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DESCRIPTION OF A NEW ENDEMIC GENUS OF TRICHOPTERA FROM MADAGASCAR (ODONTOCERIDAE)

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Madagocerum gen. n. is described from Madagascar, representing the second genus of Odontoceridae from the Afrotropical Biogeographical Region. The following new species are described: *M. bhemi*, *M. idvigum* and *M. thoderirk* spp. n. All species were collected from moderately high elevations (above 1,550 meters).

Key words: Trichoptera, Odontoceridae, *Madagocerum*, new genus, Madagascar

INTRODUCTION

The family Odontoceridae presently includes 143 extant species. Three extinct genera are known, the oldest being Baltic Amber fossils dated to Eocene. The 15 extant genera are classified into the two subfamilies Odontocerinae WALLENGREN, 1891 and Pseudogoerinae WALLACE et ROSS, 1971. The Pseudogoerinae includes only one species, *Pseudogoera singularis* CARPENTER, 1933 from the Nearctic Region. Six out of the 14 Odontocerinae genera are monotypic and 5 genera include only 4 or fewer species. The 2 largest genera, *Psilotreta* BANKS, 1899 (54 species) and *Marilia* MÜLLER, 1880 (62 species), are known from the Oriental, Neartic and Palaearctic Regions, and Oriental, Australian, Nearctic and Neotropical Regions, respectively. The other genera are restricted in distribution to only one biogeographical region.

No phylogenetic hypothesis has been presented supporting monophyly of the family, either based on molecular characters or morphological characters. WEAVER (1983) presented 3 potential synapomorphies for the family: Larval abdomen with reduced lateral fringes; adult sexual dimorphism, involving reduced branching of M only in the male forewings; and the male genitalia with inferior appendages with rectangular harpago with mesal spines. The larval stage is unknown for several genera, and the potential adult synapomorphies are dubious. One reason for lacking phylogenetic hypotheses might be that the species in most genera are rare and partly unavailable for exhaustive morphological examination, and tissue sampling for sequencing. There are apparently no morphological characters in the adults available for unambiguously grouping the family as monophyletic, and even

separating the families Odontoceridae and Philorheithridae is difficult (OLÁH & JOHANSON, 2010). But HOLZENTHAL *et al.* (2007) grouped their 4 included odontocerid genera into a (unsupported) monophyletic group. Based on Bayesian inference of molecular data MALM (2010) concluded that the monophyly of the 2 included genera of Odontoceridae is weakly supported to unsupported depending on inclusion and exclusion of various gene codon positions. In order to distinguish odontocerids from other families based on morphological characters, a combination of different character states is therefore important.

In most genera, the apicomesal nodule on the first maxillary palp segments is usually absent, but may be present in *Lannapsyche* MALICKY, 1989 species. The forewing postanal vein (*sensu* SCHMID, 1998) forms a potential synapomorphy supporting the monophyly of Philorheithridae and Odontoceridae (WEAVER *et al.* 2008). A sclerotized and microtrichous forewing anal lobe is frequently present on the base. The wing venation is variously reduced compared to in the Philorheithridae. In the forewings, the discoidal cell is closed, and the median cell is open or absent in both sexes; the thyridial cell is present in females, but lacking in the males of the 2 genera *Marilia* and *Psilotreta*, and in *Pseudogoera* CARPENTER, 1933 as the M stem is missing. The extinct species *Electrocerum pedestre* ULMER, 1912 from Baltic Amber, and extant members of the genera *Barypenthus* BURMEISTER, 1839, *Namamyia* BANKS, 1905, *Perissoneura* MCLACHLAN, 1871, *Barynema* BANKS, 1839, *Parthina* DENNING, 1954, *Nerophilus* BANKS, 1899*, Pseudogoera*, *Lannapsyche*, *Phraepsyche* MALICKY et Chantaramongkol, *in* MALICKY *et al.* 2000, and *Anastomoneura* HUAMANTINCO et NESSIMIAN, 2004 all have closed thyridial cells in the male forewings. Reduction of the forewing median vein occurs also in the Molannidae and in the Beraeidae. Mesoscutellar setal warts are usually fused into a single, large, ovoid wart sparsely covered with setae, but in *Barypenthus* they form a pair of small warts.

JOHANSON and OLÁH (2009) described *Madagocerum flinti* JOHANSON et OLÁH collected from Fianarantsoa Province, 7 km W Ranomafana at 1100 m altitude, which represented the first record of species in this genus. In their work the genus was not formally described. In order to expand our knowledge on the diversity of Odontoceridae, we formally describe the genus *Madagocerum* gen. n. together with 3 new species from Madagascar.

MATERIALS AND METHODS

This study is based on five male and one female specimens preserved in 70–80% alcohol, and collected on moderately high elevations (1550–1800 m a.s.l.) by Mr. R. PAULIAN in January 1954 and 1958. The abdomen of the specimens was cleared, mounted and genitalia illustrated following the

procedure given in OLÁH and JOHANSON (2008). When sufficient material was available the head and thorax (except wings) were macerated together with the abdomen. The terminology applied to head groove and setal warts follows that by OLÁH and JOHANSON (2007).

The wings were examined and illustrated based on right wings mounted on dry permanent slides or temporary slides in glycerine. The head and thoracic characters characters were examined on specimens being temporary mounted in glycerine. The maxillary palp formula is given as a sequence represents the increasing segment length, with equally long segments given in (parenthesis).

All material is deposited in Muséum National d'Histoire Naturelle, Paris, France.

Madagocerum gen. n.

Type species: *Madagocerum bhemi* sp. n.

The genus somewhat resembles philorheithrid genera in the genitalia, particularly by the preanal appendages that are fused to the dorsum of segment IX without visible seam, and the 2 appendages are more or less fused basally. This unique condition occurs otherwise only in the 4 philorheithrid genera *Aphilorheithrus* MOSELY, 1936, *Psilopsyche* ULMER, 1907, *Ramiheithrus* NEBOISS, 1974, *Kosrheithrus* MOSELY *in* MOSELY et KIMMINS, 1953, and partly also in *Mystacopsyche* SCHMID, 1955.

Head characters relating this genus to the Odontoceridae are the absence of apicomesal nodule on the first maxillary palp segment, lack of pilifer on the frons; reduced Cu2 in the forewings, convex forewing termen, reduced anal lobe at the forewing bases, absence of jugal lobe and jugal vein in the forewings; and the presence of only a single, large ovoid mesoscutellar setose wart.

Diagnosis – *Madagocerum* species are similar to species in *Lannapsyche* and *Phraepsyche* and unlike those in all other genera in the family by the presence of two pairs of pronotal, bulbous and compact setal warts instead of one pair. *Madagocerum* species are distinguished from those in *Phraepsyche* by the much longer forewing discoidal cell, the forewing nygma is located closer to the mid-length of fork II than to basis of fork II, the venation of the hind wings is more intact, and the coxopodites of the genitalia are much wider in lateral view. *Madagocerum* species are separated to those in *Lannapsyche* by the absence of M3+4 in the hind wings, and in genitalia by the presence of well-developed superior appendages and absence of setae posterodorsally on segment IX. *Madagocerum* species are easily distinguished from the Seychellean *Leptodermatopteryx tenuis* ULMER, 1910 by having narrower hind wings than forewings (opposite in *L. tenuis*), long triangular forewing thyridium cell instead of lens-shaped and convex thyridium cell, absence of discoidal cell in the hind wings, and in the genitalia by the wider coxopodites in lateral view.

Description – Male (in alcohol). Body dark brown; forewings brown, without pattern (in alcohol).

Head: Ocelli absent. Tentorium slender, almost U-shaped in dorsal view; without dorsal arm, with small hump; anterior arms narrowing slightly anteriorly; posterior arms short, wide, ending in pair of large posterior tentorial pits; tentorial bridge slender, slightly arching; in lateral view anterior tentorial arms straight, produced into short, thin frontogenal septum; internal sclerotized fold not extending dorsad to circumantennal sclerite; internal fold of frontogenal septum visible on facial surface, forming thin frontogenal suture above anterior tentorial pits and clypeogenal suture below tentorial pits. Facial groove pattern dominated by surface grooves of thin frontogenal septum starting from anterior tentorial pits; frontogenal vertical groove running posteriorly and slightly laterally to ventral margin of rounded frontogenal compact setal warts. Clypeogenal vertical grooves located ventrally of anterior tentorial pits; weakly developed, running obliquely, slightly mesally near upper corner of labrum. Clypeolabral groove not visible. Line separating labrum and clypeus not visible. Clypeus with pair of medium-sized, rounded, compact setose warts. Subantennal groove present, running vertically between ocellar grooves and frontogenal compact setose warts, short, not reaching anterior margin of warts. Subocular grooves indiscernible. Vertex wider than long; epicranial groove complete, frontal branch indiscernible; coronal groove well pigmented, visible along entire length of vertex. Antennal sockets located on slightly elevate humps at antennal grooves. Occipito-postgenal grooves visible on vertex between occipital and postgenal setal warts. Postoccipital groove present, encircling foramen magnum, or occipital foramen; without postoccipital lobe. Labrum freely hanging, membranous, movable; ligulate structure without setae. Mandibles membranous, almost indiscernible; lacinia forming short, slender, mesad curving setose lobes. Pair of large, rounded, frontogenal compact setose warts dominating on face, immediately above small, rounded clypeogenal warts. Pair of rounded, small, clypeal mesal compact setose wart present below anterior tentorial pits and clypeogenal grooves. Anterior part of vertex with pair of rounded, elevated, medioantennal compact setal warts; vertexal lateroantennal compact setose warts absent; large vertexal medioocellar diffuse setose warts, or surfaces, present. Occipital compact setose warts forming largest setal vertexal structures, located obliquely, dominating on posterior surface of vertex. Broad postgenal compact warts curving along posterior section of ocular grooves. Maxillary palp formula I–II–IV–(III, V), segment I without apicomesal nodule or erect apical setae. Antennal scapes shorter than head. Each pedicel half as long as first segment of flagellum.

Pair of large, rounded frontogenal compact setose warts dominating on face, just above small, rounded clypeogenal warts; other warts visible on face is pair of round, small, clypeal mesal compact setose wart between, or below, anterior tentorial pits, and between clypeogenal grooves. Anterior area of vertex with pair of rounded, elevated, well-separated vertexal medioantennal compact setal warts. Vertexal lateroantennal compact setose warts absent. Vertexal medioocellar diffuse setose warts, or surface, large. Occipital compact setose warts representing largest setal structure on vertex. Wide postgenal compact warts curving along posterior section of ocular grooves. Maxillary palps five-segmented; maxillary palp formula I–II–IV–(III, V), first segments without nodule. Antennal scapes shorter than head. Pedicels half as long as first segment of flagellum.

Thorax: Pronotum with 2 pairs setal warts; both elevated; mesal pair large, circular, with straight-lined mesal margin, slightly separate mesally by deep, narrow depression or fissure; lateral pair small, longitudinally ovoid. Mesoscutum with pair of medium-sized, circular, compact setose warts in middle of segment, along median notal suture. Single, longitudinally ovoid, setose wart present at middle of mesoscutellum, sparsely covered by setae. Proepisternum with large, vertically elongated, ovoid, setose wart. Precoxale with large, nearly round setal wart. Large, compact, setal wart present anteriorly on each cervical sclerite; apparently forming sclerotized surface on membranous part of neck, anteriorly tangential with cervical sclerite. Lateral cervical sclerites forming narrow anterior arm articulating anteriorly to back of head with occipital condyle above posterior tentorial pits,

fused to posterior cervical sclerites. Posterior cervical sclerite forming widening plate, rounded posteriorly, with dorsal sinus producing into elongate, filiform, apicodorsal corners; complex posterior arms reaching prothoracic episternum by posterior, round apex; articulating to weakly sclerotized anteromedian band of prothoracic eusternum by thin, ventral, intercervical sclerites fused to posterior sclerites. Dark structures of cervical sclerite complex visible on pale, membranous neck. Leg claws symmetrical; spur formula 244. Each foreleg with anterior spur half as long as posterior spur, covered by decumbent setae, posterior spur bare; both mid leg and hind leg with posterior spurs 1/3 as long as anterior spurs; all spurs with aciculate surface microsculpture; spurs of same colour as legs. Legs covered by thin, short, light brown, vestitural decumbent setae.

Wings: Forewing narrow, apically rounded; membrane light brown; termen slightly convex; basal lobe covered by microtrichia; jugum absent. Forewing forks I, II, III and V present; Sc running to R1; R1 running to R2 before C, veins meeting at hypertrophied pterostigma; Cu2 apparently lacking in forewings; postanal vein present, running closely to posterior margin.

Male genitalia: Abdominal segment IX fused annularly, short, glabrous; anterior margin convex in lateral view, with mesally depressed lateral concavity conspicuous in dorsal view; posterior margin without pronounced apical lobe; antecosta and antecostal sutures on anterior margin of segment IX narrow. Intersegmental depression between segments IX and X very deep, stepwise; segment X sunk deep to upper 1/3 of segment IX. Segment X bilobed, straight, oriented posteriad. Apicoventral setose lobes forming setose apices. Apicodorsal setose lobes present at middle of segment; with scattered setae. Preanal appendages fused with tergum IX. Coxopodites robust; harpagones variously formed. Phallic apparatus with broad, ventrad directed, short basal part, and straight, horizontal apical part, small phallotremal sclerites almost indiscernible.

Etymology: *Madago-*, derived from Madagascar, and *-cerum*, from Greek *keras*, horn, antenna; name referring to the type locality.

Madagocerum bhemi sp. n.
(Figs 1–4)

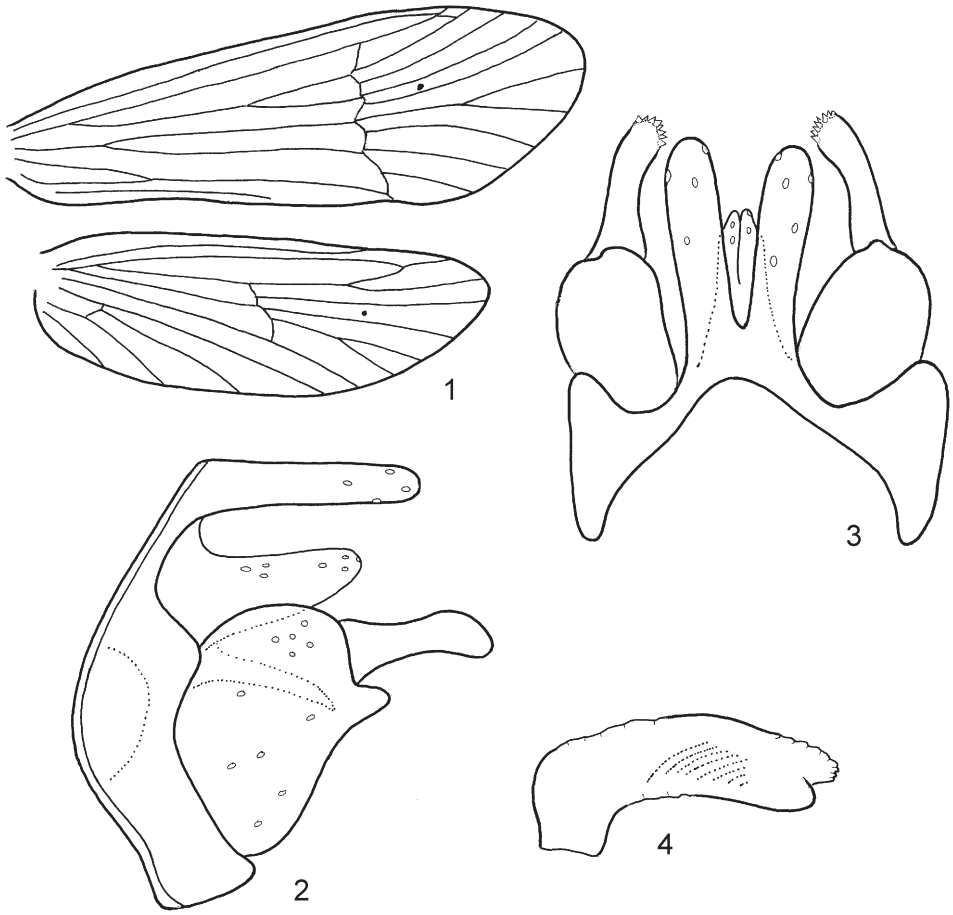
Diagnosis –This species is most similar to *M. idvigun* sp. n. in having a short segment IX. It is distinguished from *M. idvigum* by the broader, blunt and divergent preanal appendages in dorsal view, not narrow, tapering and tangential; segment X is shorter than the preanal appendages, not longer; the coxopodites have no apicodorsal spiny protuberance; the harpagones are narrow, not broad; and the phallic apparatus is broad, not narrowing apically.

Description – Male (in alcohol). Body dark brown, except paler ventrally; cephalic and thoracic appendages light brown; forewing membrane light brown, without pattern (in alcohol).

Wings (Fig. 1): Forewing apex narrowly rounded; 5.0 mm; membrane light brown; termen slightly convex; basal lobe present covered by microtrichia; jugum absent. Forewing forks I, II, III, and V present; Sc running to R1, and R1 running to R2 before C, meeting at hypertrophied pterostigma; distally almost indiscernible; Cu2 apparently absent in forewings; postanal vein running closely to posterior wing margin.

Male genitalia (Figs 2–4): Abdominal segment IX fused annularly, short in lateral view, particularly at dorsal 1/3rd; venter 3 times longer than dorsum; anterior margin convex in lateral view,

with lateral concavity conspicuous in dorsal view; posterior margins concave, with small, subtriangular apical lobe at dorsal margin of coxopodites; each antecosta and antecostal suture narrow on anterior margin of segment IX, forming pigmented marginal rim running evenly along anterior margin; acrotergite absent; surface of segment IX glabrous, spine row absent on posterior margins. Intersegmental depression between segments IX and X very deep, stepwise; segment X sunk to upper 1/3rd of segment IX, visible in lateral view; intersegmental depression covered by fused base of preanal appendages. Segment X broadly rod-like, directed straight posterad. Apicoventral setose lobes represented by setose apex of segment. Apicodorsal setose lobes reduced to central areas with scattered setae. Segment X body deeply cleft, with tangential lobes. Dorsal interlobular gap filled, as seen in dorsal view. Large, deeply bilobed preanal appendages dominating above phallic apparatus; fused basally; horizontal, posterad directed lobes fused to dorsum of segment IX; fused seam, representing borderline between segment IX and preanal appendages indiscernible; in lateral view, dorsal



Figs 1–4. *Madagocerum bhemi* gen. et sp. n., holotype: 1 = right wings, 2 = genitalia, lateral view, 3 = genitalia, dorsal view, 4 = phallus, lateral view

and ventral margins straight, producing regular, parallel-sided rods. Preanal appendages divergent in dorsal view, parallel-sided; rod-like. Coxopodites robust, dorsal margins rounded, convex; ventral margins concave, ending in small apicoventral corners. Harpagones slender, constricted at mid-length; capitate, with mesad turning apex with few, dark, short, conical spines. Phallic apparatus with broad, ventrally directed, short basal part; horizontal apical part long, straight. Small phallotremal sclerites almost indiscernible.

Material examined – Holotype: Male: "Madagascar: Andohahela: 1800 m, i.1954 [Paulian]". Paratype: 1 male: same data as holotype.

Etymology: *Bhemi*, slender in Sanskrit, named after the slender harpagones in this species compared to in other species in the genus.

Madagocerum idvigun sp. n.
(Figs 5–16)

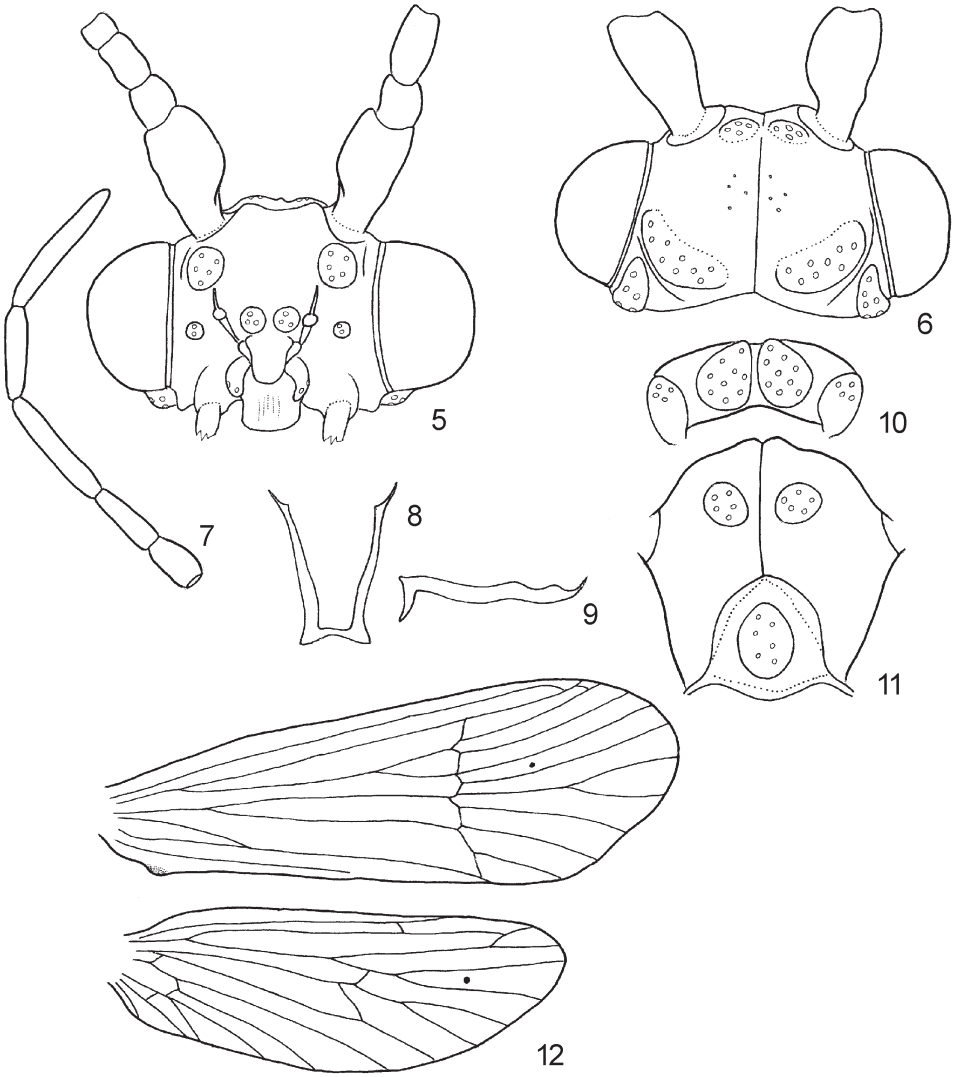
Diagnosis – This species resembles *M. bhemi* sp. n. in its short segment IX, but the remaining parts of the genitalia are different. *Madagocerum idvigun* sp. n. has narrow, tapering and tangential preanal appendages, not broad, blunt and divergent as in *M. bhemi*; segment X is as long as the preanal appendages, not shorter as in *M. bhemi*; each coxopodite has an apicodorsal spiny protuberance; both harpagones are broad, not narrow as in *M. bhemi*; and the phallic apparatus is more slender and narrowing apically.

Description – Male (in alcohol). Body light brown; forewing membrane light brown, without pattern (in alcohol).

Wings (Fig. 12): Forewing apex narrowly rounded; 5.0 mm; membrane light brown; termen slightly convex; basal lobe covered by microtrichia; jugum absent. Forewing forks I, II, III, and V present; Sc fusing with R1; R1 fusing with R2 before C, meeting at hypertrophied pterostigma; distally almost indiscernible; Cu2 apparently absent in forewings; postanal vein running closely to posterior wing-margin.

Male genitalia (Figs13–16): Abdominal segment IX fused annularly, short in lateral view; tergum almost as long as venter; anterior margin convex, with triangular pleural plate bearing mesally depressed lateral concavity in dorsal view; posterior margin straight, with tiny subtriangular apical lobe below preanal appendages; antecosta and antecostal suture, on anterior margin of segment IX narrow, forming dark marginal rim running evenly along anterior margin; acrotergite well developed, with sclerotized rim; entire surface of segment IX glabrous, spine row absent on posterior margins of segment IX, setose areas absent from apicopleural and apicoventral regions. Intersegmental depression between segments IX and X very deep, stepwise. Segment X sunk deep to upper 1/3rd of segment IX in lateral view; intersegmental depression covered by fused base of preanal appendages. Segment X very shallow, slender; deeply bilobed; slightly arching mesad in dorsal view, dorsad in lateral view. Apicoventral setose lobes represented by apex; apicodorsal setose lobes reduced to small setal areas on middle; segment X deeply cleft; dorsal interlobular gap long, almost closed in ventral view. Large, deeply bilobed preanal appendages dominating over phallic apparatus; fused ba-

sally; horizontal, posterad directed lobes fused to dorsum of segment IX; fused seam, representing borderline between segment IX and preanal appendages invisible; in lateral view, dorsum straight horizontal, venter slightly tapering; in dorsal view with individual preanal appendages, or bilobed structures, more slender than in dorsal view, tapering, weakly constricted; mesal margins parallel sided in dorsal view; almost touching along their lengths. Coxopodites robust, with protuberance on apicodorsal corner covered by stout, medium-long spines; slightly directed mesad. Harpagones large,

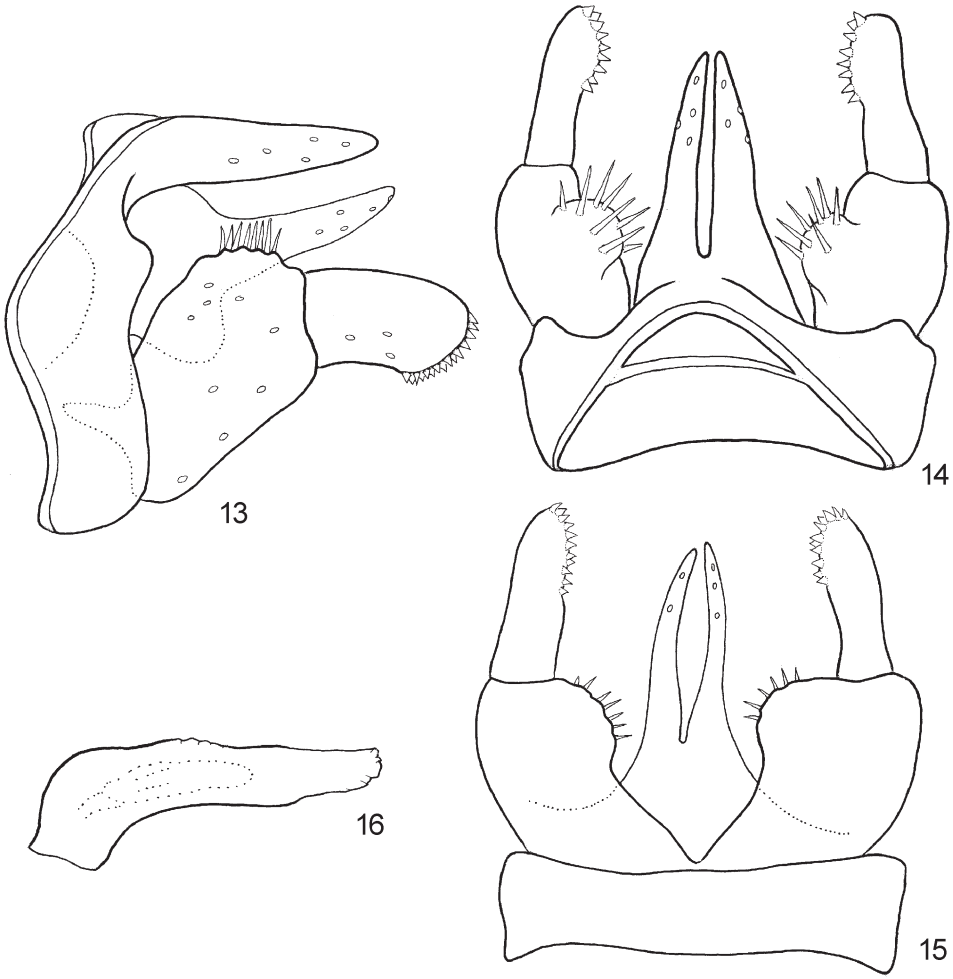


Figs 5–12. *Madagocerum idvigum* sp. n., holotype: 5 = head, frontal view, 6 = head dorsal view, 7 = right maxilary palp, 8 = tentorium, dorsal view, 9 = tentorium, lateral view, 10 = pronotum, dorsal view, 11 = mesonotum, dorsal view, 12 = right wings

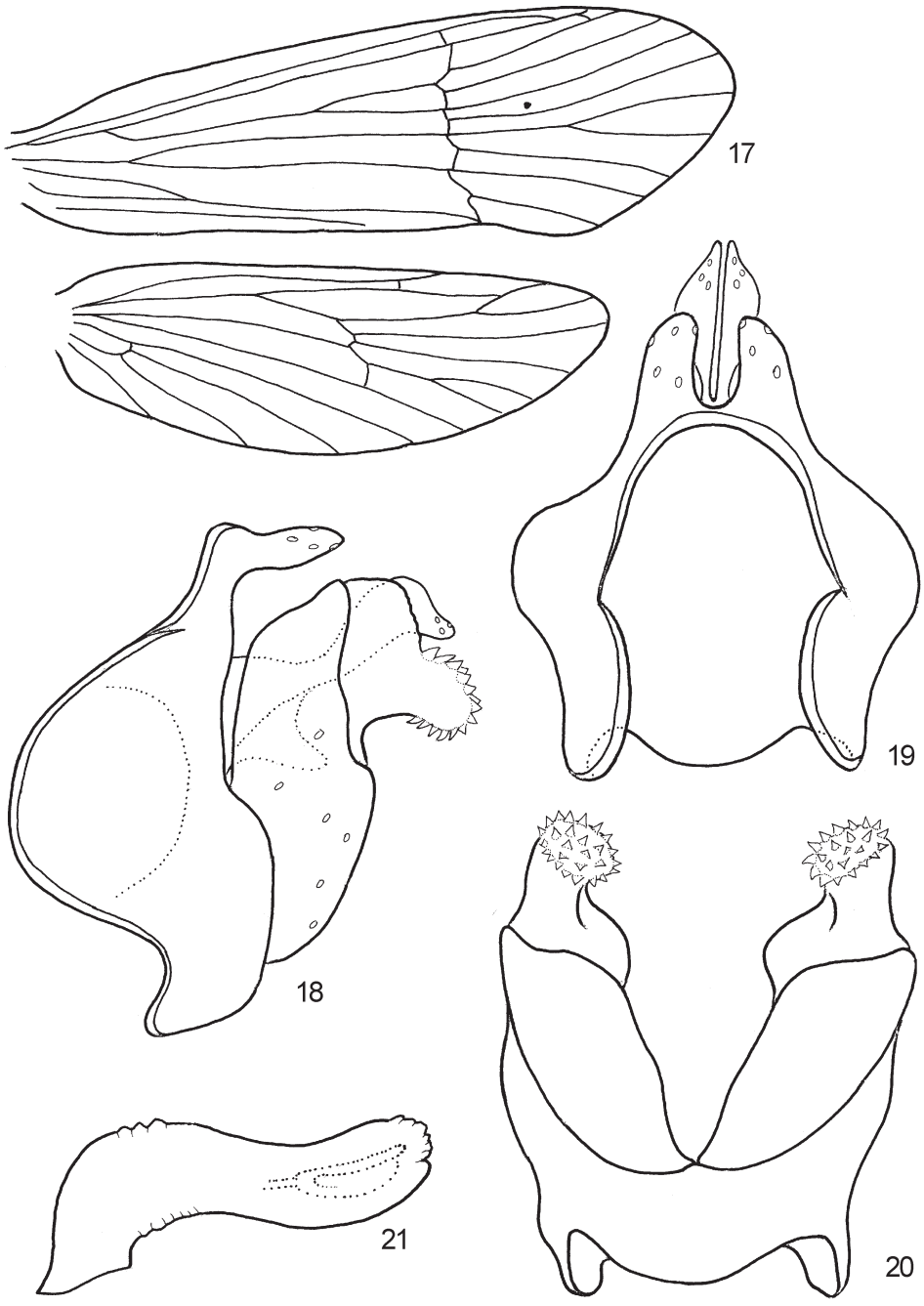
broad, with slightly ventrad and mesad curving spiny apical surface, spines dark, short, conical. Phallic apparatus with broad, ventrally directed, short, basal part; apical part horizontal, straight, narrowing. Small phallotremal sclerites almost indiscernible.

Material examined – Holotype: Male: "Madagascar: Vacoana, Foret, Imatso 1550 m, 22.i.1958 [Paulian]".

Etymology: *Idvigun*, from Sanskrit "idvigunn", meaning double; referring to the similar shape of the preanal appendages and segment X in dorsal view; and the additional spiny hump on the dorsum of the coxopodites duplicate the spiny apex of the harpagones.



Figs 13–16. *Madagocerum idvigum* sp. n., holotype: 13 = genitalia, lateral view, 14 = genitalia, dorsal view, 15 = genitalia, ventral view, 16 – phallus, lateral view



Figs 17–21. *Madagocerum thoderirk* sp. n., holotype: 17 = right wings, 18 = genitalia, lateral view, 19 = genitalia, dorsal view, 20 = genitalia, ventral view, 21 = phallus, lateral view

Madagocerum thoderirk sp. n.
(Figs 17–21)

Diagnosis – This species is easily distinguished from the 2 other species of the new genus by its long pleural region of segment IX, that are short in the other species; the short preanal appendages, being long in the other species; and by having very robust coxopodites.

Description – Male (in alcohol). Body light brown; forewing membrane light brown (in alcohol).

Wings (Fig. 17): Forewing forks I, II, III, and V present; Sc running to R1, and R1 running to R2 before C, meeting at hypertrophied pterostigma; distally almost indiscernible; Cu2 apparently absent; postanal vein running closely to posterior wing-margin.

Male genitalia (Figs 18–21): Abdominal segment IX fused annularly, anteriorly produced into rounded plates; tergum IX short, venter 2 times longer than tergum; anterior margin convex, with rounded pleural plate bearing mesally depressed, large lateral concavity; posterior margin straight, without apical lobe; ventral half of posterior margin produced apicad at base of coxopodites; antecosta and antecostal suture on anterior margin of segment IX narrow, forming pigmented marginal rim running evenly along anterior margin; dorsally more strongly developed, separated from rest of antecostal sutures. Acrotergites very small membranous; entire surface of segment IX glabrous; spine row on posterior margins of segment IX absent; setose areas absent from apicopleural and apicoventral regions. Intersegmental depression between segments IX and X very deep, stepwise; segment X sunk deep to upper third of segment IX in lateral view; intersegmental depression partly covered by preanal appendages in dorsal view. Segment X aviform in lateral view; deeply bilobed in dorsal view, constricting basally, broadening at midway, tapering apex; in dorsal view with parallel-sided mesal margins. Apicoventral setose lobes represented by apical setae. Apicodorsal setose lobes reduced to small setal area on middle. Segment X with long dorsal interlobular gap; each lateral lobe with parallel-sided mesal margin in dorsal view. Short, filiform preanal appendages fused to dorsum of segment IX; fused seam, or borderline between segment IX and preanal appendages, not visible. Coxopodites robust, wide, cover almost entire segment X and posterior part of phallic apparatus. Harpagones large, broad, with slightly ventrad and mesad curving apicoventral lobe and spiny apex; spines dark, short, conical. Phallic apparatus with short, broad, ventrad directed basal part; long, straight horizontal mid-part; slightly curving dorsad at apex. Small phallotremal sclerites almost indiscernible.

Material examined – Holotype: Male: "Madagascar: Andohahela: 1800 m, 22.i.1958 [Paulian]". Paratypes: 1 male, 1 female, same data as holotype.

Etymology: *Thoderirk,* robust in Sanskrit, name referring to the robust gonocoxites.

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REFERENCES

BANKS, N. (1899) Descriptions of new North American neuropteroid insects. *Transactions of the American Entomological Society* **25**: 199–218.

BANKS, N. (1905) Descriptions of new Nearctic neuropteroid insects. *Transactions of the American Entomological Society* **32**: 1–20.

BANKS, N. (1939) New genera and species of Neuropteroid insects. *Bulletin of the Museum of Comparative Zoology* **85**: 439–504.

BURMEISTER, H. (1839) *Handbuch der Entomologie, 2, 2.* Theodore Christian Friedrich Enslin, Berlin, pp. 757–1050.

CARPENTER, F. M. (1933) Trichoptera from the mountains of North Carolina and Tennessee. *Psyche* **40**: 32–47.

DENNING, D. G. (1954) New species of western Trichoptera. *Journal of the Kansas Entomological Society* **27**: 57–64.

HOLZENTHALC, R. W., BLAHNIK, R. J., KJER, K. M. & PRATHER, A. L. (2007) An update on the phylogeny of caddisflies (Trichoptera). Pp. 143–153. *In:* BUENO-SORIA, J., BARBA-ALVAREZ, R. & ARMITAGE, B. (eds): *Proceedings of the XIIth International Symposium on Trichoptera. The Caddis Press.*

HUAMANTINCO, A. A. & NESSIMIAN, J. L. (2004) A new Neotropical genus and species of Odontocerinae (Trichoptera: Odontoceridae) from southeastern Brazil. *Aquatic Insects* **26**: 281–288.

JOHANSON, K. A. & OLÁH, J. (2009) Description of three new species of caddisflies from the Fianarantsoa Province, Madagascar. *Spixiana* **32**: 193–200.

MALICKY, H. (1989) Odontoceridae aus Thailand (Trichoptera). *Opuscula Zoologica Fluminensia* **36**: 1–16.

MALICKY, H., CHANTARAMONGKOL, P., CHAIBU, P., PROMMI, T., SILALOM, S., SOMPONG, S. & TAHNI, I. (2000) Neue Köcherfliegen aus Thailand (Insecta, Trichoptera) (Arbeit über thailändische Köcherfliegen Nr. 30). *Linzer biologische Beiträge* **32**: 861–874.

MALM, T. (2010) *Climbing the Trichoptera tree – investigations of branches and leaves.* PhD Thesis, Department of Zoology, Stockholm University. 15 pp.

MCLACHLAN, R. (1871) On new forms, etc., of extra-European Trichopterous insects. *Journal of the Linnean Society of London, Zoology* **11**: 98–141.

MOSELY, M. E. (1936) Tasmanian Trichoptera or caddis-flies. *Proceedings of the Zoological Society of London* **1936**: 395–424.

MOSELY, M. E. & KIMMINS, D. E. (1953) *The Trichoptera of Australia and New Zealand*. British Museum (Natural History), London, 550 pp.

MÜLLER, F. (1880) Sobre as casas construidas pelas larva's de insectos Trichopteros da Provincia de Santa Catharina. *Archivos do Museu Nacional, Rio de Janeiro* **3**: 99–134, 210–214.

NEBOISS, A. (1974) A new caddis-fly genus from Victoria and Tasmania (Philorheithridae: Trichoptera). *Victorian Naturalist* **91**: 322–325.

OLÁH, J. & JOHANSON, K. A. (2007) Trinominal terminology for cephalic setose warts in Trichoptera (Insecta). *Braueria* **34**: 43–50.

OLÁH, J. & JOHANSON, K. A. (2008) Generic review of Hydropsychinae, with description of *Schmidopsyche*, new genus, 3 new genus clusters, 8 new species groups, 4 new species clades, 12 new species clusters and 62 new species from the Oriental and Afrotropical regions (Trichoptera: Hydropsychidae). *Zootaxa* **1802**: 1–248.

OLÁH, J. & JOHANSON, K. A. (2010) Description of 33 new species of Calamoceratidae, Molannidae, Odontoceridae and Philorheithridae (Trichoptera), with detailed presentation of their cephalic setal warts and grooves. *Zootaxa* **2457**: 1–128.

SCHMID, F. (1955) Contribution à la connaissance des Trichoptères néotropicaux. *Mémoires de la Société Vaudoise des Sciences Naturelles* **11**: 117–160.

SCHMID, F. (1998) *The insects and arachnids of Canada Part 7. Genera of the Trichoptera of Canada and adjoining or adjacent United States*. NRC Research Press, Ottawa, 319 pp.

ULMER, G. (1907) Neue Trichopteren. *Notes from the Leyden Museum* **29**: 1–53.

ULMER, G. (1910) Trichoptera. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, vol. 3. *Transactions of the Linnean Society of London, Second Series, Zoology* **14**: 41–54.

ULMER, G. (1912) Die Trichopteren des Baltischen Bernsteins. *Beiträge zur Naturkunde Preussens*, **10**. Schriften der Physikalisch-Ökonomischen Gesellschaft zu Königsberg, Leipzig.

WALLACE, J. B., ROSS, H. H. (1971) Pseudogoerinae: a new species of Odontoceridae (Trichoptera). *Annals of the Entomological Society of America* **64**: 890–894.

WALLENGREN, H. D. J. (1891) Skandinaviens Neuroptera. Andra afdelningen. *Svenska Vetenskaps-Akademiens Handlingar* **24**(10): 1–173.

WEAVER, J. S., III (1983) *The evolution and classification of Trichoptera, with a revision of the Lepidostomatidae and a North American synopsis of this family*. PhD Thesis. Clemson University, Clemson, SC, USA, 435 pp.

WEAVER, J. S. III, GIBON, F.-M. & CHVOJKA, P. (2008) A new genus of Philorheithridae (Trichoptera) from Madagascar. *Zootaxa* **1825**: 18–28.

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