm, length of forewing 13–15 mm. Head and thorax variably dark tobacco-brown, abdomen lighter, more greyish. Forewing relatively short, broad, with apex pointed. Ground colour light ochreous brown or tobacco-brown, irrorated with a few dark brown scales, outer part of cell often suffused with reddish-brown; veins partly covered with dark brown scales. Crosslines visible, simple, dark brown, antemedial and medial lines slightly sinuous or almost straight, postmedial line angled outwards around reniform; ante- and postmedial lines defined by light ochreous stripes. Orbicular and reniform stigmata present, small, encircled with brown, orbicular rounded, reniform narrow, straight or finely arcuate, both filled with whitish-grey. Subterminal line less waved, an indistinct line but sharply defined by dark chocolate-brown inner part and light ochreous-grey or ochreous-brown outer part of marginal field. Terminal line a row of black spots, cilia finely spotted, slightly darker than ground colour. Hindwing shining whitish-grey, medial and marginal parts suffused with dark grey-brown. Discal spot and transverse line usually poorly visible, veins covered with dark brown scales. Terminal line brown, cilia whitish- or ochreous grey.

Female genitalia (Fig. 77): ovipositor relatively long, narrow, weakly sclerotized, apophyses thin, long. Ostium bursae cup-shaped, ventral plate forming a narrow half-ring, dorsal plate a large, trapezoidal-subrectangular, medially subdivided plate. Ductus bursae elongate, flattened, medially dilated, both surfaces granulosely sclerotized. Lateral pocket situated medially, less reclinate, edge

Figs 75–79. Female genitalia of *Dasypolia* species. 75–76 = *D. (s. l) yeti* HACKER & PEKS, 75 = holotype, 76 = China, Tibet; 77 = *D. (s. l.) picurka* sp. n., paratype; 78 = *D. (s. l) conistroides* sp. n., holotype; 79 = *D. (s. l) nivalis* sp. n., paratype



of ductus bursae sometimes almost flat. Cervix bursae long, broadly tubular, membranous, corpus bursae small, elliptical.

Bionomics: This species was found at different, relatively low elevations, most often in the upper forest zones of the Nepalese Himalaya.

Distribution: Central Nepal.

Dasypolia (s. l.) conistroides sp. n.
(Figs 27, 28, 78)

Holotype: female, "Nepal, Ganesh Himal, 3 km SE from Somdang, 3450 m, 6. IV. 1995, 85°13'E, 28°11'N, leg. Márton Hreblay & Lajos Németh", slide No. 7454 HREBLAY (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest).

Paratypes: Nepal, Ganesh Himal: 4 females, 3 km SE from Somdang, 3450 m, 6. IV. 1995, 85°13'E, 28°11'N, leg. M. HREBLAY and L. NÉMETH; 1 female, 2 km E of Yurekharka, 3000 m, 5.IV.1995, 85°15'E, 28°10'N (coll. M. HREBLAY, L. NÉMETH and G. RONKAY).

Slide No. 7490 HREBLAY (females).

Diagnosis: the comparison of *D. conistroides* with the related *D. picurka* is given under the preceding species. Dark specimens of this species show a surprisingly high (superficial) similarity to specimens of *Conistra torrida* (LEDERER, 1857) and with some species of the genus *Himalistra* HACKER & RONKAY, 1993.

Description: wingspan 34–38 mm, length of forewing 16–18 mm. Head, thorax dark rufous- or chocolate-brown, abdomen lighter, more ochreous-greyish. Forewing elongate with apex pointed, relatively broad, costal margin rather convex. Ground colour dark reddish- or chocolate-brown, irrorated with some ochreous and blackish, veins covered with blackish-grey and a few white(ish) scales. Ante- and postmedial lines double, sinuous, dark brown filled with ochreous, medial line a diffuse, broad, dark brown or blackish stripe. Orbicular and reniform stigmata sharply defined, their outlines yellowish, defined partly with black-brown and filled with ground colour. Orbicular small, more or less rounded with a pointed extension running to antemedial, reniform narrow, lower half slightly tapering, surrounded by a dark brown or blackish-brown patch. Subterminal line diffuse, sinuous, whitish-ochreous, defined by a wide dark brown zone at inner side. Terminal line more or less continuous, black(ish), cilia reddish-brown or dark brown, slightly spotted with whitish. Hindwing whitish grey, suffused strongly with dark brown-grey. Discal spot and transverse line strong, defined by lighter stripes, veins usually darker brown. Marginal area often with an indistinct whitish zone along terminal line, cilia pale brownish.

Female genitalia (Fig. 78): ovipositor relatively long, narrow, less sclerotized, apophyses thin, long. Ostium bursae subrectangular or cup-shaped, ventral plate a narrow half-ring divided medially, dorsal plate much larger, subtriangular-lanceolate, medially less divided. Ductus bursae tubular, flattened, both surfaces granulosely sclerotized, dorsal plate significantly smaller, weaker. Lateral pocket well developed, situated more or less medially. Cervix bursae relatively long, broadly tubular, membranous, corpus bursae small, elliptical.

Bionomics: The specimens of this newly discovered species inhabit the upper forest zones (3000–3600 m).

Distribution: Nepal: Ganesh Himal.

Dasypolia (Dasymixis) orogena sp. n.
(Figs 29, 70)

Holotype: female, "Nepal, Ganesh Himal, 1 km SE from Somdang, 3300 m, 7. IV. 1995, 85°13'E, 28°11'N, leg Márton Hreblay et Lajos Németh"; slide No. 7612 HREBLAY (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest).

Paratypes: Nepal, Ganesh Himal: 10 males from the same site as holotype, 24. X. 1995, leg. M. HREBLAY and L. BÓDI; 4 males, 3 km SE of Somdang, 3450 m, 85°13'E, 28°11'N, 23. X. 1995, leg. M. HREBLAY and L. BÓDI; 2 males, Khurpudanda Pass, 85°13'E, 28°11'N, 3650 m, 22. X. 1995, leg. M. HREBLAY and L. BÓDI; 5 males, Khurpudanda Pass, W slope, 3700 m, 18–19. X. 1995, leg. M. FIBIGER, S. KOVÁCS, L. PEREGOVITS and L. RONKAY; 1 male, 2 km E of Yurekharka, 3000 m, 85°15'E, 28°10'N, 21. X. 1995, leg. M. HREBLAY and L. BÓDI (coll. HNHM Budapest, M. FIBIGER, M. HREBLAY, S. KOVÁCS and G. RONKAY).

Slide Nos 8289, 8290, 8291 HREBLAY, 5362 RONKAY (males).

Diagnosis: the closest relatives of *D. orogena* sp. n. are *D. magnifica* and *D. leucocera*, these species are easily distinguishable by their external characters (see RONKAY and VARGA, 1990, Plate F, Fig. 14; HACKER and PEKS, 1993, Plate E, figs 1, 2; Plate O, Fig. 18). The new species is medium-sized with broad, rather short wings with strongly pointed apex, the forewing ground colour is very pale, shining ashy grey with ochreous sheen, the crosslines are pale, more or less obsolescent. *D. magnifica* has the forewing narrower, less pointed at apex, the ground colour is significantly darker, most often reddish-brownish (but some specimens are darker ochreous- or brownish-grey), the crosslines are stronger, defined with lighter stripes, the darker outlines of the white stigmata are sharper and the hindwing is paler. *D. leucocera* is larger in size, the body is more robust, the forewing is much narrower, longer, the crosslines are much sharper, the stigmata are larger, broader, the arrowheads of the subterminal are sharply defined, blackish, etc.

The female genitalia differ from those of *D. leucocera* (RONKAY and ZILLI, 1993; p. 502, Fig. 11) by its longer, stronger ductus bursae, stronger sclerotization of cervix bursae, much shorter, smaller corpus bursae bearing the two signa close to fundus; those of *D. orogena* and *D. magnifica* cannot be compared as the female of *D. magnifica* is unknown.

The species of the subgenus *Dasymixis* RONKAY & VARGA, 1990, can be divided into two groups. The western group comprises larger, often very large, robust species (*diva, leucocera*, two other, as yet, undescribed species from the Pamir region and the Tien Shan chain), distributed from Kashmir westwards to north-east Turkey. The second group contains three smaller, more gracile species distributed in the southern Himalayas (*magnifica* in Himachal Pradesh, *orogena* and an undescribed species related to *magnifica* in Central Nepal). The external differences between the members of the subgenus are often large; the genital structure is more similar, although the two species groups are easily separable.

Description: Female: wingspan 38 mm, length of forewing 18 mm. Head and thorax light ashy grey; abdomen darker grey-brown. Forewing broad, high triangular, with apex strongly pointed. Ground colour pale, whitish ashy grey, irrorated with a few ochreous and red-brownish scales, reniform surrounded by a dark red-brownish patch. Crosslines pale, diffuse, simple, less sinuous. Orbicular and reniform stigmata well discernible, pure white, encircled finely with darker grey, reniform with some light greyish scales in darker centre. Subterminal line whitish, defined by a narrow, red-brownish inner line. Terminal line continuous, pale grey-brown, cilia pale ochreous-grey. Hindwing whitish-grey, inner area suffused strongly with dark grey-brown, marginal area with a narrow whitish-greyish zone. Veins covered with dark brown, discal spot strong, small, with lighter centre, transverse line interrupted, diffuse. Terminal line dark brown scales, cilia whitish-ochreous. Male unknown.

Female genitalia (Fig. 70): Ovipositor and gonapophyses very long. Ostium bursae more or less discoidal, flattened, ventral side with two long, narrow, sclerotized ribbons, dorsal surface with a discoidal-cordiform, strongly sclerotized plate. Ductus bursae broadly tubular, flattened, constricted at middle, both surfaces strongly, granulosely sclerotized. Lateral margins slightly reclinate but not pocket-like. Cervix bursae small, semiglobular-conical, with partly sclerotized wrinkles, corpus bursae ovoid-elliptical, membranous, bearing two short signa close to its proximal end.

Bionomics: The specimens of the type series were collected in a rather small area around the Khurpudanda Pass, the habitats are rocky conifer woodlands close to a stream valley and steep rocky slopes covered with dense, rich, subalpine vegetation.

Distribution: Nepal: Ganesh Himal.

Dasypolia (Dasythorax) pygmaea sp. n.
(Figs 15, 69)

Holotype: female, Pakistan, Shandur Pass, 3600 m, 36°05N', 72°32'E, 21. VI. 1992, leg. M. HREBLAY and G. CSORBA (coll. J. PLANTE, Martigny).

Paratypes: Pakistan: 6 females, Shandur Pass, 3600 m, 36°05N', 72°32'E, 21. VI. 1992; 1 female, 2 km N of Karimabad, 1920 m, 36°25'N, 74°40'E, leg. M. HREBLAY et G. CSORBA (coll. M. HREBLAY and, J. PLANTE).

Slide Nos 3409, 3458 HREBLAY (females).

Diagnosis: the new species belongs to the *D. anartinus* species complex containing *D. monotonus* and the different races of *D. anartinus* (Fig. 16). It differs externally from its relatives by its relatively narrow, more pointed forewings and its more intensive forewing pattern. The female genitalia of *D. pygmaea* and *D. anartinus* are easily distinguished: the ovipositor, the ostium bursae and the ductus bursae are significantly narrower in *D. pygmaea*, the ductus bursae is considerably longer; the cervix bursae of the new species is much shorter while the corpus bursae is longer, narrower.

Description: Female: wingspan 26–29 mm, length of forewing 12–13 mm. Body and forewing dark ochreous-grey mixed with ochreous, dark brown and olive-grey hairs and scales. Forewing narrow, elongate, with apex slightly pointed, wing pattern strong, dark, but rather diffuse. Ante- and postmedial lines broad, strongly sinuous, blackish brown, defined with ochreous stripes, medial line a broad, dark brown shadow. Orbicular and reniform stigmata marked with small, indistinct ochreous patches, without darker outlines but with more or less discernible dark centres. Subterminal line ochreous, strongly waved, defined with a narrow, dark inner zone. Terminal line a row of blackish spots, cilia as ground colour, spotted with ochreous. Hindwing almost unicolorous, dark grey-brown, marginal area even darker; discal spot and transverse line diffuse, poorly visible. Terminal line dark brown, cilia ochreous with dark olive-greyish outer half. Male unknown.

Female genitalia (Fig. 69): Ovipositor rather short, weak, gonapophyses thin. Ostium bursae small, calyculate, granulosely but weakly sclerotized. Ductus bursae tubular, flattened, posteriorly somewhat constricted, both surfaces granulosely sclerotized. Lateral pocket present, small, more or less reclinate. Cervix bursae tiny, wrinkled, corpus bursae elongate-elliptical, membranous.

Distribution: North Pakistan: Hindukush, Karakoram.

Dasypolia (s. l.) nivalis sp. n.

(Figs 30, 56, 57, 79)

Holotype: male, "China, Tibet: 4 km S of Karru-Ochen Tso, 85°50'E, 28°32'N, 4850 m, 30.IX.1994, leg. M. Hreblay et T. Csővári". Slide No. 6883 male HREBLAY; (coll. HREBLAY, deposited in the Hungarian Natural History Museum, Budapest).

Paratype: female, [?China], Tibet, near Kampa Dzong, 17.000', 11.IV.1922, slide No. 4453 RONKAY (coll. BM(NH)).

Diagnosis: The new species is rather remote from any known taxa of the genus; the basal cornuti field of vesica and the structure of the ostium and the ductus bursae show closer affinities with the members of the subgenus *Dasythorax*, although the external appearance of the other *Dasythorax* species is strongly dissimilar. The wing shape and the forewing coloration of the species resemble more closely those of the taxa of the subgenus *Cteïpolia*, but the antennae, the hindwing coloration and the genitalia of both sexes show significant differences (see RONKAY *et al.*, 1995). *D. nivalis* differs from all members of the subgenus *Dasythorax* by its inflated harpe and the very short tube of vesica armed with a few small cornuti.

Description: wingspan 29–30 mm, length of forewing 13–14 mm. Head and thorax light ashy grey, mixed with dark grey, sides of palpi and tufts of vertex and prothorax dark grey. Antennae of male shortly bipectinate, those of female finely serrate. Forewing narrow, elongate, apically slightly dilated, apex more or less pointed. Ground colour of forewing dark grey, basal area slightly, marginal field strongly irrorated with whitish-grey. Ante- and postmedial crosslines double, sinuous, dark grey, defined by lighter shadows, costal spots of crosslines well defined, dark patches. Subterminal line represents a border between darker inner and lighter outer fields. Orbicular minute, rounded, blackish, filled with whitish, reniform relatively small, encircled with dark grey and filled with whitish and some dark grey scales; claviform absent. Terminal line fine, dark blackish grey, cilia grey, variegated with whitish and dark grey. Hindwing whitish, costal margin irrorated with darker scales. Discal spot visible, veins defined by greyish scales, marginal area rather broad, dark grey, cilia whitish marked with dark grey. Underside of forewing grey, apical and costal zones significantly lighter. Hindwing whitish, costal and marginal areas dark grey, discal spots sharply defined on both wings.

Male genitalia (Figs 56, 57): Uncus relatively thick, medium long, apically tapering. Tegumen low, broad, penicular lobes large, rounded, densely hairy, vinculum very short, thick, rounded. Fultura inferior a small quadrangular, smooth plate, without apical incision or medial process. Valva rather short, stubby, cucullus very short, rounded, sclerotized, covered with strong but short setae ("corona"). Sacculus short, clavus rounded triangular, flattened, setose. Costal plate strong, costal process acute triangular, relatively long. Harpe straight, medium-long, distally dilated with apex rounded. Aedeagus cylindrical, moderately long, carina with weak lateral bars but without stronger ventral or dorso-lateral plate(s). Vesica very short, everted forward, recurved dorsally at medial third. Basal part finely scobinate, medial and distal parts membranous. Medial part with a rounded conical, ventral diverticulum and a few (7) small, rather thick cornuti.

Female genitalia (Fig. 79): ovipositor rather short, broad, weakly sclerotized, gonapophyses medium-long. Ostium bursae large, cup-shaped, finely sclerotized, covered with minute spines. Posterior third of ductus bursae globular, finely sclerotized, with a few heavily sclerotized plates. Anterior part of ductus bursae narrow, tubular, membranous, cervix bursae very small, conical, corpus bursae long, sacculiform.

Bionomics: The species was found on the Tibetan plateau at very high altitude.

Distribution: China: Tibet.

Description of the genitalia of *Dasypolia (s. l.) yeti* HACKER & PEKS, 1993 (Figs 31, 32, 58, 59, 75, 76)

Type material examined: holotype female, India, Himachal Pradesh, Rohtang Pass S-slope, halfway to Mahri, 3000 m, 32°22'N, 77°15'E, 17.X.1990, leg. HACKER & PEKS, slide No. 7161 HREBLAY (coll. HACKER, Staffelstein).

Additional material examined: China, Tibet: 1 male, 4 females, 1 km S of Nyalam, 86°00'E, 28°13'N, 3700 m, 3. X. 1994; 1 male, 8 km of Nyalam, 85°57'E, 28°07'N, 3220 m, 4.X.1994, leg. HREBLAY and CSŐVÁRI (coll. CSŐVÁRI, HREBLAY and PLANTE).

Slide Nos 6813 HREBLAY (male), 6789 HREBLAY (female).

Male genitalia (Figs 58, 59): Uncus slender, relatively long, with apex pointed and finely curved. Tegumen moderately high, penicular lobes narrow, densely hairy; vinculum rather short, U-shaped. Valvae broad, medially slightly dilated, distally tapering, cucullus finely pointed. Sacculus short, costal plate weak, costal process absent. Harpe long, slender, with apex finely pointed, curved at base and at apical third. Aedeagus cylindrical, carina with triangular lateral bars but without dorsal plate. Vesica short, tubular, broader at basal third; membranous, without diverticulum.

Female genitalia (Figs 75, 76): ovipositor and gonapophyses very long. Ostium bursae membranous, conical, with a long, narrow, sclerotized ribbon running from anterior papillae anales to tip of ostium, forming a large V. Ductus bursae tubular, thin, membranous, cervix bursae reduced, corpus bursae ovoid, without signa.

* * *

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