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***Rhantus elisabethae* sp. n. - a new diving beetle from Papua New Guinean highlands**

(Coleoptera: Dytiscidae)

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Abstract

We describe *Rhantus elisabethae* sp.n. from Papua New Guinea's central highlands. The new species is close to *R. bacchusi* and *R. papuanus*, but well characterized by its different male genital structure. Comparative analysis of the cytochrome c oxidase 1 gene suggests recent speciation in this group of *Rhantus* species.

Introduction

Papua New Guinea's (PNG) extensive highlands are home to diverse endemic fauna, in many parts still awaiting discovery and scientific documentation. However, this fauna is increasingly threatened by intensifying gardening and deforestation (BALKE et al. 2005). As part of a UK Darwin Initiative Project, we conduct biotic surveys to remedy the lack of knowledge in selected groups of insects, train Papua New Guinean conservation biologists, and prepare information materials for local communities. Our focus are aquatic insects, and here we report the discovery of a conspicuous new species of the genus *Rhantus* DEJEAN. These comparably large diving beetles are a characteristic part of the highland water beetle fauna. Known PNG species include the widespread *R. suturalis* (MAC LEAY, 1833), *R. bacchusi* BALKE, 2001 only known from the Eastern Highlands Province and *R. papuanus* BALFOUR-BROWNE, 1939 (BALKE 1993, 2001) only recorded from the Eastern Huon Peninsula and thought to be extinct (GROOMBRIDGE 1994). We now conducted surveys in the Eastern parts of PNG's central highlands, between Tari and Mount Hagen, and discovered a new species of *Rhantus* described herein.

We used DNA sequencing to phylogenetically place the new species and to characterise its infraspecific haplotype diversity. Methods applied are standard procedure explained elsewhere (BALKE et al. 2007).

- BMNH - Natural History Museum, London, UK
- NMW - Naturhistorisches Museum Wien, Austria
- PNGNIC - PNG National Insect Collection, Port Moresby, Papua New Guinea
- ZSM - Zoologische Staatssammlung, Munich, Germany

***Rhantus elisabethae* sp.n.**

(Figs 1-3)

Types: Holotype male: Papua New Guinea: Enga, Kumul Lodge at foot of Mt. Hagen, 2700 m, 5.xii.2006, 05.47.548S 143.58.761E, BALKE & KINIBEL (PNG 124) (BMNH).

Paratypes: 7 inds. same as holotype (PNGNIC, NMW, ZSM); 1 female, Papua New Guinea: Southern Highlands, Sopolkul, 30-35 km NE Mendi, 2680 m, 16.vi.2006, 06.02.944S 143.46.485E, John (PNG 79) (PNGNIC); 11 inds., Papua New Guinea: Southern Highlands, Tari, Mt. Ambua, 2500 m, 14.v.2006, 05.58.169S 143.06.749E, BALKE (PNG 63) (PNGNIC, ZSM). The PNG numbers refer to M. BALKE's locality numbers.

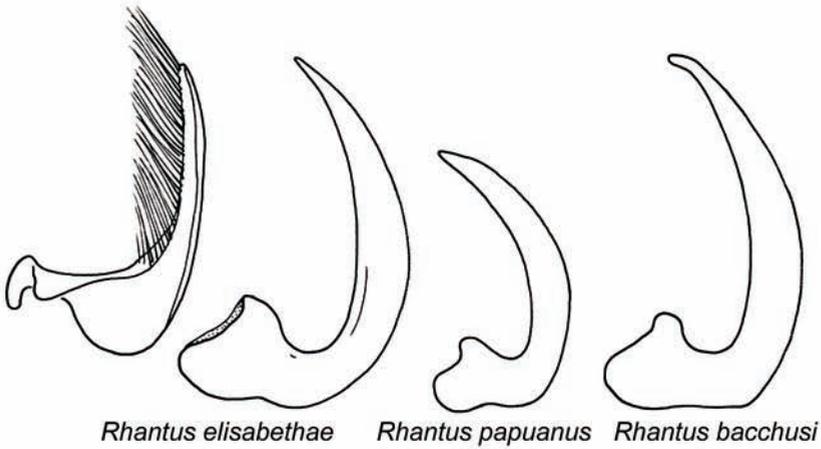
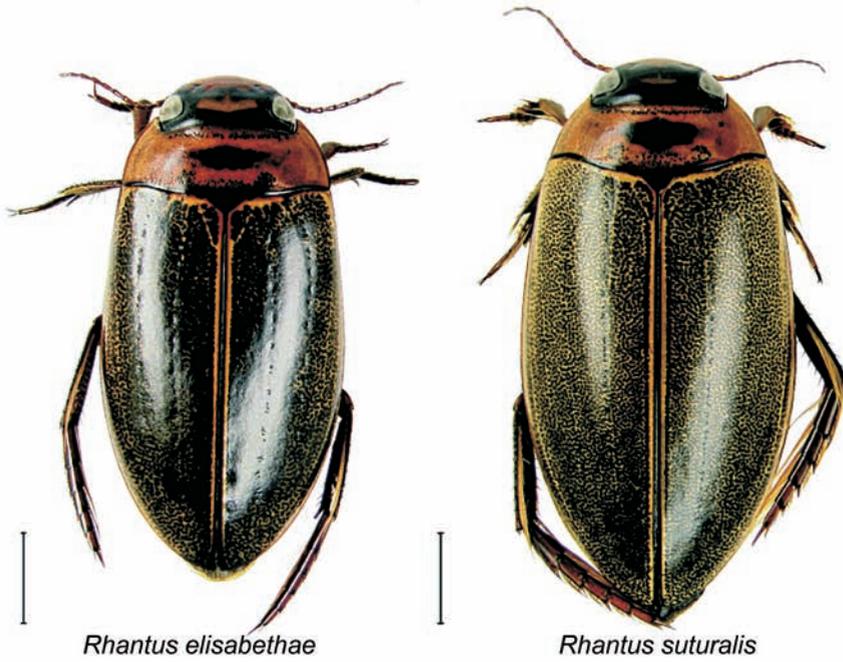


Fig. 1. Habitus, male genital structures, and last ventrite of *Rhantus* spp. For the latter, the curvature of the hind margin as seen in one specimen is depicted above the hind margin of the fully drawn ventrite. (scale 2.00 mm).

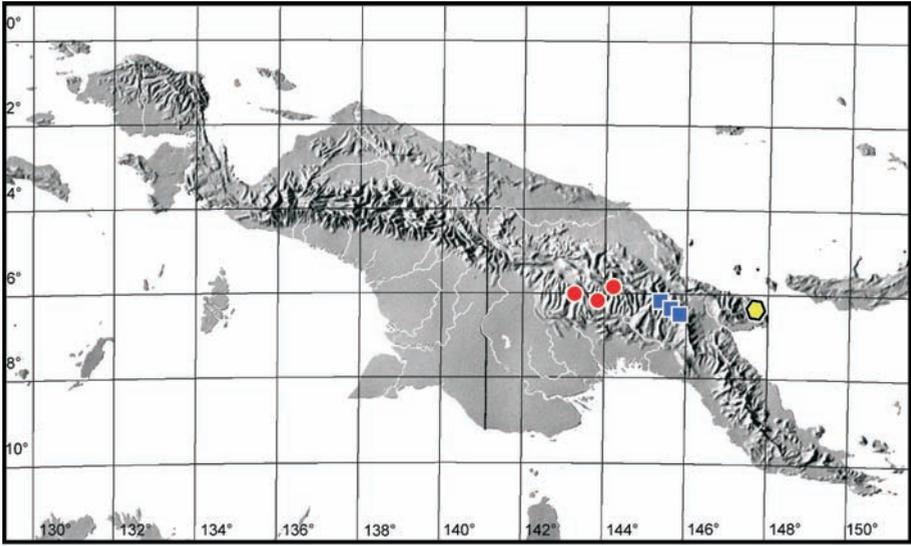


Fig. 2. Distribution of *Rhantus elisabethae* (red dots), *R. bacchusi* (blue squares) and *R. papuanus* / *R. sp. Huon* (yellow polygon).

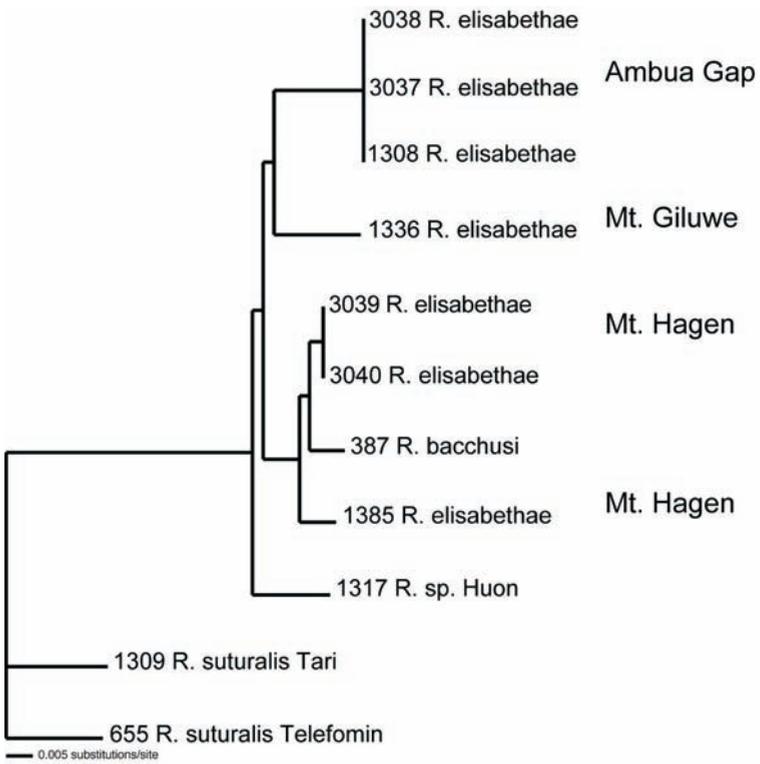


Fig. 3. Neighbour joining diagram illustrating *cox1* sequence similarities between *Rhantus* spp.

Descriptive notes

Size: Length 10.9 - 11.1 mm, greatest width 5.3 - 5.5 mm.

Species similar to *R. bacchusi* and *R. papuanus* sharing a slightly more parallel-sided body outline compared to e.g. *R. suturalis*; pronotum with marginal bead broad and extending to anterior angle, pronotum slightly narrower between hind angles than immediately in front of hind angles; dark ventral side, as well as male fore and middle claws simply curved, of subequal length and c. $\frac{3}{4}$ length of fifth tarsomere.

Rhantus elisabethae is however readily characterised by (1) its laterally strongly rugose last ventrite (Fig. 1), a character less apparent in *R. papuanus* and much less apparent in *R. bacchusi*; (2) and the different shape of the median lobe of the aedeagus (Fig. 1), which is larger than in *R. papuanus* and *R. bacchusi*, and of different curvature. The parameres of *Rhantus elisabethae* (Fig. 1) resemble in shape the other species, and also bear some trumpet-shaped setae in the fringe of long golden setae.

Etymology: For Mrs Elisabeth HINTELMANN (Munich), celebrating her outstanding, long-term contributions in support of systematic zoology.

Distribution: So far known from the mountain area between Mountain Hagen and Mount Ambua, including Mount Giluwe (Fig. 2).

Habitat: At Ambua gap, the new species was collected from among grasses in the shallow to c. 50 cm deep water at the edge of a roadside irrigation pool, associated with *R. suturalis*. At Mount Giluwe, the single beetle was taken out of a small waterhole in *Sphagnum* bog, with *Limbodessus* sp., *R. suturalis* and *Carabdytes upin*. Finally, close to the foot of Mt. Hagen on the Kumul Lodge ground, we collected *R. elisabethae* from a small swampy spot (2 m x 40 cm, max. depth ca. 5 cm only) on peaty ground, feeding into a first order stream, in disturbed *Pandanus* moss forest; one specimen was collected from a roadside ditch nearby, with *R. suturalis* and *Limbodessus* sp.

Molecular Biology

Seven specimens were used to sequence the 3' end of the cytochrome c oxidase subunit 1 gene. Intraspecific uncorrected p-distances were 0 - 3.7 %, distributed as follows: 0% (4 matches), 1.0 - 1.5% (2 matches), 2.5 - 3.0% (8 matches), 3.0 - 3.5% (7 matches), which is a comparably high intraspecific diversity, considering the small overall range of the species. Specimens cluster according to geographical locality (Mt. Giluwe only one specimen available), suggesting interrupted or restricted genetic exchange between localities. Remarkably, the single individual of *R. bacchusi* included was subordinated withing *R. elisabethae* in the distance-based neighbour joining analysis. We found similar scenarios in other New Guinean *Rhantus* species, indicative of recent speciation and incomplete lineage sorting. In other words, in such recently diversified groups, DNA sequence data from mitochondrial genes alone can not be considered useful for rapid species discovery. We found another genetically very similar morphospecies of *Rhantus* on the Huon Peninsula of PNG, in Fig. 3 marked as "1317 *R. sp.* Huon" which we first identified as *R. papuanus*, but which appears to represent another narrowly endemic, undescribed species. We will address this issue later after more material becomes available from that region.

We also included one specimen of *R. elisabethae* in a phylogenetic analysis of New Guinean and Australian Colymbetini, based on ca. 4 kb DNA sequence data from mitochondrial and nuclear genes (BALKE et al. in preparation). *Rhantus elisabethae* unambiguously forms a clade with *R. bacchusi*, as intuitively suggested based on morphology.

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