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Description of *Copelatus djiboutensis* sp.n., and notes on *C. gestroi* (SHARP, 1882) (Coleoptera: Dytiscidae)

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Abstract

Copelatus djiboutensis (Coleoptera: Dytiscidae) from Djibouti is described and compared with *C. gestroi* (SHARP, 1882) and *C. antoniorum* HÁJEK & BRANCUCCI, 2011. These three species are tentatively placed in the *C. hydroporoides* group. Variability and distribution of *Copelatus gestroi* (SHARP, 1882) are discussed. The female holotype of *C. gestroi* from Eritrea deviates from females of *C. gestroi* sensu auct. from the Sinai, Israel and the Arabian Peninsula (Saudi Arabia, Oman, Yemen) in body form and elytral microreticulation; therefore, it cannot be excluded that specimens from the Sinai, Israel and the Arabian Peninsula represent a different species.

Key words: Coleoptera, Dytiscidae, *Copelatus*, new species, taxonomy, distribution, Djibouti, Eritrea, Egypt, Sinai, Israel, Arabian Peninsula.

Introduction

Quite recently, the junior author discovered a new species of the genus *Copelatus* ERICHSON, 1832 in Djibouti (East Africa), which is obviously closely related with *C. gestroi* (SHARP, 1882) and *C. antoniorum* HÁJEK & BRANCUCCI, 2011 (see HÁJEK & BRANCUCCI 2011). Eventually, the female holotype of *C. gestroi* and numerous additional specimens of *C. gestroi* sensu auct. from various countries were studied. Remarkably, the holotype (female) of *C. gestroi* from Eritrea differs significantly from females of *C. gestroi* from the Sinai, Israel and the Arabian Peninsula. Possibly, *C. gestroi* represents a mixture of two or even more different species. The new species from Djibouti, *C. djiboutensis*, is described below and a species group assignation for *C. djiboutensis* and its allies is proposed.

Material and methods

A total of 90 specimens of *Copelatus gestroi* sensu lato and *C. djiboutensis* was examined. They are deposited in the following institutions and private collections:

BZL	Oberösterreichisches Landesmuseum, Biologiezentrum, Linz-Dornach, Austria
CGW	Coll. Günther Wewalka, Vienna, Austria
CHF	Coll. Hans Fery, Berlin, Germany (property of NMW)
MNG	Museo di storia naturale Giacomo Doria, Genova, Italy
NMB	Naturhistorisches Museum Basel, Switzerland
NMP	Národní muzeum, Prague, Czechia
NMW	Naturhistorisches Museum Wien, Vienna, Austria

Abbreviations: TL (total length of beetle); TL-H (total length without head); EL (elytral length); MPW (maximum pronotal width); MEW (maximum elytral width).

Label data of type specimens and of some historical specimens are cited between quotation marks. Comments are given between square brackets.

Male genitalia were studied in dry condition and drawn with the help of a drawing tube (Wild # 308700). The terminology to denote the orientation of the genitalia follows MILLER & NILSSON (2003).

Copelatus djiboutensis sp.n.

TYPE LOCALITY (see Fig. 10): Waterfall near Campement Touristique Ditillou, 11°46'25"N 42°40'48"E, ca. 760 m a.s.l., ca. 20 km WSW Tajourah, Goda Mountains, Tajourah Prov., Djibouti.

TYPE MATERIAL: **Holotype** ♂ (NMW): "DJIBOUTI: Tajourah Prov. Goda Mountains ca. 20 km WSW Tajourah 28.I.2016 leg. M.A. Jäch (DJI 4)", "690-760 m a.s.l. 11°46'25.5"N/42°40'48.7"-11°46'23.5"N/42°41'5.5" stream ca. 1.5 km SW Campement Touristique Ditillou" [printed white labels], "HOLOTYPE Copelatus djiboutensis sp.n. Wewalka & Jäch, 2017" [printed red label]. **Paratypes**: 2 ♂♂, 1 ♀ (CGW, NMW): same label data as holotype. The paratypes are provided with printed red paratype labels.

DESCRIPTION: Habitus as in Fig. 1. Body oblong-oval, almost parallel-sided, broadest slightly posterior of middle, slightly convex. Head relatively broad; clypeus truncate. Pronotum relatively long, broadest slightly anterior of posterior angles, lateral margins more curved in posterior than in anterior half. Base of elytra as broad as pronotum posteriorly; lateral margin of elytra hardly curved in anterior third.

Morphometric measurements:
Holotype: TL 6.5 mm, TL-H 5.9 mm, EL 4.9 mm, MPW 2.7 mm, MEW 2.8 mm.
Paratypes: TL 5.4–6.5 mm, TL-H 4.6–5.9 mm, EL 3.8–4.9, MPW 2.2–2.7 mm, MEW 2.2–2.8 mm.

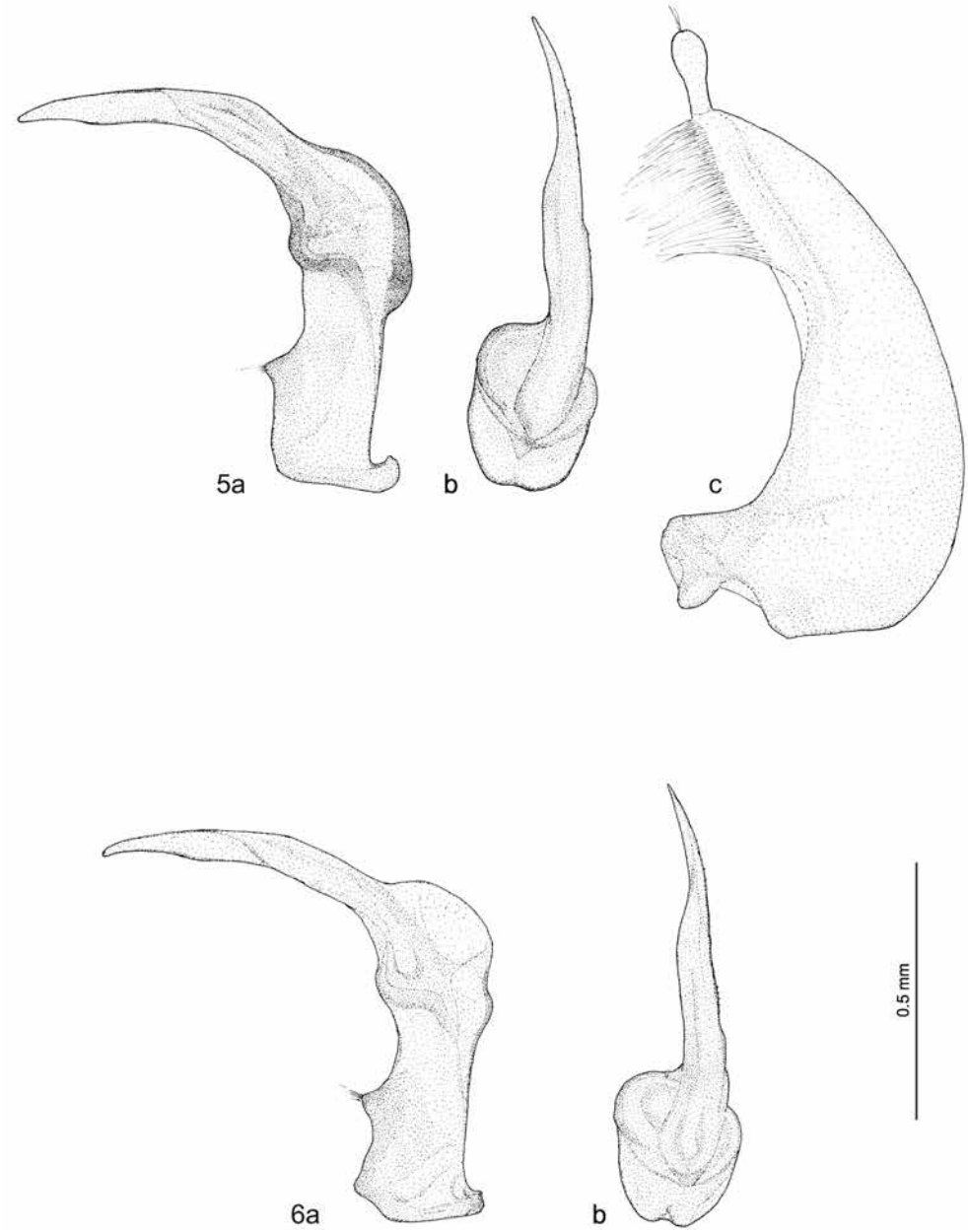
Colour (Fig. 1): Head reddish-brown, sometimes dark-brown behind eyes. Pronotum dark-brown, more or less yellowish-brown at anterior angles and along lateral sides. Elytra dark-brown with a broad, posteriorly undulated yellowish-brown basal band not reaching suture; sometimes vaguely lighter at posterior fifth. Epipleura and most of the rest of the ventral surface reddish-brown, darker on lateral sides of head, posterior angles of pronotum, lateral sides of metacoxae and on last three ventrites. Antennae and legs reddish-brown.

Structures: Clypeus without bead. Lateral margin of pronotum with a fine rim missing at anterior corner. Lateral margin of elytron with a fine rim missing at apex. Prosternal process broadly lanceolate, distinctly convex, bluntly pointed, with thick bead, especially near procoxae. Metaventral wings narrow and curved. Metacoxal lines completely reduced. Posterior margin of metacoxal process with a distinctly impressed, short groove.

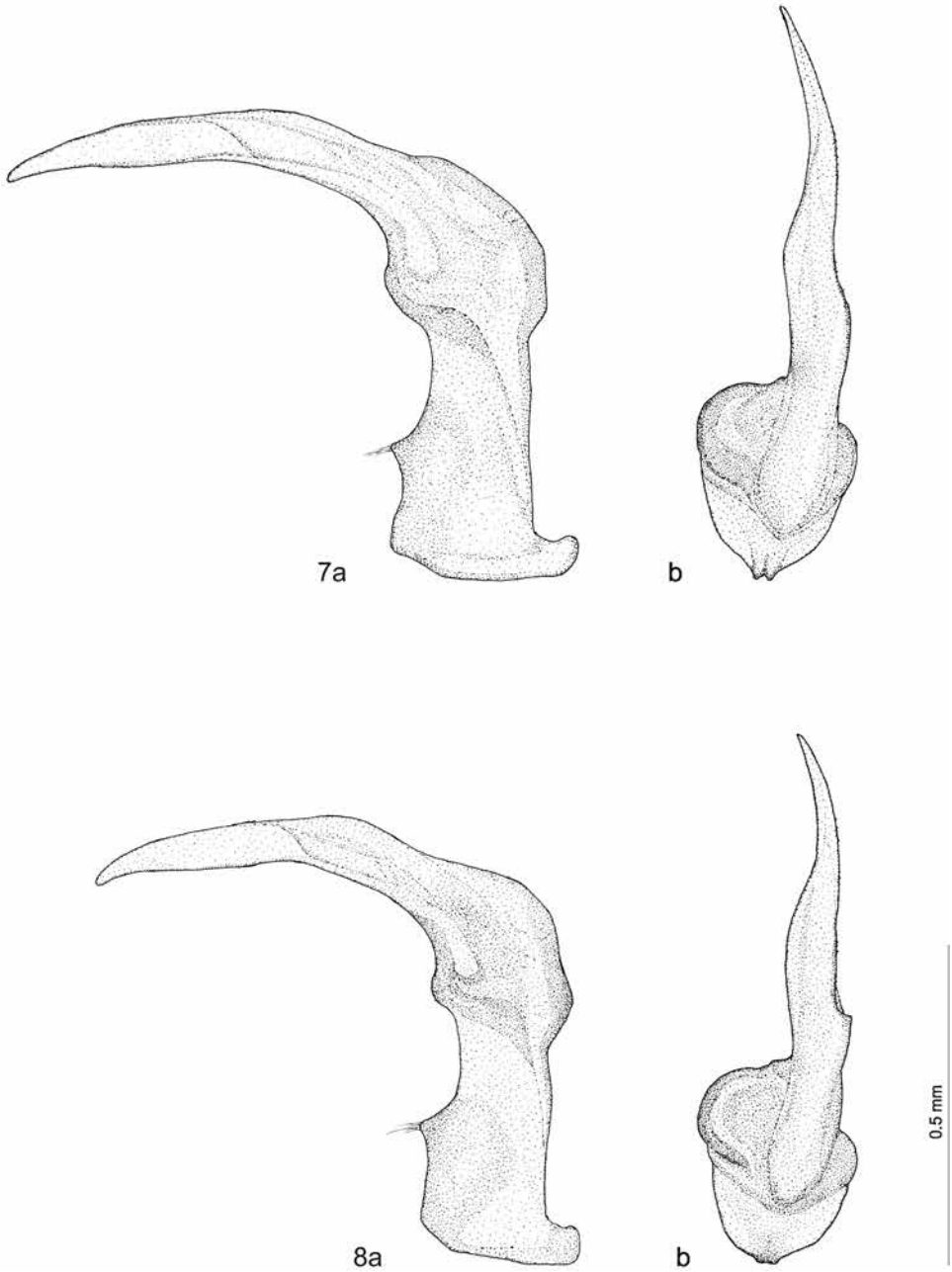
Surface sculpture: Head with regular, dense and fine microreticulation, with fine and sparse punctation, additionally with rows of strong, deeply impressed punctures along inner margins of eyes and with four short oblique rows anteromedial of eyes. Pronotum with regular, dense and fine microreticulation, with fine and sparse punctation, additionally with a row of stronger punctures along margins, missing in middle of posterior margin; with short longitudinal strioles of different lengths, except on disc. Elytra with microreticulation similar to that of pronotum; with three regular rows of strong punctures between suture and shoulder, one row along lateral declivity and with an additional irregular submarginal row; with numerous, densely set longitudinal curved fine strioles providing the surface with a somewhat mat appearance. Ventral side: Prosternal process smooth, with few fine punctures. Metaventrite and metacoxae with fine microreticulation, without punctation. Metacoxae with few fine transverse wrinkles and few fine longitudinal striae. Abdomen with very fine microreticulation visible only under high magnification, without punctation. Abdominal ventrites 1–4 with distinct oblique striae, ventrite 5 with few fine transverse striae.

Fig. 1: *Copelatus djiboutensis*, holotype, TL: 6.5 mm.

Figs. 2–4: *Copelatus gestroi*, 2) holotype (female) from Eritrea, TL: 6.7 mm, 3) male from Elba Mountain (south-eastern Egypt), TL: 6.2 mm, 4) male from Israel, TL: 5.8 mm.



Figs. 5–6: Aedeagus, a) median lobe in lateral and b) ventral view, c) lateral lobe: 5) *Copelatus djiboutensis* (holotype), 6) *C. gestroi* (Elba Mountain, south-eastern Egypt).



Figs. 7–8: Aedeagus, a) median lobe in lateral and b) ventral view: 7) *Copelatus gestroi* (Oman), 8) *C. gestroi* (Israel).

Male: Pro- and mesotarsal claws slightly longer. Pro- and mesotarsomeres I–III distinctly dilated. Aedeagus: Median lobe as in Fig. 5a–b; lateral lobe as in Fig. 5c.

Female: Habitus, colour and surface sculpture as in male. Pro- and mesotarsal claws slightly shorter. Pro- and mesotarsomeres not modified.

AFFINITIES: *Copelatus djiboutensis* is similar to *C. gestroi* sensu auct. in habitus, colouration, lack of distinct metacoxal lines, strong punctures forming four irregular rows on elytra (with an additional submarginal row). It can be separated mainly by the presence of numerous longitudinal curved fine strioles on elytra and many short longitudinal strioles on the pronotum. It also differs in slightly less curved lateral sides of pronotum broadest anterior of posterior corners. The body of *C. djiboutensis* is very slender (ratio TL-H/MEW 2.08–2.15, mean value 2.11; ratio EL/MEW 1.72–1.74, mean value 1.73), thus especially resembling specimens of *C. gestroi* sensu auct. from Israel and Sinai. Significant differences in the male genitalia could not be found, mainly because of the overall variability of the aedeagus of *C. gestroi* (see below).

Copelatus djiboutensis also resembles *C. antoniorum* described from northern Oman and the eastern United Arab Emirates. The two species are similar in habitus, colouration and sculpture, but *C. djiboutensis* can be distinguished by slightly less curved lateral sides of pronotum (being broadest anterior of posterior corners), larger basal band on elytra, presence of fine strioles on elytra in both sexes, completely reduced metacoxal lines.

ETYMOLOGY: This species is named after the country, in which the type specimens were collected.

HABITAT: All specimens were collected from a small pool at the base of a waterfall (see Fig. 10).

DISTRIBUTION (Fig. 9): Known only from the type locality.

Copelatus gestroi (SHARP, 1882) sensu lato

Aglymbus gestroi SHARP 1882: 597; ZIMMERMANN 1920: 147; GUIGNOT 1961: 746; GUÉORGUIEV 1968: 38; WEWALKA 1974: 110; ALFIERI 1976: 35; BRANCUCCI 1980: 109; FURTH 1983: 5, 15; BRANCUCCI 1985: 236; WEWALKA 1986: 279; JÄCH & MARGALIT 1987: 332; SALEH AHMED 1996: 205; ZALAT et al. 2000: 14; NILSSON 2001: 55; NILSSON 2003: 47; AHMED 2004: 36; ZALAT et al. 2009: 11.

Copelatus gestroi: SHAVERDO et al. 2008: 50; HÁJEK & REITER 2014: 81; SALAH & RÉGIL CUETO 2014: 148; NILSSON & HÁJEK 2017a: 63; NILSSON & HÁJEK 2017b: 16.

TYPE LOCALITY: Sciotel Valley, ca. 15°35'N 38°20'E, ca. 800 m a.s.l., ca. 21–26 km SW Keren, Anseba Region or Gash-Barka Region, central Eritrea.
For detailed map of Sciotel Valley see: https://www.loc.gov/resource/g8340m.gct00182/?sp=25.

TYPE MATERIAL: **Holotype** ♀ (MNG): "Bogos. [area of 'Bogo' (= Bilin or Bilen) people] 1870 Sciotel[1] [former Italian colony ("Colonia italo-africana di Sciotel", 1867–1869)] O. Beccari [Odoardo Beccari, 1843–1920, Italian botanist]" [partly printed and partly handwritten white label with black frame], "Typus" [printed white label with red frame], "Gestroi Sharp" [printed white label with black frame], "Aglymbus Gestroi Sharp 2 883 . typus!" [handwritten white label], "HOLOTYPUS ♀ Aglymbus gestroi Sharp, 1882" [partly printed and partly handwritten red label with black frame], "Museo Civico di Genova" [printed white label, black frame partly cut off].

ADDITIONAL MATERIAL EXAMINED:

ISRAEL: Dead Sea area: 4 ♂♂, 3 ♀♀ (CGW, NMB, NMW): Nahal Arugot [see WEWALKA 1974, JÄCH & MARGALIT 1987, SHAVERDO et al. 2008]; 1 ♂ (CGW): Ein Namer [see WEWALKA 1974, JÄCH & MARGALIT 1987].

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[1] The name Sciotel was incorrectly spelled as "Seiotel" in the original description and in various subsequent publications, including catalogues.

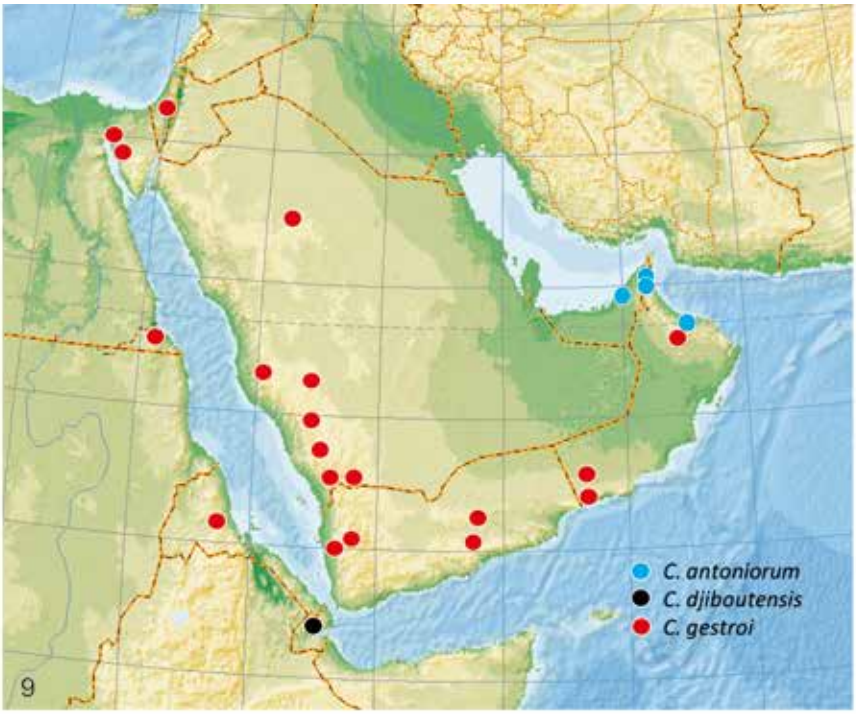

Fig. 9: Distribution of *Copelatus antoniorum, C. djiboutensis*, and *C. gestroi*. Unconfirmed literature records from Egypt not shown.

Fig. 10: Type locality of *Copelatus djiboutensis*: waterfall near Campement Touristique Ditillou, Goda Mountains, Djibouti.

EGYPT: Sinai: 1 ♂ (CGW): "Wadi Taar" [see WEWALKA 1974, SHAVERDO et al. 2008]; 1 ♀ (BZL): "Tor ?[illegible letter(s), probably 'b.'] Suez [we were not able to interpret this locality unambiguously, it might refer to El Tor in south-western Sinai or to Suez in north-western Sinai]", "Gehr. W. Müller Vermächt. 1909", "Coll. Gschwendtner" [unpublished record].

Hala'ib Triangle [south-eastern Egypt]: 3 ♂♂ (BZL, NMB): "GABAL [Mountain] ELBA W. AIDEP [Wadi Aideib] 26.I.1933 \ EGYPT Min. [Ministry] Agric. [Agriculture] (Egypt) Coll. PROF.PRIESNER \ Coll. Gschwendtner" [see WEWALKA 1974].

SAUDI ARABIA: Ha'il Prov.: 1 ♂, 3 ♀♀ (NMB): Naqben, 27°41'N 41°38'E, 1050 m, 28.–30.IV.1985, leg. W. Büttiker [unpublished record].

Makkah Prov.: 5 ♀♀ (NMB): Wadi Shuqub; 1 ♂, 1 ♀ (NMB): Wadi Shuqub, "Turabah" [Turbah] [see BRANCUCCI 1980]; 2 ♂♂ (NMB): Wadi Majarish [see BRANCUCCI 1985].

Al Baha Prov.: 2 ♀♀ (NMP): Wadi Tourbah, 19°55.774'N 41°26.574'E, 9.III.2012, leg. H. Al Dhafer et al.; 1 ♂, 3 ♀♀ (NMP): Wadi Tourbah, 20°14'23"N 41°14'32"E, 14.X.2010, leg. H. Al Dhafer et al.; 2 ♂♂, 2 ♀♀ (NMP): Wadi Tourbah, 20°14'24"N 41°15'12"E, 1.VI.2011, leg. H. Al Dhafer & A. El Ghabawi [unpublished records]; 1 ♂, 2 ♀♀ (NMB): Khoda [see BRANCUCCI 1985]; 1 ♂, 1 ♀ (NMB): "Al Mindak" [Al Mandaq] [see BRANCUCCI 1985]; 2 ♀♀ (NMB): Wadi Shumrukh [see BRANCUCCI 1985].

Azir Prov.: 1 ♂ (NMB): "Mahaiel" [Muhayil] [see BRANCUCCI 1985].

Jizan Prov.: 1 ♂, 3 ♀♀ (NMB): "Fifa" [Fayfa] [see BRANCUCCI 1985].

Najran Prov.: 1 ♂, 1 ♀ (NMB): Wadi Hismah [see BRANCUCCI 1980].

OMAN: Northern Ad-Dachiliyya Prov.: 8 ♂♂, 5 ♀♀ (CGW, NMW): Al Hoota cave system NW Nizwa [see SHAVERDO et al. 2008]; 4 ♂♂, 5 ♀♀ (CHF, NMB): "Cave Ğabal Ahdar" [Al Hoota cave], 23°05'N 57°21'E, 700 m, 17.IV.1987, leg. F. Krupp [unpublished record].

Dhofar Prov.: 1 ♂, 5 ♀♀ (NMP): Mudhai oasis [see HÁJEK & REITER 2014].

YEMEN: Al Hudaydah Prov.: 1 ♂, 1 ♀ (NMP): Jabal Bura valley forest NP [see HÁJEK & REITER 2014].

Hadramaut Prov.: 1 ♀ (NMP): Shibam; 1 ♀ (NMP): Wadi Dawan [see HÁJEK & REITER 2014].

Sana'a Prov.: 2 ♀♀ (NMP): Wadi Moor [see HÁJEK & REITER 2014]; 1 ♂ (NMP): 5 km SW of Al Badia vill., 15°04.7'N 43°46.7'E, ca. 1475 m, 5.+19.XI.2010, leg. J. Hájek [unpublished record].

DIAGNOSIS: Habitus and colour as in Figs. 2–4. Median lobe of aedeagus as in Figs. 6–8; lateral lobe as in *C. djiboutensis*.

Morphometric measurements:

Eritrea (holotype ♀): TL 6.7 mm, TL-H 6.0 mm, EL 5.1 mm, MPW 2.7 mm, MEW 3.1 mm, EL/MEW 1.65.

Egypt (Elba Mountain): TL 6.1–6.6 mm, TL-H 5.6–5.9 mm, EL 4.7–5.1 mm, MPW 2.5–2.7 mm, MEW 2.8–3.0 mm, EL/MEW 1.65–1.71 (mean value 1.68).

Israel and Sinai: TL 5.6–6.2 mm, TL-H 5.0–5.5 mm, EL 4.1–4.7 mm, MPW 2.3–2.5 mm, MEW 2.3–2.7 mm, EL/MEW 1.68–1.77 (mean value 1.72).

Saudi Arabia: TL 5.2–6.5 mm, TL-H 4.8–6.0 mm, EL 4.1–5.0 mm, MPW 2.1–2.6 mm, MEW 2.3–2.9 mm, EL/MEW 1.66–1.82 (mean value 1.72).

Oman: TL 5.3–6.6 mm, TL-H 4.8–6.0 mm, EL 4.0–5.1 mm, MPW 2.2–2.7 mm, MEW 2.3–2.9 mm, EL/MEW 1.68–1.78 (mean value 1.74).

Yemen: TL 5.6–6.6 mm, TL-H 5.0–5.9 mm, EL 4.3–5.0 mm, MPW 2.2–2.7 mm, MEW 2.5–2.9 mm, EL/MEW 1.65–1.76 (mean value 1.70).

COMMENTS: The body form of *Copelatus gestroi* sensu lato varies considerably (see Figs. 2–4). The female holotype (Fig. 2) from Eritrea (ratio TL-H/MEW 1.96; ratio EL/MEW 1.65) and – to a lesser extent – the three male specimens from Elba Mountain (Fig. 3) in south-eastern Egypt (ratio TL-H/MEW 1.96–2.01, mean value 1.98; ratio EL/MEW 1.65–1.71, mean value 1.81) are broader oval and slightly more convex than specimens from the remaining areas, i.e. eight specimens from Israel and Sinai (ratio TL-H/MEW 2.00–2.15, mean value 2.06; ratio EL/MEW 1.68–1.77, mean value 1.72), 33 specimens from Saudi Arabia (ratio TL-H/MEW 1.98–2.16, mean value 2.04; ratio EL/MEW 1.66–1.82, mean value 1.72), 19 specimens from Oman (ratio TL-H/MEW 1.99–2.13, mean value 2.06; ratio EL/MEW 1.68–1.78, mean value 1.74) and seven specimens from Yemen (ratio TL-H/MEW 1.96–2.07, mean value 2.02; ratio EL/MEW 1.65–1.76, mean value 1.70). They are more slender (sometimes even very slender), more parallel-sided and more flattened (see Fig. 4). Furthermore, in the holotype the elytral microreticulation is much more strongly impressed than in females from the other areas providing it

with a rather mat appearance. Unfortunately, we have not seen any male from Eritrea or any female from Elba Mountain (south-eastern Egypt).

The median lobe of the aedeagus shows also geographical variation, mainly in proportions and outlines of the median part (Figs. 6–8). In some specimens from Israel there is – in ventral aspect – a kind of denticle on the right side of the median lobe (Fig. 8b). In other specimens from Israel and from other areas there is only a flat knob instead (Figs. 6b, 7b).

Due to the body form and the very strong microreticulation of the holotype it can be assumed that at least the specimens from the Sinai, Israel and the Arabian Peninsula are not conspecific with the holotype. They probably represent one or more undescribed species. However, in the absence of any fresh material from the type locality we are unable to draw final conclusions. DNA-sequencing is strongly suggested.

HABITAT: Specimens have been collected in residual pools of springs and streams, and in underground water in a cave system.

DISTRIBUTION (Fig. 9): Eritrea, Egypt (Sinai and Elba Mountain), Israel (Dead Sea area), Saudi Arabia (Ha'il, Makkah, Al Baha, Azir, Jizan, Najran), Yemen, Oman.

Several authors (e.g., ZALAT et al. 2000, SALAH & RÉGIL CUETO 2014) recorded *Copelatus gestroi* from the following Egyptian bioregions: Northern Coastal Strip (CS), Eastern Desert (ED), Western Desert (WD), without providing any detailed locality data or references to such data. We have not seen any specimen from these regions and thus we regard these records as unconfirmed.

The occurrence of *Copelatus gestroi* in Ethiopia has never been confirmed; records from Ethiopia by various modern authors (e.g., ZALAT et al. 2000) are in fact based on a misinterpretation of the type locality. Records from Madagascar (e.g., ZALAT et al. 2000) are definitely based on errors.

Discussion

NILSSON & HÁJEK (2017a: 63) placed *Copelatus gestroi* and *C. antoniorum* under "*Copelatus* group unknown". Because of the absence of distinct elytral striae we propose to include these two species and *C. djiboutensis* in the "group *hydroporoides*".

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The habitus photographs were made by Dr. Harald Schillhammer (NMW).

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