

## A review of *Copelatus* from Cuba, with the description of two new species (Coleoptera: Dytiscidae: Copelatinae)

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**Abstract.** This paper deals with the taxonomic composition, distribution and bionomics of the genus *Copelatus* Erichson, 1832 in Cuba. Two new species, *C. cordovai* sp. nov. and *C. danyi* sp. nov., are described. Diagnostic characters including illustrations of male genitalia are provided and illustrated for *C. barbouri* Young, 1942, *C. caelatipennis angustatus* Chevrolat, 1863, *C. caelatipennis princeps* Young, 1963, *C. cubaensis* Schaeffer, 1908, *C. darlingtoni* Young, 1942, *C. insolitus* Chevrolat, 1863, *C. montivagus* Young, 1942, and *C. posticatus* (Fabricius, 1801). A key for the 10 species of *Copelatus* occurring in Cuba is provided. *Copelatus blatchleyi* Young, 1953, not recorded from Cuba, is included in the key due to its presence in extreme southern Florida and the Bahamas. Maps of known distribution of Cuban *Copelatus* are given for each species. *Copelatus caelatipennis princeps* is recorded for the first time from the West Indies. Records of *C. glyphicus* (Say, 1823) and *C. anastomosans* Guignot, 1952 from Cuba are probably misidentifications and the species are not considered to be members of the Cuban fauna.

**Key words.** Coleoptera, Dytiscidae, Copelatinae, *Copelatus*, new species, new records, key to species, Cuba, Caribbean, Neotropical Region

### Introduction

The subfamily Copelatinae is a fairly diverse group of aquatic insects represented by seven genera: *Agaporomorpha* Zimmermann, 1921, *Aglymbus* Sharp, 1880, *Copelatus* Erichson, 1832, *Lacconectus* Motschulsky, 1855, *Liopterus* Dejean, 1833, *Madaglymbus* Shaverdo & Balke, 2008, and *Exocelina* Broun, 1886. In general the subfamily is relatively homogeneous

morphologically and only the single tribe Copelatini is recognized (MILLER 2001). Members of Copelatinae are widely distributed in small water bodies, but a subset of species inhabits bromeliad phytotelmata and is strictly specialized to this habitat (BALKE et al. 2008). The subfamily also contains a stygobiont species, the Australian *Exocelina abdita* (Balke, Watts, Cooper, Humphreys & Vogler, 2004) (BALKE et al. 2004b).

Copelatinae is represented in Cuba only by the genus *Copelatus*, which has been little studied in the Caribbean area in general and in Cuba specifically. *Copelatus caelatipennis angustatus* Chevrolat (1863), *C. insolitus* Chevrolat, 1863, and *C. posticatus* (Fabricius, 1801) were the first species of the genus recorded from Cuba by CHEVROLAT (1863) and were later confirmed by SPANGLER (1981). E. A. Schwarz and P. J. Darlington collected specimens of *Copelatus* in Cuba between 1905 and 1936. From those collections, four additional species were described by SCHAEFFER (1908) and YOUNG (1942): *C. barboursi* Young, 1942, *C. cubaensis* Schaeffer, 1908, *C. darlingtoni* Young, 1942, and *C. montivagus* Young, 1942. PECK (2005) published a more complete checklist of Cuban *Copelatus* with data on their distribution. Two additional species were recorded from Cuba without providing any details on locality data or collector: LENG & MUTCHLER (1918) reported *C. glyphicus* (Say, 1823) and GUIGNOT (1952) *C. anastomosans* Guignot, 1952; both these records were considered as dubious and requiring verification by subsequent authors (YOUNG 1963, PECK 2005). A paucity of information on this diverse group of beetles prompted this study, which aims at describing the *Copelatus* fauna of Cuba. We thus present here a summary of previously published and new information on members of the genus. General information on morphology, zoogeography and bionomics is given under each species

## Material and methods

**Specimens examined.** Descriptions, data on geographical distribution and other findings reported in this paper are based on examination of recently collected or historical adult specimens deposited in the following collections:

- CZCTR Museo de Historia Natural "Charles Ramsden", Facultad de Ciencias Naturales, Universidad de Oriente, Santiago de Cuba, Cuba (Y. S. Megna);  
FSCA Florida State Collection of Arthropods, Gainesville, Florida, USA (M. Thomas)  
MCZ Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA (P. Perkins);  
NMPC National Museum, Prague, Czech Republic (J. Hájek).

Holotype specimens borrowed from the MCZ had been photographed by the MCZ and entered into the MCZ Image Database (see <http://insects.oeb.harvard.edu/mcz/about.htm>), with a label attached to indicate so. Specimens examined have the codes that represent collections in which specimens are deposited, except when these are in the Zoological Collection of the Museum of Natural History "Charles Ramsden" (CZCTR).

In this paper label information is given with the information from each label separated by slashes; authors' comments on these labels are given in brackets.

**Measurements.** Body measurements provided in Table 1 were taken to the nearest 0.1 mm using a MBS-9 stereomicroscope or a Wild MZ8, both with an ocular reticle. When possible,

nine specimens of each sex were measured. In the descriptions and diagnoses, measurements are given as a minimum – maximum range. General body shape was quantified with the ratios PL/PW and TL/EW. The following abbreviations are used for body measurements:

DBE	minimum distance between eyes;
EL	elytral length (along midline from anterior margin to apex);
EW	elytral width (across greatest transverse width of both elytra combined);
HL	head length (along midline from the anterior clypeal margin to the anterior pronotal margin);
HW	head width (maximum width near posterior margin of the head);
PL	pronotal length (along midline from anterior to posterior margin);
PW	pronotal width at level of posterior margin;
TL	total length (= HL+PL+EL).

**Sex determination and dissection of male genitalia.** Determination of the sex is easily made by reference to the shape of the pro- and mesotarsi of the males, which are more dilated than those of the female. Females of several species have the elytra densely and complexly striate while those of the males are mostly smooth. A character used in diagnosis of the species studied was the form of the male genitalia. The terminology to denote the orientation of the genitalia follows MILLER & NILSSON (2003). Prior to dissection, dry specimens were relaxed in hot water for 10 minutes. The genitalia were extracted by inserting a needle into the abdominal opening. The median lobe and the parameres were disarticulated and mounted together with the specimen, or placed in a microvial of glycerin and pinned with the specimen. If the abdomen was removed, it was also mounted on the same card/point as the genitalia or specimen.

**Distribution.** Maps indicating the known distribution of *Copelatus* in Cuba are given for each species. They are based on specimens examined as well as literature records (Appendix). The principal faunal studies that we have consulted are those of CHEVROLAT (1863), GUNDLACH (1891), YOUNG (1942, 1963), SPANGLER (1981) and PECK (2005).

### Checklist of the Cuban species of *Copelatus*

(\* endemic species; ° first record)

- \**Copelatus barbouri* Young, 1942
- Copelatus caelatipennis angustatus* Chevrolat, 1863
- ° *Copelatus caelatipennis princeps* Young, 1963
- \**Copelatus cordovai* sp. nov.
- Copelatus cubaensis* Schaeffer, 1908
- \**Copelatus danyi* sp. nov.
- \**Copelatus darlingtoni* Young, 1942
- Copelatus insolitus* Chevrolat, 1863
- \**Copelatus montivagus* Young, 1942
- Copelatus posticatus* (Fabricius, 1801)

## Taxonomy

### *Copelatus* Erichson, 1832

*Copelatus* Erichson, 1832: 18

*Copelatus*: GUÉORGUIEV (1968: 6), NILSSON (2001: 55), BALKE et al. (2004a: 873), MICHAT & TORRES (2009: 312).

**Diagnosis of Cuban species.** Adults of the genus *Copelatus* found in Cuba are characterized by: moderate size, TL = 4.0–7.0 mm, EW = 1.9–3.5 mm (Table 1); eyes with anterior margin notched on inner margin above base of antenna; clypeus with anterolateral foveae transversely elongate but not contiguous medially; scutellum visible in dorsal view, pronotum distinctly margined laterally; prosternum and its process on same plane in lateral aspect; metacoxal lines strongly convergent anterior to metacoxal lobes, almost touching anterior to metacoxal lobes, then diverging anteriorly; abdominal ventrites with short, curved striae; pro- and mesotarsi distinctly pentamerous, with tarsomeres 1 to 3 moderately dilated in the male; protibia dilated apically.

**Description of Cuban species. Body Shape.** Body oval, elongate, slightly attenuated posteriorly, dorsoventrally depressed; broadest near midlength; lateral outline continuous in dorsal aspect.

**Color.** Variable, dorsal surface yellow, testaceous, brown or rufous to black, with fasciae testaceous or yellow; ventral surface yellow and rufous to black.

**Sculpture and punctation.** Dorsally with fine widely spaced punctures. Head with a row of coarser punctures along inner margin of each eye and a small depression on clypeal suture. Pronotum with a transverse row of coarser punctures along base, lateral bead abbreviated and not extending onto anterolateral angle. Head and pronotum with short longitudinal striae in some species. Elytron smooth, densely striate or with a submarginal and 6 or 10 discal striae (Figs. 4, 8). Abdominal ventrites with short curved striae.

**Head.** HL = 0.4–0.7 mm; HW = 1.2–1.9 mm. Eyes with anterior margin emarginate above base of antenna. Antenna elongate and slender, with 11 antennomeres subequal in length. Clypeus with anterolateral fovea transversely elongate but not contiguous medially. Labrum subrectangular; anterior margin strongly emarginate medially with numerous setae.

**Thorax.** Pronotum with hind margin straight, maximum width at level of posterior margin, posterolateral angle obtuse, PL = 0.5–1.0 mm, PW = 1.6–2.9 mm. Scutellum visible in dorsal view. Prosternum convex medially, with anterior margin sinuate; prosternal process short, oval, finely margined laterally, bluntly pointed apically, flattened apically and broadly contacting metaventricle. Metacoxal process with rounded lobe covering base of trochanter. Length of elytron 3.0–5.5 mm. Hind legs slender; metatibial spurs acute apically; metatarsomeres 1 to 4 flattened ventrally; metatarsal claws equal.

**Abdomen.** Posterior margin of last ventrite rounded.

**Male genitalia.** Parameres symmetrical, broad or narrow with setae on apical half; median lobe in some species strongly modified.

**Sexual dimorphism.** Males with pro- and mesotarsomeres 1–3 moderately enlarged, with rows of adhesive suckers or setae. Protibiae of males of some species with ventrobasal emarginations. Dorsal striation of females of some species different from that of males, with elytra, pronotum and head densely striate.

Key to *Copelatus* of Cuba

- 1 Elytra with well-defined striae, either linear or undulating/anastomosing (Figs. 2–4, 8–10). ..... 2
- Elytra mostly smooth, at most with longitudinal series of weak punctures (Figs. 1, 5, 6, 7). ..... 9
- 2 Elytra with 5–10 well defined linear striae; males and females (Fig. 2–4, 8–10). ..... 3
- Elytra striae fine, undulating/anastomosing; females<sup>1</sup> (Fig. 9). ..... 12
- 3 Each elytron with 5 or 6 discal striae (Fig. 4). ..... 4
- Each elytron with 10 discal striae (Fig. 8). ..... 5
- 4 Each elytron with a posterolateral submarginal stria and 6 discal striae (Fig. 4). .....  
..... *C. cubaensis* Schaeffer, 1908
- Each elytron with a posterolateral submarginal stria and 5 discal striae. ....  
..... *C. blatchleyi* Young, 1953  
(not recorded from Cuba, but may occur there due to its presence in Florida Keys and Bahamas)
- 5 Each elytron with striae 1, 3, 5, and 9 extending to apical third (Fig. 8). Body size larger, TL > 6.0 mm; EW > 3.0 mm. .... *C. posticatus* (Fabricius, 1801)
- Each elytron with all striae almost complete (Fig. 2); TL < 6.5 mm. .... 6
- 6 Median lobe with apex similar to a bird head (Fig. 20a) (*C. caelatipennis*). ..... 7
- Median lobe of different shape, not similar to a bird head. .... 8
- 7 Pronotum in both sexes usually without strioles on disc, if strioles are present, they are restricted to pronotal sides. .... *C. caelatipennis angustatus* Chevrolat, 1863
- Pronotum in both sexes usually with short strioles on disc. ....  
..... *C. caelatipennis princeps* Young, 1963
- 8 Male protibia with two ventrobasal emarginations; median lobe with outside margin abruptly expanded at midlength (Figs. 21a, b); parameres broad, with short setae on inner margin (Fig. 21c); female with interstitial space mostly smooth. .... *C. cordovai* sp. nov.
- Male protibia without emarginations ventrobasally; median lobe with inner margin strongly concave at midlength (Fig. 11a); parameres narrow, with long setae on inner margin (Fig. 11c); female with interstitial space with minute, complex striation (Fig. 9).  
..... *C. danyi* sp. nov.
- 9 Larger, TL = 5.9– 6.3 mm; elytra with apical fasciae reduced (Fig. 1). .....  
..... *C. barbouri* Young, 1942
- Smaller, TL = 5.3–5.9 mm; elytra with apical fasciae large (Figs. 5–7). ..... 10
- 10 Male protibiae not modified, their posterior margin straight (Fig. 17). .....  
..... *C. darlingtoni* Young, 1942
- Male protibiae modified, their anterior margin weakly to strongly bowed, posterior margin with ventrobasal emargination (Fig. 18). ..... 11
- 11 Elytra fusco-testaceous with base and apex lighter (Fig. 6); median lobe with apex strongly curved in lateral aspect (Fig. 14a). ..... *C. insolitus* Chevrolat, 1863
- Elytra fuscous with well-defined basal markings and testaceous apex (Fig. 7); median lobe with apex slightly curved in lateral aspect (Fig. 15a). ..... *C. montivagus* Young, 1942

<sup>1</sup> Identification of isolated females is problematic/impossible.

- 12 Elytra shinier, with sculpture finer, more closely spaced and more undulating. .... *C. darlingtoni* Young, 1942  
 – Elytra duller, with sculpture coarser, more widely spaced and less undulating. .... 13
- 13 Elytra darker, elytral disc fuscous. .... *C. montivagus* Young, 1942  
 – Elytra lighter, elytral disc fusco-testaceous or lighter. .... *C. insolitus* Chevrolat, 1863

## Species descriptions

### *Copelatus barbouri* Young, 1942

(Figs. 1, 12, 16, 24)

*Copelatus barbouri* Young, 1942: 88.

*Copelatus barbouri*: SPANGLER (1981: 167), NILSSON (2001: 64), PECK (2005: 44).

**Type locality.** Cuba, Guantánamo Province, North of Imías.

**Type material examined.** HOLOTYPE: ♂ (MCZ): ‘Mts. N. of Imías, eastern Oriente, July 25–28, 1936, 3000–4000 ft. [printed] / Cuba 1936, Darlington, Collector [printed] / M.C.Z. Type 25903 [printed] / Holotype m# *C. barbouri* [in pencil] / Feb-July 2002. MCZ Image Database [printed]’. PARATYPE: 1 ♂ (MCZ): ‘Mts. N. of Imías, eastern Oriente, vii. 25-28-36, 3000–4000 ft. [handwritten label, ink] / Cuba 1936, P.J. Darlington, Collector [handwritten label, ink] / Paratype *C. barbouri* Young [partly typed, partly in pencil]’.

**Diagnosis.** TL 5.9–6.3 mm, EW 3.0–3.2 mm; see Table 1 for other body measurements. Male and female elytra non-striate, reddish-brown with testaceous basal and apical fasciae (Fig. 1); male anterior tibiae slightly modified (Fig. 16).

*Copelatus barbouri* is very similar to *C. montivagus* (Fig. 7), but differs from it by slightly larger body size, narrower basal elytral fascia with ragged posterior border, males with less strongly bowed protibia (Fig. 16) and slightly thicker median lobe in lateral and ventral aspects (Figs. 12a, b).

**Ecology.** Nothing is known of the ecology of this species, except that it is recorded from mountains.

**Distribution.** *C. barbouri* is known only from few specimens from the mountains north of Imías (Guantánamo Province) in eastern Cuba (Fig. 24).

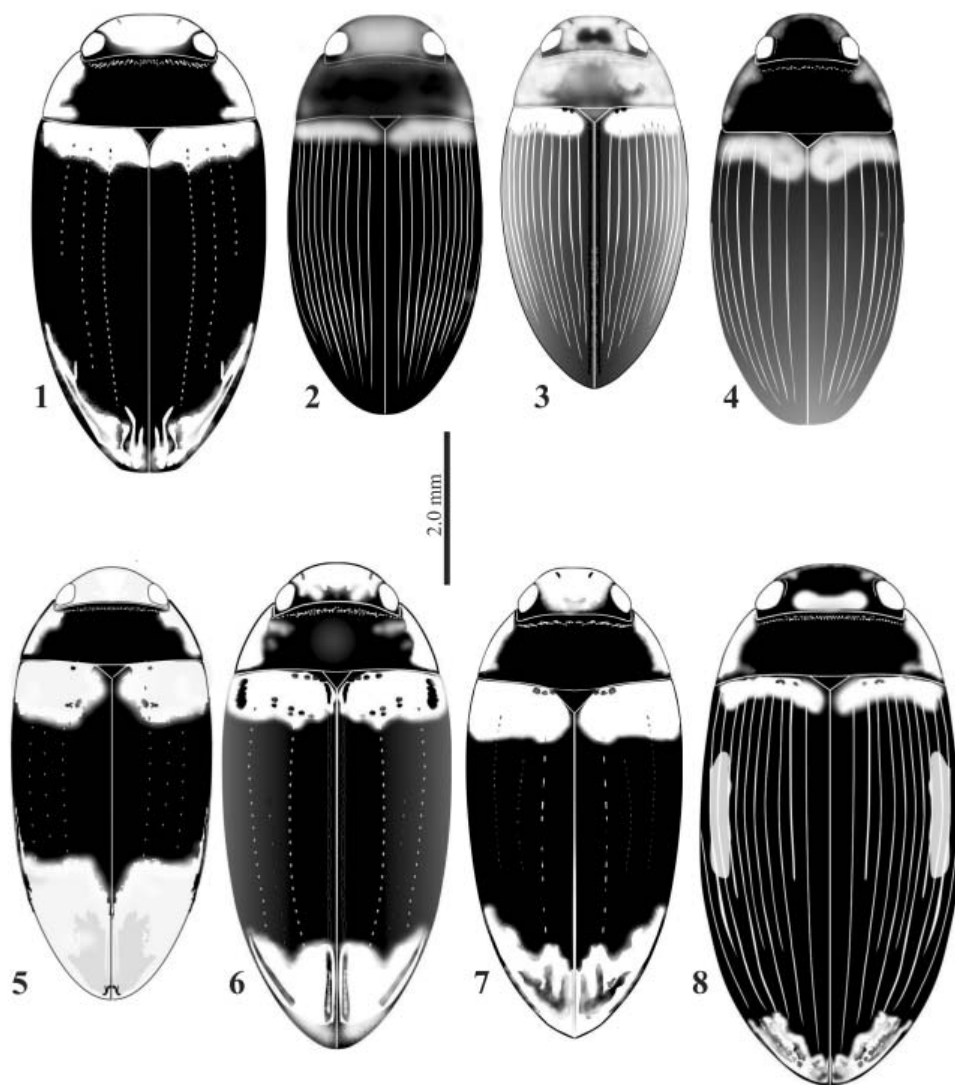
**Remarks.** There is some confusion between this species and *C. montivagus*. YOUNG (1942: 89) stated that the male protibiae of *C. montivagus* were not so strongly modified (about intermediate between those of *barbouri* and *darlingtoni*). However, the protibiae of *C. darlingtoni* are unmodified (Fig. 17), those of *C. barbouri* are slightly modified (Fig. 16) and those of *C. montivagus* strongly bowed (Fig. 19).

YOUNG (1942: 89) wrote that ‘the figure of the genitalia was from the male paratype’. The junior author examined this specimen, which had its abdomen removed and point mounted with the rest of the specimen, but no genitalia are directly associated with the pinned specimen.

The junior author has dissected the genitalia from the holotype; they are now in a microvial on the specimen’s pin. The single slide of male genitalia (the median lobe and both parameres) in the MCZ labeled (in pencil) as *C. barbouri* has no indication of a type number on it; the collection data (as on the pinned specimens) are handwritten in ink, along with the number ‘#1023’. These genitalia are identical to those dissected from the holotype by the junior author and are probably those figured by YOUNG (1942), but without a type indication on the slide it is not possible to confirm this.



No females of this species were examined. The putative female of *C. barbouri* lacks dorsal sculpturing. Its placement in the key and the diagnosis of the female above is dependent on the description of YOUNG (1942). YOUNG (1942: 88) noted that ‘it can be that I have incorrectly associated the males with these females, but all of the specimens are from the same locality and were taken in the same date period. There are, besides, no obvious differences except in



Figs. 1–8. Habitus and color patterns of *Copelatus* species from Cuba. 1 – *C. barbouri* Young, 1942; 2 – *C. caelatipennis angustatus* Chevrolat, 1863; 3 – *C. cordovai* sp. nov.; 4 – *C. cubaensis* Schaeffer, 1908; 5 – *Copelatus darlingtoni* Young, 1942; 6 – *C. insolitus* Chevrolat, 1863; 7 – *C. montivagus* Young, 1942; 8 – *C. posticatus* (Fabricius, 1801).

size and the secondary sexual characters of the tibiae and tarsi. The male of *C. barbouri* is sufficiently distinct by virtue of its general habitus, color pattern, and genitalia, to be separated from any other *Copelatus* I have seen, and if the smooth females really represent the same species, it is the most distinctive of the Cuban forms'.

### *Copelatus caelatipennis angustatus* Chevrolat, 1863

(Figs. 2, 20, 25)

*Copelatus angustatus* Chevrolat, 1863: 201.

*Copelatus angustatus*: GUNDLACH (1891: 37).

*Copelatus caelatipennis angustatus*: YOUNG (1963: 59), SPANGLER (1981: 153), EPLER (1996: 3.33, 2010: 5.45), LARSON et al. (2000: 48), FERNÁNDEZ (2001: 30), NILSSON (2001: 59), PECK (2005: 44).

**Type locality.** Cuba, La Habana Province.

**Material examined.** CUBA: PINAR DEL RÍO: Soroa, 13.vi.1963, 1 ex.; Dos Hermanas, 2.vii.1963, 1 ex. LA HABANA: Mariano, iii.1963, 8 exs. SANCTI SPÍRITUS: Los Galleguitos, 24.ii.1960, 1 ex. LAS TUNAS: Sábalo, 6.viii.2005, Y. S. Megna leg., 1 ex.; Comunales, 4.x.2008, Y. S. Megna leg., 2 exs.; Comunales, 9.viii.2006, Y. S. Megna leg., 1 ex.; 12.i.2009, Y. S. Megna leg., 2 exs.; 16.i.2009, Y. S. Megna leg., 4 exs. GRANMA: Cauto Cristo, 13.vii.2004, L. Chavéz leg., 4 exs. SANTIAGO DE CUBA: Caney del Sitio, 1.vi.2005, Y. S. Megna leg., 15 exs.; Las Lagunitas, 18.iii.2006, Y. S. Megna leg., 7 exs.; San Rafael, 3.ix.2006, Y. S. Megna & Deler-Hernández leg., 85 exs.; Monte Barranca, 4.xii.2007, Deler-Hernández leg., 7 exs.; 5.xii.2007, Deler-Hernández leg., 3 exs. GUANTÁNAMO: La Marsella, 22.i.2004, Y. S. Megna leg., 1 ex.

**Diagnosis.** TL 4.4–4.9 mm; EW 2.0–2.3 mm; see Table 1 for other body measurements. Elytron with a posterolateral submarginal stria and 10 discal striae (Fig. 2); male protibia ventrobasally without emarginations; median lobe similar to a bird's head (Fig. 20a); pronotum in both sexes usually without striae on disc, striae if present, restricted to sides.

*Copelatus caelatipennis angustatus* is externally very similar to *C. caelatipennis princeps* and *C. caelatipennis fragilis* Sharp, 1882, but can be separated by its pronotum that is usually without striae on the disc in both sexes.

**Ecology.** Previous to this study, the habitat of *C. caelatipennis angustatus* had not been known as all specimens reported were collected at light (SPANGLER 1981). This suggests that this species is a good flyer. In Cuba, *C. caelatipennis angustatus* was collected in lentic (permanent and temporary) environments and is predominantly associated with turbid waters and muddy habitats.

**Distribution.** Widely distributed in Cuba (Fig. 25). Also known from southern Florida (YOUNG 1963; EPLER 1996, 2010; LARSON et al. 2000).

### *Copelatus caelatipennis princeps* Young, 1963

(Fig. 26)

*Copelatus caelatipennis*: SCHAEFFER (1908: 17), LENG & MUTCHLER (1918: 87), BLATCHLEY (1919: 313), YOUNG (1954: 107, 1953b: 5).

*Copelatus caelatipennis princeps* Young, 1963: 59.

*Copelatus caelatipennis princeps*: SPANGLER (1981: 153), EPLER (1996: 3.33, 2010: 5.45), LARSON et al. (2000: 48), NILSSON (2001: 59), PECK (2005: 44).

**Type locality.** USA, Florida, Dade Co., Miami River.

**Material examined.** CUBA: ISLA DE LA JUVENTUD: Punta del Este, 22.v.2006, Y.S. Megna leg., 7 exs.; Cerro Caudal, 22.v.2006, Y. S. Megna leg., 9 exs. GUANTÁNAMO: Cabacú, 16.ii.2010, R. Correa leg., 7 exs., 21.ii.2010, R. Correa



leg., 3 exs.; Jobo Dulce, 11.ii.2010, R. Correa leg., 3 exs., 18.ii.2010, R. Correa leg., 12 exs., 20.ii.2010, R. Correa leg., 12 exs.; La Alegría, 10.ii.2010, R. Correa leg., 5 exs., 13.ii.2010, R. Correa leg., 9 exs., 15.ii.2010, R. Correa leg., 1 ex., 19.ii.2010, R. Correa leg., 12 exs.; El Yunque, 29.i.2010, R. Correa leg., 1 ex.

**Diagnosis.** Corresponding to *C. caelatipennis angustatus* in all diagnostic characters mentioned under that subspecies, but may be separated from it by the short, uniformly distributed striae on the pronotal disc in both sexes. In addition, females of *C. c. princeps* often bear short striae also on the basal third of the elytra.

**Ecology.** According to YOUNG (1963), *C. caelatipennis princeps* usually occurs only in clear, unpolluted water in the USA. In Cuba, the species was collected in temporary lentic environments with turbid water and muddy bottom, from lowlands up to 50 m a.s.l.

**Distribution.** In the USA known from New Jersey and Illinois to Florida and Texas (LARSON et al. 2000). In Cuba, *Copelatus caelatipennis princeps* is recorded from both western (Isla de la Juventud) and eastern parts of the country (Guantánamo province) (Fig. 26). This is the first record of this subspecies from the West Indies.

### *Copelatus cordovai* sp. nov.

(Figs. 3, 21, 27, 34)

**Type locality.** Cuba, Las Tunas Province, Amancio, Comunales, 20°49'59"N, 77°32'32"W, ca. 34 m a.s.l.

**Type material.** HOLOTYPE: ♂ (CZCTR): 'CUBA: Las Tunas: Comunales, 16.i.2009, Y.S. Megna leg. 20°49'59"N, 77°32'32"W, elevation ca. 34 m [printed] / Holotype, *Copelatus cordovai* sp. n., Megna det. 2012 [red, printed]'. PARATYPES (deposited in CZCTR if not stated otherwise):

**CUBA: LAS TUNAS:** 4 ♂♂ 3 ♀♀, with same data as holotype; 1 ♂ 2 ♀♀, 'CUBA: Las Tunas: Sábalo, 06.viii.2005, Y.S. Megna leg. 77°13'11"W 20°43'43"N, elevation ca. 5 m'; 1 ♂, 'La Curva, 16.viii.2006, Y.S. Megna leg. 77°33'21"W 20°51'29"N, elevation ca. 33 m'; 2 ♀♀, 'Comunales, 12.i.2009, Y.S. Megna leg. 77°32'32"W 20°49'59"N, elevation ca. 34 m'. **ISLA DE LA JUVENTUD:** 2 ♂♂, 'CUBA: Isla de la Juventud: Nueva Gerona, 20.v.2006, Y.S. Megna leg. 82°49'24"W 21°53'00"N, elevation ca. 42 m'. **GRANMA:** 1 ♂, 'CUBA: Granma: Cauto Cristo, 12.vii.2004, L. Chávez leg. 76°28'56"W 20°33'36"N, elevation ca. 44 m'; 1 ♂ 2 ♀♀, 'Cauto Cristo, 13.vii.2004, Y.S. Megna & L. Chávez leg. 76°28'56"W 20°33'36"N, elevation ca. 44 m'; 2 ♀♀, 'Cauto Cristo, 03.viii.2004, L. Chávez leg. 76°28'54"W 20°33'33"N, elevation ca. 44 m'; 1 ♂, 'Cauto Cristo, 24.vii.2004, Y.S. Megna & L. Chávez leg. 76°29'06"W 20°33'32"N, elevation ca. 44 m'; 1 ♂, 1 ♀ (NMPC), 'Cauto Cristo, 10.viii.2004, L. Chávez leg. 76°28'54"W 20°33'33"N, elevation ca. 44 m'; 1 ♀, 'Cauto Cristo, 25.viii.2004, L. Chávez leg. 76°28'54"W 20°33'33"N, elevation ca. 44 m'. Each paratype is provided with its respective red paratype label.

**Description.** TL 4.0–4.5 mm; EW 1.9–2.3 mm; see Table 1 for remaining body measurements.

**Color.** Dorsal surface yellow to testaceous. Elytra with broad basal diffuse band extended to lateral margins in some specimens (Fig. 3); venter yellowish.

**Sculpture and punctuation.** Elytron with a submarginal and 10 discal striae (Fig. 3). First three abdominal ventrites with short curved striae.

**Structure.** Prosternum rounded medially, with anterior margin sinuate; prosternal process short, oval, finely margined laterally, bluntly pointed apically, flattened apically and broadly contacting anteromedial metaventral process; rounded lobes of metacoxal processes covering base of trochanters. Male protibia with two ventrobasal emarginations; metatibial spurs acute apically; metatarsomeres 1 to 4 flattened ventrally; metatarsal claws equal.

**Male genitalia.** Median lobe with outside margin abruptly expanded in middle part (Figs. 21a, b); parameres broad, inner margin with short setae over apical half (Fig. 21c).

**Sexual dimorphism.** Males with pro- and mesotarsomeres 1–3 widened, with sucker-like setae. Protibia with two ventrobasal emarginations. Female protibia without ventrobasal emargination.

**Diagnosis.** Adults of *C. cordovai* sp. nov. are recognized by the combination of the following characters: elytron with a posterolateral submarginal stria and 10 discal striae (Fig. 3); male protibia with two ventrobasal emarginations; median lobe with abrupt widening in middle part (Figs. 21a,b); parameres with short setae on inner margin (Fig. 21c).

*Copelatus cordovai* sp. nov. can be confused with the Nearctic species *C. glyphicus* (Say, 1823) due to the similar pattern of 10 discal striae, but can be separated from it by the thicker median lobe (the median lobe of *C. glyphicus* is slender and strongly curved to the side apically).

**Etymology.** The specific epithet *cordovai* is a noun in the genitive case which honors Yunier Córdova Cóbas (Barcelona, España) for his contribution and help to the senior author's studies on aquatic coleopterans.

**Ecology.** *Copelatus cordovai* sp. nov. was collected in lentic (permanent and temporary) habitats with abundant aquatic vegetation, muddy bottom and high water temperatures, from lowlands up to 50 m a.s.l. (Fig. 34)

**Distribution.** In Cuba, *Copelatus cordovai* sp. nov. is recorded from both western (Isla de la Juventud) and eastern parts of the country (Las Tunas and Granma provinces) (Fig. 27).

### *Copelatus cubaensis* Schaeffer, 1908

(Figs. 4, 22, 28)

*Copelatus cubaensis* Schaeffer, 1908: 18.

*Copelatus cubaensis*: YOUNG (1963: 60), SPANGLER (1981: 167), EPLER (1996: 3.33, 2010: 5.45), LARSON et al. (2000: 47), NILSSON (2001: 68), PECK (2005: 44).

**Type locality.** Cuba, Cienfuegos Province, Cayamas.

**Material examined:** CUBA: ISLA DE LA JUVENTUD: Nueva Gerona, 28.v.2006, Y. S. Megna leg., 1 ex. Las Tunas. Sábalo, 06.viii.2005, Y. S. Megna leg., 1 ex.; Comunales, 12.i.2009, Y. S. Megna leg., 2 exs. SANTIAGO DE CUBA: San Rafael, 03.ix.2006, Y.S. Megna & Deler-Hernández leg., 17 exs.

**Diagnosis.** TL 4.5–5.4 mm; EW 2.3–2.7 mm; see Table 1 for other body measurements. Adults of this species are recognized by the following combination of characters: elytron with one posterolateral submarginal stria and six discal striae (Fig. 4); elytra lighter than pronotum; genitalia with broad parameres and median lobe with broad lobate apex (Fig. 22).

*Copelatus cubaensis* is very similar to *C. blatchleyi*, but differs from it by the characters given in the identification key, the slightly different coloration of elytra, which are usually lighter than pronotum, the male genitalia and the generally larger size (TL 4.5–5.4 mm). The two species have similar genitalia with broad parameres, but the median lobe of *C. cubaensis* is more truncate apically (Fig. 22a) while that of *C. blatchleyi* is more rounded (see YOUNG 1963: Fig. 7). *Copelatus blatchleyi* has the elytra usually darker than the pronotum and TL 4.5–4.8 mm (EPLER 2010).

**Ecology.** YOUNG (1963) reported that this species was collected using a blacklight trap in Florida. In Cuba, the species was collected in lentic (permanent and temporary) habitats located in lowlands, where it was predominantly associated with turbid waters with muddy bottom.

**Distribution.** In the USA known from southern Florida (EPLER 1996, 2010; LARSON et al. 2000). Until now, all Cuban records of *C. cubaensis* were from western Cuba only (SCHAEFFER 1908, YOUNG 1963, PECK 2005), but the distribution range of the species is now extended to the Isla de la Juventud and the eastern parts of the country (Fig. 28).

**Remarks.** This species is similar to *C. blatchleyi* Young, 1953, which is not recorded from Cuba. However, the presence of *C. blatchleyi* in extreme southern Florida and the Bahamas (YOUNG 1953a, EPLER 2010) indicates that it may occur in Cuba.

### *Copelatus danyi* sp. nov.

(Figs. 9, 10, 11, 29, 35)

**Type locality.** Cuba, Isla de la Juventud, Punta del Este, 21°33'43"N 82°33'18"W, ca. 3 m a.s.l.

**Type material.** HOLOTYPE: ♂ (CZCTR): 'CUBA: Isla de la Juventud: Punta del Este, 22.v.2006, Y.S. Megna leg. 21°33'43"N, 82°33'18"W, elevation ca. 3 m [printed] / Holotype, *Copelatus danyi* sp. n., Megna det. 2012 [red, printed]'. PARATYPES (deposited in CZCTR if not stated otherwise): **CUBA: ISLA DE LA JUVENTUD:** 3 ♂♂ 1 ♀, with same data as holotype; 2 ♂♂ 1 ♀, 'CUBA: Isla de la Juventud: Cerro Caudal, 22.v.2006, Y.S. Megna leg. 82°38'03"W 21°36'28"N, elevation ca. 12 m'. 1 ♀, '22.v.2006, Y.S. Megna leg. 82°38'06"W 21°36'27"N, elevation ca. 12 m'. **SANCTI SPIRITUS:** 14 ♂♂, 9 ♀♀ (CZCTR, NMPC): 'CUBA: Sancti Spiritus: Codina, 01.vii.2010, Y.S. Megna & A. Deler-Hernández leg. 80°03'36"W 21°54'42"N, elevation ca. 891 m'. Each paratype is provided with its respective red paratype label.

**Description.** TL 4.7–5.1 mm; EW 2.2–2.4 mm; see Table 1 for remaining body measurements.

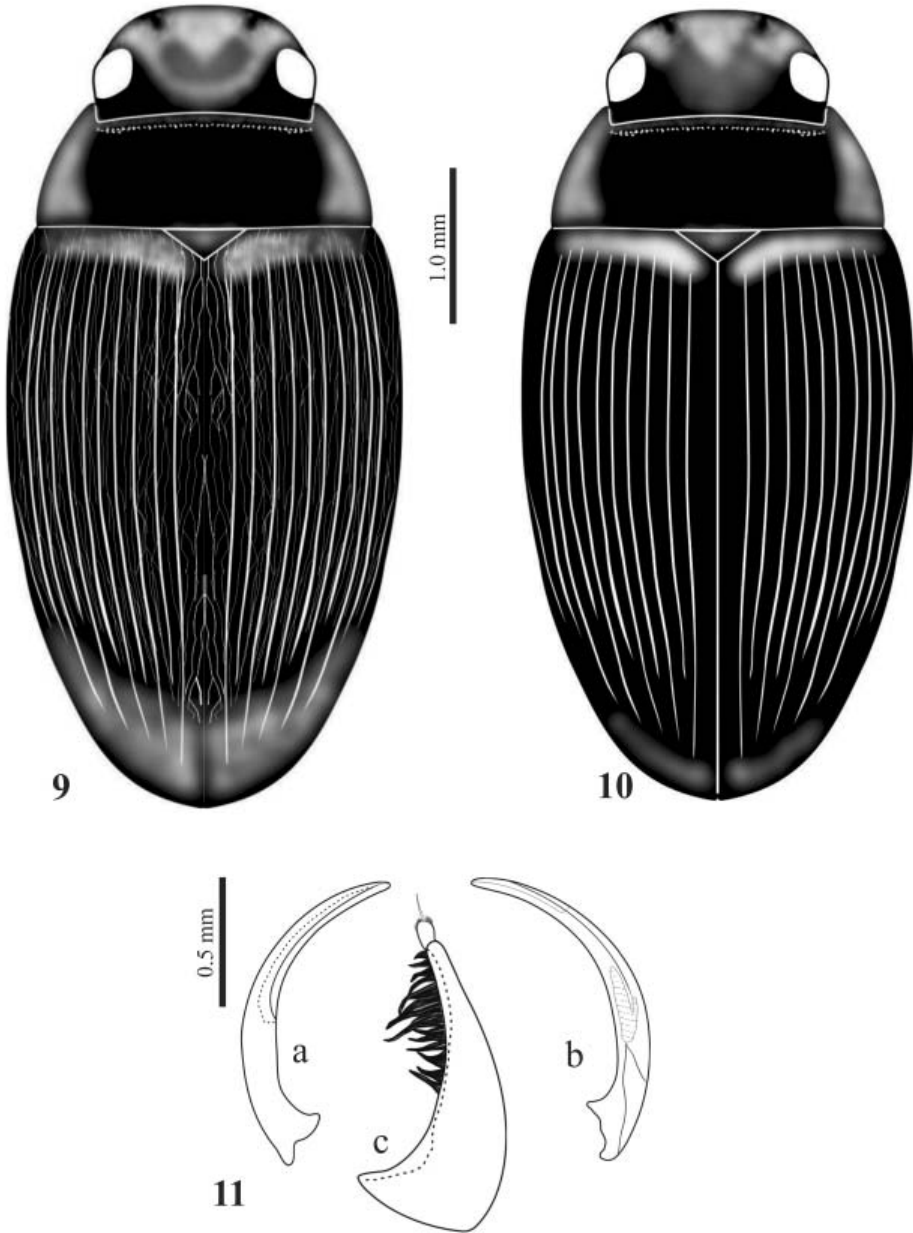
**Color.** Head rufous, with piceous spot at posterior margin of eyes. Pronotum piceous, with rufous lateral margins. Elytra rufous, with narrow basal testaceous band not extended to lateral margins (Fig. 10); venter piceous; pro- and mesothoracic legs testaceous; prosternum rufous.

**Sculpture and punctuation.** Dorsum with fine, widely spaced punctures. Head with short strioles on front. Pronotum with transverse row of coarser punctures along base, lateral bead abbreviated and not extending onto anterolateral angle, with short longitudinal strioles on disc. Elytron with a submarginal and 10 discal striae (Fig. 10). First four abdominal ventrites with short curved strioles.

**Structure.** Prosternum rounded medially, with anterior margin sinuate; prosternal process short, oval, finely margined laterally, bluntly pointed apically, flattened apically and broadly contacting anteromedial metaventral process; metacoxal processes with rounded lobe covering base of trochanter. Male protibia without ventrobasal emargination; metatibial spurs acute apically; metatarsomeres 1 to 4 flattened ventrally; metatarsal claws subequal.

**Male genitalia.** Median lobe with inner margin strongly concave over middle part (Fig. 11a); parameres narrow, subtriangular, with inner margin setose over middle part (Fig. 11c).

**Sexual dimorphism.** Males with pro- and mesotarsomeres 1–3 widened, with sucker-like setae; elytron with posterolateral submarginal stria and 10 discal striae, and with punctuation coarse and irregular. Pronotum with short and longitudinal strioles in males, whereas densely and complexly striate in females. Elytra rufous, with a narrow basal testaceous band not extended to lateral margins. Females with posterolateral submarginal stria and 10 discal striae on elytron and with interstitial space complexly striate (Fig. 9). Elytra piceous, without a narrow basal testaceous band.



Figs. 9–11. *Copelatus danyi* sp. nov. 9 – female habitus; 10 – male habitus; 11 – male genitalia (a – median lobe in right lateral view; b – same in left lateral view; c – left paramere in lateral view).

**Diagnosis.** Males of *C. danyi* sp. nov. are recognized by the combination of the following characters: elytron with a posterolateral submarginal stria and 10 discal striae (Fig. 10) and female with interstitial space complexly striate (Fig. 9); male protibia without ventrobasal emargination; median lobe of aedeagus with inner margin strongly concave at midlength (Fig. 11a); parameres narrow, with inner margin setose at midlength (Fig. 11c).

*Copelatus danyi* sp. nov. can only be confused with *C. posticatus*, but can be separated by its small size and the form of the 10 discal striae.

**Etymology.** The specific epithet *danyi* is a noun in the genitive case which honors Dany Daniel González-Lazo (Universidad de Oriente) for his contribution to the study of aquatic insects.

**Ecology.** *Copelatus danyi* sp. nov. was collected in temporary lagoons with turbid water and high temperatures in the coastal zone. Specimens were also collected in backwaters located in highlands with a low exposure to sun, without aquatic vegetation. The bottom of the collecting sites varied from muddy with abundant detritus to sandy-stony (Fig. 35).

**Distribution.** *Copelatus danyi* sp. nov. is recorded from western and central parts of the country including Isla de la Juventud (Fig. 29).

### *Copelatus darlingtoni* Young, 1942

(Figs. 5, 13, 17, 30)

*Copelatus darlingtoni* Young, 1942: 87.

*Copelatus darlingtoni*: SPANGLER (1981: 167), FERNÁNDEZ (2001: 30), NILSSON (2001: 65), PECK (2005: 44).

**Type locality.** Cuba, Pinar del Río Province, Sierra del Rangel.

**Material examined.** HOLOTYPE: ♂ (MCZ): ‘Rangel Mts., P. de R. Aug. 24, 1936, about 1500 ft. [printed] / Cuba 1936, Darlington Collector [printed] / M.C.Z. Type 25902 [printed] / Holotype *Copelatus darlingtoni* [handwritten, ink]’. PARATYPE: 1 ♂ (MCZ): same data as holotype but no red M.C.Z. label [printed] / ‘Paratype *Copelatus darlingtoni* Young [handwritten, ink]’.

**Diagnosis.** TL 5.5–5.6 mm; EW 2.5–2.8 mm; see Table 1 for remaining body measurements. Male without impressed striae on elytra but with weakly impressed series of punctures (Fig. 5); protibia without ventrobasal emargination (Fig. 17). Females unlike males, with numerous fine, undulating/anastomosing striae on elytra, leaving only front of head, clypeus, and apex of elytra smooth.

*Copelatus darlingtoni* externally differs from *C. barbouri*, *C. insolitus* and *C. montivagus* by the characters given in the identification key and also by the moderately larger (1.20–1.25 mm) aedeagus (Fig. 12).

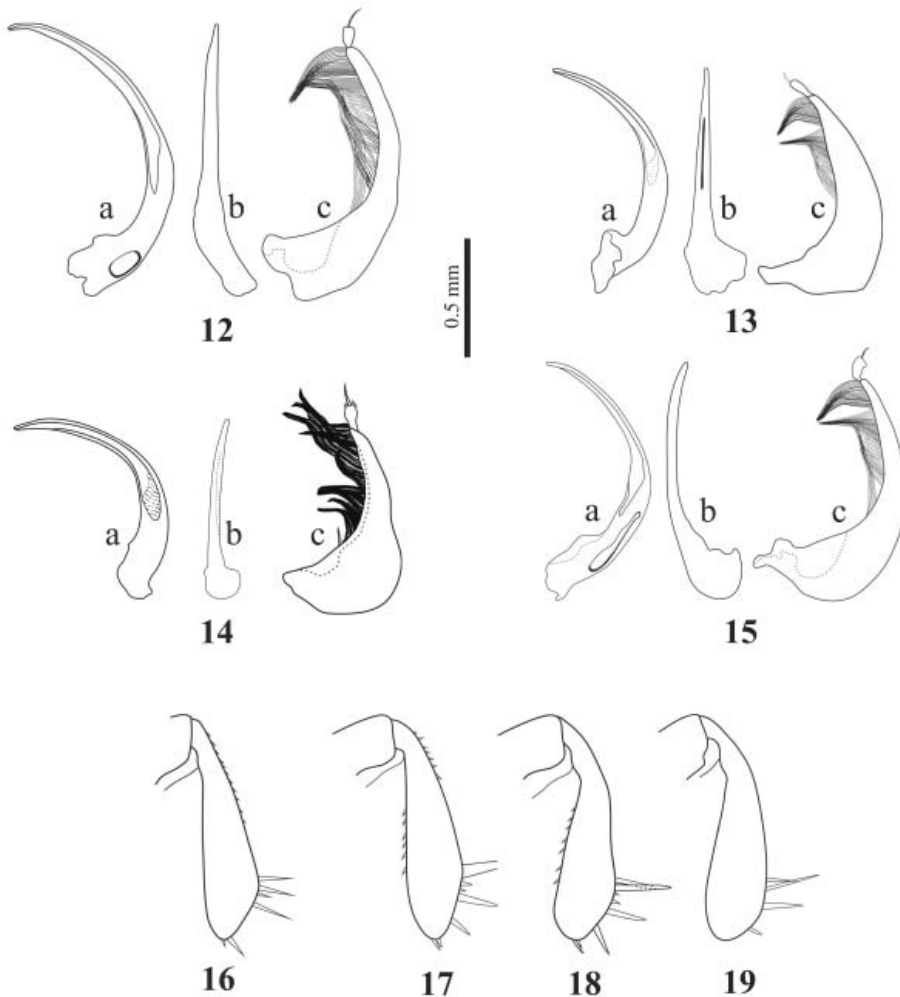
**Ecology.** All we know about this species is that it was collected in backwaters of small streams, located in highlands (YOUNG 1942).

**Distribution.** *Copelatus darlingtoni* has been only recorded western parts of Cuba (YOUNG, 1942) (Fig. 30).

**Remarks.** The junior author has dissected the genitalia from the holotype male; they are now in a microvial on the specimen’s pin. No females of this species were examined for this study. Females of *C. darlingtoni*, *C. insolitus* and *C. montivagus* are very similar (YOUNG 1942) and are best separated with comparative material or by association with males.

***Copelatus insolitus* Chevrolat, 1863**

(Figs. 6, 14, 18, 31)

*Copelatus insolitus* Chevrolat, 1863: 201.*Copelatus insolitus*: GUNDLACH (1891: 37), YOUNG (1942: 83), SPANGLER (1981: 153), NILSSON (2001: 66), PECK (2005: 44).**Type locality.** Cuba, La Habana Province. The type locality of *C. insolitus* is Havana, but doubt exists on the occurrence of this species there due to the fact that all material examined previously from Cuba, Jamaica and Central America has been from rather high mountains (YOUNG 1942).

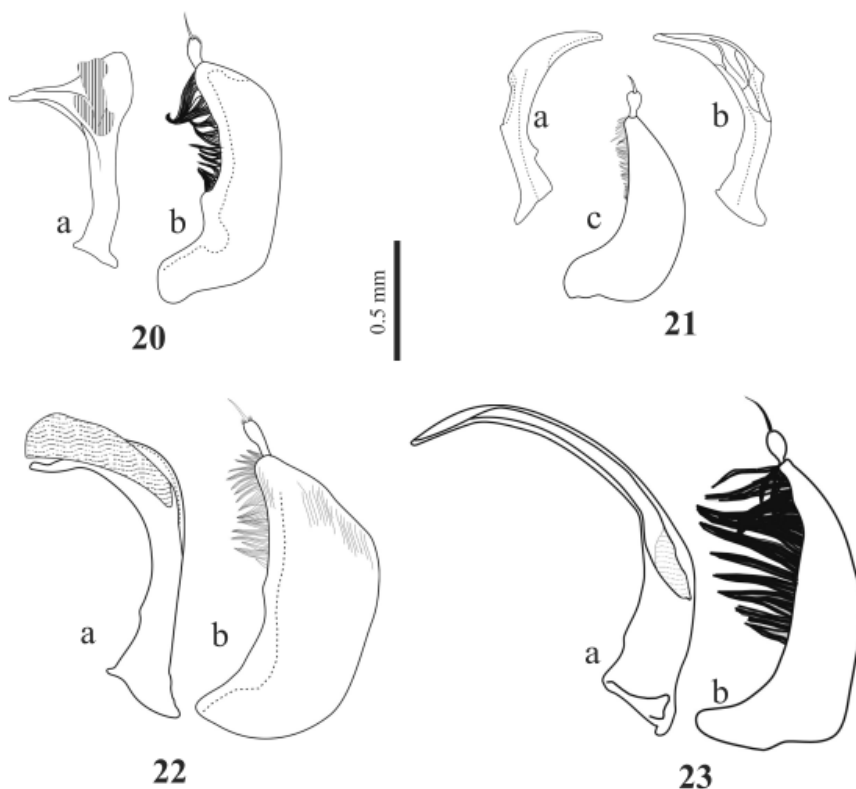
Figs. 12–19. Male genitalia (12–15) and left protibia (16–19) of Cuban species of *Copelatus*. 12, 16 – *C. barbouri* Young, 1942; 13, 17 – *C. darlingtoni* Young, 1942; 14, 18 – *C. insolitus* Chevrolat, 1863; 15, 19 – *C. montivagus* Young, 1942. Parts of male genitalia: a – median lobe of the aedeagus in left lateral view, b – same in ventral lateral view, c – left paramere in lateral view.



**Material examined.** CUBA: SANCTI SPIRITUS: Tope de Collantes, 29.vi.10, Y. S. Megna leg., 19 exs.; Codina, 01.vii.2010, Y. S. Megna leg., 13 exs. SANTIAGO DE CUBA: La Majagua, 14.viii.2004, Y. S. Megna leg., 74 exs.; La Platica, 12.vi.2004, Y. S. Megna leg., 3 exs.; La Estrella, 01.xii.2005, Y. S. Megna leg., 22 exs.; La Cubana, 02.xii.2005, Y. S. Megna leg., 25 exs.; Las Candelarias, 16.xi.2005, Y. S. Megna & A. Deler-Hernández leg., 3 exs.; Gran Piedra, 01.v.2005, Y. S. Megna, Y. Alarie & A. Deler-Hernández leg., 3 exs., 03.viii.2005, Deler-Hernández leg., 32 exs.; El Olimpo, 04.viii.2005, Deler-Hernández leg., 7 exs.; Los Morones, 18.vi.2008, Y. S. Megna leg., 1 ex.; Loma del Gato, 25.vi.2009, Deler-Hernández leg., 8 exs. GUANTÁNAMO: Monte Iberia, 07.ii.2004, Y. S. Megna leg., 1 ex.; 04.x.2003, Y. S. Megna leg., 2 exs.

**Diagnosis.** TL 5.3–5.9 mm; EW 2.5–2.9 mm; see Table 1 for remaining body measurements. Female unlike male, with elytral striae undulating/anastomosing; male protibia with two ventrobasal emarginations, and median lobe in lateral aspect as in Figure 14a. See under *C. darlingtoni*.

**Ecology.** All material examined previously from Cuba, Jamaica and Central America has been from rather high mountains (YOUNG 1942). The species was frequently collected in backwaters of small streams with muddy-stony bottoms, abundant detritus, located in highlands with a low exposure to sun and without aquatic vegetation.



Figs. 20–23. Male genitalia of Cuban species of *Copelatus*. 20 – *C. caelatipennis angustatus* author, year; 21 – *C. cordovai* sp. nov.; 22 – *C. cubaensis* Schaeffer, 1908; 23 – *C. posticatus* (Fabricius, 1801). Parts of male genitalia: a – median lobe of aedeagus in left lateral view, b – left paramere in lateral view.

**Distribution.** This species is known from Cuba, Jamaica, Hispaniola and Central America (YOUNG 1942). It is widely distributed in Cuba (Fig. 31).

**Remarks.** The type locality of *C. insolitus* is Havana, but doubt exists on the occurrence of this species there due to the fact that all material examined previously from Cuba, Jamaica and Central America has been from rather high mountains (YOUNG 1942). The widespread *C. insolitus* is joined in Cuba by three other rather similar species apparently endemic to Cuba: *C. barbouri*, *C. darlingtoni* and *C. montivagus*. These Cuban species are not known to occur together. YOUNG (1942: 90) hypothesized that these species represented “developing endemic forms on the various isolated mountain ranges.” The males all lack well defined striae and possess similar, but different, color patterns; they can be separated by the shape of their protibiae and their genitalia. Females of *C. darlingtoni*, *C. insolitus* and *C. montivagus* are very similar and are best separated with comparative material or by association with males; the female of *C. barbouri* lacks elytral striae.

### *Copelatus montivagus* Young, 1942

(Fig. 7, 15, 19, 32)

*Copelatus montivagus* Young, 1942: 89.

*Copelatus montivagus*: SPANGLER (1981: 167), NILSSON (2001: 66), PECK (2005: 44).

**Type locality.** Cuba, Guantánamo Province, Maisí, springs head of river Ovando.

**Type material examined.** HOLOTYPE ♂ (MCZ): ‘Upper Ovando R, eastern Oriente, July 17–20, 1936, 1000–2000 ft. [printed] / Cuba, 1936, Darlington, Collector [printed] / M.C.Z. Type 25904 [printed] / Holotype *Copelatus montivagus* Young [handwritten label, ink] / Feb–July 2002. MCZ Image Database [printed]’. PARATYPE: 2 ♂♂ (MCZ, FSCA): same locality data as holotype [printed] / ‘Paratype *Copelatus montivagus* Young [handwritten label, ink].’

**Additional material examined:** CUBA: GRANMA: ♀ (MCZ): ‘Pico Turquino, S. side 1500 ft., June 25, 1936 / Cuba, Darlington Collector [printed] / ? *montivagus*, not a type [handwritten, pencil]’; ♀ (MCZ): ‘Pico Turquino, S. side 3000 ft., June 25, 1936 / Cuba, Darlington, Collector / [printed] / ? *montivagus*, not a type [handwritten, pencil]’; 9 exs. (CZCTR): Bartolomé Massó, La Platica 27.iii.2012, A. Deler-Hernández leg.; 7 exs. (CZCTR, NMPC): same locality, 26.vi.2012, A. Deler-Hernández & M. Fikáček leg.

**Diagnosis.** TL 5.6–5.9 mm; EW 2.8–3.0 mm; other measurements and ratios in Table 1. Reddish-brown with testaceous basal and apical fasciae (Fig. 7). Male elytra non-striate, female unlike male, with elytral striae undulating/anastomosing.

*Copelatus montivagus* is very similar to *C. barbouri*, but differs by its slightly smaller size, wider basal elytral fascia with a more even posterior border, and males with more strongly bowed protibia (Fig. 19) and slightly thinner median lobe (Figs. 15a,b).

**Ecology.** *Copelatus montivagus* was reported from backwaters of a small stream in highlands (from 1000 to 2000 feet elevation).

**Distribution.** *Copelatus montivagus* had previously been recorded from eastern Cuba only (Fig. 32).

**Remarks.** YOUNG (1942: 90) stated that a slide of the genitalia of the holotype was made and listed the holotype as “type no. 25,904”. However the specimen in the MCZ labeled as the holotype was undissected. The junior author has since dissected the genitalia from the specimen labeled as the holotype – they are now in a microvial on the specimen’s pin. The single slide of male genitalia (the median lobe and one paramere) found in the MCZ and labeled (in

Table 1. Measurements in mm (minimum, maximum, mean) of morphometric characters for Cuban species of *Copelatus* Erichson. HL: Head length; HW: Head width; DBE: Distance between eyes; PL: Pronotal length; PW: Pronotal width; EL: Elytral length; EW: Elytral width; TL: Total body length.

	HL	HW	DBE	PL	PW	EL	EW	TL	TL/EW	PL/PW
<b><i>C. barbouri</i></b>										
♂♂ (n=2)	0.5	1.7–1.8	1.1–1.2	0.9–1.0	2.7–2.9	4.5–4.9	3.0–3.2	5.9–6.3	1.0	0.3
<b><i>C. caelatipennis angustatus</i></b>										
♂♂ (n=9)	0.5–0.6 0.52	1.3–1.4 1.33	0.7–0.8 0.77	0.6–0.8 0.70	1.8–2.0 1.93	3.3–3.7 3.51	2.0–2.3 2.12	4.5–4.9 4.73	1.8–2.2 1.98	0.3–0.4 0.34
♀♀ (n=9)	0.5–0.6 0.54	1.2–1.4 1.31	0.7–0.8 0.73	0.6–0.8 0.68	1.8–1.9 1.84	3.2–3.6 3.40	2.0–2.2 2.11	4.4–4.9 4.63	1.8–2.2 1.98	0.3–0.4 0.34
<b><i>C. cordovai</i> sp. nov.</b>										
♂♂ (n=9)	0.4–0.5 0.44	1.2–1.4 1.28	0.6–0.8 0.68	0.6–0.7 0.65	1.7–1.9 1.82	3.2–3.4 3.26	2.0–2.3 2.12	4.2–4.5 4.36	1.8–2.2 1.98	0.3–0.4 0.34
♀♀ (n=9)	0.4–0.5 0.45	1.2–1.3 1.27	0.6–0.8 0.67	0.5–0.6 0.55	1.6–1.8 1.70	3.0–3.3 3.15	1.9–2.2 2.10	4.0–4.3 4.20	2.0–2.2 2.09	0.3–0.4 0.36
<b><i>C. cubaensis</i></b>										
♂♂ (n=9)	0.5–0.6 0.53	1.3–1.5 1.41	0.7–0.9 0.82	0.8–0.9 0.82	2.1–2.4 2.23	3.7–4.0 3.81	2.4–2.7 2.47	5.0–5.4 5.16	1.8–2.2 1.98	0.3–0.4 0.34
♀♀ (n=9)	0.5–0.6 0.52	1.3–1.4 1.37	0.7–0.9 0.81	0.6–0.8 0.73	2.2–2.3 2.17	3.4–4.0 3.65	2.3–2.6 2.47	4.5–5.3 4.91	1.8–2.2 1.98	0.3–0.4 0.34
<b><i>C. danyi</i> sp. nov.</b>										
♂♂ (n=9)	0.5–0.6 0.54	1.3	0.8–0.9 0.82	0.8	2.0–2.1 2.02	3.4–3.7 3.54	2.3–2.4 2.32	4.7–5.0 4.88	2.0–2.1 2.02	0.4
♀♀ (n=9)	0.5–0.6 0.56	1.2–1.4 1.28	0.8–0.9 0.84	0.7	1.9–2.1 2.00	3.4–3.9 3.58	2.2–2.4 2.32	4.7–5.1 4.84	2.0–2.1 2.02	0.4
<b><i>C. darlingtoni</i></b>										
♂♂ (n=2)	0.5	1.4–1.5	0.9–1.0	0.8–0.9	2.2–2.4	3.8–4.2	2.5–2.8	5.5–5.6	2.0–2.2	0.3–0.4
<b><i>C. insolitus</i></b>										
♂♂ (n=9)	0.6–0.7 0.63	1.4–1.6 1.47	0.8–1.1 0.95	0.8–0.9 0.85	2.3–2.6 2.41	3.9–4.3 4.13	2.5–2.9 2.70	5.4–5.8 5.62	1.8–2.2 1.98	0.3–0.4 0.34
♀♀ (n=9)	0.6–0.7 0.62	1.3–1.6 1.46	0.8–1.1 0.93	0.7–1.0 0.83	2.2–2.4 2.32	3.9–4.4 4.18	2.5–2.8 2.63	5.3–5.9 5.64	1.8–2.2 1.98	0.3–0.4 0.34
<b><i>C. montivagus</i></b>										
♂♂ (n=6)	0.4–0.5 0.40	1.6–1.7 1.62	1.1–1.2 1.11	0.8–0.9 0.83	2.6–2.7 2.64	4.3–4.5 4.43	2.8–3.0 2.91	5.5–5.9 5.77	2.0–2.1 2.02	0.3–0.4 0.34
♀♀ (n=7)	0.4–0.5 0.47	1.5–1.7 1.66	1.0–1.1 1.03	0.8–0.9 0.84	2.4–2.5 2.42	4.3–4.4 4.33	2.8–2.9 2.81	5.6–5.8 5.71	2.0–2.1 2.02	0.3–0.4 0.34
<b><i>C. posticatus</i></b>										
♂♂ (n=9)	0.5–0.6 0.53	1.6–1.8 1.68	0.9–1.1 0.96	0.8–0.9 0.83	2.5–2.8 2.62	4.7–5.3 4.95	3.0–3.4 3.20	6.0–6.7 6.32	1.7–2.2 1.98	0.3–0.4 0.34
♀♀ (n=9)	0.4–0.6 0.48	1.6–1.9 1.70	0.9–1.1 1.00	0.7–1.0 0.83	2.6–2.8 2.70	4.8–5.5 5.07	3.2–3.5 3.26	6.1–7.0 6.40	1.8–2.2 1.98	0.3–0.4 0.34

pencil) as *C. montivagus* has no type number attached; the collection data (as on the pinned specimens) are hand written in ink, along with the number “#1024”. These genitalia appear identical to those dissected from the holotype. However, they may not be those illustrated by YOUNG (1942: Plate XIII: Fig. 2) because one of the parameres is missing from the slide (Young figured both parameres).

The male paratype deposited in FSCA (with the same locality data as the holotype) is dissected in a similar manner as the paratype of *C. barbouri* (with abdomen removed and point mounted with rest of specimen). This is probably the paratype from Young’s own collection (a large amount of which was donated to the FSCA). No slide is directly associated with this dissected specimen.

YOUNG (1942: 90) tentatively included two additional female specimens in this species, but did not designate them as type material. The junior author examined these specimens, from the MCZ collection. Young stated that these two specimens “were collected by Dr. Darlington in a pool with muddy bottom, cut off only by a gravel bar from a swift mountain brook at 1500 feet elevation, in June, 1936”. However, locality labels read 1500 feet for one specimen, 3000 feet for the other. The measurements in Table 1 are from these two specimens and another five specimens examined. See also *C. barbouri* above.

### *Copelatus posticatus* (Fabricius, 1801)

(Figs. 8, 23, 33)

*Dytiscus posticatus* Fabricius, 1801: 268.

*Colymbetes elegans* Babington, 1841: 11. Synonymized by GEMMINGER & HAROLD (1868: 458).

*Copelatus signatus* Sharp, 1873: 53. Synonymized by BRANDEN (1885: 85).

*Copelatus posticatus*: CHEVROLAT (1863: 200), GUNDLACH (1891: 36), YOUNG (1963: 65), SPANGLER (1981:153), PECK et al. (1998: 158), NILSSON (2001: 62), PECK (2005: 44), LOZADA et al. (2004: 104), MEGNA & DELER-HERNÁNDEZ (2006: 154).

**Type locality.** Americae Insulis.

**Material examined.** **CUBA:** ISLA DE LA JUVENTUD: Nueva Gerona, 20.v.2006, Y. S. Megna leg., 2 exs.; 28.v.2006, Y.S. Megna leg., 9 exs.; Punta del Este, 22.v.2006, Y. S. Megna leg., 13 exs.; Cerro Caudal, 22.v.2006, Y.S. Megna leg., 7 exs.; 22.v.2006, Y. S. Megna leg., 9 exs. **PINAR DEL RÍO:** Playa Antonio, 22.vii.2003, Y. S. Megna & O. Bello leg., 2 exs.; Viñales, 20.xi.2007, Deler-Hernández leg., 3 exs. **SANCTI SPIRITUS:** Codina, 01.vii.10, Y. S. Megna leg., 2 exs.; Río Caburní, 29.vi.10, Y. S. Megna leg., 13 exs. **HOLGUÍN:** Cabonico, 08.ix.2004, Y. S. Megna leg., 15 exs. **SANTIAGO DE CUBA:** Loma Blanca, 27.vii.2005, Y. S. Megna leg., 5 exs.; La Candelaria, 16.xi.2005, Y. S. Megna & A. Deler-Hernández leg., 17 exs.; La Estrella, 01.xii.2005, Y. S. Megna leg., 18 exs.; La Cubana, 02.xii.2005, Y. S. Megna leg., 2 exs.; Dos Boca, 25.iv.2005, Y. T. Cambas leg., 6 exs.; El Manguito, 16.iii.2006, Y. S. Megna leg., 5 exs.; Los Reynaldos, 17.iii.2006, Y. S. Megna leg., 2 exs.; Las Lagunitas, 18.iii.2006, Y. S. Megna leg., 3 exs.; San Rafael, 03.ix.2006, Y. S. Megna & A. Deler-Hernández leg., 42 exs.; Los Morones, 18.vi.2008, Y. S. Megna leg., 1 ex.; San Miguel de Parada, 26-VI-2008, A. Deler-Hernández leg., 1 ex. **GUANTÁNAMO:** Jiguaní, 5.ii.2004, Y. S. Megna leg., 75 exs.; Pozo Prieto, 5.ii.2004, Y. S. Megna leg., 7 exs.; Santa María, 6.ii.2004, Y. S. Megna leg., 3 exs., 3.x.2003, Y. S. Megna leg., 13 exs. El Yunque, 29.i.2010, A. Deler-Hernández & R. Correa leg., 25 exs., 30.i.2010, A. Deler-Hernández & R. Correa leg., 11 exs., 1.iii.2010, R. Correa leg., 3 exs.; Cabacú, 16.ii.2010, R. Correa leg., 12 exs., 21.ii.2010, R. Correa leg., 22 exs.; Guamá, 6.iii.2010, R. Correa leg., 19 exs.; El Güirito, 06.ii.2010, R. Correa leg., 3 exs.; Jobo Dulce, 11.ii.2010, R. Correa leg., 3 exs., 18.ii.2010, R. Correa leg., 8 exs., 20.ii.2010, R. Correa leg., 12 exs.; La Alegría, 10.ii.2010, R. Correa leg., 5 exs., 13.ii.2010, R. Correa leg., 19 exs., 15.ii.2010, R. Correa leg., 2 exs., 19.ii.2010, R. Correa leg., 15; Nibujón, 03.ii.2010, R. Correa leg., 1 ex.; El Manglerito, 04.ii.2010, A. Deler-Hernández & R. Correa leg., 3 exs.

**Diagnosis.** TL 6.0–7.0 mm; EW 3.0–3.5 mm. Adults of *C. posticatus* can readily be distinguished by their large size, elytron with a posterolateral submarginal stria and 10 discal striae, with one, three, five, seven and nine almost complete (Fig. 8), and median lobe in lateral aspect as in Figure 23a.

*Copelatus posticatus*, *C. terminalis* Sharp, 1882, *Copelatus integer* Sharp, 1882 and *C. distinctus* Aubé, 1838 are externally similar (YOUNG 1963). However, *C. posticatus* can be recognized by its large size and the shape of elytron. Examination of male genitalia, especially the shape of apical portion of the median lobe, is needed for a reliable identification of all species.

**Ecology.** *Copelatus posticatus* is generally found in the weedy margins of shallow ponds and ditches in Cuba (SPANGLER 1981). However, this species was also found in the backwaters of small streams. *C. posticatus* appears to be a primary invader in newly formed water bodies and is predominantly associated with turbid waters and muddy bottom. It is the most frequently collected species of the genus in Cuba.

**Distribution.** *Copelatus posticatus* is one of the most common *Copelatus* species recorded from Cuba. It occurs widely in the Greater and Lesser Antilles, Central and South America (SPANGLER 1981, PECK 2005). It is widely distributed in Cuba (Fig. 33).

### Species excluded from Cuban fauna

The following records of *C. glyphicus* and *C. anastomosans* are probably misidentifications or mislabeled specimens, and the two species should not be considered members of the Cuban fauna.

#### *Copelatus anastomosans* Guignot, 1952

*Copelatus anastomosans* Guignot, 1952: 30.

*Copelatus anastomosans*: PECK (2005: 44).

**Type locality.** Brazil.

**Comments.** GUIGNOT (1952) recorded *C. anastomosans* for Cuba, but without locality data. This species has its type locality in Brazil and has not been recorded from any other country in the Caribbean region.

#### *Copelatus glyphicus* (Say, 1823)

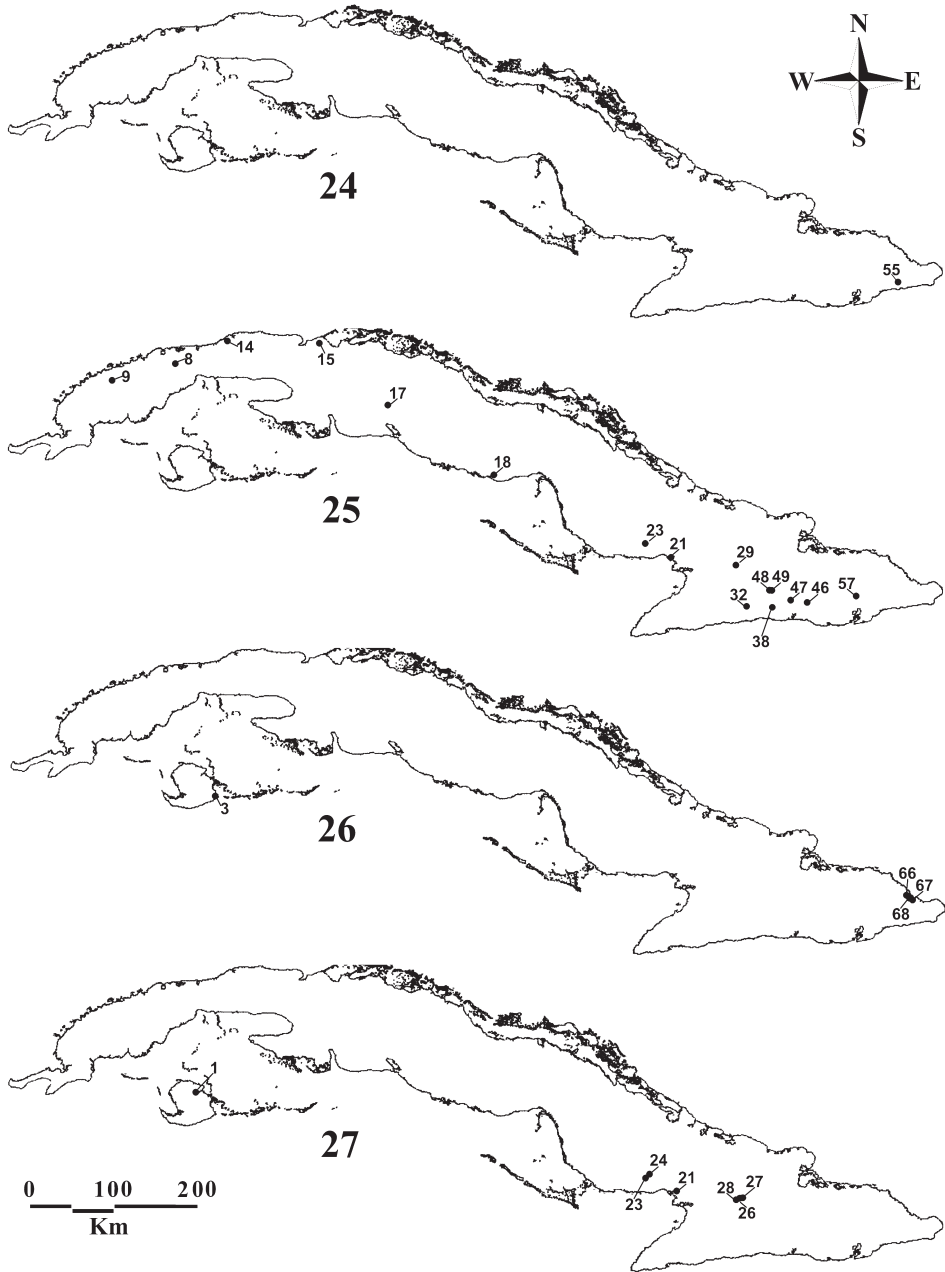
*Colymbetes glyphicus* Say, 1823: 99.

*Copelatus decemstriatus* Aubé, 1838: 379. Synonymized by MELSHEIMER (1853: 31).

*Copelatus glyphicus*: LENG & MUTCHLER (1918: 87), YOUNG (1963: 62), LARSON et al. (2000: 51), PECK (2005: 44).

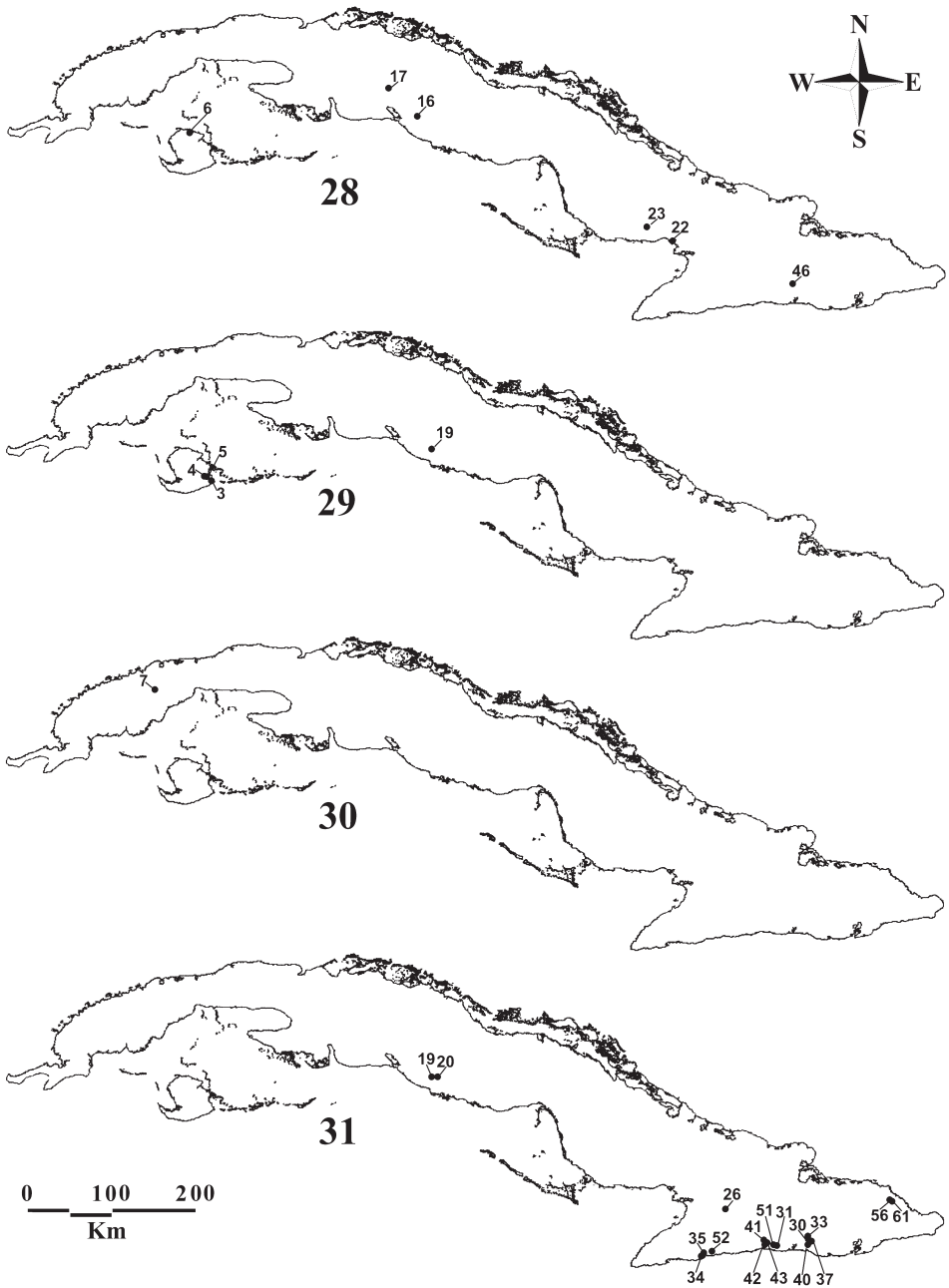
**Type locality.** USA, South Carolina, Charleston Co., Sullivans Island.

**Comments.** LENG & MUTCHLER (1918) reported *C. glyphicus* (Say, 1823) for Cuba and Guadeloupe, but did not provide locality data and the collector. YOUNG (1963) considered that these records were probably incorrect and applied to other species.

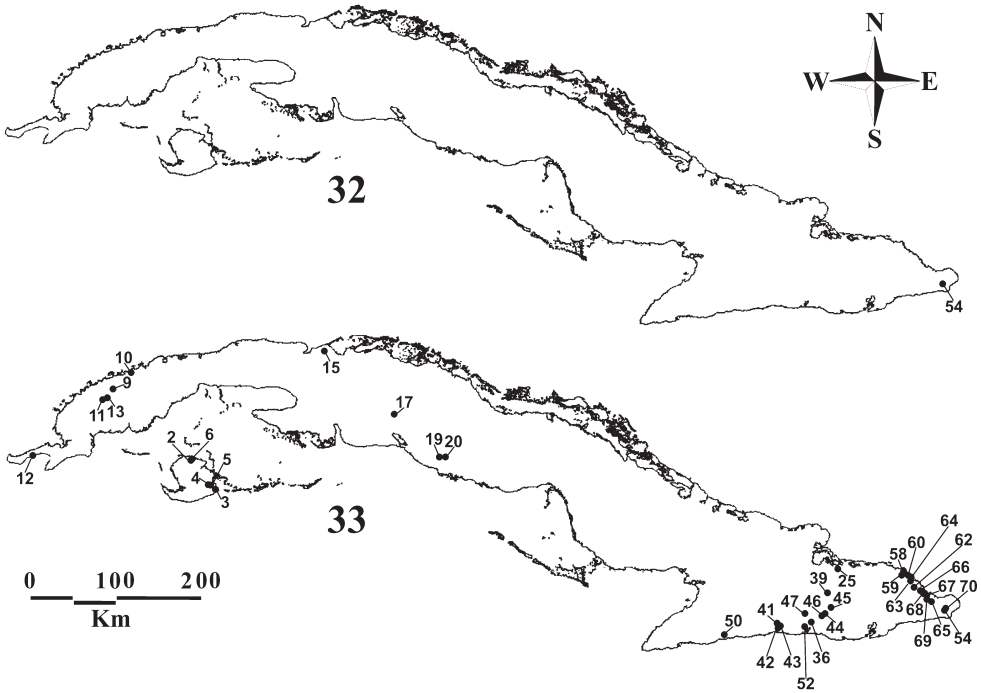


Figs. 24–27. Known distribution of *Copelatus* species in Cuba. 24 – *C. barbouri* Young, 1942; 25 – *C. caelatipennis angustatus* Chevrolat, 1863; 26 – *C. caelatipennis princeps* Young, 1963; 27 – *C. cordovai* sp. nov. See Appendix 1 for additional information on the localities reported in each map.





Figs. 28–31. Known distribution of *Copelatus* species in Cuba. 28 – *C. cubaensis* Schaeffer, 1908; 29 – *C. danyi* sp. nov.; 30 – *C. darlingtoni* Young, 1942; 31 – *C. insolitus* Chevrolat, 1863. See Appendix 1 for additional information on the localities reported in each map.



Figs. 32–33. Known distribution of *Copelatus* species in Cuba. 32 – *C. montivagus* Young, 1942; 33 – *C. posticatus* (Fabricius, 1801). See Appendix 1 for additional information on the localities reported in each map.

## Discussion

To date, 10 species of *Copelatus* are known from Cuba, with the possibility of at least one additional species, *C. blatchleyi*, that may occur. Five of these species (*C. barbouri*, *C. cordovai*, *C. danyi*, *C. darlingtoni*, and *C. montivagus*) are apparently endemic to Cuba.

The most common and widespread species of *Copelatus* from Cuba are, in decreasing order: *C. posticatus*, *C. cordovai* sp. nov., *C. insolitus*, *C. caelatipennis angustatus*, *C. caelatipennis princeps*, *C. danyi* sp. nov., *C. cubaensis*, *C. montivagus*, *C. barbouri*, and *C. darlingtoni*. The prevalence of *C. insolitus*, *C. montivagus*, *C. barbouri* and *C. darlingtoni* in mountainous freshwater ecosystems would suggest that these species represent good bio-indicators of pristine habitat. The springs or streams are in highlands, and may have isolated in previous geologic times; thus these areas may have the potential to generate endemic species (*C. danyi* sp. nov., *C. montivagus*, *C. barbouri*, and *C. darlingtoni*). These areas of high species endemism coincide with the main mountainous nuclei of the East, Center and West. Because *Copelatus* species are predaceous, their distribution is not directly correlated with associated vegetational assemblages but is more directly related to environmental factors such as climate, habitat heterogeneity and historical events.



Fig. 34. Yoandri S. Megna collecting *Copelatus cordovai* sp. nov. at the type locality in Amancio (Cuba, Las Tunas). Photo B. Reyes-Tur.



Fig. 35. Albert Deler-Hernández collecting *Copelatus danyi* sp. nov. at the type locality of Codina (Cuba, Sancti Spiritus). Photo D. Leyva.

This study reveals that most of the non-endemic *Copelatus* species in Cuba have a wide distribution, with a geographical range that covers both Nearctic and Neotropical Regions. In this sense, it is important to note that these species have more affinity with the Central and South American fauna than with North American fauna, implying that the Cuban fauna is probably mainly of the South American origin. A subaerial connection called GAARlandia (Greater Antilles Ridge + Aves Ridge), connected northwestern South America with larger landmasses emergent on these ridges (ITURRALDE-VINENT & MACPHEE 1999, MACPHEE et al. 2003).

For the identification of the *Copelatus* species of Cuba it is often necessary to use, more or less, a combination of three taxonomic characters: (1) the shape of the median lobe of the aedeagus; (2) the pattern of sculpture and punctuation; and (3) the shape of the male protibiae. These characters allow an analysis of the morphological variability of *Copelatus* species. In some cases identifications are augmented with the general habitus of the species and their body size. However, any of the characters mentioned above can vary in some species (*C. insolitus*, *C. montivagus*, *C. barbouri*, *C. darlingtoni* and *C. danyi* sp. nov.), thus identification of females without males is often impossible.

The males of *C. barbouri*, *C. darlingtoni*, *C. insolitus* and *C. montivagus* are very similar; *C. insolitus* is widespread but *C. barbouri*, *C. darlingtoni* and *C. montivagus* are endemic to Cuba. As noted by YOUNG (1942: 90), these taxa may represent variants of *C. insolitus* that have developed in the isolation of Cuba; their genitalia are very similar but apparently separable, and the differences in the curvature of the protibiae are slight and may represent a grade. The females of these species, with the exception of the putative female of *C. barbouri* with its smooth elytra, are difficult to separate without associated males. Females of *C. darlingtoni*, *C. insolitus* and *C. montivagus* bear extensive dorsal sculpturing on the elytra, pronotum and dorsum of the head. This sculpture differs from that on other striate species, such as *C. caelatipennis*, in that the sculpture is more fine, dense and anastomosing, and is also strongly developed on the dorsum of the pronotum and the head. In *C. caelatipennis* the pronotal sculpture is weaker and consists mostly of punctures and short longitudinal striae; the sculpture of the elytra is composed of straight striae.

GUÉORGUIEV (1968) established species groups for *Copelatus* delimited by the number and position of elytral striae. Three of these groups occur in Cuba: *C. erichsonii* group (includes *C. caelatipennis angustatus*, *C. caelatipennis princeps* and *C. posticatus*); *C. hydroporoides* group (= *C. haemorrhoidalis* group; see NILSSON & FERY (2006: 56)) (includes *C. barbouri*, *C. darlingtoni*, *C. insolitus* and *C. montivagus*); and *C. irinus* group (includes *C. cubaensis*). Accordingly, *Copelatus cordovai* sp. nov. and *C. danyi* sp. nov. could be placed in the *erichsonii* group due to the elytron having a posterolateral submarginal stria and 10 discal striae. However, these groups appear artificial due to extreme dissimilarities in the genitalia of species placed in the same group (e.g., *C. caelatipennis* and *C. posticatus*) or species with similar genitalia placed in different groups (e.g., *C. blatchleyi* and *C. cubaensis* have very similar genitalia and could be in the same group, but *C. blatchleyi* is placed in the *C. pulicarius* group while *C. cubaensis* is in the *C. irinus* group, based on the number of elytral striae). Obviously, more analysis is needed to better define or eliminate these groups.

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## Appendix

Collection localities of *Copelatus* species from Cuba. ELV = elevation (in meters). PRV = Province. PR – Pinar del Río, HA – La Habana, MT – Matanzas, CI – Cienfuegos, SS – Sancti Spiritus, LT – Las Tunas, GR: Gramma, HG – Holguín, SC – Santiago de Cuba, GT – Guantánamo. Localities marked with an asterisk (\*) belong special municipality Isla de la Juventud

Code	PRV	Locality	Sampling site	Date	Coordinates	ELV
1.	*	Nueva Gerona	permanent lagoon 1	20.v.2006	82°49'24"W 21°53'00"N	42
2.	*	Nueva Gerona	backwaters 2	20.v.2006	82°49'11"W 21°53'06"N	42
3.	*	Punta del Este	temporal lagoon	22.v.2006	82°33'18"W 21°33'43"N	3
4.	*	Cerro Caudal	permanent lagoon	22.v.2006	82°38'03"W 21°36'28"N	12
5.	*	Cerro Caudal	temporal lagoon	22.v.2006	82°38'06"W 21°36'27"N	12
6.	*	Nueva Gerona	temporal lagoon 2	28.v.2006	82°49'13"W 21°52'58"N	42
7.	PR	Sierra de Rosario	Rangel	25.viii.1936	83°11'W 22°44'N	500
8.	PR	Soroa	Lomas de Soroa	13.vi.1963	83°00'W 22°48'N	485
9.	PR	Viñales	Dos Hermanas	2.xii.1963	83°44'W 22°37'N	200
10.	PR	La Palma	Sanquily	16.v.1973	83°32'W 22°49'N	20
11.	PR	Quemado de Pineda	Colorado stream	14.iv.1973	83°88'30"W 22°50'00"N	400
12.	PR	Guanahacabibes	Playa Antonio; temporal lagoon	22.vii.2003	84°39'14"W 21°54'26"N	3
13.	PR	El Moncada	Hoyo de Fania	13.iv.1963	84°80'W 22°54'N	–
14.	HA	Marianao	–	iii.1963	82°24'W 23°04'N	50
15.	MT	Cárdenas	Cárdenas; lagoon	–	81°26'W 23°03'N	–
16.	CI	Cayamas	–	–	80°48'W 22°15'N	20
17.	CI	Soledad	–	–	80° 18'W 22° 05'N	–
18.	SS	Los Galleguitos	–	24.ii.1960	79°17'W 21°35'N	5
19.	SS	Tope de Collantes	Codina; stream, backwaters	1.vii.2010	80°03'36"W 21°54'42"N	891
20.	SS	Tope de Collantes	El Nueve; Caburní river, backwaters	29.vi.2010	80°00'59"W 21°55'50"N	539
21.	LT	Sábalo	temporal lagoon 1	6.viii.2005	77°13'11"W 20°43'43"N	5
22.	LT	Sábalo	temporal lagoon 2	6.viii.2005	77°15'15"W 20°44'33"N	5
23.	LT	Amancio	Comunales; permanent lagoon	9.viii.2006	77°32'32"W 20°49'59"N	34
24.	LT	La Curva	temporal lagoon	16.viii.2006	77°33'21"W 20°51'29"N	33
25.	HG	Cabonico	stream, backwaters	8.ix.2004	75°28'01"W 20°39'24"N	92
26.	GR	Bayamo	Buena Vista	vii.1857	76°63'W 20°36'N	–
27.	GR	Cauto Cristo	temporal lagoon 1	12.vii.2004	76°28'56"W 20°33'36"N	44
28.	GR	Cauto Cristo	permanent lagoon 1	24.vii.2004	76°29'06"W 20°33'32"N	44
29.	GR	Cauto Cristo	permanent lagoon 2	25.viii.2004	76°28'54"W 20°33'33"N	44
30.	SC	Gran Piedra	–	30.–31.v.1936	75°39'W 20°01'N	1000
31.	SC	El Cobre	Loma del Gato	3.–7.vii.1936	75°55'W 20°02'N	900
32.	SC	Matias	stream Seboruquito	19.iii.1973	76°21'W 20°09'N	290
33.	SC	Gran Piedra	springs head of river Baconao	17.ii.1973	75°38'W 19°57'N	670
34.	SC	La Platica	temporal lagoon	12.vi.2004	76°53'53"W 19°55'17"N	20
35.	SC	La Majagua	stream, backwaters	14.viii.2004	76°52'32"W 19°57'38"N	350
36.	SC	Dos Boca	La Purisima, stream, backwaters	25.iv.2005	75°44'03"W 20°05'35"N	122
37.	SC	Gran Piedra	river Indio, backwaters	1.v.2005	75°38'48"W 20°01'17"N	980
38.	SC	Caney del Sitio	river Cauto, backwaters	1.vi.2005	76°02'06"W 20°10'21"N	150
39.	SC	Loma Blanca	temporal lagoon	27.vii.2005	75°36'18"W 20°18'16"N	270
40.	SC	El Olimpo	stream 2, backwaters	4.viii.2005	75°40'13"W 20°00'33"N	820
41.	SC	La Candelaria	river Cauto	16.xi.2005	76°07'28"W 20°06'24"N	235

Continued on the next page

## APPENDIX. Continuation.

Code	PRV	Localities	Sampling sites	Date	Coordinates	ELV
42.	SC	La Estrella	springs head of river Cauto, backwaters	1.xii.2005	76°10'42"W 20°02'38"N	620
43.	SC	La Cubana	River La Cubana, backwaters	2.xii.2005	76°07'32"W 20°03'12"N	360
44.	SC	El Manguito	temporal lagoon	16.iii.2006	75°44'03"W 20°05'35"N	162
45.	SC	Los Reynaldos	temporal lagoon	17.iii.2006	75°31'43"W 20°11'12"N	100
46.	SC	Las Lagunitas	temporal lagoon	18.iii.2006	75°38'16"W 20°10'19"N	160
47.	SC	Dos Caminos	San Rafael; permanent lagoon	3.ix.2006	75°49'57"W 20°10'38"N	150
48.	SC	Monte Barranca	stream, backwaters	4.xii.2007	76°02'32"W 20°22'41"N	160
49.	SC	Monte Barranca	Embalse Monte Barranca	5.xii.2007	76°02'32' W 20°22'59"N	169
50.	SC	Los Morones	Río la Mula, backwaters	18.vi.2008	76°45'36"W 19°56'57"N	8
51.	SC	Loma del Gato	Chan Chan	25.vi.2009	76°02'22"W 20°01'47"N	807
52.	SC	San Miguel de Parada	laguna temporal	26.vi.2008	75°52'23"W 20°00'54"N	2
53.	SC	Guamá	Pico Turquino	25.vii.1936	76°81'W 19°97'N	914
54.	GT	Maisí	springs head of river Ovando	17.–20.vii.1936	74°17'W 20°08'N	457
55.	GT	Imías	norte de Imías	25.–28.vii.1936	74°55'W 20°11'N	1066
56.	GT	Monte Iberia	Monte Iberia; stream 1, backwaters	4.x.2003	74°42'31"W 20°26'22"N	420
57.	GT	La Marsella	Río Guaso, backwaters	22.i.2004	74°42'31"W 20°26'22"N	60
58.	GT	Jiguani	Jiguani; temporal lagoon	5.ii.2004	74°44'59"W 20°30'06"N	40
59.	GT	Jiguani	Pozo Prieto; permanent lagoon	5.ii.2004	74°44'10"W 20°31'51"N	40
60.	GT	Santa María	permanent lagoon	6.ii.2004	74°43'20"W 20°30'54"N	40
61.	GT	Monte Iberia	permanent lagoon	7.ii.2004	74°42'31"W 20°27'07"N	420
62.	GT	Yunque de Baracoa	permanent lagoon	29.i.2010	74°33'00"W 20°20'38"N	200
63.	GT	Nibujón	temporal lagoon	3.ii.2010	74°36'43"W 20°26'28"N	6
64.	GT	Taco	El Manglerito; temporal lagoon	4.ii.2010	74°39'51"W 20°30'51"N	12
65.	GT	Güirito	temporal lagoon	6.ii.2010	74°25'33"W 20°17'03"N	155
66.	GT	La Alegría	permanent lagoon	10.ii.2010	74°29'17"W 20°18'57"N	157
67.	GT	Jobo Dulce	permanent lagoon	11.ii.2010	74°27'39"W 20°18'34"N	30
68.	GT	Cabacú	Escuela Especial; permanent lagoon	16.ii.2010	74°28'58"W 20°19'14"N	10
69.	GT	Guamá	permanent lagoon	6.iii.2010	74°28'02"W 20°17'52"N	50
70.	GT	Maisí	La Tinta	3.iv.1969	74°21'01"W 20°07'48"N	495