

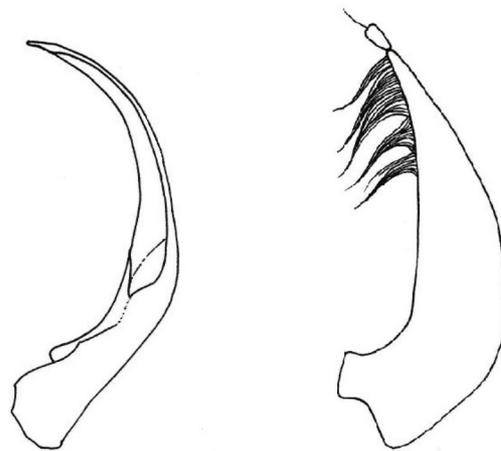
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Copelatus yaguarete sp. nov. a new species of the *Copelatus erichsoni* group from Central America (Coleoptera: Dytiscidae)

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Front cover: *Copelatus yaguarete* sp. nov. from left to right: male habitus (dorsal view), median lobe (left lateral view) and left paramere (lateral view).

***Copelatus yaguarete* sp. nov. a new species of
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Abstract

A new species of the *Copelatus erichsoni* group is described. *Copelatus yaguarete* sp. nov. was collected from rock pools in the Cockscomb Basin Wildlife Sanctuary (CBWS) in Belize (Central America). The species is superficially similar to *Copelatus terminalis* Sharp, 1882 with respect to its coloration but is readily distinguished by both external characters and the male genitalia.

Keywords: Dytiscidae, Copelatinae, *Copelatus*, Neotropic region, Belize

Introduction

Copelatus Erichson, 1832 is the most speciose genus of Dytiscidae with currently 439 described species (NILSSON & HÁJEK, 2017). In the New World the Nearctic species were revised by YOUNG (1963), but in the Neotropical region this genus was never revised and in South America many new species are still awaiting description (MILLER & BERGSTEN, 2016). In Central America and the Caribbean basin there are 39 species known (excluding four additional subspecies) (NILSSON & HÁJEK, 2017), several of these are restricted to the Antilles, most of which are one island endemics. On continental Central American most of the 22 species were described by SHARP (1882a, 1882b, 1887) and later updated by GUIGNOT (1952), since then no new species have been described from this region.

In 2015 a field survey was carried out with the objective of improving the knowledge of the water beetles of Belize. During this survey an unknown species of *Copelatus*, belonging to the *Copelatus erichsoni* group, was found in several small puddles on rock faces next to two waterfalls in the Cockscomb Basin Wildlife Sanctuary. The species, which is superficially similar to *Copelatus terminalis* Sharp, 1882 in size and coloration, turned out to be a yet undescribed species.

Materials and methods

Habitus photographs were made with the semi-automatic camera system described by BRECKO *et al.* (2014). This Canon-Cognisys set-up uses a Canon 700D camera equipped with a Canon macro lens MP-E 65 mm. The image stacking software package Zerene Stacker (Build T201404082055) was used for image stacking. This method was designed and described in detail by BRECKO *et al.* (2014). Drawings of the male genitalia were made based on digital images.

The main description is based on the male holotype. The terminology concerning the elytral stria and their intervening spaces is used as follows: the longitudinal discal striae of the elytra are count from the suture outwards, the inner one being the first discal stria; the spaces intervening these discal stria, from here on named interstices, are also count beginning with the inner one (the space between the suture and the first stria is the sutural interstice and the space between the first and second stria is the first interstice, etc.).

Exact label data are cited for all specimens. A single slash (/) separates different label lines and a double slash (//) different labels. Additional remarks are given between brackets ([]). The following abbreviations are used in the text: TL (total length, measured from the clypeus to the apex of the elytra), MW (maximum width, measured at the broadest point). The terminology on the orientation of the genitalia follows MILLER & NILSSON (2003).

The holotype and a male and female paratype are deposited in the collection of the Royal Belgian Institute of Natural Sciences, Brussels, Belgium (RBINS). Further paratypes will be deposited in the following collections:

BMNH = The Natural History Museum, London, United Kingdom
 CKS = Collection K. Scheers, Sint-Niklaas, Belgium
 NMPC = National Museum (Natural History), Prague, Czech Republic
 NMW = Naturhistorisches Museum Wien, Austria
 ZSM = Zoologische Staatssammlung, Munich, Germany

Taxonomy

Order **Coleoptera** Linnaeus, 1758
 Suborder **Adephaga** Schellenberg, 1806
 Superfamily **Caraboidea** Latreille, 1804
 Family **Dytiscidae** Leach, 1815
 Subfamily **Copelatinae** van den Branden, 1885
 Genus ***Copelatus*** Erichson, 1832

Type species: *Copelatus posticatus* (Fabricius, 1801).

***Copelatus yaguarate* sp. nov.**

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(Figs 1-3)

TYPE LOCALITY. Tiger Fern waterfall [16°46'50,44"N, 88°26'28,6"W], Cockscomb Basin Wildlife Sanctuary, Stann Creek, Belize.

TYPE MATERIAL. Holotype, ♂ Tiger Fern waterfall/ Cockscomb Basin Wildlife Sanctuary/ small puddle on rock next to waterfall/ 16°46'50,44"N; 88°26'28,6"W, 06.V.2015/ Leg. K. Scheers & A. Thomaes [white label, printed]// Holotype/ *Copelatus yaguarate* sp. nov. Scheers det. 2018 [red label, printed] (RBINS, I.G.: 33.687). Paratypes: 7♂♂ and 5♀♀, Tiger Fern waterfall/ Cockscomb Basin Wildlife Sanctuary/ small puddle on rock next to waterfall/ 16°46'50,44"N; 88°26'28,6"W, 06.V.2015/ Leg. K. Scheers & A. Thomaes [white label, printed]// Paratype/ *Copelatus yaguarate* sp. nov. Scheers det. 2018 [red label, printed]; 12♂♂ and 31♀♀, Trail to Ben's Bluff/ Cockscomb Basin Wildlife Sanctuary/ small puddles on rockface/ 16°46'22,8"N, 88°27'3,3"W, 07.V.2015, Leg. K. Scheers & A. Thomaes [white label, printed]// Paratype/ *Copelatus yaguarate* sp. nov. Scheers det. 2018 [red label, printed] (1♂ and 2♀♀ BMNH, 14♂♂ and 29♀♀ CKS, 1♂ and 1♀ NMPC, 1♀ NMW, 1♂ and 2♀♀ RBINS (I.G.: 33.687), 1♂ and 1♀ ZSM).

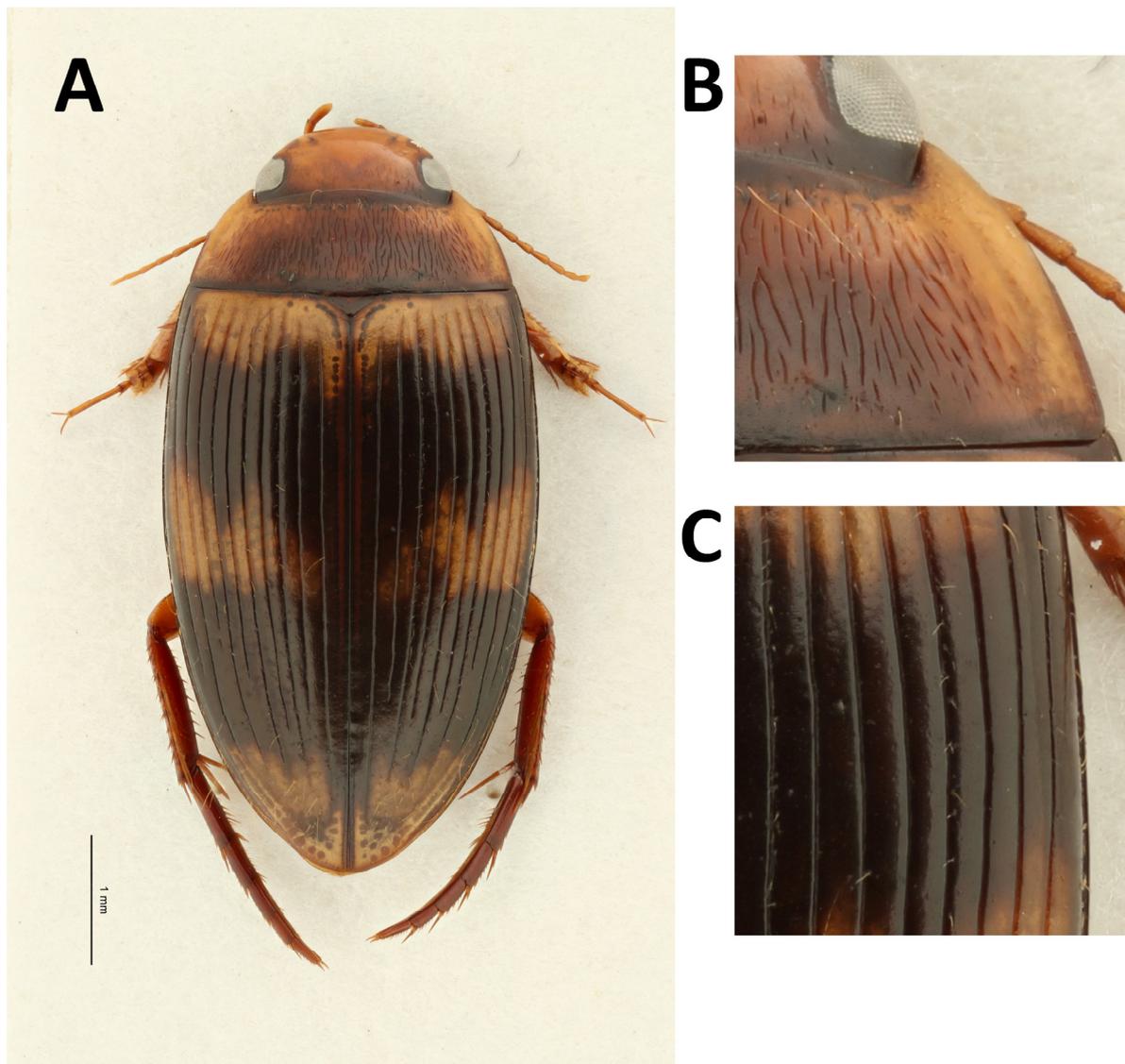


Fig. 1. *Copelatus yaguarete* sp. nov. male. A, dorsal view; B, detail head and pronotum; C, detail elytra.

DESCRIPTION.

Size: holotype TL: 5.9 mm, MW: 2.95 mm. paratypes TL: 5.55 – 5.90 mm, MW: 2.70 – 2.95 mm.

Colour: Head completely testaceous with exception of a dark brown to pitch-coloured area behind the eyes, extending narrowly along the eyes. Pronotum testaceous, narrowly darkened along the base, broadly pale at the lateral portions reaching inwards anteriorly. Scutellum dark brown to pitchy. Elytra pitchy brown, slightly paler along the suture. Each elytra with a three yellow fascia: a basal one which extends from the suture to just before the tenth discal stria, reaching the anterior edge of the elytra and protruding posteriorly at the sutural interstice and the fourth and fifth interstice giving this fascia a sinuate appearance; a second transverse one on the middle of the elytra extending from the area between the tenth discal stria and the sublateral stria inwards to the first discal stria and is broadest from the lateral part to the eighth interstice and at the fourth interstice and narrowing towards the sixth and first interstice; and a third apical one extending anteriorly $1/5^{\text{th}}$ of the elytral length, just reaching the ends of the first, third, fifth, seventh and ninth discal striae (Figs 1-2). Epipleura dark pitchy brown, distinctly paler near the shoulder. Antennae with all segments uniformly pale testaceous. Legs and tarsi completely and uniformly pale testaceous. Venter clear orange-testaceous.

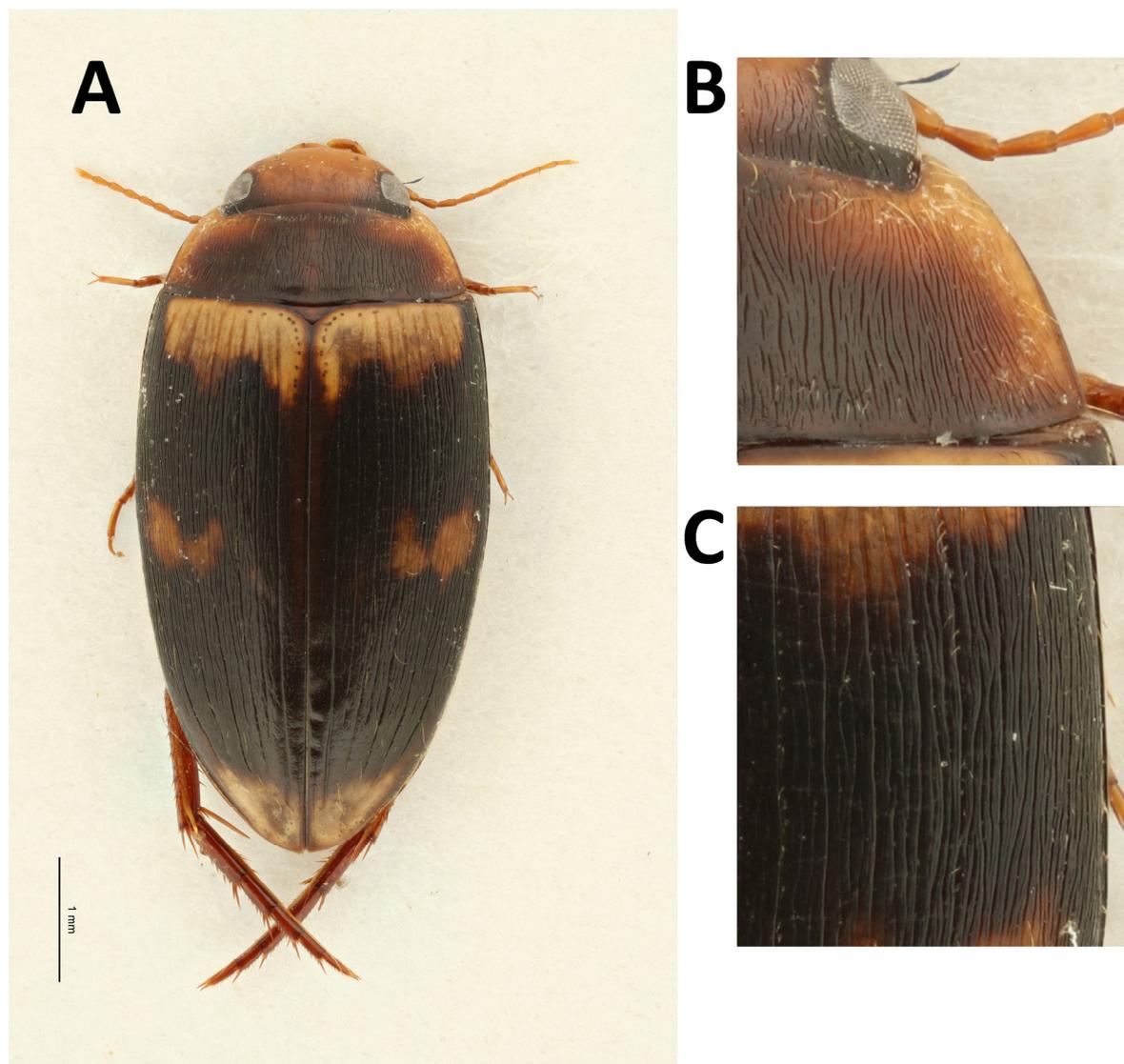


Fig. 2. *Copelatus yaguarete* sp. nov. female. A, dorsal view; B, detail head and pronotum; C, detail elytra.

Head: Upper surface shining, microreticulation fine but distinct throughout and slightly more prominent behind the eyes. Finely and evenly punctate, posterior half with distinct elongate striae. Antennae filiform but slightly flattened.

Pronotum: Maximum width at the base, sides evenly curved with a sublateral depression parallel to lateral margins. Lateral rim distinct, disappearing just before anterior angle. Transverse row of coarser punctures along base distinct, in the middle portion bearing short setae the rest bearing rather long setae (in most material these setae are partly missing, which is also the case in the holotype). Upper surface shining, microreticulation fine but distinct. Punctuation fine and evenly distributed. Pronotum almost completely covered with distinct elongated, rather deeply impressed striae, absent near the lateral sides and narrowly along the base. Longitudinal striae very variable in length, some short, others reaching more than half of length of pronotum.

Scutellum: Microreticulation same as on the pronotum.

Elytra: Each elytra with a sublateral stria and ten longitudinal discal striae. The sublateral stria very short but distinct, the discal stria distinct, rather deeply impressed. All striae starting near the base of the elytra with the first, third, fifth, seventh and ninth striae continuing down to about 4/5th of the elytra, the second, fourth, sixth, eighth and tenth shortened posteriorly. The

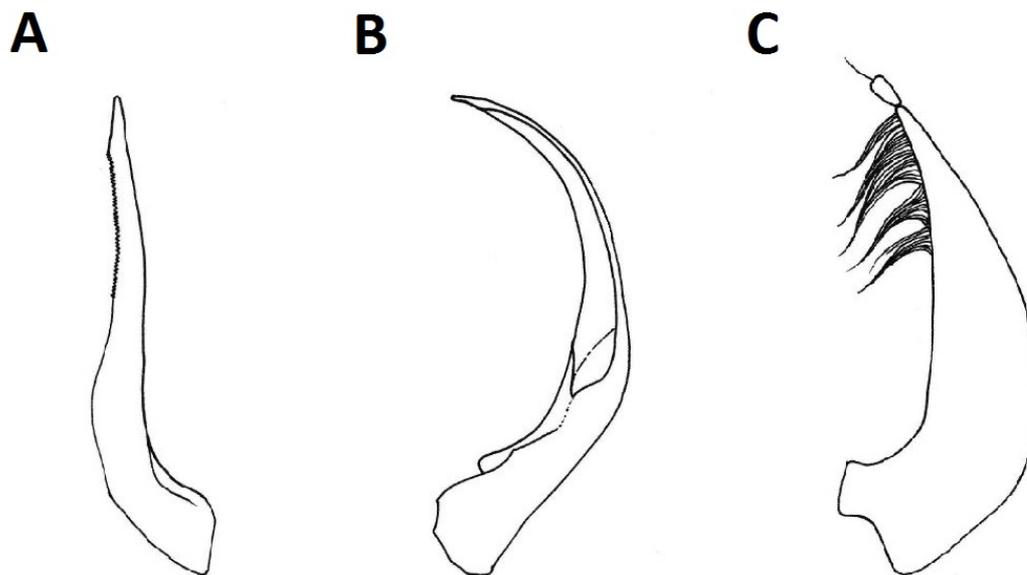


Fig. 3. *Copelatus yaguarete* sp. nov. male genitalia. A, median lobe of the aedeagus, left lateral view; B, median lobe, ventral lateral view; C, left paramere in lateral view.

discal striae run subparallel to each other having their greatest width at about $2/5^{\text{th}}$ of their length and narrow down only slightly towards the apex and base. Punctuation rather fine and sparsely but evenly distributed. A longitudinal series of larger punctures bearing setae is present at the third and seventh discal striae, also in the fifth, ninth and tenth striae and in the subapical some larger setae-bearing punctures are present.

Venter: completely shallow but distinctly microreticulated. Metacoxa with distinct longitudinal striae. Sternite 1 to 4 laterally broadly with longitudinal striae, strongly curving inwards on sternite 3 and 4. All sternites medially finely punctated.

Legs: protibia simple, without ventrobasal emarginations in both sexes. Mesotibia simple. Mesotarsal claws unmodified and equal in length. Protarsal claws sexual dimorphic (see male and female sexual characters).

Aedeagus: median lobe in ventral view with the left side with the left margin serrated from near the apex to about $2/5$ of the total length (Fig. 3A), in lateral view with the inner margin evenly curved and the outer margin straightened near the base (Fig. 3B). Parameres rather narrow, inner margin with long setae along the apical half (Fig. 3C).

Male sexual characters: pro- and mesotarsomeres 1–3 distinctly widened, with sucker-like setae. Protarsal claws long and slender, rather strongly curved near the base, then straight for the apical $5/6^{\text{th}}$. Head and pronotum with striae as described above (Fig. 1B). Elytra in between discal striae smooth and finely punctated, without anastomosing striae (Fig. 1C).

Female sexual characters: Pro- and mesotarsomeres 1–3 unmodified. Head with striae more numerous and much denser behind the eyes. Pronotum of females with striae more numerous, much denser frontolaterally, on disc with very small, short striae in between the large striae (Fig. 2B). Elytra in between the discal striae with complex elongate anastomosing striae on anterior $4/5$ of elytra (Fig. 2A, 2C).

Variability: Although the striae on pronotum are consistently longer in females than in males, the length of these striae is very variable between individuals of the same sex. In some males striae are present reaching more than $4/5^{\text{th}}$ of the length of pronotum while other specimens have the longest striae on the pronotum less than $1/3^{\text{rd}}$ of the pronotal length. The

yellow transverse fascia in the middle of the elytra shows a great deal of variation in extent, both intersexual as intrasexual. In the females the central transverse fascia is typically more reduced than in the males, broken up in two spots. In one female paratype the central transverse fascia is nearly completely absent and only one very indistinct, poorly delimited spot is distinguishable at the eight interstice.

DIFFERENTIAL DIAGNOSIS: Superficially this species resembles *C. terminalis* in size and coloration, but it is easily distinguished by both the male and female sexual features and the male genitalia. In the male *C. yaguarete* sp. nov. the frontal claws are long and straightened and the pronotum is densely covered with rather deep and long stioles. Also on the base of the head some distinct strioles are present. In *C. terminalis* the male frontal claws are short and distinctly bend inwards, the strioles on the pronotum are sparser, shorter and less deep, especially on the disc while the base of head is free of strioles. The female of *C. terminalis* lacks the complex elongate anastomosing strioles on the elytra which are very prominent in *C. yaguarete*. Furthermore the testaceous pattern on the elytra in both species is variable but consistently different. The median lobe of the male genitalia is very similar with that of *Copelatus integer* Sharp, 1882 in general shape and in the form and extent of the serrated margin, but the species is readily distinguished from it by means of its coloration, striolation. Furthermore the median lobe is less curved and the parameres are distinctly narrower in *C. integer* than in *C. yaguarete* sp. nov.

DISTRIBUTION.

To date known only from two localities in the Cockscomb Basin Wildlife Sanctuary in Belize. This reserve is located at the base of the Maya mountains. The two known sites are located in the eastern part of the Cockscomb Basin Wildlife Sanctuary and lay within the South Stann Creek river catchment. At the type locality at the Tiger Fern double waterfall the species was found in a small isolated puddle on the plateau between the two waterfalls at approximately 140m a.s.l. (Figs 4-5). At the second site it was common in small puddles on a sloping rock face next to a rapid in the stream some meters downstream of the waterfall at the trail to Ben's Bluff at approximately 100m a.s.l..

ECOLOGY.

At both known sites *C. yaguarete* sp. nov. was restricted to small puddles on bare granite rock faces next to a waterfall and nearby rapids (Figs 4-5). These puddles were about 4-7cm deep and filled with decaying leaves. These puddles are at least partly filled by misted water from the waterfall and rapids and during the rainy season by rainwater. It is possible that some of these puddles are also very briefly flooded by the stream after heavy rain during the rainy season. In these puddles *C. yaguarete* sp. nov. was the dominant species and co-occurred here with *C. integer* and *C. posticatus* (Fabricius, 1801). The surrounding area consists of tropical forest, mainly of secondary growth, on poor soil. No specimens were found in the stream itself nor in any of the other lotic and lentic habitats sampled in the Cockscomb Basin Wildlife Preserve or Belize as a whole.

ETYMOLOGY.

The specific epithet *yaguarete* derives from the Tupian specific word for jaguar, in which *yaguara* stands for "beast" and the suffix *-eté* means "real" or "true" and is a latinised noun in apposition. This name refers to the type locality which is located in the Cockscomb Basin Wildlife Sanctuary which is internationally recognized as the world's first jaguar preserve.



Fig. 4. Tiger Fern double waterfall in the Cockscomb Basin Wildlife Sanctuary, Stann Creek, Belize, the type locality of *Copelatus yaguarete* sp. nov. The white arrow indicates rockpool in which the specimens were found (Photograph K. Scheers).



Fig. 5. Type locality of *Copelatus yaguarete* sp. nov. In this small rock puddle the new species was found together with *Copelatus integer* Sharp, 1882 and *C. posticatus* (Fabricius, 1801) (Photograph K. Scheers).

Discussion

The new species clearly belongs to the *Copelatus erichsoni* group as defined by GUÉORGUIEV (1968) based on the presence of a sublateral striae and ten discal striae on each elytron. Delimitations of these species groups are however solely based on the position and number of elytral striae (GUÉORGUIEV, 1968) and most probably does not reflect the actual relationships between the species. There are multiple species groups which contain two or more distinct groups regarding male genitalia, which is at least suggestive for polyphyly. Furthermore there are species where the number of elytral striae is intersexual dimorphic, intrasexual variable or even both (i.e. *Copelatus guadelupensis* Legros, 1948) which make the classification of certain species difficult. *Copelatus yaguarete* sp. nov. is clearly closely related to *C. integer*, *C. posticatus* and *C. terminalis*, based on the presence of ten discal striae and one sublateral stria on each elytra and a very similar morphology of the male genitalia. In particular the shape of the median lobe, more or less evenly curved laterally and having a serrated edge near the apex, could be a synapomorphy of a monophyletic species group within the probably paraphyletic *Copelatus erichsoni* group. The recently described Cuban endelic *Copelatus danyi* Megna & Epler, 2012, also belonging to the *Copelatus erichsoni* group as defined by GUÉORGUIEV (1968), has a similar sexual sculpture of complex anastomosing striae on the elytra and additionally also has a very short sublateral stria and could also be related to *C. yaguarete* sp. nov. In the description of this species (MEGNA & EPLER, 2012), however, there is no mention of the presence, nor the absence, of a serrated edge near the apex of the median lobe.

At both known sites the new species was restricted to small puddles on bare granite rock faces next to a waterfall and a big rapid. No specimens were found in the streams themselves or in any other habitat in the Cockscomb Basin Wildlife Sanctuary and Belize as a whole. At present, the new species is however known from only two sites and more research in the future is necessary to ascertain if *C. yaguarete* sp. nov. is in fact restricted to this specific habitat.

At the moment this species is only known from the type locality and one nearby site in the Cockscomb Basin Wildlife Preserve. The species was not found at any other site in Belize during the collecting campaign. The known sites are within 60 km of the border with Guatemala and therefore *C. yaguarete* sp. nov. could occur in Guatemala and maybe also in Southern Mexico. Because of the very specific habitat in which the specimens were collected, it is however also possible that *C. yaguarete* sp. nov. is a narrow endemic species. If so, *C. yaguarete* sp. nov. would be the second endemic Dytiscidae known from Belize, the Bidessini *Bidessonotus pollostus* Young, 1990 being the other one.

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