



The epigean Australasian species of *Neobidessodes* gen.n. diving beetles— a revision integrating morphology, cybertaxonomy, DNA taxonomy and phylogeny (Coleoptera: Dytiscidae, Bidessini)

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Abstract

We use mitochondrial DNA sequence data and morphology to reassess taxonomy and phylogeny of Australasian diving beetles previously assigned to *Bidessodes* Régimbart, 1900 (Coleoptera: Dytiscidae, Bidessini). *Bidessodes* was described for a South American species. A molecular phylogenetic analysis of a set of the morphologically rather homoplastic Bidessini shows that Australasian *Bidessodes* form a clade distant from the Neotropical species and are thus assigned the new generic name *Neobidessodes* **Hendrich & Balke gen.n.** The seven Australian *Bidessodes* species known to date are transferred: *Neobidessodes bilita* (Watts, 1978), **comb.n.**; *N. denticulatus* (Sharp, 1882), **comb.n.**; *N. flavosignatus* (Zimmermann, 1922), **comb.n.**; *N. grossus* (Zimmermann, 1922), **comb.n.**; *N. gutteridgei* (Watts & Humphreys, 2003) (stygobitic species), **comb.n.**; *N. limestonensis* (Watts & Humphreys, 2003) (stygobitic species) **comb.n.** and *N. mjobergi* (Zimmermann, 1922), **comb.n.** The epigeal species are re-described. Lectotypes for *Bidessus flavosignatus* Zimmermann, 1922; *Bidessus grossus* Zimmermann, 1922 and *Bidessus mjobergi* Zimmermann, 1922 are designated, and two new species, *Neobidessodes samkrisi* **Hendrich & Balke sp.n.** from southern New Guinea (Merauke, West Papua) as well as *Neobidessodes thoracicus* **Hendrich & Balke sp.n.** from the Kimberley region, the Northern Territory and northern Queensland, are described. We delineate the species using traditionally employed morphological structures such as male genital structure and beetle size, shape and colour pattern. Illustrations based on digital images are provided here and as online resources. *Cox1* data for 42 individuals were used too as characters for DNA taxonomy (or barcoding). The signal is mixed. Of the nine species, all retrieved as monophyletic groups or clusters. *N. samkrisi* **sp.n.** and *N. flavosignatus* are morphologically strongly divergent, yet *cox1* distance only amounts to 0.85–1.14%, while intraspecific distances for *N. denticulatus* are 0.0–1.28%. The epigeal species of the genus are distributed from southern New Guinea, tropical and subtropical north of Australia, and along the east coast south to Victoria. All species occur in small streams, creeks, and pools of intermittent rivers or billabongs with sandy or gravelly bottom. The morphologically highly derived, blind and wingless stygobitic species are endemic to the Three Rivers calcrete in the Yilgarn, Western Australia. Important species characters (median lobes, parameres (in part) and colour patterns) are illustrated. A key to all seven epigeal species is provided. The known distribution and habitat preferences of each species are outlined briefly.

Key words: Dytiscidae, Bidessini, new genus, new species, lectotypes, morphological characters, DNA barcoding, barcoding gap, molecular systematics, phylogeny, Australia, New Guinea, Papua

Introduction

The Bidessini comprise more than 600 species and belong to the most diverse tribes of the Dytiscidae. Bidessini contain numerous undescribed species in the Neotropical, Oriental and Australasian regions. They are a difficult taxon at the genus level due to extensive homoplastic trends in morphological characters traditionally used to infer generic structure (Biström 1988; Miller & Spangler 2008). In Australia the situation is rather stable, however. Most Australian genera have been revised or will be revised in the near future (Balke & Ribera 2004; Watts 1978; Watts & Humphreys 2001, 2003, 2004, 2006, 2009; Watts & Leys 2005; Hendrich & Wang 2006; Hendrich & Balke 2009).

Bidessodes was originally described as a genus (Régimbart 1900). Zimmermann (1920) treated it as a subgenus of *Bidessus*, but Guignot (1958) reinstated its original rank. Young (1986) dealt with the American species and split the genus up into three subgenera: *Bidessodes* s.str., *Hughbosdinius* (misspelled as *Hughbosdineus*) and *Youngulus*. The two latter were originally described as separate genera (Spangler 1981). The type species of the genus is *Bidessodes semistriatus* Régimbart, 1900 being designated by Young (1969).

The subgenus *Bidessodes* s.str. has 13 Neotropical species including three recently described new species (Benzi Braga & Ferreira 2009), subgenus *Hughbosdinius* has two and *Youngulus* one species, the latter three also from the Neotropis. And so far also seven additional species from Australia were included in *Bidessodes* of which five were revised by Watts (1978) and two highly derived groundwater species added by Watts & Humphreys (2003).

In northern Australia, *Bidessodes* are among the most common and widespread diving beetles. Based on morphological and molecular evidence, we investigate taxonomy and phylogeny of Australian Bidessini so