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Article



Petrodessus conatus sp. n., a new genus and species of Bidessini from hygropetric habitats in tropical Australia (Coleoptera: Dytiscidae: Hydroporinae)

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Abstract

Petrodessus conatus sp. n., **new genus and species**, is described from hygropetric habitats in northeastern Australia. The genus is similar to *Uvarus* Guignot, 1939 or *Microdessus* Young, 1967 in lacking a transverse occipital line, a transverse carina on elytral epipleuron at the humeral angle and having both basal elytral and pronotal striae. The genus differs from these in having the anterior margin of the clypeus distinctly modified, flattened and anteriorly produced. This character state is somewhat more like that in *Clypeodytes* Régimbart, 1894, *Leiodytes* Guignot, 1936, *Neoclypeodytes* Young, 1967, but *Petrodessus* n. gen. differs from these in lacking a transverse occipital line and having the basal elytral and pronotal striae distinctly and strongly impressed. This is the first hygropetric diving beetle described from Australia.

Key words: Coleoptera, Dytiscidae, Hydroporinae, Bidessini, new genus, new species, hygropetric habitats, tropical bioregion

Introduction

Hygropetric habitats, where thin layers of water seep over the surfaces of rocks, have recently become a source for a rich diversity of previously unknown water beetles with numerous new species, genera and even family-groups discovered during the past few years (Balke *et al.* 2003; K.B. Miller 2009; K.B. Miller & Spangler 2008; Perkins 2005, 2006; Ribera *et al.* 2002; Short & García 2010; Spangler & Steiner 2005). Diving beetles (Dytiscidae) are well-represented among these new taxa. Given the extensive distribution of uncollected, or undercollected, hygropetric habitats throughout the world, it seems probable that the discovery of new dytiscid taxa will continue for some time as collectors focus more attention on these habitats. The use of permethrin-based chemicals to "fog" wet surfaces has made collecting these habitats much easier. Beetles are agitated by fogging and expose themselves at which point they can be easily collected. Specimens can also be collected at night when they emerge from concealment and move about. The new genus and species described here were discovered using these focused collecting methods in hygropetric habitats in northeastern Australia. The species is in the tribe Bidessini, a group that includes *Fontidessus* K.B. Miller & Spangler, 2008, *Incomptodessus* K.B. Miller & García, 2011. These three groups, apparently only distantly related to the taxon described here, were recently described from similar hygropetric habitats in northern South America.

Materials and Methods

Measurements. Measurements were taken with an ocular scale on a Zeiss Discovery V8 dissecting microscope. Large and small specimens were measured preferentially to assess the range of sizes. Measurements include: 1) total length (TL), 2) greatest width across elytra (GW), 3) greatest width of pronotum (PW), 4) greatest width of head (HW), and 5) distance between eyes (EW). Several ratios are also calculated provided to give an indication of relative size or shape.

Material. Specimens were examined from long series collected at two main localities during a field campaign by the author in March, 2011. The holotype and several paratypes are deposited in the Queensland Museum (C. Burwell, curator). Paratypes are distributed between the Queensland Museum, the Australian National Insect Collection (S.A. Ślipiński, curator), the Museum of Southwestern Biology Division of Arthropods (K.B. Miller, curator) and the author's research collection.

Taxonomy

Petrodessus n. gen. (Figs 1–14)

Type species. *Petrodessus conatus* sp. n., by monotypy.

Diagnosis and description. This genus differs from others in the tribe by the combination of: 1) transverse occipital line absent (Fig. 1), 2) basal pronotal striae present, basally deeply impressed with a shallow, transverse groove connecting the striae (Fig. 1), 3) basal elytral stria present, basally deeply impressed (Fig. 1), 4) elytral sutural stria absent, 5) anterior clypeal margin strongly flattened, anteriorly produced, with broad anterior margin (Fig. 1), 6) elytron without longitudinal carinae (Fig. 1), 7) epipleuron without transverse carina at humeral angle, 8) lateral lobes of aedeagus two-segmented (Figs 5,6), and 9) protibia broadly triangular, heavily spinous (Fig. 2). Individuals have relatively few natatory setae on the legs, which are robust and spinous, in general (Figs 2,3).



FIGURES 1–7. *Petrodessus conatus* sp. n. 1) Dorsal habitus. 2) Left proleg, anterior aspect. 3) Left metaleg, anterior aspect. 4) Male median lobe, right lateral aspect. 5) Male right lateral lobe, right lateral aspect. 6) Male median lobe and right lateral lobe, ventral aspect. 7) Female genitalia, ventral aspect. Scale bar = 1.0 mm for 1-3 only.

Etymology. The genus name is formed from a combination of *petro*, Greek for "rock", and *dessus*, a common root in other genus names in this tribe to signify the rock-surface habitat of the single member of the genus. The gender of the name is masculine.

Distribution. *Petrodessus* n. gen. is known from the following newly described species from Tully Gorge and Paluma Range National Parks in the Misty Mountains and Paluma Mountain Range of Australia (Fig. 8).



FIGURE 8. Petrodessus conatus sp. n., distribution.

Discussion. This genus keys to couplet 14 in Biström's (1988) key to the Bidessini genera of the world where it does not fit either choice, Microdessus Young, 1967 or Uvarus Guignot, 1939. It can be easily distinguished from each of these taxa by the prominently flattened and produced anterior clypeal margin (Fig. 1). Balke and Ribera (2004) pointed out the problems with using the transverse occipital line as a diagnostic character for genera within Bidessini contending that it exhibits considerable homoplasy in the group. Presence or absence of this feature appears in an early couplet (#4) in Biström's (1988) key. When *Petrodessus* n. gen. is run through that part of the key with taxa that have an occipital line present, it keys out to Neoclypeodytes Young, 1967, a Nearctic group. Petrodessus n. gen. bears some resemblance to Neoclypeodytes and also Clypeodytes Régimbart, 1894, Leiodytes Guignot, 1936 and Borneodessus Balke, Hendrich, Mazzoldi & Biström, 2002. From Clypeodytes, Petrodessus n. gen. differs in the lack of a transverse epipleural carina at the humeral angle, the lack of any longitudinal carinae on the elytra, and the lack of a transverse occipital line. The genus differs from *Leiodytes* in lacking rows of punctures on the medial portion of the metasternum. From Borneodessus, Petrodessus n. gen. differs especially in the lack of the basal elytral striae in the former taxon. The similarity to *Neoclypeodytes* in characters is more pronounced, though Neoclypeodytes itself has taxa with character combinations making discrete definition of that genus problematic, as well (Miller, 2001), and Petrodessus n. gen. is superficially quite different. Rather than expanding Neo*clypeodytes* to include this new species, which lacks one of the few consistent features within *Neoclypeodytes* (the transverse occipital line), it seems best to put this species in its own genus until a more thoroughgoing clarification of the genus-level classification in the large and problematic Bidessini can be established.

Petrodessus conatus sp. n.

(Figs 1–14)

Type locality. Australia, Queensland, Paluma Range National Park, Twin Falls, 19°0.483'S 146°14.333'E.

Material examined. HOLOTYPE: m# in the Queensland Museum labeled, "Australia, Queensland, Paluma Range NP, TwinFalls 19° 0.483'S 146° 14.333'E 19 Mar 2011, KB Miller, leg. KBM19031101 rock seeps", "Holotype *Petrodessus conatus* K.B. Miller, 2011" [red label with black line border]. PARAPTYES: 160 same collecting labels as holotype; 16 labeled, "Australia, Queensland Paluma Rng NP, nr Crystal Ck 19°0.922'S 146°15.988'E 18 Mar 2011, KB Miller, leg. KBM18031102 rock seeps."; 19 labeled "AUS, Qld, Tully Gorge NP, at Frank Roberts Lookout, 19Mar2011 17°46.706'S 145°39.052'E KB Miller, leg. KBM19031102 rock seeps.". All paratypes with "Paratype *Petrodessus conatus* K.B. Miller, 2011" [red label with black line border].

Diagnosis. *Petrodessus conatus* sp. n. is the only member of this genus and is characterized by the diagnostic features of *Petrodessus* n. gen. Likely species level diagnostic features include the coloration, which is uniformly red-brown to yellow-brown, and the shape of the male genitalia with the male median lobe in lateral aspect elongate and slender and evenly and shallowly curved to the pointed apex (Fig. 4) and in dorsal aspect moderately broad basally and medially and then tapered to a pointed apex (Fig. 6).

Description. Measurements. TL = 1.5-1.7 mm, GW = 0.8-1.0 mm, PW = 0.7-0.8 mm, HW = 0.5-0.6 mm, EW = 0.2-0.3 mm, TL/GW = 1.7-1.8, TL/PW = 1.1-1.2. Body broad, robust, globular (Fig. 1); lateral outline slightly discontinuous between pronotum and elytron (Fig. 1); lateral margins of pronotum broadly and evenly curved (Fig. 1); lateral margins of elytron broadly curved (Fig. 1).

Coloration. Head anteriorly yellow, broadly yellow-brown posteriorly and near eyes; pronotum yellow on anterolateral surfaces, medially and posteriorly yellow-brown; elytron uniformly brown, epipleuron yellow; legs and appendages yellow; ventral surfaces yellow-red to red-brown.

Sculpture and structure. Head with fine, inconspicuous, irregular punctation, surface between punctures with fine, inconspicuous microsculpture; eyes medium in size (Fig. 1, HW/EW = 1.6-1.8); anterior margin of clypeus distinctly produced anteriorly, flattened and distinctly beaded (Fig. 1). Pronotal surface similar to that of head; with posterior angles obtuse; lateral bead narrow, of even width throughout (Fig. 1); pronotal striae prominent, extending about 1/4 distance across pronotum, region mediad to striae deeply impressed (Fig. 1). Elytron with anterolateral angle obtuse, not extended anteriorly; surface similar to pronotum; basal stria prominent, shorter than length of pronotal striae, region mediad to striae deeply impressed (Fig. 1). Prosternal process narrow, apically pointed, apically contacting metaventrite, lateral margins convergent to apex; metacoxal process with lateral lobe minute but distinct; metaventrite finely, sparsely punctate, metacoxa more coarsely punctate medially. Pro- and mesotarsi moderately broad in male, slightly narrower in female. Metatrochanter large relative to metafemur (Fig. 3).

Male genitalia. Median lobe in lateral aspect elongate, slender, of even width, evenly curved to pointed apex (Fig. 4); in ventral aspect moderately broad in basal half, apically evenly tapered to narrowly pointed apex (Fig. 6). Lateral lobe in lateral aspect elongate and relatively slender, apical half of even width, elongate, apically broadly rounded with small medial hook, dorsal margin with series of elongate setae (Figs 5, 6).

Etymology. This species is named *conatus*, Latin for "endeavor" in honor of the *HMS Endeavor*, Captain James Cook's ship in which he led the first European expedition to make contact with the east coast of Australia. The specific epithet is a noun in the nominative singular standing in apposition.

Habitat and natural history. This species appears to be exclusively hygropetric on water seeps on rock faces that are vertical, nearly vertical, or even overhanging (Figs 9–14). Specimens were collected in algal matts on the rock surface (Fig. 14), but also often on bare rock where they seemed to take refuge in cracks or behind pieces of debris. In some cases they were densely concentrated and abundant, but in others they were relatively sparsely distributed. Large numbers of specimens were collected only from nearly vertical to overhanging surfaces. Specimens were easily found and collected at night simply by examining the wet surfaces. However, they were more easily seen and collected using permethrin fogging which resulted in agitation of the specimens which then moved about. Specimens were found among numerous Trichoptera and Scirtidae larvae as well as Hydraenidae and Hydrophilidae specimens. Considerable water in different habitats was available near the sites of collection including large, torrential rivers, medium to small streams, waterfalls, and small standing water bodies. Although other diving beetles were found in these habitats, no *Petrodessus* were found there.

Interestingly, two of the few known terrestrial diving beetles, *Terradessus caecus* Watts, 1982, and *T. ano-phthalmus* Brancucci & Monteith, 1997 (possibly members of Bidessini) were discovered in this same wet tropical bioregion of Australia (Watts 1982, Brancucci & Monteith, 1997). The boundary between aquatic and terrestrial habitats in wet tropical areas can be relatively vaguely delimited. This area of Australia may be, therefore, particularly suitable for studying evolutionary transitions between aquatic and terrestrial trophic zones through intermediate habitats such as those with *Petrodessus*.



FIGURES 9–14. *Petrodessus conatus* sp. n., habitats. 9–11) Paluma Range National Park, Twin Falls site (10 close-up). 12, 13) Tully Gorge National Park site. 14) Paluma Range National Park, Twin Falls site, close-up of specimen on habitat.

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