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A new species of the Australian genus *Necterosoma* from Timor (Coleoptera: Dytiscidae: Hydroporini)

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Abstract. *Necterosoma timorense* sp. nov. is described from a forest reserve at Mt. Mutis, West Timor. It is the third species of *Necterosoma* W. J. Macleay, 1871 found outside of Australia. *Necterosoma timorense* sp. nov. can be distinguished from all hitherto known species by the more robust and broader body, the distinct subhumeral expansion of female elytra, and the form of male genitalia. The new species is lotic, being collected from small pools of an intermittent stream, partly shaded by eucalypt forest. Altogether 12 species of *Necterosoma* are now described.

Key words. Coleoptera, Dytiscidae, Hydroporinae, *Necterosoma*, new species, West Timor, Indonesia, Australian Region

Introduction

The diving beetle genus *Necterosoma* W. J. Macleay, 1871 is an Australian faunal element of the tribe Hydroporini (subfamily Hydroporinae), with nine described species from Australian continent and two species in New Caledonia (for summary, see Hendrich et al. 2010a). Here, we describe a characteristic new species of *Necterosoma* from Timor, the most spectacular discovery among the collected aquatic beetles of the island.

The island of Timor, northwest of Australia is the largest (28,000 km²) and easternmost of the Lesser Sunda Islands. For reasons of simplification, some authors (e.g. Nilsson 2001, 2013) include Timor in the Oriental zoogeographical region, however, more precisely it belongs to the transitional border area between the Oriental and Australian Regions, frequently called Wallacea (e.g. Lohman et al. 2011). Many parts of the island are mountainous, and the highest point is Mt. Foho Tatamailau (2,963 m) in East Timor. The climate is tropical, with distinct

rainy and dry seasons. The 12,000 hectares of the unique Mt. Mutis (2,427 m) mountain forest is dominated by homogenous stands of *Eucalyptus urophylla* S. T. Blake (Myrtaceae). The forested slopes of Mt. Mutis, the type locality of the new species, are a critical watershed for the island of Timor and play a strong role in the culture and economy of several villages located in and around Mt. Mutis (Lentz & Mallo 1998).

Material and methods

Collections. The specimens included in this study are deposited in the following institutional and private collections:

ANIC Australian National Insect Collection, CSIRO, Canberra, Australia;
HFCB Hans Fery collection, Berlin, Germany, property of NHMW;
LHCB Lars Hendrich collection, Berlin, Germany, property of NHMW;
MZBC LIPI Division of Zoology, Museum Zoologicum Bogoriense, Cibinong, Indonesia;
NMPC Národní muzeum, Prague, Czech Republic;
NHMW Naturhistorisches Museum Wien, Vienna, Austria;
SAMA South Australian Museum, Adelaide, Australia;
ZSM Zoologische Staatssammlung, Munich, Germany.

Morphological observations. The style of the descriptive notes of the new *Necterosoma* follows Watts (1978), Hendrich (2003) and Hendrich et al. (2010a). Photographs were taken with a Leica Photar 1:2 / 25 on bellows attached to a Nikon D700 camera; an image stack was produced with a custom built robotic macrorail. The principal setup is illustrated on our wiki: http://zsm-entomology.de/wiki/Digital_imaging_in_the_beetle_lab. The male genitalia were studied in dry condition; their photographs were taken with an Olympus camera DP 73 attached to an Olympus SZX16 stereomicroscope. Images at different focal planes were combined using the Helicon Focus 5.1.19 software and subsequently adapted with the Adobe Photoshop 9.0 software. The terminology to denote the orientation of the genitalia follows Miller & Nilsson (2003). Exact label data are cited for the material. Additional remarks are found in square brackets.

The following abbreviations are used in descriptions: TL – total length, length from front of head to apex of elytra; TL-h – total length minus head length, length of body from anterior margin of pronotum to apex of elytra; TW – maximum width of body measured at right angles to TL.

DNA extraction and amplification. DNA extractions were carried out on fresh material kept in 96% ethanol using the DNeasy Tissue Kit (Qiagen GmbH, Hilden, Germany). We sequenced a fragment of the cytochrome oxidase subunit 1 (CO1) using standard protocols (http://zsm-entomology.de/wiki/The_Beetle_D_N_A_Lab) for 91 specimens of *Necterosoma* along with three specimens of *Barretthydrus* Lea, 1927 as outgroups. The DNA strands obtained after sequencing were eye-corrected and aligned under Geneious R6 (available from http://www.geneious.com). Based on this matrix of nucleotides, the relationships within the genus *Necterosoma* were inferred in a Bayesian framework using MrBayes 3.2 (Ronquist et al. 2012). We used a partitioning scheme including a partition for each coding position and a GTR+Γ+I model for each partition. The analyses consisted of two independent runs of 4

Markov Chain Monte Carlo running 5 million generations and sampling every 500 cycles in order to calculate posteriori probabilities (PP). The convergence of the runs was assessed under Tracer 1.5 (Rambaut & Drummond 2007) using the shape of the log-likelihood curves and the Effective Sample Size values for each parameter. Once the generations prior to convergence were discarded, we used the remaining topologies to generate a 50% majority-rule consensus tree. In order to test the robustness of the resulting topology, we also performed phylogenetic inference using Parsimony under TNT 1.1 (Goloboff et al. 2008), with the *Tree Ratchet*, *Tree Fusing* and *Tree Drifting* algorithms (Goloboff 1999), and 1000 *Jacknife* replicates (JK).

The *Necterosoma Cox1* sequences were submitted to GenBank during earlier study (Hendrich et al. 2010b), new sequences were submitted under accession numbers HG003878 and HG003879.

Taxonomy

Necterosoma W. J. Macleay, 1871

Necterosoma W. J. Macleay, 1871: 124. Type species: *Necterosoma vittipenne* W. J. Macleay, 1871 (= *Hydroporus penicillatus* Clark, 1862) by subsequent designation of Guignot (1946).

Necterosoma: Sharp (1882): 412 (redescription); Branden (1885): 44 (catalogue); Zimmermann (1919): 145 (key); (1920): 63 (catalogue); Watts (1978): 90 (redescription); Zwick (1979): 179 (redescription); Pederzani (1995): 34 (key); Nilsson (2001): 174 (catalogue); Hendrich et al. (2010a): 154 (redescription, catalogue); Nilsson (2013): 160 (catalogue).

Diagnosis. Small to medium-sized beetles (4.0–5.4 mm), characterised by distinctly pentamerous protarsi, sides of elytra with small subapical spine, males with protibiae notched on inner side, often strongly so. Most species with distinct colour pattern on elytra, and raised elytral striae in three species. From *Sternopriscus* Sharp, 1880, another Australian genus the members of which have pentamerous protarsi, *Necterosoma* differs with 'normal' mesepimeron being in more or less vertical position, at pronounced angle with metanepisternum, and with medially contiguous metacoxal cavities with the interlaminary bridge totally concealed (cf. Zimmerman 1982).

Distribution. Eleven species were recently recognised in the genus: two species are endemic to New Caledonia; nine species occur in Australia (three species also reach Tasmania) (Watts 1978, 2002; Zwick 1979; Hendrich 2003; Hendrich et al. 2010a). Presence of the genus in New Guinea is possible.

Necterosoma timorense sp. nov.

(Figs 1–7)

Type locality. Indonesia, West Timor, Mount Mutis, 09°38′07.44″S, 124°12′48.00″E, ca. 1580 m alt.

Type material. Holotype: ♂: 'Indonesia: Timor, Mt. Mutis, creeks & streams, 1580m, 1.x.1992, 09 38.124S 124 12.800E, Balke (TIM04) [printed]', 'HOLOTYPE, *Necterosoma*, *timorense* sp. nov., Balke, Toussaint, Hendrich & Hajek des. 2013 [red label, printed]' (MZBC). Paratypes: 40 ♂♂ 39 ♀♀, same label data as the holotype (ANIC, HFCB, LHCB, MZBC, NHMW, SAMA, ZSM); 2 specimens with additional 'DNA MB 4488' and 'DNA MB 4489', respectively [green label indicating the specimen with voucher number was used for DNA extraction] (ZSM); 5 ♂♂ 3 ♀♀, 'INDONESIA, W Timor, Bali prov., Soe env., Desa Nenas, Mutis Mts, 20.-28.xi.2012, 1500-1600m, J. Horák leg. [printed]' (NMPC). All paratypes are provided with a red printed paratype label.

Additional material. 9 larvae from 'Indonesia: Timor, Mt. Mutis, creeks & streams, 1580m, 1.x.1992, 09 38.124S 124 12.800E, Balke (TIM04)'.

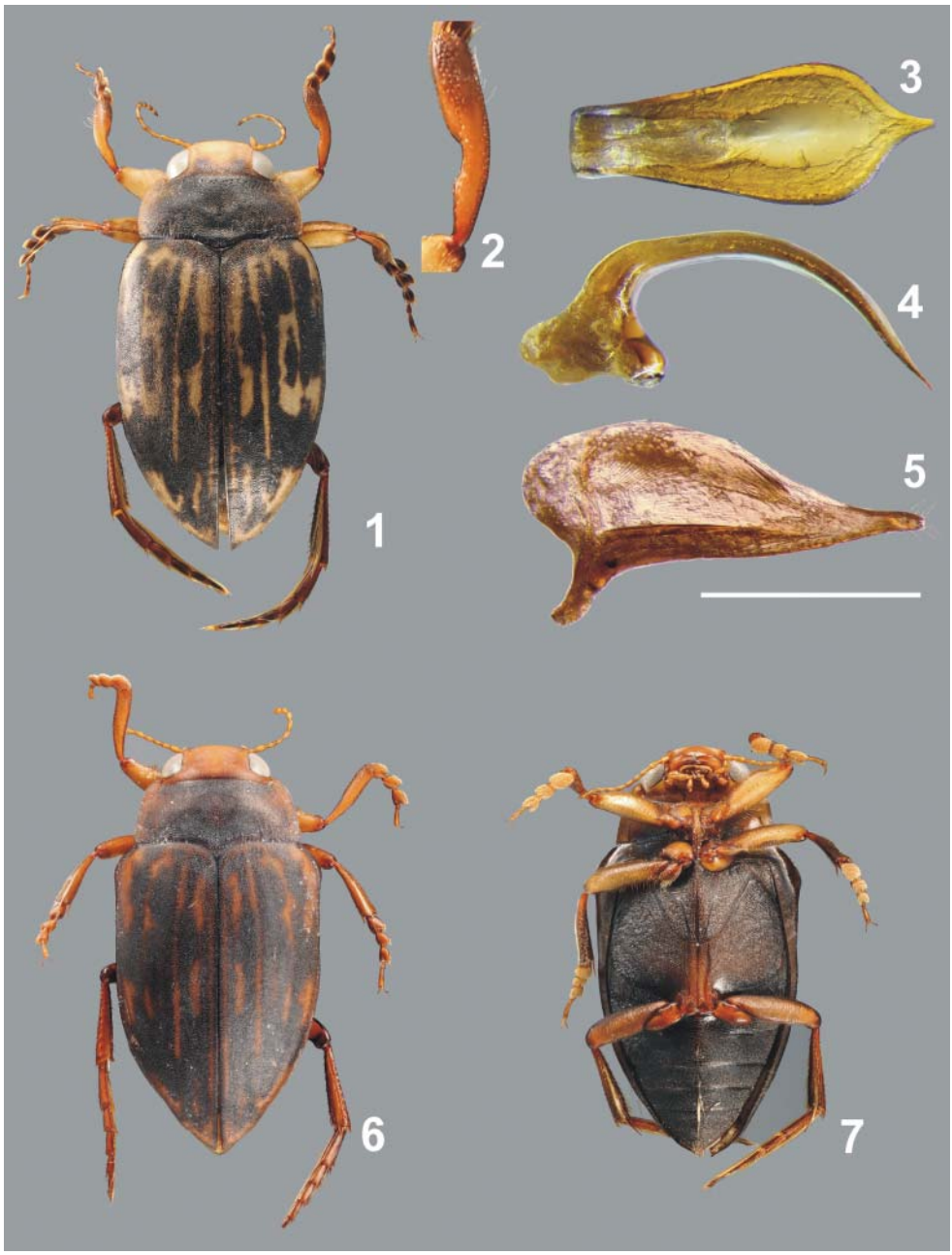
Description. ***Male holotype*.** Comparatively large to other species of genus, yellowish to dark brown species, with black longitudinal markings on elytra. Body elongate, dorsoventrally flattened, widest in middle of elytra. Beetle appearance rather shiny (Fig. 1).

Colouration. Head testaceous, darkened posteriorly; mouth appendages testaceous, terminal palpomere of maxillary palps piceous; antennae testaceous, antennomeres V–XI darkened apically. Pronotum dark brown with rufo-piceous lightenings along sides (broader anterolaterally). Elytra rufo-piceous with well separated black longitudinal stripes. Prosternum and metacoxal processes rufo-piceous, rest of ventral surface black. Legs testaceous; metafemora, tibiae apically and laterally, and tarsi darkened.

Sculpture (Figs 1, 3–4): Head microreticulated, reticulation composed of shallowly impressed polygonal meshes. Punctation simple, punctures irregularly dispersed, with diameter bigger than that of meshes; distance between punctures smaller than their diameter; punctures coarser and denser posteriorly. Head dorsally with two clypeal grooves. Fore margin of clypeus not bordered. Sides of pronotum rounded, weakly bordered; disc convex, medially with shallow longitudinal depression. Base of pronotum with several short longitudinal grooves, and shallow transverse depression along basal margin. Punctation coarse, especially on sides; punctures sometimes confluent, thus microreticulation poorly perceptible. Row of large setigerous punctures presents along anterior margin. Surface of pronotum and elytra covered with short recumbent golden setae. Elytra without carinae. Elytral punctation coarse, microreticulation absent; longitudinal puncture lines poorly perceptible. Subapical spine on lateral margin of elytra small but distinct. Prosternal process lanceolate, distinctly keeled; not narrowed compared to other species of genus. Metacoxal lines relatively close, subparallel anteriorly; metacoxal processes covered with recumbent setae. Punctation of metaventrite, metacoxae and abdominal ventrite I coarse, punctation of abdominal ventrites II–V progressively becoming finer and denser from ventrite II to apical ventrite; microreticulation absent. Abdominal ventrites medially with tuft of long golden setae, apical ventrite covered with recumbent setae; tip of ventrite slightly produced into a weak broad spine covered with setae. Protrochanters on anterior side, mesotrochanters and mesotibiae on posterior side with long golden setae; metatibia with very long natatorial setae on posterior side, metatarsi with natatorial setae on both sides. Pro- and mesotarsi moderately expanded, protarsomere II about 1.2× as wide as long. Protibia moderately expanded with large notch on inner edge near base (Fig. 2). Mesotibia expanded, quite strongly curved.

Genitalia. Median lobe of aedeagus broadly lanceolate in ventral view; its extreme tip truncate (Figs 3–4). Lateral lobes (parameres) with distinct longitudinal carina and fine long striolae on outer side; apically with setae (Fig. 5).

***Female*.** Punctation of dorsal surface finer and denser than in male, thus beetle appearance matt. Microreticulation on pronotum absent. Body widest behind shoulders. Sides of pronotum converging anteriorly, nearly parallel-sided in basal two thirds; anterior angles acute, posterior angles rectangular. Sides of elytra with distinct subhumeral expansion (Figs 6–7). Puncture lines on elytra more distinct than in male. Pro- and mesotarsus only little expanded, tarsomere



Figs 1–7: *Necterosoma timorense* sp. nov. 1 – male habitus; 2 – male protibia; 3 – median lobe in ventral view; 4 – median lobe in lateral view; 5 – right lateral lobe (paramere); 6 – female habitus in dorsal view; 7 – female habitus in ventral view. Scale bar (Figs 3–5): 0.5 mm.

II about as wide as long. Pro- and mesotibia simple, their inner side nearly straight. Apical ventrite as in male but spine more robust and prominent, and setae longer.

Variability. Specimens of type series vary significantly in body colouration, especially in extension of rufo-piceous lightenings of anterolateral part of pronotum, and in colour on elytra, which varies from almost totally black to having black longitudinal stripes well separated.

Figs 8–10: Indonesia, West Timor, track to Mt. Mutis. Rest pools of an intermittent creek in mixed eucalypt forest (*Eucalyptus urophylla* S. T. Blake). Type locality of *Necterosoma timorense* sp. nov.

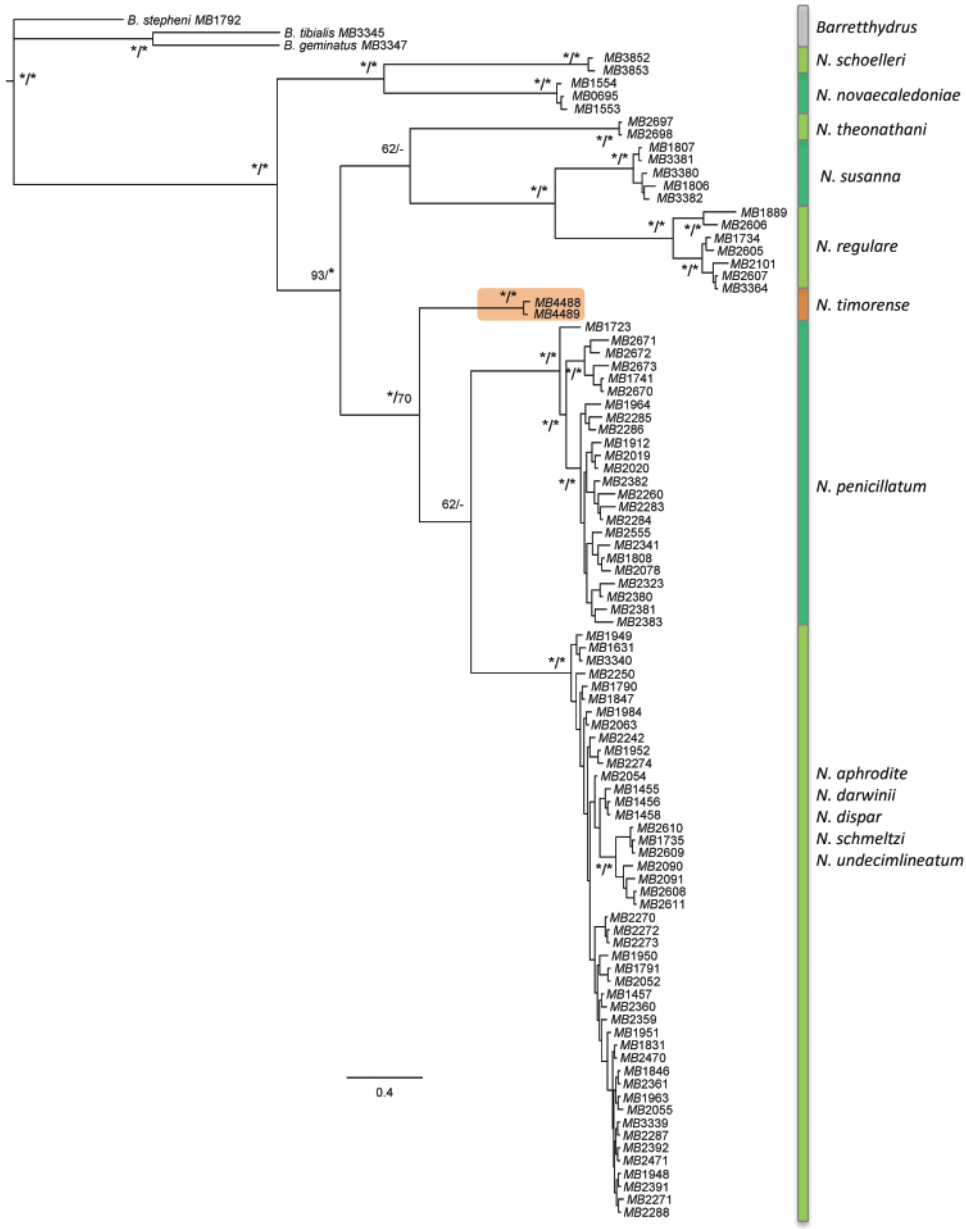


Fig. 11. Phylogenetic tree of the genus *Necterosoma* W. J. Macleay, 1871 under Bayesian Inference. The asterisks indicate a strong support in Bayesian Inference (posterior probability PP > 0.95) or in Parsimony (jackknife JK > 70). The nodes without value are poorly supported (PP < 70 or JK < 50).

Measurements. Males: TL 4.9–5.3 mm (holotype 5.3 mm); TL-h 4.5–4.9 mm (holotype 4.7 mm); TW 2.4–2.6 mm (holotype 2.6 mm). Females: TL 4.8–4.9 mm; TL-h 4.4–4.5 mm; TW 2.4–2.5 mm.

Differential diagnosis. In coloration, paler specimens of *N. timorense* sp. nov. are close to the Australian *N. penicillatum* (Clark, 1862), darker specimens resemble Australian *N. schmeltzi* Sharp, 1882 and *N. aphrodite* Watts, 1978. From all three species, *N. timorense* sp. nov. can be distinguished by a distinct subhumeral expansion of the female elytra (Figs 6–7), the shape of the notch on inner edge of the male protibia (Fig. 2), and the shape of the median lobe (Figs 3–4).

Etymology. Named after the island Timor, where the type material was collected; adjective in the nominative singular.

Collection circumstances. All specimens of *N. timorense* sp. nov. were collected in partly shaded rest pools of intermittent forest streams, at an altitude of 1,500–1,600 m. The beetles were found in shallow water, among roots, twigs and submerged leaf packs (Figs 8–10). *Necterosoma timorense* sp. nov. was found syntopically with the Gyrinidae *Dineutus regimbarti regimbarti* Régimbart, 1882 and *Macrogyrus obliquatus* Aubé, 1838, the Dytiscidae *Copelatus melanogrammus* Régimbart, 1883, *Hydaticus pacificus* Aubé, 1838, *Platynectes* sp., *Rhantus suturalis* (W. S. Macleay, 1825) and *Sandracottus chevrolati* Aubé, 1838, and some unidentified Hydrophilidae of the genera *Anacaena* Thomson, 1859, *Enochrus* Thomson, 1859, and *Helochares* Mulsant, 1844.

Distribution. Only known from the type locality on Mt. Mutis in West Timor (Indonesia) but probably more widespread on the island.

Discussion

Virtually nothing is known about the dytiscid fauna of Timor. Seven species were described from the island (Aubé 1838, Blanchard 1843, Régimbart 1899, Zimmermann 1923), additional four species were recorded by Régimbart (1899); together with the new *Necterosoma* and a record of *Rhantus suturalis* mentioned in the present work, only 12 species of Dytiscidae are known to occur in Timor. However occurrence of many other species is expected, including undescribed taxa from the genera *Laccophilus* Leach, 1815, *Neptosternus* Sharp, 1882 or *Platynectes* Régimbart, 1879 (M. Balke et al., unpublished data).

A preliminary analysis of the mitochondrial DNA CO1 fragment (Fig. 11) suggests that *Necterosoma timorense* sp. nov. is closely related to a clade of six Australian *Necterosoma*, including the most widespread, good flier *N. penicillatum*. We will compile a phylogenetic analysis based on additional genes in the future.

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