

Synopsis of the genus *Limnichomorphus*, with description of two Oriental and Palaearctic species (Coleoptera: Limnichidae)

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Hernando, C. & Ribera, I. 2004. Synopsis of the genus *Limnichomorphus*, with description of two Oriental and Palaearctic species (Coleoptera: Limnichidae). *Entomol. Probl.* 34(1–2): 37–45. – The genus *Limnichomorphus* PIC and its two known species (*L. curtulus* PIC from Vietnam and *L. ohbayashii* SATÔ from the Ryukyu archipelago) are re-described, and their male and female genitalia figured for the first time. Lectotype and Paralectotypes are designated for *L. curtulus*. The genus is placed in a newly characterised “*Limnichus* group of genera” based on external and genital characters, including (in addition to *Limnichus* LATREILLE) the genera *Geolimnichus* HERNANDO & RIBERA, *Limnichoderus* CASEY and *Limnichomorphus* PIC. Two new species of *Limnichomorphus* are described, *L. puetzi* sp.nov. from Nepal, and *L. ciampori* sp.nov. from Borneo. The two species are characterised by their external morphology and male genitalia.

Key words: Coleoptera, Limnichidae, *Limnichomorphus*, Oriental and Palaearctic realms, new species, lectotype designation.

Introduction

The genus *Limnichomorphus* was briefly described by PIC (1922) for a single species from Tonkin (currently Vietnam), *L. curtulus* PIC. Subsequently, SATÔ (1966), in a revision of the Japanese Limnichidae, described the second species of the genus, *L. ohbayashii* SATÔ. In his original description, PIC (1922) placed the new genus close to *Limnichus* LATREILLE, from which it could be separated by the general body shape: “J’ établis ce genre pour une petite espèce courte et trapue, ayant la tête très rentrée dans le prothorax, celui-ci un peu échancré en avant, l’écusson peu distinct. – A placer près de *Limnichus* Latr.”. SATÔ (1966) presented some additional diagnosis characters such as the presence of a transverse series of punctures close to the anterior margin of the pronotum (actually a series of small tubercles, see below), and the elytral pubescence, consisting of short, recumbent setae.

Here we re-describe the genus and the two known species, figuring their male and female genitalia for the first time, and designate a Lectotype and Paralectotypes for *L. curtulus*. In addition, we place *Limnichomorphus* in the newly defined “*Limnichus* group of genera” within the Limnichinae, and describe two new species from Nepal and Borneo.

Material

The studied material is deposited in the following institutions and private collections:

CHB Coll. C. Hernando, Barcelona, Spain

CKE Coll. Andreas Kopetz, Erfurt, Germany
CPE Coll. A. Pütz, Eisenhüttenstadt, Germany
MNHN Muséum national d’Histoire Naturelle, Paris, France
NMW Naturhistorisches Museum, Vienna, Austria
NKE Naturkundemuseum, Erfurt, Germany

***Limnichomorphus* PIC**
(Figs 1–29)

Type species. *Limnichomorphus curtulus* PIC by monotypy.

Diagnosis. Habitus as in Figs 1–2. *Limnichomorphus* can be characterised by the following character combination: 1) body shape short and very convex, almost hemispherical in some species; 2) Antennae with 11 antennomeres; short, not reaching base of pronotum; not pedunculated; three last segments symmetrical, forming a loose club; inserted in prothorax when folded; 3) Head with supraocular depressions; 4) Pronotum transverse; with a transverse series of small tubercles close to anterior margin; base slightly sinuate, firmly inserted in scutellar area; 5) Dorsal surface covered with short, recumbent pubescence; 6) Protibiae with a pre-apical comb of spines on anterior face (Fig. 5); 7) Prosternal cavity in mesosternum semicircular; 8) Prothoracic hypomera with a basal depression for insertion of anterior legs, delimited by anterior transverse carinae; 9) Metasternum, metepisternum, mesoepimerum, mesopisternum and base of epipleura sulcate for insertion of median legs; 10) Three first ventrites connate; first, and in some species second, ventrite excavated for reception of posterior legs (Figs 10, 16, 22, 28); 11) Medial part of



Figs 1, 2. Habitus of *Limnichomorphus* spp.: 1) *L. puetzi* sp.nov.; 2) *L. ciampori* sp.nov. (photographs by Fedor Čiampor).

posterior margin of last abdominal sternite with a small (in some species almost imperceptible) semicircular emargination, either with a denticle or a small medial protuberance; 12) Aedeagus trilobed; parameres articulated with an apical membranous lamina with specific differences; phallobase asymmetrical (Figs 6, 12, 18, 24); 13) Genital segment membranous except for the margin of basal third, which is strongly sclerotised; slightly asymmetrical; apex narrower and with long setae; with two lateral expansions strongly sclerotised, articulated to lamina of genital segment approximately at the middle (Figs 8, 14, 20, 26); 14) Ovipositor with gonocoxal valvae straight; convergent at apex; apex of strouts longer than base of the gonocoxites (Fig. 3); spiculum ventrale “Y” shaped, with two apical branches fused in a single membrane (Fig. 4).

Sexual dimorphism: males with glandular pores in the 3rd to 5th ventrites (depending on the species), except *L. curtulus*, which does not have any (only visible with transmission microscope) (Figs 10, 16, 22, 28).

Ecology. The scarce ecological data on the species of the genus seem to point towards a terrestrial habitat, sometimes linked to forest litter. *Limnichomorphus ohbayashii* was collected with Berlese funnels in forest litter, and *L. ciampori* sp.nov. among vegetation debris and forest litter around fallen trees. On the contrary, *L. puetzi* sp.nov. seems to have a riparian habit (or at least linked to the proximity of water). There are no data with reference to the habitat of *L. curtulus*.

Distribution. The genus has a wide distribution in the Oriental and the SE of the Palaearctic regions, from central Nepal in the west to the Ryukyu archipelago in the east and Borneo in the south. However, the four known species have reduced and widely disjointed distributions: *L. curtulus* and *L. puetzi* sp.nov. are only known from the type localities (in Vietnam and central Nepal, respectively), *L. ciampori* sp.nov. is known from two nearby localities in the NE of Borneo, and *L. ohbayashii* from several localities in the small island of Iriomote, usually considered to be in the limit of the Palaearctic region, but which an aquatic beetle fauna clearly of Oriental origin (M. A. Jäch, in litt.,

2004). The small size and somewhat cryptic habitat of the species of the genus could be the reason for these apparently reduced distributions. It is expected that a more comprehensive research on the microcoleopterous forest litter fauna of the Oriental region would reveal the existence of new populations of the same species, as well as a number of unknown ones.

Systematic placement. The genus *Limnichomorphus* has to be included in the subfamily Limnichinae, as it has five-segmented tarsi and, excavated ventral surface for the reception of the femora and tibiae (profemora on the hypomera, mesofemora on the metasternum, metafemora on the first ventrite) (HINTON 1939; WOOLDRIDGE 1975). Within the Limnichinae, a group of genera could be defined based on the following exclusive characters (*Limnichus* group of genera): 1) Antennae with 11 antennomeres, the last three forming a loose club; 2) head with supraocular depressions for the reception of the antennal club; 3) protibiae with a pre-apical comb of spines on the external surface (Fig. 5); and 4) male genital segment with apical setae (Figs 8, 14, 20, 26). This group of genera includes *Limnichus* LATREILLE (widely distributed through the Old World), *Limnichoderus* CASEY (Nearctic and Neotropical); *Geolimnichus* HERNANDO & RIBERA (Afrotropical) and *Limnichomorphus*. The genus *Chibidoronus* SATÔ (a single species in the Ryukyu Islands, Japan, SATÔ 1966) most likely belongs to the same group, although no material could be studied. These four genera can be separated through the following key.

Key to the *Limnichus* group of genera

- 1 Dorsal pubescence long and erect, without short, recumbent setae. Base of pronotum straight, not inserted in the scutellar area. Ovipositor with curved, divergent gonocoxite valves; strouts with apex bifurcated, dorsal branch longer than base of the gonocoxites. Spiculum ventrale “Y” shaped, with membranous expansions of the two apical branches not fused *Geolimnichus*
- Dorsal surface covered with short, recumbent setae; either with or without long erect setae. Base of pronotum sinuate, strongly inserted in the scutellar area. Ovipositor with straight gonocoxite valves, strouts not bifurcated. Spiculum ventrale “Y” shaped, with the membranous expansions of the two apical branches fused ... 2
- 2 Prosternal apophysis with a longitudinal sulcus *Limnichoderus*
- Prosternal apophysis without longitudinal sulcus 3
- 3 General body shape elongated, oval. Dorsal surface with double pubescence: one formed by short, recumbent setae and another by disperse long, erect setae. Pronotum trapezoidal. Anterior margin of pronotum without series of small tubercles. Apex of strouts truncated, not extending longer than base of gonocoxites ... *Limnichus*
- General body shape almost spherical. Dorsal surface with short, recumbent setae only. Pronotum transverse. Anterior margin of pronotum with a series of small

tubercles. Apex of strouts longer than base of gonocoxites *Limnichomorphus*

Key to the species of *Limnichomorphus*

- 1 Second ventrite with a shallow depression for the insertion of the metatarsi (Figs 10, 16). Elytral pubescence forming a zigzag pattern 2
- Second ventrite with deep, well defined sulci for the insertion of the metatarsi (Figs 22, 28). Elytral pubescence regularly arranged, not forming well defined patterns 3
- 2 Body shape slightly more elongated. Elytra with strong humeral callus. Metasternal wings well developed. Disk of metasternum punctured. Metacoxae with a transverse series of regular punctures. First ventrite with intermetacoxal plate elongated, almost parallel-sided, only curved at the apex (Fig. 11). Sternites with coarse, dense punctures. Males without glandular pores on the ventrites (Fig. 10). Last ventrite emargination with a prominent medial denticle (Fig. 10). Aedeagus as in Figs 6, 7 *L. curtulus*
- Body shape almost perfectly hemispherical. Elytra without humeral callus. Metasternal wings absent. Disk of metasternum without punctures. Metacoxae densely and irregularly punctured. First ventrite with intermetacoxal plate with sides regularly curved (Fig. 17). Sternites with coarse, sparse punctures. Males with glandular pores on the ventrites 3 to 5 (Fig. 16). Last ventrite with a small, almost imperceptible emargination with a medial protuberance (Fig. 16). Aedeagus as in Figs 12, 13 *L. ohbayashii*
- 3 Prosternal apophysis narrow and without border; flat in lateral view. Disk of the metasternum strongly punctured. Male ventrites 4 and 5 with glandular pores (Fig. 22). Aedeagus as in Figs 18, 19 *L. puetzi* sp.nov.
- Prosternal apophysis broad and strongly bordered; concave in lateral view. Disk of the metasternum not punctured. Male ventrites 3 to 5 with glandular pores (Fig. 28). Aedeagus as in Figs 24, 25 *L. ciampori* sp.nov.

Limnichomorphus curtulus Pic (Figs 3–4, 6–11)

Limnichomorphus curtulus Pic, 1922: 4

Type locality. Vietnam, Hoa-Binh.

Type material. Lectotype (MHNP) by present designation: “Hoo-Binh [currently Hoa-Binh] / Tonkin”; “Type [hw]”; “TYPE” [red printed label]; “Muséum Paris / Coll. M. Pic”; “*Limnichomorphus* / n.g. / *curtulus* n. sp. [hw]”. **Paralectotypes** 1 male, 1 female (MHNP) (both specimens dissected, genitalia glued in a transparent card in the same pin) with same label data as lectotype. In the original description, Pic (1922) does not specify the number of specimens, the depository of the material, or the precise locality (“Tonkin”). We have examined all the material identified as *L. curtulus* in the Pic collection in the MNHP, but it is still possible (although not likely) that other material (from the same or a different locality) exists. We therefore designate a Lectotype to fix the concept of the species.

Description. Length 1.4–1.5 mm (head excluded); maximum width 1.0–1.1 mm. Body elongated, oval. Elytra dark brown, head and pronotum black. Dorsal surface covered with silvery, short and dense recumbent pubescence; elytral pubescence with an alternate orientation, forming a zigzag. Anterior margin of pronotum curved; anterior angles prominent; transverse series of small tubercles on anterior margin not very apparent. Elytra with humeral callus. Metasternal wings well developed. Prosternal apophysis with fine punctation; surface among punctures smooth and shiny. Metasternum with fine, but well impressed punctures, sparse on disk; surface among punctures microreticulated. Metacoxae with a transverse, regular series of punctures. Surface of sternites with strong, contiguous punctation, with a rugose aspect. Without glandular pores on ventrites (Fig. 10). First ventrite with intermetacoxal plate triangular, with sides almost straight, curved only at apex (Fig. 11). Second abdominal sternite with shallow, not well defined depressions for reception of metatarsi (Fig. 10). Distal emargination of last ventrite with a prominent medial denticle (Fig. 10).

Aedeagus as in Figs 6, 7. Median lobe as long as parameres, and as long as phallobase. Membranous apex of parameres strongly curved inwards, almost reaching median lobe.

Genital segment as in Figs 8, 9. Apex broad, with long, straight, sparse setae, close to lateral margin.

Habitat. Unknown.

Distribution. So far known only from the type locality.

Limnichomorphus ohbayashii SATÔ (Figs 5, 12–17)

Limnichomorphus ohbayashii SATÔ, 1966: 58

Type locality. Japan, Ryukyu Islands, Iriomote-jima Island.

Material examined. 4 exx. (CHB): “[IRIOMOTE I.] / Trans-island / Road nr. Otomi / 40m alt. 12. X. / 1988 M. Sakai”; “Leaf Litter”; “*Limnichomorphus* / *ohbayashii* / M. Satô / Det. M. Satô, 1993”.

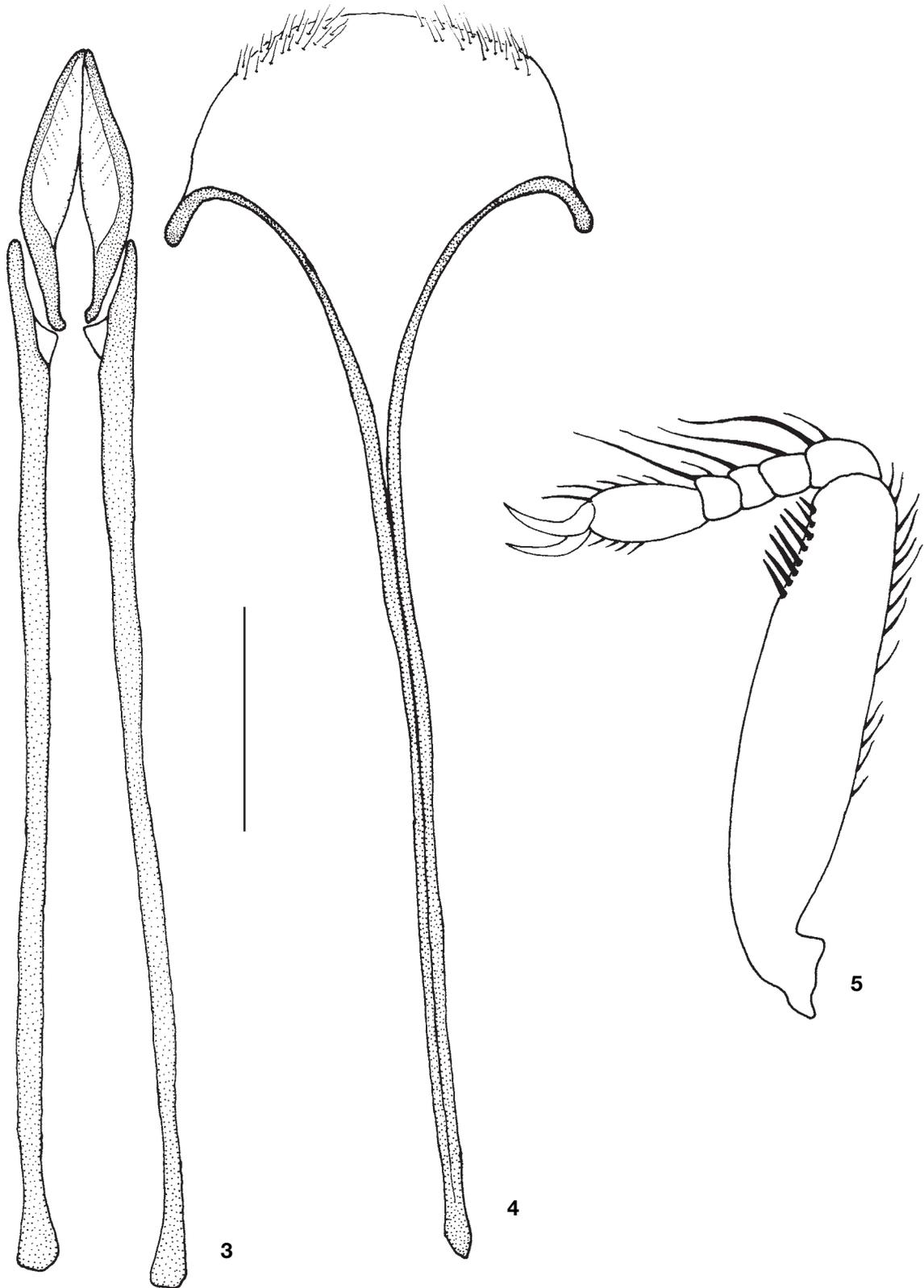
Description. Length 1.1–1.2 mm (head excluded); maximum width 0.9 mm. Body almost spherical. Dorsal surface black, head appendices and legs brown. Surface covered with silvery, short and dense recumbent pubescence; elytral pubescence with an alternate orientation, forming a zigzag. Anterior margin of pronotum straight; anterior angles not prominent; transverse series of small tubercles on anterior margin well developed. Elytra without humeral callus. Metasternal wings absent. Prosternal apophysis with coarse, dense punctation; punctures almost contiguous, with a rugose appearance. Metasternum without punctures on disk, with only a weak microreticle. Metacoxae densely and irregularly punctated. Surface of sternites with strong, sparse punctation. Males with glandular pores on ventrites 3, 4 and 5 (Fig. 16). First ventrite with intermetacoxal plate triangular, with sides regularly curved (Fig. 17). Second abdominal sternite with shallow,

not well defined depressions for reception of metatarsi (Fig. 16). Last ventrite with a small, almost imperceptible emargination with a medial protuberance (Fig. 16).

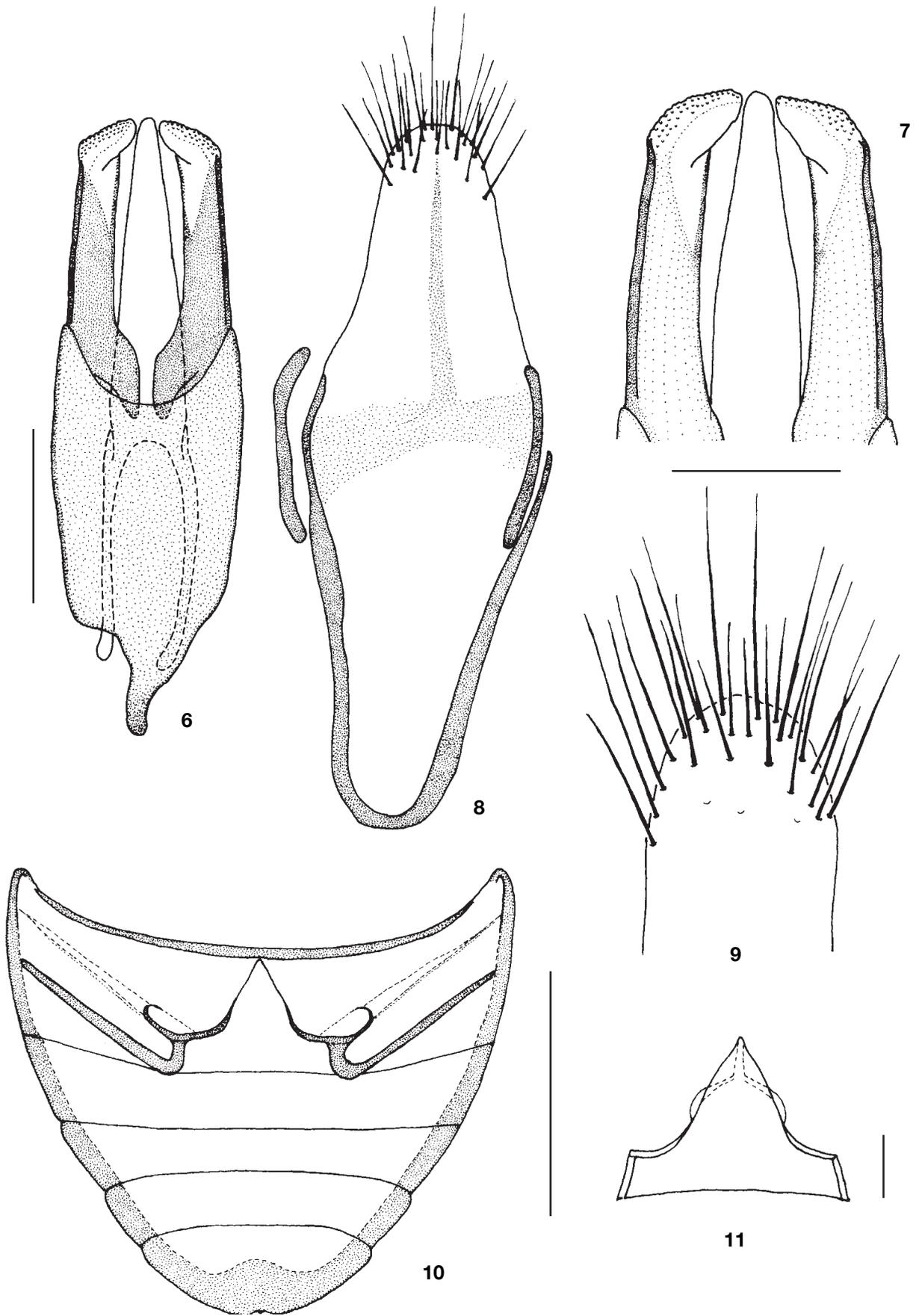
Aedeagus as in Figs 12, 13. Median lobe shorter than parameres; parameres as long as phallobase. Membranous

apex of parameres slightly curved inwards, well separated from median lobe.

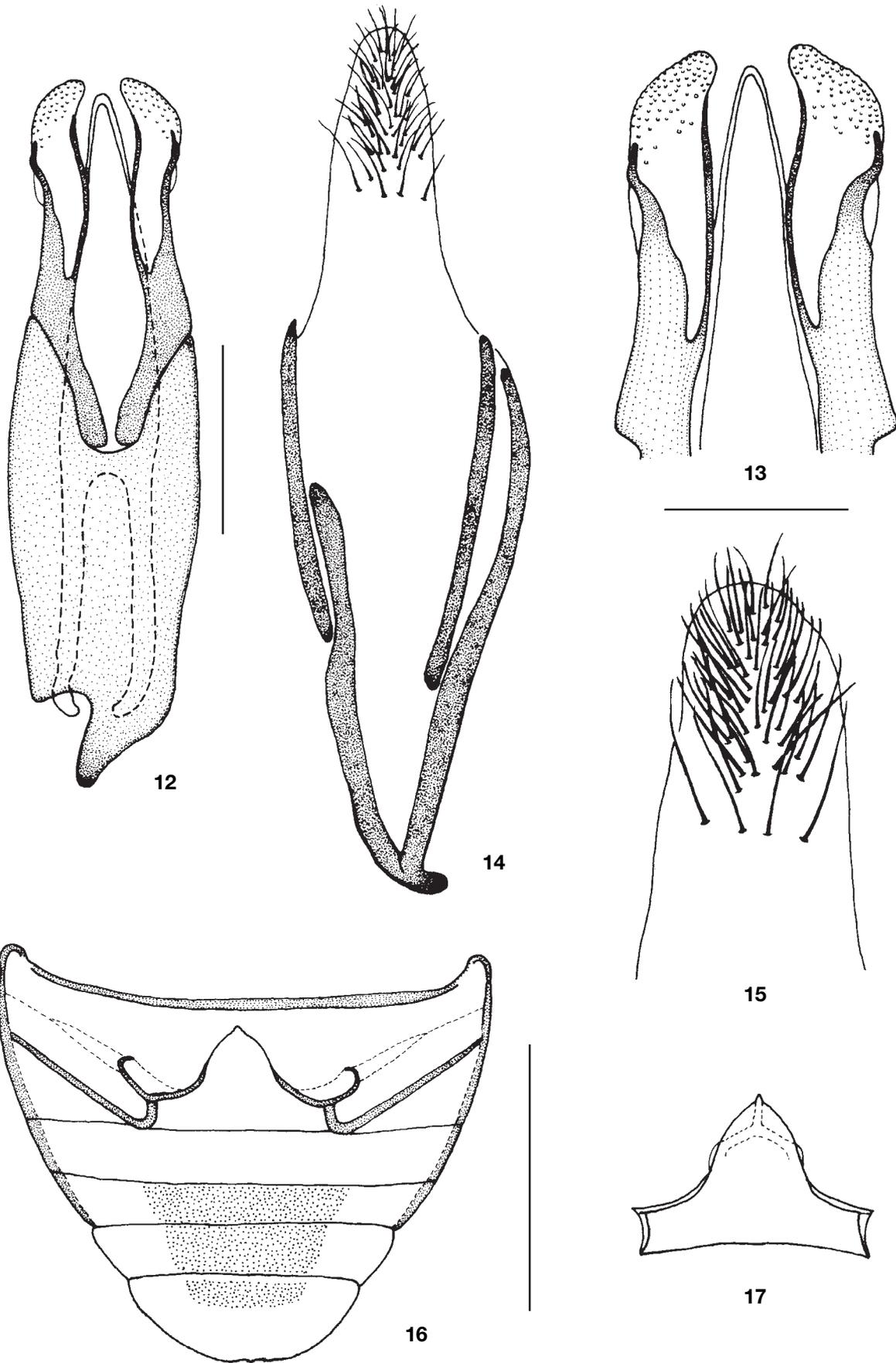
Genital segment as in Figs 14, 15. Apex narrow, with long, curved, dense setae; covering most of apex from margins to internal side.



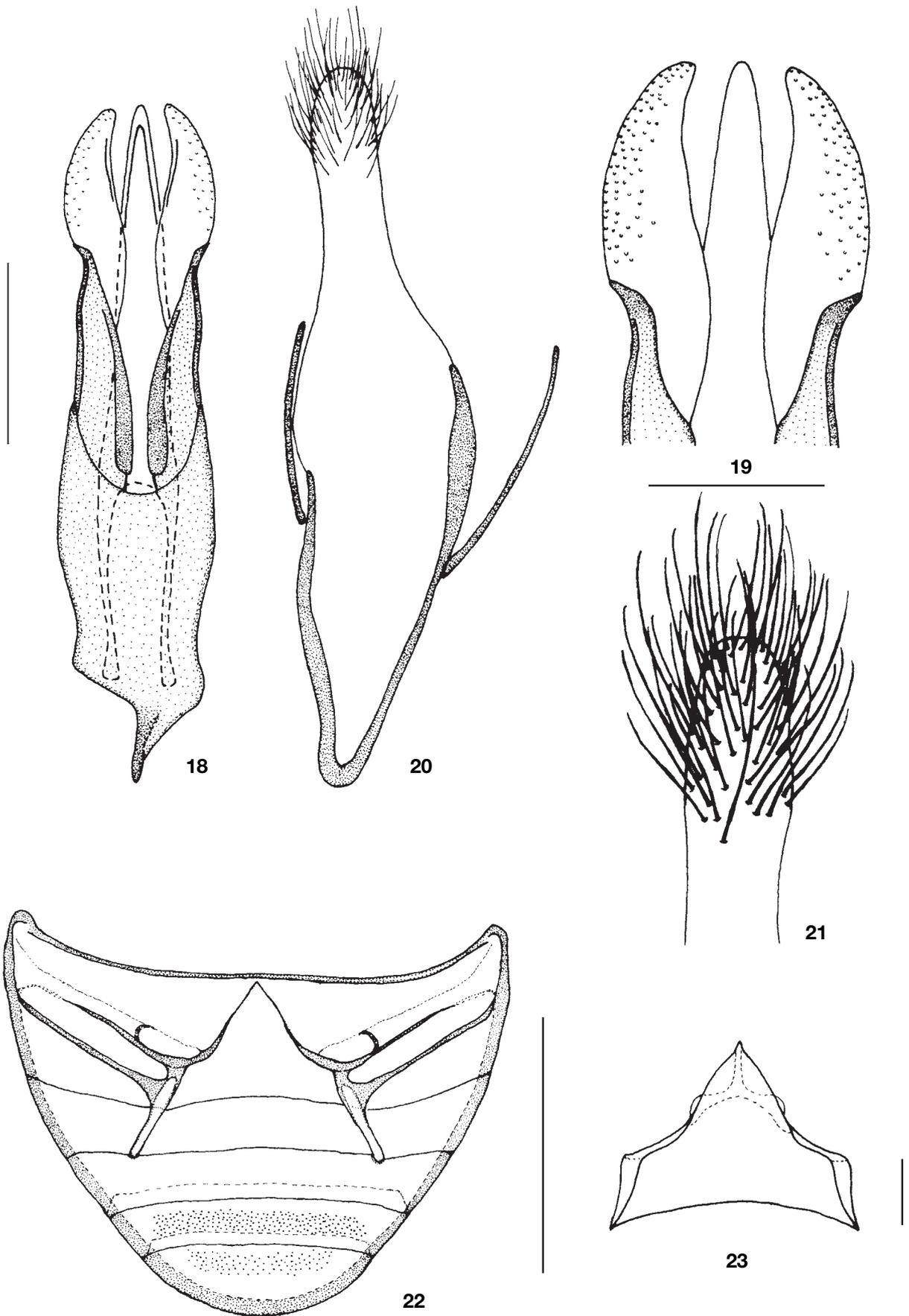
Figs 3–5: 3) Ovipositor of *L. curtulus*; 4) spiculum ventrale of *L. curtulus*; 5) anterior leg of *L. ohbayashii*. Scale bars: 0.1 mm.



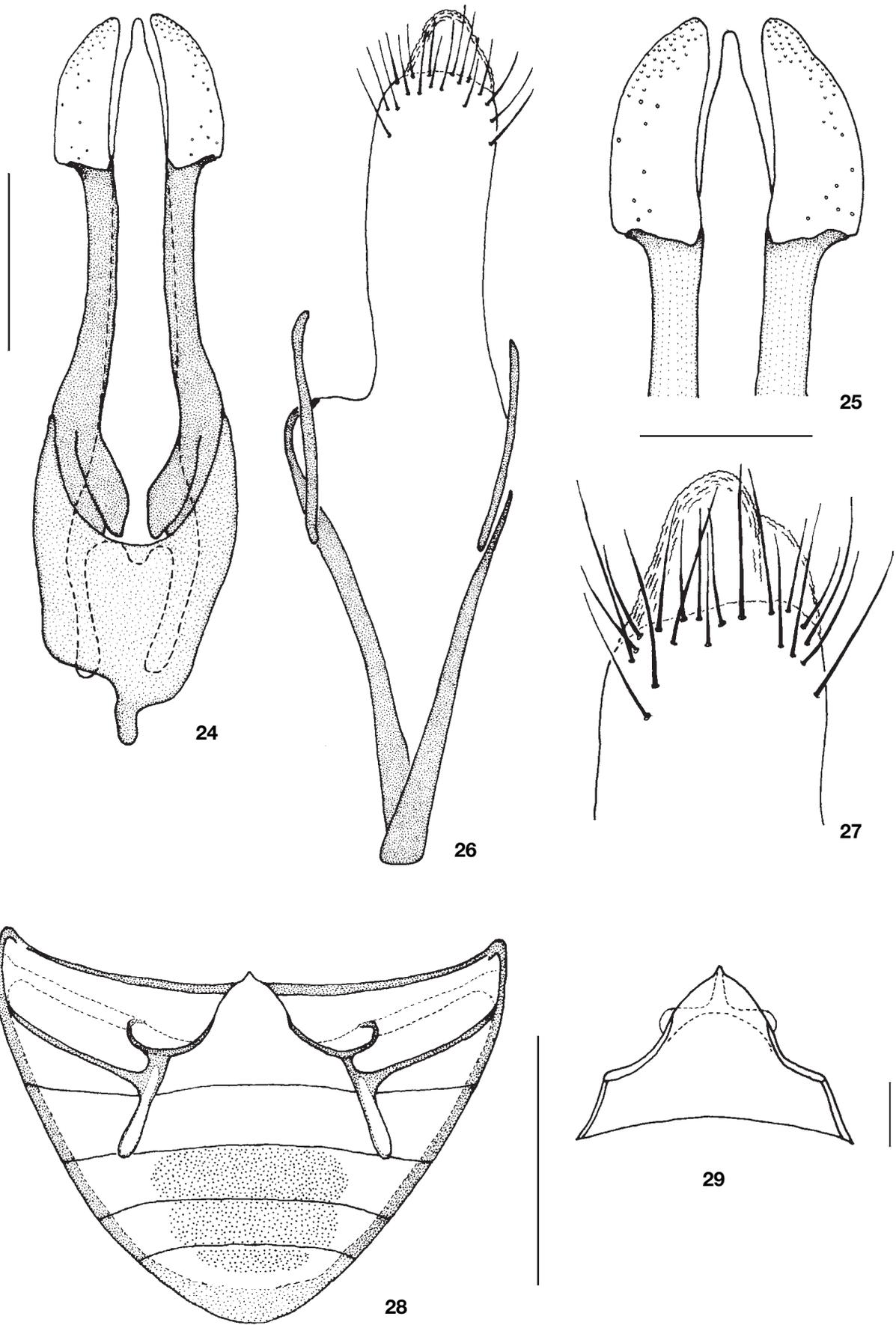
Figs 6–11. *Limnichomorphus curtulus*: 6) aedeagus, ventral view; 7) detail of the apex of the aedeagus; 8) genital segment, ventral view; 9) detail of the apex of the genital segment; 10) abdomen; 11) apophysis of the first ventrite. Scale bars: (6, 8, 11) 0.1 mm; (7, 9), 0.05 mm; (10) 0.5 mm.



Figs 12–17. *Limnichomorphus ohbayashii*: 12) aedeagus, ventral view; 13) detail of the apex of the aedeagus; 14) genital segment, ventral view; 15) detail of the apex of the genital segment; 16) abdomen; 17) apophysis of the first ventrite. Scale bars: (12, 14, 17) 0.1 mm; (13, 15) 0.05 mm; (16) 0.5 mm.



Figs 18–23. *Limnichomorphus puetzi* sp.nov.: 18) aedeagus, ventral view; 19) detail of the apex of the aedeagus; 20) genital segment, ventral view; 21) detail of the apex of the genital segment; 22) abdomen; 23) apophysis of the first ventrite. Scale bars: (18, 20, 23) 0.1 mm; (19, 21) 0.05 mm; (22) 0.5 mm.



Figs 24–29. *Limnichomorphus ciampori* sp.nov.: 24) aedeagus, ventral view; 25) detail of the apex of the aedeagus; 26) genital segment, ventral view; 27) detail of the apex of the genital segment; 28) abdomen; 29) apophysis of the first ventrite. Scale bars: (24, 26, 29) 0.1 mm; (25, 27) 0.05 mm; (28) 0.5 mm.

Habitat. Found among leaf litter (SATÔ 1966).

Distribution. Known from the island of Iriomote, Ryukyu Archipelago (Japan).

***Limnichomorphus puetzi* sp.nov.**

(Figs 1, 18–23)

Type locality: Central Nepal, Province of Narayani Sauraha, Rapti river, 27° 34' 51" N, 84° 29' 30" E.

Type material: **Holotype** male (NKE): "NEPAL c. Prov. Narayani / Sauraha, Rapti River / 27° 34' 51" N, 84° 29' 30" E / 14.–15.07.2001, LF, 180m / riverside leg. A. Kopetz". **Paratypes** 4 exs. (NMW, CHB, CKE, CPE) with same data as holotype.

Description. Length 1.2–1.3 mm (head excluded); maximum width 1.0–1.1 mm. Body almost spherical. Dorsal surface brown or dark brown, head appendices and legs brown. Surface covered with silvery, very short and dense recumbent pubescence; elytral pubescence with a regular orientation backwards. Anterior margin of pronotum straight; anterior angles not prominent; transverse series of small tubercles on anterior margin poorly developed. Elytra without humeral callus. Metasternal wings well developed. Prosternal apophysis narrow, flat in lateral view, margins not bordered; with dense punctation; space between punctures approximately as their diameter. Metasternum with dense punctation on disk. Metacoxae densely and irregularly punctated. Surface of sternites with strong, sparse punctation. Males with glandular pores on ventrites 4 and 5 (Fig. 22). First ventrite with inter-metacoxal plate triangular, with sides regularly curved (Fig. 23). Second abdominal sternite with deep, well defined depressions for complete reception of metatarsi (Fig. 22). Last ventrite with a small emargination with a medial protuberance (Fig. 22).

Aedeagus as in 18, 19. Median lobe as long as parameres; parameres as long as phallobase. Membranous apex of parameres widened, slightly curved inwards, well separated from median lobe.

Genital segment as in Figs 20, 21. Apex narrow, with long, curved, dense setae; covering most of apex from margins to internal side, except for a wide membranous marginal band.

Habitat. The species seems to be riparian.

Distribution. So far only known from the type locality.

Etymology. Named after Andreas Pütz, specialist in the taxonomy of Byrrhidae and Limnichidae, who allowed us the study of this interesting material.

***Limnichomorphus ciampori* sp.nov.**

(Figs 2, 24–29)

Type locality: Malaysia, Borneo, Sabah, Crocker Range, Mawar Waterfall.

Type material: **Holotype** male (NMW): "MALAYSIA: Sabah / Crocker Range 17. 6. 1996 / Mawar Waterfall env. (9c)"; "vegetation debris and / forest litter around / fallen trees".

Paratypes 1 ex. (NMW): "Malaysia. Sabah. Crocker / Range. Tonom env. Kalang / Waterfall. 16.–18. V. 1998 / J. Kodada & F. Čiampor lgt.".

Description. Length 1.4–1.5 mm (head excluded); maximum width 1.1–1.2 mm. Body almost spherical. Head and pronotum black, elytra dark brown, head appendices and legs brown. Surface covered with golden, short and dense recumbent pubescence; elytral pubescence with a regular orientation backwards. Anterior margin of pronotum slightly curved; anterior angles not prominent; transverse series of small tubercles on anterior margin well developed. Elytra without humeral callus. Metasternal wings well developed. Prosternal apophysis wide, concave in lateral view, with margins clearly bordered; with dense punctation; space between punctures smaller than their diameter. Metasternum without punctation on disk, with a weakly impressed microreticle. Metacoxae densely and irregularly punctated. Surface of sternites with strong, sparse punctation. Males with glandular pores on ventrites 3 to 5 (Fig. 28). First ventrite with inter-metacoxal plate triangular, with sides strongly curved (Fig. 29). Second abdominal sternite with deep, well defined sulci for complete reception of metatarsi (Fig. 28). Last ventrite with a very small, almost imperceptible emargination.

Aedeagus as in Figs 24, 25. Median lobe shorter than parameres; parameres twice as long as phallobase. Membranous apex of parameres widened, slightly curved inwards, well separated from median lobe.

Genital segment as in Figs 26, 27. Apex wide, with long, straight, sparse setae very close to the margins; with an apical membranous expansion not covered with setae.

Habitat: vegetation debris and forest litter around fallen trees.

Distribution. So far only known from two nearby localities in the Crocker Range, NE Borneo (Malaysia).

Etymology. We are pleased to name this species after Fedor Čiampor, a friend and specialist on riffle beetles (Elmidae).

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