ZooKeys 889: 1–15 (2019)
doi: 10.3897/zookeys.889.38638
http://zookeys.pensoft.net

RESEARCH ARTICLE

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A new genus and species of fish parasitic cymothoid (Crustacea, Isopoda) from the Indian Ocean coast of South Africa, with a key to the externally attaching genera of Cymothoidae

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Academic editor: *Saskia Brix* | Received 30 July 2019 | Accepted 9 October 2019 | Published 14 November 2019

http://zoobank.org/88E937E5-7C48-49F8-8260-09872CB08683

Citation: Bruce NL, Welicky RL, Hadfield KA, Smit NJ (2019) A new genus and species of fish parasitic cymothoid (Crustacea, Isopoda) from the Indian Ocean coast of South Africa, with a key to the externally attaching genera of Cymothoidae. ZooKeys 889: 1–15. https://doi.org/10.3897/zookeys.889.38638

Abstract

Bambalocra intwala **gen. et sp. nov**. is described from Sodwana Bay, north-eastern South Africa. The monotypic genus is characterised by the broadly truncate anterior margin of the head with a ventral rostrum, coxae 2–5 being ventral in position not forming part of the body outline and not or barely visible in dorsal view, and the posterolateral margins of pereonites 6 and 7 are posteriorly produced and broadly rounded. The antennulae bases are widely separated, with both antennula and antenna slender. The species is known only from the type locality and the known hosts are species of Pomacanthidae (Angelfish). A revised key to the externally attaching genera of Cymothoidae is provided.

Keywords

coral reefs, external attaching parasites, Kwazulu-Natal, Pomacanthidae, Sodwana Bay, southern Africa

Introduction

Taxonomic research on the family Cymothoidae Leach, 1814 has always been episodic (see Smit et al. 2014). In the latter part of the previous century Brusca (1981) revised the Cymothoidae of the East Pacific, Bruce (1986) revised the genus *Mothocya* Costa, in Hope 1851 and the Australian externally and gill-attaching genera (Bruce 1987a, b, c, 1990, 1991) while Williams and Bunkley-Williams (1978, 1980, 1981, 1994; Bunkley-Williams et al. 1998, 2006; Bunkley-Williams and Williams 1981, 1999, 2000) undertook major revisions of the Caribbean taxa as well as making a significant contribution to knowledge of the Japanese cymothoid fauna (Bunkley-Williams and Williams 1986; Williams and Bunkley-Williams 1986, 1994). A period of relative quietude followed until the revisionary work of Hadfield et al. (2010–2017) on the South African cymothoid fauna and the revision of Australian buccal attaching genera by Martin and Bruce (2014–2016).

In the period 1980 to the present day, despite the activity of the authors cited here, only six new cymothoid genera have been described (Boyko et al. 2019). The discovery, among specimens of unidentified Cymothoidae held at the South African Museum of a specimen that could not be placed into any existing externally attaching genus, is therefore of great interest. The species shares characters of *Renocila* Miers, 1880 and *Anilocra* Leach, 1818, but lacks the diagnostic characters of both genera. Equally the new species could not be placed into *Nerocila* Leach, 1818 or *Creniola* Bruce, 1987 (see generic 'Remarks'). As the species does have a highly distinctive character, ventrally positioned and posteriorly acute coxal plates, we feel that the species is sufficiently distinctive to warrant a new genus.

The South African cymothoid fauna had remained little studied, with only 12 species in seven genera reported (Kensley 1978) until the recent revisions of Hadfield et al. (2010, 2013, 2014a, 2014b, 2015; Hadfield and Smit 2017), Van der Wal et al. (2017, 2019), and Welicky and Smit (2019), now with 21 species in eight genera. The major taxa remaining to be revised are the externally attaching genera *Nerocila* and *Renocila*, both of which have numerous unreported species in the Western Indian Ocean region (pers. obs.) and are currently under study. The diversity of cymothoids in this region is relatively high but, as is typical of the Cymothoidae, regional generic endemism is low with *Cinusa* Schioedte & Meinert, 1884 the only endemic genus (Hadfield et al. 2010). It is therefore of interest that a new and apparently endemic genus has been discovered in the subtropical Indian Ocean coast of South Africa.

Materials and methods

Unidentified material from Sodwana Bay, South Africa, was loaned from the Iziko South African Museum (**SAMC**). Methods follow Hadfield et al. (2010) and van der Wal et al. (2019). Species descriptions were prepared using DELTA (Descriptive Language for Taxonomy), following a general Cymothoidae character data set

originally developed by Hadfield et al. (2013) and recently updated (Hadfield et al. 2016). Fish nomenclature was taken from FishBase (Froese and Pauly 2019) and Catalog of Fishes (Eschmeyer 2019).

Abbreviations:

RS robust seta/e;
SAMC South African Museum, Cape Town;
TL total length;
W width.

Taxonomy

Suborder Cymothoida Wägele, 1989
Superfamily Cymothooidea Leach, 1814
Family Cymothoidae Leach, 1814

Genus *Bambalocra* gen. nov.
http://zoobank.org/F47D09E3-61CF-4A9F-B64C-2DD2D4C2796D

Type species. *Bambalocra intwala* sp. nov.; original designation.

Etymology. Bamba is an isiZulu word meaning 'to grip', combined with the ending *–locra*, alluding to related genera such as *Anilocra*; the name refers to the isopod gripping onto its host. Gender is female.

Diagnosis of female. Cephalon anterior margin wide, with ventral posteriorly directed rostrum separating bases of antennulae; posterior margin not trilobed. Body weakly vaulted; coxae 2–6 ventral, not visible in dorsal view; posterolateral margins of pereonites 6 and 7 posteriorly produced, that of pereonite 7 extending posteriorly along pleon to pleonites 2 or 3. Pleonites all wide, posterolateral margins narrowly rounded to acute, pleonite 1 largely visible; pleonites 1–2 ventrolateral margins not produced. Antennula and antenna both slender, antenna longer than antennula; bases widely separate. Pleopods 1–2 lamellar, pleopods 3 and 4 endopod with small, weak lobes, pleopod 5 endopod with small fleshy lobes; peduncle of pleopods 2–5 with fleshy medial lobes present.

Additional characters. Body twice as long as wide. Eyes posterolateral in position, less than 0.3 width of cephalon. Pereonite 2 shortest, 5 and 6 longest; pereonite 5 widest. Pleotelson flat. Mandible palp articles robust; article 3 broadly rounded, as long as proximal width. Maxillula with 4 terminal RS. Maxilla with 1 and 2 small recurved RS each on medial and lateral lobe, respectively. Maxilliped articles broad, article 3 with 3 RS. Pereopods 1–5 subequal in length, 6 slightly longer than 1–4; pereopod 7 longer than pereopod 6. Brood pouch formed by two large oostegites arising from pereonite 6, smaller alternately overlapping oostegites arising from pereonites 1–4, posterior pocket present. Uropod rami subequal in length, visible in dorsal view, slightly exceeding pleotelson posterior margin.

Male (juvenile). Smaller, narrower, less ovate than female; pereonites 2–7 posterolateral angles rounded, not or weakly posteriorly produced. Appendages similar to female, except folds on pleopods 3–5 endopod absent.

Remarks. *Bambalocra* gen. nov. can immediately be identified and distinguished from all other marine cymothoid genera by coxae 2–5 being ventral in position, not forming part of the body outline and not or barely visible in dorsal view, all are posteriorly acute, and the posterolateral margins of pereonite 6 and 7 are posteriorly produced and broadly rounded. The antennula bases are widely separated, with both antennula and antenna slender.

Bambalocra gen. nov. superficially resembles *Renocila* in having a relatively broad body with a weakly vaulted dorsum and the posterolateral margins of pereonites 6 and 7 expanded and posteriorly directed; in dorsal view the anterior margin of the cephalon appears similar, being weakly produced and wide. Unlike *Renocila* the ventral rostrum is triangular (vs. broadly truncate in *Renocila)* and is posteriorly directed separating the antennular bases (vs. not posteriorly directed between the antennular bases); pleonite 1 in *Bambalocra* is not markedly narrower than the remaining pleonites (vs. narrower, which is diagnostic for *Renocila*). Most species of *Renocila* have the antennula both longer and larger than the antenna, usually with strongly flattened expanded articles, while in *Bambalocra* the antennula is shorter than the antenna and both are slender; in most species of *Renocila* the coxae of pereonites 2–4 or 2–5 are visible in dorsal view.

Both *Nerocila* and *Creniola* have the posterior margin of the cephalon strongly trilobed, contrasting strongly to that of *Bambalocra*. Species of *Nerocila* are characterised by having pleonites 1 and 2 with ventral processes, while in *Creniola* the pleon is as wide or wider than the pereon. In both these genera the coxae are conspicuous in dorsal view. Most species of *Anilocra* have a relatively elongate body, with a strongly vaulted dorsum; the coxae and the posterolateral margins of pereonites 5–7 are neither expanded nor posteriorly produced.

Bambalocra intwala sp. nov.

http://zoobank.org/6C41B5E7-9853-48E9-8DBF-3BDD1661AE07
Figures 1–5

Material examined. ***Holotype*:** South africa • 1 ♀ (ovigerous, 23.5 mm TL, 12 mm W); Sodwana Bay, Kwazulu-Natal; 27°32'S, 32°41'E; April 1979; host not recorded, coll. R.E. Stobbs; SAMC-A091364.

***Paratypes*:** South africa • 1 ♂ (immature, 7.5 mm TL, 3.0 mm W) 3 ♀♀ (23–24 mm TL, 11.0–12.0 mm W); same data as holotype; SAMC-A091365 • 1 ♀ (20.0 mm TL, 11.0 mm W); Sodwana Bay, Kwazulu-Natal; 27°30'S, 32°41'E; 12.8 m depth; July 1976; host not recorded, coll. Richard Winterbottom (RW 76-14); SAMC-A091366 • 1 ♀ (21.0 mm TL, 11.5 mm W); Durban Sea World; September 2003; from a dwarf angelfish (*Centropyge*); SAMC-A091367.

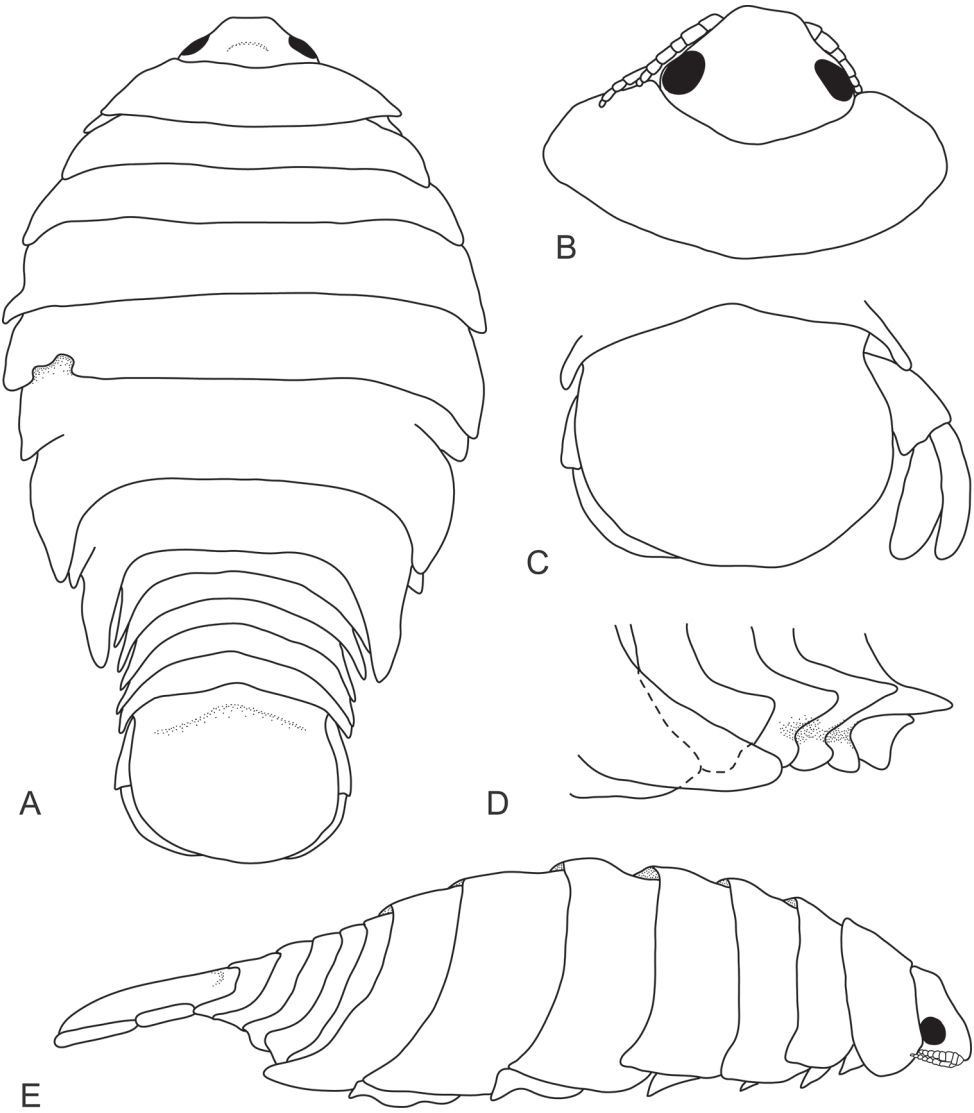

Figure 1. *Bambalocra intwala* sp. nov. Holotype, 23.5 mm (SAMC-A091364) **A** dorsal view **B** dorsal view, head, pereonite 1 **C** pleotelson **D** pleonites, lateral view **E** lateral view.

Description of female (from holotype and 23.0 mm female paratype). *Body* oval, 1.9 times as long as greatest width, dorsal surfaces smooth, widest at pereonite 5, narrowest at pereonite 1; lateral margins ovate. *Cephalon* 0.7 times longer than wide, *frontal margin* broadly truncate. *Eyes* oval with distinct margins, eye width 0.2 times width of cephalon. Pereonite 1 anterior border anteriorly concave, anterolateral angles narrowly rounded. Coxae 2 and 3 narrow with posteroventral angles with small distinct produced point; coxae 4–7 with small, distinct dorsally directed point, not extending past pereonite margin. Pereonites 4–7 with posteroventral angle weakly produced,

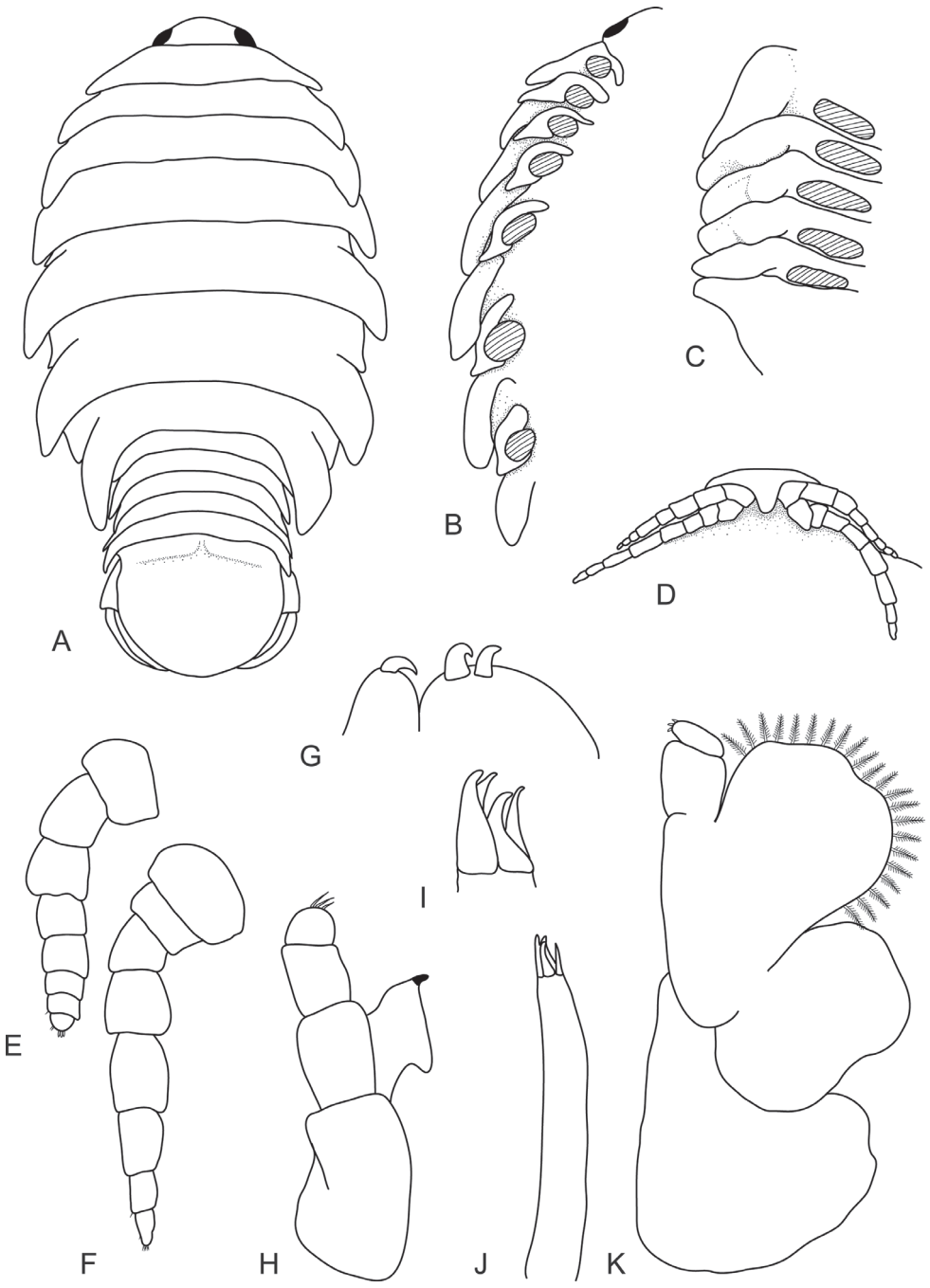

Figure 2. *Bambalocra intwala* sp. nov. Female paratype, 23.0 mm (SAMC-A091365) **A** dorsal view **B** coxae, ventral view **C** pleonites, ventral view (pleopods removed) **D** frons **E** antennula **F** antenna **G** maxilla apex **H** mandible **I** maxillula apex **J** maxillula **K** maxilliped.

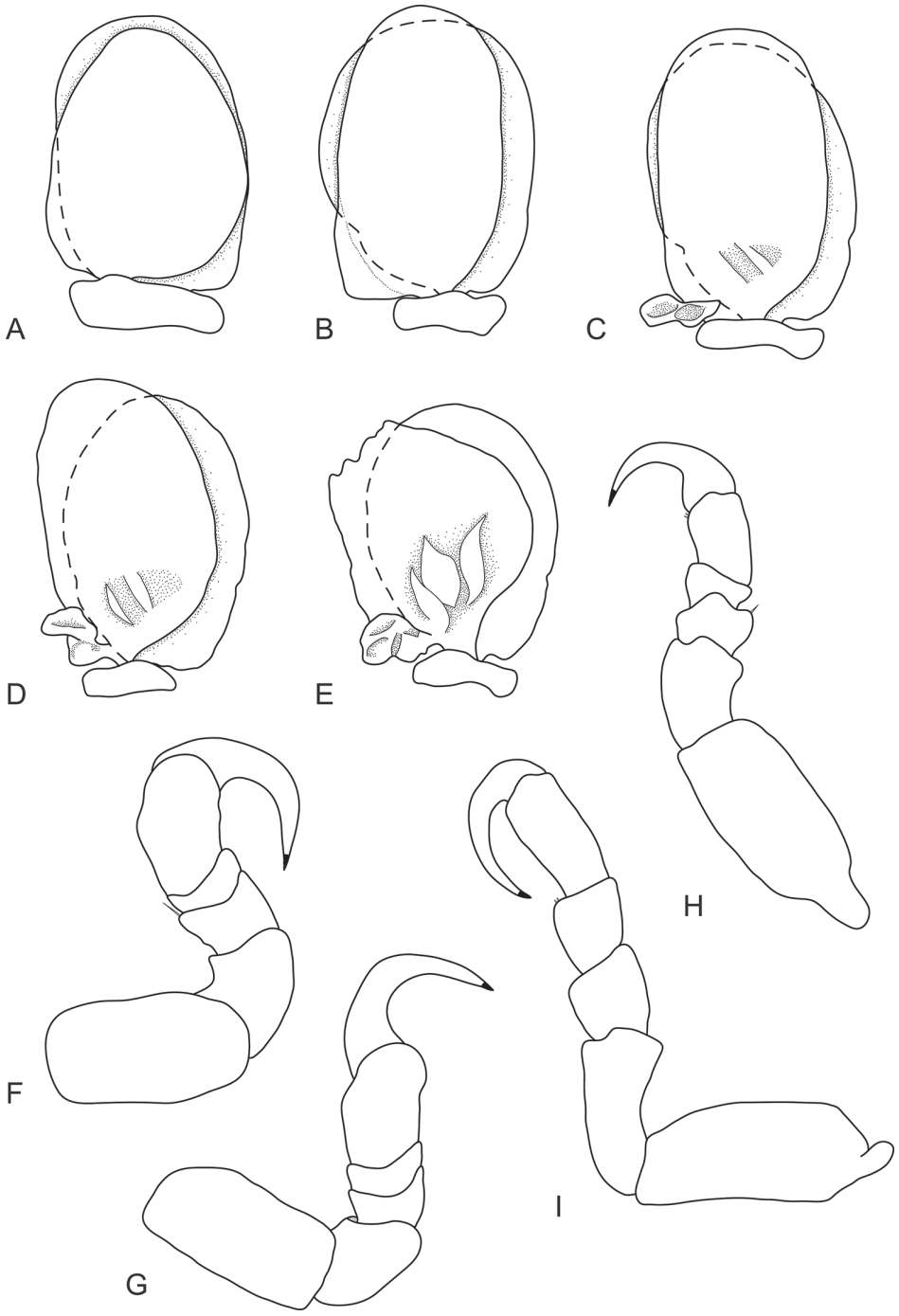

Figure 3. *Bambalocra intwala* sp. nov. Female paratype, 23.0 mm (SAMC-A091365) **A–E** pleopods 1–5 respectively **F** pereopod 1 **G** pereopod 2 **H** pereopod 6 **I** pereopod 7.

acute; pereonite 7 posterolateral margins extending to pleonite 3. *Pleon* 0.4 times as wide as pereon. Pleonites posterior margin evenly concave; pleonite 1 widest, visible in dorsal view; pleonite 2 partially overlapped by pereonite 7; posterolateral angles of pleonite 2 narrowly rounded. Pleonites 3–5 similar in form to pleonite 2; pleonite 5 not overlapped by lateral margins of pleonite 4, posterior margin slightly concave. *Pleotelson* 0.8 times as long as anterior width, dorsal surface smooth, lateral margins convex, posterior margin evenly rounded.

Antennula length shorter than antenna, extending to anterior of pereonite 1, consisting of 8 articles; peduncle articles 1 and 2 distinct and articulated; article 2 1.7 times as long as article 1; 0.4 times as long as combined lengths of articles 1 and 2. *Antenna* extending to anterior margin of pereonite 1, consisting of 8 articles; article 3 1.4 times as long as article 2; article 4 1.4 times as long as article 3; article 5 1.4 times as long as article 4; terminal article with 3 short simple setae distally.

Mandibular molar process present, small; palp article 3 with 3 simple setae. *Maxillula* with lateral RS largest. *Maxilliped palp* consisting of 3 articles, with lamellar oostegite lobe; article 2 without setae, article 3 with 3 recurved short RS.

Pereopod 1 basis 1.7 times as long as greatest width; ischium 0.5 times as long as basis; merus proximal margin without bulbous protrusion; propodus 1.5 times as long as wide; dactylus moderately slender, 1.3 times as long as propodus, 3.2 times as long as basal width. *Pereopod 2* propodus 1.4 times as long as wide; dactylus 1.5 times as long as propodus. *Pereopod 3* similar to pereopod 2. *Pereopod 6* basis 2.1 times as long as greatest width, ischium 0.3 times as long as basis; propodus 1.2 times as long as wide; dactylus 2.1 times as long as propodus. *Pereopod 7* longer than other pereopods, slightly longer than pereopod 6; basis 2.3 times as long as greatest width; ischium 0.7 times as long as basis, without protrusions; merus proximal margin without bulbous protrusion, as long as wide, 0.4 times as long as ischium; carpus 1.2 times as long as wide, 1.1 times as long as ischium, without bulbous protrusion; propodus 1.9 times as long as wide, 1.4 times as long as ischium; dactylus moderately slender, 1.6 times as long as propodus, 3.5 times as long as basal width.

Pleopods 1 and 2 rami simple, 3–5 endopods with weak fleshy ridges. *Pleopod 1* exopod 1.4 times as long as wide, lateral margin weakly convex, distally broadly rounded, mesial margin weakly convex; endopod 1.2 times as long as wide, lateral margin convex, distally broadly rounded, mesial margin slightly convex; peduncle 2.8 times as wide as long. Pleopod endopods 3–5 each with proximomedial lobe.

Uropod 0.8 times as long as pleotelson; peduncle 0.7 times as long as rami, lateral margin without setae; rami not extending beyond pleotelson, marginal setae absent, apices broadly rounded. *Endopod* 2.9 times as long as greatest width, as long as exopod, lateral margin convex, mesial margin straight. *Exopod* extending to end of endopod, 3.1 times as long as greatest width, lateral margin convex.

Male (juvenile paratype 7.5 mm**)**. Body approximately 2.0 times longer than wide; posterolateral margins of pereonites laterally extending giving indented body outline;

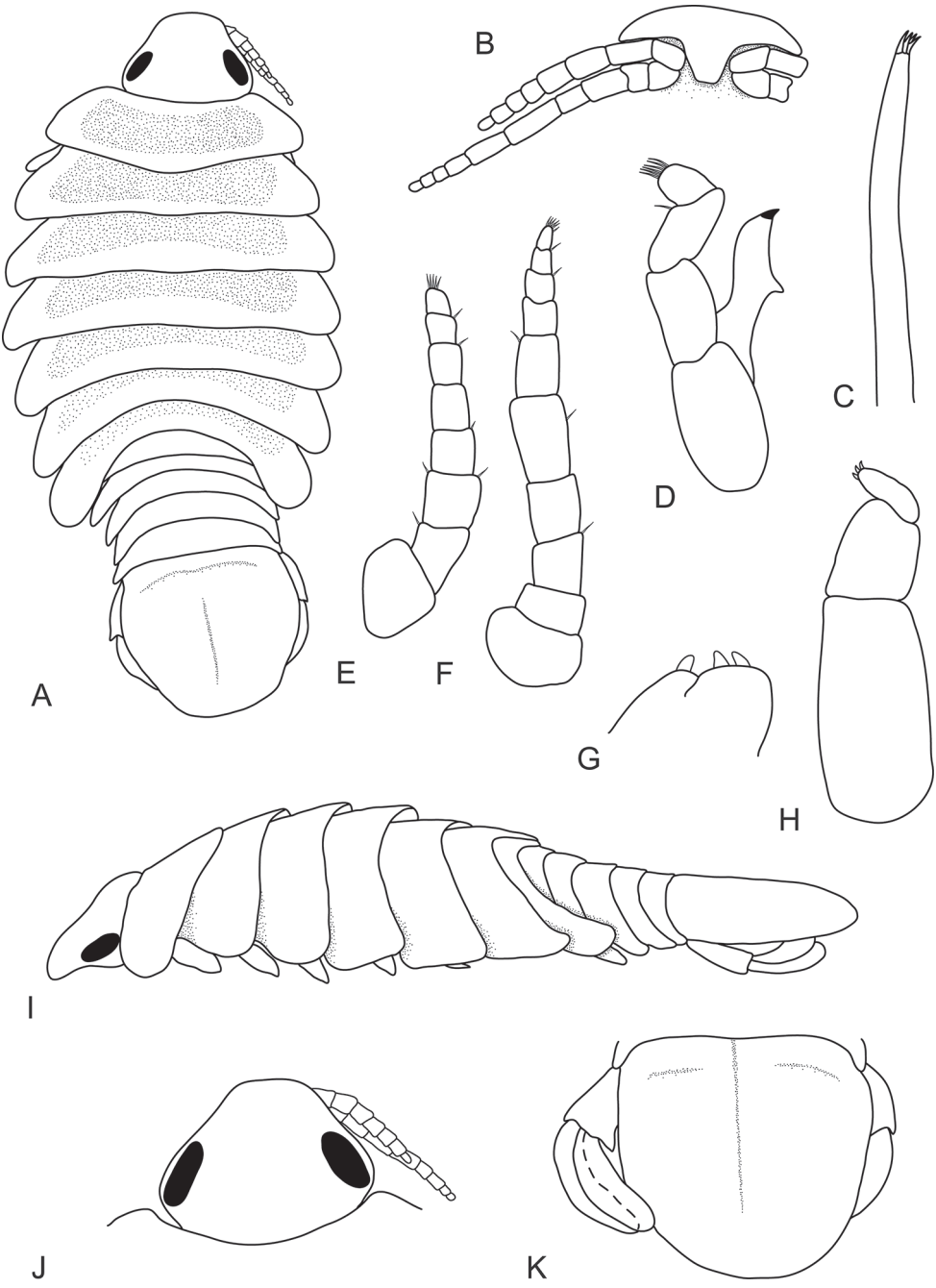

Figure 4. *Bambalocra intwala* sp. nov. Male paratype, 7.5 mm (SAMC-A091365) **A** dorsal view **B** frons **C** maxillula **D** mandible **E** antennula **F** antenna **G** maxilla apex **H** maxilliped **I** lateral view **J** head, dorsal view **K** pleotelson and uropods.

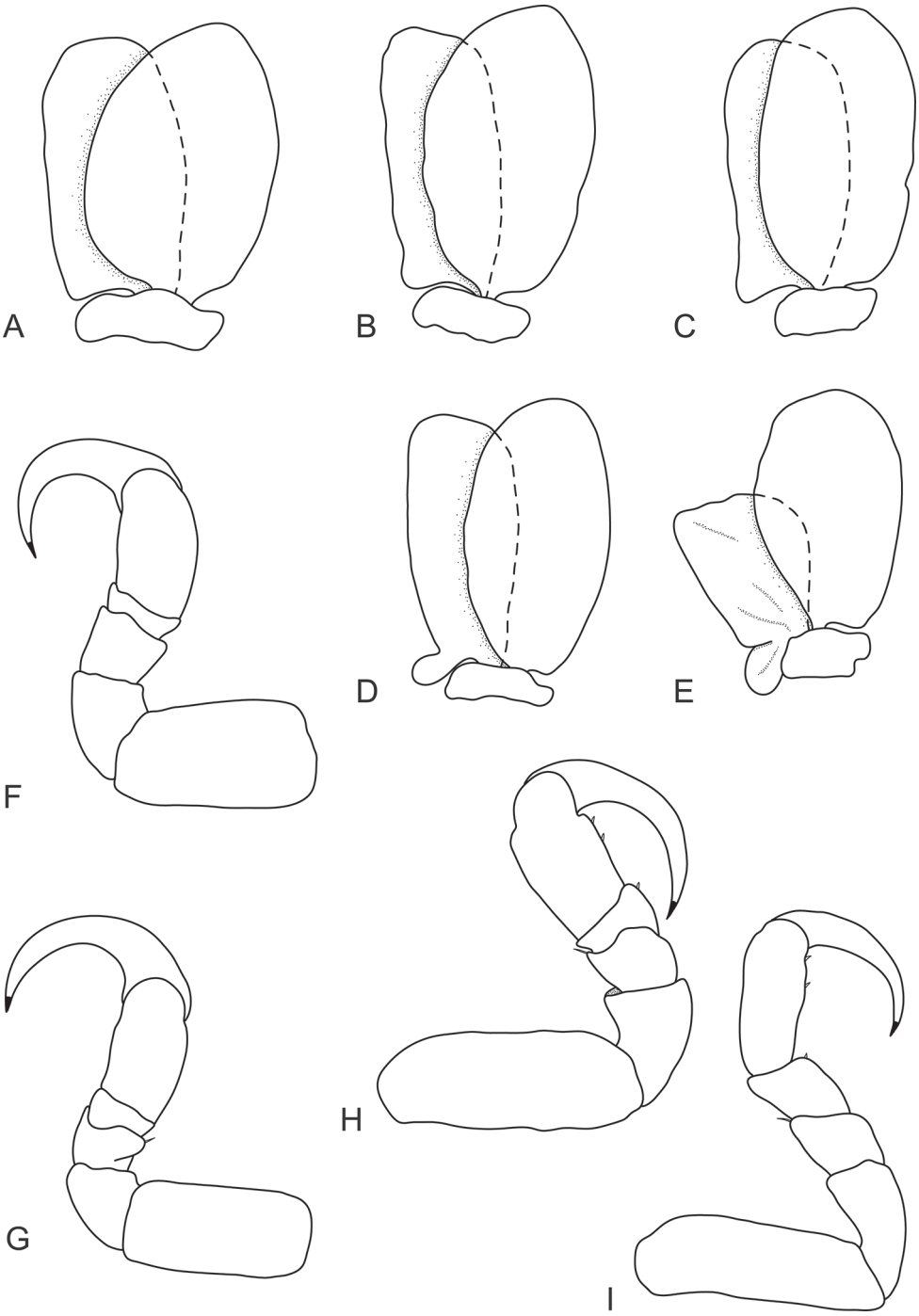

Figure 5. *Bambalocra intwala* sp. nov. Male paratype, 7.5 mm (SAMC-A091365) **A–E** pleopods 1–5 respectively **F** pereopod 1 **G** pereopod 2 **H** pereopod 6 **I** pereopod 7.

coxae posteriorly acute; pereonite 7 extending to posterior of pleonite 2. Pleon half as wide as body, all pleonites visible in dorsal view. *Pleotelson* 0.9 times as long as anterior width, lateral margins convex, posterior margin evenly rounded.

Antennula with 8 articles. Antenna with 10 articles. Mandible article 3 with 6 RS. Pereopods similar in proportions to female. Pleopods similar in proportions to female; pleopod 2 appendix masculina and penial processes absent.

Uropod 0.8 as long as pleotelson, peduncle 0.5 times as long as rami, rami not extending beyond pleotelson, apices narrowly rounded. *Endopod* 4.0 times as long as greatest width, 0.8 as long as exopod, lateral margin weakly convex, mesial margin weakly concave. *Exopod* extending beyond end of endopod, 4.7 times as long as greatest width, lateral margin convex, mesial margin concave.

Remarks. As the genus is monotypic, the species is identified by the generic characters, in particular the coxae being ventral in position rather than lateral, the pleonites being all wide, without ventrolateral processes, in combination with the short posteriorly directed ventral rostrum that separates the slender antennula and antenna.

Host. There is no host data for the holotype and wild-caught paratypes; the specimen from the Durban Aquarium is from a dwarf angelfish (*Centropyge*). Several species of externally attaching cymothoid have been photographed by SCUBA divers on the coral reefs at Sodwana Bay; from the photographs three species of Pomacanthidae (angelfish) are identified as probable hosts: *Apolemichthys trimaculatus* (Cuvier, 1831), *Pomacanthus imperator* (Bloch, 1787), and *Pygoplites diacanthus* (Boddaert, 1772), but these hosts need to be confirmed by direct capture of the isopods in situ.

Etymology. The epithet is the word for louse (*intwala*) in the isiZulu language (noun in apposition).

Key to the externally attaching genera of the Cymothoidae (modified after Bruce, 1987)

1	Cephalon posterior margin trisinuate; coxae 5–7 as long as or longer than respective pereonite (except *N. lomatia*)	**2**
–	Cephalon posterior margin not trisinuate; coxae 5–7 manifestly shorter than respective pereonite	**5**
2	Pleonites 1 and 2 ventrolateral margins produced	***Nerocila***
–	Pleonites 1 and 2 ventrolateral margins not produced	**3**
3	Body dorsal surface strongly vaulted; coxae 5–7 ventrally directed; pleonites strongly produced ventrally	***Plotor***
–	Body dorsal surface weakly vaulted; coxae 5–7 posteriorly directed; pleonites not strongly produce ventrally	**4**
4	Uropod rami long, extending well beyond posterior of pleotelson; coxae conspicuous in dorsal view	***Amblycephalon***
–	Uropod rami short, not extending beyond posterior of pleotelson; coxae inconspicuous in dorsal view	***Creniola***

5 Cephalon without rostrum, or rostrum not projecting between antennula bases; antennula broader than and as long as, or longer than antenna; posterolateral margins of pereonites 5–7 produced; coxae 5–7 posteriorly acute.... ..... ***Renocila***

– Rostrum folded under, projecting between antennula bases; antennula more slender than and shorter than antenna; posterolateral margins of pereonites 6 and 7 produced (*Bambalocra*) or not produced coxae posteriorly rounded... **6**

6 Coxae ventral in position, not or barely visible in dorsal view; posterolateral margins of pereonites 6 and 7 posteriorly produced, rounded; pleopods 1 and 2 lamellar, pleopods 3–5 endopods with weak lobes; pleopods hardly visible in dorsal view..... ***Bambalocra* gen. nov.**

– Coxae lateral in position, largely not visible in dorsal view, posterolateral margins of pereonites 5–7 not produced; pleopod 5 with prominent folded fleshy lobes; pleopods clearly visible in dorsal view **7**

7 Mandible palp article 3 shorter than article 2; maxilla with 2 short hooked RS each on medial and lateral lobe, medial lobe partly fused to lateral; antennula articles 4–8 short; pleonites 3–5 or 4 and 5 more than half width (ca. 0.70) of pereon ..... ***Anilocra***

– Mandible palp article 3 longer than article 2; maxilla with 2 large nodular RS each on medial and lateral lobe, medial lobe distinct; antennula articles 4–8 elongate; pleonites 3–5 or 4 and 5 less than half width (ca. 0.45) of pereon..... ..... ***Pleopodias***

Acknowledgements

RLW received final support from the Claude Leon Foundation for this research. The financial assistance of South Africa's National Research Foundation (NRF) (Project IFR17021022411 Grant 109352, NJS, PI) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the authors and are not necessarily to be attributed to the NRF. We would like to thank Albé Bosman, Collections Manager at the Iziko South African Museum, for providing information on and the loan of the museum specimens. This is contribution number 353 from the NWU-Water Research Group.

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ZooKeys 889: 17–22 (2019)
doi: 10.3897/zookeys.889.35805
http://zookeys.pensoft.net

SHORT COMMUNICATION

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Scolopostethus affinis (Schilling) (Hemiptera, Heteroptera, Rhyparochromidae, Drymini): a new alien established in North America

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Academic editor: *L. Livermore* | Received 27 April 2019 | Accepted 26 September 2019 | Published 14 November 2019

http://zoobank.org/D0BEF455-0EEC-4D27-ABFD-C65071514D18

Citation: Larson DJ, Scudder GGE (2019) *Scolopostethus affinis* (Schilling) (Hemiptera, Heteroptera, Rhyparochromidae, Drymini): a new alien established in North America. ZooKeys 889: 17–22. https://doi.org/10.3897/zookeys.889.35805

Abstract

Scolopostethus affinis, a species native to the Palearctic region, is reported from two localities in Montreal, Quebec. The species appears established and breeding in Quebec and is a new alien species in North America. A description of *S. affinis* is given, with illustrations, and details of the life cycle and diagnostic characters.

Keywords

Canada, Hemiptera, Rhyparochromidae, *Scolopostethus affinis*

Introduction

The genus *Scolopostethus* Fieber (Rhyparochromidae: Rhyparochrominae: Drymini) comprises a group of 34 relatively small species that occur within the Holarctic and northern Ethiopian biogeographic regions (Slater 1964, Dellapé and Henry 2019). One species, *S. thomsoni* Reuter, is Holarctic occurring across Northern North America, four are Nearctic (Henry and Froeschner 1988) and 29 are Palearctic.

Scolopostethus affinis (Schilling) is an Old-World species, a Euro-Siberian element in the fauna, known from all of Europe, including Russia, with recorded occurrence in Asia (Péricart 1998). In the British Isles, it is quite common, and occurs on a wide variety of soils where it is often associated with nettles (*Urtica dioica* L.) (Southwood and Leston 1959). It is usually brachypterous, but macropters are sometimes present (Southwood and Leston 1959).

There is an extensive literature on *S. affinis*, as documented by Slater (1964) and Dellapé and Henry (2019). Slater (1964) lists the references that give illustrations. In the recent literature, a colour illustration is included in Southwood and Leston (1959), and Péricart (1998) provides illustrations relevant for accurate identification. The latter two authors provide keys to European species. Larson and Scudder (2018) describe and illustrate the two species then recognised on the prairies and in eastern Canada and discuss previously reported species.

Eyles (1963a) described the life cycle of *S. affinis* in England and concluded that it has a single generation a year, but Southwood and Leston (1959) state that it is either single-brooded, with a long oviposition season, or double-brooded. Eyles (1963b) describes the egg and the five immature stages, although these immature stages cannot be separated from those of *S. thomsoni* and have a similarly timed life cycle. However, Eyles and Blackith (1965) found that *S. affinis* did not successfully hybridise with other species of *Scolopostethus*.

Eyles (1964) showed that seeds are the principal item of food in the diet of *S. affinis*. When larvae were reared on different seeds, seeds of the stinging nettle (*Urtica dioica* L.) produced the most productive growth curve. Eyles (1963a) found that *S. affinis* in England overwinters in nettle litter or in leaf litter near nettles, and was most readily collected in nettles. Eyles (1964) showed that although *S. affinis* survived to the third instar on a diet of beetle larvae, it scarcely showed any growth.

Materials and methods

Quebec specimens have been compared with material collected in England and Germany. Measurements were obtained from this European material, but total length of Quebec specimens is also given.

Quebec specimens are deposited in the following collections:

CNC Canadian National Collection, Agriculture and Agri-Food Canada, Ottawa;
DJL D.J. Larson collection;
GGES G.G.E. Scudder collection.

All European specimens studied are in the latter collection.

Taxonomy

***Scolopostethus affinis* (Schilling, 1829)**
Fig. 1

Pachymerus affinis Schilling, 1829, Beitr. Ent. Schles. Fn. 1: 80.
Scolopostethus affinis: Stål 1862, Ofv. Vet. Akad. Forh. 10: 219 (current combination).
Scolopostethus adjunctus Douglas & Scott, 1865, Brit. Hem. Het.: 183 (synonym).
Scolopostethus affinis: Slater 1964, Cat. Lygaeidae World 2: 954 (bibliography).
Scolopostethus affinis: Péricart 1998, Fauna de France 84B: 301 (description).
Scolopostethus affinis: Dellapé & Henry, Lygaeoidea Species File, Ver. 5.0/5.0 (2019) (bibliography, distribution).

Description. ***Colour.*** Head fuscous; antennae with first and second segments completely pale ferruginous, third antennal segment basally pale ferruginous, with rest of third segment and whole of fourth segments dark brown; rostrum with first segment fuscous, second and third segments ochraceous, and fourth segment ferruginous. Pronotum with anterior lobe of disc fuscous, posterior lobe ferruginous with humeral angles and patch on each side of midline dark brown; anterior margin of pronotum dark ferruginous; lateral carina dusky anteriorly, but pale ochraceous at level of transverse impression, and more or less fuscous posteriorly. Scutellum fuscous. Hemelytra flavo-ochraceous, with posterior third of corium fuscous and streaks of fuscous extending basally along R+M, along subcostal area and along second row of punctures adjacent to scutellum; corium with a distinct quadrate fuscous spot about middle and almost or actually contacting costal margin; clavus with apical fuscous streak between middle rows of punctures; membrane pale with veins fuscous. Legs flavescent, with fore femora medially dark brown. Venter fuscous with anterior margin of prosternum, posterior margin of proplura and metapleura, and coxal covers (= acetabula) flavo-ferruginous.

Structure. Head punctate; rostrum reaching to or almost to middle coxae, with first segment reaching to or almost to anterior margin of prosternum. Pronotum punctate, especially near anterior margin; pronotum of brachypterous forms rather quadrate and slightly concave at level of transverse impression: pronotum in macropters distinctly wider than long and distinctly concave laterally; anterior lobe of disc longer than posterior lobes, in most cases twice as long. Hemelytra in brachypters reaching middle of tergum VI, in macropters reaching virtually to end of abdomen. Clavus with three rows of regular punctures, plus a few odd punctures in apical half between the two rows nearest scutellum. Fore femora incrassate, with rows of small spines both antero- and postero-ventrally, the antero-ventral row extending along most of femora with small spines both distal and proximal to the larger spine, found on the apical third of femora. Fore tibia of male distinctly curved, with apex expanded and with small

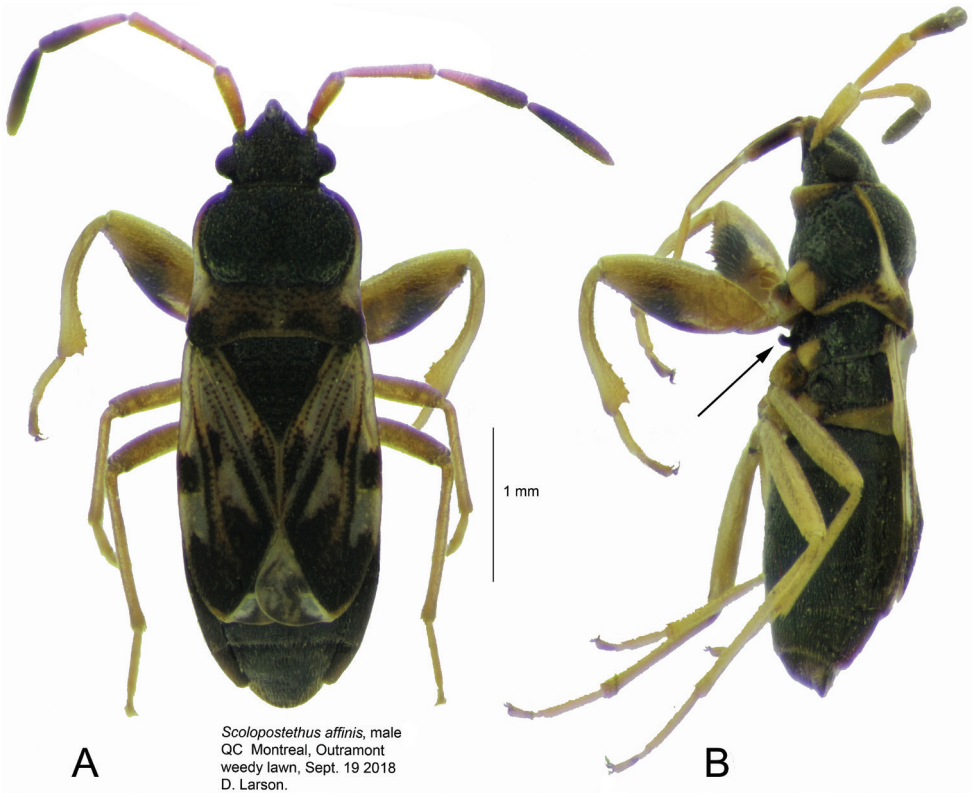

Figure 1. *Scolopostethus affinis*, male brachypter. **A** dorsal aspect **B** lateral aspect, arrow indicates mesosternal process.

spines. Mesosternum of male with a pair of curved processes, replaced in female by short tubercles, best seen in side view.

Measurement of British specimens (all measurements in mm):

Male brachypter (*N* = 10). Head width: 0.76 (0.70–0.82).
Antennal measurements: 0.38 (0.37–0.43): 0.64 (0.62–0.70): 0.59 (0.56–0.60): 0.67 (0.13–0.70).
Pronotal width: 1.16 (1.07–1.23) pronotal length 0.95 (0.90–1.07).
Total length: 3.79 (3.60–3.80).

Male macropter. Head width: 0.79 (0.75–0.83).
Antennal measurements: 0.38 (0.37–0.40): 0.61 (0.60–0.63): 0.57: 0.65 (0.63–0.67).
Pronotal width: 1.14 (1.00–1.25), pronotal length 0.82 (0.77–0.87).
Total length: 3.80 (3.50–4.04).

Female macropter (*N* not recorded). Head with: 0.82 (0.80–0.83).
Antennal measurements: 0.37 (0.36–0.40): 0.62 (0.60–0.63): 0.58 (0.57–0.62): 0.67 (0.65–0.70).

Pronotal width: 1.32 (1.28–1.38), pronotal length 0.91 (0.90–0.92).
Total length: 4.13 (4.00–4.25).

Measurements of Quebec specimens
Total length: male (*N* = 10) 3.40–3.77; female (*N* = 10) 3.70–4.14.
Percent brachypterous: male 85.7 % (*N* = 21); female 63.6% (*N* = 11).

Diagnosis and remarks. The species is easily recognised and distinguished from Nearctic species of *Scolopostethus* by the pair of curved processes on the mesosternum of males (Fig. 1B), and the short tubercles on the mesosternum of females in front of the middle coxae, which are best seen in the side view of thorax. The antennae are distinct (Fig. 1) in that the second segment lacks a fuscous apex and is unicolourous whereas in *S. thomsoni* Reuter, the second antennal segment has the apex clearly fuscous.

The fore femora of *S. affinis*, like *S. thomsoni*, have a row of short spines both antero- and postero-ventrally, with the antero-ventral row with short spines both proximal and distal to the larger spine.

Material examined. Quebec material examined is as follows:

- 17♂ 8♀, QUEBEC, Montreal, Outremont, weedy lawn, 29.ix.2018 (D. Larson) [CNC, DJL, GGES].
- 5♂ 1♀, QUEBEC, Montreal, Olympic Park, 24.ix.2018 (D. Larson) [DJL, GGES].

Discussion

This species was collected in Outremont, Quebec, in a ruderal area around a newly constructed building, with many weeds, including dandelion (Asteraceae: *Taraxacum* sp.), knapweed (Asteraceae: *Centaurea* sp.), nettles (Urticaceae: *Urtica dioica* L.), burdock (Asteraceae: *Arctium* sp.), and lamb's quarters (Amaranthaceae: *Chenopodium album* L.). Although late-instar nymphs were abundant, proving the species was present as a reproducing colony, no specimens were retained.

The true bug fauna of Quebec is well known. If this apparently synanthropic species had been present in Quebec for any length of time, it is highly probable it would have been discovered before now. Thus, *S. affinis* is likely a recent introduction into the fauna. As the species has a wide range in the Palearctic, indicating it can survive in diverse environments, and is clearly adapted to some types of human-modified environments, it is likely to persist and spread in North America. The North American population contains both brachypters and macropters so rapid dispersal by flight is a possibility but also synanthropic species have the advantage of human assisted dispersal so that rapid spread is possible. Fortunately, this species is not known to have any deleterious effects on crops and its propensity of feeding on seeds of plants we regard as weeds may make it a welcome addition to our environments. It is not known how it might interact with North American species although it does coexist with a diverse fauna of Palearctic *Scolopostethus*, which includes the Holarctic *S. thomsoni*, so it may occupy an uncontested niche.

Acknowledgements

Launi Lucas kindly prepared the manuscript. We thank Thomas Henry, Laurence Livermore and an anonymous reviewer for their very helpful and constructive reviews.

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ZooKeys 889: 23–35 (2019)
doi: 10.3897/zookeys.889.36436
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RESEARCH ARTICLE

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Two new species of braconid wasps (Hymenoptera, Braconidae) from India

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Academic editor: *J. Fernandez-Triana* | Received 22 May 2019 | Accepted 26 August 2019 | Published 14 November 2019

http://zoobank.org/D1E6D6F0-B26A-4091-81F8-2BD43F563F4F

Citation: Ahmad Z, Ghramh HA, Ansari A (2019) Two new species of braconid wasps (Hymenoptera, Braconidae) from India. ZooKeys 889: 23–35. https://doi.org/10.3897/zookeys.889.36436

Abstract

Two new species viz., *Pambolus* (*Phaenodus*) *shujai* **sp. nov.**, and *Parachremylus trachysi* **sp. nov.**, of braconid wasps are described as new to science. *Parachremylus trachysi* **sp. nov.**, is reared from larvae of the leaf miner *Trachys* sp. (Coleoptera, Buprestidae) on *Corchorus* sp. (Wild Jute Plant). A new species of *Pambolus* Haliday along with two known species is also recorded. A key to the Indian species of *Pambolus* is also provided. Diagnoses with morphological characters and illustrations are provided.

Keywords

Braconidae, coleopteran leafminer host, *Corchorus*, *Pambolus*, *Parachremylus*, taxonomy, *Trachys*

Introduction

Braconid wasps (Hymenoptera, Braconidae) represent an important insect group of natural parasitoids which have an efficient role in biological control programs (Matthews 1974, Shaw 1995). Braconids are speciose with 19,801 described species belonging to 1071 genera, which represent nearly 20% of the total hymenopteran diversity worldwide (van Achterberg 2014, Yu et al. 2016). Braconids are distributed in all zoogeographical regions (Wahl and Sharkey 1993) and play an ecological role as regulators of other insect

groups. The majority of the species are parasitoids especially upon the larval stages of insect pests in the various orders including Hemiptera, Coleoptera, Diptera, Hymenoptera, and Lepidoptera (Shaw and Huddleston 1991, Whitfield and Wharton 1997).

In the present work, two new braconid species, one each from the genus *Pambolus* Haliday and the genus *Parachremylus* Foerster are described as new to science. Taxonomically the genus *Pambolus* was included either in the subfamily Hormiinae Foerster, 1862 s. l. (Whitfield and Wharton 1997) or in a separate subfamily Pambolinae Marshall, 1885 (van Achterberg 1995, Braet and van Achterberg 2003, van Achterberg and Braet 2004). The subsequent classification is most popular among the recent workers (Martínez et al. 2012) as it is based upon a natural group as revealed by a previous phylogenetic study of the cyclostome subfamilies of Braconidae (Zaldívar-Riverón et al. 2006). Presently *Pambolus* is subdivided into two subgenera *Pambolus* (females always brachypterous or micropterous, and males always macropterous) and *Phaenodus* (females always macropterous, and males usually macropterous) (Belokobylskij and Kula 2012). *Phaenodus* is often treated as a separate genus (see Belokobylskij 1986, Belokobylskij 1988, Belokobylskij 1992b, Papp 1996, 2000, Belokobylskij 1998, 1999, Braet and van Achterberg 2003). The genus *Pambolus* is cosmopolitan in distribution and is particularly diverse in the Neotropics (Whitfield and Wharton 1997). Of the 43 species worldwide, six are reported from the Oriental region (Yu et al. 2016) of which three species, viz., *P.* (*Phaenodus*) *ignarus* Papp, *P.* (*Ph.*) *topali* Papp and *P.* (*Ph.*) *ruficeps* Belokobylskij are reported from India (Papp 1996). All species known from India, including the new species described herein, belong to the subgenus *Phaenodus*. A key to the Indian species of the genus *Pambolus* is also provided in this paper.

The systematic position of the genus *Parachremylus* Granger is disputed, either included in the subfamily Exothecinae (tribe Avgini Belokobylskij, 1993) or more traditionally in the subfamily Hormiinae (Wharton 1993). The genus *Parachremylus* is restricted to the Old World tropics and is represented by only four species viz., *P. litchi* Belokobylskij & Maeto, *P. oblongus* (Papp), *P. seyrigi* Granger and *P. temporalis* Belokobylskij (Papp 1996, Papp 1997, Belokobylskij and Maeto 2006, Yu et al. 2016). In the present work, one new species of *Parachremylus* is described from the leafmining larvae of *Trachys* sp., on *Chorchorus* sp., a wild jute plant in India. This is the first record of this genus reared from coleopteran leafminer hosts. Other species of this genus viz., *P. litchi* (Belokobylskij and Maeto 2006) were reared from larvae of *Conopomorpha sinensis* and *C. litchiella* (Lepidoptera: Gracillariidae).

Materials and methods

The specimens were collected from northern Uttar Pradesh in order to study the biodiversity and conservation of parasitoid wasps in the northern region of India. The subfamily keys of van Achterberg (1993) and Wharton et al. (1997) and generic keys of Belokobylskij (1993) and Wharton (1993) were used for the identification. Descriptions by Belokobylskij (1992a) and Papp (1996) were used for *Pambolus*, and descriptions by

Belokobylskij and Maeto (2006) were used for determining *Parachremylus* species. We followed Sharkey and Wharton (1997) for terminology of various body parts and wing venation and Eady (1968) for the terminology of micro-sculpture. The following abbreviations are used in the text: **OOL** – ocello-ocular line (distance from the outer edge of a lateral ocellus to the compound eye); **POL** – post-ocellar line (distance between the inner edges of the two lateral ocelli); **AOL** – anterior-ocellar line (distance between the inner edges of anterior and lateral ocellus); **ØOD** – diameter of an ocellus; **T1** – First metasomal tergite; **F1** – First antennal flagellomere. All descriptions, measurements, and photographs of wings and body parts were made under a Zeiss Discovery V20 stereo zoom microscope while scanning electron microscope (SEM) photomicrographs were taken using a LEO 435VP SEM. The specimens have been deposited in the Insect Collection section of the Department of Zoology, Aligarh Muslim University, Aligarh, India (ZDAMU).

Results

Taxonomy

Genus *Pambolus* Haliday, 1836

Key to the Indian species of *Pambolus* (*Phaenodus*) Haliday (females)

1 Female length 3–4.2 mm; notauli distinct throughout, deep, crenulated; antennae about 1.5–1.7 × as long a body; propodeal spines as long as second and third tarsomere of hind tarsus; face and vertex sculptured usually rugose to rugulose **2**

– Female length at most up to 2.8 mm; notauli indistinct anteriorly, rather prominent posteriorly; antennae about 2.0 × as long as body; propodeal spines short, half as long as third tarsomere of hind tarsus; face polished, vertex smooth to finely granulate **3**

2 Eyes about 2.0 × as long as temple in dorsal view, latter rounded; hind femur 4.6–5.0 × as long as broad medially; antennae with 27–30 segments. T1 as long as broad apically; vertex, and occiput rather transversely rugulo-rugose .... ***P.* (*Ph.*) *topali* Papp**

– Eyes 2.7–3.0 × as long as temple in dorsal view, latter receded; hind femur 3.5–3.8 × as long as broad medially; antennae with 33–40 segments. T1 1.1–1.3 × as long as broad apically; vertex and, occiput coriaceous to rugulose .... ***P.* (*Ph.*) *ruficeps* Belokobylskij**

3 Antennae yellowish brown; malar space 2.0–2.5 × basal width of mandible; pterostigma 4.0–5.0 × as long as wide; propodeal spines located anterior to middle of propodeum; antennae 26 segmented..... ***P.* (*Ph.*) *ignarus* Papp**

– Antennae with F17–F29 creamish-white; malar space 3.5 × basal width of mandible; pterostigma 3.0 × as long as wide; propodeal spines located in the middle of the propodeum; antennae 29 segmented..... ..... ***P.* (*Ph.*) *shujai* Ahmad, sp. nov.**

Pambolus (*Phaenodus*) *ignarus* Papp

Figs 1–3

Pambolus (*Phaenodus*) *ignarus* Papp, 1996: 46; Yu et al. 2016.

Material examined. 2 females, "INDIA: Uttar Pradesh, Aurriya, 23.IX.03; coll. M Shamim (ZDAMU)". 1♀, "INDIA: Uttar Pradesh, Aligarh, 09.X.01; Coll. Zubair Ahmad (ZDAMU)".

Remarks. *Pambolus* (*Ph.*) *ignarus* is known among all the Oriental species by its smaller size and almost absence of notauli, which is hardly impressed on the anterior part of mesoscutum and without any crenulation. A brief diagnosis is as follows: body length 1.8 mm long; forewing length 1.9 mm; ground color of head brownish yellow; meso- and metasoma rusty brown; antennae unicolor (yellowish brown); head in dorsal view less transverse 1.7 × as broad as long; eye 4.0 × as long as temple; antenna nearly 2.0 × as long as body and with 25 segments; F1 5.0 × as long as broad apically; face polished; notauli hardly distinct on disc of mesonotum; mesonotum finely granulose; propodeal spines short, as long as half of third tarsomere of hind tarsus; forewing vein r arising beyond middle of pterostigma; ovipositor sheath as long as hind basitarsus.

Host. Unknown.

Distribution. India: Karnataka, Uttar Pradesh (Papp 1996).

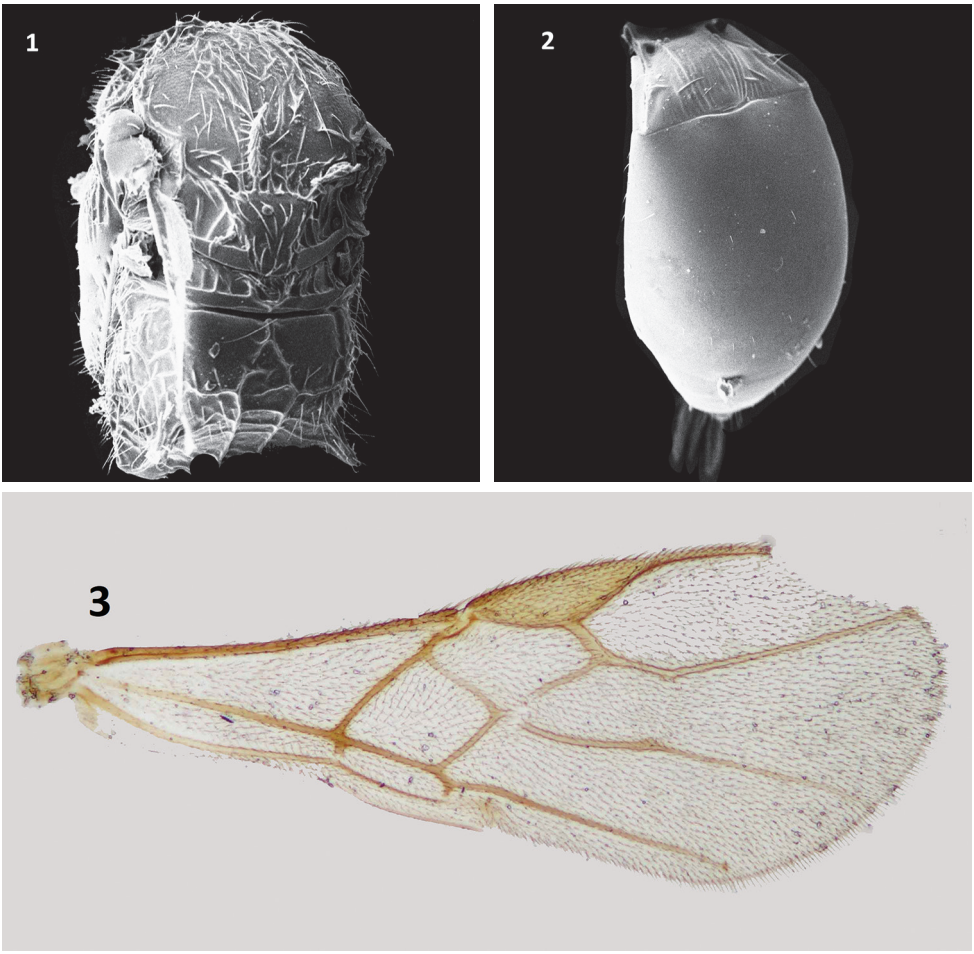
Pambolus (*Phaenodus*) *shujai* Ahmad, sp. nov.

http://zoobank.org/D6EE6537-36D1-4F99-B972-71C77A6D9243

Figs 8, 9

Material examined. Holotype, female, "INDIA: Uttar Pradesh, Etawah, 13.IV.02; coll. M Shamim (ZDAMU)". **Paratypes**, 3 females with same data as holotype.

Diagnosis. The new species *Pambolus shujai* Ahmad sp. nov., is closely related to *Pambolus ignarus* Papp. However, it differs from *P. ignarus* in having (1) antennae with F17–F29 creamish-white (antennae yellowish brown in *P. ignarus*); (2) POL: ØOD: OOL = 2:1.5:6 (POL: ØOD: OOL = 2: 2: 5 in *P. ignarus*); (3) antennae as long as body (antennae 2.0 × as long as body length in *P. ignarus*); (4) propodeal spines present at the middle of propodeum, length of spine 0.4 × as long as fore basitarsus, 0.3 × the distance between them (pair of lateral spines present at one-third below the middle of propodeum; length of spines as long as fore basitarsus, 0.5 × the distance between them length in *P. ignarus*); (5) hind basitarsus 1.2 × as long as tarsal segment 2–4 combined (hind basitarsus 0.7 × as long as tarsal segment 2–4 combined in *P. ignarus*); (6) forewings distinctly shorter than the body (forewings distinctly longer than the body *P. ignarus*). (7) pterostigma 3.0 × as long as wide (pterostigma 5 × as long as wide *P. ignarus*). The new species also differs from other Indian species, *P. ruficeps* Belokobylskij, by having (1) vertex finely granulates around ocelli, smooth elsewhere (rugulose in *P. ruficeps*); (2) forewing veins r, 2RS, 3RSa thickened (forewing veins r, 2RS, 3RSa



Figures 1–3. *Pambolus* (*Ph.*) *ignarus* Papp **1** mesosoma, dorsal view **2** metasoma, dorsal view **3** forewing.

normal in *P. ruficeps*); (3) antennae as long as body (antennae 1.5–1.7 × as long as body length in *P. ruficeps*); (4) face smooth (face reticulate rugulose in *P. ruficeps*).

Description. Female, body length: 2.8 mm; forewing: 2.3 mm.

Head. Antennae 29 segmented, almost as long as body; scape 1.6 × as long as wide, F1 3.5–4.0 × as long as wide, head transverse, ca. 2.0 × as wide as long in dorsal view, temple smooth, distinctly widening ventrally, widest distance from eyes 2.0 × as long as eye dorsally; AOL: POL: ØOD: OOL =1:2:1.5:6; malar space 3.5 × basal width of mandible; face sparsely setose, smooth, 1.3 × as wide as long; clypeus smooth, distinctly separated from face, slightly convex, 3.5 × as wide as long; hypoclypeal depression elliptical almost 3.0 × as wide as long medially; frons strigose with few setae; vertex finely granulate around ocelli, rest smooth.

Mesosoma. Mesosoma 1.8 × as long as wide in dorsal view, 2.0 × as long as high in lateral view; pronotum small and sparsely setose; median and lateral lobes of mesoscu-

tum granulate, sparsely setose; notauli poorly developed anteriorly, distinct posteriorly with some longitudinal carinae; scutellar sulcus deep and broad with four crenulae, 0.6–0.7 × as long as scutellum, scutellum polished with fine setae laterally and posteriorly, side of scutellum concave with longitudinal striations, metanotum almost at the same level, longitudinally striated, sparsely setose; propodeum with strong areolation, areola elongate, with a pair of spines, present at the middle of propodeum; propodeal spine 0.4 × as long as fore basitarsus and 0.3 × the distance between them; propleuron anteriorly granulate, posteriorly rugose, sparsely setose; mesopleuron anteriorly rugose, otherwise smooth and polished; episternal scrobe deep and isolated, crenulate at the margins.

Wings. Forewing 2.7 × as long as wide, 0.8–0.9 × as long as body, 2.7 × as long as hind tibia; pterostigma 3.0 × as long as wide, 0.8 × length of R1a, r arising from its middle; r about as long as width of pterostigma; second marginal cell of moderate size; 3RSa 0.9 × as long as r, 0.5 × 2RS, 0.25 × 3RSb; r-m 0.7 × 3RSa; CU1b arising from the middle of brachial cell; marginal cell somewhat short about 2.25 × as wide as high, 3RSb straight and falls much before the tip of wing; (RS+M)a slightly curved; hind wing 4.0 × as long as wide; M+CU 0.6 × 1M.

Legs. Hind leg setose, hind femur 4.0 × as long as broad, hind tarsus 0.9 × as long as hind tibia, hind basitarsus 1.2 × as long as tarsal segment 2–4 combined.

Metasoma. Metasoma as long as head and mesosoma combined in dorsal view, 2.0 × as long as wide; T1 longitudinally striated, strongly broadening posteriorly; 2 × as long as broad basally, spiracles present a little basally from middle; further tergites polished; ovipositor sheath in lateral view 1.1 × as long as tarsomere 2–4 combined; ovipositor short, straight and pointed.

Color. Head brownish yellow with dark brown patches; eyes, stemmaticum, propleuron, mesopleuron, propodeum black; mesonotum, metanotum, legs brownish; metasoma reddish brown; ovipositor sheath brownish; mandibles yellowish brown; tip of mandible, claws, antennal segment F1–F16 dark brown; F17–F29 creamish-white; ocelli transparent; wings hyaline, pterostigma yellowish brown, veins yellowish brown and thickened.

Male. Unknown.

Host. Unknown.

Distribution. India (Uttar Pradesh).

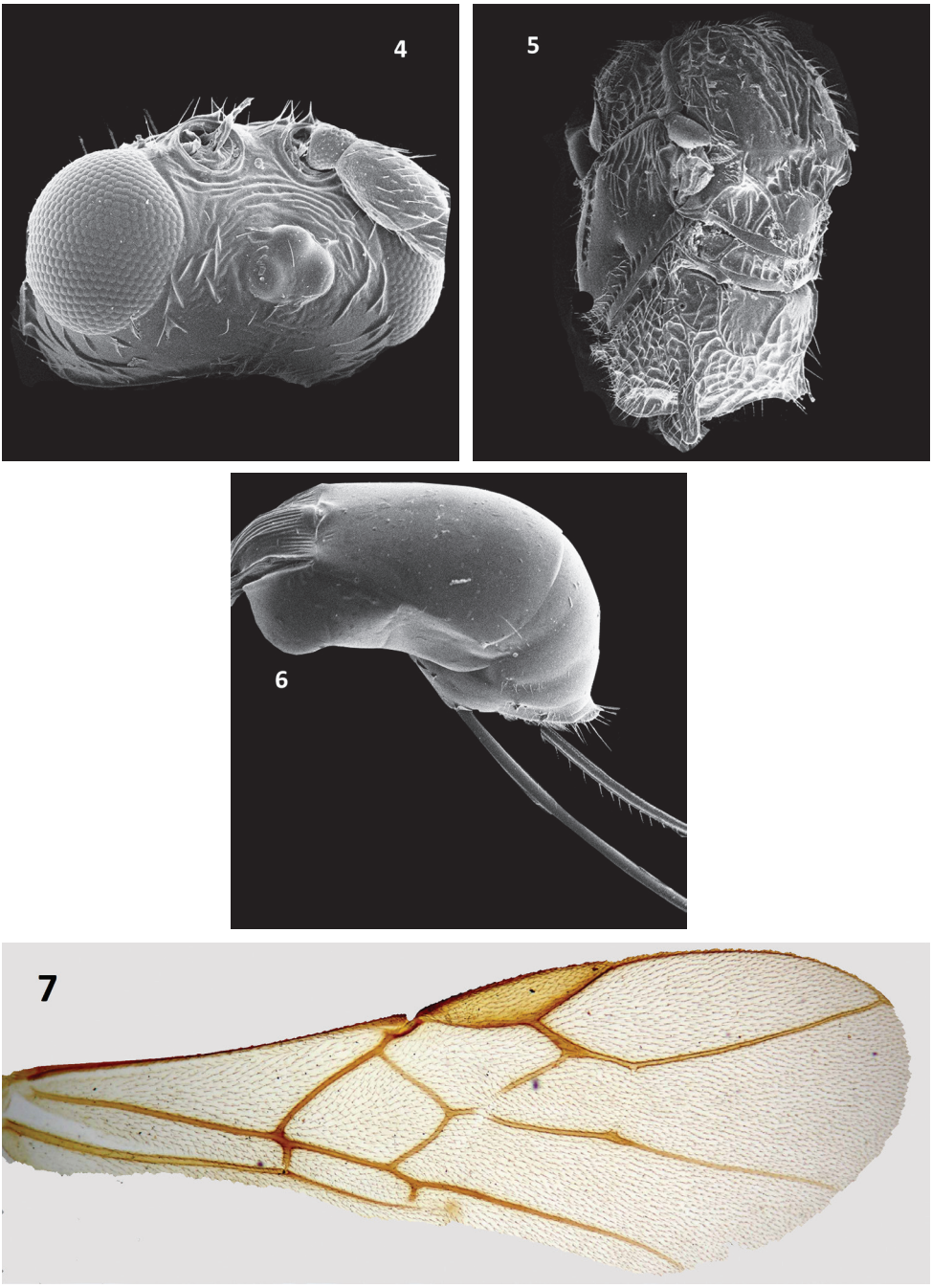
Etymology. The species is named after Dr Shujauddin for his valuable contributions to the taxonomy of Indian Braconidae.

Pambolus (*Phaenodus*) *ruficeps* Belokobylskij

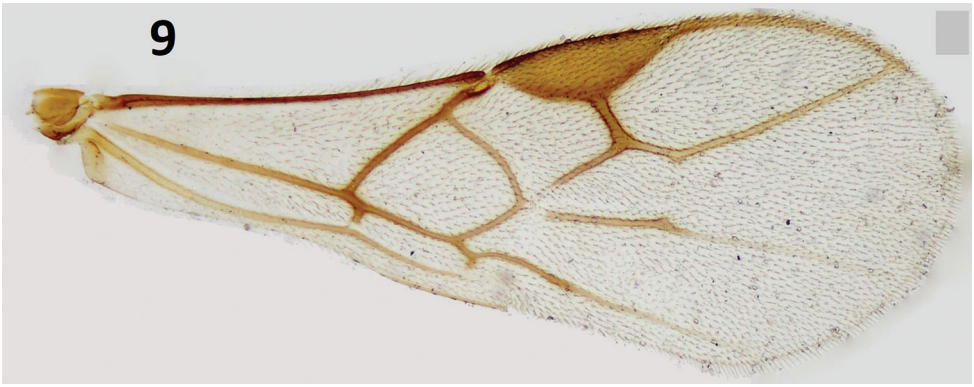
Figs 4–7

Pambolus (*Phaenodus*) *ruficeps* Belokobylskij, 1988: 27 (Taiwan); Belokobylskij 1990: 128 (Malaysia) Belokobylskij 1992a, 167 (Vietnam); Papp 1996: 50 (India)

Material examined. 2 females, "INDIA: Uttar Pradesh, Etawah, 13.IV.02; coll. M Shamim (ZDAMU)".



Figures 4–7. *Pambolus* (*Ph.*) *ruficeps* Belokobylskij **4** head, dorsal view **5** mesosoma, dorso-lateral view **6** metasoma, lateral view **7** forewing.



Figures 8, 9. *Pambolus* (*Ph.*) *shujai* Ahmad sp. nov. **8** habitus, lateral view **9** forewing.

Diagnosis. *Pambolus* (*Ph.*) *ruficeps* is quite unlike all Oriental species of the genus *Pambolus* due to the presence of a heavily sculptured head. A brief diagnosis of *P.* (*Ph.*) *ruficeps* follows: body length 3.0–4.2 mm long, forewing length 3.0 mm long; eye 2.7–3.0 × as long as temple in dorsal view, latter receded; antenna with 33–40 segmented, 1.5–1.7 × as long as body; vertex, occiput coriaceous to rugulose; face reticulate rugulose; notauli distinct and crenulated; vein r, 2RS, 3RSa normal; propodeal spine as long as second or third tarsomere of hind tarsus; hind femur 3.5–3.8 × as long as broad medially; F1 1.1–1.3 × as broad behind as long medially.

Host. Unknown.

Distribution. India: Jammu and Kashmir, Orissa and Uttar Pradesh; Malaysia, Taiwan, Vietnam (Papp 1996).

***Parachremylus* Granger, 1949**

***Parachremylus trachysi* Ahmad, sp. nov.**
http://zoobank.org/6837B17F-77C7-48C1-A5A6-B11EAEFA9C69
Figs 10–13

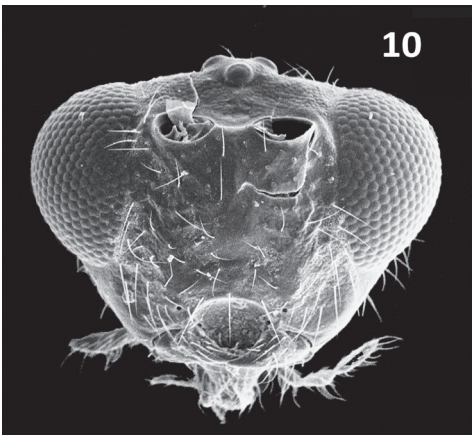
Material examined. Holotype, female, "INDIA: Uttar Pradesh, Aligarh, 10.VIII.2005; ex *Trachys* sp. on *Corchorus* sp., Coll. Zubair Ahmad (ZDAMU)". **Paratypes**, 3 females and 2 males; with same data as holotype.

Diagnosis. Following the key to world species of *Parachremylus* by Belokobylskij and Maeto (2006), *Parachremylus trachysi* sp. nov., runs near to another Indian species viz., *P. oblongus* (Papp). The new species shares similarities with *P. oblongus* in having the presence of longer temple; transverse diameter of eye 4.0 × as long as temple length in dorsal view; malar space 1.2 × basal width of mandible; mesopleuron smooth in upper half, striation partly present in subalar depression only; 1–4 segments of hind tarsomere with narrow and partly indistinct flanges and shallow field of hind half of mesonotum with a medio-longitudinal carinae running up to middle of mesoscutum. However, the new species can easily be distinguished from *P. oblongus* by having the head and mesosoma densely setose (head and mesosoma sparsely setose in *P. oblongus*); median longitudinal carina of metasoma reaching up to almost T3 (median longitudinal carina of metasoma reaching up to almost T2 in *P. oblongus*); pterostigma 3.5 × as long as high (pterostigma 5.0 × as long as high in *P. oblongus*); malar space 1.2 × as long as basal width of mandible (malar space 0.75 × as long as basal width of mandible in *P. oblongus*); scutellar sulcus with three crenulae (scutellar sulcus with five crenulae in *P. oblongus*); forewing veins 2RS and 3RSa 3.5 × as long r (forewing veins 2RS and 3RSa 2.7 × as long r in *P. oblongus*)

Description. Female, body length: 2.1 mm; forewing: 2.0 mm.

Head. Antennae 27 segmented, about as long as body length, F1– F2 3–3.3 × as long as apical width, except the apical segment which is 4.5 × as long as wide; head transverse, 1.5–1.7 × as wide as long in dorsal view and 1.2 × as high as long in lateral view; eyes in lateral view 1.2 × as high as wide, 4.0 × as long as temple, inner margin of eyes not parallel; temple granulate, sparsely setose, its widest part behind eye 0.25 × as long as width of eye; occipital carina dorsally slightly curved towards ocelli, rather widely interrupted medially; occiput with uniform transverse striations; AOL: POL: OOL: ØOD = 2:1:3:2; face polished, laterally shagreened, sparsely setose, 1.5 × as wide as long medially; clypeus 1.6 × as wide as long; vertex granulate, sparsely setose; malar space 0.4 × as long as eye and 1.2 × as long as basal width of mandible;

Mesosoma. Mesosoma 1.5 × as long as wide in dorsal view , 1.6 × as long as high in lateral view; pronotum small, indistinct; median and lateral lobes of mesoscutum granulate, sparsely setose; notauli broad anteriorly, shallow posteriorly, shallow field of hind half of mesonotum with a medio-longitudinal carinae running up to middle of mesoscutum; scutellar sulcus deep and 3.5 × as wide as long with three crenulae; scutellum indistinctly granulate, rather densely setose; propodeal areola with a median longitudinal carina anteriorly, two transverse carina inside, lateral areola with longi-



Figures 10–13. *Parachremylus trachysi* Ahmad, sp. nov. **10** head, anterior view **11** mesosoma, dorsal view **12** metasoma, dorsal view **13** forewing.

tudinal striations anteriorly and inside with transverse ruguae; propleuron smooth; mesopleuron smooth and polished except few striation at subalar depression.

Wings. Forewing 2.5 × as long as wide, as long as body; pterostigma 3.0 × as long as wide, issuing r from its middle; length of marginal cell along R1a about 1.2 × as long as pterostigma; 2RS and 3RSa 3.5 × as long r respectively; hind wing vein M+CU 0.8 × 1M; hind femur 3.4–3.6 × as long as broad medially; hind tibia 1.2 × as long as hind tarsus; hind basitarsus 0.6 × as long as tarsomere 2–4 combined.

Metasoma. Metasoma dorsally sub-sclerotized, 1.0 × as long as head and mesosoma combined, T1 evenly and distinctly broadening posteriorly, T2 2.1 × as broad as long, 1. 5 × as long as T3; T3 3.0 × as broad as long; T4 4.0 ×, as wide as long medially; basal pair of carinae of T1 meeting at its basal one-third and continuing a medio-longitudinal carinae up to apical end of T3; all tergites sub- sclerotized; ovipositor sheaths setose and blunt, in lateral view 1.2 × as long as hind basitarsus.

Color. Vertex yellow with brown marking, mandibles, scutellar sulcus, metanotum creamish; tip of mandible, mesoscutum, claws, dark brown; antennae brown; ocelli transparent; eyes, stemmaticum black; wings hyaline, pterostigma pale yellow, veins brown; scutellum, propodeum, legs yellow.

Male. Same as ♀ except body size (2 mm).

Host. *Trachys* sp. on *Corchorus* sp. (Wild Jute).

Distribution. India (Uttar Pradesh).

Etymology. The species name is derived from the name of the genus of the host insect.

Acknowledgements

The first two authors (Zubair Ahmad and Hamed A. Ghramh) extend their appreciation to the Research Center of Advanced Material, King Khalid University, Abha, KSA. The first author (ZA) extends his gratitude to the Research Center Advanced Materials Science (RCAMS), King Khalid University for funding through research program (RCAMS)-009/19. We also thank the editor, associate editor, and anonymous reviewers for their valuable and helpful comments to improve the quality of the manuscript. Authors are also thankful to Phillip Raines (Academic Organizer, Native English Language Section, King Khalid University Abha, Saudi Arabia) for improving the use of English in the manuscript.

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ZooKeys 889: 37–47 (2019)
doi: 10.3897/zookeys.889.34942
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RESEARCH ARTICLE

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Three new species of the genus *Centistidea* Rohwer, 1914 (Hymenoptera, Braconidae, Miracinae) from India and Saudi Arabia

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Academic editor: *J. Fernandez-Triana* | Received 28 March 2019 | Accepted 26 August 2019 | Published 14 November 2019

http://zoobank.org/B29D952D-7108-449C-9DBE-AFB4FE04CA89

Citation: Ghramh HA, Ahmad Z, Pandey K (2019) Three new species of the genus *Centistidea* Rohwer, 1914 (Hymenoptera, Braconidae, Miracinae) from India and Saudi Arabia. ZooKeys 889: 37–47. https://doi.org/10.3897/zookeys.889.34942

Abstract

Centistidea acrocercopsi Ahmad & Pandey, **sp. nov.,** *C. cosmopteryxi* Ahmad & Pandey, **sp. nov.,** and *C. tihamica* Ghramh & Ahmad, **sp. nov.** are described as new to science. The genus *Centistidea* Rohwer (Hymenoptera: Braconidae: Miracinae) is recorded for the first time from Saudi Arabia. Two species were reared from *Acrocercops phaeospora* Meyrick and *Cosmopteryx phaeogastra* (Meyrick) in India, while *Centistidea tihamica* was collected by Malaise trap in Saudi Arabia. Characters of these new species and their affinities with related taxa are discussed. Data on habitat, host records, and host plant species for all the parasitoid species are also provided.

Keywords
Acrocercops phaeospora, *Cosmopteryx phaeogastra*, India, leafminer, parasitoids, *Phaseolus cylindrica*, Saudi Arabia, *Syzigium cuminii*

Introduction

The subfamily Miracinae is a small cosmopolitan subfamily with two genera, *Centistidea* Rohwer, 1914 and *Mirax* Haliday, 1833, bearing 56 species worldwide (Papp 2013; Cauich-Kumul et al. 2014; Farahani et al. 2014; Yu et al. 2016; Ranjith et al. 2018). Members of this subfamily are solitary koinobiont endoparasitoids which usually attack leaf-mining caterpillars of lepidopteran families, viz., Nepticulidae, Tischeriidae, Heliozelidae, Lyonetiidae, and Gracillariidae (Maetô 1995; Memmott et al. 1994; Shaw and Huddleston 1991). This subfamily is characterized by the presence of a Y-shaped structure formed by the sclerotized part of the first three metasomal tergites, surrounded by membranous lateral parts, a reduced wing venation, the antenna being 14-segmented, and the compound eyes setose. The subfamily Miracinae has been studied by the following workers: Palaearctic Region (Papp 1984; Western Palaearctic, Tobias 1986; former USSR, Papp 1987; Korea, Belokobylskij 1989; East Palaearctic, Maetô 1995; Japan, Papp and Chou 1996; Taiwan, Wu et al. 2000; China, Beyarslan 2009; Turkey), Oriental Region (van Achterberg and Mehernejad 2002; North Oriental, Farahani et al. 2014; Iran, Ranjith et al. 2018; South India), and Neotropical Region (Papp 2013; Colombia and Honduras, Cauich-kumul et al. 2014; Mexico).

Centistidea Rohwer is a small genus with 27 described species worldwide (Yu et al. 2016; Ranjith et al. 2018). The genus *Centistidea* differs from *Mirax* in having the propodeum with medio-longitudinal carina and the notauli usually shallowly impressed anteriorly (van Achterberg and Mehernejad 2002; Papp 2013). Recently, Ranjith et al. (2018) described seven new species of *Centistidea* from the southern part of the Indian peninsula. In the present work, three new species of *Centistidea* are described as new to science, of which two are from the northern part of India and one species, *Centistidea tihamica* sp. nov., is described from Saudi Arabia.

Materials and methods

The Indian specimens were collected from western Uttar Pradesh (north India) in order to identify the parasitoids of leaf miners along the roadside at Aligarh Muslim University campus. Saudi specimens were collected by Malaise trap from Tihama in Asir region (southwestern Saudi Arabia). We have followed van Achterberg (1988) for the terminology of various body parts and wing venation, and Eady (1968) for terminology of micro-sculpture. The specimens were deposited in the Insect Collection of the Department of Zoology, Aligarh Muslim University, Aligarh, India (**ZDAMU**).

Taxonomic accounts

***Centistidea acrocercopsi* Ahmad & Pandey, sp. nov.**
http://zoobank.org/58BABAEF-CDF0-4C96-90A9-37A3FAD2FA3E
Figs 1–4

Material examined. Holotype: INDIA • ♀: Uttar Pradesh, Etah, 7.VIII.2004; ex. *Acrocercops phaeospora* (Meyrick) on *Syzygyium cuminii,* Z. Ahmad leg. (ZDAMU). **Paratype**: 1♀, with same data as holotype (HB-138, ZDAMU).

Diagnosis. Following the key to East Palearctic and Oriental species of the genus *Centistidea* Rohwer (Ranjith et al. 2018), *C. acrocercopsi* sp. nov. keys near to *C. rugator* (Ranjith et al. 2018); however, it differs in the following characters (*C. rugator* in parentheses): (i) body largely yellowish (body largely yellowish except tergites 1–6 dark brown dorsally), (ii) length of eye 1.3 × long as temple in dorsal view (length of eye 2.90 × as long as temple), (iii) ovipositor sheath 0.10 × as long as fore wing length (0.20 × as long as forewing), (iv) first tergite smooth, widening medially, slightly narrowing basally and apically, 4.0 × as long as its maximum width (first tergite smooth, widening medially, distinctly narrowing basally and apically, 3.0 × as long as its maximum width).

Description. Female: body length: 1.7 mm; length of fore wing: 2.1 mm; length of antenna: 1.7 mm.

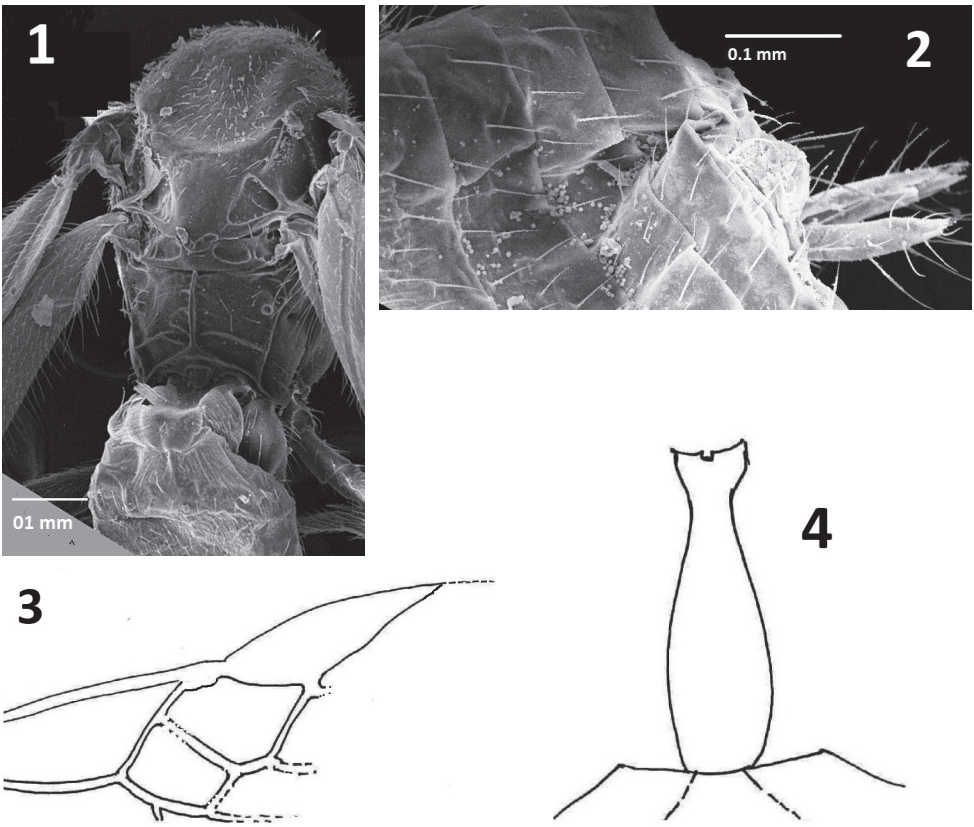
Head: ca. 2 × as wide as long in dorsal view; length of eye 1.3 × as long as temple in dorsal view; temple and vertex shiny with indistinct punctures; OOL: POL: AOL: OD = 6: 3: 2: 1.5; inner margin of eyes subparallel; face distinctly convex medially, flattened laterally and almost smooth and shiny; clypeus smooth and evenly convex; malar space ca. 2 × as long as basal width of mandible; antenna 14-segmented, F_1 as long as F_2, apical flagellomere pointed.

Mesosoma: 1.4 × as long as wide; mesoscutum shiny with indistinct punctures, notauli only anteriorly impressed and finely crenulate; prescutellar furrow poorly developed without any groove; scutellum smooth and shiny, medio-posterior depression of scutellum elliptical; propodeum somewhat smooth, with a complete median longitudinal carinae and two transverse carinae posteriorly, few rugosities adjacent to median longitudinal carina; meso- and metapleuron almost smooth and shiny.

Wings: Pterostigma with long and slender apical expansion, 2.7 × longer than wide, vein r issuing from its middle; vein 1-M 1.5 × longer than vein m-cu; vein 1-CU1 0.9 × as long as vein 2-CU1

Legs: Hind coxa smooth, length of femur, tibia, and basitarsus of hind leg 3.0 ×, 7.1 ×, and 4.0 × their maximum width, respectively; length of hind tibial spur 0.30 × as long as hind basitarsus. Hind tarsal claw large and without acute lobe.

Metasoma: 1.5 × as long as wide; first tergite, smooth, widening medially, slightly narrowing basally and apically, 4.0 × as long as its maximum width; second tergite sclerotized with strong longitudinal striations; hypopygium small, membranous, desclerotized, sparsely setose at apex, not surpassing end of metasoma; ovipositor thick, setose, distinctly shorter than petiole and hind basitarsus.



Figures 1–4. *Centistidea acrocercopsi* sp. nov. **1** mesosoma and metasoma, dorsal view **2** hypopygium **3** forewing **4** metasomal T1 and T2.

Color: Largely yellow except for the following: antenna (except for scapus and pedicel yellow), veins, pterostigma, and ovipositor apically brown; wings moderately infuscate apically.

Male. Unknown.

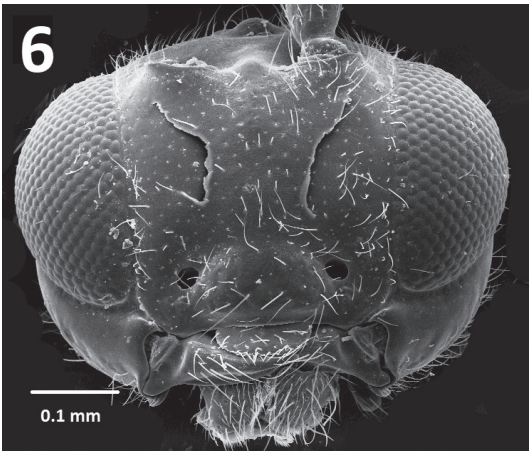
Host. *Acrocercops phaeospora* (Meyrick).

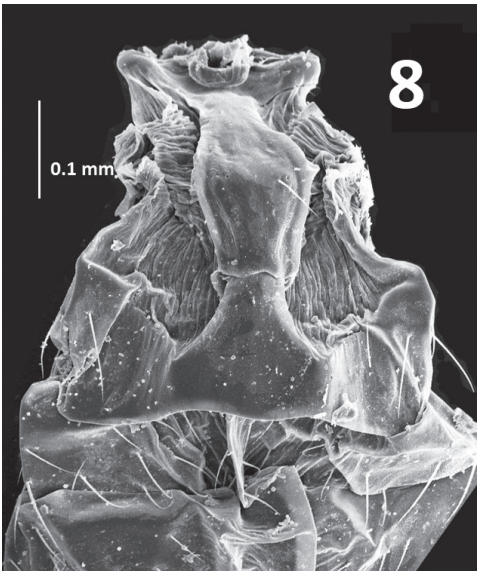
Distribution. India: Uttar Pradesh.

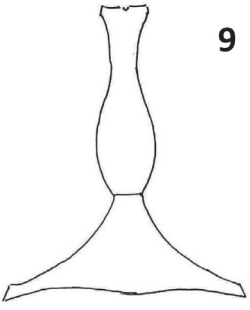
Etymology. The new species is named after its host insect.

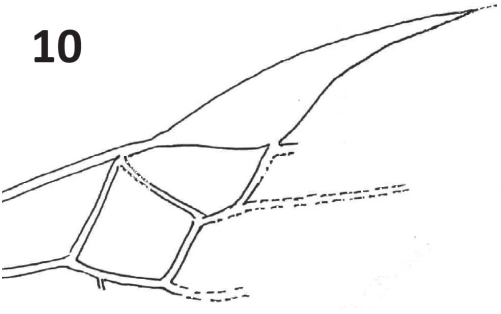
***Centistidea cosmopteryxi* Ahmad & Pandey, sp. nov.**
http://zoobank.org/BF7CFA22-06E7-4308-A0F6-D839996B4013
Figs 5–10

Material examined. Holotype: INDIA • ♀; Uttar Pradesh, Etah, 5.x.2004; ex. *Cosmopteryx phaeogastra* (Meyr) on *Phaseolus cylindrica* (coll. Z Ahmad) (ZDAMU). **Paratype**: 1♀, with same data as holotype (HB-139, ZDAMU).









Figures 5–10. *Centistidea cosmopteryxi* sp. nov. **5** body profile, dorsal view **6** head, frontal view **7** mesosoma, dorsal view **8** metasoma, dorsal view **9** metasomal T1 and T2 **10** forewing.

Diagnosis. Following the key to East Palaearctic and Oriental species of the genus *Centistidea* Rohwer (van Achterberg and Mehernejad 2002; Ranjith et al. 2018), *C. cosmopteryxi* sp. nov. keys with *C. sii* (Maetô, 1995) on the presence of yellowish head, notauli only anteriorly impressed and finely crenulate, and vein 1-R1 of fore wing distinctly vein-like. This combination of characters is quite unique among the genus *Centistedea*. However, the new species differs in the following characters: (i) wings slightly infuscate (wings hyaline in *C. sii*), (ii) length of eye 1.8 × temple (dorsal length of eye 1.10 × temple in *C. sii*), (iii) length of first tergites 2.3 × its maximum width and 3.2 × its apical width (length of first tergites 3–3.5 × its maximum width and 3.2 × its apical width in *C. sii*). When considering the similarities of characters like vein 1-CU1 of fore wing 0.9 × as long as vein 2-CU1 and scutellum with oval pits medio-posteriorly, then the new species runs near to *C. mogra* (Papp 1987). However, it differs in the following characters: (i) sub-alar depression of fore wings finely aciculate (sub-alar depression of fore wings smooth in *C. mogra*), (ii) propodeum with some rugosity on anterior part of median longitudinal carina (propodeum without any rugosity on anterior part of median longitudinal carina in *C. mogra*), (iii) vein 1-CU1 slightly shorter than 2-CU1 (vein 1-CU1 of fore wing as long as 2-CU1 in *C. mogra*), and (iv) mesonotum complete dark brown (mesonotum tinged with brown in *C. mogra*).

Description. Holotype: Female body length: 2.0 mm; length of forewing: 2.1 mm; length of antenna: 2.0 mm.

Head: 1.9 × as wide as long in dorsal view (12 : 23); length of eye 1.8 × temple (9 : 5) in dorsal view: head and vertex indistinctly punctate; OOL; POL : AOL: OD = 4: 2: 1: 2; inner margin of eyes subparallel; face distinctly convex medially, flattened laterally smooth; clypeus smooth and evenly convex; malar space 0.9 × as long as basal width of the mandible; antennae with 14 segments, F_1 ca. 5 × as long as wide, 1.1 times longer than F_2, penultimate flagellomere 2.5–3.0 × as long as wide and apical flagellomere pointed.

Mesosoma: 1.5 × as long as wide; mesoscutum shiny with few distinct punctures, notauli only anteriorly impressed and finely crenulate; prescutellar furrow distinct as a narrow groove with few crenulations; scutellum almost smooth and shiny, medio-posterior depression of scutellum oval and moderately close to each other; propodeum almost smooth (except few rugosity on anterior part of median longitudinal carina) with a complete median longitudinal carina bifurcate posteriorly near the end of propodeum, median carina of propodeum absent behind level of costulae; pair of membranous white spots at side of pronotum distinct, mesopleuron and metapleuron smooth.

Wings: Pterostigma with a long slender, apical expansion, 2.4 × longer than wide; vein 1-R1 of fore wing distinctly vein-like; vein r issuing from its middle; vein 1-M 1.6 × longer than vein m-cu; vein 1-CU1 of fore wing 0.9 × as long as vein 2-CU1

Legs: Hind coxa smooth, lengths of hind femur, tibia, and basitarsus of hind leg 3.0, 7.0, and 4.5 × their maximum widths, respectively; length of hind tibial spurs 0.26 × and 0.33 × as long as hind basitarsus.

Metasoma: Ca. 2.0 × as long as wide; first tergite smooth, widening medially, distinctly narrowing basally and apically, 3.2 × as long as its maximum width; T_2 subtriangular, smooth, laterally membranous and longitudinally striated; T_3 longitudinally

striated; ovipositor sheaths setose at apical half 0.1 × as long as forewing; hypopygium smooth medially folded, truncate apically, weakly sclerotized and setose.

Color: Yellowish brown except for the following: antennae, mesonotum, and metasoma dark brown to blackish brown; propleuron, mesopleuron, metapleuron, and ovipositor brown; T_3, laterotergites yellow; wings infuscate.

Male. Unknown.

Host. *Cosmopteryx phaeogastra* (Meyrick).

Distribution. India: Uttar Pradesh.

Etymology. The new species is named after its host insect.

***Centistidea tihamica* Ghramh & Ahmad, sp. nov.**

http://zoobank.org/4B0EEBD0-E096-4325-9089-AB0C0B931574

Figs 11–13

Material examined. Holotype: Saudi Arabia • ♀; Abha, Tihama, 5.x.2015; malaise trap (coll. Z Ahmad). **Paratype**: 3 ♀; with same data as holotype (HB-139, ZDAMU).

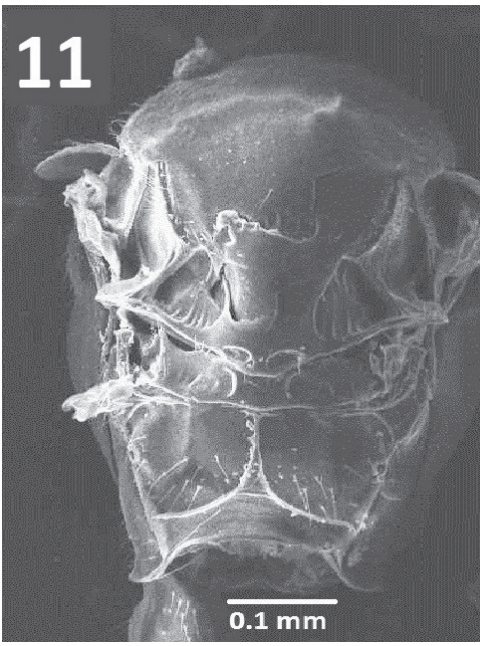
Diagnosis. Following the key to East Palaearctic and Oriental species of the genus *Centistidea* Rohwer (Ranjith et al. 2018), *C. tihamica* sp. nov. keys near *C. zhaoi* Chen et al., 1997; however, it differs in the following characters: (i) mesoscutum blackish brown (mesoscutum yellowish), (ii) dorsal length of eye 1.5 × temple (dorsal length of eye 1.80 × temple), (iii) first flagellomere 1.25 × as long as second flagellomere (first flagellomere 1.30 × as long as second flagellomere), (iv) mesonotum complete dark brown (mesonotum tinged with brown).

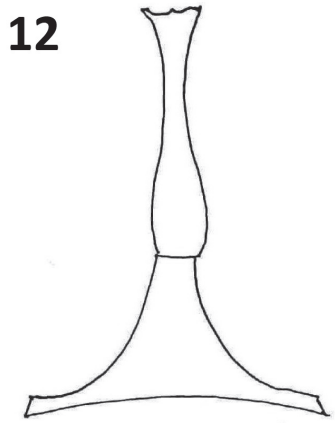
Description. Holotype: Female: body length: 1.8 mm; length of forewing: 1.9 mm; length of antenna: 1.8 mm.

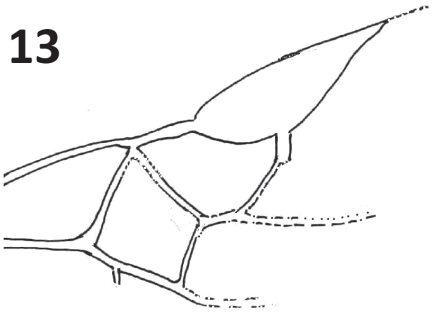
Head: 2.0 × as wide as long in dorsal view, distinctly wider than the mesosoma dorsally; length of eye 1.5 × temple in dorsal view: head and vertex indistinctly punctate; OOL: POL : AOL: OD = 4: 2: 1: 2; inner margin of eyes subparallel; face distinctly convex medially, flattened laterally smooth; clypeus smooth and evenly convex; malar space 0.9 × as long as basal width of the mandible; antenna with 14 segments, F_1 ca. 6 × as long as wide, 1.25 × longer than F_2, penultimate flagellomere 2.5–3.0 × as long as wide, and apical flagellomere pointed.

Mesosoma: 1.5 × as long as wide; mesoscutum shiny with few distinct punctures, notauli only anteriorly impressed; prescutellar furrow distinct, present as a narrow groove and crenulations; scutellum almost smooth and shiny, medio-posterior depression of scutellum semicircular; propodeum almost smooth with a complete median longitudinal carina bifurcate posteriorly, median carina of propodeum absent behind level of costulae, posterior part clearly differentiated from dorsal part of propodeum**;** mesopleuron and metapleuron smooth.

Wings: Pterostigma with a long slender, apical expansion, 2.2 × longer than wide; vein r very prominent and 0.2 × as long as the height of pterostigma, vein 1-M 1.5 × longer than vein m-cu; vein 1-CU1 of fore wing 0.7 × as long as vein 2-CU1.







Figures 11–13. *Centistidea tihamica* sp. nov. **11** mesosoma, dorsal view **12** metasomal T1 and T2 **13** forewing.

Legs: Hind coxa smooth, lengths of hind femur, tibia, and basitarsus of hind leg 3.0, 7.0, and 4.0 × their maximum widths, respectively; length of hind tibial spurs 0.23 × and 0.32 × as long as hind basitarsus.

Metasoma: Ca. 2.0 × as long as wide; first tergite, smooth, widening medially, distinctly narrowing basally and apically, 4.0 × as long as its maximum width; T_2 subtriangular, smooth, laterally membranous, and longitudinally striated; T_3 longitudinally striated; ovipositor sheaths 0.15 × as long as forewing; hypopygium smooth, medially folded, truncate apically, weakly sclerotized, and setose.

Color: Yellowish brown except for the following: head and legs yellowish; antennae, mesosoma, and metasoma dark brown to blackish brown; laterotergites yellowish; wings slightly infuscate.

Male. Unknown.

Host. Unknown.

Distribution. Saudi Arabia: Abha.

Etymology. The new species is named after its locality.

Discussion

In this study, *Centistidea tihamica* sp. nov. is described from the southwestern region of Saudi Arabia, thus increasing the distributional range of the genus *Centistidea* to the Afrotropical region. The genus *Centistidea* is very well represented in almost all zoogeographical regions except for Northwestern Palearctic and the Afrotropical region (van Achterberg and Mehernejad 2002; Yu et al. 2016; Ranjith et al. 2018). Southwest Saudi Arabia is divided by steep rocky mountains into two main subdivisions, a lowland coastal plain at the west, known as "Tihama", and a mountainous area with an elevation of 3,000 m highlands at its peak at the east, known as "Asir Mountains range (Alahmed et al. 2010; Ibrahim and Abdoon 2005). Although the geographical location of the southwestern region of Saudi Arabia is debatable, many workers have considered it to belong to the Afrotropical region (Sclater 1858; Wallace 1876 and Hölzel 1998). Studies of several taxonomic groups of insects have revealed that this region has a clear faunal similarity with the Afrotropical region (Cowie, 1989; Mahnert et al. 2014; Sharaf et al. 2014; El-Hawagry and Al Dhafer 2015; Abdel-Dayem et al. 2018). In the present study two species, *Centistidea acrocercopsi* sp. nov. and *Centistidea cosmopteryxi* sp. nov., also extended the distribution of *Centistidea* to the northern part of India, as it was previously reported only from the southern part of the Indian Peninsula (Ranjith et al. 2018).

Acknowledgements

The first two authors (HAG and ZA) extend their appreciation to the Research Center of Advanced Material, King Khalid University, Abha, KSA. The second author (ZA) extends his gratitude to the Deanship of Scientific Research at King Khalid University for funding through research program (RGP1)-194/39. We also thank the editor, associate editor, and anonymous reviewers for their valuable and helpful comments to improve the quality of the manuscript.

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ZooKeys 889: 49–56 (2019)
doi: 10.3897/zookeys.889.38296
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Annamanum flavimaculatum, a new species of longhorn beetle (Coleoptera, Cerambycidae) from China

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Academic editor: *Francesco Vitali* | Received 16 July 2019 | Accepted 27 September 2019 | Published 14 November 2019

http://zoobank.org/14BBC62B-F241-42CA-906E-D6D38849B91D

Citation: Yang S, Yang S (2019) *Annamanum flavimaculatum*, a new species of longhorn beetle (Coleoptera, Cerambycidae) from China. ZooKeys 889: 49–56. https://doi.org/10.3897/zookeys.889.38296

Abstract

Annamanum flavimaculatum **sp. nov.** is described and illustrated from Guizhou and Guangxi, China. Diagnosis for distinguishing the new species to its close congeners is presented and identification key to the genus is also updated.

Keywords

Lamiinae, Leigongshan Nature Reserve, Lingui, Maoershan

Introduction

The genus *Annamanum* Pic, 1925 is a large genus in the subfamily Lamiinae (Coleoptera, Cerambycidae) with 30 described species (Tavakilian and Chevillotte 2018) distributed in South China, Japan, Vietnam, Laos, Cambodia, India, Myanmar, and Malaysia (Lin and Ge 2017). Of these, 14 species were recorded in China (Lin and Ge 2017; Holzschuh 2017; Tavakilian and Chevillotte 2018). With the specimens collected from Leigonshan area of Leishan County, Guizhou Province, and Maoershan and Lingui, Guangxi Province, China, a new species of the genus is discovered and described as *Annamanum flavimaculatum* in this article. In addition to *A. albisparsum* (Gahan, 1888), *A. lunulatum* (Pic, 1934), and *A. magnum* Holzschuh, 2017, this is the fourth *Annamanum* species recorded in the Leigongshan area.

Materials and methods

Specimens were collected by two collecting methods: net sweeping and six level Lindgren funnel traps (Sanyong Biologic Techonology Ltd, Xiamen, Fujian Province, China) with 99% ethanol as lure. Collected specimens were pinned or glued on pinned paper cards. Labels were handwritten or printed in Chinese. Materials from Guizhou are preserved in the School of Life Sciences, Guizhou Normal University, Guiyang, Guizhou, China. Materials from Guangxi are preserved in Collection of Wen-Xuan Bi, Shanghai, China.

Specimen examination and dissection were conducted under an AmScope SM-4TZ stereomicroscope. Adults were photographed with Canon EOS 6D digital camera equipped with EOS MP-E 65 lenses. Male genitalia were photographed with Olympus DP22 camera mounted on an Olympus SZX7 stereomicroscope.

The collection acronyms used in the text are as follows:

CBWX Collection Wen-Xuan Bi, Shanghai, China;
GZNULS School of Life Sciences, Guizhou Normal University, Guiyang, China.

Taxonomy

***Annamanum flavimaculatum* sp. nov.**
http://zoobank.org/C4EE8EDD-377D-4625-94DB-24C6FA355C94
Figures 1–3

Type locality. Queniao Tea Farm, Queniao Village, Leishan County, Guizhou Province, China.

Type-specimen. Holotype male, glued on paper point, with genitalia in a separate microvial. Original label: "中国贵州省雷山县方祥乡雀鸟村茶场，2015年6月18日，六层漏斗诱捕器，杨书林采" [Queniao Tea Farm, Queniao Village, Fangxiang, Leishan County, Guizhou Province, China, 2015.VI.18, six level Lindgren funnel trap, Shulin Yang leg. (GZNULS)], HOLOTYPE / Annamanum / flavimaculatum / Shulin Yang [handwritten red label].

Other materials. Paratypes: 2♂♂, original labels: "中国贵州省雷山县雷公山国家级自然保护区，2012年7月22日，2016年7月13日，杨书林采" [Leigongshan National Nature Reserve, Leishan County, Guizhou Province, China, collecting dates: 2012.VII.22 and 2016.VII.13, Shulin Yang leg.] (GZNULS); 2♂♂, original labels: "中国贵州省雷山县雷公山国家自然保护区，2017年7月22-27日，李泊言采" [Leigongshan National Nature Reserve, Leishan County, Guizhou Province, China, 2017.VII.22-27, Boyan Li leg.] (GZNULS); 1♀, original labels: "中国贵州省雷山县雷公山国家自然保护区，2017年8月27日，杨绍勇采" [Leigongshan National Nature Reserve, Leishan County, Guizhou Province, China, 2016.VIII.27, leg. Shaoyong Yang] (GZNULS); 1♀, Original label: "中国贵州省雷山县方祥乡雀鸟村茶场，2015年6月18日，杨光祖采" [Queniao Tea Farm, Queniao Vil-

Figure 1. Habitus of *A. flavimaculatum* sp. nov. **a, c** male **b** female (**a, b** dorsal view **c** lateral view showing the mesosternal intercoxal process; not to scale). Scale bars: 10 mm (**a, b**).

Figure 2. Habitus of *A. flavimaculatum* sp. nov. of specimens collected from Guangxi, China (Photographs courtesy of Mei-Ying Lin and Wen-Xuan Bi).

lage, Leishan County, Guizhou Province, China, 2015.VI.18, Guangzu Yang leg.] (GZNULS); 1♀, Original label: "中国贵州省雷山县方祥乡雀鸟村茶场，2019年8月2日，杨书林采" [Queniao Tea Farm, Queniao Village, Leishan County, Guizhou Province, China, 2019.VIII.2, Shulin Yang leg.] (GZNULS); 1♀, Original label: "中国贵州省雷山县方祥乡雀鸟村茶场，2019年9月12日，杨书林采" [Queniao Tea Farm, Queniao Village, Leishan County, Guizhou Province, China, 2019.IX.12, Shulin Yang leg.] (GZNULS); 1♂, original labels: "广西猫儿山迴龙寺，1900 – 1700 m, 2012.VII.23，毕文烜" [Translation: Huilongsi, Maoershan, Guangxi Province, 2012.VII.23, Wen-Xuan Bi leg.] (CBWX); 1♂, original labels: "广西猫儿山三江源，1950–2000 m, 2014.VII.30，宋晓彬" [Sanjiangyuan, Maoershan, Guangxi Province, 2014.VII.30, Xiaobin Song leg.] (CBWX); 1♀, original labels: "广西临桂广福顶，1350 m, 2018.VII.2" [Guangfuding, Lingui, Guangxi Province, 2018.VII.2, local collector leg.] (CBWX).

Differential diagnosis. The new species can be distinguished from its congeners by its unique elytral pattern: apical half of elytron mostly covered with dense yellow hairs that compose a large yellow marking; black hair clustered as dots near suture on the anterior half of the yellow marking, sometimes weakly forming a line, and then obliquely extending from suture backwards to elytral margin; small black hair clusters sparsely scattered within the yellow marking.

Description. ***Body length:*** 13.8–20.4 mm, male (Figure 1a, c) 13.8–17.6 mm (N = 5), female (Figure 1b) 17.5–20.4 mm (N = 4). Measurements for specimens from Guanxi (Figure 2) not available. ***Head:*** black, frons generally densely punc-

Figure 3. Male genitalia of *A. flavimaculatum* sp. nov. **a–c** tegmen **d–f** median lobe (**a, c** dorsal view **b, e** lateral view **c, f** ventral view). Scale bar: 0.5 mm.

Figure 4. Female terminalia and genitalia of *A. flavimaculatum* sp. nov. **a** dorsal view **b** ventral view **c** ovipositor (dorsal view). Scale bars: 1 mm (**a, b**) 0.5 mm (**c**).

tured, vertex densely punctured, both frons and vertex covered with dense yellow hairs. Antennae of males exceed apex of elytra by six antennomeres; of females by five antennomeres; antennal tubercles strongly raised; scape and pedicel black, covered with long hairs, not erect but flat towards apex; cicatrix complete, narrow; rest of the antennomeres reddish brown, sparsely covered with white yellowish hairs; base and apex of each antennomere are covered with darker hairs. Eyes deeply emarginated; lower lobe twice as high as gena and one-fourth as wide as frons width between lower lobes of eyes. Labium with small sparse punctures and sparse long dark brown hairs. Mandibles with dense long yellow hairs at outer side and sparse hairs on the front. ***Thorax:*** Pronotum black with coarse granules, covered with yellow hairs, whose thickness varies among individuals; disk slightly raised; a small callus at each side of the apical margin, not extending beyond middle. Lateral spines strong, acute, slightly posteriorly and upwards curved. Sternum reddish brown, covered with dense yellow hairs. Scutellum covered with dense white yellowish pubescence, apex rounded. Mesosternal intercoxal process with a slightly projected antero-ventral tubercle (Figure 1c). ***Elytra:*** gradually tapered in male, less tapered in female, with irregular coarse granules obliquely protruding backwards and gradually smaller posteriorly. Basal fifth bulged between humeri and scutellum. Basal half black, intermingled with yellow and black hairs; black hairs forming a broad transverse black band at the middle, nearly reaching suture. Apical half reddish brown, without granules but with coarse

small punctures, mostly covered by yellow hairs forming a large yellow marking with intermingled black hair dots; some of these dots are near suture on the anterior half of the yellow marking and weakly form a line which extends obliquely towards outer margin of elytron from middle of the marking; black dots larger in female. Apex nearly rounded, slightly truncated in inner half. ***Legs:*** with dense white yellowish pubescence; femora dark brown, clubbed, not cylindrical, with sparse small punctures; tibiae reddish brown. ***Abdomen:*** reddish brown, ventrites with white yellowish pubescence intermingled with sparse punctures. Pygidium shallowly truncated at apex, deeper at the middle in some males. The sexual dimorphism is not very conspicuous. ***Male genitalia*** (Figure 3): Tegmen (Figure 3a–c), lateral lobes gradually narrowing towards apices, each apex rounded with setae that are shorter than half of lateral lobe. Median lobe (Figure 3d–f) moderately curved, median struts about half the length of median lobe, ventral plate truncated at apex, slightly concave in the middle. ***Female genitalia*** (Figure 4): bursa copulatrix and spermatheca small and short; spermathecal duct and spermathecal gland long, apex of spermathecal gland winded up like a spiral, but with the winding up part not completing a circle.

Etymology. The name refers to the yellow patch on the apical half of elytron.

Distribution. China: Guizhou, Guangxi.

Modified couplets to key by Gressitt (1951) of Chinese *Annamanum* species to accommodate the new species

1 Pronotum without three distinctly raised areas and without a prominent tooth on each side anterior to lateral tubercle **2**

– Above characters present; elytra dark brown with several oblique or irregular pale brown stripes or marks ..... ***A. sinicum***

2 Elytra each without a large blackish brown or black lateral spot behind middle **3**

– Elytra each with a large blackish brown or black lateral spot behind middle ... **7**

3 Elytra without yellow bands crossing on suture or yellow patches **5**

– Elytra with yellow bands crossing on suture or yellow patches..... **4**

4 Elytra with two yellow bands crossing on suture, forming a shape of letter x... ..... ***A. yunnanum***

– Elytra with one big yellow marking at apex, not forming a shape of letter "X" ..... ***A. flavimaculatum***

5 Elytra each with a fairly large yellow or whitish spot **6**

– Elytra with many small yellow or whitish marks, sometimes forming a vague band at middle, but no very large spots..... ***A. albisparsum***

6 Basal antennal segments with long slender hairs; frons coarsely granulate .... ***A. strandi***

– Basal antennal segments without long slender hairs; frons not coarsely granulate; antennae uniformly pubescent..... ***A. szetschuanicum***

7 The lateral spot on elytra black, largest width about 1/4 of elytral length, bounded by a thin ring of yellow hairs, these yellow hairs not expanding anteriorly and posteriorly..... ***A. lunulatum***

– The lateral spot on elytra velvety brown, largest width about 1/3 of elytral length, with pale and yellow hairs around, these hairs expanding anteriorly to basal 1/4 of elytra and posteriorly to apices of elytra ..... ***A. magnum***

Acknowledgements

This manuscript was funded by Guizhou Science and Technology Department (Grant No. 黔科合SY字 [2013]3170 and 黔科合J字LKS[2011]38号), Guizhou Human Resources and Social Security Department [黔人项目资助合同(2013)12号], and the National Science Foundation of China (31360435) to Shulin Yang. We thank Yaokui Yang, Zhongying Long, Guangzu Yang and Boyan Li for collecting specimens. We thank Xianlin Zeng, Qingbei Weng, and Qianquan Chen access to microscopes. We would like to express our appreciation and thanks to Gunvi Lindberg, Swedish Museum of Natural History (NHRS), for photographing the types of *A. szetschuanicum* (NHRS-JLKB000065449) and *A. yunnanum* (NHRS-JLKB000065450), to Wen-Xuan Bi (Shanghai) and Mei-Ying Lin (Beijing) for offering photographs and the information of Guangxi specimens, and to Xavier Gouverneur, Mei-Ying Lin, Francesco Vitali, and an anonymous reviewer for their help to improve this manuscript. Finally, we thank the owner, Francesco Vitali, and participants of the online Cerambycoidea Forum (http://www.cerambycoidea.com) for their help with identification.

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ZooKeys 889: 57–63 (2019)
doi: 10.3897/zookeys.889.38909
http://zookeys.pensoft.net

RESEARCH ARTICLE

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Amamiclytus wuxingensis sp. nov. (Coleoptera, Cerambycidae), the third species of the genus from mainland China

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Academic editor: *Francesco Vitali* | Received 8 August 2019 | Accepted 16 October 2019 | Published 14 November 2019

http://zoobank.org/7EB89C92-1275-40F2-B338-3B469EDF43A8

Citation: Yang S, Wang C (2019) *Amamiclytus wuxingensis* sp. nov. (Coleoptera, Cerambycidae), the third species of the genus from mainland China. ZooKeys 89: 57–63. https://doi.org/10.3897/zookeys.889.38909

Abstract

Amamiclytus wuxingensis **sp. nov.**, the third species of the genus from mainland China, is described and illustrated with specimens collected from Wuxing Village, Leishan County, Guizhou Province, China. Distribution and grouping of the new species are discussed and the key to the East Asian species of the genus is updated to accommodate species recorded from mainland China.

Keywords

longhorn beetle, Cerambycinae, Clytini, taxonomy

Introduction

Amamiclytus Ohbayashi, 1964 (Cerambycidae, Cerambycinae, Clytini) is a genus of small-bodied longhorn beetles with black, glossy bodies and white pubescent maculations on the elytra (Niisato and Han 2011). Species of this genus can be distinguished from species of similar genera, e.g., *Raphuma* Pascoe, 1858 and *Demonax* Thomson, 1861, by their widely separated antennal cavities, dilated apical segments of maxillary

* The authors contributed equally to this work.

palpi in the male, hairy hind tibiae and unique structures on the male genitalia, i.e., minute or medium-sized spinous spicules behind crescent-like sclerites on the base of the endophallus, and dense minute serrate or crenulate spicules on the apical part of the endophallus but without a pair of sclerotized lines formed by spinous spicules on the apical part of endophallus, as in species of the genus *Demonax* (Niisato and Han 2011, 2013). There are 19 taxa described from Asia, including India, Sri Lanka, China, Thailand, Laos, Vietnam and Ryukyu Islands (Tavakilian and Chevillotte 2018). Species of this genus were firstly reported for mainland China in 2013 with *Amamiclytus wenshuani* Niisato & Han, 2013 and *Amamiclytus limaticollis* (Gressitt, 1939) (Niisato and Han 2013). To date, there are eight species recorded for China, including two from the mainland and six from Taiwan (Niisato and Han 2013; Tavakilian and Chevillotte 2018). The ninth species of the genus for China, which is the third species for mainland China and the first for Guizhou Province, is described hereafter with specimens collected from Wuxing Village, Leishan County, Guizhou Province.

Materials and methods

Specimens were collected by net sweeping on a flowering bird cherry (*Prunus* sp.). Collected specimens were glued onto pinned paper cards. Labels were handwritten in Chinese. All materials, including the holotype, are preserved in the School of Life Sciences, Guizhou Normal University, Guiyang, China (**GZNULS**).

An AmScope SM-4TZ stereomicroscope was used for specimen observation and dissection. Photos for the adult habitus were taken using a Canon EOS 6D digital camera with a Canon MP-E 65 mm lens. Male genitalia were photographed with an Olympus DP22 under an Olympus SZX7 stereomicroscope.

Abbreviations for maculations consisting of white pubescence follow Niisato and Han (2011) and are listed for reference here: **Pb**: basal band on pronotum; **B**: basal bands near elytral bases; **S**: sutural spot on elytra behind scutellum; **La** : lateral bands before middle of elytra; **Lp**: transverse bands behind middle of elytra; **A**: apical bands of elytra; **Msl**: lateral maculation of mesosternum; **Mss**: maculation on mesosternal process; **Mta**: L-shaped band along apical margin of metathorax; **V1–V4**: lateral bands along apical margins of abdominal ventrites 1–4.

Taxonomy

***Amamiclytus wuxingensis* sp. nov.**
http://zoobank.org/A63B961D-D1E6-42D9-AB48-61979EB5801E
Figs 1, 2

Type locality. Wuxing Village, Leishan County, Guizhou Province, China. 26°21.36'N, 108°01.82'E, altitude ca 1190 m.

Type series. ***Holotype*** male, glued on paper card, with genitalia in a separate microvial. Original label: "中国贵州省雷山县五星村/蔷薇科稠李属植物/东经：108°01.82'，北纬：26°21.36' / 2019年4月6日/杨书林采" [Wuxing Village, Leishan County, Guizhou Province, China / flowering bird cherry (*Prunus* sp.) / 26°21.36'N, 108°01.82'E. / 6 April 2019 / Shulin Yang leg.] (GZNULS). HOLOTYPE / Amamiclytus / wuxingensis / Shulin Yang [red handwritten label]. ***Paratype*** 2 males, same data as holotype.

Differential diagnosis. *Amamiclytus wuxingensis* sp. nov. should be grouped into Group III proposed by Niisato and Han (2011) along with *Amamiclytus juni* Niisato & Han, 2011, *Amamiclytus yulongi* Niisato & Han, 2011 and *A. limaticollis*. They share common body and genitalia characters; short, broadened and matted body, rather transverse pronotum with distinctly arcuate sides, without white pubescence near the basal margin, median struts about half the length of median lobe, and parameres about 2/5 the length of tegmen.

Amamiclytus wuxingensis sp. nov. can be distinguished from most of its congeners, including *A. yulongi* and *A. limaticollis* of the same group, by the La extending forward and reaching to S. The La does not extend toward and reach S in most of the other congeners.

Amamiclytus juni and *Amamiclytus mimicus* Holzschuh, 2018 also have La extending towards and reaching S as in *A. wuxingensis* sp. nov. *A. wuxingensis* sp. nov. differs from *A. juni* in the a) La is distinctly rounded arcuate while less rounded and obliquely turning from the middle of the elytron towards S in *A. juni*; b) Lp transverse while slightly arcuate in *A. juni*; c) Ps absent while present in *A. juni*; d) Mss sparse while completely absent in *A. juni*. Furthermore, characters of male genitalia, e.g., the widened part at the base of the parameres and the pointed apex of the dorsal plate of the median lobe, can be used to differentiate *A. wuxingensis* sp. nov. from *A. juni*. Tergite eight is as wide as sternite eight and its apex is concave at the middle in *A. wuxingensis* sp. nov. Tergite eight is much wider than sternite eight and its apex is truncate in *A. juni*.

Amamiclytus wuxingensis sp. nov. can be distinguished from *A. mimicus* by the absence of the white band on the pronotal base and the presence of a white band on the elytral apex. On the other hand, *A. mimicus* has a white band at the pronotal base but no white band on the elytral apex. The white spot behind the suture is short and the white band before the middle of elytra is distinctly arcuate in *A. wuxingensis* sp. nov., while they are long and obliquely transverse, respectively, in *A. mimicus*.

Description. Male. ***Body*** (Fig. 1), length: 3.5–5.0 mm (N = 3). Black, glossy in general, dark brown in mouthparts, antenna, abdomen and legs. Body sparsely clothed with long pale hairs, which are darker on disc of pronotum. *Maculations*: Pb absent though sparsely covered with white hairs on basal third of pronotum; B absent; S on basal 1/8, longitudinally, short; La on basal 2/5 of elytron, obliquely arcuate and reaching S; Lp on apical third of elytron, transverse, slightly oblique, complete and reaching suture; A distinct, slightly wider than Lp; Msl distinct; Mss sparse; Mta distinct, dense on apical third of metepisternum and along posterior margin of metasternum and on hind coxae; V1 distinct, dense on sides of posterior margin of ventrite; V2 nearly absent, only sparsely with white hairs; V3 and V4 absent. ***Head*****:** Frons nearly square,

Figure 1. Habitus of *Amamiclytus wuxingensis* sp. nov., holotype (dorsal). Scale bar: 1 mm.

longer than wide, narrowest at the middle of lower eye lobes, clothed with sparse and long hairs with a pattern extending outwards from center of frons; clypeus slightly convex; vertex gradually raised towards antennal insertions; occiput convex with dense

Figure 2. Male genitalia of *Amamiclytus wuxingensis* sp. nov. **a, b** tegmen **c, d** median lobe **e** line drawing of abdominal segment eight (**a, c, e** ventral view **b, d** lateral view). Scale bar: 0.2 mm.

large punctures and clothed with sparse short pale hairs; antennae thin and relatively short, reaching 2/5 of elytral apex, clothed with long pale hairs on scape and mostly short but denser pale hairs on other antennomeres, long spinous hairs at internal apices of antennomeres 3, 4 and 5; antennomere 3 distinctly longer than scape and antennomere 4. ***Thorax*:** Pronotum slightly longer than wide, constricted abruptly at base; disc slightly raised and convex, matted with sparse granules; scutellum long triangular, slightly acute at apex; prosternum with sparse white hairs covering most of prosternum except the frontal margin of prosternum and the prosternal process. ***Elytra*:** nearly parallel-sided, rounded at humeri, obliquely truncated at apex; disc almost evenly convex except depressed parts at basal fifth near humeri; sparsely fine punctured. ***Legs*** relatively short and slender, with hind femora gradually swollen apically, exceeding elytral apices at apical sixth. ***Abdomen*** sparsely fine punctured, with sparse long pale hairs. ***Male genitalia*** (Fig. 2): Median lobe slightly arcuate in lateral view. Dorsal plate slightly narrower than ventral plate in apical fourth, narrowed down to a point at apex. Ventral plate also narrowed to a sharp point at apex. Median struts about half the length of median lobe, widest at base, constricted to basal fifth, nearly parallel for remainder. Tegmen elongate, slightly shorter than median lobe; parameres about 2/5 the length of tegmen, each paramere nearly parallel-sided, slightly narrowed in external side in apical fifth, rounded at apex, provided with numerous short setae and a few relatively long setae at apex; basal ridge slightly raised. Tergite eight elongate and

quadrate, slightly narrowed towards apex, which is rounded at sides and concave at the middle, with short to long sparse setae. Sternite eight as wide as tergite eight, concave at the middle as tergite eight, apical margin bi-arcuately rounded, and provided with sparse short to long setae.

Etymology. The name of the new species, *wuxingensis*, refers to the type locality, Wuxing Village, Guizhou Province, China.

Note. Niisato and Han (2013) discussed the wide gap in the distribution of *Amamiclytus* in South China and Southwest China and they expected to discover further members of *Amamiclytus* in these areas. The locality of *A. wuxingensis* sp. nov. falls in this wide distribution gap. Description of *A. wuxingensis* confirms and continues the expectation of discovering more members of *Amamiclytus* in these areas.

Key to species of the genus *Amamiclytus* from East Asia

1 Pronotum longer than wide, weakly or moderately arcuate at sides, usually provided with a white basal band **2**
– Pronotum as long as wide, usually strongly arcuate at sides, without white pubescence along basal margin **7**
2 Elytra glossy **3**
– Elytra matted **6**
3 Elytra provided with white spot near suture behind scutellum **4**
– Elytra without white spot near suture behind scutellum **5**
4 Elytra strongly glossy, white band on base of pronotum distinct, white band on mesosternal process almost absent ..... ***A. nobuoi* Niisato & Han, 2011**
– Elytra slightly glossy, white band on base of pronotum not distinct, white pubescence on mesosternal process distinct ..... ***A. wenshuani* Niisato & Han, 2013**
5 Elytra moderately glossy, without long pale hairs; frons distinctly longer than wide; erect pale hairs on hind tibiae sparse and not so long ..... ***A. subnitidus* Niisato & Han, 2011**
– Elytra strongly glossy, scattered with a few erect long pale hairs; frons almost as long as wide; erect pale hairs on hind tibiae dense and long ..... ***A. setiger* Niisato & Han, 2011**
6 Pronotum provided with a dense basal white band; elytra without white spots near suture behind scutellum ..... ***A. nubilus* Niisato & Han, 2011**
– Pronotum only sparsely clothed with white pubescence near basal margin; elytra with a white spot near suture behind scutellum .... ***A. hirtipes* (Matsushita, 1940)**
7 Ante-median white bands on elytra usually reaching white spot behind suture... ..... **8**
– Ante-median white bands on elytra not reaching white spot behind suture **9**
8 Ante-median white bands on elytra reaching white spot behind suture in a rather oblique way from middle of elytron; post-median white bands on elytra arcu-

ate; prosternal process only with sparse hairs; mesosternal process without white hairs ..... ***A. juni* Niisato & Han, 2011**

– Ante-median white bands on elytra strongly arcuate and reaching white spot behind suture; post-median white bands on elytra transverse, slightly oblique; prosternal process without white hairs; mesosternal process with sparse white hairs ... . ***Amamiclytus wuxingensis* sp. nov.**

9 Abdomen without lateral white bands on ventrites 3 and 4 .... ***A. limaticollis* (Gressitt, 1939)**

– Abdomen with lateral white bands on ventrites 3 and 4 .... ***A. yulongi* Niisato & Han, 2011**

Acknowledgements

This manuscript was funded by Guizhou Science and Technology Department (Grant No. 黔科合SY字 [2013]3170 and 黔科合J字LKS[2011]38号), Guizhou Human Resources and Social Security Department [黔人项目资助合同(2013)12号] and the National Science Foundation of China (31360435) to Shulin Yang. We thank Xianlin Zeng, Qingbei Weng and Qianquan Chen for help to access to microscope. We thank Tatsuya Niisato, Chang-do Han and Francesco Vitali for their help to improve this manuscript.

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ZooKeys 889: 65–80 (2019)
doi: 10.3897/zookeys.8889.34690
http://zookeys.pensoft.net

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A new species of *Laccobius* Erichson, 1837 (Hydrophilidae, Coleoptera) from the Chinese Himalaya, with comments on taxonomic status of subgenera *Glyptolaccobius* Gentili, 1989 and *Cyclolaccobius* Gentili, 1991 and additional faunistic records from China

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Academic editor: *Pavel Stoev* | Received 20 March 2019 | Accepted 12 Septembe 2019 | Published 14 November 2019

http://zoobank.org/690B0BA9-1209-45FE-B2B1-863815F0B2A4

Citation: Jia F, Chen J-H, Fikácek M (2019) A new species of *Laccobius* Erichson, 1837 (Hydrophilidae, Coleoptera) from the Chinese Himalaya, with comments on taxonomic status of subgenera *Glyptolaccobius* Gentili, 1989 and *Cyclolaccobius* Gentili, 1991 and additional faunistic records from China. ZooKeys 889: 65–80. https://doi.org/10.3897/zookeys.889.34690

Abstract

A new species of the water scavenger beetle, *Laccobius* (*Glyptolaccobius*) *motuoensis* **sp. nov.**, is described from Motuo County, Xizang, China and its diagnostic characters are illustrated. Examination of this new species and re-examination of previously described species revealed that the separation of the subgenus *Glyptolaccobius* Gentili, 1989 and *Cyclolaccobius* Gentili, 1991 is artificial: both subgenera are hence combined here. *Cyclolaccobius* **syn. nov.** is synonymized with *Glyptolaccobius*, and the latter is shown to be diagnosed by 7-segmented antennae as a unique synapomorphy. All species treated until now under *Cyclolaccobius* are here transferred to *Glyptolaccobius*, with the only exception of *L. hingstoni* Orchymont, 1926, *L. jumlanus* Gentili, 2015 and *L. zugmayeri* Knisch, 1910 which are tentatively transferred to the subgenus *Hydroxenus* Wollaston, 1867, as their antennae bear eight antennomeres. Three species are recorded for the first time from China: *L.* (*Microlaccobius*) *orientalis* Knisch, 1924 from Xizang, *Laccobius* (*M.*) *exilis* Gentili,1974 from Xinjiang, and *Laccobius* (*M.*) *sublaevis* J. Sahlberg, 1900 from Xinjiang. Additional faunistic data from China are provided for the following species: *L.* (*Microlaccobius*) *hammondi* Gentili, 1984, *Laccobius* (*M.*) *formosus* Gentili, 1979, *Laccobius* (*Hydroxenus*) *hingstoni* d'Orchymont,

1926, *Laccobius* (*Glyptolaccobius*) *yunnanensis* Gentili, 2003, *Laccobius* (*Compsolaccobius*) *decorus* (Gyllenhal, 1827), *Laccobius* (*Dimorpholaccobius*) *bipunctatus* (Fabricius, 1775), *Laccobius* (*D.*) *striatulus* (Fabricius, 1775), *Laccobius* (s. str.) *bedeli* Sharp, 1884, *L.* (s. str.) *binotatus* d'Orchymont, 1934, *Laccobius* (s. str.) *cinereus* Motschulsky, 1860, and *Laccobius* (s. str.) *minutus* (Linnaeus, 1758).

Keywords
Aquatic beetles, new combination, new synonym, Oriental Region, Palearctic Region, water scavenger beetle.

Introduction

Since the species of the genus *Laccobius* Erichson, 1837 occurring in China and neighboring areas were reviewed by Gentili (1995, 2003) and Jia et al. (2013a), and only three species of this genus were described from this region more recently (Jia et al. 2013b; Gentili 2015; Zhang and Jia 2017). The fauna of the eastern Himalayas and neighboring mountain systems have not yet been investigated properly and the discovery of additional species is expected.

In total, 34 species of *Laccobius* have been recorded from China to date (Hansen 1999; Short and Fikáček 2011; Fikáček et al. 2015; Zhang and Jia 2017). Here, we summarize new findings based on the material collected in Xinjiang, Qinghai, Xizang and northwestern Sichuan during 2016–2018 deposited in the collection of Sun Yat-sen University, Guangzhou, China. A new species is described and three species are reported from China for the first time. Additional faunistic records are provided for several other species. The total number of *Laccobius* species occurring in China now rises to 38. The examination of the new species also urged us to re-examine the antennal morphology of the species assigned to the subgenera *Glyptolaccobius* Gentili, 1989 and *Cyclolaccobius* Gentili, 1991; this is revealed to be unique for these two subgenera indicating that they should be combined here into a single subgenus.

Material and methods

A few specimens were dissected for each species examined. After 8–10 hours in 10% KOH at room temperature, male genitalia were transferred to a drop of distilled water, remaining membranes were removed under a compound microscope, and the cleaned genitalia was subsequently mounted into a drop of glycerin on a piece of transparent plastic attached below the respective specimen. Habitus photographs were taken using a Zeiss Discovery V20 with Zeiss AxioCam HRc. Photographs of genitalia were taken using Zeiss Axioskop 40 binocular microscope with a QIMAGING Micropublisher 3.3 RTV camera; the pictures were subsequently combined with the Auto-Montage software. Scanning electron microscope photographs were taken using a Phenom Pro SEM.

Morphological terminology largely follows Gentili and Fikáček (2009) and Jia et al. (2013a).

Examined specimens are deposited in the following collections:

NMPC National Museum, Prague, Czech Republic;
SYSU Biological Museum, Sun Yat-sen University, Guangzhou, China.

Results

Description of new species

***Laccobius* (*Cyclolaccobius*) *motuoensis* sp. nov.**
http://zoobank.org/1D637BE4-2A99-4400-8386-9B6B25C87EE3
Figs 1–25

Type locality. China, Xizang, Linzhi Prefecture, Motuo County, Lagong, 29°18'50"N, 95°19'07"E.

Type material. ***Holotype***: ♂ (SYSU): China, Xizang, Linzhi Prefecture, Motuo County, Lagong (中国, 西藏, 林芝, 墨脱县, 拉贡), 29°18'50"N, 95°19'07"E, 1271 m. 22.vi. 2018, Shi-shuai Wang & Zu-long Liang let. (transcribed from Chinese). ***Paratypes*** (47 spec.): 39 spec. (SYSU, NMPC): same label data as the holotype; 8 spec. (SYSU): China, Xizang: near road of Motuo to Bomi, Wudang waterfall, 18.viii.2018, Run Zhou.

Diagnosis. Length 1.9–2.2 mm. Dorsal surface dark brown or black with broad lateral yellow band on pronotum and elytra, posterior half of elytra yellowish. Head and pronotum without shagreen on interstices. Head without pale preocular spots. Antenna with seven antennomeres, the third antennomere very small, globular. Elytra often with a pair of yellow spots on the base of third primary series of punctures. Elytra without sulci, with 10 primary series of punctures; primary series of punctures strong and coarse, secondary ones consisting of smaller and more scarcely arranged punctures, punctures with short yellow setae. Aedeagus: total length 0.45 mm; median lobe as long as parameres, broad basally, narrowest medially, subapically with a series of backward directed setae; parameres subrectangular apically, almost as wide as medial lobe at apex.

Description. Total length 1.9–2.2 mm (holotype: 2.15 mm); maximum width 1.35–1.45 mm (holotype: 1.4 mm). Total length / total width ratio = 1.5. Body oval, moderately convex, maximum width at anterior third of elytra (Fig. 1).

Head. Black with greenish reflection, without preocular spots, smooth. Labrum about 2.7× as wide as long, without specula in both sexes, feebly emarginated on anterior margin, surface densely punctured (Fig. 7). Clypeus and frons blackish, surface with irregularly arranged punctures, punctures sparse and less impressed than on labrum, each puncture with decumbent white seta on disc, punctures in anterior corner of clypeus as dense as on labrum. Frontoclypeal suture scarcely apparent. Eyes oblong, oblique (Fig. 8), closest to each other posteriorly, slightly protruding laterally, minimum interocular distance in dorsal view 2.7× the width of one eye. Mentum with mesh-like microsculpture anteriorly and laterally (Fig. 7), without punctures, but

Figures 1–6. *Laccobius* (*Glyptolaccobius*) *motuoensis* sp. nov. **1, 2** habitus (**1** dorsal view **2** lateral view) **3, 4** base of the elytron (**3** specimen with yellow spot **4** specimen without yellow spot) **5, 6** male genitalia (**5** dorsal view **6** lateral view).

smooth and with a few punctures in posterior half; submentum smooth with sparse punctures. Maxillary palpi (Fig. 14) yellowish, not becoming dark at extreme apex; palpomere 2 almost same length as palpomere 3, palpomere 4 asymmetrical, inner margin straight and outer margin convex, ca. 1.5× as long as palpomere 3. Apical labial palpomere asymmetrical with straight inner face and convex outer face (Fig. 7), about as long as penultimate one. Antennae with 7 antennomeres (Fig. 9), yellow brown with antennal club of the same color; scape ca. 2.2× as long as pedicel, antennomere 3 very small, globular, cupule globular and asymmetrical; antennomeres 5–7 with densely arranged setae, antennomere 7 constricted near apex.

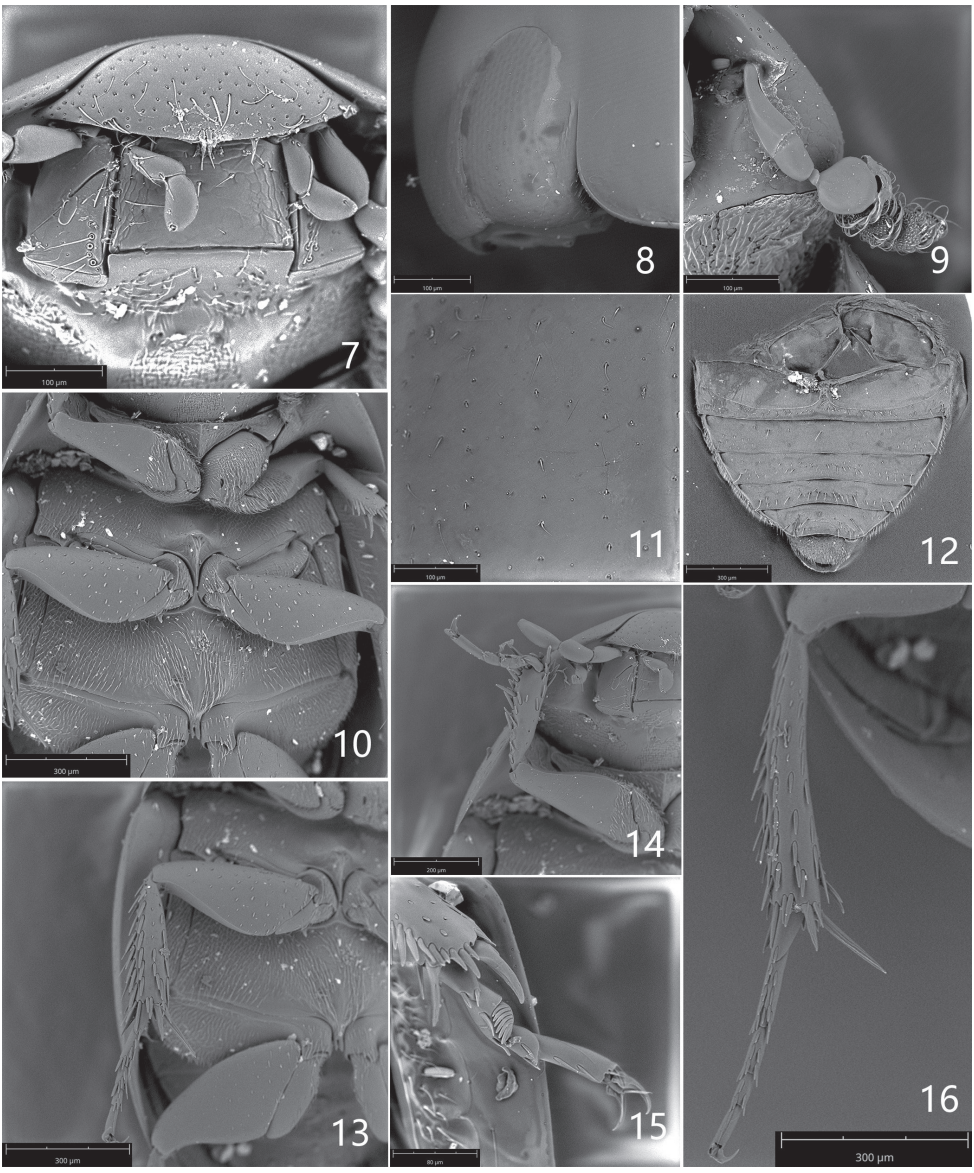
Thorax. Pronotum transverse, smooth; black with greenish reflection, lateral margins with yellow stripe that extends to posterior margin near posterior corner (Figs 1, 2), the yellow patch with posterior margin 2× as wide as anterior margin; punctures coarse and sparse, bearing decumbent yellowish setae; lateral stria fine, ending in posterior corner, but shortly continuous along anterior margin. Scutellar shield equilaterally triangular, black with few punctures. Prosternum black with dense decumbent pubescence, with a longitudinal keel medially (Fig. 10). Mesoventrite with arrow-head-shaped elevation (Fig. 10), the top of the elevation with a tuft of long setae; a longitudinal carina reaching to posterior margin of mesocoxae (Fig. 10). Metaventrite pubescent with a very narrow longitudinal glabrous area medioposteriorly (Fig. 10). Elytra smooth, slightly elongate, ca. 1.1× as long as wide, dark brown with wide lateral yellow margin that always narrower than posterior margin of pronotal lateral yellow margin (Figs 1, 4); posterior half yellow, fused with lateral yellow margin (Figs 1, 2); base of elytra with a pair of distinct pale yellow spots ca. at mid width (Figs 1, 3), sometimes elytra almost black on disc, and the basal yellow spot absent or unclear (Fig. 4); primary series punctures not sulciform; primary series of punctures strong and coarse, regularly arranged; secondary ones with small and scarce punctures (Fig. 11). Epipleura oblique, ending at level of metafemora.

Legs. Yellow brown. Trochanters pubescent; profemora with anterior surface densely pubescent basally, with tibial grooves; protibiae smooth, bearing stiff setae (Fig. 14). Mesotrochanters and mesofemora smooth (Fig. 13), the latter with tibial grooves; mesotibiae with longitudinal rows of stiff setae (Fig. 13). Metatrochanters and metafemora smooth (Fig. 13), the latter with tibial grooves; metatibiae with longitudinal rows of stiff setae, long spur as long as first and second tarsomeres combined (Fig. 16). Tarsal natatory setae nearly absent. Legs with five tarsomeres; second metatarsomere ca. 1.4× as long as metatarsomere 3 (Fig. 16).

Abdomen. Ventrites 1–5 smooth, without microsculpture, sparsely pubescent; each ventrite with long setae posteriorly, ventrite 6 densely pubescent (Fig. 12).

Male. Second protarsomere dilated, with a clasping structure that contains 7 lobes (Fig. 15).

Aedeagus. (Figs 5, 6). Total length 0.42 mm. parameres nearly 1.6× as long as phallobase. Phallobase 1.3× as long as wide. Median lobe as long as parameres, broad basally, gradually narrowed from base to mid length and then slightly widened to apex; with a series of backward directed setae subapically, apex rounded. Parameres subrectangular apically, almost as wide as medial lobe apically.



Figures 7–16. *Laccobius* (*Glyptolaccobius*) *motuoensis* sp. nov. **7** head, ventral view **8** compound eye in lateral view **9** antenna **10** ventral view of thorax **11** punctures on elytral base **12** abdomen **13** mesothoracic leg **14** prothoracic leg **15** male protarsus **16** metathoracic leg.

Differential diagnosis. This species closely resembles *L. yunnanensis* Gentili, 2003 and *L. sipeki* Gentili & Fikáček, 2009 in the genital morphology (including the series of long hairs on distal half of the median lobe) and the coloration of elytra having a dark base with small basal spots and widely pale apical portion. It can be distinguished from *L. yunnanensis* by having an elytral series regular throughout (somewhat irregular

Figures 17–22. Male genitalia of the species similar to *Laccobius motuoensis* sp. nov. **17–19** *L. sipeki* Gentili & Fikáček, holotype (**17** ventral **18** lateral **19** ventral) **20–22** *L. yunnanensis* Gentili, specimen from China: Yunnan: Rehai Hot springs (coll. NMPC) **20** detail of the apical half of medial lobe **21** ventral view **22** lateral view.

Figures 23–25. Habitats of *Laccobius motuoensis* sp. nov. Xizang: near road of Motuo to Bomi, Wudang waterfall.

at base in *L. yunnanensis*), primary series of punctures distinctly stronger and coarser than secondary ones (with some punctures at least as large as those on primary series in *L. yunnanensis*) and the median lobe ca. the same width in apical half (distinctly widened apically in *L. yunnanensis*). It can be distinguished from *L. sipeki* by the absence of the parasutural furrow (with distinct rather deep parasutural groove in *L. sipeki*) and the apex of the median lobe reaching the level of parameral apices only (slightly overlapping parameral apices in *L. sipeki*).

Etymology. This species is named after type locality.

Distribution. Only known from two close localities in the eastern Himalaya (Xizang, Motuo County).

Synonymy of the subgenera *Glyptolaccobius* and *Cyclolaccobius*

The subgenera *Glyptolaccobius* and *Cyclolaccobius* both contain species that inhabit mostly hygropetric habitats (seepages, wet rocks, sides of waterfalls) and are both characterized by large transverse eyes, which distinguish them from remaining groups of the genus *Laccobius*. The principal character distinguishing both subgenera is the presence (in *Glyptolaccobius*) or absence (in *Cyclolaccobius*) of the 'parasutural furrow', i.e., the longitudinal impression situated parallel to the suture in the posterior half of elytra. This character is usually clearly visible in *Glyptolaccobius* and clearly absent in *Cyclolaccobius*, but confusion still happens: Gentili (2006) and Gentili and Fikáček (2009) described three species of *Glyptolaccobius* (*L. silvester* Gentili, 2006, *L. hanka* Gentili & Fikáček, 2009 and *L. josefi* Gentili & Fikáček, 2009) which were later transferred to *Cyclolaccobius* by Gentili (2012). Both subgenera were mentioned as bearing 8-segmented antenna, similarly to all other *Laccobius* species (see Gentili 2006, fig. 3).

Recently, Zhang and Jia (2017) described a new *Glyptolaccobius* species from Yunnan, China (*L. yinziweii* Zhang & Jia, 2017) which is unusual among all known *Laccobius* as its antenna consisted of seven antennomeres only: scape, pedicel, one intermediate antennomere (instead of two in other *Laccobius* species), cupule and three-segmented antennal club (see Zhang and Jia 2017: figs 8, 9) showing scanning electron micrographs of the antennae). The examination of the antennal morphology of *L. motuoensis* described in this paper surprisingly revealed the same morphology with only seven antennomeres. In contrast to *L. yinziweii*, *L. motuoensis* clearly lacks the parasutural furrow, and both species sharing the unique antennal morphology are hence members of different subgenera. Moreover, the genital morphology of *L. motuoensis* closely resembles that of *L. yunnanensis* (a member of *Cyclolaccobius*) and *L. sipeki* (member of *Glyptolaccobius*). In addition, the elytral coloration of *L. motuoensis*, with pale spots basally, completely dark portion subbasally and at mid length and a pale portion in the apical third to fourth of the elytra, is found in a group of species of which some are treated as *Glyptolaccobius* (*L. sipeki*, *L. yinziweii*) and some as *Cyclolaccobius* (*L. josefi*, *L. hanka* and *L. nigrogilvus*).

All these observations motivated us to check the antennal morphology of a wider spectrum of species assigned to *Glyptolaccobius* and *Cyclolaccobius*. We examined the following species: *L. affinis* Knisch, 1927 (the type species of *Glyptolaccobius*), *L. pluvialis*

Gentili, 2006, *L. qinlingensis* Jia, Gentili & Fikáček, 2013, *L. sipeki* Gentili & Fikáček, 2009, *L. yinziweii* Zhang & Jia, 2017 (all latter with the parasutural furrow, i.e., members of *Glyptolaccobius*), *L. hanka* Gentili & Fikáček, 2009, *L. hainanensis* Jia, Gentili & Fikáček, 2013, *L. hingstoni* Orchymont, 1926, *L. martini* Jia, Song & Gentili, 2013, *L. nitidus* Gentili, 1984, *L. politus* Gentili, 1979, and *L. yunnanensis* Gentili, 2003 (all latter without parasutural furrow, i.e., members of *Cyclolaccobius*). All of these except *L. hingstoni* have 7-segmented antennae. Moreover, *L. hanka* (without parasutural furrow, member of *Cyclolaccobius*) and *L. pluvialis* (with parasutural furrow, member of *Glyptolaccobius*) were found as closely related sister taxa in the molecular phylogeny of Toussaint and Short (2018). All this evidence clearly indicates that species assigned at the moment to the subgenera *Glyptolaccobius* and *Cyclolaccobius* likely form a monophyletic group characterized by a unique synapomorphy within *Laccobius*, i.e., the 7-segmented antenna. The presence/absence of the parasutural furrow seems to be a phylogenetically flexible character within *Laccobius* since species that closely resemble each other in other characters sometimes differ in the presence/absence of the parasutural furrow only. We hence conclude that keeping *Glyptolaccobius* and *Cyclolaccobius* as two subgenera is actually more confusing than helpful for taxonomic work, even if these subgenera would be considered just as artificial groups designed to facilitate taxonomic work on this large genus (until a phylogenetic study is performed). For this reason, we are performing the following taxonomic changes here:

1. We synonymize *Glyptolaccobius* Gentili, 1989 with *Cyclolaccobius* Gentili, 1991 syn. nov.
2. *Glyptolaccobius* sensu nov. is diagnosed by having antennae with seven antennomeres (in contrast to eight antennomeres in remaining subgenera of *Laccobius*). All species currently treated under *Cyclolaccobius* and having 7-segmented antennae are here transferred to *Glyptolaccobius*.
3. The only three species treated until now as *Cyclolaccobius* which do not have 7-segmented antennae (i.e., *L. hingstoni*, *L. zugmayeri* Knisch, 1910 and *L. yumlanus* Gentili, 2015; see Gentili 2015) are tentatively transferred to the subgenus *Hydroxenus* Wollaston, 1867 (= *Platylaccobius* Gentili, 1974) where they were assigned originally before being transferred to *Cyclolaccobius*. These three species differ from other *Cyclolaccobius* and *Glyptolaccobius* species by having a much larger body size, elongate oval body, eyes not so transversely reniform and by their biology: *L. hingstoni* was collected in the littoral zone of standing waters (ponds, lakes) i.e. not in hygropetric habitats or habitats associated with stony streams which are typical for the *Glyptolaccobius*+*Cyclolaccobius* species.

Additional studies are necessary to understand the systematics of *Laccobius* and to test the phylogenetic position of *L. zugmayeri* and related species as well as to test the monophyly of the subgenera. At the moment, only the subgenus *Glyptolaccobius* in the new meaning (i.e., containing all *Laccobius* species with 7-segmented antenna, and characterized by a hygropetric lifestyle) and *Yateberosus* (a New Caledonia endemic subgenus with the larva having closed spiracular system and abdomen bearing tracheal

gills, see Fikáček et al. 2018) seem to be supported by unique morphological synapomorphies combined with geographically limited range (in *Yateberosus*) or a specific lifestyle (in *Glyptolaccobius*), and hence are candidates for monophyletic groups. The monophyly of all other subgenera is doubtful and needs to be further tested.

Key to species of *Laccobius* (*Glyptolaccobius*) from China

Gentili (1995) provided a series of keys for the identification of all *Laccobius* species known from China and neighboring areas. These keys are still up-to-date for most subgenera and include even the species recorded subsequently as new for China (Jia et al. 2013; this paper, see below). Only two parts need to be updated: (1) *Laccobius jumlanus* Gentili, 2015 was mistakenly treated under the name *L. zugmayeri* Knisch, 1910 in the key (see Gentili 2015 for details); and (2) the key of species of the subgenus *Glyptolaccobius* sensu nov. needs to be updated as all species described as new since 1995 belong to this subgenus. The following key to *Glyptolaccobius* sensu nov. in China is modified from Gentili (1996, 1998).

1 Elytra with distinct parasutural furrows **2**
– Elytra without distinct parasutural furrows **3**
2 Body length 2.7–2.9 mm; elytra without pale yellow spots at base; median lobe bearing lateral subapical rows of stout spines (Jia et al, 2013: figs 3–5) ..... ***L. qinlingensis* Jia, Gentili & Fikáček**
– Body length 1.8–2.1 mm; base of elytra with two or four distinct pale yellow spots; median lobe without lateral subapical rows of spines (Zhang and Jia 2017: figs 6, 7) ..... ***L. yinziweii* Zhang & Jia**
3 Body length 2.0–2.8 mm; elytral borders and epipleura are swollen at base; median lobe narrowly pointed apically (Gentili 1995: figs 52, 53) ..... ***L. nitidus* Gentili**
– Body length 1.8–2.1 mm; elytral borders and epipleura are not swollen at base; median lobe rounded apically **4**
4 Apical part of the median lobe without series of fine setae. Elytra completely black at the base. Species from Hainan and Taiwan **5**
– Apical part of the median lobe with series of fine setae. Elytra with or without pale basal spots. Continental species **6**
5 Median lobe strongly constricted subapically (Jia et al. 2013: figs10–12). Hainan ..... ***L. hainanensis* Jia, Gentili & Fikáček**
– Median lobe indistinctly constricted subapically (Jia et al. 2013: figs 14–16). Taiwan ..... ***L. politus* Gentili**
6 Elytral series regular throughout; primary series of punctures distinctly stronger and coarser than secondary ones; median lobe ca. of the same width in apical half (Figs 5, 6) ..... ***L. motuoensis* sp. nov.**
– Elytral series somewhat irregular at base, with some secondary punctures at least as large as those on primary series; median lobe distinctly widened apically (Figs 20–22) ..... ***L. yunnanensis* Gentili**

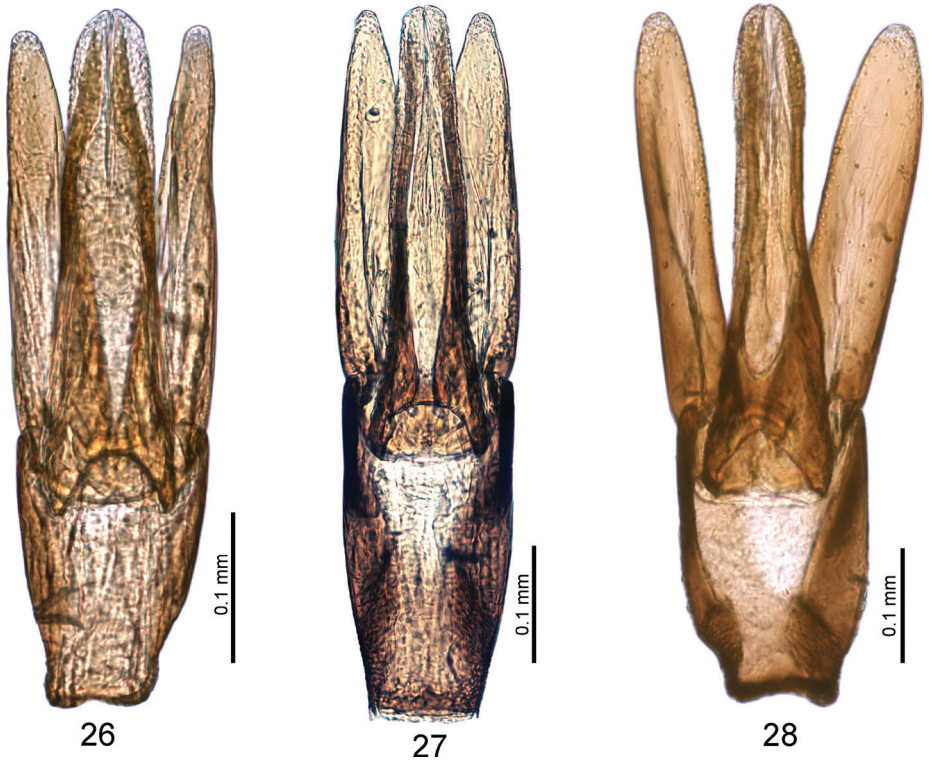
Additional faunistic data to China

***Laccobius* (*Microlaccobius*) *orientalis* Knisch, 1924**
Fig. 27

Material examined. XIZANG: 41 spec. (SYSU): Linzhi, Bomi County, Hagu township, Taohuagou, 29°59'42"N, 95°37'15"E, 2673 m, 20.vi.2018, Shi-shuai Wang & Zu-long Liang leg.

Diagnosis. Body length 2.8–3.0 mm. Frons between eyes ca. 2.6–3.0× as wide as one eye in dorsal view. Pronotum black or dark brown medially, with a pair of light spots at anterior margin, with broad yellow band laterally, without shagreen, smooth and shining. Punctures of third and fifth elytral rows uniform, arranged almost in a straight line (a few punctures slightly out of line). Aedeagus (Fig. 27): Basal two-thirds of parameres almost parallel-sided, gradually narrowed towards apex in apical one-third, pointed apically; median lobe almost as wide as parameres basally, gradually narrowed towards apex, rounded apically.

Distribution. Widely distributed species, recorded from north Africa through Near East and Central Asia to the Himalaya and Tibetan Plateau (Hansen 1999, Fikáček et al. 2015). **New for China.**



Figures 26–28. Aedeagi of the species newly recorded from China (all based on Chinese specimens): **26** *Laccobius exilis* Gentili **27** *L. orientalis* Knisch **28** *L. sublaevis* Sahlberg.

***Laccobius* (*Microlaccobius*) *exilis* Gentili, 1974**
Fig. 26

Material examined. XINJIANG: 15 spec. (SYSU): Yili, Chabuchar, beside road, 43.77N, 81.15E, 574 m, 4.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg.; 1 male (SYSU): Altai, Habahe County, Baishahu, 48.37N, 85.74E, 553 m, 10.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg.

Diagnosis. Body length 2.3–2.7 mm. Frons between eyes ca. 2.8–3.0× as wide as one eye in dorsal view. Pronotum black or dark brown medially, without a pair of light spots at anterior margin, with broad yellow band laterally, without shagreen, smooth and shining. Punctures of third and fifth elytral rows uniform, arranged almost in a straight line (Gentili 1995: fig. 162). Aedeagus (Fig. 26) with parameres narrowed towards apex, rounded apically; median lobe wide throughout, slightly wider than parameres, especially in apical part.

Distribution. Widely distributed species, recorded from Turkey through Central Asia to the Himalaya, Myanmar and the Tibetan Plateau (Gentili 1995, Hansen 1999, Fikáček et al. 2015). **New for China.**

***Laccobius* (*Microlaccobius*) *sublaevis* J. Sahlberg, 1900**
Fig. 28

Material examined. XINJIANG: 1 male (SYSU): Bayinguoleng Mongolian Autonomous Prefecture, Hejing County, Gongnais Forest Farm, 43°14'15"N, 84°39'41"E, 2019 m, 1.vii.2017, Rui-juan Zhang, Shi-shuai Wang, Kai Chen & Yong-jiang Duan leg. 1 male (SYSU): Gongnais valley, 31.vii.2005, Ling Zhao leg.

Diagnosis. Size 2.8–3.0 mm. Frons between eyes ca. 2.8–3.0× as wide as one eye. Pronotum black or dark brown medially, without a pair of light spots at anterior margin, with broad yellow band laterally, without shagreen, smooth and shining. Punctures of third and fifth elytral rows in disorder, not arranged in straight lines (Gentili 1995: fig. 161). Aedeagus (Fig. 28) with median lobe slightly widened apically; parameres with subparallel sides, rounded apically.

Distribution. Central Asian species reaching to the Tibetan Plateau and the Himalaya Region (Gentili 1995, Fikáček et al. 2015). **New for China.**

***Laccobius* (*Microlaccobius*) *hammondi* Gentili, 1984**

New material examined. SICHUAN: 3 spec. (SYSU): Luding County, Moxi town, Yuejin village, a pool with sands, 29°44'6.1"N, 102°04'5.6"E, 2150 m, 30.vi–1.vii.2016, F.-L.Jia, R.B. Angus, Kai Chen, Z.-Q. Li leg.

Distribution. See Fikáček et al. (2015). **New for Qinghai-Tibetan Plateau.**

***Laccobius* (*Microlaccobius*) *formosus* Gentili, 1979**

New material examined. SICHUAN: 3 spec. (SYSU): Dayi County, Shitouhe River, 30°34–38'N, 102°16–23'E, 616–766 m, 4.vii.2017, F.-L. Jia & R.B. Angus leg.

Distribution. See Fikáček et al. (2015). **New for Sichuan.**

***Laccobius* (*Hydroxenus*) *hingstoni* d'Orchymont, 1926**

New material examined. XIZANG: 11 spec. (SYSU): Rikaze Prefecture, Jiangzi County, Zijin Wetland Park, 28°56'21"N, 89°33'50"E, 3974 m, 1.vii.2018, Shi-shuai Wang & Zu-long Liang leg.; 16 spec. (SYSU, NMPC): Shannan Prefecture, Langkazi County, Haweng village, 28°58'54"N, 90°23'44"E, 4432 m, 2.vii.2018, Shi-shuai Wang & Zu-long Liang leg.

Distribution. See Fikáček et al. (2015).

***Laccobius* (*Cyclolaccobius*) *yunnanensis* Gentili, 2003**

New material examined. YUNNAN: 5 spec. (SYSU): Lushui County, Pianma town, 26.01N, 98.62E, 1908 m, 19.v.2016. Yu-dan Tang & Rui-juan Zhang leg.

Distribution. China (Yunnan: Lushui, Mojiang), Myanmar.

***Laccobius* (*Compsolaccobius*) *decorus* (Gyllenhal, 1827)**

New material examined. QINGHAI: 1 male (SYSU), near Qinghaihu Lake, 27.vii.2017, Yang Liu leg.

Distribution. See Fikáček et al. (2015).

***Laccobius* (*Dimorpholaccobius*) *bipunctatus* (Fabricius, 1775)**

New material examined. XINJIANG: 9 spec. (SYSU): Altai prefectures, Xiaodonggou Forest Park, 47.94N, 88.15E, 1108 m, 12.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 22 spec. (SYSU), Bayinguoleng Mongolian Autonomous Prefecture, Hejing County, Gongnais Forest Farm, 43°14'15"N, 84°39'41"E, 2019 m, 1.vii.2017, Rui-juan Zhang, Shi-shuai Wang, Kai Chen & Yong-jiang Duan leg. 12 spec. (SYSU), Altai, Bahahe County, Baihualin, 48.07N, 86.34E, 512 m, 7.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 2 exs. (SYSU), Altai, Habahe County, Baishahu, 48.37N, 85.74E, 553 m, 10.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 8 exs. (SYSU), Tacheng Prefecture, Natural Forest, 46.37N, 85.74E, 1042 m, 10.vii.2017, Rui-juan

Zhang & Shi-shuai Wang leg. 15 exs. (SYSU), Yili Kazak Autonomous Prefecture, Xinyuan County, Natural forest, 43°22'54"N, 83°33'52"E, 1282m, 2.vii.2017, Rui-juan Zhang, Shi-shuai Wang, Kai Chen & Yong-jiang Duan leg. 2 exs. (SYSU), Altai Prefecture, Burjin County, Kanas, 48.31N, 87.11E, 1336 m, 11.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 4 exs. (SYSU), Tacheng Prefecture, Yikekure village, 46.81N, 85.98E, Rui-juan Zhang & Shi-shuai Wang leg.

Distribution. See Fikáček et al. (2015).

Laccobius (*Dimorpholaccobius*) *striatulus* (Fabricius, 1775)

New material examined. XINJIANG: 6 exs. (SYSU), Tacheng Prefecture, Emin County, Shuimogou, 46.39N, 83.93E, 863 m, 6.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 40 spec. (SYSU), Altai Prefecture, Keketuohai wetland, 47°01'16"N, 89°45'22"E, 1343 m, 13.vii.2017, Rui-juan Zhang, Shi-shuai Wang, Kai Chen & Yong-jiang Duan leg. 108 spec. (SYSU), Altai, Habahe County, Baishahu, 48.37N, 85.74E, 553 m, 10.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 16 spec. (SYSU), Altai, Bahahe County, Baihualin, 48.07N, 86.34E, 512 m, 7.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 5 spec. (SYSU), Habahe County, Tiereketi Town, 48.42N, 86.73E, 1242 m, 10.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 3 spec. (SYSU), Altai Prefecture, a small pool beside road, 47.86N, 88.10E, 1107 m, Rui-juan Zhang & Shi-shuai Wang leg. 4 spec. (SYSU), (SYSU), Bayinguoleng Mongolian Autonomous Prefecture, Hejing County, Gongnais Forest Farm, 43°14'15"N, 84°39'41"E, 2019 m, 1.vii.2017, Rui-juan Zhang, Shi-shuai Wang, Kai Chen & Yong-jiang Duan leg. 2 spec. spec. (SYSU), Tacheng Prefecture, Yikekure village, 46.81N, 85.98E, Rui-juan Zhang & Shi-shuai Wang leg.

Distribution. See Fikáček et al. (2015).

Laccobius (s. str.) *bedeli* Sharp, 1884

New material examined. XINJIANG: 1 male (SYSU), Altai, Habahe County, Baishahu, 48.37N, 85.74E, 553 m, 10.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg.

Distribution. See Fikáček et al. (2015). **New for Xinjiang.**

Laccobius (s. str.) *binotatus* d'Orchymont, 1934

New material examined. QINGHAI: 12 spec. (SYSU), Huangzhong County, Kangoumen village, 36°29'24"N, 101°40'2"E, 2502 m, 28.viii.2018, Zu-long Liang & Jun-wei Deng leg.; 3 spec. (SYSU), Huangzhong County, Yajia village, 36°27'41"N, 101°42'38"E, 2610 m, 28.viii.2018, Zu-long Liang & Jun-wei Deng leg.; 4 spec. (SYSU), Huangzhong County, Shangshanzhuang Village, 36°26'33"N, 101°40'51"E,

2674 m, 28.viii.2018, Zu-long Liang & Jun-wei Deng leg.; 4 spec. (SYSU), Ping'an County, Baijiacun village, 36°26'46"N, 102°3'28"E, 2240 m, 29.viii.2018, Zu-long Liang & Jun-wei Deng leg.; 1 male (SYSU), Huzhu County, Nanmenxian town, 36°59'21"N, 101°54'9"E, 2910 m, 30.viii.2018, Zu-long Liang & Jun-wei Deng leg. **SICHUAN:** 9 spec. (SYSU), Luding County, Moxi town, Yuejin village, a pool with sands, 29°44'6.1"N, 102°04'5.6"E, 2150 m, 30.vi-1.vii.2016, Fenglong Jia, Robert, R.B. Angus, Kai Chen & Zhi-qiang Li leg.

Distribution. See Jia et al. (2013a) and Fikáček et al. (2015). **New for Sichuan.**

Laccobius (s.str.) *cinereus* Motschulsky, 1860

New material examined. QINGHAI: 19 spec. (SYSU), Maduo, Yematan, 34°42'5"N, 98°4'5"E, 3178 m, 21.viii.2018, Zu-long Liang & Jun-wei Deng leg.; 15 spec. (SYSU), Maduo, Donggecuona Lake, 35°17'12"N, 98°42'22"E, 4085 m, 24.vii.2018, Zu-long Liang & Jun-wei Deng leg.; 54 spec. (SYSU), Gangcha, beside national road G135, 37°17'23"N, 100°14'49"E, 3178 m, 21.viii.2018, Zu-long Liang & Jun-wei Deng leg. **XINGJIANG:** 1 male (SYSU), Altai, Bahahe County, Baihualin, 48.07N, 86.34E, 512 m, 7.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg.

Distribution. See Fikáček et al. (2015). **New for Xinjiang.**

Laccobius (s. str.) *minutus* (Linnaeus, 1758)

New material examined. XINJIANG: 23 spec. (SYSU), Altai prefectures, Xiaodonggou Forest Park, 47.94N, 88.15E, 1108 m, 12.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 53 spec., (SYSU), Altai Prefecture, Burjin County, Kanas, 48.31N, 87.11E, 1336 m, 11.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 92 spec. (SYSU), Altai Prefecture, Habahe County, Baihualin, 48.07N, 86.34E, 512 m, 7.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg. 1 ex. (SYSU), Huocheng County, Daxigou, Fushoushan mount, 44.40N, 80.73E, 1201 m, 4.vii.2017, Rui-juan Zhang & Shi-shuai Wang leg.

Distribution. See Fikáček et al. (2015).

Acknowledgments

We thank Mr Zu-Long Liang, Sun Yat-sen University, for his help to prepare SEM photographs. We are grateful to Mr Zhou Run from the Chinese Academy of Sciences, Institute of Zoology, Beijing, China, for his donation of some specimens. This work was financially supported by National Natural Science Foundation of China (31772494) to F.-L. Jia and J.-H. Chen, and by the Ministry of Culture of the Czech Republic (DKRVO 2019-2023/5.I.a, National Museum, 00023272) to M. Fikáček.

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ZooKeys 889: 81–152 (2019)
doi: 10.3897/zookeys.889.39090
http://zookeys.pensoft.net

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Taxonomic revision of Australian *Copelatus* Erichson, 1832 (Coleoptera, Dytiscidae, Copelatinae)

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Academic editor: *M. Michat* | Received 14 August 2019 | Accepted 24 October 2019 | Published 14 November 2019

http://zoobank.org/7E7A3D19-6D70-4039-8C08-7B248A27EB33

Citation: Hendrich L, Shaverdo H, Hájek J, Balke M (2019) Taxonomic revision of Australian *Copelatus* Erichson, 1832 (Coleoptera, Dytiscidae, Copelatinae). ZooKeys 889: 81–152. https://doi.org/10.3897/zookeys.889.39090

Abstract

The genus *Copelatus* in Australia is revised and nine species are recognised. One new species, *Copelatus martinbaehri* **sp. nov.**, is described from Papua New Guinea (Central Province) and Cape York Peninsula (Iron Range NP and Mt Tozer). *Copelatus divisus* Watts, 1978, **syn. nov.**, is considered a junior synonym of *C. portior* Guignot, 1956, described from New Guinea. Species delimitation is based on the morphological characters and Cox1 data. All species are (re)described, and their important species characters (median lobes, parameres, habitus and colour patterns) are illustrated. A key to all nine species is provided. The known distribution and habitat preferences of each species are outlined briefly. In Australia, all nine species are distributed in the northern half of the continent. Four species are also reported from New Guinea: in addition to *C. martinbaehri* **sp. nov.**, we record *C. clarki* Sharp, 1882 for the first time from southern New Guinea, and consider literature records of *C. irregularis* W.J. Macleay, 1871 and *C. marginatus* Sharp, 1882 from New Guinea as doubtful. *Copelatus portior* is widely distributed in Australasia, while *C. tenebrosus* is widely distributed in the Indomalayan and Australasian realms. All Australian *Copelatus* are confirmed to be lentic, found in a large variety of stagnant water, mainly in lowland areas up to 250 m.

Keywords

Australia, DNA taxonomy, new species, re-descriptions, synonym

Introduction

The genus *Copelatus* Erichson, 1832 has a worldwide distribution, with highest diversity in the tropics (Nilsson and Hájek 2019). With more than 400 described species, it

represents the most speciose genus of the family Dytiscidae (Nilsson and Hájek 2019, Ranarilalatiana et al. 2019). *Copelatus* species inhabit a large variety of both running and stagnant water, mainly in forested areas of the tropics, and have been recorded in South America also from water tanks inside bromeliad plants (Balke et al. 2008) and on Madagascar from wet leaf litter on tropical forest floors (Ranarilalatiana and Bergsten 2019). Recently one species from Brazil was described from a cave (Caetano et al. 2013).

Most species of *Copelatus* are characterised by longitudinal elytral striae, which number has been used to group the species into species groups (Sharp 1882; Guignot 1961; Guéorguiev 1968), although this character does not always delineate monophyletic groups (Balke et al. 2004; Hájek et al. 2010, 2018). In fact, elytral striation can vary even within species and, thus, the use of this character contributes to confusion in the current classification of *Copelatus* (Bilardo and Rocchi 2004, 2015; Megna and Epler 2012; Hájek et al. 2018; Manuel et al. 2018).

The Australian Copelatini species have last been revised by Watts (1978), who has recognised 24 *Copelatus* species. In his key, he divided them into species with "elytron with 4 or more sharply incised longitudinal striae" and species with "elytron without longitudinal striae or with numerous very short striae". Later, the representatives without longitudinal striae were transferred into the genus *Exocelina* Broun, 1886 (Nilsson and Fery 2006; Nilsson 2007). The remaining eight species comprise the Australian *Copelatus* and occur from the tropical north along the east coast south to southern Queensland and along the west coast south to the Pilbara. Most of them are endemic to Australia (Hendrich et al. 2019). Three species, *C. clarki* Sharp, 1882 (by the present record), *C. irregularis* W.J. Macleay, 1871 and *C. marginatus* Sharp, 1882 (old literature records, doubtful) are considered to have wider areas including New Guinea. *Copelatus portior* Guignot, 1956 is widely distributed in Australasia, while *C. tenebrosus* Régimbart, 1880 is known from many parts of Indomalayan and Australasian realms.

All species of Australian *Copelatus* are found in small rock, residual and side pools of streams and intermittent creeks, in forest pools, and at flooded lake and river margins, often rich in submerged and emerged vegetation, and with decaying plant material. They occur mainly in lowland areas up to 250 m.

During our recent work on Australasian Copelatini, we have recognised one *Copelatus* species hitherto unknown to science; in addition, one new synonym has been discovered. The (re)description of all nine taxa and clarification of their identity, distribution, and habitat preferences are the aims of the present paper.

Materials and methods

This study is based on the examination of 1,682 specimens. Type material of most species, except for *C. daemeli* and *C. irregularis* (see under those species) was examined. Furthermore, the first author has studied all available specimens stored in relevant Australian museums and private collections.

The material used for this study is deposited in the following institutional and private collections:

AMS	Australian Museum, Sydney, New South Wales, Australia;
ANIC	Australian National Insect Collection, Canberra, Australia;
NHMUK	The Natural History Museum [formerly British Museum (Natural History)], London, England, BMNH;
CGW	Collection G. Wewalka, Vienna, Austria;
CLH	Collection L. Hendrich, Berlin, Germany; property of the NMW;
HNHM	Magyar Természettudományi Múzeum [Hungarian Natural History Museum], Budapest, Hungary;
MAGNT	Museum and Art Gallery of the Northern Territory, Darwin, Northern Territory, Australia;
MZB	Museum Zoologicum Bogoriense, Cibinong, Indonesia;
NMPC	Národní Muzeum, Praha, Czech Republic;
NMW	Naturhistorisches Museum Wien, Vienna, Austria;
QDPIB	Queensland Department of Primary Industries, Brisbane, Queensland, Australia;
QM	Queensland Museum, Brisbane, Queensland, Australia;
SAMA	South Australian Museum, Adelaide, South Australia, Australia;
ZSM	Zoologische Staatssammlung, München, Munich, Germany.

Beetles were studied with a Leica MZ 12.5 dissecting scope at 10–100×. Habitus photos were made by František Slamka (Bratislava, Slovakia) using a digital photo imaging system and incident light, composed of a Leica DM 2500 M microscope and a Tucsen 5.0 MP camera. The microscope was fitted with Leica HCX PL "Fluotar" 5× and 10× metallurgical grade lenses (Buffington and Gates 2008). Image stacks were aligned and assembled with the computer software Helicon Focus 4.77™. Male genitalia were studied and figured in wet condition. Aedeagus images were captured by Harald Schillhammer (Vienna, Austria) with a Nikon D4 (in combination with a Novoflex bellows and a Mitutoyo 10/0.25 Apo ELWD) tethered to a PC and controlled with Nikon Camera Control Pro. Resulting image stacks were treated with Zerene Stacker and then post-processed in Adobe Photoshop CS 5.

The descriptive style follows Watts (1978) and Hájek et al. (2018). Label data of all the material are cited in quotation marks. Comments in square brackets are ours. The terminology to denote the orientation of the genitalia follows Miller and Nilsson (2003).

Abbreviations used in the text are:

hw	handwritten,	**TL**	total length,
MW	maximum width,	**TL-H**	total length without head.

Coordinates are given in decimal notation unless cited verbatim from labels. Beside various Australian road maps, we also used Google Earth (http://earth.google.com) to locate several localities. The distribution map is based on the records cited here and the results from "Atlas of living Australia" [https://www.ala.org.au/].

We delineate the species using traditionally employed morphological characters such as shape, structure and setation of the male genitalia; size, shape and colour pattern of the body, shape of the male protibia, as well as features of the dorsal surface sculpture.

DNA sequencing and data analysis

The sequence data partly originate from Hendrich et al. (2010). We preserved a part of our collections in 96% ethanol and later extracted DNA for sequencing. The laboratory methods employed are detailed on our DNA laboratory wiki: https://zsm-entomology.de/wiki/The_Beetle_D_N_A_Lab. PCR conditions with Mango Taq (Bioline) were 1'94 °C – 35× (30 s 94 °C – 30 s 47 °C – 1'72 °C) – 10'72 °C – (hold at 14 °C) with primers Jerry and Pat to amplify and sequence the 3' of the gene encoding for cytochrome c oxidase 1 (Simon et al. 1994). All 46 individual vouchers bear a green cardboard label that indicates the DNA extraction number of M. Balke (e.g. "DNA M. Balke 2291"). This number links the DNA sample, the dried mounted voucher specimen, deposited in ZSM. We used a simple approach to calculate a neighbour joining tree (*p*-distances) in Geneious (11.0.4.) software (Fig. 29) and visual inspection to learn if there was any hidden diversity or haplotype sharing. The sequence data have been deposited at DRYAD (datadryad.org) as a Geneious project and in FASTA file format: https://datadryad.org/stash/dataset/doi:10.5061/dryad.w0vt4b8m7.

GenBank accession numbers are AY368215–AY368217, EF670049, FR732611, FR732615, FR732620, FR732636, FR732654, FR732730, FR732732, FR732748, FR732802, FR732803, FR732807, FR732808, FR732809, FR732999, FR733000, FR733016, FR733023–FR733026, FR733033–FR733037, FR733047, FR733137, FR733213, FR733285, FR733287, FR733303, FR733425–FR733427, FR733505, FR733558, FR733559, LN717083, LT615908, LT615914.

Taxonomy

The morphologically delineated species were all retrieved as monophyletic groups in our cox1 DNA sequence tree (Fig. 29). We observe geographic structure for the Western Australian and Queensland individuals of *C. irregularis*, but these are samples from most distant localities only, and the divergence amounts to only c. 1%.

Genus *Copelatus* Erichson, 1832

Small to medium sized (4.2–8.0 mm in Australia), elongate or oblong-oval and more flattened diving beetles, narrowing towards apex. Scutellum visible. Elytra of all Australian species with longitudinal striae being numbered from innermost to outermost (except submarginal stria). Prosternum and its process in same plane or process slightly

deflected upwards behind procoxae. Prosternal process short. Metepisternum extended to mesocoxal cavity. Lateral parts of metaventrite ("metasternal wings") relatively broad at level of mesocoxa and very narrow laterally. Metacoxal processes with an apical cleft; metacoxal lines present. Metafemur ventrally without setigerous row at outer posterior angle. Tarsi with five distinct tarsomeres; male with protarsomeres 1–3 broadly dilated but not forming a round palette, and with four rows of larger adhesive discs bordered by long and thick setae. Metatarsal claws of same length. Median lobe asymmetrical.

Copelatus bakewelli J. Balfour-Browne, 1939

Figures 1, 11, 20, 30

Copelatus bakewelli J. Balfour-Browne 1939: 86 (original description); Watts 1978: 127 (description); Watts 1985: 26 (general distribution); Watts 2002: 42 (checklist); Nilsson and Hájek 2019: 62 (catalogue).

Type locality. "North Australia".

Type material. *Holotype*: Female, "Holotype" [round label with red frame], "Na" [hw label], "6756" [printed label], "Copelatus bakewelli B-B. Type" [hw label] (NHMUK).

Additional material studied (285 specimens). *Western Australia*: 2 exs., "AUSTRALIA WA, Synnot Range 1/9/1969, 16°25'S, 125°28'E, Giuliani D.D. leg." (WAM); 1 ex., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.6.1999, Hendrich leg. Loc. 9/109" (CLH); 4 exs., "AUSTRALIA/WA/ Shire of Wyndham-East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.6.1999, Hendrich leg./coll. Loc. 10/110" (CLH); 77 exs., "AUSTRALIA/WA/Shire of Wyndham-East Kimberley, Mitchell Plateau, Little Mertens Falls, 300 m, 15.6.1999, Hendrich leg./coll. Loc. 11/111b" (CLH, ZSM); 8 exs., "AUSTRALIA/WA/ East Kimberley, Mitchell Plateau, Little Mertens Falls, 300 m, 15.6.1999, Hendrich leg./coll. Loc. 11a/111a" (NMW); 2 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Mitchell Plateau, Port Warrender Road/Kalumburu Road, Lowya Creek, 290 m, 18.6.1999, Hendrich leg. Loc. 13/113" (CLH); 1 ex., "AUSTRALIA/WA/Shire of Wyndham - East Kimberley, Mitchell Plateau, Kalumburu Road, 25 km NW King Edward Homestead, N.N. Creek, 370 m, 18.6.1999, Hendrich leg. Loc. 114" (CLH); 4 exs., "AUSTRALIA/WA/ Shire of Wyndham - East Kimberley, Gibb River Road, 10 km E Hann River, Snake Creek, 470 m, 19.6.1999, Hendrich leg. Loc. 16/116" (CLH). ***Northern Territory*:** 1 ex., "Australia: NT, Cullen River n. Cullen, at Stuart Hwy, 102 m, 23.VIII.2006, 14.02.052S 131.56.561E, L. & E. Hendrich leg. (NT 13)", "DNA Balke 2213" [green printed label] (ZSM); 1 ex., "Australia: NT, Kakadu Hwy, Harriet Creek at Hwy Cross., 153 m, 24.VIII.2006, 13.44.512S 131.54.012E, L. & E. Hendrich leg. (NT 14)", "DNA Balke 1614" [green printed label] (ZSM); 2 exs., "Australia: NT, Litchfield NP, Creek near Wanggi Falls, 191 m, 20.VIII.2006, 13.11.221S 130.43.327E, L. & E. Hendrich leg. (NT 4)", "DNA Balke 2190", "DNA Balke 2191" [green printed label] (ZSM); 2 exs., "AUSTRALIA NT Kakadu NP Alligator R. Gungaree Rainforest

Figure 1. Habitus and colouration of *Copelatus bakewelli*, female. Total length 5.2 mm.

Dec. 22/93 S&J Peck" (ZSM); 1 ex., "NT, Horse Creek fossil site, Camfield Station [-17.1166 131.5166] 2/8/1992", "1004435" (MAGNT); 1 ex., "NT, Top Humbert Yard, Humbert River [-16.4333, 130.4666] 7/1986", "1004443" (MAGNT); 2 exs., "Bathurst Is. + Melville Is. N.T. XII. 1975 D. Curry", "QDPC 0-172712", "QDPC 0-172713" (QDPC); 2 exs., "Australia, NT, Litchfield NP, Florence Falls, 12°51'15"S, 132°45'16"E, 63 m, at light, 12.V.2006, leg. Berger & Dostal (5/06)" (CGW); 8 exs., "Australia, NT, 80 km W Roper Bar, 14°54'19"S, 133°57'28"E, 78 m, at light, 14.V.2006, leg. Berger & Dostal (7/06)" (CGW); 1 ex., "Australia, N.T./Katherine Gorge, Butterfly Gorge Walk, 150 m, 4.7.1999, Hendrich leg. Loc. 33/133" (CLH); 3 exs., "Australia, N.T. Kakadu N.P., Mary River District, 3 km ESE Gunlom Camping Area. South Alligator River, 50 m, 2.11.1996, 13°27.276'S, 132°26.268'E L. Hendrich leg./Lok. 14" (CLH); 3 exs., "Australia, N.T./Kakadu N.P., Jim Jim District, Gungurul Lookout, 50 m, 1.11.1996, 13°59.359'S, 132°19.904'E L. Hendrich leg./ Lok. 11" (CLH); 19 exs., "Australia, N.T./Kakadu N.P., Mary River District, Gunlom Camping Area, 50 m, 3.11.1996, 13°26.082'S, 132°24.929'E L. Hendrich leg./ Lok. 15" (CLH); 2 exs., "Australia, N.T./Kakadu N.P., Jim Jim District, Barramundie Gorge, Maguk, 50 m, 31.10.1996, 13°18.823'S, 132°26.198'E. L. Hendrich leg./ Lok. 9" (CLH); 12 exs., "Australia, NT/Kakadu N.P., Mary River District, Gunlom Waterfall Creek, 150 m, 2.11.1996, 13°26.082'S, 132°24.929'E L. Hendrich leg./ Lok. 13" (CLH); 51 exs., "Australia, N.T./Kakadu N.P., Jim Jim District, 1 km S Jim Jim Falls, 70 m, 26.10.1996, 13°16.718'S, 132°49.490'E L. Hendrich leg./Lok. 3" (CLH); 39 exs., "Australia, N.T./Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 26. & 27.10.1996 13°16.218'S, 132°49.276'E L. Hendrich leg./ Lok. 2." (CLH); 13 exs., "Australia N.T./Kakadu N.P., Nourlangie District, Gubara, 50 m, 25.10.1996, 12°50.101'S, 132°52.501'E L. Hendrich leg./ Lok. 1" (CLH); 1 ex., "Australia, NT, Pine Creek, Roper Gulf (S)Waterfall Ck., 60 mi. E of Pine Ck. [-13.81667, 132.7], 7.08.1964, Carne, P.B. leg. (ANIC); 1 ex., "Australia, NT, Daly Basin, Katherine (T) Tindal, -14.51667, 132.3667, 1.12.1967, Vestjens, W.J.M. leg. (ANIC); 10 exs., "Australia: NT, Litchfield NP, TJAYNERA FALLS, 13°15'S, 130°44'E, 63 m, S. Jákl leg., 20–27.XI.2008" (NMPC). ***Queensland:*** 2 exs., "QLD Cook, 2 km NNW Jowalbinna [-15.75, 144.25] 17/01/1994 Zborowski P. & Edwards, E.D.", "25-023624-470" (ANIC); 1 ex., "QLD Cook, 14 km ENE Heathlands [-11.68, 142.7], rainforest, 21/10/1993 Zborowski P. & Rentz D.C.F.", "25-022999-353" (ANIC); 1 ex., "QLD, Townsville [-19.4833, 146.8167], 25.3.1996, CH Watts", "25-001942" (SAMA); 1 ex., "QLD, Townsville [-19.2, 146.68], 6–11/2/1998, AJ Watts", "25-001940" (SAMA); 1 ex., "Bamaga N. Qld. March 1984 J.W. Turner", "QDPC 0-172711" (QDPC); 3 exs., "Bamaca [=Bamaga] xii.1983", "Australian QLD J. Sedlacek" (CLH); 1 ex., "Australia, Queensland, Bald Hills Station 4 km N of Isabella Falls, 15°15' 145°00', 29. December 1984, mv lamp, G. & A. Daniels" (QM).

Description of male. ***Body shape.*** In dorsal view, oblong oval, broadest at midlength of elytra, moderately convex. Body outline continuous, without discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus not bordered.

Pronotum broadest between posterior angles, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 1).

***Colouration*:** Body black, clypeus anteriorly, sides of pronotum, base of elytra, and humeral angle of elytra paler, ferruginous; ventral side reddish, appendages testaceous (Fig. 1).

***Dorsal surface sculpture*:** Whole surface shiny (Fig. 1). Head uniformly microreticulated, reticulation composed of moderately deeply impressed isodiametric meshes. Punctation composed of very small punctures, sparsely spread on surface; rows of deep and coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with some moderately strong, short striae, more dense and weak laterally; lateral beading of pronotum very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse setigerous punctures present along anterior margin, basal margin (except for basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. Punctation consisting of very fine sparse punctures. Each elytron with 11 strongly impressed discal and one submarginal longitudinal striae, intervals subequal, alternate striae tending to be shorter apically; subbasal stria reaching from middle of elytron almost to end of stria 10.

***Antennae and legs*:** Antenna with antennomeres long and slender. Protibia straight, not modified. Pro- and mesotarsomeres 1–3 distinctly broadened, with adhesive discs on their ventral side; claws simple.

***Ventral part*:** Finely microreticulated, with intermixed, sparsely distributed, very small punctures. Prosternum obtusely keeled medially. Prosternal process shortly lanceolate, apex obtuse; distinctly bordered laterally. Lateral parts of metaventrite tongue-shaped, very slender. Metacoxal lines almost complete and absent only close to metaventrite. Metacoxae with some short and deep striae, and abdominal ventrites 1–3 with numerous longitudinal striae.

***Male genitalia*:** Median lobe consisting of a few sclerites, closely attached together; apex in lateral view thin and elongate (Fig. 11A, B). Shape of paramere narrowly triangular, with thin, elongate subdistal part and weak but evident long setae along dorsal margin (Fig. 11D).

Female. Similar to male in habitus. Pro- and mesotarsomeres not broadened, without adhesive setae. Pronotal striae finer and denser.

Measurements. TL = 5.1–5.25 mm; TL-H = 4.5–4.65 mm; MW = 2.45–2.50 mm.

Variability. All specimens studied are rather uniform in shape and colour, and vary only little in body length.

Differential diagnosis. *Copelatus bakewelli* is close to the form of *C. daemeli* with 11 elytral striae and *C. irregularis* but smaller and without testaceous basal and apical markings on the elytra. Pronotal striae are weak (absent in *C. daemeli*) and the male protibia is not bent as in *C. irregularis*. Furthermore, all three species can easily be separated by the form of their median lobes.

Distribution. Endemic. The species occurs from the Kimberley region in northwestern Australia and in the Arnhemland in the Northern Territory to northern Queensland. In that area, the species is mainly distributed in rainforest pockets of the stone country (Fig. 20).

Habitat. A lentic species, which occurs in isolated pools of different size in otherwise dry riverbeds of seasonal streams, creeks and rivers. The bottom is consisted of gravel, sand and a layer of rotten plant debris. Occasionally, it occurs in protected bays, at the edge of large (25–50 m width), slow flowing and shallow (up to 20 cm depth) rivers, shaded by old riverine Melaleuca trees. There, the adults can be found among floating roots and organic debris of the paperbark trees. In northern Australia, at Gunlom waterfall, a large series was collected in a small (ca. 50 cm^2, 10 cm depth), water filled and shaded pothole (Fig. 30), filled up with rotten leaves. In Kakadu and the Kimberley region, *C. bakewelli* is more or less restricted to the stone country and the monsoon rainforest pockets. The species is also attracted to light.

Copelatus clarki Sharp, 1882

Figures 2, 12, 22, 31

Copelatus clarki Sharp 1882: 585 (original description); Larson 1993: 52 (habitat information); Larson 1997: 276 (habitat information); Watts 1978: 125 (description); Watts 1985: 26 (general distribution); Watts 2002: 42 (checklist); Nilsson and Hájek 2019: 47 (catalogue).

Type locality. "Australia [Queensland] (Cape York)".

Type material. ***Lectotype*** (designated by Watts 1978: 125): Male, "Lectotype" [round label with violet frame], "Type" [round printed label with red frame], "Cape York. 676" [hw label], "Sharp Coll. 1905-313." [printed label], "Type to 76 Copelatus clarki n. sp. Cape Yorke" [hw label], "Copelatus clarki Sharp Det. C. Watts det. 1971" [hw label] (NHMUK). ***Paralectotype*****:** Female, "Paralectotype" [round label with blue frame], "Cotype" [roundish label with yellow frame], "Cape York. 676" [hw label], "Sharp Coll. 1905-313." [printed label], "Copelatus clarki Cap York" [hw label], "Copelatus clarki Sharp Det. C. Watts det. 1971" [hw label] (NHMUK).

Additional material studied from Australia (304 specimens). ***Western Australia*****:** 4 exs., "AUSTRALIA/WA/ Shire of Wyndham-East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.6.1999, Hendrich leg./Coll./Loc. 10/110" (CLH); 1 ex., "Australia, WA/Shire of Wyndham-East Kimberley, Kalumburu Road, Meelarie Creek, 5 km N Drysdale Crossing, 350 m, 18.–19.6.1999, Hendrich leg. Loc. 15/115" (CLH). ***Northern Territory*****:** 1 ex., "Northern Territory, Magela Ck, nr. rum pipe [Mudginberri Homestead], Pine Creek [-12.7, 132.95], 7.1.1987, Dostine, P." (ANIC); 2 exs., "Australia07, NT 112, Mary River NP, Mary River Billabong 5 km nnw. Mary River Creek 12.53.49S, 131.38.33E, 28 m, 4.–5.12.2007, M. Baehr" (ZSM); 2 exs., "Australis07, NT 109, Kakadu NP Jim Jim Billabong, 12 km SSE Cooinda 12.56.26S, 132.33.10E, 16 m, 2.–3.12.2007, M. Baehr" (ZSM); 1 ex., "Australia07, NT3 Litchfield NP Tabletop Swamp, 212 m, 13.10.65S 130.44.82E 30.–31.10.2007, M. Baehr" (ZSM); 1 ex., "Australia07, NT13, Kakadu NP, South Alligator R. Cr., Old Jim Jim Rd., 43 m, 13.02.95S 132.19.13E, 3.–4.11.2007 M. Baehr"

Figure 2. Habitus and colouration of *Copelatus clarki*, female. Total length 8.0 mm.

(ZSM); 1 ex., "Australia: NT, Manton Dam Recr. Area, 46 km S Darwin, 35 m, 19. VIII.2006, 12.50.270S 131.08.050E, L. & E. Hendrich leg. (NT 1)", "DNA Balke 1658" [green printed label] (ZSM); 2 exs., "Australia: NT, Anniversary Creek, 12 km S Adelaide River Scenic Route, 43 m, 22.VIII.2006, 13.19.252S 131.08.271E, L. & E. Hendrich leg. (NT 7)", "DNA Balke 1639", "DNA Balke 2176" [green printed label] (ZSM); 1 ex., "Australia NT / Litchfield N.P., Florence Falls Rainforest Walk, 120 m, 4.11.1996 13°06.705'S, 130°47.220'E L. Hendrich leg. /Lok.17" (CLH); 2 exs., "Australia NT/ Kakadu N.P., Mary River District, Gunlom Waterfall Creek, 150 m, 2.11.1996 13°26.082'S, 132°24.929'E L. Hendrich leg./Lok.13" (CLH); 1 male, "Australia NT/ Litchfield N.P., Florence Falls Camping Area, 120 m, 4.11.1996 13°06.705'S, 130°47.220'E L. Hendrich leg./Lok. 16" (CLH); 1 ex., "Australia NT/ Kakadu N.P., Jim Jim District, Barramundie Gorge, Maguk, 50 m, 31.10.1996 13°18.823'S, 132°26.198'E L. Hendrich/Lok. 9" (CLH); 7 exs., "Australia NT/ Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 26. & 27.10.1996 13°16.218'S, 132°49.276'E L. Hendrich leg./Lok. 2" (CLH); 9 exs., "Australia NT/ Kakadu N.P., Jim Jim District, Gungurul Lookout, 50 m, 1.11.1996 13°59.359'S, 132°19.904'E, L. Hendrich leg./Lok. 11" (CLH); 1 ex., Australia, NT, Pine Creek, Brocks Ck. [-13.46667, 131.4167], 25.4.1932, Campbell, T.G. (ANIC); 1 ex., "Australia: NT, Georgetown Billabong, 750 m E Jabiru East, 30 m, 29.VIII.2006, 12.40.716S 132.55.861E, L. & E. Hendrich leg. (NT 20)" (ZSM); 1 ex., "Australia: NT, Kakadu NP, Sandy Billabong 6 km S Muriella Park Camp. Area, 20 m, 31. VIII.2006, 12.54.077S 132.46.411E, L. & E. Hendrich leg. (NT 25)" (ZSM); 5 exs., "Australia, NT, Darwin, 12°51'24"S, 131°46'48"E, 52 m, at light, leg. Berger & Dostal (2/06)" (CGW); 1 ex., "Australia, NT, Litchfield NP, Florence Falls, 12°51'15"S, 132°45'16"E, 63 m, at light, 12.V.2006, leg. Berger & Dostal (5/06)" (CGW); 2 exs., "Australia, NT, Kakadu NP, Muirella, 40 m, at light, 10.V.2006, leg. Berger & Dostal (3/06)" (CGW). 46 exs., "Australia: NT, Litchfield NP, TJAYNERA FALLS, 13°15'S, 130°44'E, 63 m, S. Jákl leg., 20–27.XI.2008" (NMPC); 1 ex., "Australia: NT, Nitmiluk NP, Edit Falls, 14°10'S, 132°06'E, 37 m, S. Jákl leg., 3.XII.2008" (NMPC); 5 exs., "Austr., NT, Kakadu NP, Jim Jim Billabong, 12°56'S, 132°33'E, 5 m, 5.–8.12.[20]08, Sv. Bílý leg." (NMPC); 1 ex., "Austr., NT, Kakadu NP, Gunlom, 11.12.08, 13°26'S, 132°34'E, 64 m, Sv. Bílý leg." (NMPC); 2 exs., "Australia, NT, Douglas, Hot Springs, 12.12.08, 13°45'S, 131°26'E, 35 m, Sv. Bílý leg." (NMPC); 1 ex., "Australia NT, 25 km S of Katherine, 168 m, 14°31'S, 132°25'E, 16.–17.1.2009, Sv. Bílý leg." (NMPC). ***Queensland*:** 3 exs., "AUSTRALIA Qld Mareeba S-edge Res. Stn. Sept 30/90 D. Larson" (ZSM); 1 ex., "AUSTRALIA Qld Ellis Beach 30 km N Cairns Jan 11 1991 D. Larson" (ZSM); 1 ex., "AUSTRALIA Qld 15 km N Cairns Jan 11, 1991 D.J. Larson" (ZSM); 3 exs., "QLD, Barkly (S) [-19.5000, 132.5000] Tepper JP", "25-0017652" (SAMA); 1 ex., "Australia, QL, Marbeeba, 700 m, 22.I.1993, leg. G. Wewalka (19)" (CGW); 1 ex., "Australia, QL, Dalrymple, 30 km N Charters Towers, 300 m, 18.I.1993, leg. G. Wewalka (10, 11)" (CGW); 1 ex., "Australia, QL (16) Ravenshoe, 900 m, 90 km W Innisfail, 20.I.1993, leg. Wewalka" (NMW); 5 exs., "Australia, QL, 15–20 km S Innisfail, 20 m, 24.I.1993, leg. G. Wewalka (24)" (CGW); 5 exs., "Australia, QL, 10 km S Tully, S Innisfail, 30 m, 25.I.1993, leg. G. Wewalka (26)" (CGW); 2 exs., "Aus-

tralia QLD/30 km NNW Mareeba, near Mitchell lake, 9.11.1996 Hendrich leg./Lok. 20" (CLH); 1 ex., "Australia: N QLD, 30 km NW Mareeba, Lake Mitchell at Developmental R., 381 m, 12.IX.2006, 16.47.499S 145.21.444E, L. & E. Hendrich leg. (QLD 30)", "DNA Balke 1780" (ZSM); 1 ex., "Australia: N QLD, W Mossman Syndicate Road at Harlows Bridge, 12 m, 14.IX.2006, 16.16.289S 145.23.401E, L. & E. Hendrich leg. (QLD 34)" (CLH); 8 exs., "Australia: N QLD, Cape Tribulation Road S of ferry station, forest swamp, 12 m, 15.IX.2006, 16.17.469S 145.19.122E, L. & E. Hendrich leg. (QLD 35)" (CLH, ZSM); 1 ex., "Australia: C QLD, 18 km S Calen, Mt. Charlton-Calen Road, Boulder Creek, 42 m, 23.IX.2006, 21.00.365S 148.43.231E, L. & E. Hendrich leg. (QLD 45)" (CLH); 3 exs., "Australia: C QLD, 10 km S Mizani, 500 m S Lake Kinchant Camping Area, 46 m, 24.IX.2006, 21.12.599S 148.54.153E, L. & E. Hendrich leg. (QLD 47)" (CLH); 1 ex., "Australia: C QLD, Mackay, 33 km S Sarina, Bolingbroke Road at Railway Cross., 221 m, 24.IX.2006, 21.38.378S 149.08.183E, L. & E. Hendrich leg. (QLD 48)" (ZSM); 3 exs., "Australia: S QLD, 15 km S Agnes Water, entrance Errimbula NP, 15 m, 25.IX.2006, 24.15.193S 151.49.222E, L. & E. Hendrich leg. (QLD 51)" (CLH); 4 exs., "Australia: S QLD, Winfield, Winfield Road, forest pool, 21 m, 26.IX.2006, 24.34.084S 152.00.513E, L. & E. Hendrich leg. (QLD 54)" (CLH); 6 exs., "Australia: S QLD, Bundaberg reg., 2 km W Woodgate, swamp, 33 m, 27.IX.2006, 25.07.325S 152.30.270E, L. & E. Hendrich leg. (QLD 57)" (ZSM; CLH); 4 exs., "Australia: N QLD, 4 km NW Cardwell, Ellerbeck Road, 13 m, 19.IX.2006, 18.14.520S 145.58.458E, L. & E. Hendrich leg. (QLD 38)" (CLH); 4 exs., "Australia: N QLD, 20 km NE Mareeba, Hodzic Road, 361 m, 12.IX.2006, 16.49.556S 145.27.211E, L. & E. Hendrich leg. (QLD 28)", 2 specimens with "DNA Balke 2504" and "DNA Balke 2506" [green printed labels] (CLH); 3 exs., "Australia: S QLD, 40 km E Bundaberg, Tusky Creek, 9 m, 26.IX.2006, 24.39.139S 152.01.477E, L. & E. Hendrich leg. (QLD 52)" (CLH); 8 exs., "Australia S QLD, N Stradbroke Island, Brown Lake, 60 m, Baumea swamp, 27°29'37.09"S, 153°25'50.08"E, 18.X.2014 Lars Hendrich leg. (QLD1/14)" (ZSM); 1 ex., "Australia, Queensland, Hinchinbrook (S) Ingham [-18.65, 146.1666667], 30.3.1960, Harley, K.L. leg." (ANIC); 1 ex., "Australia, Queensland, Brigalow Belt North, Townsville [-19.26667023, 146.8166656], 22.12.1967, Ferrar, P." (ANIC); 1 ex., "Australia, Queensland, Cassowary Coast (R), Forest Marsh Innisfail [-17.53333, 146.0167], 7.9.1965" (ANIC); 1 ex., "Australia, Queensland, Cairns, Green Hill, 5 mi. E of Kamma [between Edmonton and Gordonvale, -17.05, 145.8], 7.12.1968, Brooks, J.G." (ANIC); 1 ex., "Queensland, 4.5 mi. NE Innisfail, Jubilee Rd. [-17.53333, 146.0167], 4.11.1966, Britton, E.B. leg. (ANIC); 1 ex., "Queensland, Goondi Hill Swamp, Innisfail, 3.11.1966, [-17.51666667, 146.0166667], Britton, E.B." (ANIC); 1 ex., "Queensland, Cairns (R) Edge Hill, Cairns [-16.9, 145.7333333], 23.2.1965 Brooks, J.G." (ANIC); 1 ex., "North Queensland, Townsville [-19.26667023, 146.8166656], 26.4.1968 Ferrar, P." (ANIC); 1 ex., "North Queensland, 6 1/2 miles S of Townsville [-19.36667, 146.8167], 20.03.1967, Upton, M.S. leg."(ANIC); 1 ex., "North Queensland Townsville [-19.26667023, 146.8166656], 26.3.1968, Ferrar, P." (ANIC); 1 ex., "Cape York Pen. Claudie Riv Xing Iron Range, 11.IX.1974 Walford-Huggins" (CLH); 3 exs., "Cape York Pen. Claudie

Riv Xing Iron Range, 7.VI.1975 Walford-Huggins" (CLH); 1 ex., "Gum Leaf Lagoon Edward Riv. Mission 21 Nov. 1983 Walford-Huggins" (CLH); 1 ex., "Sarina, NQ Half Tide Beach, 3.ii.73 J. Frost" (CLH); 2 exs., "Australia: S QLD, Tuan State Forest near Poona Crk., water point 9, Scrubby Crk. upstream, 20 m, 29.IX.2006, 25.44.449S 152.51.316E, L. & E. Hendrich leg. (QLD 60)" (CLH); 1 ex., "Australia: C QLD, 10 km S Mizani, Lake Kinchant, seapage, 48 m, 24.IX.2006, 21.11.580S 148.53.522E, L. & E. Hendrich leg. (QLD 46)", "DNA Balke 1754" [green printed label] (ZSM); 1 ex., "Australia: S QLD, N Brisbane, Caboolture/Beerburrum road, near King John Creek, 29 m, 9.X.2006, 27.03.014S 152.57.021E, L. & E. Hendrich leg. (QLD 62)", "DNA Balke 2316" [green printed label] (ZSM); 1 ex., "Australia QLD01/19 Mt. Eliott NP 200 m, 4.–6.4.2001, M. Baehr" (ZSM); 5 exs., "Australia, Queensland, Archer River Crossing, 13°25'S, 142°56'E, 7. April 1989, mv lamp, G. & A. Daniels" (QM); 1 ex., "Australia, Queensland, West Claudie River 4 km SW road junction, 27. November 1987, mv lamp, G. Daniels, M.A. Schneider" (QM); 1 ex., "Australia, Queensland, Gordon Creek area, Claudie River Distr., 30. June 1982, M.A. Schneider, G. Daniels" (QM); 1 ex., "Australia, Queensland, 10 km NW Archer River Crossing 13°22'S, 142°54'E, 30. April 1989, mv lamp, G. & A. Daniels" (QM); 2 exs., "Australia, Queensland, Saibai Island, 6. February 1986, 09.23S, 142.40E, at light, Houston, Hamacek" (QDPIB); 1 ex., "Australia, Queensland, St. Pauls Moa Island, 10.–16. Febr. 1986, at light, K. Houston, E. Hamacek" (QDPIB); 1 ex., "Australia, Queensland, CYP Batavia Downs, 12.40S 142.40E, 3. March 1993, 10.III.1993, at light, I. Cunningham" (QDPIB); 2 exs., "Australia, Queensland, Cow Bay N of Daintree, 25.1.–7.2.1984, I. C. Cunningham" (QDPIB); 1 ex., "Australia, Queensland, 15 km WNW of South Johnstone, 7. Jan. 1986, light trap, Halfpapp (QDPIB); 1 ex., "Australia, Queensland, 15 km WNW of South Johnstone, 1.XI.1985, light trap, Fay, Halfpapp" (QDPIB); 2 exs., "Australia, Queensland, Mossman River, 5. January 1984, light trap, J.D. Brown" (QDPIB); 2 exs., "Australia, Queensland, 23 km E of Mareeba, 29. Jan. 1989, at light, R.I. Storey" (QDPIB); 1 ex., "Australia, Queensland, Walkamin, 20. March 1984, light trap, J.D. Brown" (QDPIB); 1 ex., "Australia, Queensland, Tolga, 14. Feb. 1986, light trap, J.D. Brown" (QDPIB); 2 exs., "Australia Qld., Helenvale, 3. 12. 1988 (UV light), Vr. R. Bejšák lgt." (NMPC); 1 ex., "N Queensland, 14.1.2000, Kuranda, Sv. Bílý leg." (NMPC); 2 exs., "N Queensland, 17.1.2000, Laura, Sv. Bílý leg." (NMPC); 3 exs., "N Queensland, 22.1.2000, Undara, Sv. Bílý leg." (NMPC).

Additional material studied from New Guinea (80 specimens). ***Indonesia*****:** ***Papua*****:** 36 males, 43 females, "Indonesia: Papua, Merauke, Wasur, pools, 20 m, 15–16.x.2011 UNCEN (PAP02)" (MZB, NMW, ZSM). ***Papua New Guinea:*** 1 male, "Papua New Guinea: Western Province, Balimo, 0 m, 9.–11.xi.2008, 08.01.823S 142.57.458E, Posman (PNG185)", "DNA M.Balke 3806" [green printed label] (ZSM).

Description of male. ***Body shape*****:** In dorsal view oblong oval, broadest at midlength of elytra, moderately convex. Body outline, without discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus not bordered. Pronotum broadest between posterior angles, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 2).

***Colouration*:** Body black, except around eyes clypeus ferruginous; sides of pronotum and elytra basally and laterally (including epipleura) ferruginous; appendages testaceous (Fig. 2).

***Dorsal surface sculpture*:** Whole surface shiny (Fig. 2). Head uniformly microreticulated, reticulation weakly impressed with very small meshes. Densely, weakly and minutely punctate; rows of coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with lateral beading very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse punctures present along anterior margin, basal margin (except basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. Punctation consisting of very fine sparse punctures. Apex of elytra with some large punctures. Each elytron with eight impressed discal and one submarginal longitudinal striae; stria 2 weakly impressed, reduced to a few elongated short striae; stria 1 well separated from suture and in position of innermost row of serial punctures, striae 4 and 6 shorter than striae 5, 7, and 8.

***Antennae and legs*:** Antenna with antennomeres long and slender. Protibia modified, angled near base, slightly broadened anteriorly. Pro- and mesotarsomeres 1–3 distinctly broadened, with adhesive discs on their ventral side; claws simple.

***Ventral part*:** Finely microreticulated, with sparsely distributed, very small punctures. Prosternum obtusely keeled medially. Prosternal process strongly convex, apex bluntly pointed; distinctly bordered laterally. Lateral parts of metaventrite tongue-shaped, very slender. Metacoxal lines close, deep, almost complete and absent only close to metaventrite, and evenly and slightly diverging anteriorly. Metacoxae without striae, but abdominal ventrites 1–4 with numerous longitudinal striae.

***Male genitalia*:** Median lobe consisting of a few sclerites, well separated apically (Fig. 12A, B, C). Shape of paramere narrowly triangular, with very dense, strong, long setae along dorsal margin (Fig. 12D).

Female. Similar to male in habitus. Protibia simple, not angled basally and only slightly broadened distally; pro- and mesotarsomeres not broadened, without adhesive setae.

Measurements. TL = 7.2–8.0 mm; TL-H = 6.5–7.15 mm; MW = 3.4–3.5 mm.

Variability. All specimens studied are rather uniform but can vary in body length. In approximately half of the studied specimens, stria 2 on elytra is not interrupted and reduced to a few elongated short striae. There is a slight variation in the extension of the ferruginous basal band on elytra.

Differential diagnosis. The species can be separated from all other Australian *Copelatus* with more than six striae on elytron by the broad distance between the elytral suture and stria 1 (Watts 1978) and the shape of the median lobe. *Copelatus clarki* is the largest species of the genus in Australia.

Distribution. The species is widely distributed in the northern half of Australia. Records are from north-western Australia (Kimberley region), Northern Territories and Queensland south to Brisbane and Stradbroke Island (Fig. 22).

In this study, the species is recorded for the first time from southern New Guinea (Indonesia: Papua Province, Merauke Regency and Papua New Guinea: Western Province).

Habitat. A widely distributed species in tropical northern Australia, *C. clarki* can be found in almost all lentic habitat types, in open country as well as forested areas (Larson 1993). Most specimens were obtained from isolated pools of seasonal creeks and streams, and pools adjacent to streams in Eucalypt or tropical woodland, filled from leaf and debris (Fig. 31A). During dry periods, the species occurred in high densities in shallow water under dense emergent grasses adjacent to the water's edge in irrigation reservoirs and dugouts (Larson 1993). On Stradbroke Island, the species was collected in the shallow water of a seasonal *Baumea* sedge swamp (Fig. 31B). The species is also attracted to light.

Copelatus daemeli Sharp, 1882

Figures 3, 4, 13, 21, 32

Copelatus daemeli Sharp 1882: 593 (original description); Larson 1993: 52 (habitat information); Watts 1978: 126 (description); Watts 1985: 26 (general distribution); Watts 2002: 42 (checklist); Nilsson and Hájek 2019: 62 (catalogue).

Type locality. "Australia [Queensland] (Cape York)".

Type material. We were not able to find the type material of *C. daemeli*, neither in Muséum national d'Histoire naturelle, Paris (MNHN) nor in the NHMUK. *Copelatus daemeli* is originally a manuscript name of Wehncke. The depository of many of Wehncke's types is unknown, but those which were found and studied are mostly stored in the MNHN. The identity of the species is quite clear and it cannot be confused with any other Australian (or New Guinean) species, therefore the designation of a neotype is not necessary and simply refers to undoubted identity of the species in the revision of Watts (1978).

Material studied (40 specimens). ***Western Australia*:** 1 ex., "Wyndham-East Kimberley, Mitchell Plateau [-14.6667, 125.7333] 23/9/1982 BV Timms", "25001777" (SAMA); 1 ex., "AUSTRALIA/WA/ Shire of Wyndham-East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.6.1999, Hendrich leg./ Coll./Loc. 10/110" (CLH). ***Northern Territory*:** 1 ex., "Australia: NT, Finnis River 10 km W Batchelor, 43 m, 20.VIII.2006, 13.01.278S 130.57.217E, L. & E. Hendrich leg. (NT 2)", "DNA M. Balke 2523" [green printed label] (ZSM); 1 ex., "Australia: NT, Litchfield NP, Greenant Creek E Tolmer Falls, 51 m, 21.VIII.2006, 13.12.126S 130.42.173E, L. & E. Hendrich leg. (NT 6)", "DNA M. Balke 1607" [green printed label] (ZSM); 1 ex., "Australia: NT, Kakadu NP, small creek on the road to Gunlom, 101 m, 25.VIII.2006, 13.30.422S 132.26.191E, L. & E. Hendrich leg. (NT 16)", "DNA M. Balke 1603" [green printed label] (ZSM); 6 exs., "Australia, NT, Litchfield NP, Florence Falls, 12°51'15"S, 132°45'16"E, 63 m, at light, 12.V.2006, leg. Berger & Dostal (5/06)" (CGH); 1 ex., "Australia, NT, Darwin, 12°51'24"S, 131°46'48"E, 52 m, at light, leg. Berger & Dostal (2/06)" (CGW); 8 exs., "Australia NT/ Old Stuart Hwy, Scenic Drive, Robin Falls, Creek, 50 m, 7.7.1999, Hendrich leg. Loc. 37/137" (CLH); 1 ex., "Australia NT/Litchfield N.P., Florence Falls Camping Area, 120 m,

Figure 3. Habitus and colouration of *Copelatus daemeli*, female with 11 fully developed elytral striae. Total length 6.3 mm.

Figure 4. Habitus and colouration of *Copelatus daemeli*, male with reduced elytral striae. Total length 6.2 mm.

4.11.1996 13°06.705'S, 130°47.220'E L. Hendrich leg./Lok. 16" (CLH); 1 male, "Australia, N.T./Kakadu N.P., Gunlom Camp. Area, pool in Monsoonal Forest, ca. 50 m, 3.11.1996, 13°26.082'S, 132°24.929'E L. Hendrich leg./Lok. 15" (NMW); 1 ex., "Australia, N.T./Kakadu N.P., Mary River District, Gunlom Camping Area, 50 m, 3.11.1996, 13°26.082'S, 132°24.929'E L. Hendrich leg./Lok. 15" (CLH); 1 ex., "Australia, Northern Territory, Tiwi Islands (S), Tiwi Cobourg, Melville Island, [-11.41666985, 131.5166626], 4.2.1968, Matthews, E. leg." (ANIC); 1 ex., "NT Darwin [-12.4500, 130.8331] 13/5/1963 CHS Watts", "25-008438" (SAMA); 2 exs., "Australia NT Darwin Holmes Jungle Pk uv lt Dec2/93 S Peck" (ZSM). ***Queensland*:** 1 ex., "Australia, QLD, Cape York Peninsula, Lockerbie [-10.8, 142.4667] 31.3.1964, Common, I.F.B. & Upton, M.S. leg." (ANIC); 1 ex., "Australia, Queensland, Iron Range Cape York Pen., 26. May 1971-2. June 1971, B.K. Cantrell" (QM); 1 ex., "QLD, Townsville [-19.2, 146.68], 6-11/2/ 1998, AJ Watts", "25-001789" (SAMA); 3 exs., "QLD, Heathlands, Cook [-11.75, 142.58], at light 16/03/1994 Zborowski, P.", "25-023758-978" (ANIC); 4 exs., "QLD, Heathlands, Cook Pappan Creek [-12.65, 142.01], at light 18/02/1994 Zborowski, P.", "25-023756-974" (ANIC); 2 exs., "QLD Cook Iron Range [-12.73332977, 143.2832947] 11/05/1971 JG Brooks", "25-019347-156" (ANIC); 1 ex., "QLD Burster Creek [-10.93333, 142.3833], open forest, at light, 17/10/1992 Weir, T.A. & Zborowski, P.", "25-019372-244" (ANIC).

Description of male. ***Body shape*:** In dorsal view, narrowly elongate, broadest at midlength of elytra. Body outline with small discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus not bordered. Pronotum broadest in middle, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 4).

***Colouration*:** Body dark brown to black, clypeus and sides of pronotum dark ferruginous; appendages testaceous (Fig. 4).

***Dorsal surface sculpture*:** Whole surface shiny (Fig. 4). Head uniformly microreticulated, reticulation weakly impressed with very small meshes. Densely, weakly and minutely punctate; rows of coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with lateral beading very thin and indistinct. Microreticulation similar to that of head. Punctation similar to that of head; row of coarse punctures present along anterior margin, basal margin (except for basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. Serial punctures very indistinct, located in striae 4, 6, 8 and 10. Each elytron with ten discal and one well marked submarginal longitudinal stria, alternate striae shorter apically and with a tendency to be interrupted basally. Striae 3 and 5 reduced to a few short grooves and stria 2 broken up basally. Submarginal stria reaching from middle of elytra almost to apical end of stria 10.

***Antennae and legs*:** Antenna with antennomeres long and slender. Protibia modified, angled near base, slightly broadened anteriorly. Pro- and mesotarsomeres 1–3 distinctly broadened, with adhesive discs on their ventral side; claws simple.

***Ventral part*:** Finely microreticulated, with sparsely distributed, very small punctures. Prosternum obtusely keeled medially. Prosternal process quite strong, convex,

narrowly flanged and bluntly pointed. Lateral parts of metaventrite tongue-shaped, very slender. Metacoxal lines deep, close apically, evenly and slightly diverging anteriorly. Metacoxae with short sharp striae and abdominal ventrites 1–3 with larger but weaker longitudinal striae.

***Male genitalia*:** Median lobe consisting of a few sclerites, well separated apically (Fig. 13A, B, C). Shape of paramere narrowly triangular, with very dense, strong, long setae along dorsal margin (Fig. 13D).

Female. Similar to male in habitus. Protibia simple, not angled basally and only slightly broadened distally; pro- and mesotarsomeres not broadened, without adhesive setae.

Measurements. TL = 6.2–6.3 mm; TL-H = 5.5–5.6 mm; MW = 2.9–2.95 mm.

Variability. A dimorphic species. Despite the fact that all specimens studied are rather uniform in habitus and colouration, they vary in extension and number of their elytral striae. Several specimens of both sexes, collected at the same spot at the same time with the main form (NT, Robin Falls), have 11 fully developed elytral striae. (Fig. 3).

Differential diagnosis. On the first view *C. daemeli* (especially the form with 11 elytral striae) resembles *C. bakewelli* but differs in the lack of short striae on the pronotum, the larger size, and the less developed and often shortened and reduced elytral striae in most of the specimens. Furthermore, both species can easily be separated by the form of the median lobe.

Distribution. Endemic. The species is distributed from the Kimberley region in Western Australia, over Northern Territory (Melville Island, Kakadu Area and around Darwin) to coastal Queensland (Cape York Peninsula) south to Townsville (Fig. 21). Always rare and collected only in low numbers.

Habitat. The habitat of *C. daemeli* is not well-known. The few specimens have been collected mainly in seasonal habitats, preferably in forested areas. Several specimens were obtained from isolated pools of intermittent creeks and streams, and pools adjacent to streams in eucalypt or tropical woodland (Fig. 32A, B). In Queensland Larson (1993) found a few specimens in a small, silty drying water hole in the otherwise dry bed of a small intermittent stream. Few specimens were taken from a slow flowing spring-fed stream. The species is also attracted to light.

Copelatus irregularis W.J. Macleay, 1871

Figures 5, 14, 23, 31, 34

Copelatus irregularis W.J. Macleay 1871: 126 (original description); Watts 1978: 126 (description); Watts 1985: 26 (general distribution); Larson 1993: 52 (habitat information); Larson 1997: 275 (habitat information); Hendrich 2003: 51 (new records); Watts 2002: 42 (checklist); Nilsson and Hájek 2019: 62 (catalogue).

Type locality. "[Australia, Queensland] Lizard Island".

Type material. ANIC, studied but the exact data not noted.

Figure 5. Habitus and colouration of *Copelatus irregularis*, male. Total length 7.7 mm.

Material studied (221 specimens). ***Western Australia*:** 8 exs., "WA, E-Pilbara, Weeli Wolli Springs, NW of Newman [555 m], 22°54.886'S, 119°12.661'E, 2005, C.H.S. Watts leg.", "DNA Balke 2655", "DNA Balke 2656" [green printed labels] (ZSM); 3 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Raod, Barnett River Gorge, 16°32'15.17"S, 126°7'30.43"E, 450 m, 19.6.1999, Hendrich leg. Loc. 17/117" (CLH); 7 exs., "WA Palm Springs 9/09/2001, JSC" (DPAW); 4 exs., "WA Warrie Springs 8/09/2001 MDS" (DPAW); 4 exs., "AUSTRALIA WA, Mt Fanny 08/07/1969, Giles 50 mi 180, 25°47'S, 128°35'E, Giuliani D.D. leg." (WAM); 3 exs., "AUSTRALIA WA, Synnot Range 01/09/1969, 16°25'S, 125°28'E, Giuliani D.D. leg." (WAM); 1 ex., "AUSTRALIA/WA, Gill Pinnacle, 10/07/1969, 24°54'S, 128°47'E, Giuliani D.D. leg." (WAM); 2 exs., "AUSTRALIA/WA, Charnley River, 25 mi E Beverley Springs, 09/09/1969, 16°15'S, 125°26'E, Giuliani D.D. leg." (WAM); 4 exs., "AUSTRALIA/ WA, Nullagine [-21.8833, 120.1166] 19.–20.1.1974, Douglas A.M. & M.J. leg." (WAM); 2 exs., "AUSTRALIA/WA, Marandoo Camp, at light, 22°38'S, 118°06'E, 5.–19.5.1980, Houston, T.F. et al. leg." (WAM); 1 ex., "AUSTRALIA/WA, Lyons River, Mt Augustus, at light, 24°19'12"S, 116°49'48"E, 2.–3-IX.1980, Howard, C.A. & Houston, T.F. leg." (WAM); 1 ex., "Western Australia, Pilbara, Ashburton (S), Millstream, Deep Reach [-21.58333, 117.0667], 8.11.1970, Britton, E.B." (ANIC); 1 ex., "Australia, WA, Pilbara, Hamersley Range, 17 km S Auski Roadhouse, Fig Tree Crossing 400 m, 28.8.2002, 22°32'S, 118°44'E, Hendrich leg. (Loc. WA 9/173)" (CLH); 2 exs., "Australia, WA, Pilbara, Hamersley Range, Karijini N.P., Dales Gorge [Fortescue Falls and Circular Pool], 400 m, 28.8.2002, 22°29'S, 118°35'E, Hendrich leg. (Loc. WA 10/174)" (CLH); 2 exs., "Australia, WA, Pilbara, Hamersley Range, Karijini N.P., Kalamina Gorge, 450 m, 29.8.2002, 22°25'S, 118°23'E, Hendrich leg. (Loc. WA 11/175)" (CLH); 1 ex., "Australia, WA, Pilbara, Hamersley Range, Karijini N.P., Knox Gorge, 450 m, 29.8.2002, 22°21'S, 118°18'E, Hendrich leg. (Loc. WA 12/176)" (CLH). 1 ex., "W AUSTRALIA, E-Pilbara, Weeli Wolli Springs, 22°54.886'S, 119°12.661'E, 555 m, xi.2001, M. Häckel leg." (NMPC). ***Northern Territory*:** 12 exs., "Australia NT, Trephina Gorge, East MacDonnell Ranges [-23.529, 134.375], October 1972, leg. M. Baehr" (CLH, ZSM); 1 ex., "Australia, NT, Litchfield NP, Florence Falls, 12°51'15"S, 132°45'16"E, 63 m, at light, 12.V.2006, leg. Berger & Dostal (5/06)" (CGW); 2 exs., "Australia, NT, 80 km W Roper Bar, 14°54'19"S, 133°57'28"E, 78 m, at light, 14.V.2006, leg. Berger & Dostal (7/06)" (CGW); 1 ex., "Australia, NT, 40 km v. Port Roper, 14°54'04.8"S, 135°03'24.7"E, 134 m, 15.V.2006, leg. Berger & Dostal" (CGW); 1 male, "Australia, N.T./Kakadu N.P., Jim Jim District, Barramundie Gorge, Maguk, 50 m, 31.10.1996, 13°18.823'S, 132°26.198'E. L. Hendrich leg./ Lok. 9" (NMW); 8 males, 4 females, "Australia, N.T./ Kakadu N.P., Gunlom Camp. Area, pool in Monsoonal Forest, ca. 50 m, 3.11.1996, 13°26.082'S, 132°24.929'E L. Hendrich leg./Lok. 15" (NMW); 1 male "Thorey 1867" [partly hw], "Nov: Holl: bor:" [hw], "Coll. Mus. Vindob." (NHW). 2 exs., "Australia: NT, Litchfield NP, TJAYNERA FALLS, 13°15'S, 130°44'E, 63 m, S. Jákl leg., 20–27. XI.2008" (NMPC); 1 ex., "Australia: NT, Victoria Highway, 110 km to KUNUNURRA, 15°57'S, 129°33'E, 76 m, S. Jákl leg., 30.XI.2008" (NMPC); 1 ex., "Australia: NT, Nitmiluk NP, Edit Falls, 14°10'S, 132°06'E, 37 m, S. Jákl leg., 3.XII.2008"

(NMPC); 1 ex., "Australia: NT, 70 km SW of Mataranka, 15°1'S, 132°50'E, 190 m, S. Jákl leg., 22.–23.XII.2008" (NMPC); 2 exs., "Australia NT, 25 km S of Katherine, 168 m, 14°31'S, 132°25'E, 16.–17.1.2009, Sv. Bílý leg." (NMPC). ***Queensland*:** 2 exs., "AUSTRALIA, QLD. Mulgrave R, nr The Fisheries Nov. 9/90 Larson" (ZSM); 3 exs., "AUSTRALIA QLD. McLeod R nr base Windsor Tableland Nov. 12/90 Larson" (ZSM); 4 exs., "Australia S QLD, N Stradbroke Island, creek @Trans-island Rd. 1 km SE Brown Lake, 18.X.2014, 27°30'8.43"S, 153°26'10.78"E, Lars Hendrich leg. (QLD2/14)" (NMW); 1 ex., "QL, 35–47 km SWW Mt. Gamet, 31.I.-4.II.2012, leg. S. Prebsl" (CGW); 11 exs., "Australia, QL, Ravenshoe, 90 km W Innisfail, 900 m, 20.I.1993, leg. G. Wewalka (16)" (CGW); 18 exs., "Australia, QL, Greenvale, 150 km NW Charters Towers, 600 m, 19.I.1993, leg. G. Wewalka (12–14)" (CGW); 6 exs., "Australia QLD/30 km NNW Mareeba, near Mitchell Lake, 9.11. 1996 Hendrich leg./Lok. 20" (CLH); 6 exs., „Australia: S QLD, 40 km E Bundaberg, Tusky Creek, 9 m, 26.IX.2006, 24.39.139S 152.01.477E, L. & E. Hendrich leg. (QLD 52)" (ZSM); 6 exs., "Australia: C QLD, 18 km S Calen, Mt. Charlton-Calen Road, Boulder Creek, 42 m, 23.IX.2006, 21.00.365S 148.43.231E, L. & E. Hendrich leg. (QLD 45)" (ZSM); 3 exs., "Australia: C QLD, 10 km S Mizani, Lake Kinchant, seapage, 48 m, 24.IX.2006, 21.11.580S 148.53.522E, L. & E. Hendrich leg. (QLD 46)" (ZSM); 11 exs., "Australia: C QLD, Paluma Road 4 km W Bruce Hwy, Maiden Hair Fern Crk., 270 m, 20.IX.2006, 19.00.162S 146.17.070E, L. & E. Hendrich leg. (QLD 40)", 4 specimens with "DNA Balke 1863", "DNA Balke 1864", "DNA Balke 2140", "DNA Balke 2141" [green printed labels] (CLH, ZSM); 2 exs., "Australia: S QLD, Winfield, Winfield Road, forest pool, 21 m, 26.IX.2006, 24.34.084S 152.00.513E, L. & E. Hendrich leg. (QLD 54)" (CLH); 1 ex., "Queensland, Pt. Denison [Port Denison, now Bowen -20.05, 148.25]" (ANIC); 1 ex., "Queensland, North Burnett (R) Gayndah, [-25.63333333, 151.6]" (ANIC); 1 ex., "Queensland Tablelands, N side of Lake Tinaroo, 9.11.1966 [-17.16667, 145.55], Britton, E.B." (ANIC). 1 ex., "Queensland, Tablelands, Mt. Lewis, tin working site, 3.12.1968 [-16.58333015, 145.2832947], Britton, E.B. & Misko, S." (ANIC); 1 ex., "Queensland, Townsville (C), Mt. Spec, 5.1.1965, -18.95, 146.1833333, Brooks, J.G." (ANIC); 1 ex., "Queensland Rockhampton (R) Pistol Gap, Byfield, 10.1.1970 [-22.83333333, 150.6666667], Britton, Holloway & Misko" (ANIC); 1 ex., "Queensland, 9 miles W of Paluma, Charters Towers (R), 15.4.1969 [-19.1, 146.0667], Common, I.F.B. & Upton, M.S." (ANIC); 1 ex., "North Queensland, Magnetic Island [-19.13333, 146.8333], Lea, A.M." (ANIC); 1 ex., "Queensland Tablelands (R) Mary Creek [-16.55, 145.2], 4.12.1968 Britton, E.B. & Misko, S." (ANIC); 1 ex., "Queensland, Townsville (general), 26.3.1968 [-19.26667023, 146.8166656] Ferrar, P." (ANIC); 1 ex., "Queensland, Cardstone, 16.12.1965 [-17.76666667, 145.5833333] Hyde, K." (ANIC); 1 ex., "Queensland, Townsville (general) [-19.26667023, 146.8166656], 21.12.1967, Ferrar, P." (ANIC); 1 ex., "Queensland Tablelands (R), Mary Creek, 5.12.1968 [-16.55, 145.2] Britton, E.B. & Misko, S." (ANIC); 1 ex., "QLD, Magnetic Island [-19.13, 146.83], A.M. Lea", "K.215158" (AMS); 1 ex., "Queensland [-22.82407, 147.63635] K.K. Spence", "K.215159" (AMS); 1 ex., "Queensland [-23.37805, 150.51361] T.G. Sloane",

"K.215160" (AMS); 1 ex., "Queensland Magnetic Island [-19.13, 146.83] A.M. Lea", "K.215161" (AMS); 1 ex., "Queensland Hayman Island [-20.0508, 148.88783] Jan 1935, F.A. McNeil", "K.215162" (AMS); 1 ex., "Australia Queensland [-22.82407, 147.63635], "K.215163" (AMS); 1 ex., "Australia Queensland, The Rock Pool, Carnarvon NP [-25.06756, 148.246259] 26 Apr 2006, at MV lamp, D.R. Britton, J.R. Weiner, "K.363072" (AMS); 1 ex., "Australia, Queensland, Tewah Creek via Tin Can Bay, 17. October 1970, T. Weir" (QM); 1 ex., "Australia, Queensland, Baldy Mt. Road, 6 miles SW Atherton, 1100 m, 27. December 1972, B.K.Cantrell" (QM); 1 ex., "Australia, Queensland, Bald Hills Station 4 km N of Isabella Falls, 15°15' 145°00', 29. December 1984, mv lamp, G. & A. Daniels" (QM); 2 exs., "Australia, Queensland, Kenilworth State Forest, via Kenilworth, 20. October 1972, B.K. & J.A. Cantrall" (QM); 4 exs. "Australia, Queensland, Davies Creek via Mareeba, 27. Nov. 1981, R.I. Storey" (QDPIB); 2 exs., "Australia Queensland, Walkamin, 20. March 1984, light trap, J.D. Brown" (QDPIB); 1 ex., "Australia, Queensland Danbulla S.F. via Yungaburra, 13. February 1992, at light, Storey, De Faveri & Huwer" (QDPIB); 1 ex., "Australia, Queensland, 10. Dec. 1985, 15 km WNW of South Johnstone, light trap, Fay & Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, 9. IX. 1985, 15 km WNW of South Johnstone, light trap, Fay & Halfpapp" (QDPIB); 4 exs., "Australia, Queensland, 23 km E of Mareeba, 29. January 1989, at light, R.I. Storey" (QDPIB); 2 exs., "Australia, Queensland, Tolga, 10. December 1982, light trap, J.D. Brown" (QDPIB); 1 ex., "Australia, Queensland", Paluma, 9.–13. January 1989, light trap, rainforest, R.I. Storey (QDPIB); 1 ex., "Australia, Queensland, Windsor Tableland, 16. December 1984, at light, R.I. Storey (QDPIB); 1 ex., "Australia, Queensland, Garradunga, 17. December 1992, J. Hasenpusch" (QDPIB); 1 ex., "Australia, Queensland, Mt. Mulligen Plateau, 700 m, 15.–19. IV. 1985, at light, K.H. Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, Yam Island 24–27 March 1988, at light, Fay, Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, Pinnarendi Station 60 km W of Mt. Garnet, 7. February 1989, D. Heiner" (QDPIB); 3 exs., "N Queensland, 15.1.2000, Davis Creek, Sv. Bílý leg." (NMPC); 1 ex., "N Queensland, 29.1.–3.2.2000, The Lynd Junction, Sv. Bílý leg." (NMPC); 6 exs., "N Queensland, 5.2.2000, Ravenshoe, Sv. Bílý leg." (NMPC); 3 exs., "N Queensland, 13.2.2000, Undara, Sv. Bílý leg." (NMPC).

Doubtful record. 1 ex., "Tasmania, Gladstone, Dorset, A.M. Lea" (SAMA), probably mislabelled.

Description of male. ***Body shape*:** In dorsal view, oblong oval, broadest at midlength of elytra, moderately convex. Body outline almost continuous, with slight discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus not bordered. Pronotum broadest just before posterior angles, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 5).

***Colouration*:** Body black, most of clypeus, sides of pronotum, base and tip of elytra, appendages and much of ventral surface testaceous (Fig. 5).

***Dorsal surface sculpture*:** Whole surface shiny (Fig. 5). Head uniformly microreticulated, reticulation composed of moderately deeply impressed isodiametric very

small meshes. Punctation composed of very small punctures sparsely spread on surface; rows of deep and coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with some moderately strong, short striae, more dense and weak laterally; lateral beading of pronotum very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse setigerous punctures present along anterior margin, basal margin (except basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. Punctation consisting of very fine sparse punctures. Each elytron with 11 strongly impressed discal and one submarginal longitudinal striae, intervals subequal, alternate striae tending to be shorter apically; submarginal stria reaching from little behind middle of elytron almost to end of stria 10. Serial punctures on elytron untraceable.

***Antennae and legs*:** Antenna with antennomeres long and slender. Protibia modified, distinctly broadened anteriorly (2/3rd) and strongly narrowed basally (1/3rd). Pro- and mesotarsomeres 1–3 distinctly broadened, with adhesive discs on their ventral side; claws simple.

***Ventral part*:** Finely microreticulated, with intermixed, sparsely distributed, very small punctures. Prosternal process rather flat, distinctly bordered laterally, weakly and bluntly pointed. Lateral parts of metaventrite tongue-shaped, very slender. Metacoxal lines close, well-marked and moderately divergent anteriorly. Metacoxae with some short and deep striae, abdominal ventrites 1–3 with numerous longitudinal striae.

***Male genitalia*:** Median lobe consisting of a few sclerites, well separated apically (Fig. 14A, B, C). Shape of paramere narrowly triangular, with very dense, strong, long setae along dorsal margin (Fig. 14D).

Female. Similar to male in habitus. Pro- and mesotarsomeres not broadened, without adhesive setae. Pronotal striae fine and dense.

Measurements. TL = 6.8–7.8 mm; TL-H = 6.0–6.9 mm; MW = 3.2–3.4 mm.

Variability. All specimens studied are rather uniform in shape and size but vary in the extension of the testaceous elytral markings.

Differential diagnosis. The species is close to *C. bakewelli* but can be easily separated by the larger size, the dorsal colouration, and the form of the median lobe.

Distribution. The species is widely distributed in the northern half of Australia. Records are from the Northern Territory (inland to the East MacDonnell Ranges), north-western Australia (Kimberley region and the Pilbara), and Queensland south to Brisbane (Fig. 23).

According to the literature, *C. irregularis* occurs also in New Guinea, cited in Guignot (1956: 55) and Zimmermann (1920: 140); Papua in Guéorguiev (1968: 9); Papua New Guinea: Central Province: Redscar Bay in Régimbart (1899: 306) and Guéorguiev and Rocchi (1993: 158). However, all these records are in need of confirmation.

Habitat. This is a widely distributed species and one of the most common *Copelatus* in tropical northern Australia. It can be found in almost all habitat types, preferably in forested areas. Most specimens were obtained from shallow water, amongst leaves and plant debris, of isolated pools of seasonal creeks and streams, and pools adjacent to streams

in Eucalypt or tropical woodland. Also, a few specimens were taken from slow flowing spring-fed streams. In the Pilbara (Hendrich 2002), *C. irregularis* was found in different isolated and half-shaded rocky and sandy pools (10–20 m², up to 1.5 m depth) of an intermittent stream. The bottom of most habitats consisted of sand and stones, with a thin layer of mud and plant debris (Figs 31A, 34A). *Copelatus irregularis* is also attracted to light.

Copelatus marginatus Sharp, 1882

Figures 6, 15, 25

Copelatus marginatus Sharp 1882: 579 (original description); Watts 1978: 124 (description); Watts 1985: 26 (general distribution); Larson 1993: 53 (habitat description); Watts 2002: 42 (checklist); Wewalka et al. 2010: 50–51 (description, new records); Nilsson and Hájek 2019: 58 (catalogue).

Type locality. "Australia, [Queensland], Rockhampton".

Type material. ***Lectotype*** (designated by Watts: 1978: 124): Male, "Lectotype" [printed label with violet frame]; "Rockhampton 675." [printed label]; "Sharp Coll 1905-313." [printed label]; "Type 675 Copelatus marginatus Rockhampton" [hw label] (NHMUK). ***Paralectotypes*****:** 1 male, 5 females, "Paralectotype" [printed label with blue frame]; "Rockhampton 675." [printed label]; "Sharp Coll 1905-313." [printed label]; "Type 675 Copelatus marginatus Co-type" [hw label] (NHMUK).

Additional material studied (244 specimens). ***Western Australia*****:** 1 ex., "Australia07, WA 50, Parrys Lagoon, Marigu Billabong, 25 km SE Wyndham, 77 m, 15.32.98S 128.15.59E, M. Baehr" (ZSM); 1 ex., "AUSTRALIA/WA, Koolan Island [16°09'S, 123°45'E], VIII–IX 1967, Milton O. leg." (WAM); 1 ex., "AUSTRALIA/WA, Derby [-17.3166, 123.6333], 2.1962, Beamish, G. leg." (WAM); 1 ex., idem but „10.4.1964" (WAM). ***Northern Territory*****:** 1 ex., "Australia, N.T. Binis Track 10.IV.2011 LF; H = 427 m 20°51'51.4"S, 135°12'01.6"E leg. Michael Langer" (ZSM); 1 ex., "Australia, NT, 80 km W Roper Bar, 14°54'19"S, 133°57'28"E, 78 m, at light, 14.V.2006, leg. Berger & Dostal (7/06)" (CGW); 1 ex., "Australia, NT, Kakadu NP, Muirella, 40 m, at light, 10.V.2006, leg. Berger & Dostal (3/06)" (CGW); 1 ex., "Katherine (T) Vestjens, 1.12.1967 [-14.51667, 132.3667], W.J.M. Tindal" (ANIC); 1 ex., "Katherine [-14.46667, 132.2667], 9.2.1968, Watson, J.A.L." (ANIC); 1 ex., "Howard Springs 27.01.1968 [-12.45, 131.05] Watson, J.A.L." (ANIC); 1 ex., "Northern Territory Katherine [-14.46667, 132.2667], 6.2.1968, Matthews, E." (ANIC); 1 ex., "Northern Territory, Lee Point, Darwin [-12.33333333, 130.9], 7.3.1967, Upton, M.S." (ANIC); 1 ex., "Northern Territory, Roper Gulf (S), Mataranka [-14.93333333, 133.0666667], 1.3.1967, Upton, M.S." (ANIC); 1 ex., "NT Davenport Murchison Ranges, Barkly (S), 15 miles N of Tennant Ck. [-19.4, 134.1833333], 27.2.1967, Upton, M.S." (ANIC); 1 ex., "NT Brock Creek, Burnside [Brocks Creek] [-13.46667, 131.4167], 27.3.1929, Campbell, T.G." (ANIC); 1 ex., "Howard Springs, Litchfield (M) [-12.45, 131.05], 27.1.1968, Matthews, E." (ANIC); 1 ex., "Australia N.T.

Figure 6. Habitus and colouration of *Copelatus marginatus*, female. Total length 5.8 mm.

Kununurra m 50 23.VIII.1996 P.M. Giachino legit" (CLH); 1 ex., "Australia N.T. Umbrawarra Gorge Campground, ca. 40 km S Pine Creek, 27.IV.–18.V.2009, S 13°58'01.4"S, 131°41'57.2"E, 163 m, NF, leg. M. Langer" (CLH); 2 exs.,"Australia: N.T./ ca. 30 km S Daly Waters und ca. 90 km N Elliott am Stuart Hwy 04.IV.2011 LF H = 269 m 16°46'38.8"S, 133°25'53.8"E leg. Michael Langer" (CLH); 11 exs., "Australia: NT, Litchfield NP, TJAYNERA FALLS, 13°15'S, 130°44'E, 63 m, S. Jákl leg., 20–27.XI.2008" (NMPC); 5 exs., "AUSTRALIA: NT, 25 km S of KATHERINE, rd to Kununurra, 14°44'S, 132°01'E, 100 m, S. Jákl leg., 17.–31.XII.2008" (NMPC); 12 exs., "AUSTRALIA: NT, 25 km S of KATHERINE, nr Cutta Cutta caves, 14°31'S, 132°25'E, 168 m, S. Jákl leg., 23.–31.XII.2008" (NMPC); 1 ex., "Australia: NT, Nitmiluk NP, Edit Falls, 14°10'S, 132°06'E, 37 m, S. Jákl leg., 3.XII.2008" (NMPC); 2 exs., "AUSTR. NT, Mataranka, 14°53'S, 132°01'E, 18.12.08, 148 m, Sv. Bílý leg." (NMPC); 70 exs., "Australia: NT, 70 km SW of Mataranka, 15°19'S, 132°50'E, 190 m, S. Jákl leg., 22.–23.XII.2008" (NMPC); 1 ex., "AUSTRALIA: NT, West Macdonnell Range NP, SIMPSON GAP, 23°40'S, 133°43'E, 600 m, S. Jákl leg., 3.–5.I.2009" (NMPC). ***Queensland*:** 1 ex., "Cardstone [-17.76666667, 145.5833333], 16.12.1965, Hyde, K." (ANIC); 1 ex., "Mary Creek [-16.55, 145.2], 4.12.1968, Britton, E.B. & Misko, S." (ANIC); 1 ex., "Cairns [-16.91667, 145.7667] Taylor, F.H." (ANIC); 1 ex., "Queensland, Whitsunday, Mimosa Motel, 3 m. S Bowen [-20.01667, 148.25], 23.3.1967, Brooks, J.G." (ANIC); 1 ex., "Townsville [-19.26667023, 146.8166656], Taylor, F.H." (ANIC); 36 exs., "Australia/Queensland 30 km E Normanton riverside at light, 1.1996, S. Lamond leg. Coll. Hendrich" (CLH); 31 exs., "Australia/ Queensland 20 km E of Normanton February 1996, at light, Steven Lamond leg. Coll. L.Hendrich" (CLH); 4 exs., "Bowen N.Q. 23/ III/1962 A. & M. Walford-Huggins" (CLH); 10 exs., "Australia, QL, Rollingstone, 20 km NW Townsville, 20 m, 17.I.1993, leg. G. Wewalka (7)" (CGW); 3 exs., "Australia, QL, Dalrymple, 30 km N Charters Towers, 300 m, 18.I.1993, leg. G. Wewalka (10, 11)" (CGW); 1 ex., "QL, 15 km S Ogmore, 24.I.2012, leg. S. Prepsl" (CGW); 3 exs., "Australia, Queensland, Horn Islet, Sir Edward Pellew Group, 15. February 1968-21. February 1964, B. Cantrell" (QM); 1 ex., "Australia, Queensland, Iron Range, Cape York 23. April 1966, G. Monteith" (QM); 2 exs., "Australia, Queensland, CYP Batavia Downs, 12.40S, 142.40E, 3. March 1993-10. March 1993, at light, I. Cunningham" (QDPIB); 6 exs., "Australia, Queensland, Tolga, 26. Jan.–31. Jan. 1981, at light, N. Gough" (QDPIB); 1 ex., "Australia, Queensland, Burketown 31. Jan. 1992, at light, B.M. Waterhouse, J.F. Grimshaw" (QDPIB); 1 ex., "Australia, Queensland Danbulla S.F. via Yungaburra 13. February 1992 at light, Storey, De Faveri & Huwer" (QDPIB); 1 ex., "Australia, Queensland, Normanton, 4. September 1982, at light, R.I. Storey" (QDPIB); 1 ex., "Australia Queensland Kauri Creek, Para Grass, 30. August 1995, B. Hebert" (QDPIB); 1 ex., "Australia, Queensland, Ingham, 6. March 1984 at light, K.H. Halfpapp" (QDPIB); 4 exs., "AUSTRALIA Qld. Windsor Tableland Feb 6-8/91 Larson & Storey" (ZSM); 2 exs., "N Queensland, 14.1.2000, Kuranda, Sv. Bílý leg." (NMPC); 1 ex., "N Queensland, 9.2.2000, Kuranda, Sv. Bílý leg." (NMPC); 1 ex., "N Queensland, 7.2.2000, Mt. Carbine, Sv. Bílý leg." (NMPC); 1 ex., "N Queensland, 13.2.2000, Undara, Sv. Bílý leg." (NMPC).

Description of male. ***Body shape*****:** In dorsal view oval, almost ovoid, broadest in basal third of elytra, moderately convex. Body outline without discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus truncate. Pronotum broadest between posterior angles, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 6).

Colouration**.** Body dark red-brown to black, clypeus anteriorly, sides of pronotum broadly and elytra laterally (including epipleura) paler, ventral side and appendages testaceous (Fig. 6).

Dorsal surface sculpture**:** Whole surface almost matt (Fig. 6). Head uniformly microreticulated, reticulation composed of moderately deeply impressed meshes. Punctation composed of coarse setigerous punctures, and very small punctures spreading sparsely on surface; rows of coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with lateral beading very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse setigerous punctures present along anterior margin, basal margin (except for basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. Serial punctures on elytra rather weak. On each elytron six moderately impressed thin discal and one submarginal longitudinal striae, progressively closer towards sides; stria 1 (sutural stria) reduced to apical fourth, striae 2 and 4 complete, striae 3 and 5 a little shorter basally. Submarginal stria short, expanding from behind middle of elytron to end of stria 6.

Antennae and legs**:** Antenna with antennomeres long and slender. Protibia modified, distinctly broadened anteriorly. Pro- and mesotarsomeres 1–3 distinctly broadened, with adhesive discs on their ventral side; claws simple.

Ventral part**:** Finely microreticulated, with intermixed, sparsely distributed, very small punctures. Prosternal process shortly lanceolate, apex obtuse; distinctly bordered laterally. Lateral parts of metaventrite tongue-shaped, slender. Metacoxal lines close, evenly and moderately diverging anteriorly, ending short of metasternum. Metacoxae and abdominal ventrites 1–3 with numerous longitudinal or oblique striae.

Male genitalia**:** Median lobe narrow, simple, tapering and slightly curved downwards apically in lateral view (Fig. 15A, B, C). Shape of paramere broadly triangular, with weak, relatively short setae, mainly along dorsal margin of subdistal part (Fig. 15D).

Female. Similar to male in habitus. Protibia simple, not angled basally and only slightly broadened distally; pro- and mesotarsomeres not broadened, without adhesive setae. Pronotum basolaterally with numerous short longitudinal strioles. Elytra between striae and side with numerous short longitudinal strioles.

Measurements. TL = 5.7–6.0 mm; TL-H = 5.3–5.6 mm; MW = 2.7–2.8 mm.

Variability. All specimens studied are rather uniform and vary only in body length. In some specimens, the submarginal stria is reduced to few elongate grooves.

Differential diagnosis. The species is close to *C. tenebrosus* but can be easily separated by the larger size, much shorter inner striae of elytra, and the form of the median lobe.

Distribution. The species occurs in tropical and subtropical northern and central Australia, along the east coast south to Brisbane (WA, NT, QLD) (Fig. 25). Addi-

tionally, *C. marginatus* was recorded from New Caledonia (South Province) and West Samoa by Wewalka et al. (2010). Zimmermann (1927: 17) reported the species from Tonga (two specimens from Tonga: Nukualofa, 22.xi.1925). He wrote also that the presence of the species in Samoa is confirmed by material of Dr K. Friederichs (Friederichs 1922: 148: Samoa, five specimens). Later, *C. marginatus* was reported from Samoa (Upolu), Fiji (Viti Levu and Vanua Levu) and New Guinea (Dorey, now Manokwari, Indonesia: West Papua Province) by Balfour-Browne (1945: 106 and 113) which was repeated by some later authors (Guéorguiev 1968: 21; Guéorguiev and Rocchi 1993: 159; Wewalka et al. 2010: 51). The records from Fiji and New Guinea are in need of confirmation.

Habitat. Most specimens were collected during or just after the rainy season when the beetles can be collected in seasonal flood meadows along rivers and creeks, shallow roadside ditches and swampy areas. At that time of the year, *C. marginatus* is often attracted in larger numbers to light (e.g., Normanton). In north-eastern Queensland, the species was collected in a small roadside pool and in isolated pools in seasonal fingertip tributary streams, all in closed forest (Larson 1993).

***Copelatus martinbaehri* sp. nov.**
http://zoobank.org/294C8A13-B08A-4815-B6B1-944CEED737EF
Figures 7, 16, 28

Type locality. Moreguina (St Stephen's Mission), Central Province, Papua New Guinea Central, 50 m, 10.018104S, 148.467793E.

Type material. ***Holotype*:** Male, "Papua New Guinea Central, Moreguina, 18.viii.2008 Posman (PNG184)" [printed label]; "Holotype *Copelatus martinbaehri* sp.n. Hendrich, Shaverdo, Hajek & Balke des. 2019 [red printed label] (ZSM). ***Paratypes (23 specimens)*: *Australia*:** 7 exs., "12.445S, 143.14E QLD 3 km ENE Mt. Tozer 28June–4July 1986 D.H.Colless Malaise Trap" "ANIC Database No. 25 019356" [printed label]; "Aust. Nat. Ins. Coll." [green printed label] (ANIC, ZSM); 1 male, "N. Queensland IRON RANGE Gordon's CK. [Creek, -12.715780, 143.302092] 10.5.71 at light leg: J.G. Brooks" [hw on both label sides], "COLL. HENDRICH BERLIN" (NMW); 1 male, 1 female, "Gordon's CK [Creek, -12.715780, 143.302092] Iron RA [Range] N.Q. [North Queensland] 100' [100 m] 10.5.71 J.G. Brooks "at light" (CLH); 1 female, "Iron RA N.Q. 4.5.71 J.G. Brooks "at light" (CLH); 2 females, "Iron Range, Cape York Pen., N.-Qld 26 May–2 June 1971 B.K. Cantrell" (QM); 2 males, 2 females, "Iron Range, Cape York Pen. N.Q. 13.–20.V.1975 K.J. Houston At light" (QDPC, ZSM). ***Papua New Guinea*:** 1 male, 1 female, same data as holotype, one male additionally with a green label "DNA M.Balke 3803" (ZSM). 2 females, "Papua New Guinea: Central, Moreguina, 16.viii.2008 Posman (PNG183)" [printed label] (ZSM). 1 male, "Papua New Guinea: Northern Kokoda, 410 m, i.2008, 53.4[?]81S 147 43.648E, Posman, (PNG 174)" (ZSM). All paratypes with our red printed labels.

Figure 7. Habitus and colouration of *Copelatus martinbaehri* sp. nov., paratype (Mount Tozer), male. Total length 6.7 mm.

Description of male holotype. ***Body shape*****:** In dorsal view, oblong-oval, broadest in basal third of elytra, moderately convex. Body outline without discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus not bordered. Pronotum broadest between posterior angles, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 7).

Colouration**:** Body black, most of clypeus, anterior angles of pronotum, base and tip of elytra, appendages and much of ventral surface testaceous.

Dorsal surface sculpture**:** Whole surface shiny (Fig. 7). Head uniformly microreticulated, reticulation composed of moderately deeply impressed isodiametric very small meshes. Punctation composed of very small punctures spread sparsely on surface; rows of deep and coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with some weak and short striae laterally. Microreticulation and punctation similar to that of head; row of coarse setigerous punctures present along anterior margin, basal margin (except for basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. Punctation consisting of very fine sparse punctures. Each elytron with six strongly impressed discal and one submarginal longitudinal striae, intervals subequal, striae 1 and 5 tending to be shorter basally; submarginal stria reaching from little behind midlength of elytron almost to end of stria 6. Serial punctures on elytron untraceable.

Antennae and legs**:** Antenna with antennomeres long and slender. Protibia modified, distinctly broadened anteriorly (2/3rd) and strongly narrowed basally (1/3rd). Pro- and mesotarsomeres 1–3 slightly broadened, with adhesive discs on their ventral side; claws simple.

Ventral part**:** Finely microreticulated, with intermixed, sparsely distributed, very small punctures. Prosternal process rather flat, distinctly bordered laterally, weakly and bluntly pointed. Lateral parts of metaventrite tongue-shaped, very slender. Metacoxal lines close, well-marked and moderately divergent anteriorly. Metacoxae with long and deep striae, abdominal ventrite I with numerous striae and ventrites 2–3 with a few longitudinal striae.

Male genitalia**:** Median lobe sickle-shaped, narrow, simple; in ventral view, appearing somewhat flattened; in lateral view, apically tapering and strongly curved downwards (Fig. 16B, C). Shape of paramere broadly triangular, with weak, relatively short setae, mainly along dorsal margin of subdistal part (Fig. 16D).

Female. Similar to male in habitus. Protibia not modified. Pro- and mesotarsomeres not broadened, without adhesive setae.

Measurements. ***Holotype*****:** TL = 6.35 mm; TL-H = 5.85 mm; MW = 3.1 mm. ***Paratypes*****:** TL = 6.2–6.75 mm; TL-H = 5.85–6.1 mm; MW = 3.1–3.2 mm.

Variability. All specimens studied are rather uniform in shape and size but vary a bit in the extension of the testaceous elytral markings.

Differential diagnosis. Based on the characteristic sickle-shaped median lobe, the new species belongs to a difficult complex of species distributed in the Sunda Islands and New Guinea, including *C. geniculatus* Sharp, 1882, *C. gentilis* Sharp, 1882, *C. lineatus* (Guérin-Méneville, 1838) and *C. subterraneus* Guéorguiev, 1978 (of the *C. irinus* species group) and several additional undescribed species, both from the

C. irinus group (i.e., with six dorsal striae on elytra) and the *C. trilobatus* group (with 11 dorsal striae). All those species are rather uniform in body shape and colouration; they differ in elytral striation (which may be, however, variable) and less so in the shape of the median lobe in lateral view, especially in the width of the medial part and in length and curvature of the apical part. *Copelatus martinbaehri* sp. nov. differs from the other species of this complex by the shape of the median lobe, which has the central part in lateral view broader, but without distinct tubercle on the ventral side; additionally, the apical part is shorter and almost straight (the angle between central and apical part of median lobe in lateral view is nearly rectangular).

Within other Australian species with six elytral striae, *Copelatus martinbaehri* sp. nov. can be easily distinguished by its larger size (*C. tenebrosus* is always less than 5 mm), more elongate habitus (*C. portior* more ovoid, oval), elytral colouration (*C. marginatus* and *C. tenebrosus* with almost black dorsal surface), and the shape of the median lobe.

Etymology. This species is dedicated in honour of our late colleague Dr Martin Baehr (*10.3.1943, †17.4.2019, Munich, Germany), coleopterist, arachnologist, and others as well as the most knowledgeable authority for Australian ground beetles. The specific epithet is a substantive in the genitive case.

Distribution. Northern Queensland (Iron Range National Park at Cape York Peninsula) and south-eastern Papua New Guinea (Central Province) (Fig. 28).

Habitat. Unknown. Most probably, the new species is an inhabitant of temporary lowland rainforest pools. The type specimens were collected in a Malaise Trap and at light.

Copelatus nigrolineatus Sharp, 1882

Figures 8, 17, 26, 34, 35

Copelatus nigrolineatus Sharp 1882: 577 (original description); Watts 1978: 122 (description); Watts 1985: 26 (general distribution); Larson 1993: 53 (habitat information); Larson 1997: 272 (habitat information); Hendrich 2003: 51 (new records); Watts 2002: 42 (checklist); Nilsson and Hájek 2019: 62 (catalogue).

Type locality. "Australia, (Champion Bay, Carpentaria, Port Denison, Port Boweii)".

Type material. ***Lectotype*** (designated by Watts 1978: 122): Male, "Lectotype" [round label with violet frame], "11 on each elytron" [hw label], "N.W. Australia. du Bulay" [hw label], "Sharp Coll. 1905-313." [printed label], "Type 677 Copelatus nigrolineatus n.sp. Australia" [hw label], "Copelatus nigrolineatus Sharp Det. C. Watts 1974" [hw label] (NHMUK). ***Paralecotypes*****:** 1 male and 3 females, "Paralectotype" [round printed label with blue frame], "Cotype" [roundish label with yellow frame], "Port Denison 677" [hw label], "Sharp Coll. 1905-313" [printed label], "Copelatus nigrolineatus Sharp Cotype" [hw label] (NHMUK).

Additional material studied (415 specimens). ***Western Australia*****:** 43 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Great Northern Hwy, 50 km S Wyndham, Black Flag Creek, 15°52'1.22"S, 128°21'49.97"E, 50 m, 13.6.1999, Hen-

Figure 8. Habitus and colouration of *Copelatus nigrolineatus*, female. Total length 5.7 mm.

drich leg. (Loc. 4/104)" (CLH, ZSM); 10 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Road, Durack River Crossing, 15°56'28.73"S, 127°13'9.01"E, 250 m, 13.6.1999, Hendrich leg. (Loc. 6/106)" (CLH); 7 exs., "AUSTRALIA/WA/Shire of Wyndham - East Kimberley, Gibb River Road, Drysdale River Crossing, 15°41'2.91"S, 126°22'42.53"E, 380 m, 14.6.1999, Hendrich leg. Loc. 9/109" (CLH); 3 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Road, King Edward River Crossing, 14°54'10.13"S, 126°12'2.85"E, 280 m, 15.6.1999, Hendrich leg. Loc. 10/110" (CLH); 5 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Mitchell Plateau, Surveyors Pool, 14°40'26.54"S, 125°43'56.79"E, 150 m, 17.6.1999, Hendrich leg. Loc. 12/112" (CLH); 19 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Road, 10 km E Hann River, Snake Creek, 16°30'50.92"S, 126°21'19.53"E, 470 m, 19.6.1999, Hendrich leg. Loc. 16/116" (CLH); 3 exs., "AUSTRALIA/WA/Shire of Wyndham - East Kimberley, Gibb River Raod, Barnett River Gorge, 16°32'15.17"S, 126°7'30.43"E, 450 m, 19.6.1999, Hendrich leg. Loc. 17/117" (CLH); 5 exs., "AUSTRALIA/WA/Shire of Derby – West Kimberley, Gibb River Road, King Leopold Range, 500 m, 5 km NW Mount Bell, intermit. creek, 17°9'43.80"S, 125°18'33.00"E, 23.6.1999, Hendrich leg. Loc. 22/122" (CLH); 6 exs., "AUSTRALIA/WA/Shire of Derby-West Kimberley, Gibb River Road/ Fairfield Leopold Road, Lennard River Bridge, 17°9'48.49"S, 125°13'36.53"E, 50 m, 24.6.1999, Hendrich leg. Loc. 23/123" (ZSM); 6 exs., "AUSTRALIA/ WA/Shire of Halls Creek, Old Halls Creek, Elvire River, 18°14'50.04"S, 127°46'45.39"E, 310 m, 27.6.1999, Hendrich leg. Loc. 28/128" (CLH); 3 exs., "AUSTRALIA/WA, Charnley River, 25 mi E Beverley Springs, 16°15'S, 125°26'E, 9.9.1969, Giuliani, D.D. leg." (WAM); 1 ex., "Kimberley Research Station, Kununurra nr. Wyndham [-15.46667, 128.1], 27.11.1956" (ANIC); 1 ex., "Western Australia, Pilbara, Millstream [-21.58333, 117.0667], 3.11.1970, Britton, E.B." (ANIC); 1 ex., "WA Muccangarra Pool 19/10/2008" (DPAW); 7 exs., "WA Mungajee Pool 14/10/2008" (DPAW); 1 ex., "Australia, WA, Pilbara, Hamersley Range, 17 km S Auski Roadhouse, Fig Tree Crossing 400 m, 28.8.2002, 22°32'S, 118°44'E, Hendrich leg. (Loc. WA 9/173)" (CLH); 1 ex., "Australia, WA, Pilbara, Hamersley Range, Karijini N.P., Dales Gorge [Fortescue Falls and Circular Pool], 400 m, 28.8.2002, 22°29'S, 118°35'E, Hendrich leg. (Loc. WA 10/174)" (CLH); 3 exs., "Australia, WA, Pilbara, Hamersley Range, Karijini N.P., Kalamina Gorge, 450 m, 29.8.2002, 22°25'S, 118°23'E, Hendrich leg. (Loc. WA 11/175)", two specimens with "DNA Balke 3360", "DNA Balke 3361" [green printed label] (CLH); 1 ex., "Australia, WA, Pilbara, Hamersley Range, Karijini N.P., Knox Gorge, 450 m, 29.8.2002, 22°21'S, 118°18'E, Hendrich leg. (Loc. WA 12/176)" (CLH); 2 exs., "Australia, WA, Pilbara, De Grey River, River Crossing Hwy. No. 1, 72 km E of Port Hedland, 20 m, 24.8.2002, 20°10'S, 119°11'E, Hendrich leg. (Loc. WA 1/165)" (CLH); 15 exs., "Australia, WA, Pilbara, Yule River, River Crossing Camping Area at Hwy. No. 1, 53 km SW of Port Hedland, 20 m, 24.8.2002, 20°41'S, 118°17'E, Hendrich leg. (Loc. WA 2/166)" (CLH); 1 ex., „Australia, WA, Pilbara, Millstream Chichester N.P., McKenzie Springs, 200 m, 25.8.2002, 21°18'S, 117°12'E, Hendrich leg. (Loc. WA 3/167)" (CLH); 28 exs., "Aus-

tralia, WA, Pilbara, Millstream Chichester N.P., Gregory Gorge, Palm Pool at River Crossing, 26.8.2002, 21°33'S, 117°03'E, Hendrich leg. (Loc. WA 5/169)" (CLH); 3 exs., "Australia, WA, Pilbara, Millstream Chichester N.P., Fortescue River side branch, SE Visitor Centre, 26.8.2002, 21°37'S, 117°07'E, Hendrich leg. (Loc. WA 6/170)" (CLH); 2 exs., "AUSTRALIA WA, Wyndham, Parry Creek Farm, 11.X.2011, attracted to light at night, J. & S. Nunn (NMPC); 8 exs., "AU Western Australia, E-Pilbara, Weeli Wolli Spr., NW of Newman, 555 m, 22°54.886'S, 119°12.661'E, 19.–22. xi.2011, Sv. Bílý leg." (NMPC); 1 ex., "AUSTRALIA, WEST AUSTRALIA, HALLS CREEK env., 18°11.48'S, 127°38.42'E, 26.i.2014, J.Horák leg." (NMPC); 1 ex., "WA, E-Pilbara, Weeli Wolli Springs, NW of Newman, 555 m, 22°54.886'S, 119°12.66'E, 2005, C.H.S. Watts leg.", DNA Balke 2654", [green printed label] (ZSM). ***Northern Territory*:** 3 exs., "Australia: NT, Anniversary Creek, 12 km S Adelaide River Scenic Route, 43 m, 22.VIII.2006, 13.19.252S, 131.08.271E, L. & E. Hendrich leg. (NT 7)", three specimens with: "DNA Balke 2173", "DNA Balke 2174", "DNA Balke 2175" [green printed labels] (ZSM); 1 ex., "Australia: NT, Nitmiluk NP, Edith Falls, Upper Pool, 123 m, 23.VIII.2006, 14.10.573S, 132.11.537E, L. & E. Hendrich leg. (NT 12)", "DNA Balke 2165" [green printed label] (ZSM); 1 ex., "Australia: NT, Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., small puddle, 20 m, 24.VIII.2006, 13.38.142S, 132.10.345E, L. & E. Hendrich leg. (NT 15a)", "DNA Balke 1660" [green printed label] (ZSM); 1 ex., "Australia, N.T. Waterhole Ranges Owen Springs Reserve, 15.–17.IV.2011 LF; H = 600 m 24°00'33.6"S, 133°24'48.6"E leg. Michael Langer" (ZSM); 25 exs., "Australia, NT: Pungalina Homestead, 16°43'16"S, 137°24'55"E 26 Jun–8Jul 2012 T.A.Weir, N.Gunter, S.Pinzon Navarro at light, open forest by crk" (ANIC); 3 exs., "NT, 80 km W Roper Bar, 14°54'19"S, 133°57'28"E, 78 m, at light, 14.V.2006, leg. Berger & Dostal (7/06)" (CGW); 2 exs., "NT, 40 km v. Port Roper, 14°54'04.8"S, 135°03'24.7"E, 134 m, at light, 14.V.2006, leg. Berger & Dostal" (CGW); 1 ex., "NT, Katherine [-14.46667, 132.2667], 7.2.1968, Watson, J.A.L." (ANIC); 1 ex., idem, "9.2.1968" (ANIC); 1 ex., "NT Tindal [-14.51667, 132.3667], 1.12.1967, Vestjens, W.J.M." (ANIC); 1 ex., "Northern Territory Auvergne, Victoria River Bank [-15.63333, 130.4833], 1968, Parker, F." (ANIC); 1 ex., "Northern Territory, Katherine [-14.46667, 132.2667], 6.2.1968, Matthews, E." (ANIC); 1 ex., "Northern Territory Magela Ck, nr. rum pipe [Mudginberri Homestead] [-12.7, 132.95], 7.1.1987, Dostine, P." (ANIC); 1 ex., "Northern Territory, Darwin Coastal, 200 m nth Magela Creek [-11.7, 132.8667], 29.7.1984, Dostine, P." (ANIC); 2 exs., "Australia: NT, Litchfield NP, TJAYNERA FALLS, 13°15'S, 130°44'E, 63 m, S. Jákl leg., 20–27.XI.2008" (NMPC); 1 ex., "AUSTRALIA: NT, 40 km SW of KATHERINE, rd to Kununurra, 14°44'S, 132°01'E, 100 m, S. Jákl leg., 29.XI.2008" (NMPC); 1 ex., "AUSTRALIA: NT, 25 km S of KATHERINE, nr Cutta Cutta caves, 14°31'S, 132°25'E, 168 m, S. Jákl leg., 23.–31.XII.2008" (NMPC); 1 ex., "Australia: NT, Nitmiluk NP, Edit Falls, 14°10'S, 132°06'E, 37 m, S. Jákl leg., 3.XII.2008" (NMPC); 4 exs., "Australia: NT, 70 km SW of Mataranka, 15°19'S, 132°50'E, 190 m, S. Jákl leg., 22.–23.XII.2008" (NMPC); 5 exs., "AUSTR. NT, Douglas Hot Springs, 12.12.[20]08, 13°45'S, 131°26'E, 35 m, Sv. Bílý leg." (NMPC); 5 exs., "AUSTRALIA

NT, 10 km S of Banka Banka, 18°52'S, 134°04'E, 316 m, 20.12.2008, Sv. Bílý leg." (NMPC); 1 ex., "AUSTRALIA: NT, BANKA BANKA env., Road to Tennant Creek, 14°53'S, 132°01'E, 316 m, S. Jákl leg., 12–13.I.2009" (NMPC); 1 ex., "AUSTR. NT, 5.1.[20]09, McDonell NP, Serpent Gorge, S.Bílý leg. 715 m, 24°45'S, 132°59'E" (NMPC); 3 exs., "AUSTRALIA NT, Adelaide River township, 25–28 IX 2011, Attracted to light at night. J. Nunn" (NMPC). ***Queensland*:** 1 ex., "AUSTRALIA: Qld. 5 km W Mt. Molloy dugout Sept 29, 1990 D. Larson" (ZSM); 2 exs., "AUSTRALIA Qld. Rice field 8 km N Mareeba, Sept 20/90 D. Larson" (ZSM); 1 ex., "AUSTRALIA Qld, 30 km s Atherton stock pond Nov. 27/90 Larson (ZSM); 1 ex., "AUSTRALIA QLD. McLeod R nr base Windsor Tableland Nov. 12/90 Larson" (ZSM); 1 ex., "Mossman 11.viii.1975 R.A. Yule Acc 1150/17 to M.V.", "QDPC 0-172703" (QDPC); 14 exs., "QL, Greenvale, 150 km NW Charters Towers, 150 m, 19.I.1993, leg. G. Wewalka (12–14)" (CGW); 3 exs., "QL, Marbeeba, 700 m, 22.I.1993, leg. G. Wewalka (19)" (CGW); 10 exs., "QL, Dalrymple, 30 km N Charters Towers, 30 m, 18.I.1993, leg. G. Wewalka (10, 11)" (CGW); 1 ex., "QL, Cape York, VI.1993, leg. Uhler" (CGW); 2 exs., "QL, Richmon, 2.VII.1918, F. M." (CGW); 1 ex., "QL, 35–47 km SWW Mt. Gamet, 31.I-4.II.2012 leg. S. Prebsl" (CGW); 1 ex., "Einasleigh Uplands Mary Creek [Queensland Tablelands (R), -16.55, 145.2], 4.12.1968, Britton, E.B. & Misko, S." (ANIC); 1 ex., "QLD, Einasleigh Uplands, 7 miles SW of Mt. Garnet [-17.73332977, 145.0500031], 20.4.1969, Common, I.F.B. & Upton, M.S." (ANIC); 1 ex., "Cassowary Coast (R) Cardstone [-17.76666667, 145.5833333], 9.3.1966 Hyde, K." (ANIC); 1 ex., "Queensland Cairns (R), Green Hills [Green Hill] [-17.05, 145.8], 19.12.1967, Brooks, J.G." (ANIC); 1 ex., "Townsville (C), Crystal Ck., 23 mi. SSE of Ingham [-18.96666908, 146.2666626], 9.12.1968, Misko, S. & Britton, E." (ANIC); 1 ex., "Burdekin (S), Ayr [-19.56667, 147.4], 4.10.1970, Muir, W.B." (ANIC); 1 ex., "Cairns" [-16.91667, 145.7667] (ANIC); 1 ex., "Russell River at Bellenden Ker Landing [-17.3, 145.9333], 24.10.1981 Earthwatch, Qld Museum" (ANIC); 1 ex., "Townsville [-19.26667023, 146.8166656] Taylor, F.H." (ANIC); 1 ex., "Qld 7 miles NNE of Ravenshoe [-17.5, 145.5], 23.4.1969, Common, I.F.B. & Upton, M.S." (ANIC); 1 ex., "Qld Mary Creek [Queensland Tablelands (R) Einasleigh Uplands -16.55, 145.2], 4.12.1968, Britton, E.B. & Misko, S." (ANIC); 1 ex., idem, "5.12.1969" (ANIC); 9 exs., "Queensland, [Sep. 1928–July 1929] K.K.Spence", "K.215166–K.215178" (AMS); 2 exs., "Australia: N QLD, 20 km NE Mareeba, Hodzic Road, 361 m, 12.IX.2006, 16.49.556S, 145.27.211E, L. & E. Hendrich leg. (QLD 28)" (CLH); 2 exs., "Australia: C QLD, 17 km S Calen, Mt. Charlton-Calen Road, creek, 94 m, 23.IX.2006, 21.00.201S, 148.42.546E, L. & E. Hendrich leg. (QLD 44)" (CLH); 6 exs., "Australia: C QLD, 10 km S Mizani, Lake Kinchant, seapage, 48 m, 24.IX.2006, 21.11.580S, 148.53.522E, L. & E. Hendrich leg. (QLD 46)" (ZSM); 2 exs., "Australia: S QLD, 40 km E Bundaberg, Tusky Creek, 9 m, 26.IX.2006, 24.39.139S, 152.01.477E, L. & E. Hendrich leg. (QLD 52)"; 4 exs., "Australia: C QLD, 19 km S Ayr, Bannister Lagoon at Bruce Hwy, swamp, 20 m, 21.IX.2006, 19.33.403S, 147.15.078E, L. & E. Hendrich leg. (QLD 43)" (CLH); 2 exs., "Australia: C QLD, 18 km S Calen, Mt. Charlton-Calen Road, Boulder Creek, 42 m, 23.IX.2006,

21.00.365S, 148.43.231E, L. & E. Hendrich leg. (QLD 45)" (CLH); 14 exs., "Australia, Queensland, Hann River N of Laura, 24. June 1976, J.F. Donaldson" (QDBIP); 1 ex., "Australia, Queensland, Iron Range Cape York Peninsula, 13.–20. May 1975, at light, K.J. Houston" (QDBIP); 1 ex., "Australia, Queensland, McIIwraith Range NE Coen Cape Yorke Pen., 29.VI.–5.VII.1976, J.F. Donaldson" (QDBIP); 1 ex., "Australia, Queensland, 23 km E of Mareeba, 29. January 1989, at light, R.I. Storey" (QDBIP); 1 ex., "Australia, Queensland, Musgrave, 10. Oct. 1982, at light, J.W. Turner" (QDBIP); 1 ex., "Australia, Queensland, Palmer River Crossing Cooktown road, 13.–20. May 1975, at light, K.L. Houston" (QDBIP); 1 ex., "N Queensland, 18.1.2000, Granite Gorge, Sv. Bílý leg." (NMPC); 17 exs., "N Queensland, 24.1.2000, Gregory Dawns, Sv. Bílý leg." (NMPC); 4 exs., "N Queensland, 28.1.2000, Porcupine Gorge, Sv. Bílý leg." (NMPC); 14 exs., "N Queensland, 29.1.–3.2.2000, The Lynd Junction, Sv. Bílý leg." (NMPC); 1 ex., "N Queensland, 5.2.2000, Ravenshoe, Sv. Bílý leg." (NMPC); 2 exs., "N Queensland, 7.2.2000, Mt. Carbine, Sv. Bílý leg." (NMPC); 17 exs., "N Queensland, 13.2.2000, Undara, Sv. Bílý leg." (NMPC); 5 exs., "Australia Qld, Mt Isa, Moondarra rd, 13 IX 2011, In gravel at edge of Leichaerdt R., J. Nunn" (NMPC). ***New South Wales*:** 1 ex., "NSW, Wakool", "K.363073" (AMS). ***South Australia*:** 1 ex., "SA Elliston Salt Lake 23/6 1974 Timm BV", "25-002059" (SAMA).

Description of male. ***Body shape*:** In dorsal view, elongate oval, broadest at midlength of elytra, moderately convex. Body outline without discontinuity between pronotum and elytra. Head relatively broad, anterior margin of clypeus truncate. Pronotum broadest between posterior angles, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 8).

***Colouration*:** Body yellow to pale ferruginous, disc of pronotum and ventral side diffusely darker, elytral striae sharply outlined in black, appendages testaceous. Base of elytra with narrow yellowish marking (Fig. 8).

***Dorsal surface sculpture*:** Whole surface shiny (Fig. 8). Head uniformly microreticulated, reticulation composed of moderately deeply impressed isodiametric meshes. Punctation composed of small punctures, smaller than meshes of reticulation; rows of coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with lateral beading very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse setigerous punctures present along anterior margin, basal margin (except for basomedially), and laterally close to sides. Elytra with microreticulation similar to that of head and pronotum, but less impressed. On each elytron 11 sharply incised discal striae present, inner three striae only weakly impressed anteriorly.

***Antennae and legs*:** Antenna with antennomeres long and slender. Protibia modified, slightly broadened anteriorly. Protarsomeres 1–3 distinctly broadened and mesotarsomeres less so, with adhesive discs on their ventral side; claws simple.

***Ventral part*:** Finely microreticulated, with intermixed, sparsely distributed, very small punctures. Meshes isodiametric, except for metacoxae and abdominal ventrites 1–2 (longitudinal), abdominal ventrite 3 (diagonal anteriorly, transverse posteriorly), and abdominal ventrites 4–6 (transverse). Prosternum obtusely keeled medially. Prosternal process shortly

lanceolate, apex obtuse; distinctly bordered laterally. Lateral parts of metaventrite tongue-shaped, slender. Metacoxal lines nearly complete, absent only close to metaventrite. Metacoxae and abdominal ventrites 1–3 with numerous longitudinal or oblique striae.

***Male genitalia*:** Median lobe consisting of a few sclerites, well separated apically (Fig. 17A, B, C). Shape of paramere narrowly triangular, with very dense, strong, long setae along dorsal margin (Fig. 17D).

Female. Similar to male in habitus. Protibia simple, not angled basally and only slightly broadened distally; pro- and mesotarsomeres not broadened, without adhesive setae.

Measurements. TL = 5.5–5.8 mm; TL-H = 4.9–5.2 mm; MW = 2.5–2.6 mm.

Variability. All specimens studied are rather uniform and vary only in body length.

Differential diagnosis. *Copelatus nigrolineatus* is distinguished from all other Australian species by the absence of submarginal striae on the elytra, the pale dorsal surface and the form of the median lobe.

Distribution. Endemic. The species is widely distributed in the northern half of Australia. Numerous records are from the Northern Territory, north-western Australia (Kimberley region and the Pilbara), and Queensland south to Brisbane (Fig. 26). The single records from South Australia ("Elliston", SAMA) and New South Wales ("Wakool", AMS) are in need of confirmation. Most probably those single specimens were drifted southwards by heavy thunderstorms, followed by flash floods.

Habitat. This widely distributed species is the most common *Copelatus* in the Northern Territory and north-western Australia and was found in almost all habitat types. It occurs in both open country as well as forested areas. Most specimens were obtained from isolated flood-zone pools of seasonal rivers and pools adjacent to streams in Eucalypt or tropical woodland. The species tended to be found more in seepage areas or on mineral substrates than other the Australian *Copelatus* (Larson 1993). Also, a few specimens were taken from slow flowing spring-fed streams (Figs 34B, 35A, B). *Copelatus nigrolineatus* is also attracted to light.

This species is the most common Australian species of the genus in Australian entomological collections.

Copelatus portior Guignot, 1956

Figures 9, 18, 24, 33

Copelatus gentilis ab. *divisus* J. Balfour-Browne 1939: 79 (unavailable name).

Copelatus portior Guignot 1956: 53 (original description); Nilsson and Hájek 2019: 59 (catalogue).

Copelatus divisus Watts, 1978: 122 (original description); Watts 1985: 26 (general distribution); Larson 1993: 52 (habitat information); Watts 2002: 42 (checklist); Nilsson and Hájek 2019: 57 (catalogue); syn. nov.

Type localities. *Copelatus divisus*: "New Hebrides [Vanuatu], Malekula Island". *Copelatus portior*: "Seleo, Berlinhafen" [Papua New Guinea, Sandaun Province, Seleo Island, 03°08'39.2"S, 142°28'56.9"E].

Figure 9. Habitus and colouration of *Copelatus portior*, female. Total length 5.4 mm.

Type material of *Copelatus divisus*. *Holotype*: Male, "Holotype" [printed label with red frame]; "New Hebrides: NE Malekula. i.1930. L.E. Cheesmann. B.M. 1930-178." [printed label]; "1768" [hw label]; "Copelatus gentilis var. divisus, var. nov. J. Balfour-Browne det" [hw label] (NHMUK). ***Paratype*:** Male, "Paratype" [printed label with yellow frame]; "New Hebrides: NE Malekula. i.1930. L.E. Cheesmann. B.M. 1930-178." [printed label]; "1768" [hw label]; "Copelatus gentilis var. divisus, var. nov. J. Balfour-Browne det" [hw label] (NHMUK).

Type material of *Copelatus portior*. *Holotype*: Male, "N. Guinea Biró 96 [printed label]", "Seleo Berlinhaf. [printed label]", "♂" [printed label], "Type" [printed, red label with black frame], "Holotypus [printed, red typing] 1955 ♂ [hw] Copelatus portior Guignot" [hw, white label with red frame], "F. Guignot det., 19 [printed] 55 [hw] Copelatus portior n.sp. Holotype ♂ [Guignot's hw]" (HNHM).

Additional material studied (64 specimens). *Northern Territory*: 2 exs., "AUSTRALIA NT Darwin, Holmes Jungle Pk uv lght Dec. 2/93 S Peck" (ZSM); 1 ex., "Australia, Northern Territory, Berry Springs [-12.72193, 131.01027] 30/10/1991–04/11/1991, Wells, A. & Webber, Malaise trap, Field Collected – Terrestrial" (AMS). ***Queensland*:** 5 exs., "Australia: N QLD, Cape Tribulation Road S of ferry station, forest swamp, 12 m, 15.IX.2006, 16.17.469S, 145.19.122E, L. & E. Hendrich leg. (QLD 35)", "DNA Balke 1874" [green printed label] (CLH, ZSM); 1 ex., "Australia: C QLD, 18 km S Calen, Mt. Charlton-Calen Road, Boulder Creek, 42 m, 23.IX.2006, 21.00.365S, 148.43.231E, L. & E. Hendrich leg. (QLD 45)", "DNA Balke 2762" [green printed label] (ZSM); 6 exs., "Australia, QL, 10 km S Tully, S Innisfail, 30 m, 25.I.1993, leg. G. Wewalka (26)" (CGW); 1 ex., "Australia, QL, 15–20 km S Innisfail, 20 m, 24.I.1993, leg. G. Wewalka (24)" (CGW); 1 ex., "Australia, Queensland, Cape York, Lockerbie [-10.8, 142.46679], 3.4.1964, Common, I.F.B. & Upton, M.S. leg." (ANIC); 1 ex., "Australia, Queensland, Cairns [-16.91667, 145.7667], Taylor, F.H. leg." (ANIC); 1 ex., "Australia, Queensland, Cassowary Coast (R) 2 miles W of Mission Beach [-17.86667, 146], 18.4.1969, Common, I.F.B. & Upton, M.S. leg." (ANIC); 1 ex., "Australia, Queensland, Cape York Peninsula, 2 miles S Iron Range [-12.73332977, 143.2832947], 12.5.1971, Brooks, J.G. leg." (ANIC); 1 ex., "Australia, Cape York Peninsula, Queensland Gordon´s Ck., Iron Ra. [Gordon Creek, Iron Range, -12.71667004, 143.3166962], 10.5.1971, J.G. Brooks" (ANIC); 1 ex., "Gordon's CR [Creek] Iron RA [Range] N.Q. [North Queensland] 100' [100 m] 12.5.71 J.G. Brooks at light" (CLH); 1 ex., "Queensland, 8 km West of Kuranda [-16.807954, 145.583013], 3 Apr 1982, G. O'Reilly", "K.363070" (AMS); 1 ex., "Australia, Queensland [-16.81985, 145.63693], 26 Apr 1987, F. Sattler", "K.363071" (AMS); 2 exs., "Australia QLD01/32 Saltbag Ck., 18 km w. Mt. Molloy, 13.4.2001, M. Baehr" (CLH); 1 ex., "Australia NE QLD Conway Range N.P. E from Proserpine", "at light 17.–23.II.1981 leg. Hangaya, Herozeg & Vojnits" (CLH); 1 ex., "Australia, Queensland, Iron Range Cape York Pen., 26. May 1971-2. June 1971, B.K. Cantrell" (QM); 1 ex., "Australia, Queensland, West Claudie River 4 km SW road junction, 25. June 1982, mv lamp, G. Daniels, M.A. Schneider" (QM); 2 exs., "Australia, Queensland, Walkamin, 26. March 1984, light trap, J.D. Brown" (QDPIB); 1 ex., "Australia, Queensland, Cairns, February 1946" (QDPIB); 1 ex., "Australia Queensland Arriga R.S. via Mareeba, 2.–3. December 1976, at light R.I. Storey" (QDPIB); 1 ex.,

"Australia, Queensland, Davies Creek via Mareeba, 13. March 1981, R.I. Storey" (QDPIB); 2 exs., "Australia Queensland Cow Bay N of Daintree, 7.–20. February 1984, I. C. Cunningham" (QDPIB); 3 exs., "Australia, Queensland, South Johnstone R.S., 29. Nov. 1991–14. Jan. 1992, Malaise Trap, K.H. Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, Mossman River, 25. November 1984, light trap, J.D. Brown" (QDPIB); 2 exs., "Australia, Queensland, Atherton Area, 14. March 1983, light trap, J.D. Brown" (QDPIB); 1 ex., "Australia Queensland 15 km WNW of South Johnstone 4. March 1986, light trap, Fay, Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, 15 km WNW of South Johnstone, 19. Dec. 1985, light trap, Fay, Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, 15 km WNW of South Johnstone, 26. May 1986, light trap, Fay, Halfpapp" (QDPIB); 1 ex., "Australia, Queensland, Tolga, 23. January 1986, light trap, J.D. Brown" (QDPIB), 1 ex., "QLD, Mackay [-21.1500, 149.1833] 4/4 1963, CHS Watts", "25-001796" (SAMA); 1 ex., "QLD, Burdekin, Home Hill [-19.6669, 147.4167] 4/7 1963, CHS Watts", "25-001798" (SAMA); 1 ex., "QLD, Townsville [-19.2, 146.68], 6–11/2/ 1998, AJ Watts", "25-001803" (SAMA); 4 exs., "AUSTRALIA Qld Ellis Beach 30 km N Cairns J. 11 1991 Dr. Larson" (ZSM); 6 exs., "N Queensland, 14.1.2000, Kuranda, Sv. Bílý leg." (NMPC); 2 exs., "N Queensland, 9.2.2000, Kuranda, Sv. Bílý leg." (NMPC); 1 ex., "N Queensland, 15.1.2000, Davis Creek, Sv. Bílý leg." (NMPC).

Description of male. ***Body shape*****:** In dorsal view broad, ovoid, broadest part in midlength of elytra. Body outline without discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus not bordered. Pronotum broadest at base, lateral margins moderately curved. Base of elytra as broad as pronotal base; lateral margins of elytra moderately curved (Fig. 9).

Colouration**:** Body dark brown to black, anterior angles of pronotum, base of elytra, appendages and parts of abdomen testaceous.

Dorsal surface sculpture**:** Whole surface almost matt (Fig. 9). Head uniformly microreticulated, reticulation strongly impressed with small meshes. Densely, and moderately strongly punctate; rows of coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with lateral beading very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse punctures present along anterior margin, basal margin (except for basomedially), and laterally close to sides. Sides of pronotum with several short, sharp strioles. Elytra with microreticulation similar to that of head and pronotum but lacking serial punctures except for lateral row. Each elytron with six well marked striae and one submarginal stria becoming progressively closer towards sides, striae 1 and 4 continue farthest towards apex and stria 6 the least distance.

Antennae and legs**:** Antenna with antennomeres long and slender. Protibia slightly modified, slightly broadened anteriorly. Protarsomeres distinctly and mesotarsomeres 1–3 less broad, with adhesive discs on their ventral side; claws simple.

Ventral part**:** Finely microreticulated, with sparsely distributed, very small punctures. Prosternum obtusely keeled medially. Prosternal process quite strong, convex, narrowly flanged and bluntly pointed. Lateral parts of metaventrite tongue-shaped, very slender. Metacoxal lines very close posteriorly, strongly diverging anteriorly. Metacoxae with well-marked striae and abdominal ventrites 1–4 with larger but weaker longitudinal striae.

***Male genitalia*:** Median lobe anchor-like, narrow, medially bifid: left lobe short, hammer-like, right lobe long, thin, pointed and strongly curved downwards apically in lateral view (Fig. 18A, B, C). Paramere broadly triangular, with weak, relatively short setae mainly along dorsal margin of subdistal part (Fig. 18D).

Female. Similar to male in habitus. Protibia simple, not angled basally and only slightly broadened distally; pro- and mesotarsomeres not broadened, without adhesive setae.

Measurements. TL = 5.0–5.7 mm; TL-H = 4.7–5.3 mm; MW = 2.7–2.85 mm.

Variability. All specimens studied are rather uniform and vary only in body length and dorsal colouration. In some specimens, sides of elytron and areas between striae often lighter. A single female from Holmes Jungle Park in Darwin is on dorsal surface almost black, matt and with coarse microreticulation and numerous strioles on elytra and pronotum.

Differential diagnosis. *Copelatus portior* can be separated from the similar *C. tenebrosus* and *C. martinbaehri* sp. nov. by its broad and ovoid body shape, colouration of pronotum and elytra, and the six well-developed and strong elytral striae. Furthermore, it is the only Australian species with an anchor-like median lobe.

Comments on classification. *Copelatus portior* is closely related to the widespread Oriental species *Copelatus oblitus* Sharp, 1882 with which it shares a characteristic shape of male genitalia with anchor-like, medially bifid median lobe. We compared the holotypes of both *C. portior* and *C. divisus* and have found no differences between these two taxa. Therefore, we consider *Copelatus divisus* Watts, 1978 a junior subjective synonym of *Copelatus portior* Guignot, 1956.

Distribution. The species occurs in the coastal tropical rainforest areas of the Northern Territory and north-eastern Queensland, from northern Peninsula (Lockerbie) to Mackay in the south (Fig. 24). Additionally, *C. portior* is known from northern part of Papua New Guinea: Sandaun Province, Seleo Island, and Madang Province, Friedrich-Wilhelmshafen, now Madang, (Guignot 1956: 53, localities for holo- and allotypes).

Habitat. *Copelatus portior* was mainly collected in puddles and pools in temporary flooded swamp forests (Fig. 33A, B), low gradient streams and drainage ditches at the edge of cane fields (Larson 1993), and in residual pools of shallow, intermittent and smaller creeks. The beetles hide among fallen leave litter and dense emergent grasses. The substrate was generally clay. Larson (1993) collected most of his specimens in open sites where rainforest had been cleared. *Copelatus portior* is commonly attracted at light. The species is regularly collected but never abundant or in larger numbers.

Copelatus tenebrosus Régimbart, 1880

Figures 10, 19, 27, 33, 36

Copelatus tenebrosus Régimbart 1880: 210 (original description); Watts 1978: 124; Watts 1985: 26; Larson 1993: 53; Hendrich and Balke 1995: 44; Watts 2002: 33, 42; Hendrich et al. 2004: 118.*

* For full synonymy, see Sheth et al. 2018: 257 and Nilsson and Hájek 2019: 59.

Type locality. "[Indonesia, Sumatra] Solok, District of Rawas, Soeroelangoen".

Type material. Not studied. The type specimens should be deposited in the Naturalis Biodiversity Center, Leiden, The Netherlands (former Rijksmuseum van Natuurlijke Historie), but they were not found during a visit of JH. The designation of the lectotype by Watts (1978: 124) based on specimens from "Siam, Bangkok" and deposited in NHMUK is invalid and concerns almost surely the type material of *Copelatus pusillus* Sharp, 1882 (a junior subjective synonym of *C. tenebrosus*); *Copelatus tenebrosus* was described based on specimens from Sumatra.

Additional material studied (83 specimens). ***Northern Territory*:** 2 exs., "AUSTRALIA NT Kakadu NP Alligator R. Gungaree Rainforest Dec. 22/93 S&J Peck" (ZSM); 2 exs., "Australia N.T. Howard Springs, 35 m, 17–18.5.2014 ca. 25 km SE Darwin ca. 12°29.82.7"S, 131°01.95.1"E M. Langer leg. (LF) Coll. Hendrich" (ZSM); 1 ex., "Australia NT Burdulba Billabong, 15 km SSW Jabiru, 12 m, 12.46.26S 132.44.86E, 2.–3.XI.2007, at light, M. Baehr leg." (ZSM); 1 ex., "Australia: NT, Georgetown Billabong, 750 m E Jabiru East, 30 m, 29.VIII.2006, 12.40.716S 132.55.861E, L. & E. Hendrich leg. (NT 20)", "DNA Balke 2411" [green printed label] (ZSM); 1 ex., "NT, Tindal near Katherine [-14.51667, 132.3667], 1.12.1967, Vestjens, W.J.M." (ANIC); 1 ex., "NT, Darwin, 12°51'24"S, 131°46'48"E, 52 m, at light, 9.V.2006, leg. Berger & Dostal (2/06)" (CGW); 1 ex., "NT, Kakadu NP, Muirella, 40 m, at light, 10.V.2006, leg. Berger & Dostal (3/06)" (CGW); 1 ex., "NT, Litchfield NP, Florence Falls, 12°51'15"S, 132°45'16"E, 63 m, at light, 12.V.2006, leg. Berger & Dostal (5/06)" (CGW); 1 ex., "Australia, Northern Territory, Muirella Park Kakadu, 18. May 1985, at light, Fay, Halfpapp" (QDPIB); 22 exs., "Australia: NT, Litchfield NP, TJAYNERA FALLS, 13°15'S, 130°44'E, 63 m, S. Jákl leg., 20–27. XI.2008" (NMPC); 3 exs., "Australia: NT, Nitmiluk NP, Edit Falls, 14°10'S, 132°06'E, 37 m, S. Jákl leg., 3.XII.2008" (NMPC); 1 ex., "AUSTR. NT, Kakadu NP, Jim Jim Billabong, 12°56'S, 132°33'E, 5 m, 5.–8.12.[20]08, Sv. Bílý leg." (NMPC); 2 exs., "AUSTRALIA NT, Kakadu NP, Ubirr, 12°25'S, 132°57'E, 190 m, 9.–10.12.2008, Sv. Bílý leg." (NMPC); 2 exs., "AUSTR. NT, Douglas Hot Springs, 12.12.[20]08, 13°45'S, 131°26'E, 35 m, Sv. Bílý leg." (NMPC); 1 ex., "AUSTR. NT, Litchfield NP, 40 km E of Daly, 14.12.[20]08, Sv. Bílý leg." (NMPC); 3 exs., "AUSTRALIA: NT, 70 km SW of MATARANKA, 15°19'S, 132°50'E, 190 m, S. Jákl leg., 22.–23.XII.2008" (NMPC); 1 ex., "AUSTRALIA: NT, 25 km S of KATHERINE, nr Cutta Cutta caves, 14°31'S, 132°25'E, 168 m, S. Jákl leg., 23.–31.XII.2008" (NMPC). ***Queensland*:** 8 exs., "Australia: N QLD, Cape Tribulation Road S of ferry station, forest swamp, 12 m, 15.IX.2006, 16.17.469S, 145.19.122E, L. & E. Hendrich leg. (QLD 35)", two specimens with "DNA Balke 1875", "DNA Balke 1876" [green printed label] (CLH, ZSM); 1 ex., "Australia: C QLD, 10 km S Mizani, Lake Kinchant, seapage, 48 m, 24.IX.2006, 21.11.580S, 148.53.522E, L. & E. Hendrich leg. (QLD 46)", "DNA Balke 1756" [green printed label] (ZSM); 1 ex., "QLD Ingham [-18.65, 146.1666667], 23.2.1960, Harley, K.L." (ANIC); 1 ex., "QLD Ingham [-18.65, 146.1666667], 27.1.1968, Brooks, J.G." (ANIC); 1 ex., "QLD, 2 miles W of Mission Beach [-17.86667, 146.1],

Figure 10. Habitus and colouration of *Copelatus tenebrosus*, male. Total length 4.4 mm.

18.4.1969, Common, I.F.B. & Upton, M.S." (ANIC); 1 ex., "Australia Queensland 65 km East of Hughenden [-20.8287, 144.7969], 3 Feb 1981, M.S. Moulds" (AMS); 11 exs., "QL, 10 km S Tully, S Innisfail, 30 m, 25.I.1993, leg. G. Wewalka" (CGW); 2 exs., "Australia, Queensland, The Boulders Babinda, 5. February 1975, at light in rainforest B.K. Cantrell" (QDPIB); 1 ex., "Australia, Queensland, Saibai Island, 09.23S 142.40E, 6. February 1986, at light, Houston, Hamacek" (QDPIB); 1 ex., "Australia, Queensland, Wallaman Falls Area W Ingham, 7. February 1975, at light in rainforest, B.K. Cantrell" (QDPIB); 6 exs., "Australia, Queensland, 15 km WNW of South Johnstone April-May 1988, light trap, Fay, Halfpapp" (QDPIB); 1 ex., "Australia, Queensland (22°29'13"S, 144°25'54"E) [Barcadine] Taylor, Frank H. (Collector)" (AMS); 2 exs., "Australia Qld 15 km N Cairns Jan 11, 1991 D.J. Larson" (ZSM).

Description of male. ***Body shape*****:** In dorsal view, elongate oval, broadest in basal third of elytra, moderately convex. Body outline with little discontinuity between pronotum and elytra. Head relatively broad; anterior margin of clypeus truncate. Pronotum broadest just before posterior angles, lateral margins moderately curved. Base of elytra slightly broader than pronotal base; lateral margins of elytra moderately curved (Fig. 10).

Colouration**.** Body dark red-brown to black, clypeus anteriorly, anterior angles of pronotum, sides of elytron towards apex, parts of ventral side and appendages yellowish to dark ferruginous (Fig. 10).

Dorsal surface sculpture**:** Whole surface shiny (Fig. 10). Head uniformly microreticulated, reticulation composed of moderately deeply impressed meshes. Punctation composed of coarse setigerous punctures, and very small punctures spread sparsely on surface; rows of coarse punctures present around inner margin of eyes and in small depression anterolaterally of eyes. Pronotum with lateral beading very thin and indistinct. Microreticulation and punctation similar to that of head; row of coarse setigerous punctures present along anterior margin, basal margin (except basomedially), and laterally close to sides. Posterior angles of pronotum with quite dense shallow short striae. Elytra with microreticulation similar to that of head and pronotum, but less impressed. On each elytron six well impressed discal and one submarginal longitudinal striae, progressively closer towards sides; stria 1 (sutural stria) shortened at basal third, striae 2–4 almost complete, striae 5 and 6 a little shorter basally. Submarginal stria expanding from behind midlength of elytron to end of stria 5. Serial punctures on elytra, in striae 2–4 and 6, rather weak.

Antennae and legs**:** Antenna with antennomeres long and slender. Protibia strongly modified, distinctly broadened anteriorly (2/3rd) and strongly narrowed basally (1/3rd). Pro- and mesotarsomeres 1–3 moderately broadened, with adhesive discs on their ventral side; claws simple.

Ventral part**:** Strongly microreticulated, with intermixed, sparsely distributed, very small punctures. Prosternal process narrow, distinctly bordered laterally, bluntly pointed at tip. Lateral parts of metaventrite ("metasternal wings") tongue-shaped, slender. Metacoxal lines very close posteriorly, moderately diverging anteriorly. Metacoxae and abdominal ventrites 1–3 with several longitudinal striae of different lengths.

***Male genitalia*:** Median lobe apically more or less evenly narrow in ventral view, and very strongly curved downwards in lateral view (Fig. 19A, B, C). Shape of paramere broad triangular, with weak, short setae along dorsal margin of subdistal part (Fig. 19D).

Female. Similar to male in habitus. Protibia simple, not angled basally and only slightly broadened distally; pro- and mesotarsomeres not broadened, without adhesive setae.

Measurements. TL = 4.2–4.5 mm; TL-H = 3.8–4.1 mm; MW = 1.9–2.0 mm.

Variability. All Australian specimens studied are rather uniform and vary only in body length.

Differential diagnosis. The species is similar to *C. marginatus* but can be easily separated by the smaller size (smallest species of the genus in Australia), fully developed inner striae of elytra, and the shape of the median lobe.

Distribution. This is the most widespread species in the Indomalayan and Australasian realms. It occurs from Nepal, India, and Sri Lanka over Myanmar, Laos, Vietnam, Thailand, Philippines, Indonesia (Hendrich and Balke 1995), Malaysia, and New Guinea (Hendrich et al. 2004) to coastal northern and eastern Australia, south to Townsville (Fig. 27).

Habitat. The wide distribution of this species owes to the ability of adaptation to manmade habitats like rice or paddy fields and shallow irrigation ditches (Hendrich et al. 2004). In Australia, *C. tenebrosus* inhabits open, treeless and seasonally flooded meadows, billabongs, ponds, paddy fields (Larson 1993), puddles, swamps and roadside ditches with dense vegetation, often with mats of floating grasses (Figs 33A, B, 36A, B). The species is not that common in Australia as it is in many other countries of Southeast Asia (Hendrich and Balke 1995; Hendrich et al. 2004), and its population density in one spot is always very low.

Checklist of the Australian species of *Copelatus*, in alphabetic order

Copelatus bakewelli Balfour-Browne, 1939	Australia: northern parts of WA, NT, QLD
Copelatus clarki Sharp, 1882	Australia: WA, NT, QLD; Indonesia: Papua Province; Papua New Guinea: Western Province
Copelatus daemeli Sharp, 1882	Australia: northern parts of WA, NT, QLD
Copelatus irregularis W.J. Macleay, 1871	Australia: northern parts of WA, NT, QLD
Copelatus marginatus Sharp, 1882	Australia: northern parts of WA, NT, QLD; New Caledonia, West Samoa, Samoa, Tonga, Fiji (?), New Guinea (?)
Copelatus martinbaehri sp. nov.	Australia: QLD (Cape York Peninsula); Papua New Guinea (Central Province)
Copelatus nigrolineatus Sharp, 1882	Australia: WA, NT, QLD, SA, NSW (?)

Copelatus portior Guignot, 1956	Australia: NT, QLD; Papua New Guinea: Sandaun and Madang provinces
Copelatus tenebrosus Régimbart, 1880	Australia: northern parts of NT and QLD; Asia, Southeast Asia and New Guinea

Key to Australian *Copelatus* (modified after Watts 1978)

1 Elytron with a submarginal stria and six or more additional discal striae.....**2**
– Elytron without submarginal stria, but with 11 discal striae. Body colour yellow to pale ferruginous, elytral striae sharply outlined in black (Fig. 8). Median lobe as in Fig. 17.....***C. nigrolineatus***
2 Elytron with 11 striae **3**
– Elytron with 6–10 .....**5**
3 Smaller species, TL = 5.1–5.25 mm. Elytron uniformly black without any testaceous basal or apical markings on elytra (Fig. 1), apart from paler humeral angle. Pronotal striae weak. Median lobe as in Fig. 11.....***C. bakewelli***
– Larger species, TL = 6.2–7.8 mm.....**4**
4 Elytron with testaceous basal and apical markings (Fig. 5). Pronotal striae strong and short. Median lobe as in Fig. 14 .....***C. irregularis***
– Elytron dark brown to black (Fig. 3). Pronotal striae absent. Median lobe as in Fig. 13.....***C. daemeli****
5 Elytron with 6 striae **6**
– Elytron with more than 6 striae **9**
6 Inner stria of elytron short, less than half length of elytron. TL = 5.7–6.0 mm. Median lobe as in Fig. 15.....***C. marginatus***
– Inner stria of elytron long, at least 2/3rd the length of elytron or longer.....**7**
7 Elytron dark brown to black, without any testaceous basal marking (Fig. 10). Smallest species, TL = 4.2–4.5 mm. Outer stria of elytron short, not reaching shoulder of elytron. Median lobe as in Fig. 19 .....***C. tenebrosus***
– Elytron with at least narrow testaceous basal marking (Fig. 9). Larger species, TL = 5.0–6.75 mm.....**8**
8 Body broad, ovoid. TL = 5.0–5.7 mm. Outer stria of elytron complete. Anterior angles of pronotum and base of elytra narrowly testaceous (Fig. 9). Median lobe as in Fig. 18.....***C. portior***
– Body oblong-oval. TL = 6.2–6.75 mm. Outer stria on elytron almost complete. Anterior angles of pronotum, base and tip of elytra testaceous (Fig. 7). Median lobe as in Fig. 16.....***C. martinbaehri* sp. nov.**
9 Elytron with 8 striae, no striae inwards from 1st row of serial punctures (Fig. 2). Largest species, TL = 7.2–8.0 mm. Median lobe as in Fig. 12....***C. clarki***
– Elytron with 10 striae, inner striae partially reduced (Fig. 4). Smaller species, TL = 6.2–6.3 mm. Median lobe as in Fig. 13 .....***C. daemeli****

* dimorphic species

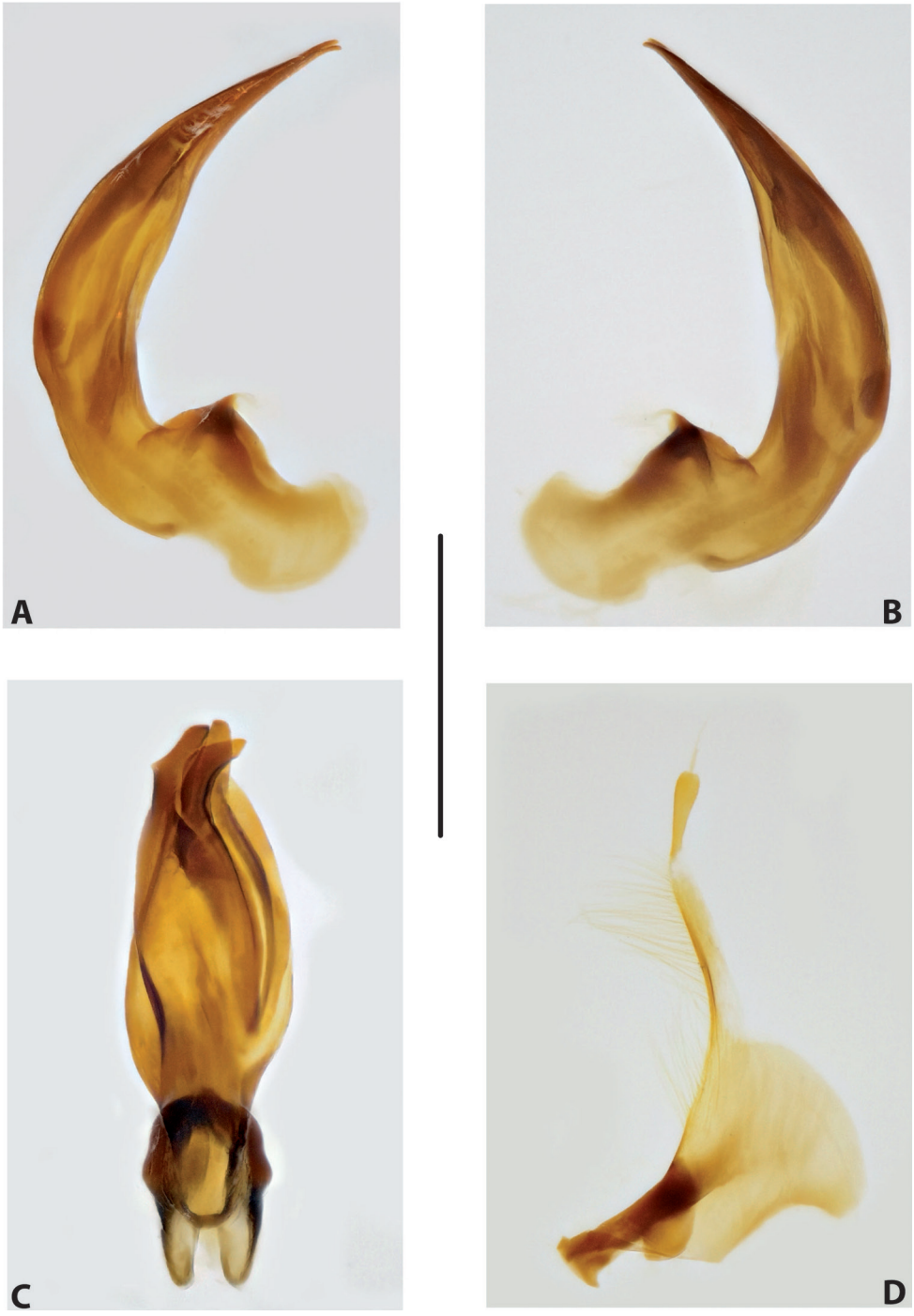


Figure 11. *Copelatus bakewelli* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

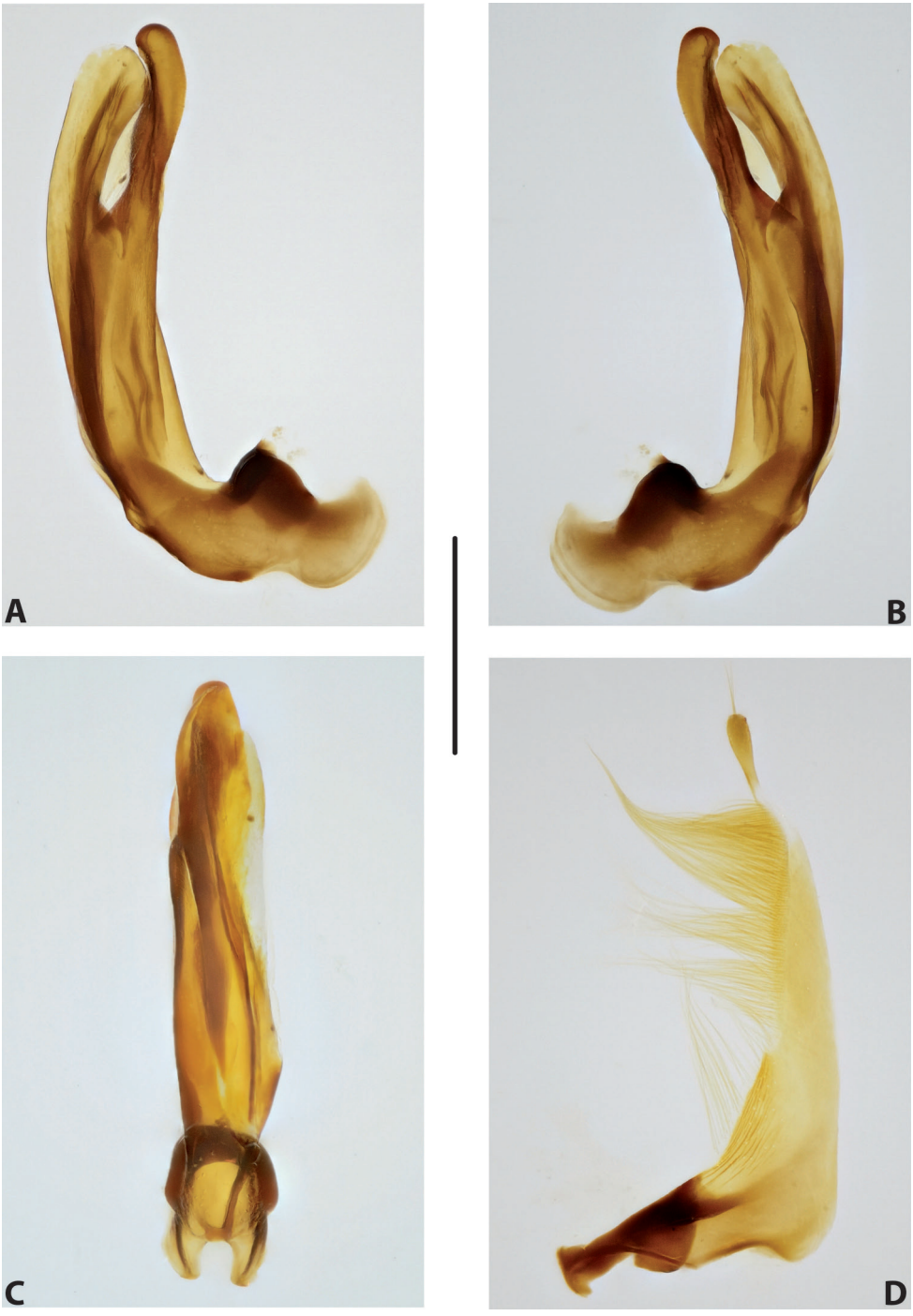


Figure 12. *Copelatus clarki* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

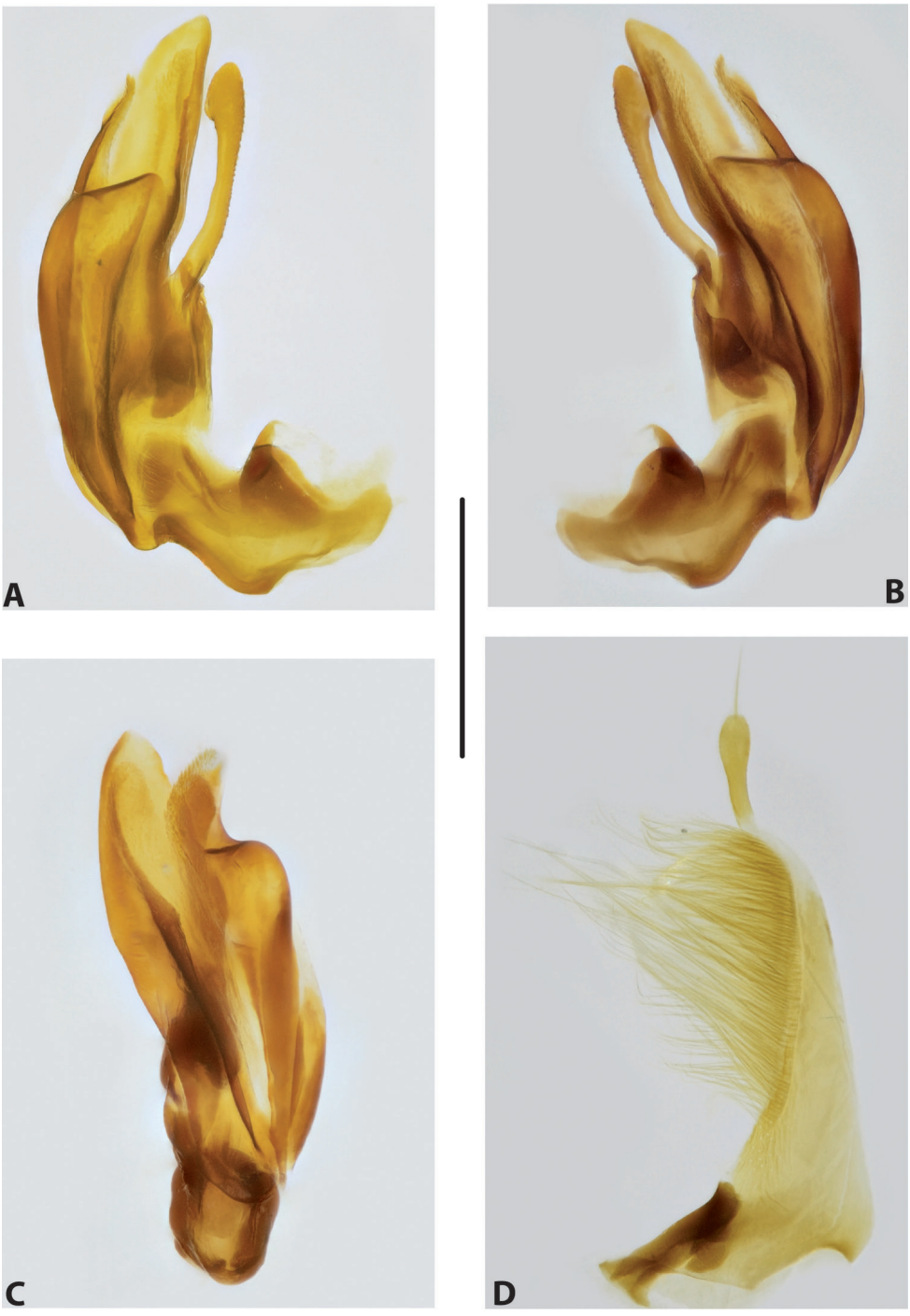


Figure 13. *Copelatus daemeli* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

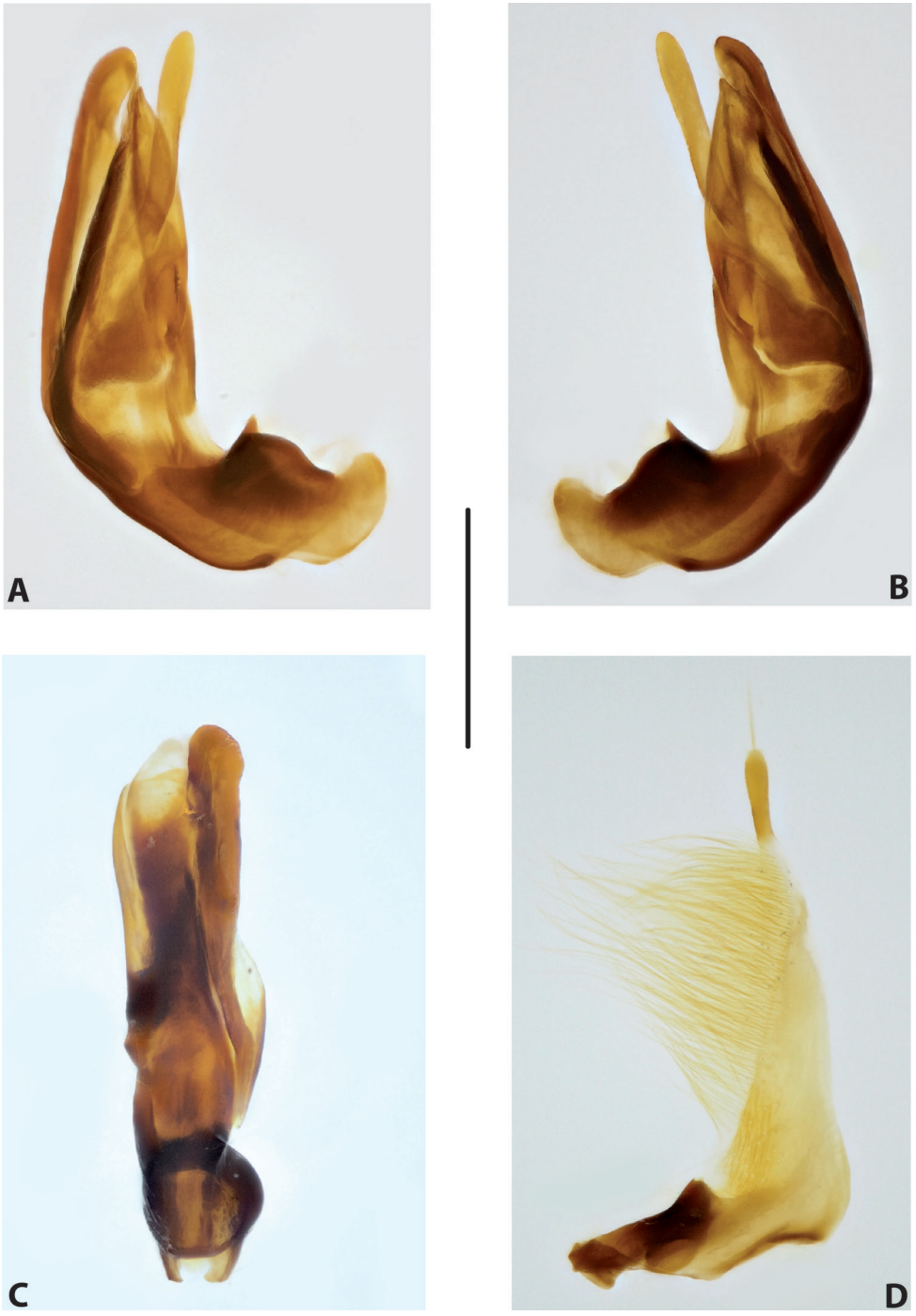


Figure 14. *Copelatus irregularis* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

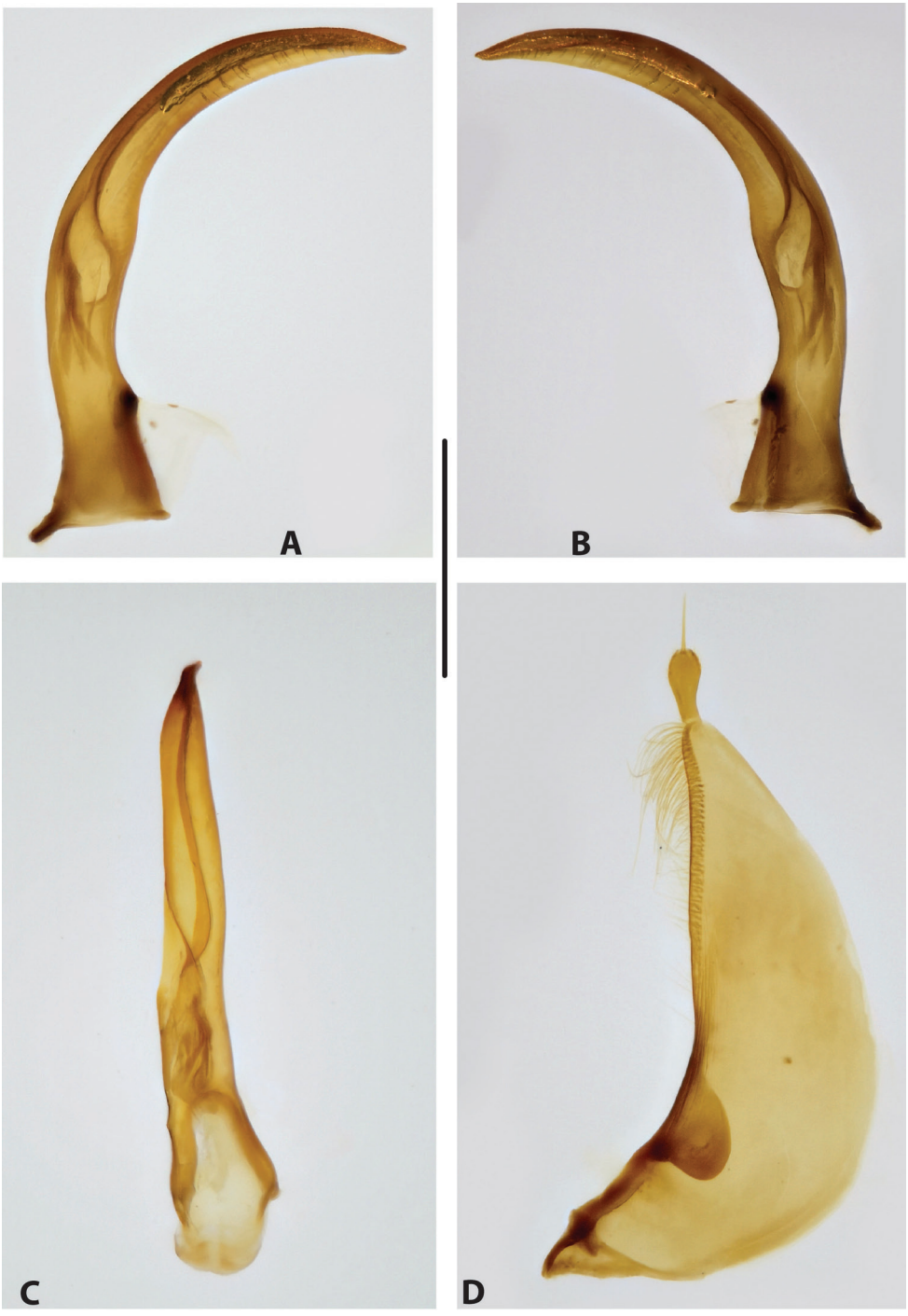


Figure 15. *Copelatus marginatus* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

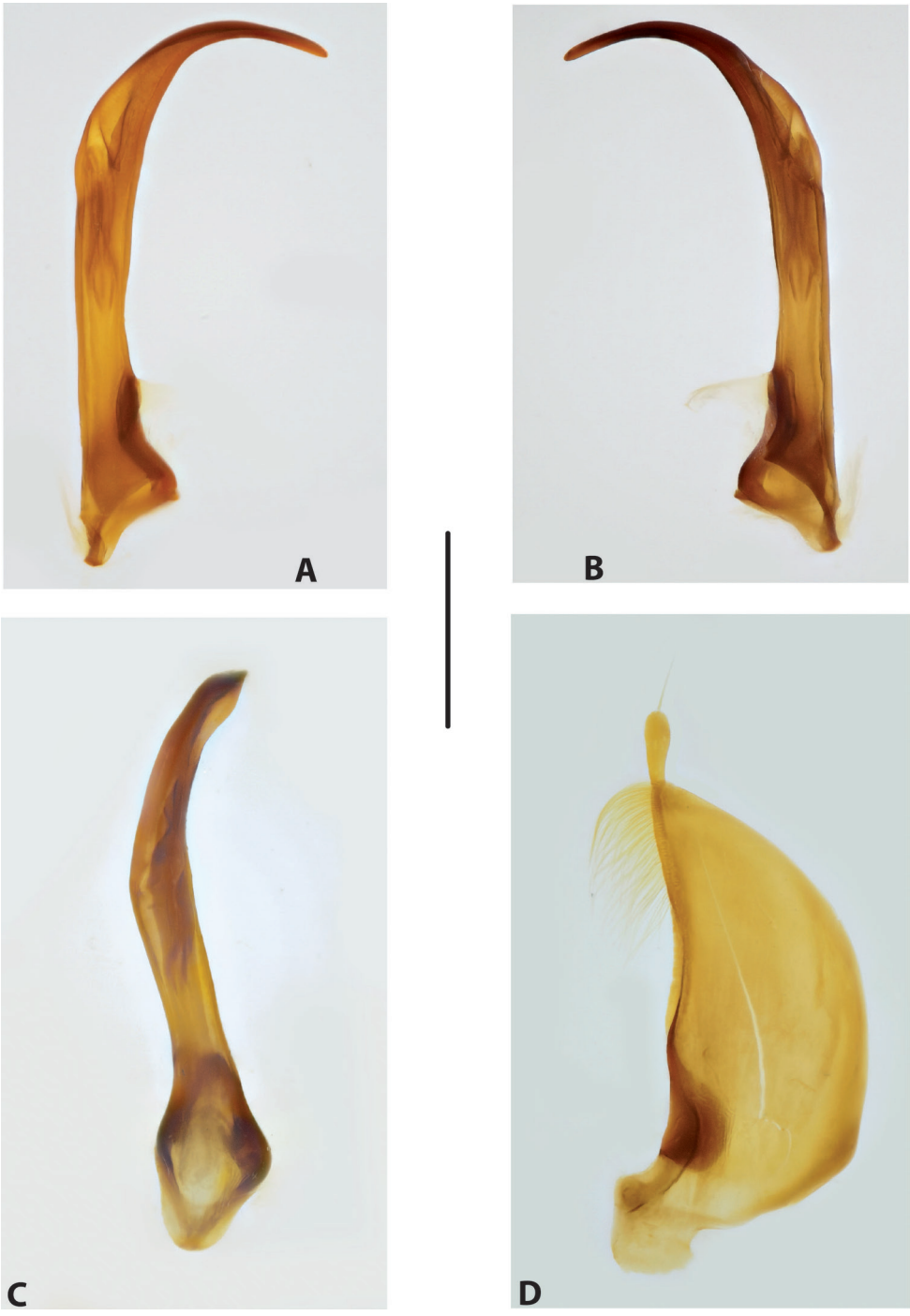


Figure 16. *Copelatus martinbaehri* sp. nov., paratype from Mount Tozer **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

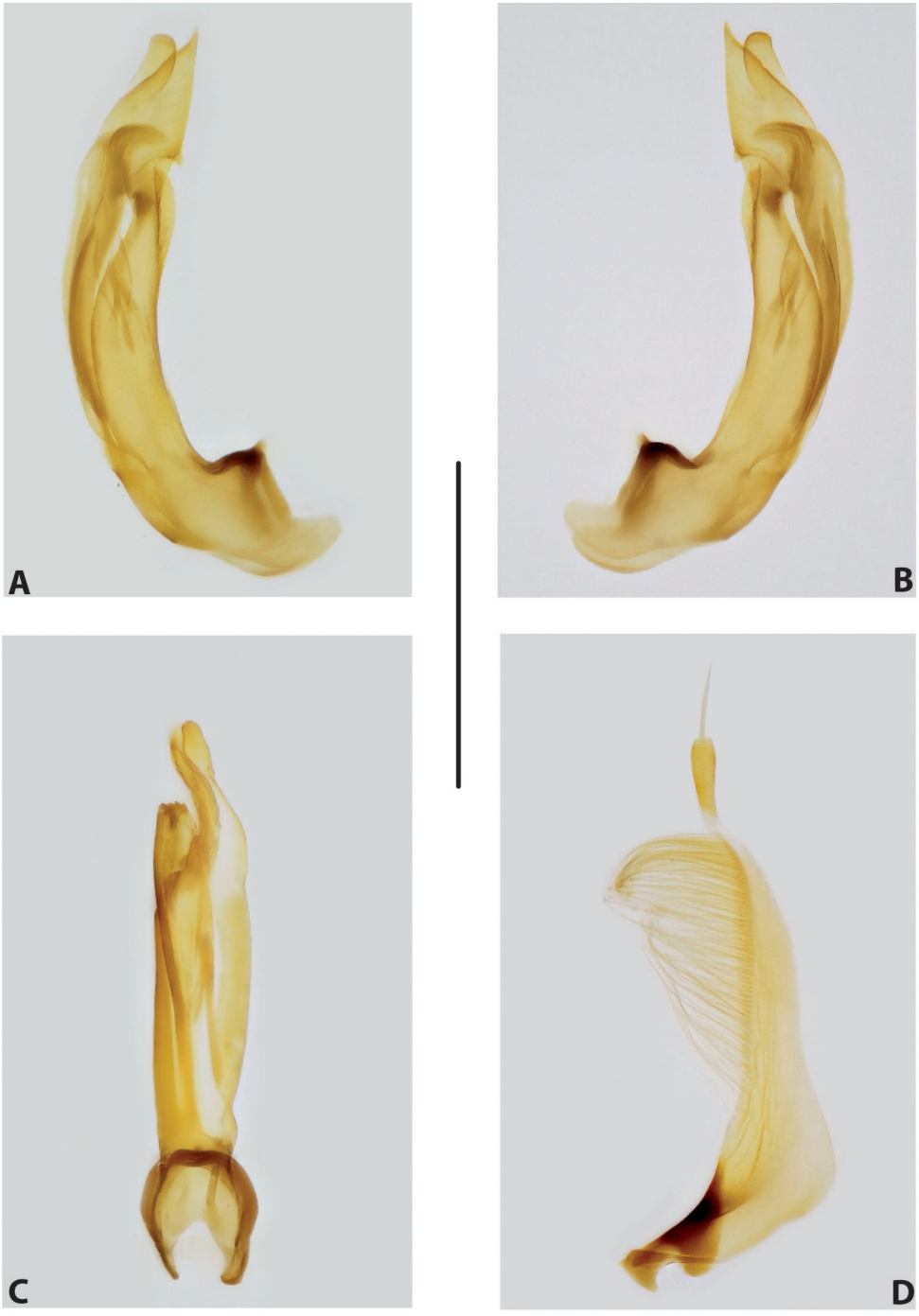


Figure 17. *Copelatus nigrolineatus* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

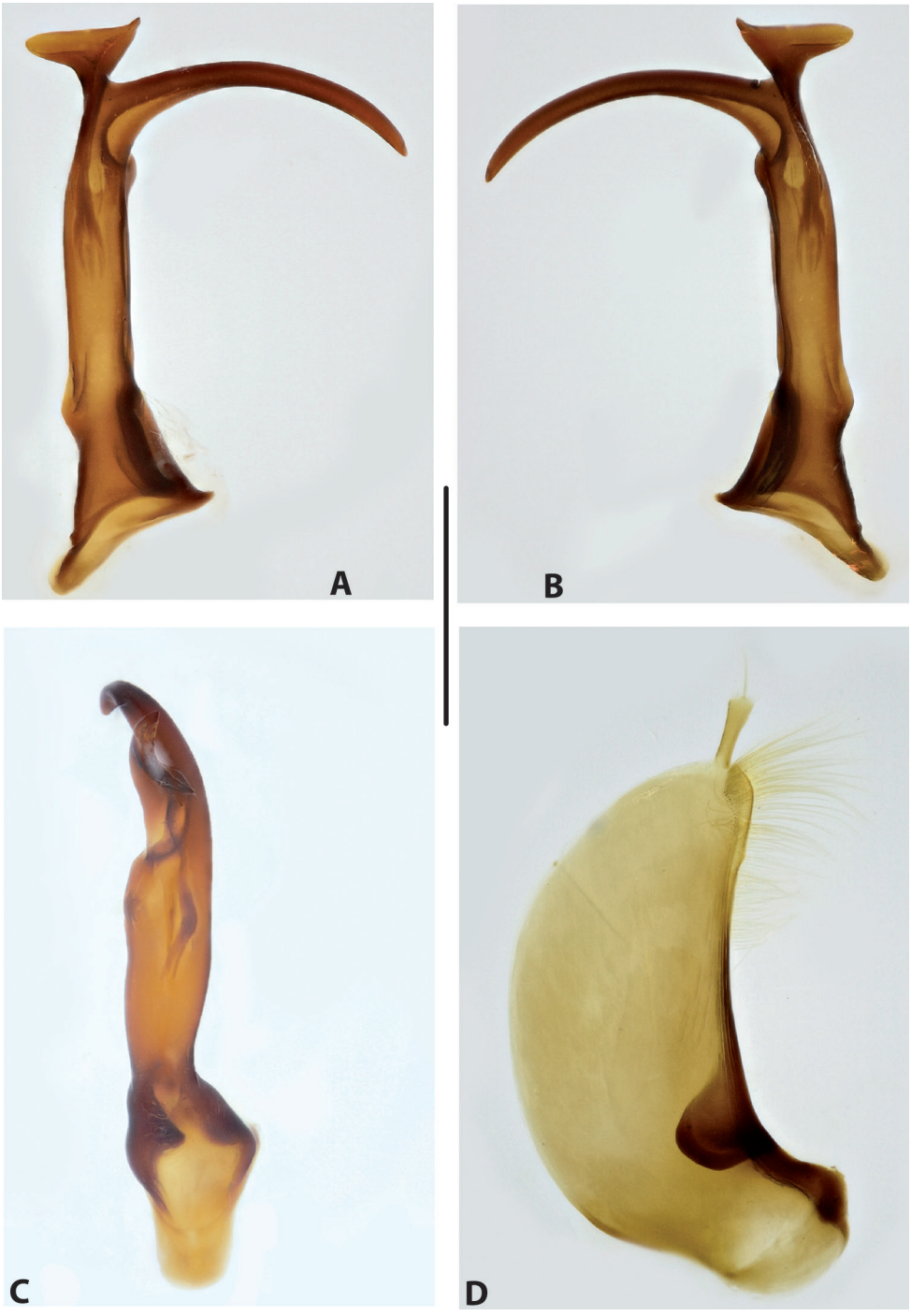


Figure 18. *Copelatus portior* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.

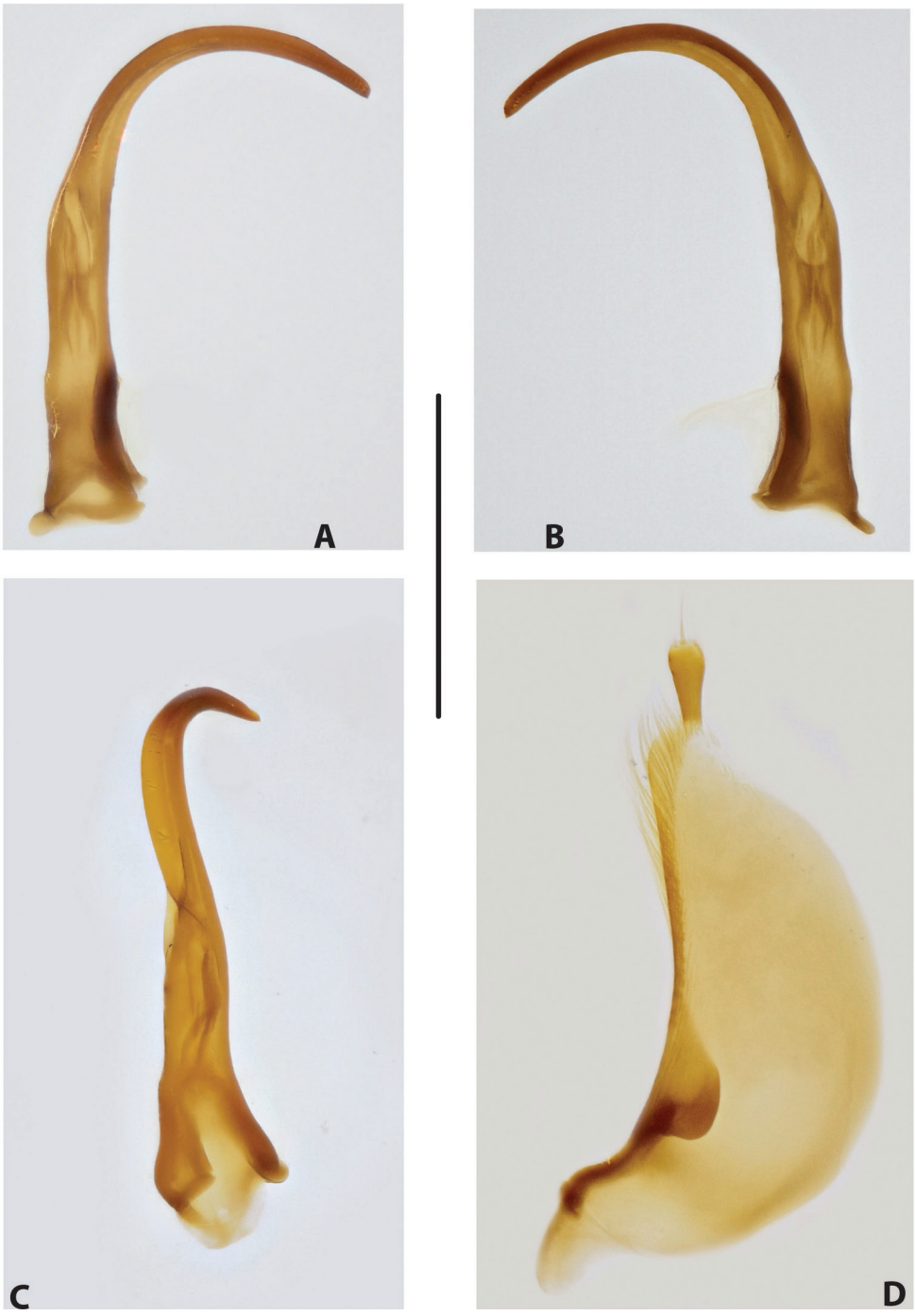
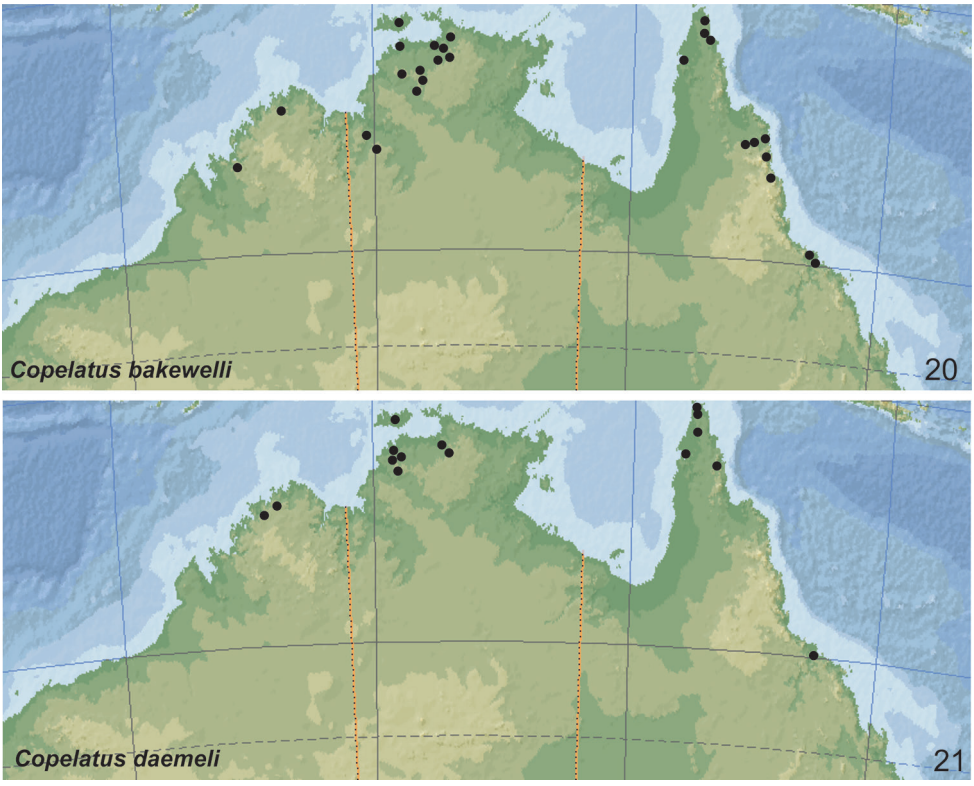


Figure 19. *Copelatus tenebrosus* **A** median lobe in lateral view, right side **B** median lobe in lateral view, left side **C** median lobe in ventral view **D** left paramere in external view. Scale bar: 0.5 mm.



Figures 20, 21. Distribution of **20** *Copelatus bakewelli* **21** *C. daemeli*.

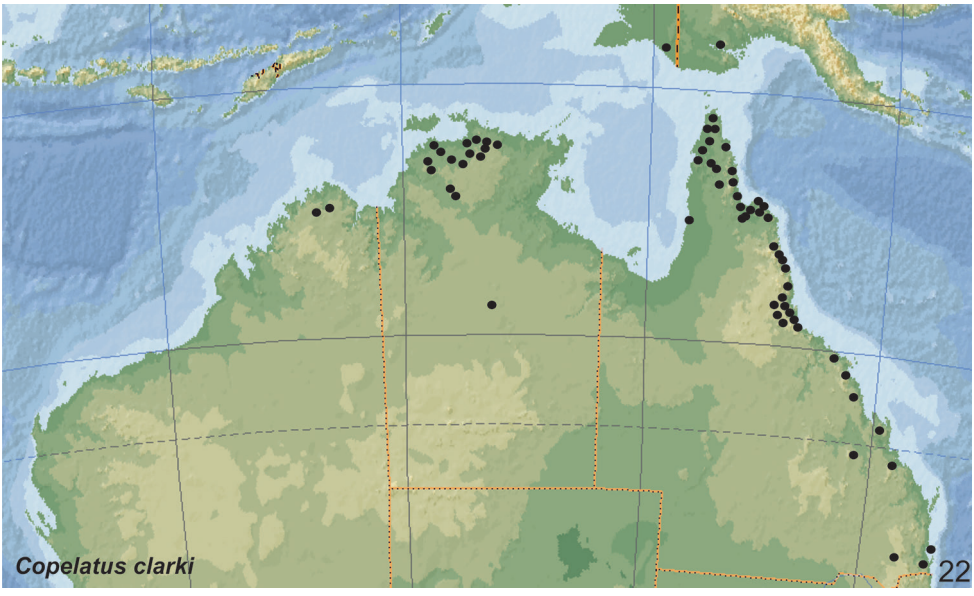


Figure 22. Distribution of *Copelatus clarki*.

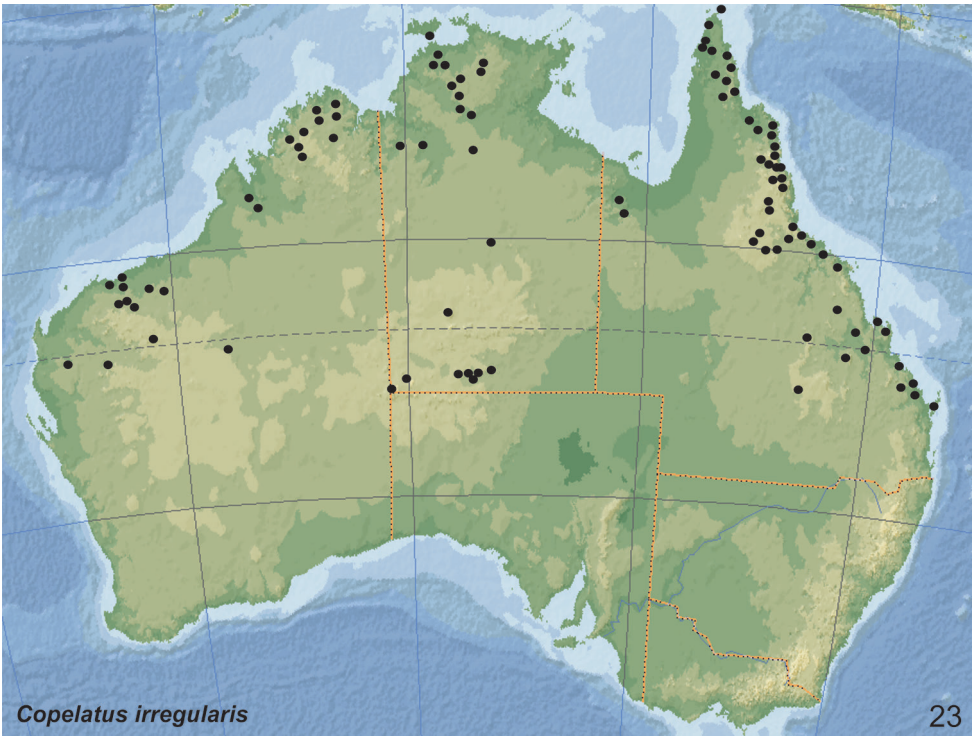


Figure 23. Distribution of *Copelatus irregularis*.

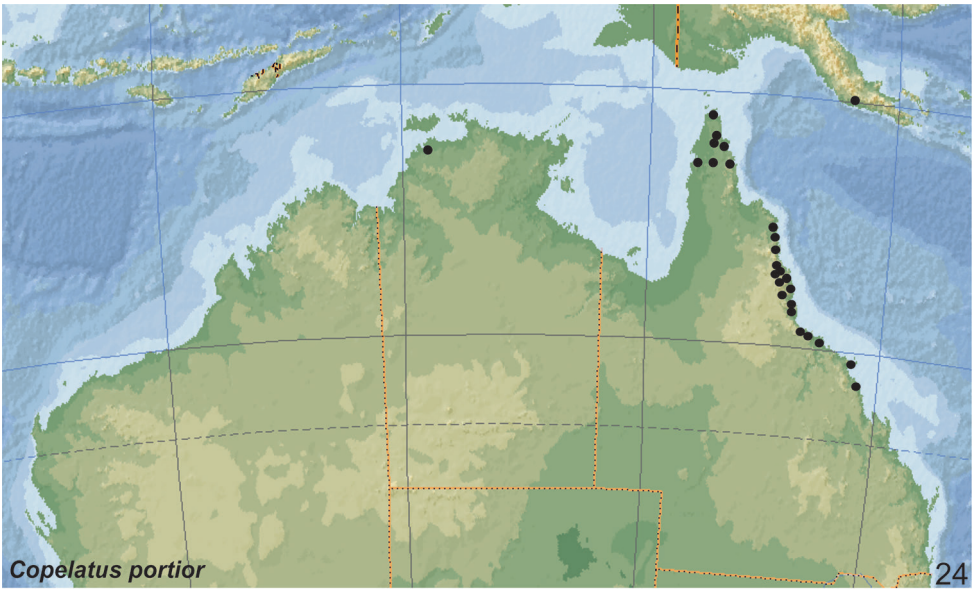


Figure 24. Distribution of *Copelatus portior*.

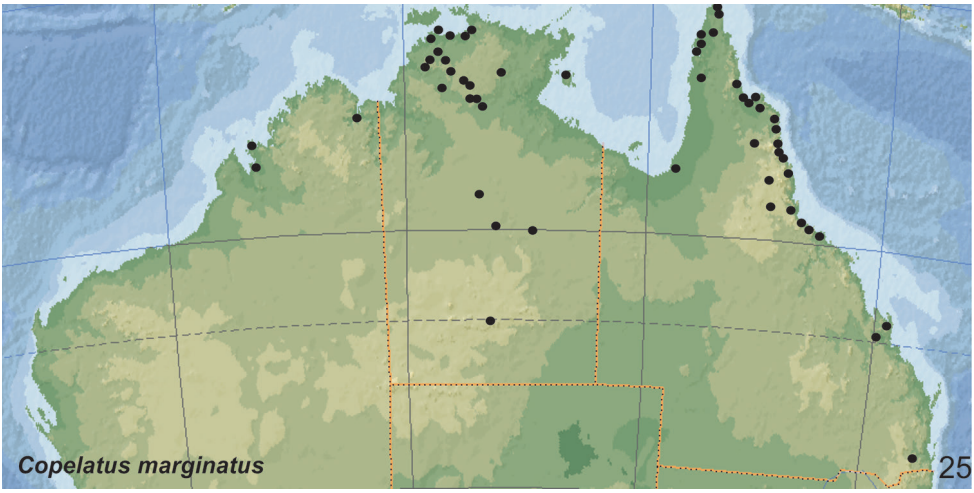


Figure 25. Distribution of *Copelatus marginatus*.

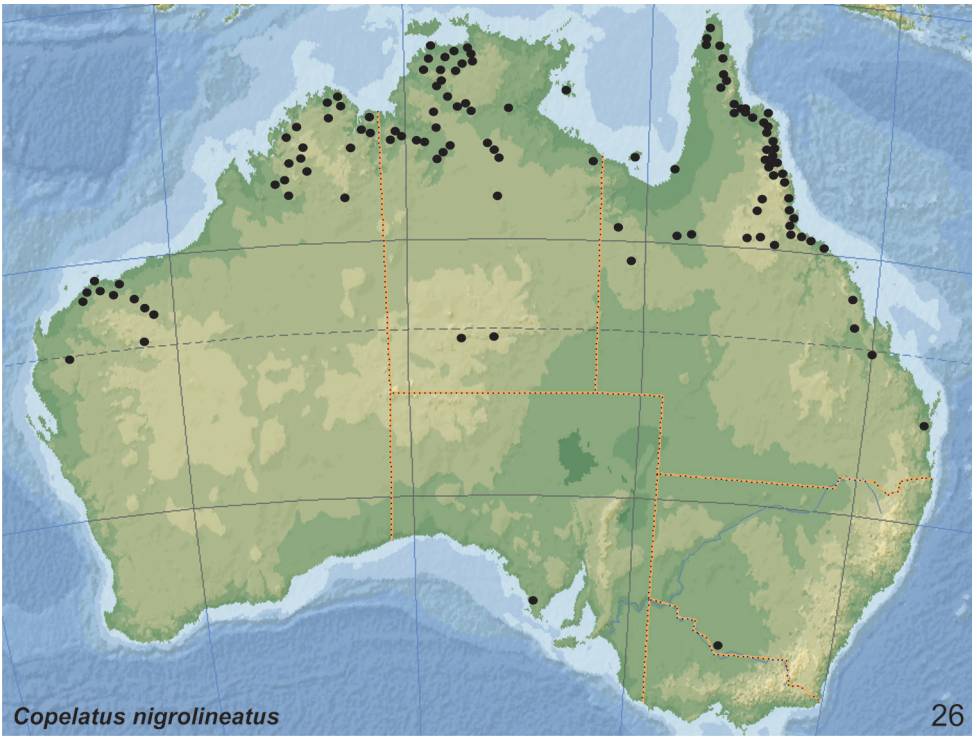
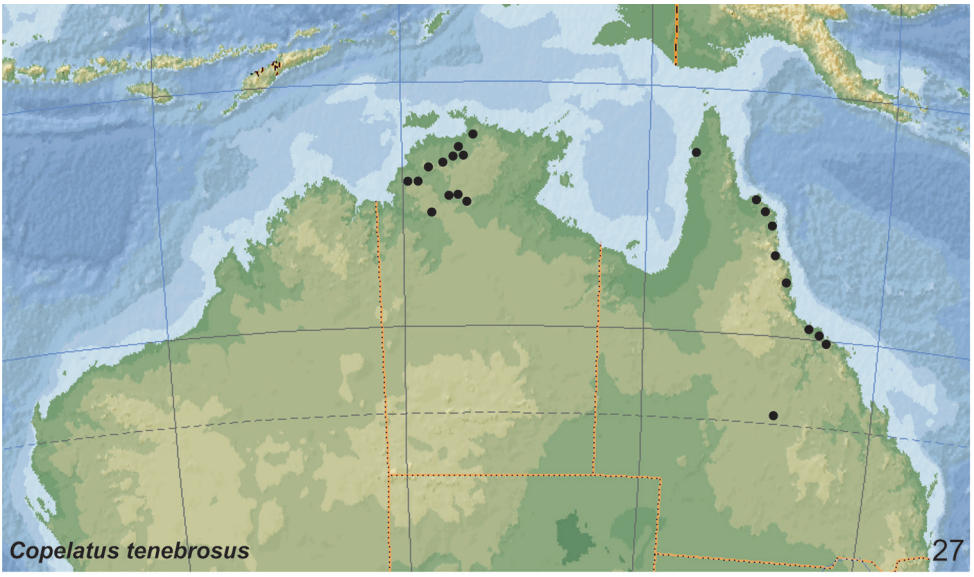
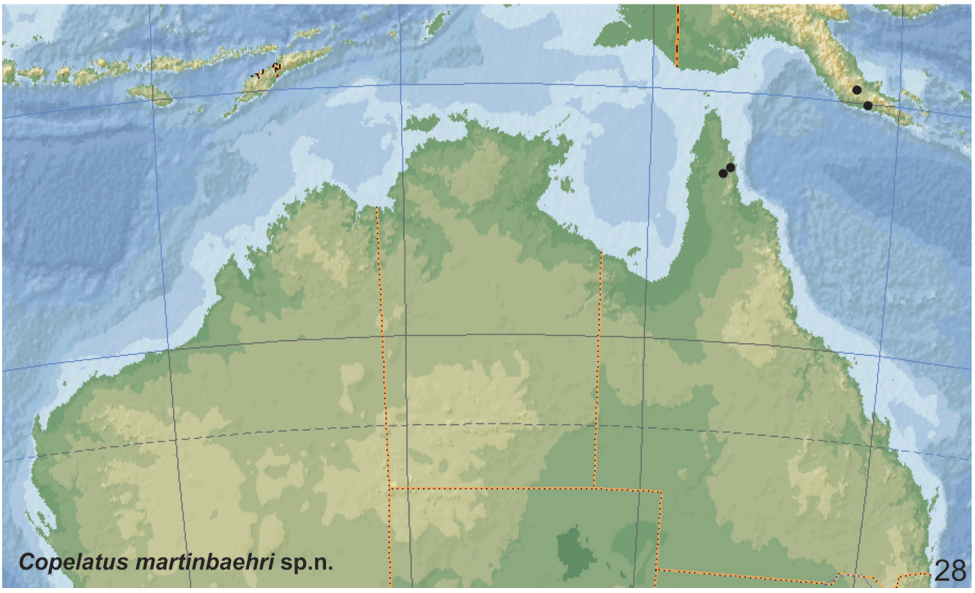


Figure 26. Distribution of *Copelatus nigrolineatus*.





Figures 27, 28. Distribution of **27** *Copelatus tenebrosus* **28** *C. martinbaehri* sp. nov.

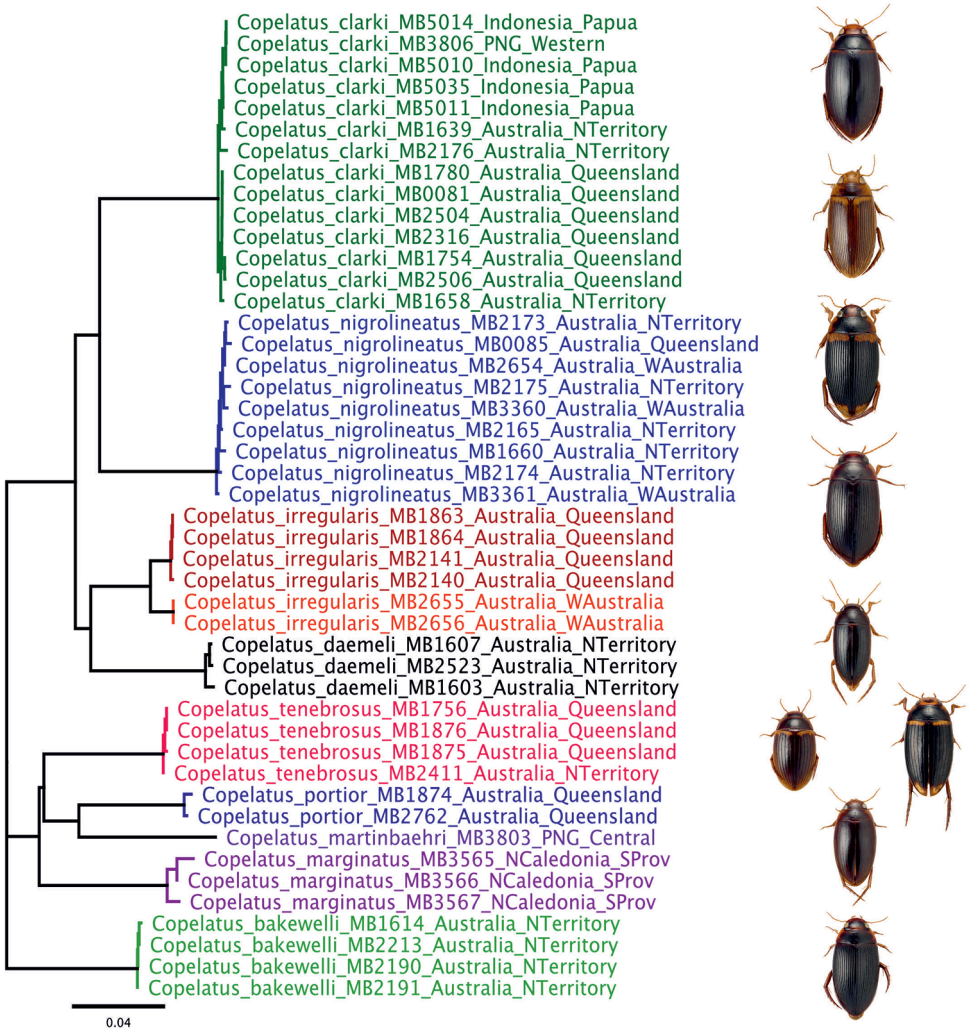


Figure 29. Maximum likelihood tree for Australian *Copelatus*. Neighbour joining tree (p-distances) calculated with Geneious (11.0.4.) software.

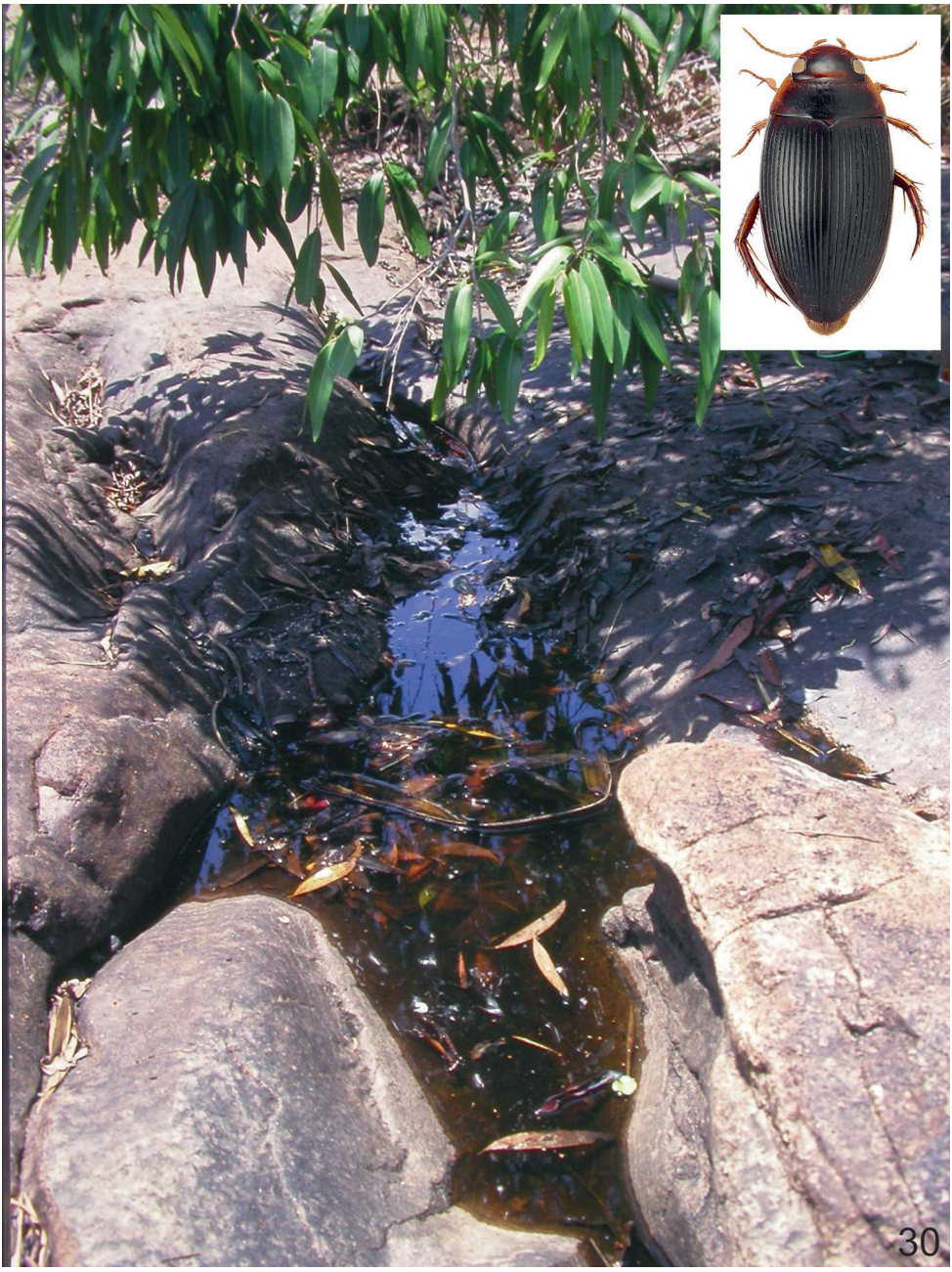


Figure 30. Habitat of *Copelatus bakewelli*, rocky pool, with rotten leaves near Gunlom Waterfall, Northern Territory. Photographs by L. Hendrich.

Figure 31. Habitat of *Copelatus irregularis* and *C. clarki* **A** residual pool of the stream bed of Oakly Creek, Queensland (Loc. 28) **B** only of *C. clarki*, Stradbroke Island, temporary sedge swamp near Brown Lake, Queensland. Photographs by L. Hendrich.

Figure 32. Habitat of *Copelatus daemeli* **A** Finnis River, Northern Territory, all beetles were at the edge among rotten leaves and twigs **B** small puddle filled with leaf litter at the road to Gunlom, Kakadu National Park, Northern Territory. Photographs by L. Hendrich.

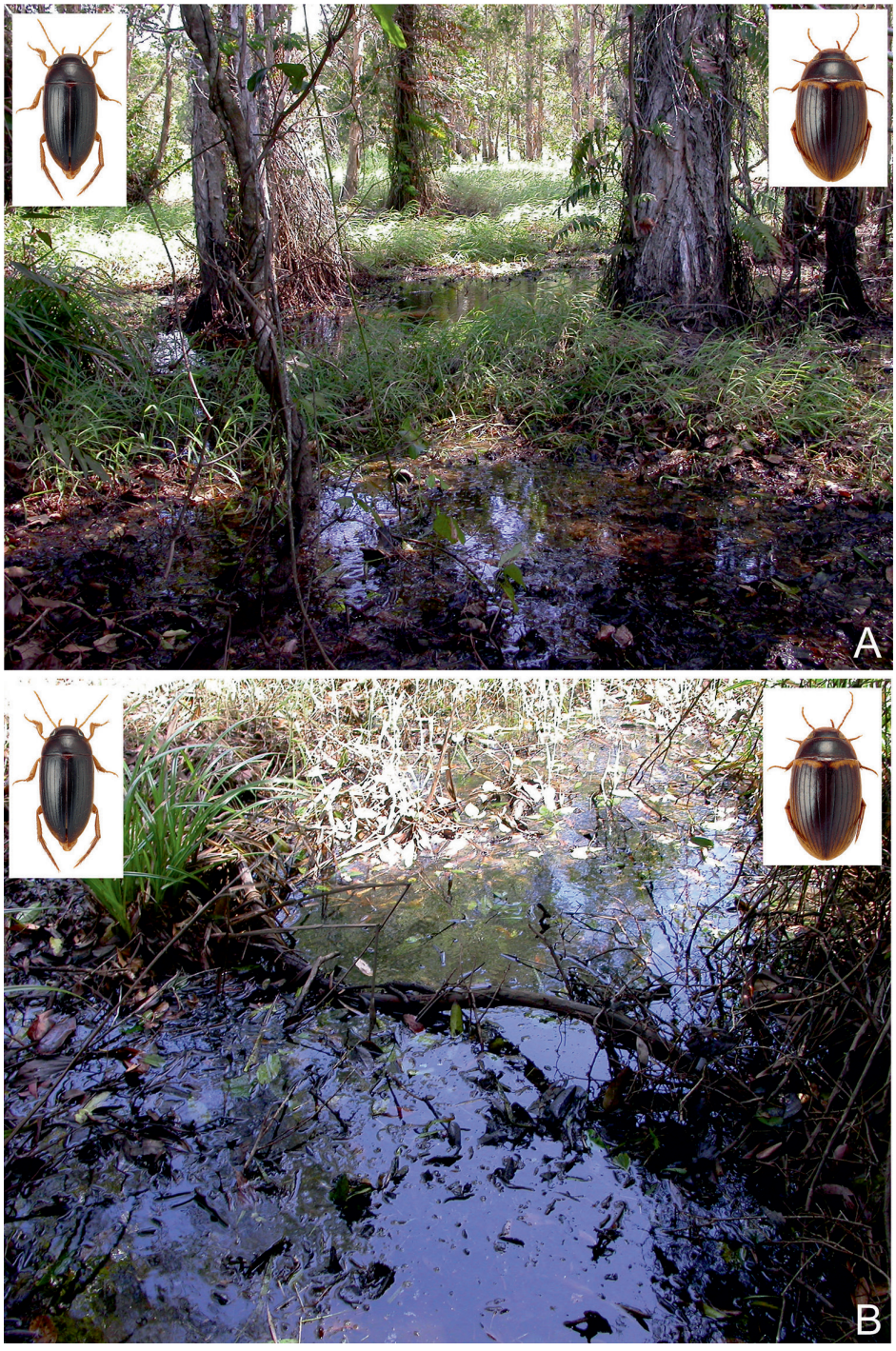


Figure 33. Habitat of *Copelatus tenebrosus* and *C. portior* **A** Queensland, swamp forest at Cape Tribulation Road **B** shallow and ephemeral swampy puddles with rotten leaves, roots and twigs, Queensland, Cape Tribulation Road. Photographs by L. Hendrich.

Figure 34. Habitat of *Copelatus irregularis* **A** Queensland, Paluma Road 4 km west of Bruce Highway, Maiden Hair Fern Creek, 270 m, shady and rocky residual pools with rotten leaves **B** of *C. irregularis* and *C. nigrolineatus*, Queensland, Winfield, Winfield Road, muddy forest pool, rich in rotten leaves, near the street, 21 m. Photographs by L. Hendrich.

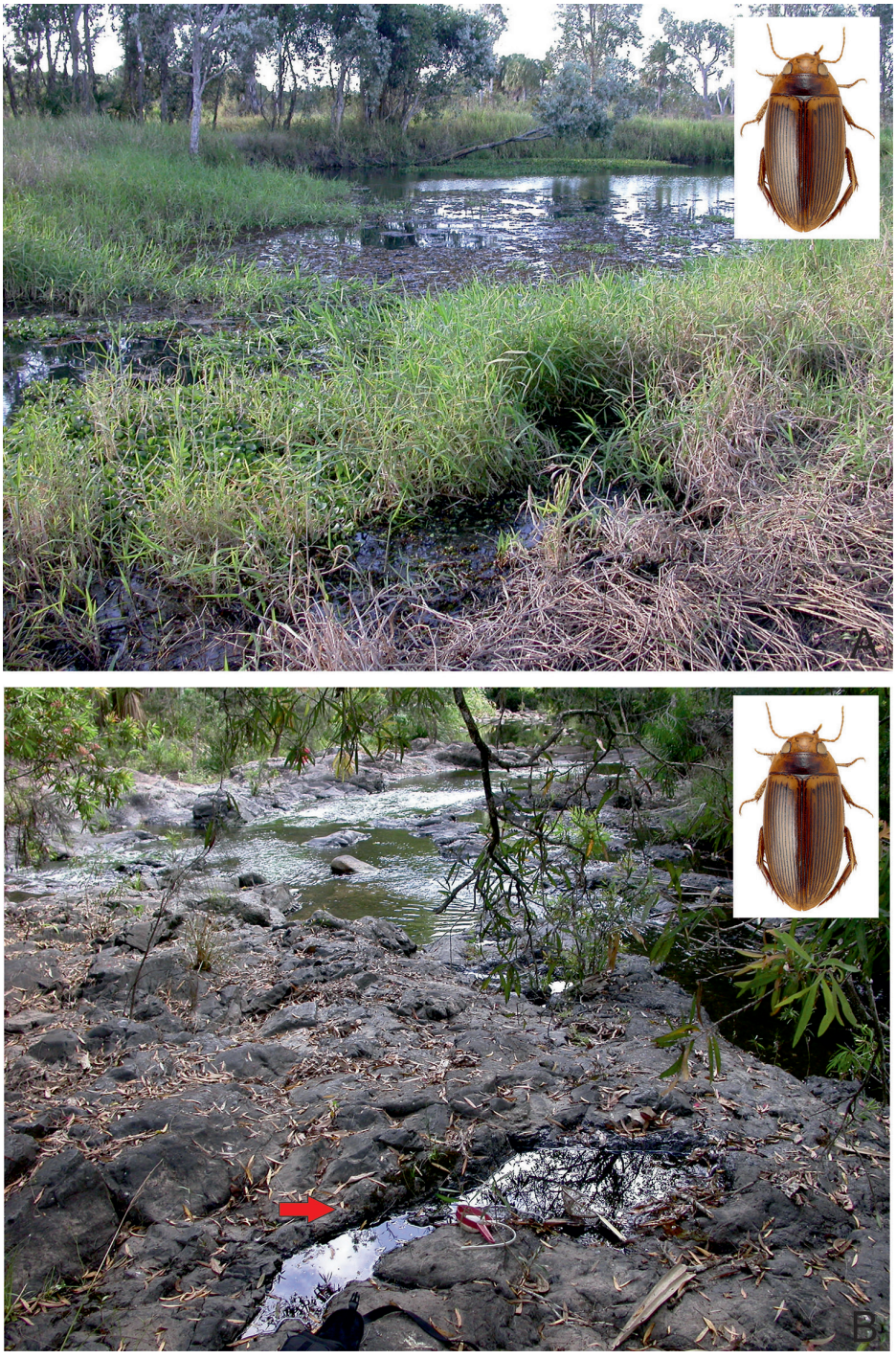


Figure 35. Habitat of *Copelatus nigrolineatus* **A** Queensland, 19 km S Ayr, Bannister Lagoon at Bruce Highway, swamp, 20 m, beetles were among mats of floating grasses **B** Queensland, 18 km S Calen, Mt. Charlton-Calen Road, rock pools filled with leaf litter at Boulder Creek, 42 m. Photographs by L. Hendrich.

Figure 36. Habitat of *Copelatus tenebrosus* **A** Northern Territory, Georgetown Billabong, 750 m east of Jabiru East, 30 m, beetles were in very shallow water among the sedges **B** Queensland, 10 km south of Mizani, Lake Kinchant, beetles were in shallow water among mats of floating grasses, 48 m. Photographs by L. Hendrich.

Acknowledgements

We are indebted to the curators C. Reid, T. Weir, C. Taylor, O. Merkl, G. Dully, M. Jäch, C. Burwell, G. Monteith, C. Watts, D. Peggie as well as G. Wewalka for lending type material and specimens, to František Slamka (Bratislava, Slovakia) and Harald Schillhammer (Vienna, Austria) for the excellent photos of habitus and male genitalia, and to Hans Fery (Berlin, Germany) for critical reading an earlier version of the manuscript. The Department of Environment and Conservation in Western Australia is acknowledged for giving permission to conduct scientific research in the Pilbara [Permit numbers: SF 003017 and NE 002348]. The Parks and Wildlife Commission of the Northern Territory, the Australian National Parks & Wildlife Service in Darwin and the Kakadu National Park are thanked for giving permission to conduct scientific research in the Northern Territory (Permit Number: 23929 and RK- 400/ RK- 660). The Department of Environment and Conservation in New South Wales [Scientific Licence No. S12040] and the Department of Sustainability and Environment in Victoria [Research Permit No. 10003840] are acknowledged for giving permission to conduct scientific research in National and State Parks. This work was supported by grants to Michael Balke: Deutsche Forschungsgemeinschaft (BA 2152/4-1, 6-1, 7-1, 11-1 and 11-2), the CLIMAQUA project funded by the Bundesministerium für Bildung und Forschung (BMBF) (grant # 01DR14001 to M. Balke), Lars Hendrich: Deutsche Forschungsgemeinschaft (HE 5729/1-1), Jiří Hájek: Ministry of Culture of the Czech Republic (DKRVO 2019-2023/5.I.a, National Museum, 00023272), and Helena Shaverdo: Fonds zur Förderung der wissenschaftlichen Forschung – the Austrian Science Fund (P 31347-B25). Finally, Lars Hendrich warmly thanks Emma Hendrich (Munich, Germany) and Ingo Weckwerth (Berlin, Germany) for their patience, assistance and enthusiastic encouragement during several field trips.

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