

Contribution to the knowledge of Macrolycini with description of *Calcaeron*, new genus (Coleoptera, Lycidae)

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Abstract

The morphology of the tribe Macrolycini of net-winged beetles (Lycidae) is studied. The subtribe Dilophotina Kleine, **nom. rev.** is revalidated from synonymy with Macrolycini. A new genus *Calcaeron* **gen. n.** and five new species: *Mesolycus hubeicus*, *M. nanensis*, *M. murzini*, *Calcaeron sundaicus* and *C. baluensis* are described. *Mesolycus* Gorham **nom. rev.** is revalidated from synonymy with *Dilophotes*, while *Flabellodilophotes* Pic, 1912 and *Biphilodes* Kazantsev, 2000 are synonymized with *Mesolycus*. *Dilophotes moxiensis* Bic is found to be synonymous to *Mesolycus ilyai* (Kazantsev). *M. mediozonatus* (Nakane), stat. n. is raised to species level. The following taxa are transferred to *Mesolycus*: *Dilophotes pygmaeus* Waterhouse, *D. shelfordi* Bourgeois, *D. discoidalis* Pic, *D. ater* Pic, *D. tricostatus* Kleine, *D. ilyai* Kazantsev, *D. qinlinganus* Kazantsev, *D. tibetanus* Kazantsev, *D. berezowskii* Kazantsev, *D. sausai* Bic, *D. laosensis* Bic, *D. bolavensis* Bic, *D. jendeki* Bic, *D. holzschuhi* Bic, *D. bhutanensis* Bic and *Flabellodilophotes obscurus* Pic. The phylogeny of Macrolycini is discussed and a key to the genera of the tribe is provided.

Key words: Coleoptera, Lycidae, Macrolycini, new genus, new species, taxonomy, phylogeny, Palaearctic and Oriental regions

Introduction

The tribe Macrolycini includes the genera *Macrolycus* Waterhouse, 1878, *Dilophotes* Waterhouse, 1879 and *Flabellodilophotes* Pic, 1912 (Bocák & Bocáková, 1990; Kazantsev, 2000a; Bic, 2002). The reason these taxa are regarded as a holophyletic group is that their bifid claws and somewhat similar pronotal structure with narrow median carina, often reduced in posterior half, are considered to be their synapomorphies.

Although this Oriental and East Palaearctic group of Lycidae has been receiving attention from taxonomists during recent decades (i.e. Nakane, 1967; 1969; 1994; Kazantsev, 1993, 2000b), publications were mostly limited to the description of new *Macrolycus* species accompanied by lists of regional faunas. Two recent papers were published on *Dilophotes* as well (Kazantsev, 2000a; Bic, 2002), with the later one also giving a list of Palaearctic and Indochinese species of the genus. The list, however, did not include at least three species from the regarded region, *D. vitalisi* Pic, 1923 (Vietnam), *D. mediozonatus* Nakane 1955, stat. nov. (Japan) and *D. libnetoides* Nakane, 1971 (Taiwan). The author also was not precise in delineating northern limits of the distribution area of *Dilophotes*, excluding Russia from the countries where these lycids may be encountered, although relevant records were available (Medvedev, 1992; Kazantsev, 2000a).

The present paper is yet another contribution to the knowledge of this lycid group, with an emphasis on its morphology and phylogeny. A phylogenetic analysis of the complex revealed the presence of three genus-group taxa, which entailed revalidation of *Mesolycus* Gorham, 1883 from synonymy with *Dilophotes*. It would be worth mentioning that this synonymy had been established without examination of types of the type species and without seeing the type species of one of the synonymized genera (Bocák & Bocák-

ová, 1988). The analysis also necessitated the revalidation of *Dilophotina* Kleine, 1928, nom. rev. and erection of a new genus *Calcaeron* gen. n., as well as placing *Flabellodilophotes* in synonymy with *Mesolyucus*. In addition, several new species are also described below, with certain taxonomic changes that appear necessary made and some poorly known taxa illustrated. One of the characters of the *Dilophotes* and *Mesolyucus* lineages, the division of the metacoxae by sutures into presumably coxal, meral and trochantal parts, appears not to have been reported before for the adult Coleoptera (Crowson, 1981).

As some of the old taxa had been introduced without nominating holotypes or mentioning the uniqueness of the specimens, lectotypes had to be designated for them, in accordance with Article 74 and Recommendation 73F of the International Code of Zoological Nomenclature.

Depositaries

ICM - Insect Centre, Severtzov Institute of Ecology and Evolution Problems, Moscow

MNHN - Museum National d'Histoire Naturelle, Paris

NNHM - National Natural History Museum, London

ZIN - Zoological Institute, St. Petersburg

ZMAU - Zoological Museum of the Amsterdam University

SVK - author's collection

Material and Methods

Specimens examined for this study were dissected after being relaxed for several hours in water, with the genitalia extracted and affixed with water-soluble glue on cardboard plates or KOH cleared and placed in vials with glycerine. Measurements were taken using an ocular grid of the MBS-1 stereo microscope. The largest width of the eye as seen from above was taken as the eye radius, while the shortest distance between the eyes in dorsal view was interpreted as the interocular distance.

To study internal structures specimens were relaxed in 10% KOH for several hours, without boiling, and description of all sutures in the text below refers to structures of such KOH-cleared specimens.

For a cladistic analysis the Phylip Pars program, version 3.6, was used.

Morphology and Systematic Account

Dilophotes Waterhouse, 1879

Dilophotes Waterhouse, 1879: 75.

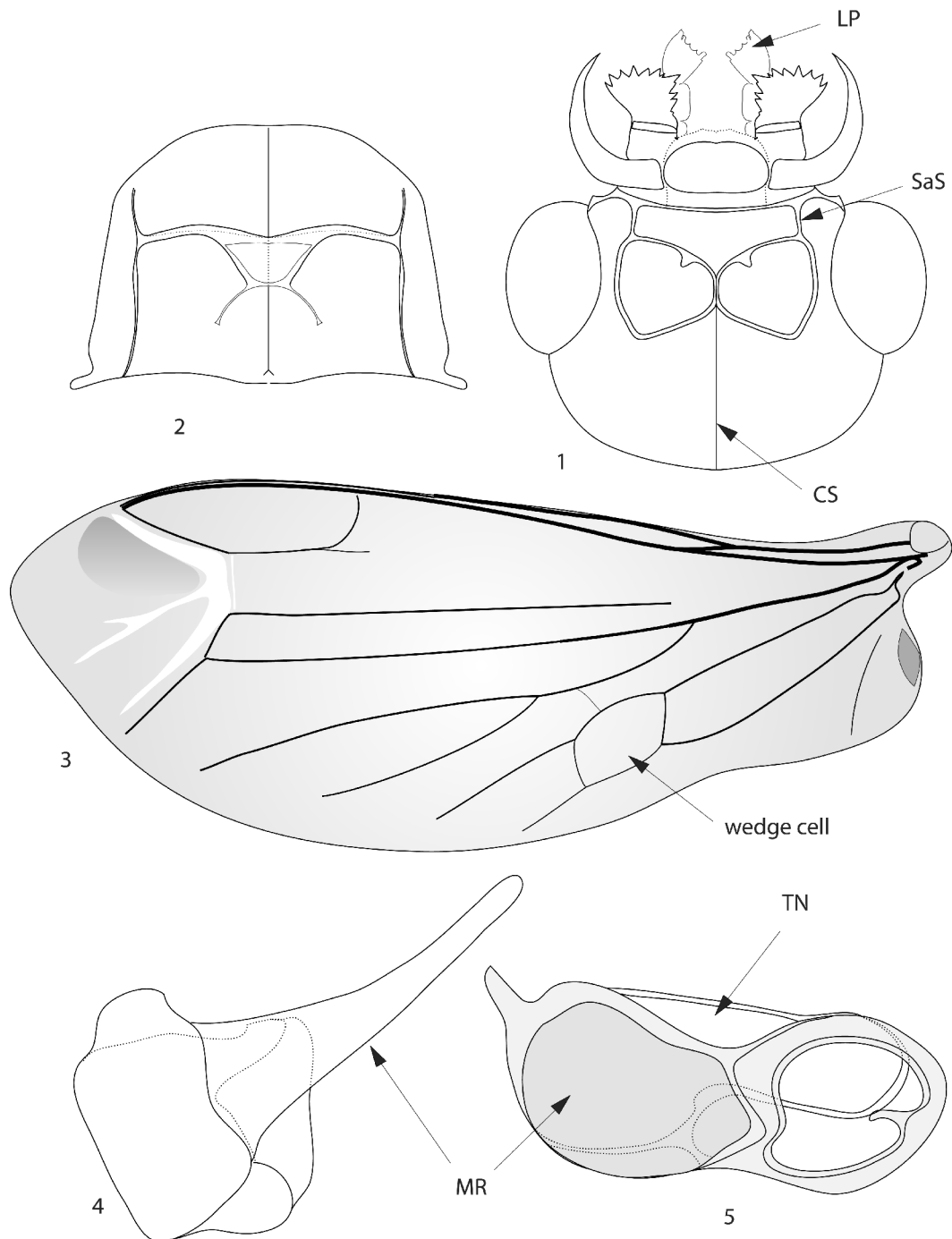
Type species: *Dilophotes exilis* Waterhouse, 1878: 116 (by original designation).

Stenolycus Ohbayashi, 1956: 58.

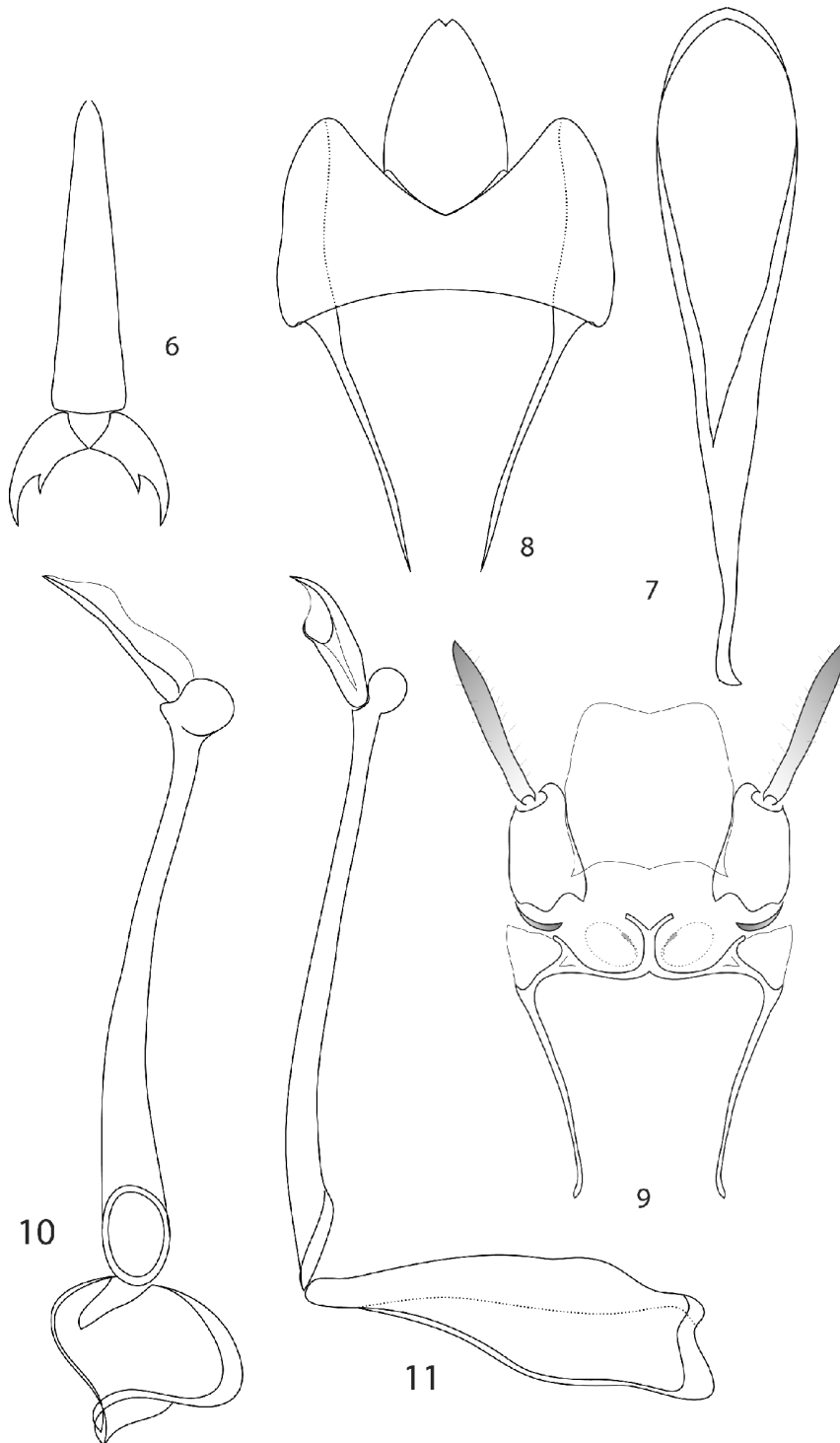
Type species: *Stenolycus ohirai* Ohbayashi, 1956: 58 (by original designation).

Redescription

Head transverse, slightly narrowed behind eyes, not or hardly wider than pronotal anterior margin. Frons plane at acute angle with vertex. Gular area reduced to sub-occipital sulcus. Sub-antennal and coronal sutures complete (Fig. 1). Tentorium represented by a pair of posterior arms. Labrum transverse, feebly emarginated medially, not rigidly attached to epistomal sulcus (Fig. 1). Eyes spherical. Mandibles evenly rounded (Fig. 1). Maxillary palpi 4-segmented, relatively stout, with ultimate palpomere flattened and dilated at apex. Mentum fully developed, submentum present; prementum undivided. Labial palpi 3-segmented, slender, ultimate palpomere flattened and dilated at apex (Fig. 1). Antennal prominence moderate, antennal sockets approximate (Fig. 1). Antennae 11-segmented, long, attaining to elytral apices, strongly compressed from antennomere 3. Antennomere 2 small, transverse and more than 5 times shorter than antennomere 3. Antennal pubescence short and decumbent, with scaliform setae on antennomeres 3 to 11. Pronotum short, transverse, inconspicuously produced anteriorly, with moderately pronounced hind angles; median suture (on inner surface) complete (Fig. 2). Prosternum narrow, Y-shaped (Fig. 2). Mesothoracic spiracles simple, small, not extending laterally beyond coxal line. Scutellum relatively wide, more or less parallel-sided and emarginate at apex, not completely covering elytral notch. Mesepimeron narrow. Elytra slightly narrowing posteriorly, dehiscent behind middle, with three primary costae, costae 2 and 3 gradually weakening towards apex, costa 1 robust only basally, interstices with irregular reticulation; elytral pubescence uniform. Metathoracic spiracles well developed. Metathoracic wing with wedge cell present (Fig. 3). Metasternal suture reaching over two thirds of metasternum; metendosternite simple, without arms, similar to that of *Mesolycus* (Fig. 26). Procoxae elongate, approximate distally; mesocoxae transverse, separated; metacoxae divided by sutures into basal and presumably meral and trochantinal parts, with basal part similar to mesocoxa (Figs. 4–5). Trochanters elongate, about twice as long as wide, but considerably shorter than femurs, connected to femurs apically; tibial spurs absent; tarsi narrow, tarsomere 4 slightly widened, tarsomeres 3 and 4 with plantar pad apically, plantar pads on tarsomeres 1 and 2 absent; all male claws bifid apically; female claws with acute tooth near base (Fig. 6). Abdominal spiracles located dorsally at the edge of sternites; tergites with median longitudinal line. Ultimate female sternite without spiculum gastrale, as in *Mesolycus* (Fig. 28). Male ultimate sternite with long, basally asymmetrical spiculum gastrale (Fig. 7). Male ultimate tergite attached to penultimate one only medially; penultimate tergite deeply incised (Fig. 8). Valvifers of female genitalia rigidly attached to each other by bridge (Fig. 9). Aedeagus with asymmetrical median lobe, internal sac and phallobase (Figs. 10–17).



FIGURES 1–5. Details of *Dilophotes depressicornis* Pic. 1 — head, dorsally; 2 — prothorax, ventrally; 3 — metathoracic wing; 4 — metacoxa, dorsally; 5 — same, posteriorly. CS — coronal suture; LP — labial palpi; MR — meron; SaS — sub-antennal suture; TN — trochantin.



FIGURES 6–11. Details of *Dilophotes depressicornis* Pic. 6 — ultimate segment of female metatarsus with claws; 7 — male ultimate sternite; 8 — male ultimate and penultimate tergites; 9 — female genitalia; 10 — aedeagus, ventrally; 11 — same, laterally.

Remarks

Dilophotes, the type species of which, *D. exilis* Waterhouse, has been studied, is characterized by the long, serrate to flabellate, antennae attaining to the elytral apices in both sexes, with scaliform setae on antennomeres 3 to 11, acute angle between the vertex and frons planes (fastigium), relatively short pronotum with complete median suture, simple mesothoracic spiracles, present wedge cell of the metathoracic wing, absent plantar pads on tarsomeres 1 and 2, presence of a median longitudinal line on tergites, rigidly attached to each other valvifers and asymmetrical median piece of the aedeagus. It is quite different from *Mesolycus*, where the mentioned characters are in the opposite condition. The flabellate antennomeres 3 to 10, manifest in a number of representatives of *Dilophotes*, are obviously of no great taxonomic value as a character, not infrequently come across in the family, including *Mesolycus*, as one of the most widespread homoplasies.

***Dilophotes exilis* Waterhouse, 1878**

Dilophotes exilis Waterhouse, 1878: 116.

Specimens examined: Holotype, female, "Borneo", "*Dilophotes exilis* Waterh. (Type)" (Waterhouse's manuscript label) (NNHM).

Remarks

The holotype of *Dilophotes exilis* is a female belonging in the group characterized by the acute angle between the vertex and frons planes, relatively short pronotum, long, serrate to flabellate, antennae attaining the elytral apices in both sexes and other characters delineated above.

***Dilophotes basalis* Pic, 1943**

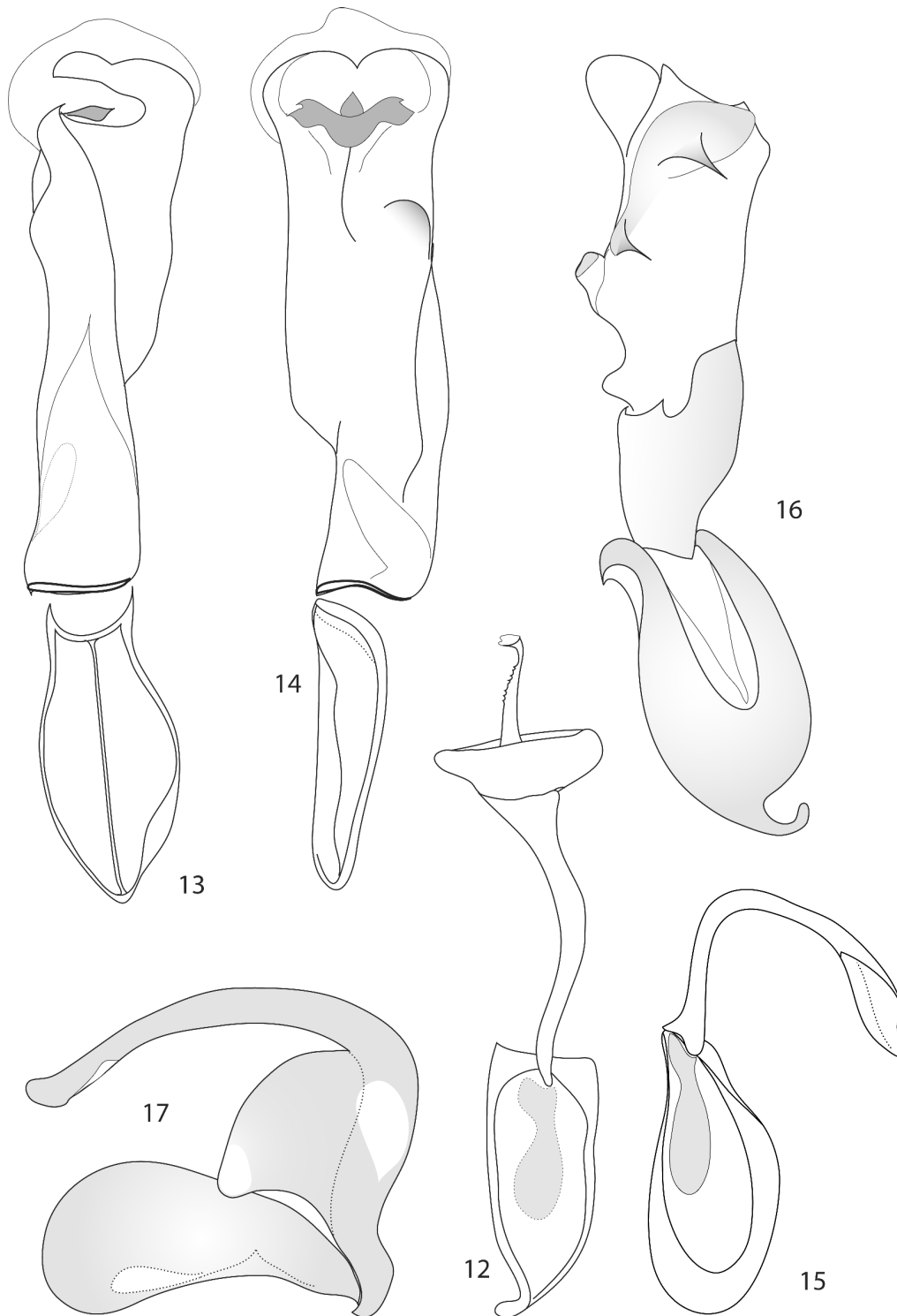
(Fig. 12)

Dilophotes basalis Pic, 1943: 14.

Specimens examined: Lectotype, hereby designated, male, "Malacca", "*Dilophotes basalis* sp. n." (Pic's manuscript label) (MNHM); male, Malaysia, Pahang, Lata Jarom, (20 km NW Raub), Gunung Benom, 350–550 m, 19–22.II.1995, M.Strba & R.Hergovits leg. (ICM).

Remarks

This is a uniformly dark brown species with a testaceous macula in the centre of the pronotum and light pubescence along the elytral costae.



FIGURES 12–17. Aedeagi of *Dilophotes* species. 12 — *D. basalis* Pic, dorsally; 13 — *D. pubescens* Pic, ventrally; 14 — same, laterally; 15 — *D. sexualis* (Pic), dorsally; 16 — *D. corporaali* Pic, ventrally; 17 — *D. luteus* Bic, laterally.

***Dilophotes pubescens* Pic, 1943**

(Figs. 13, 14)

Dilophotes pubescens Pic, 1943: 14.

Specimens examined: Lectotype, hereby designated, male, "Malacca", "*Dilophotes pubescens* sp. n." (Pic's manuscript label) (MNHM); female, Malaysia, Pahang, Taman Negara, env. Kuala-Tahan, 11–19.VI.1997, S.Kazantsev leg. (ICM).

Remarks

This uniformly black species is best distinguished from similarly coloured congeners by the details of the aedeagus (Figs. 13–14).

***Dilophotes sexualis* (Pic, 1925)**

(Fig. 15)

Dilophotes (Flabellodilophotes) sexualis Pic, 1925: 6.

Specimens examined: Holotype, male, "J.B. Corporaal, Sumatra's O.K., Lau Rakit, 300 m, 31.VIII.(19)21", "*Dilophotes (Flabellodilophotes) sexualis* sp. n." (Pic's manuscript label) (ZMAU); paratype, female, "J.B. Corporaal, Sumatra's O.K., Lau Rakit, 300 m, 31.VIII.(19)21", "*Dilophotes (Flabellodilophotes) sexualis* Pic" (Pic's manuscript label) (MNHM); male and female, E Sumatra, Riau Prov., Bukit Tigapuluh N.P., 0°50'S 102°26'E, 18–25.I.2000, D.Hauck leg. (ICM).

Remarks

Though *Flabellodilophotes* is hereby synonymized with *Mesolycus*, this species is transferred to *Dilophotes* due to the shape of the pronotum, long flabellate antennae and the structure of the aedeagus (Fig. 15).

***Dilophotes corporaali* Pic, 1921**

(Fig. 16)

Dilophotes corporaali Pic, 1921: 15.

Specimens examined: Lectotype, hereby designated, male, "J.B. Corporaal, Sumatra's O.K., Bandar Baroe, 850 m, 9.II.(19)21", "*Dilophotes Corporaali* sp. n." (Pic's manuscript label) (ZMAU); paralectotype, hereby designated, male, "Corporaal, Bandar Baroe, 4.II.1920", "*Dilophotes Corporaali* sp. n." (Pic's manuscript label) (MNHN).

Remarks

The Lectotype is hereby designated from the specimens deposited at the ZMAU, as the description (Pic, 1921) mentions the Corporaal collection, now in the ZMAU, first in the depositaries list.

***Dilophotes depressicornis* Pic, 1921**

(Figs. 1–11)

Dilophotes depressicornis Pic, 1921: 15.

Material studied: Holotype, male, "J.B. Corporaal, Sumatra's O.K., Bandar Baroe, 850 m, 10.II.(19)21", "*Dilophotes depressicornis* sp. n." (Pic's manuscript label) (ZMAU); male, "Corporaal, Sigh, 18.XII.1919", "?*Dilophotes depressicornis* Pic", "facies de *D. depressicornis*, mais probablement different" (Pic's manuscript labels) (MNHN); 5 males and 2 females, E Sumatra, Riau Prov., Bukit Tigapuluh N.P., 0°50'S 102°26'E, 18–25.I.2000, D.Hauck leg. (ICM).

Remarks

The fact that the description (Pic, 1921) mentions the Corporaal collection, now deposited at the ZMAU, as the only depositary of the type material probably indicates that it was based on one specimen; otherwise a second specimen would have been retained in the Pic collection.

***Dilophotes luteus* Bic, 2002**

(Fig. 17)

Dilophotes luteus Bic, 2002 : 22.

Specimens examined: male, Thailand bor. occ., Doi Suthep, 19–23.IV.1991, J.Farkac leg., male, N Thailand, Nan Prov., Doi Phu Kha, 700 m, 19°13'N 101°07'E, 22–26.IV.1999, D.Hauck leg. (ICM).

Remarks

This is the first record of this species from Thailand.

***Mesolytus* Gorham, 1883, nom. rev.**

Mesolytus Gorham, 1883: 398.

type species: *Mesolytus puniceus* Gorham, 1883: 399 [= *Eros atrorufus* Kiesenwetter, 1879: 305] (by original designation).

Flabellodilophotes Pic, 1912: 9, **syn. n.**

type species: *Dilophotes (Flabellodilophotes) obscurus* Pic, 1912: 9 (by original monotypy).

Dilophotellus Kleine, 1925: 134.

type species: *Dilophotellus tricostatus* Kleine, 1925: 135 (by original designation).

Biphilodes Kazantsev, 2000: 329, **syn. n.**

type species: *Dilophotes (Biphilodes) ilyai* Kazantsev, 2000: 329 (by original designation).

Redescription

Head transverse, slightly narrowed behind eyes. Frons plane at blunt angle with vertex. Gular area narrow, not separated by sutures (Fig. 18). Sub-antennal suture rudimentary, coronal suture incomplete (Fig. 20). Tentorium represented by a pair of posterior arms (Fig. 21). Labrum transverse, feebly emarginated medially, not rigidly attached to epistomal sulcus (Fig. 20). Eyes spherical. Mandibles evenly rounded (Figs. 18, 20). Maxillary palpi 4-segmented, with ultimate palpomere more or less parallel-sided and flattened at apex (Fig. 18). Mentum rudimentary, submentum present. Prementum undivided. Labial palpi 3-segmented, slender, ultimate palpomere more or less parallel-sided and flattened at apex (Fig. 19). Antennal prominence inconspicuous, antennal sockets more or less approximate (Fig. 20). Antennae 11-segmented, compressed from antennomere 3. Antennomere 2 small, transverse and more than 5 times shorter than antennomere 3. Antennal pubescence short and decumbent, sometimes with scaliform setae on antennomeres 3 to 11. Pronotum square or elongate, conspicuously produced anteriorly, with conspicuous hind angles; median suture manifest only in anterior half (Fig. 22). Prosternum narrow, Y-shaped, divided into median sclerite and lateral sulci (Fig. 22). Mesothoracic spiracles well sclerotized, hooded, not extending laterally beyond coxal line (Fig. 22). Mesoscutum composed of three basic sclerites, separated by prominent sutures, with scutellum relatively wide and feebly emarginate at apex (Fig. 23). Mesepimeron narrow (Fig. 24). Elytra slightly narrowing posteriorly, usually dehiscent behind middle, with three primary costae, costae 2 and 3 gradually weakening towards apex, costa 1 robust only basally, interstices with irregular reticulation; traces of a missing (primary) costa sometimes noticeable in close proximity of humerus; elytral pubescence uniform. Metathoracic spiracles well developed. Metathoracic wing with wedge cell absent (Fig. 25). Metasternal suture almost complete (Fig. 22); metendosternite simple, without arms (Fig. 26). Procoxae elongate, approximate distally; mesocoxae transverse, separated; metacoxae divided by sutures into presumably coxal, meral and trochantinal parts, with basal part similar to mesocoxa (Figs. 22, 27). Trochanters elongate, about 2 times longer than wide, but considerably shorter than femurs, connected to femurs apically; tibiae subequal in length to pertinent femurs, tibial spurs absent; tarsi narrow, tarsomeres 3 and 4 widened, plantar pads present on tarsomeres 1 to 4; all male claws bifid apically; female claws with acute tooth near base or in the middle. Abdominal spiracles located dorsally, relatively distant from the edge of sternites (Fig. 28); tergites without median longitudinal line. Ultimate female sternite without spiculum gastrale (Fig. 28). Male ultimate sternite with long, basally asymmetrical spiculum gastrale. Female genitalia with elongate styli, relatively short coxites and relatively

short free valvifers (Fig. 29). Aedeagus with symmetrical median lobe and internal sac structures and asymmetrical phallobase; inner sac structures often developed into movable upper and lower plates; median lobe provided apically with hood, often separated by suture (Figs. 30–47).

Remarks

Mesolycus is characterized by the following combination of characters: relatively short antennae hardly reaching over the elytral middle in both sexes, blunt angle between the vertex and frons planes, relatively long pronotum with anterior median suture, hooded mesothoracic spiracles, metathoracic wing with the absent wedge cell, usually present plantar pads on tarsomeres 1 and 2 (absent in *M. shelfordi*), absence of a median longitudinal line on tergites, free valvifers and symmetrical median piece, including the inner sac structures, of the aedeagus. The upper plate of the inner sac structures, the one adjacent to the hood of the median lobe (Figs. 42–46) is referred to by Bic (2002) as lower plate, though it reaches a position when it may be lower to the other plate only at one extreme of its up-and-down movement amplitude (Fig. 46).

The type specimen of the type species of *Flabellodilophotes*, *F. obscurus* Pic, has not been found at the Museum National d'Histoire Naturelle in Paris, where the Pic collection is located; nevertheless, its description indicates to characters (i.e. the large eyes that are wider than the pronotum, the latter being long and strongly produced anteriorly, the broad third male antennomere with the fourth and following ones flabellate) that rather confidently bring the species in question to *Mesolycus*. A male specimen from Western Sabah, Malaysia, a locality close to the type one (Brunei), agreeing with the above description, has also been found to belong to *Mesolycus*. The flabellate antennae of *M. obscurus* (Pic), comb. nov. (though reaching the elytral apices, as in *Dilophotes*) are a widespread homoplasy in the Lycidae, and, as not supported by other possible apomorphies, do not allow regarding the taxon as a valid genus/subgenus. Therefore, I am inclined to consider *Flabellodilophotes* a junior synonym of *Mesolycus*.

Biphilodes introduced as a subgenus of *Dilophotes* on the basis of reduction of elytral costa 1, now, with more material available, was found to be synonymous with *Mesolycus*. The aforesaid reduction, though more or less manifest in all allied species, appeared to lie within limits of infraspecific variability. Certain peculiarities of the aedeagi of the *ilyai* species group evidently do not justify separation of the clade at the subgenus level.

***Mesolycus pygmaeus* (Waterhouse, 1879), comb. nov.**

Dilophotes pygmaeus Waterhouse, 1879: 76.

Specimens examined: Holotype, female, "Type", "Borneo", "*Dilophotes pygmaeus* Waterh. (Type)" (Waterhouse's manuscript label) (NNHM).

Remarks

Dilophotes pygmaeus, the type of which has been studied, is a *Mesolycus* species.

***Mesolycus shelfordi* (Bourgeois, 1906), comb. nov.**

(Figs. 18–31)

Dilophotes shelfordi Bourgeois, 1878: 194.

Specimens examined: female, "Kina-Balu-Geb., 1500 m, Coll. Waterstrandt", "*Dilophotes Shelfordi* Brg." (Pic's manuscript label); male and 6 females, "Pontianak, Borneo" (MNHM and ICM).

***Mesolycus obscurus* (Pic, 1912), comb. nov.**

(Figs. 32–35)

Flabellodilophotes obscurus Pic, 1912: 9.

Specimens examined: male, N Borneo, Kinabalu, 1500–1700 m, 17–18.VI.1995, S.Kazantsev; male, E Sumatra, Riau Prov., Bukit Tigapuluh N.P., 0:50'S 102:26'E, 18–25.I.2000, D.Hauck leg. (ICM).

Remarks

The type of this taxon was not found at the Museum National d'Histoire Naturelle in Paris. A male *Mesolycus* specimen from Kinabalu in Western Sabah, a locality close to the type one (Brunei), agreeing with the description of *F. obscurus* and assumed to belong to this species, is illustrated (Figs. 32–35).

***Mesolycus discoidalis* (Pic, 1921), comb. nov.**

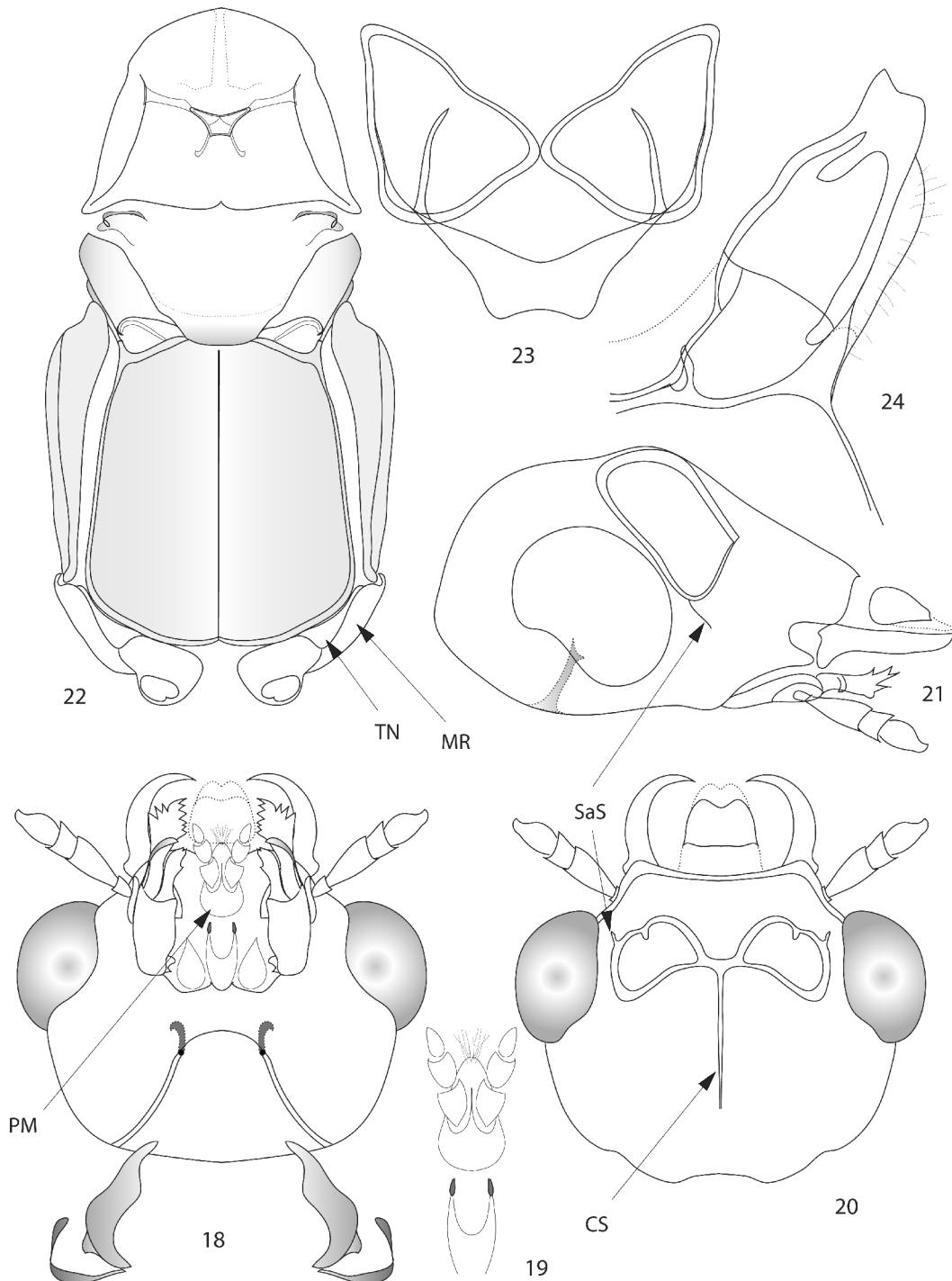
(Figs. 36–37)

Dilophotes discoidalis Pic, 1921: 15.

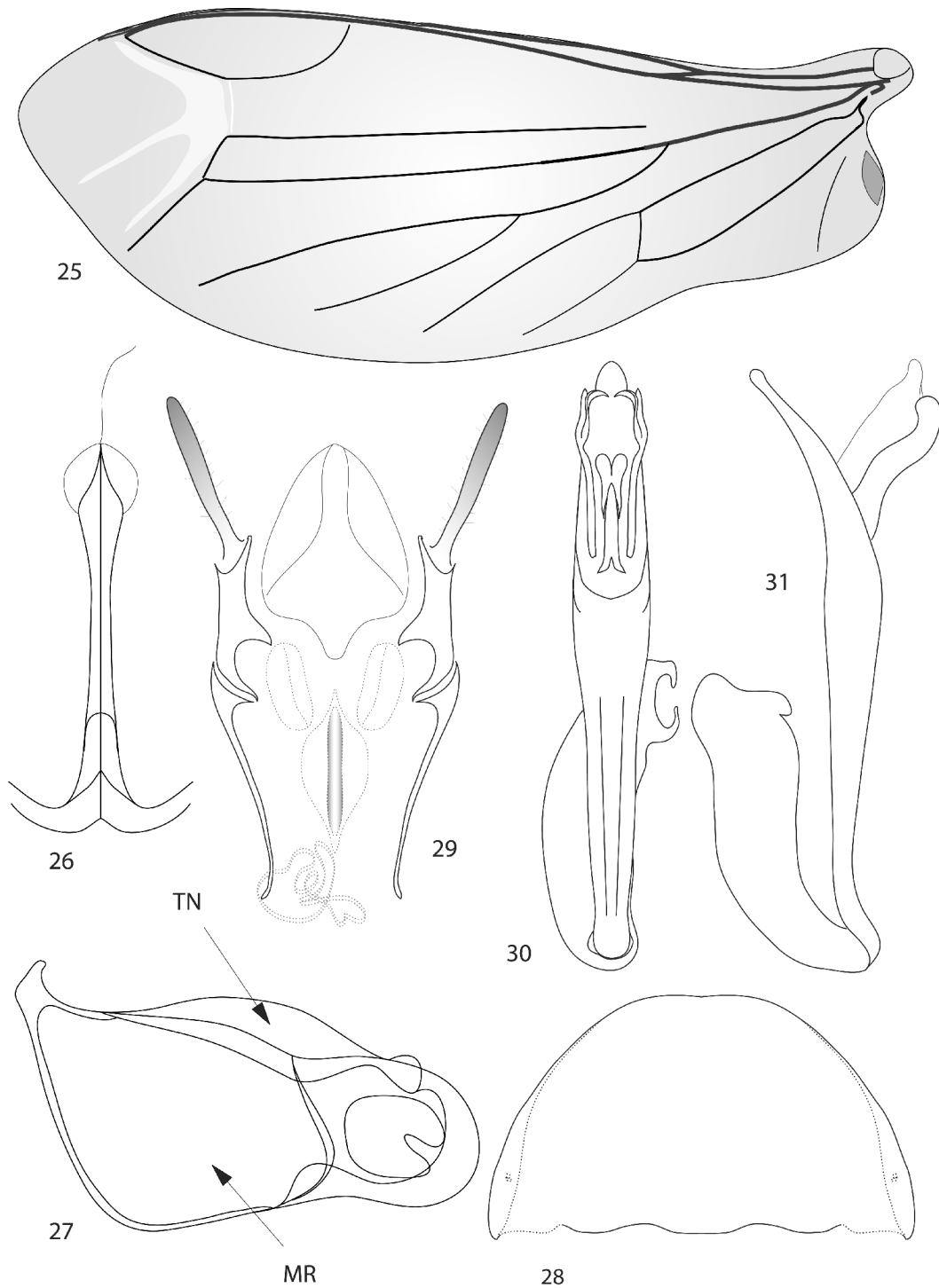
Specimens examined: Lectotype, hereby designated, male, "Borneo", "*discoidalis* sp. n." (Pic's manuscript label) (MNHM).

Remarks

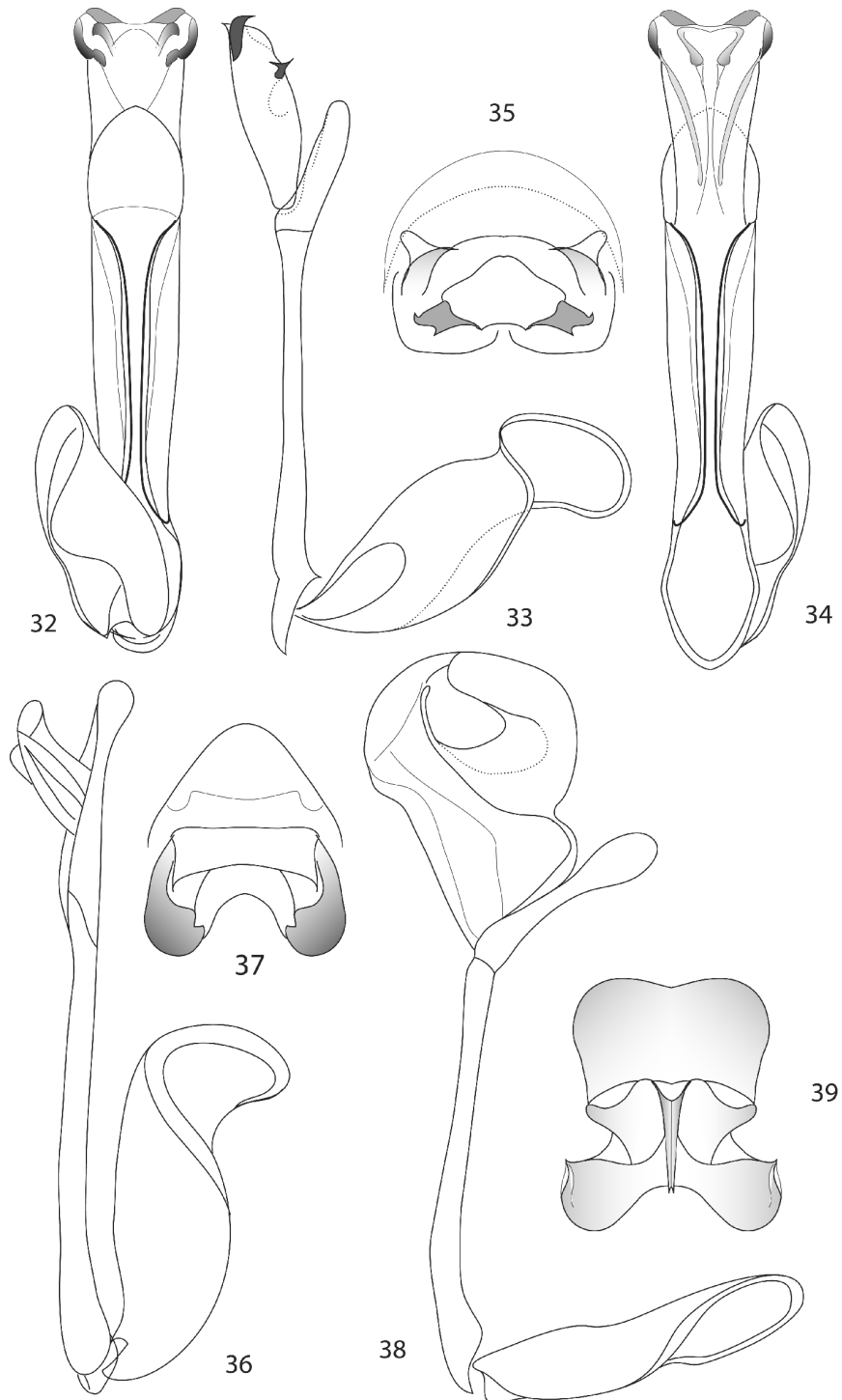
This small *Mesolycus* species is uniformly black except the testaceous elytral suture immediately behind the scutellum.



FIGURES 18–24. Details of *Mesolycus shelfordi* (Bourgeois). 18 — head, ventrally; 19 — labium; 20 — head, dorsally; 21 — head, laterally; 22 — thorax, ventrally; 23 — mesoscutum, internally; 24 — mesepimeron and mesepisternum, internally. CS — coronal suture; MR — meron; PM — prementum; SaS — sub-antennal suture; TN — trochantin.



FIGURES 25–31. Details of *Mesolycus shelfordi* (Bourgeois). 25 — metathoracic wing; 26 — metendosternite; 27 — metacoxa, internally; 28 — female ultimate sternite; 29 — female genitalia; 30 — aedeagus, ventrally; 31 — same, laterally. MR — meron; TN — trochantin.



FIGURES 32–39. Aedeagi of *Mesolycus*. 32 — *M. obscurus* (Pic), dorsally; 33 — same, laterally; 34 — same, ventrally; 35 — same, apically; 36 — *M. discoidalis* (Pic), laterally; 37 — same, apically; 38 — *M. vitalisi* Pic, laterally; 39 — same, inner sac structures, apically.

***Mesolycus vitalisi* Pic, 1923**

(Figs. 38–39)

Mesolycus vitalisi Pic, 1923: 11.

Specimens examined: Lectotype, hereby designated, female, "Chapa", "type", "*Mesolycus*" (Pic's manuscript labels), "*Mesolycus vitalisi* Pic" (Marie's manuscript label) (MNHM); 3 males and female, "Chapa" (MNHN and ICM); male and female, Vietnam, Mts W Chapa, Fan-Si-Pan, 2100 m, 2.VI.1963, O.Kabakov leg.; female, Vietnam, Lao Cai Prov., Sa Pa Distr., Fan-Si-Pan Mt., 1900–2500 m, 20.IV.–9.V.1999, N.L.Orlov leg. (ZIN and SVK).

Remarks

In addition to the genital structure (Figs. 38–39) this relatively large species belonging in the *atrорufus* group is distinguishable by its uniform orange-red upperside.

Mesolycus ater* (Pic, 1943), comb. nov.Dilophotes ater* Pic, 1943: 14.

Specimens examined: Lectotype, hereby designated, female, "Malacca", "*Dilophotes ater* sp. n." (Pic's manuscript label) (MNHM).

Remarks

This large uniformly black female specimen unquestionably belongs to *Mesolycus*.

***Mesolycus mediozonatus* Nakane, 1955, stat. nov.**

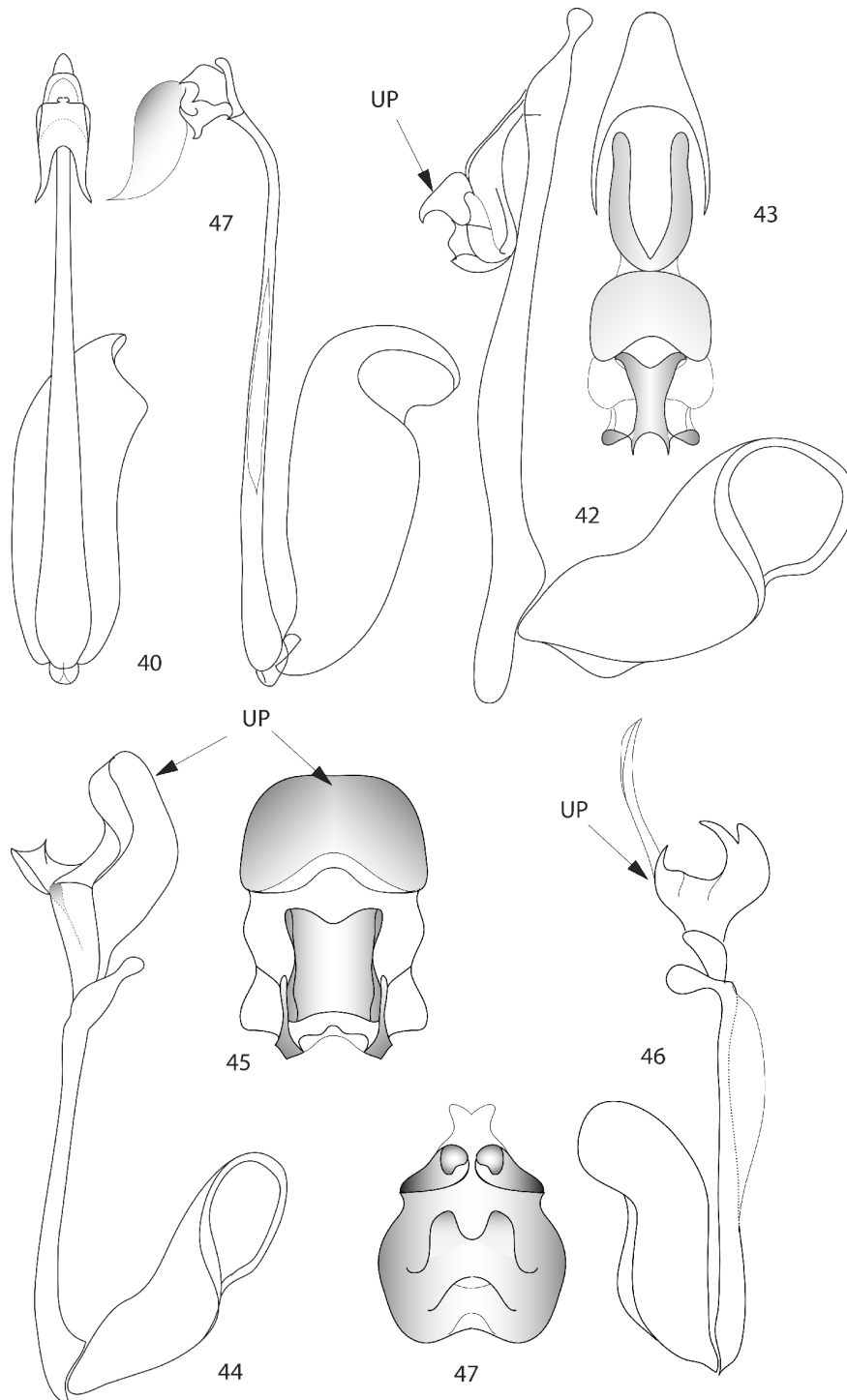
(Figs. 40–41)

Mesolycus atrорufus var. *mediozonatus* Nakane, 1955: 35.

Specimens examined: male, Japan, Mt. Zohzu, Kagawa, 15.VI.1962, H.Toshima leg.; female, Mt. Hohoh, Yamanashi, 25.VI.1962, H.Toshima leg. (SVK).

Remarks

M. mediozonatus differs from *M. atrорufus* (Kiesenwetter) by the darkened apices of the elytra and the shape of the aedeagus (Figs. 40–41).



FIGURES 40–47. Aedeagi of *Mesolycus*. 40 — *M. mediozonatus* Nakane, ventrally; 41 — same, laterally; 42 — *M. hubeicus* sp. nov., laterally; 43 — same, inner sac structures, apically; 44 — *M. nanensis* sp. nov., laterally; 45 — same, inner sac structures, apically; 46 — *M. murzini* sp. nov., laterally; 47 — same, inner sac structures, apically. UP — upper plate.

***Mesolycus ilyai* (Kazantsev, 2000), comb. nov.**

Dilophotes (Biphilodes) ilyai Kazantsev, 2000: 329.

Dilophotes moxiensis Bic, 2002: 17, **syn. n.**

Specimens examined: Holotype, male, China, C Sichuan, Xiling Snow Mts, 2750 m, 12–20.VII.1999, S.Kazantsev leg.; male and female, China, Sichuan, Gonggashan, Daxueshan Mts, W Moxi, 3200 m, 29°34'N 101°59'E, 20–21.VII.2000, A.Plutenko leg. (SVK).

Remarks

These two taxa appeared to be synonymous.

***Mesolycus qinlinganus* (Kazantsev, 2000), comb. nov.**

Dilophotes qinlinganus Kazantsev, 2000: 330.

Remarks

Due to a proofreading error wrong figures were referred to this species in Kazantsev (2000). Correct figures should be 7–8. Therefore, all references to *Dilophotes qinlinganus* in Bic (2002) should be attributed to *Dilophotes berezowskii*, and vice versa.

***Mesolycus berezowskii* (Kazantsev, 2000), comb. nov.**

Dilophotes berezowskii Kazantsev, 2000: 331.

Remarks

Due to a proofreading error wrong figures were referred to this species in Kazantsev (2000). Correct figures read 5–6. Therefore, all references to *Dilophotes berezowskii* in Bic (2002) should be attributed to *Dilophotes qinlinganus*, and vice versa.

***Mesolycus hubeicus* sp. nov.**

(Figs. 42–43)

Description

Male. Black. Pronotum, scutellum and elytra dark red.

Head slightly convex and feebly grooved behind antennal prominence. Eyes relatively small (interocular distance about 4 times as long as the radius). Ultimate joint of maxillary palpi parallel-sided and about 2 times longer than palpomere 3. Antennae slightly reaching

over elytral two thirds, with antennomere 3 and following antennomeres subequal in length to each other and about 1.3 times longer than scape.

Pronotum slightly transverse, 1.1 times wider than long, trapezoidal, with conspicuous median carina in anterior half; hind angles acuminate and produced latero-posteriorly. Scutellum square, almost parallel-sided, slightly rounded and feebly emarginate at apex. Elytra long, 3.25 times longer than wide humerally, slightly widening posteriorly, not dehiscent. Dense pubescence short and decumbent.

Metatrochanters with blunt posterior angles.

Aedeagus with relatively small hood of the median lobe (Figs. 42–43).

Length: 9.0 mm. Width (humerally): 2.2 mm.

Female. Unknown.

Type material

Holotype male: China: W Hubei, Dashennongjia Mts., 2000 m, 31.5°N 110.3°E, 21–24.VI.2001, O.Safranek leg. (ICM).

Diagnosis

Mesolycus hubeicus sp. nov. belongs in the *atrorufus* group of species, being close to *M. tibetanus*, from which it differs by the structures of the inner sac (Figs. 42–43).

Etymology

Named after the province in Central China, where the species is distributed.

***Mesolycus nanensis* sp. nov.**

(Figs. 44–45)

Description

Male. Black. Pronotum, scutellum and elytra brick-red.

Head slightly convex and feebly grooved behind antennal prominence. Eyes relatively small (interocular distance about 3 times as long as radius). Palps relatively long, ultimate joint of maxillary palpi cylindrical, flattened and tapering apically and about 1.5 times longer than palpomere 3. Antennae slightly reaching over elytral middle, with antennomere 3 and following antennomeres subequal in length to each other and about 1.3 times longer than scape.

Pronotum slightly transverse, 1.1 times wider than long, trapezoidal, with conspicuous median carina in anterior half; hind angles acuminate and produced latero-posteriorly. Scutellum square, almost parallel-sided, slightly rounded and feebly emarginate at apex.

Elytra very long, 4.25 times longer than wide humerally, parallel-sided, slightly dehiscent behind middle. Dense pubescence short and decumbent.

Metatrochanters with blunt posterior angles.

Aedeagus with prominent inner sac structures (Figs. 44–45).

Length: 8.0 mm. Width (humeraly): 1.6 mm.

Female. Unknown.

Type material

Holotype male: N Thailand, Nan Prov., Dai Phu Kha, 700 m, 19°13'N 101°07'E, 22–24.IV.1999, D.Hauck leg. (ICM).

Diagnosis

Mesolycus nanensis sp. nov. belongs in the *atrufus* group of species, being close to *M. vitalisi*, from which it differs by the structures of the inner sac (Figs. 44–45).

Etymology

Named after the province in North Thailand, where the species is distributed.

***Mesolycus murzini* sp. nov. (Figs. 46–47)**

Description

Male. Black. Pronotum reddish brown, elytra red.

Head slightly convex and shining behind antennal prominence. Eyes relatively small (interocular distance over 2 times longer than radius). Ultimate joint of maxillary palpi cylindrical, flattened and tapering apically and about 2 times longer than palpomere 3. Antennae slightly reaching over elytral two thirds, with antennomere 3 and following antennomeres subequal in length to each other and about 1.3 times longer than scape.

Pronotum square, parallel-sided, with conspicuous median carina in anterior half; prominent hind angles acute and produced latero-posteriorly. Scutellum square, almost parallel-sided, slightly rounded and feebly emarginate at apex.

Elytra long, 4 times longer than wide humeraly, slightly widening posteriorly, feebly dehiscent behind the middle. Dense pubescence short and decumbent.

Metatrochanters with blunt posterior angles.

Aedeagus with elongate narrow upper portion of the inner sac (Figs. 46–47).

Length: 7.0 mm. Width (humeraly): 1.5 mm.

Female. Unknown.

Type material

Holotype male: N Myanmar (Burma), 50 km E Putao, env. Nan Thi, 950 m, 11–16.V.1998, S.Murzin leg. (ICM).

Diagnosis

Mesolycus murzini sp. nov. belongs in the *atrufus* group of species, being separable

from Burmese species of *Mesolycus* (Kleine, 1939) by coloration and differing from all congeners by the structures of the inner sac (Figs. 46–47).

Etymology

Named in honour of Dr. Sergey Murzin, Moscow, who collected the unique specimen of this beautiful species.

Further taxa that have to be transferred to *Mesolycus* from *Dilophotes* are: *M. tibetanus* (Kazantsev, 2000), **comb. nov.**, *M. sausai* (Bic, 2002), **comb. nov.**, *M. laosensis* (Bic, 2002), **comb. nov.**, *M. bolavensis* (Bic, 2002), **comb. nov.**, *M. jendeki* (Bic, 2002), **comb. nov.**, *M. holzschuhi* (Bic, 2002), **comb. nov.**, *M. bhutanensis* (Bic, 2002), **comb. nov.**

***Calcaeron* gen. nov.**

Type species: *Calcaeron sundaicus* sp. nov. (present designation)

Description

Head transverse, slightly narrowed behind eyes, conspicuously wider than pronotal anterior margin. Frons plane at blunt angle with vertex. Labrum transverse, feebly emarginated medially, not rigidly attached to epistomal sulcus. Eyes spherical. Mandibles small, evenly rounded. Palpomeres slender, with ultimate segment narrowed and glabrous at apex; maxillary palpi 4-segmented, labial palpi 3-segmented. Prementum undivided. Antennal prominence inconspicuous, antennal sockets more or less approximate. Antennae 11-segmented, compressed from antennomere 3; antennomeres 3 to 11 almost parallel-sided. Antennomere 2 small, transverse and about 5 times shorter than antennomere 3. Antennal pubescence short and decumbent, with scaliform setae on antennomeres 3 to 11. Pronotum elongate, conspicuously produced anteriorly, with conspicuous hind angles; median suture manifest only in anterior half. Mesothoracic spiracles well sclerotized, not extending laterally beyond coxal line. Scutellum relatively wide, more or less parallel-sided and almost not emarginate at apex. Mesepimeron narrow. Elytra slightly narrowing posteriorly, dehiscent behind middle, with three primary costae, costae 2 and 3 gradually weakening towards apex, costa 1 robust only basally, interstices with irregular reticulation; elytral pubescence uniform. Procoxae elongate, approximate distally; mesocoxae transverse, separated; metacoxae divided by sutures into presumably coxal, meral and trochanteral parts, with coxal/basal part similar to mesocoxa. Trochanters elongate, about 2 times longer than wide, but considerably shorter than femurs, connected to femurs apically; tibiae almost straight, subequal in length to pertinent femurs; protibiae with large inner unpaired spur (Fig. 48), other tibial spurs absent; tarsi narrow, tarsomere 4 slightly widened, plantar pads on tarsomeres 1 to 4, tarsomeres 1 and 2 with apical plantar pad; male claws feebly bifid apically (Fig. 49). Male ultimate sternite with long, basally asymmetri-

cal spiculum gastrale (Fig. 50). Aedeagus with symmetrical median lobe and sclerotized internal sac and asymmetrical phallobase (Figs. 51–54).

Diagnosis

Calcaeron gen. n., being undoubtedly closely related to *Mesolycus*, can be easily separated by the conspicuous unpaired protibial spur (Fig. 48).

Etymology

Derived from the Latin "calcar" for "spur". Gender masculine.

***Calcaeron sundaicus* sp. nov.**

(Figs. 48–52)

Description

Male. Dark brown. Elytral costae and suture basally and trochanter-femoral joints testaceous.

Head feebly grooved behind antennal prominence. Eyes relatively large (interocular distance about twice as long as the radius). Ultimate joint of maxillary palpi about 3 times longer than palpomere 3. Antennae slightly reaching over elytral middle, with antennomere 3 and following antennomeres subequal in length to scape.

Pronotum elongate, 1.2 times longer than wide, anterior half roughly punctured, with conspicuous median carina; lateral margins parallel-sided, with hind angles acute and moderately produced latero-posteriorly. Scutellum square, parallel-sided, rounded and finely emarginate at apex.

Elytra long, 3.5 times longer than wide humerally, almost parallel-sided, interstices with 2 to 3 rows of irregular punctures. Dense pubescence short and decumbent.

Metatrochanters with blunt posterior angles.

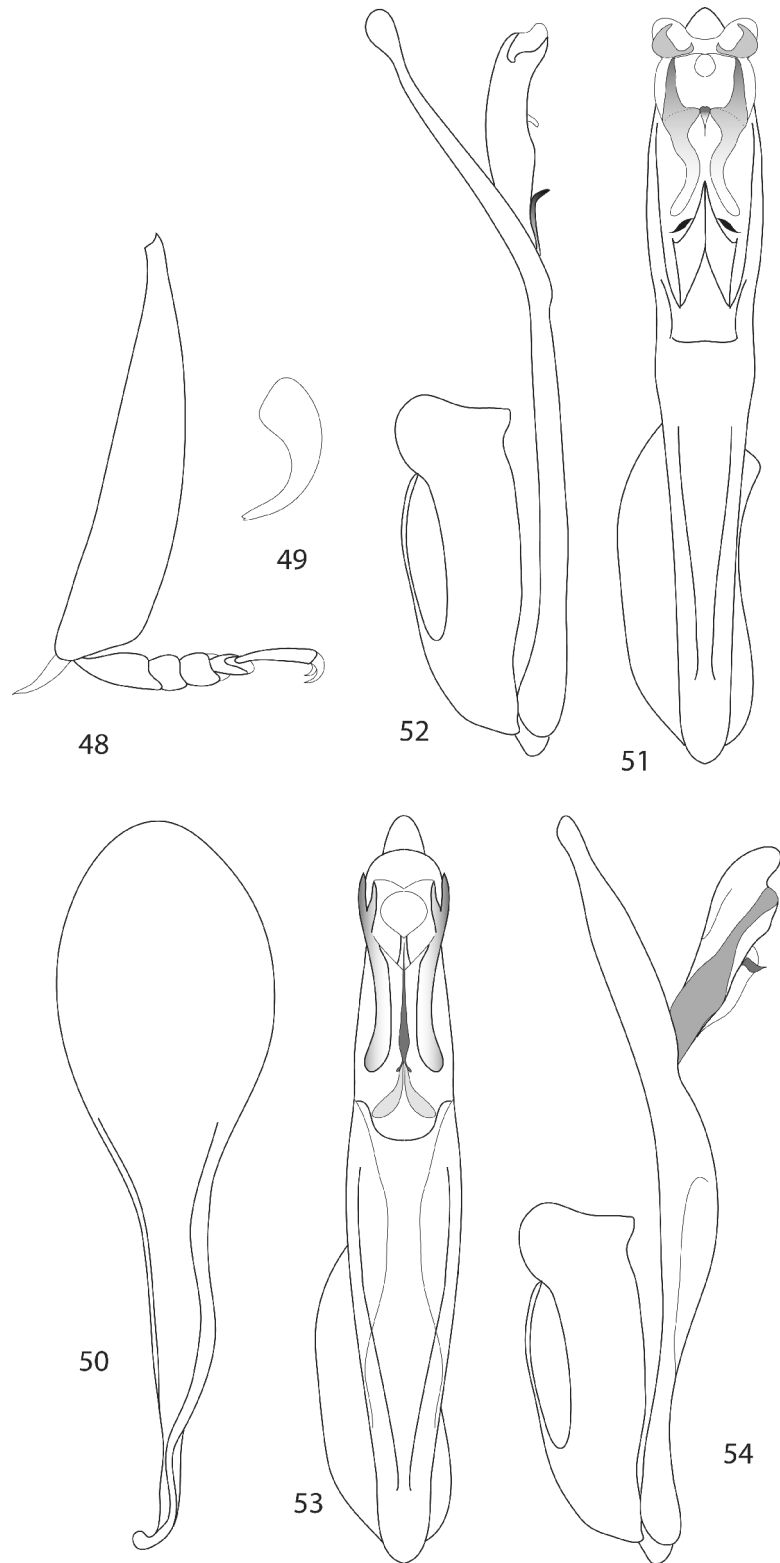
Aedeagus with straight median lobe and relatively short narrow inner sac (Figs. 51–52).

Length: 4.8–5.1 mm. Width (humerally): 1.1–1.2 mm.

Female. Unknown.

Type material

Holotype male: Malaysia, Pahang/Johor, Endau-Rompin N.P., Salendang, 100 m, 28.II–12.III.1995, M.Strba & R.Hergovits leg.; paratype male: E Malaysia: Sabah, Mt. Kinabalu, 1600 m, 16–30.VII.2002, S.Kurbatov & S.Zimina (ICM); paratype male: "Mana-Riang (Sumatra), Ranau, Palembang, April 90.2-3000', T.Z.Kannegieter" (MNHN).



FIGURES 48–54. Details of *Calcaeron* gen. nov. 48 — *C. sundaicus* sp. nov., male, protibia; 49 — same, protarsal claw; 50 — same, ultimate sternite; 51 — same, aedeagus, dorsally; 52 — same, laterally; 53 — *C. baluensis* sp. nov., male, aedeagus, dorsally; 54 — same, laterally.

Diagnosis

Calcaeron sundaicus sp. nov. differs from *C. baluensis* sp. nov., the second known *Calcaeron* species, by the structures of the inner sac (Fig. 51–52).

Etymology

Named after the Great Sunda region, where the species is distributed.

***Calcaeron baluensis* sp. nov.**

(Figs. 53–54)

Description

Male. Dark brown. Elytral costae and suture basally and trochanter-femoral joints testaceous.

Head feebly grooved behind antennal prominence. Eyes relatively large (interocular distance about twice as long as the radius). Ultimate joint of maxillary palpi about 3 times longer than palpomere 3. Antennae slightly reaching over elytral middle, with antennomere 3 and following antennomeres subequal in length to scape.

Pronotum elongate, 1.25 times longer than wide, anterior half roughly punctured, with conspicuous median carina; lateral margins parallel-sided, with hind angles acute and moderately produced latero-posteriorly. Scutellum square, parallel-sided, rounded and finely emarginate at apex.

Elytra long, 3.9 times longer than wide humerally, almost parallel-sided, interstices with 3 to 4 rows of irregular punctures. Dense pubescence short and decumbent.

Metatrochanters with blunt posterior angles.

Aedeagus with widened median lobe and relatively short narrow inner sac (Figs. 53–54).

Length: 5.2 mm. Width (humerally): 1.2 mm.

Female. Unknown.

Type material

Holotype male: N Borneo, Kinabalu, 1500–1700 m, 17–18.VI.1995, S.Kazantsev (ICM).

Diagnosis

Calcaeron baluensis sp. nov. differs from *C. sundaicus* sp. nov. by the structures of the inner sac of the aedeagus (Figs. 53–54).

Etymology

Named after the type locality, Kinabalu, in Sabah, East Malaysia.

Phylogeny

For a cladistic analysis the Phylip PARS program, version 3.6, was used, with *Calopteron* Guérin-Méneville, 1830 chosen as the outgroup, as possessing a number of hypothetically plesiomorphic conditions in the selected characters, including the prementum. PARS is a general parsimony program, which carries out the Wagner parsimony method with multiple states. The program assumes that the ancestral condition of characters is unknown.

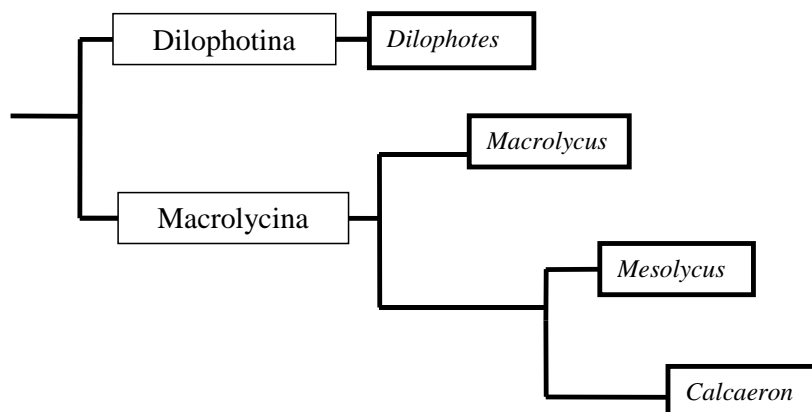
The following set of characters was selected:

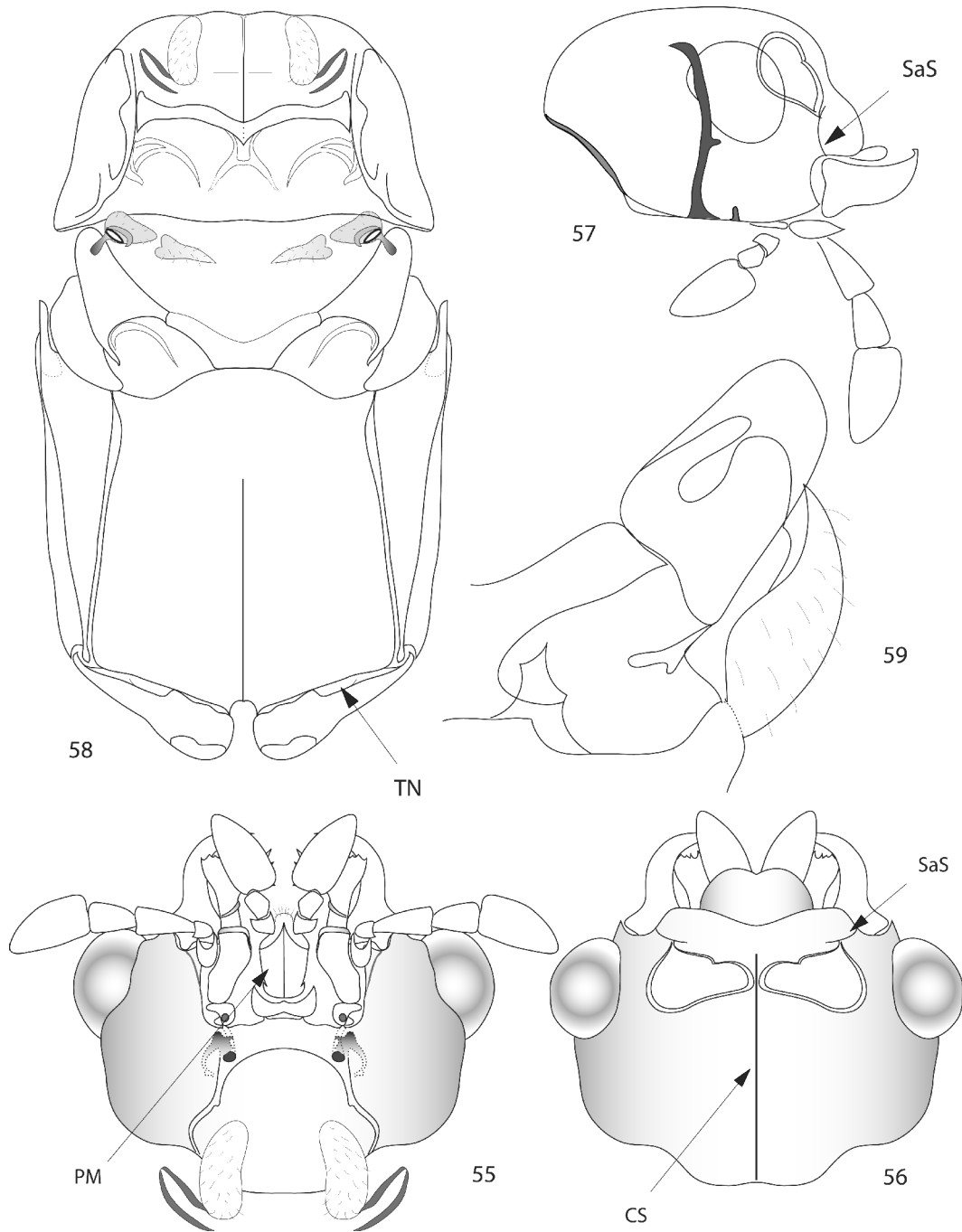
1. Ventral tentorial arms: 1, minute; 2, long or having anterior processes.
2. Coronal suture: 0, complete; 1, incomplete.
3. Fastigium: 0, acute; 1, blunt.
4. Labrum: 0, bilobed; 1, at most emarginate anteriorly.
5. Mandibles: 1, minute, not exceeding length of maxillary palps; 2, relatively large, longer than maxillary palps.
6. Ultimate labial palpomere: 0, pointed, 1, distally flattened and more or less dilated.
7. Prementum: 0, separated; 1, divided by median suture; 2, fused. Condition 0 found in *Calopteron* and condition 1 in *Macrolycus*.
8. Prosternum: 0, divided into prosternum proper and sternopleural processes; 1, fused into a single sclerite. Condition 0 was found in *Mesolycus* (Fig. 22).
9. Mesepimeron connected with metasternum: 1, by means of a narrow projection of marginal sulcus of metasternum, 2, directly. Condition 1 was found in *Mesolycus* (Fig. 24).
10. Posterior process of mesoscutellum: 0, vestigial, not locking the elytra; 1, functional, locking the elytra.
11. Elytron: 0, with longitudinal veins and regular transverse reticulation; 1, with longitudinal veins, but without regular transverse reticulation.
12. Elytral suture margin, beyond scutellar area: 0, unmodified; 1, with membranous flange.
13. Metasternal posterior angles: 0, rounded; 1, acute.
14. Metasternal suture: 0, complete, reaching mesosternum; 1, not reaching mesosternum.
15. Metendosternite: lateral arms: 0, absent; 1, present. Condition 0 was found in *Mesolycus* (Fig. 26).
16. Mesothoracic spiracles: 0, simple; 1, hooded dorsally.
17. Metathoracic wing venation: wedge cell: 0, present; 1, absent. Condition 0 was found only in *Dilophotes* (Fig. 3).
18. Metathoracic wing venation: cu-a connection: 0, absent; 1, present. Condition 0 was found in *Macrolycus* and *Mesolycus* (Fig. 25).
19. Metacoxal meral suture: 0, complete; 1, conspicuous, but incomplete; 2, vestigial or absent. Condition 0 observed in *Mesolycus* and *Dilophotes* (Figs. 4–5).
20. Tibial spurs: 0, absent; 1, present on protibae as one unpaired spur; 2, present on all

Dilophotina Kleine, 1928, nom. rev., the latter including just one genus, *Dilophotes*. The holophyly of Dilophotina is supported by two presumed apomorphies, the present wedge cell (Fig. 3) and the median longitudinal suture in all tergites, though the latter may prove to be a plesiomorphy when a comprehensive study of the morphology of the family is carried out. Such characters, as the acute fastigium, simple mesothoracic spiracles and present cu-a connection on the metathoracic wing, also distinguishing Dilophotina, appear plesiomorphic, as shared by *Calopteron*. The holophyly of Macrolycina is supported by the hooded mesothoracic spiracles (Figs. 22, 58) and the absent cu-a connection on the metathoracic wing (Fig. 25), hypothesized to be its apomorphies.

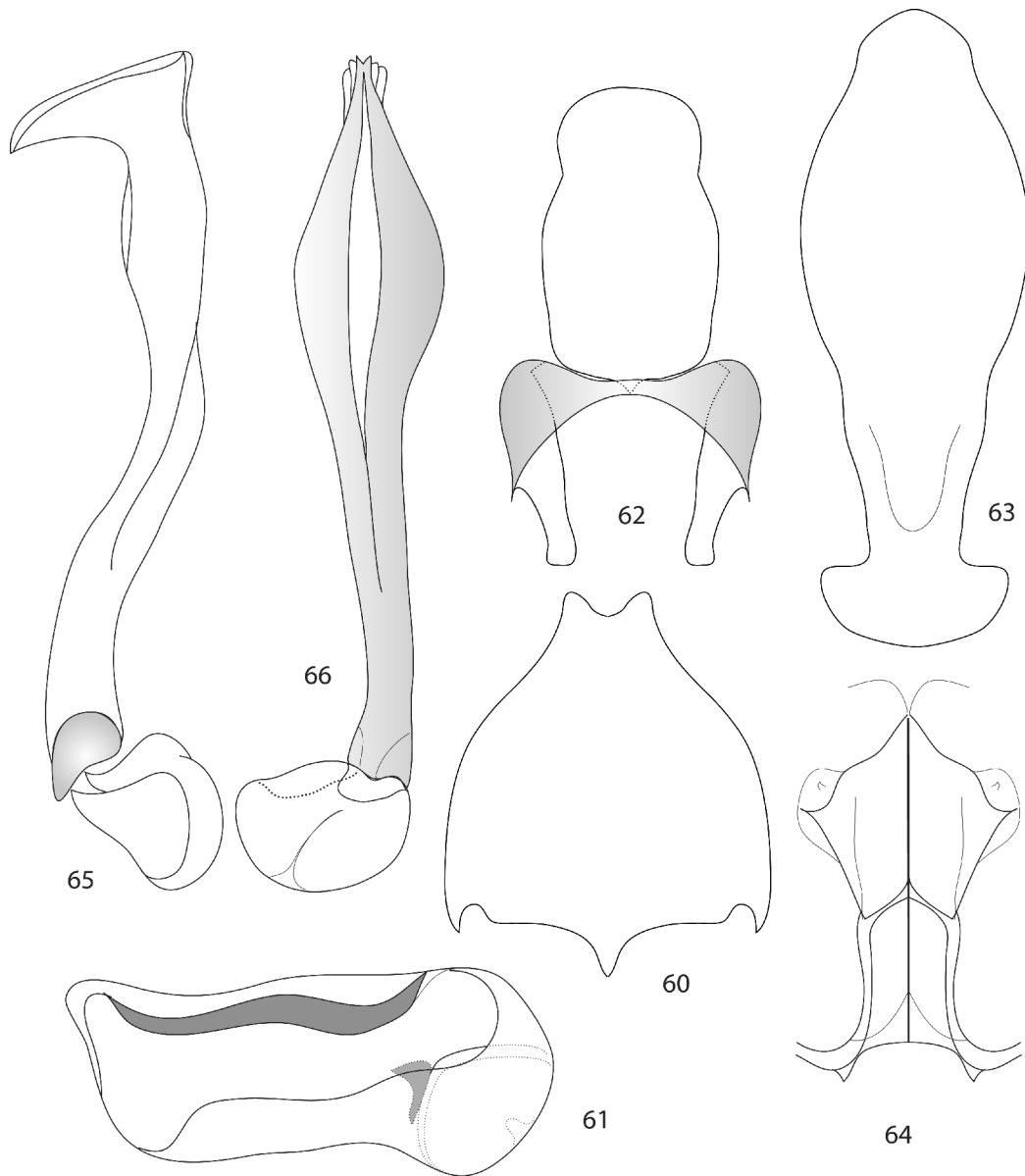
On the other hand, Dilophotina does share some morphological features with *Macrolycus* and the allied genera, as opposed to the bulk of the Lycidae, i.e. presence of the coronal and sub-antennal sutures (Figs. 56–57), presence of the median longitudinal pronotal carina (Fig. 58), bifid claws of all tarsi and asymmetrical phallobase. Of these, however, only the bifid claws are unique for the tribe and are hypothesized to be its apomorphy. The conspicuous dissimilarities of the structure of the labium (Figs. 19, 55), mesepimeron (Figs. 24, 59), metendosternite (Figs. 26, 64), metacoxae (Figs. 22, 27, 61) and male genitalia (Figs. 30–47, 65–66) within the Macrolycina are perhaps accounted for by the persistence of plesiomorphic conditions in certain taxa. The division of the metacoxa into three sclerites (Figs. 4, 5, 22, 27), as well as the absent tibial spurs appear to be symplesiomorphies of Dilophotina and Macrolycina. At the same time the apomorphies of the *Macrolycus* lineage within the Macrolycina are the vestigial meral suture of the hind coxae and, presumably, the conspicuous tibial spurs, while the holophyly of *Mesolycus-Calcaeron* is supported by the fused prementum and reduction of the number of elytral primary costae to three. Within the *Mesolycus-Calcaeron* lineage, the holophyly of *Calcaeron* is supported by the conspicuous unpaired protibial spur, such structure unknown elsewhere in the family (Fig. 48).

Thus, the hypothesized phylogeny tree of Macrolycini will be as follows:





FIGURES 55–59. Details of *Macrolycus flabellatus* (Motschulsky). 55 — head, ventrally; 56 — head, dorsally; 57 — head, laterally; 58 — thorax, ventrally; 59 — mesepimeron and mesepisternum, internally. CS — coronal suture; PM — prementum; SaS — sub-antennal suture; TN — trochantin.



FIGURES 60–66. Details of *Macrolycus flabellatus* (Motschulsky). 60 — metendosternite; 61 — metacoxa, internally; 62 — male ultimate tergites; 63 — male ultimate sternite; 64 — female ultimate sternite; 65 — aedeagus, laterally; 66 — same, ventrally.

A Key to Genera of Macrolycini

1. Prementum divided by median suture (Fig. 55), metacoxa divided into two sclerites (Figs. 58, 61), each elytron with four more or less conspicuous primary costae *Macrolycus*

- Prementum undivided (Fig. 19), metacoxa divided into three sclerites (Figs. 4, 5, 22, 27), each elytron with three more or less conspicuous primary costae 2
- 2. Coronal and sub-antennal sutures complete (Fig. 1), fastigium acute, antennae reaching elytral apices, pronotum transverse, prothoracic wing with wedge cell closed (Fig. 3), tergites with median longitudinal line, valvifers distally articulated to each other (Fig. 9), median piece and inner sac structures of aedeagus asymmetrical (Figs. 10–17) *Dilophotes*
- Coronal and sub-antennal sutures reduced (Figs. 20–21), fastigium blunt (Fig. 21), antennae usually hardly attaining to elytral two thirds, pronotum more or less elongate, prothoracic wing with wedge cell absent (Fig. 25), median longitudinal line on tergites absent, valvifers free (Fig. 29), median piece and inner sac structures of aedeagus symmetrical (Figs. 30–47) 3
- 3. Tibial spurs absent *Mesolycus*
- Protibiae with conspicuous inner unpaired spur (Fig. 48) *Calcaeron*

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