



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 epigean 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 epigean 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 epigean 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

far assigned to *Bidessodes*, show that they form a clade distant from the Neotropical *Bidessodes*, and describe *Neobidessodes* **gen.n.** for the Australian species. We taxonomically treat all epigean *Neobidessodes* **gen.n.** species, combining morphology and mitochondrial DNA sequence data. Finally, we describe one new species from southern New Guinea (West Papua) and another one from northern Australia. All DNA sequence data and digital images of morphological structures were made available online for faster dissemination of taxonomic knowledge.

Material and methods

Material. This study is based on the examination of about 6500 specimens. Types of all species were examined. We designate lectotypes for *Bidessus flavosignatus* Zimmermann, 1922, *B. grossus* Zimmermann, 1922 and *B. mjobergi* Zimmermann, 1922.

Descriptions. Beetles were studied with a Leica MZ 12.5 dissecting scope at 10–100x. Male genitalia were studied and figured in wet condition. Habitus photos of beetles were made by Alexander Riedel (Karlsruhe, Germany). Photos of the male genitalia were made using a digital photo imaging system and incident light, composed of a Leica DM 2500 M microscope and a Tucsen 5.0 MP camera. The microscope was fitted with Leica HCX PL “Fluotar” 5x and 10x metallurgical grade lenses (Buffington & Gates 2008). Image stacks were aligned and assembled with the computer software Helicon Focus 4.77TM. The terminology to denote the orientation of the genitalia follows Miller & Nilsson (2003). Abbreviations used in the text are: TL (total length), TL-H (total length without head), and MW (maximum width). Label data of type material are cited in quotation marks.

Coordinates are given in decimal notation unless cited verbatim from labels. Beside various Australian road maps, we also used Google Earth (<http://earth.google.com>) to locate several localities.

DNA sequencing and data analysis. We preserved a part of our collections in pure ethanol in the field and later extracted DNA for sequencing employing methods explained in detail in Balke *et al.* (2009) and Hendrich & Balke (2009). We used the mitochondrial DNA sequence dataset of Balke & Ribera (2004) and Hendrich & Balke (2009) which is partly based on data generated by C. Watts, S. Cooper and R. Leys (Cooper *et al.* 2002), and which was downloaded from GenBank. Here, we add our new species and a complete data set of other *Neobidessodes* **gen.n.** species as well as a few other newly acquired Bidessini from the wider Australian region and South America. The new data were submitted to GenBank and are publicly available under accession numbers listed in Table 1. Individual beetles from which we extracted and sequenced DNA all bear a green cardboard label that indicates the DNA extraction number of M. Balke (e.g. “DNA 2000 M.Balke”). This number links the DNA sample, the dried mounted voucher specimen and GenBank entries.

We used Bayesian analysis with the program MrBayes 3.0 (Huelsenbeck & Ronquist 2001) and partitioned our dataset according to the two mitochondrial DNA loci, 3' cytochrome c oxidase 1 and 3' of 16S rRNA including 16S+tRNA-Leu+nad1 (we refer to it as “16S”) with a total of 1433 aligned characters for 52 specimens, including 6 outgroup species. Data were aligned using the program MUSCLE (Edgar 2004). We used the GTR+I+G model as selected by MrModeltest (Nylander 2004) for the combined dataset and ran two independent analysis in MrBayes 3.0 for 3,000,000 generations each, with samplefreq=1000.

We ran a maximum likelihood analysis of our Bidessini dataset using the program GARLI (Zwickl 2006), which was also used to run 250 bootstrap replicates. Analyses were run on CIPRES Portal 2 (CIPRES 2009). In GARLI, we used the GTR+I+G model as selected by MrModeltest for the combined dataset and ran analyses until 10,000 generations revealed no significant improvement of likelihood scores of the topology.

We finally used parsimony searches to infer phylogenetic relations as implemented in the program TNT version 1.1, which we also used to run 1000 jackknife (removal 36%) replications to assess node stability (Goloboff *et al.* 2000) (hit best tree 5 times, keep 10000 in memory).

TABLE 1. List of species included in the analysis, with authorities, dates of description and GenBank accession numbers.

Dytiscidae	16S	Cox1
Hydroporinae		
Bidessini		
<i>Allodessus bistrigatus</i> (Clark, 1862)	AF 485931	AF 484126
<i>Allodessus bistrigatus</i> (Clark, 1862)	AY 368222	AJ 850571
<i>Allodessus megacephalus</i> (Gschwendtner, 1931)	AY 368223	AY 368227
<i>Allodessus oliveri</i> (Ordish, 1966)	AY 368224	AY 368228
<i>Allodessus thienemanni</i> (Csiki, 1938)		FN 391941
<i>Bidessodes</i> "South America" 3658	FN 546263	FN 46856
<i>Bidessodes</i> "South America" 3659	FN 546264	FN 46857
<i>Clypeodytes feryi</i> Hendrich & Wang, 2006	FN 391936	FN 391944
<i>Clypeodytes larsoni</i> Hendrich & Wang, 2006	FN 391938	FN 391946
" <i>Clypeodytes migrator</i> (Sharp, 1882)" *	AF 485935	AF 484130
" <i>Clypeodytes migrator</i> (Sharp, 1882)" *	FN 391937	FN 391945
<i>Clypeodytes weiri</i> Hendrich & Wang, 2006	FN 391935	FN 391943
<i>Gibbidessus chipi</i> Watts, 1978	AF 485937	AF 484132
<i>Hydroglyphus balkei</i> Hendrich, 1999	AF 485938	AF 484133
<i>Hydroglyphus daemeli</i> (Sharp, 1882)	AF 485939	AF 484134
<i>Kakadudessus tomweiri</i> Hendrich & Balke, 2009	FN 391931	FN 391933
<i>Kakadudessus tomweiri</i> Hendrich & Balke, 2009	FN 391932	FN 391934
<i>Limbodessus amabilis</i> (Clark, 1862)	AF 484941	AF 484136
<i>Limbodessus challaensis</i> (Watts & Humphreys, 2001)	AF 485947	AF 484142
<i>Limbodessus cheesmanae</i> (Balfour-Browne, 1939)		FN 391947
<i>Limbodessus compactus</i> (Clark, 1862)	AF 485960	AF 484155
<i>Limbodessus cueensis</i> (Watts & Humphreys, 2000)	AF 485948	AF 484143
<i>Limbodessus dispar</i> (Sharp, 1882)	AF 485942	AF 484137
<i>Limbodessus eberhardi</i> (Watts & Humphreys, 1999)	AF 485957	AF 484152
<i>Limbodessus fridaywellensis</i> (Watts & Humphreys, 2001)	AF 485950	AF 484145
<i>Limbodessus hinkleri</i> (Watts & Humphreys, 2000)	AF 485951	AF 484146
<i>Limbodessus inornatus</i> (Sharp, 1882)	AF 485943	AF 484138
<i>Limbodessus inornatus</i> (Sharp, 1882) 2628		FN 391942
<i>Limbodessus magnificus</i> (Watts & Humphreys, 2000)	AF 485954	AF 484149
<i>Limbodessus masonensis</i> (Watts & Humphreys, 2001)	AF 485952	AF 484147
<i>Limbodessus</i> Papua (species g)	FN 391939	FN 391948
<i>Limbodessus</i> Papua (species r)	FN 391940	FN 391949
<i>Limbodessus praelargus</i> (Lea, 1899)	AF 485944	AF 484139
<i>Limbodessus pulpa</i> (Watts & Humphreys, 1999)	AF 485956	AF 484151
<i>Limbodessus raesidensis</i> (Watts & Humphreys, 2001)	AF 485958	AF 484153
<i>Limbodessus rivulus</i> (Larson, 1994)	AF 485934	AF 484129
<i>Limbodessus shuckardii</i> (Clark, 1862)	AF 485961	AF 484156
<i>Neobidessodes bilita</i> (Watts, 1978) n.comb.	AF 485932	AF 484127
<i>Neobidessodes bilita</i> (Watts, 1978) n.comb. 1900		FN 46816

continued next page

TABLE 1. (continued)

Dytiscidae	16S	Cox1
<i>Neobidessodes bilita</i> (Watts, 1978) n.comb. 1901		FN 46817
<i>Neobidessodes denticulatus</i> (Sharp, 1882) n.comb. 1664		FN 46830
<i>Neobidessodes denticulatus</i> (Sharp, 1882) n.comb. 1769		FN 46821
<i>Neobidessodes denticulatus</i> (Sharp, 1882) n.comb. 1891		FN 46819
<i>Neobidessodes denticulatus</i> (Sharp, 1882) n.comb. 1999		FN 46818
<i>Neobidessodes denticulatus</i> (Sharp, 1882) n.comb. 2000		FN 46820
<i>Neobidessodes flavosignatus</i> (Zimmermann, 1922) n.comb. 1610		FN 46824
<i>Neobidessodes flavosignatus</i> (Zimmermann, 1922) n.comb. 2128		FN 46832
<i>Neobidessodes flavosignatus</i> (Zimmermann, 1922) n.comb. 2133		FN 46835
<i>Neobidessodes flavosignatus</i> (Zimmermann, 1922) n.comb. 2148		FN 46833
<i>Neobidessodes grossus</i> (Zimmermann, 1922) n.comb. 1663		FN 46825
<i>Neobidessodes grossus</i> (Zimmermann, 1922) n.comb. 2147		FN 46834
<i>Neobidessodes mjobergi</i> (Zimmermann, 1922) n.comb.	AF 485933	AF 484128
<i>Neobidessodes mjobergi</i> (Zimmermann, 1922) n.comb. 1656		FN 46826
<i>Neobidessodes mjobergi</i> (Zimmermann, 1922) n.comb. 2192		FN 46842
<i>Neobidessodes mjobergi</i> (Zimmermann, 1922) n.comb. 2193		FN 46836
<i>Neobidessodes mjobergi</i> (Zimmermann, 1922) n.comb. 2208		FN 46845
<i>Neobidessodes mjobergi</i> (Zimmermann, 1922) n.comb. 2507		FN 46848
<i>Neobidessodes samkrisi</i> Hendrich & Balke sp.n. 2843		FN 46854
<i>Neobidessodes samkrisi</i> Hendrich & Balke sp.n. 2844		FN 46855
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 1666		FN 46822
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2066		FN 46828
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2068		FN 46823
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2131		FN 46849
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2132		FN 46851
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2167		FN 46853
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 1667		FN 46827
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 1670		FN 46831
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2061		FN 46829
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2126		FN 46852
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2127		FN 46850
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2161		FN 46840
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2162		FN 46843
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2163		FN 46841
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2195		FN 46838
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2194		FN 46837
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2196		FN 46847
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2197		FN 46846
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2209		FN 46844
<i>Neobidessodes thoracicus</i> Hendrich & Balke sp.n. 2210		FN 46839
<i>Papuadessus pakdjoko</i> Balke, 2001	AY 368225	AY 368229
<i>Uvarus pictipes</i> (Lea, 1899)	AF 485959	AF 484154

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TABLE 1. (continued)

Dytiscidae	16S	Cox1
Hydroporini		
<i>Necterosoma dispar</i> (Germar, 1848)	AJ 850312	AJ 850564
<i>Paroster hinzeae</i> (Watts & Humphreys, 2001)	AF 485940	AF 484135
Carabhydrini		
<i>Carabhydrus niger</i> Watts, 1978	AJ 850312	AJ 850564
Copelatinae		
<i>Liopterus haemorrhoidalis</i> (F., 1787)	AY 334125	AY 334241
Colymbetinae		
<i>Colymbetes paykulli</i> Erichson, 1837	AY 334104	AY 334220
Dytiscinae		
<i>Dytiscus circumcinctus</i> Ahrens, 1811	AY 368226	AY 368230

* will be transferred to *Leiodytes* (Hendrich *et al.* in prep.)

A separate dataset of 3' cytochrome *c* oxidase 1 sequences from 42 *Neobidessodes* specimens was analyzed with GARLI and TNT, as above, to examine the utility of *cox1* sequence data for species delineation in this particular clade of beetles. The Species Identifier module of Taxon DNA software was used to study sequence divergence in our dataset and to cluster sequences at different *a priori* set thresholds (Meier *et al.* 2006). Taxon DNA allows for threshold violations according to the triangle inequity (i.e. in a case where the divergence A–B and B–C is 3% or less, but A–C exceeds that 3%, A, B and C would still be grouped in one 3% cluster by Taxon DNA and threshold violation would be reported).

Codens

ANIC	Australian National Insect Collection, Canberra, Australia
BMNH	Natural History Museum, London, England
CGC	Collection Gilbert L. Challet, Florida, United States
CLH	Collection Lars Hendrich, Berlin, Germany; property of the NMW
DPIM	Department of Primary Industries, Mareeba, Queensland, Australia
NTM	Museum and Art Gallery of the Northern Territory, Darwin, Australia
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden
NMB	Naturhistorisches Museum Basel, Switzerland
NMV	Museum of Victoria, Melbourne, Victoria, Australia
NMW	Naturhistorisches Museum Wien, Austria
SAMA	South Australian Museum, Adelaide, South Australia, Australia
TDMB	Természettudományi Múzeum, Budapest, Hungary
UQIC	University of Queensland Insect Collection, Brisbane, Queensland, Australia
WAM	Western Australian Museum, Perth, Western Australia, Australia
ZSM	Zoologische Staatssammlung München, Munich, Germany

Collecting procedures. Most of the specimens obtained by one of us (LH) were collected in shallow water, at the edge of slow flowing streams or larger rest pools of intermittent creeks and rivers, by using different kinds of aquatic dip nets and metal kitchen strainers. Mesh diameters varied from 0.5 to 1 mm. Mats of floating roots, leaf litter and aquatic vegetation were swept heavily; the material obtained was then placed on a white nylon sheet (1 m²) or in a white plastic box. Specimens were collected with forceps and/or an aspirator. In the dry season aggregations of several hundred specimens belonging to different species are not

unusual and the use of an aspirator is highly recommended. In the Northern Territory and in north-western Australia specimens of *Neobidessodes denticulatus*, *N. flavosignatus*, *N. grossus*, *N. mjobergi* and *N. thoracicus* sp.n. were obtained by operating light traps.

Results

Neobidessodes Hendrich & Balke gen.n.

(Figs 1–21)

Type species. *Bidessus denticulatus* Sharp, 1882 by present designation.

Diagnosis. *Neobidessodes* Hendrich & Balke gen.n. is assigned to the Bidessini based on the bi-segmented parameres of the aedeagus (Figs 17, 18) (Biström 1988). It is a genus of small to medium sized Bidessini (2.3–4.2 mm), in Australia now represented by eight species and by one species in southern New Guinea.

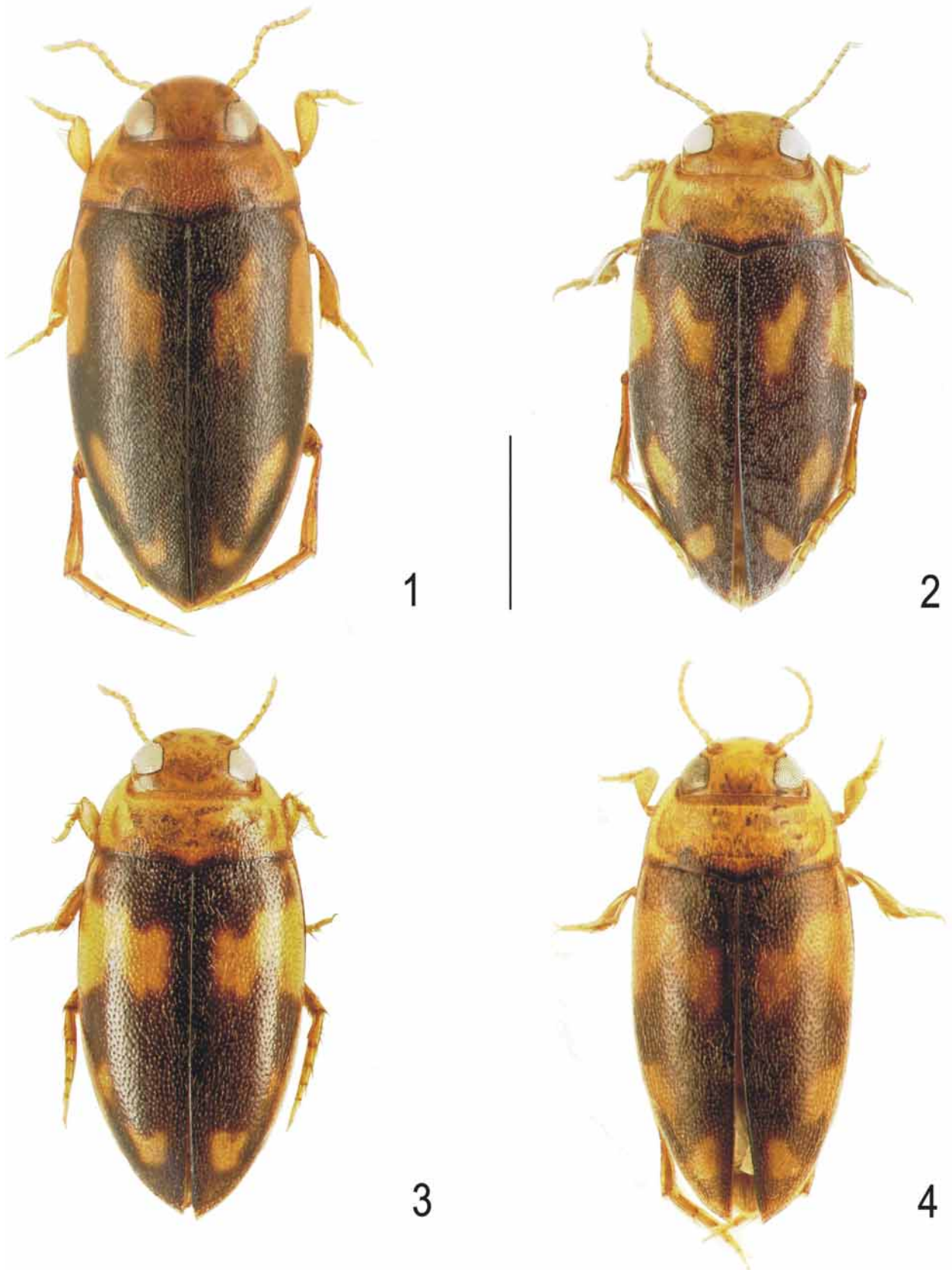
Etymology. The name *Neobidessodes* is derived from the Greek word *Neo* [new] and *Bidessodes*, a valid genus name for a group of Neotropical predaceous water beetles. Its gender is masculine.

The new genus is well separated from all other Bidessini by the combination of the following combination of characters: 1) body elongate oval; 2) basal pronotal striae in some species absent or fine, in others sharply incised, oblique, not connected by a transverse groove; 3) elytra lacking basal striae and sutural striae; 4) epipleura lacking transverse carina; 5) head lacking cervical line and its foremargin not bordered; 6) prosternal process broad, distinctly excavated and marginated; 7) inner margin of both metacoxal wings strongly ridged; 8) hind margin of abdominal ventrites 3–5 without row of minor irregular dentate processes; 9) well-developed finger-like apical lobe on distal segment of paramere. All but two (*N. limstonensis* and *N. gutteridgei*) of the species studied have a more or less contrasting black/yellow surface. The ground pattern of these species includes various yellow or reddish spots (Figs 1–12). The median lobes are simple and very elongate, in ventral view strongly tapered or rounded at tip.

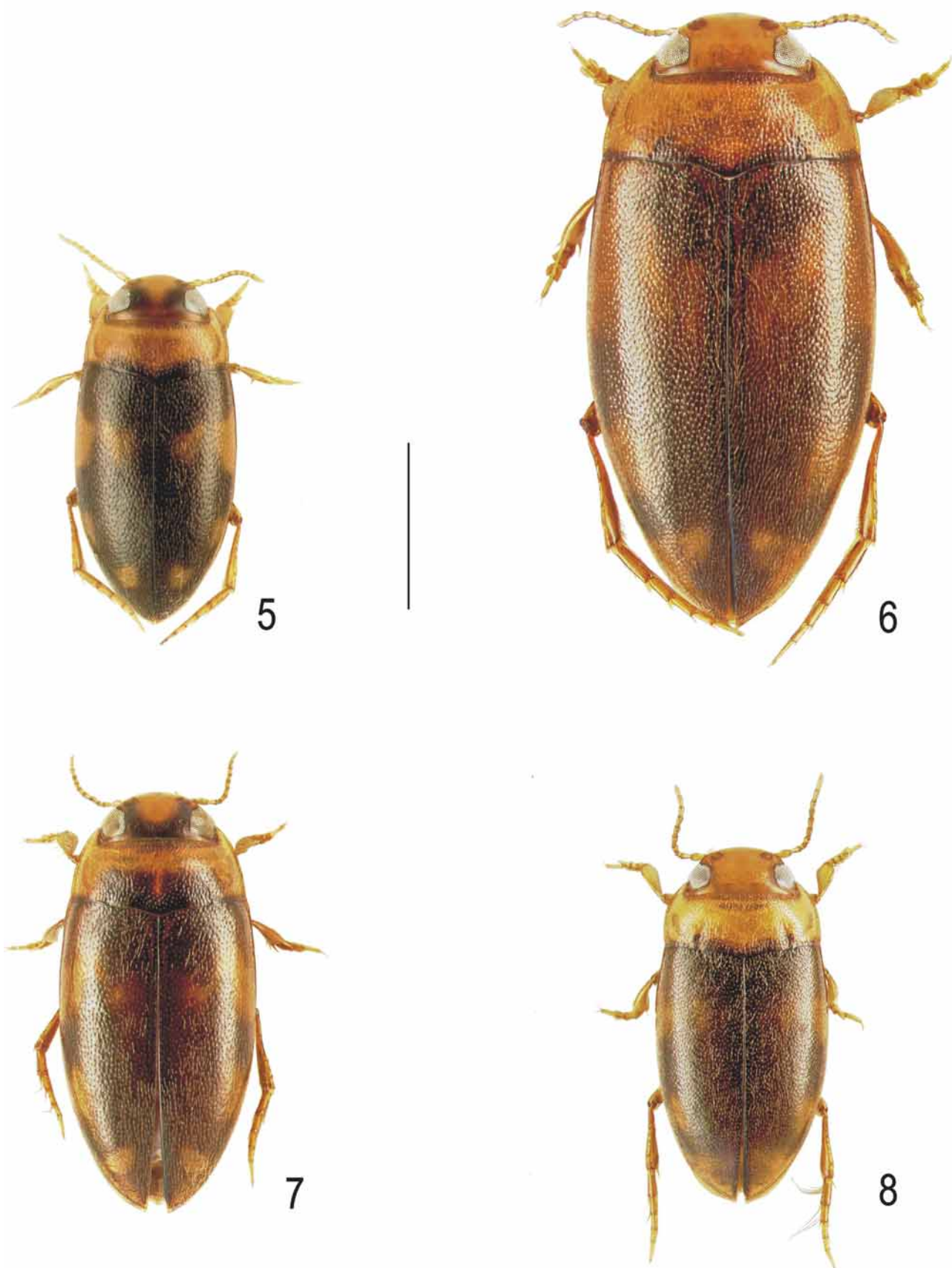
The Neotropical genus *Bidessodes* can be separated from Australian *Neobidessodes* gen.n. by having 1) a non excavated and marginated prosternal process, and 2) a visible distinct row of minor irregular dentate processes on the hind margin of the abdominal ventrites 3–5.

Molecular systematics. Our phylogenetic analyses show (Fig. 27) that *Neobidessodes* gen.n. is not part of the *Allodessus* / *Limbodessus*, the *Uvarus* / *Gibbidessus* / *Kakadudessus* or the *Leiodytes* / *Clypeodytes* clades. It is rather part of a separate lineage sister to the first two clades. The DNA sequence data from the mitochondrial cytochrome *c* oxidase 1 and 16S rRNA genes also show that *Neobidessodes* gen.n. does not belong to any of the known Oriental and Australasian Bidessini genera (the morphologically strongly deviating *Borneodessus* Balke, Hendrich, Mazzoldi & Biström, 2002 was not available for sequencing). Our data show that Australian *Neobidessodes* gen.n. are not closely related to South American *Bidessodes* and recognition of *Neobidessodes* gen.n. does not create paraphyly among other Australasian genera. This result is well supported in all analyses (Fig. 27). Essentially the same tree topology was recovered with different analytical approaches (maximum likelihood, parsimony and Bayesian probabilities as implemented in MrBayes, Fig. 27, node support values).

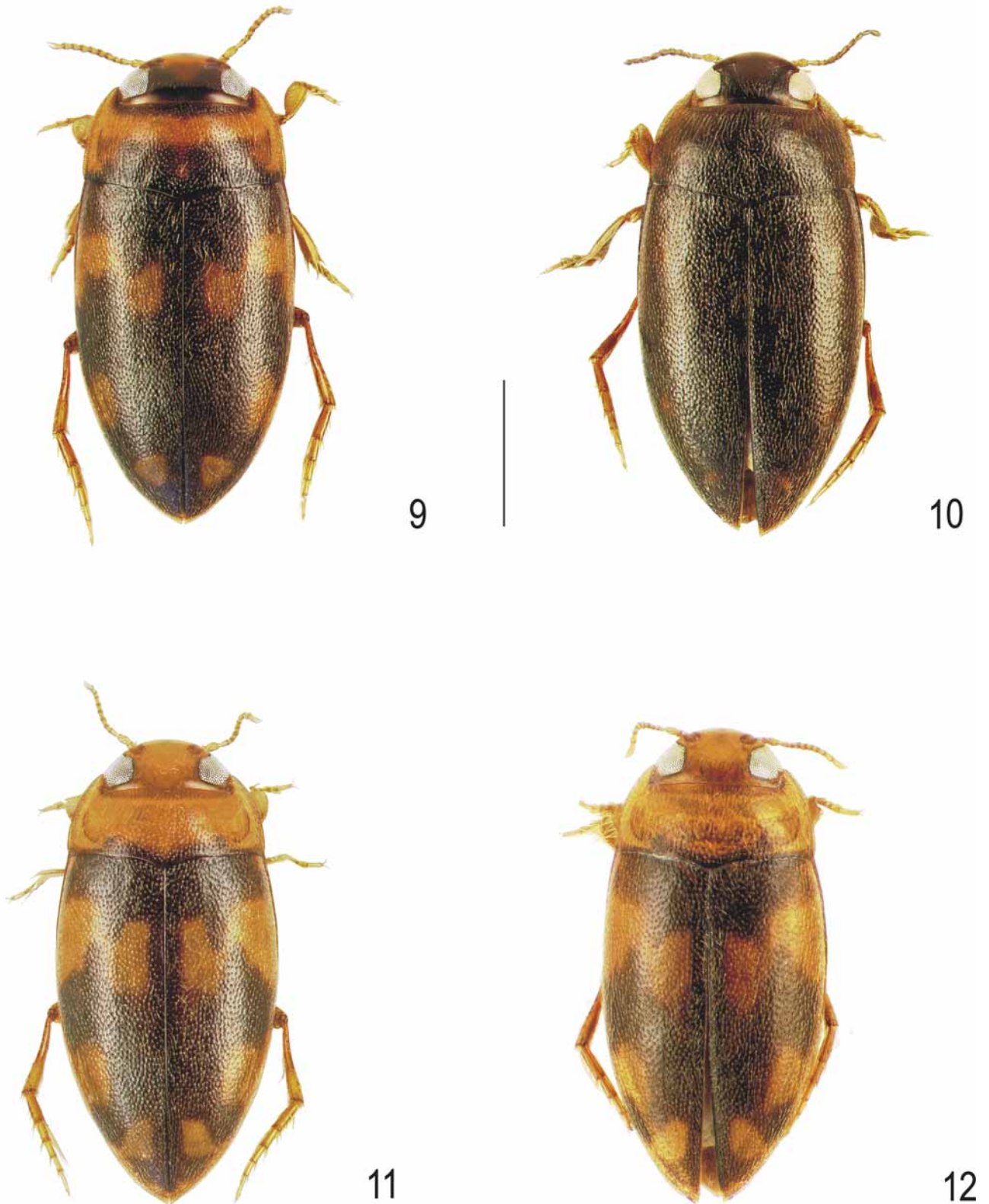
Remarks. The placement of the two stygobitic species in this genus was primarily based on evidence from *cox1* and 16S sequence data (Watts & Humphreys 2003) which suggested a relationship of the two species with *N. bilita* (Watts, 1978), *N. mjobergi* (Zimmermann, 1922) and/or *N. flavosignatus* (Zimmermann, 1922). A subsequent, comprehensive analysis of Australian stygobitic Bidessini and their epigeal relatives (Leys *et al.* 2003) suggests a sister-group relation of the stygobitic and the epigeal *Neobidessodes* (under the name *Bidessodes* at the time). There are no morphological characters that would negate their placement in *Neobidessodes* as currently defined. Our species level *cox1* data analysis (Fig. 28) confirms the sister-group relationship between stygobitic and epigeal *Neobidessodes*.



FIGURES 1–4. Habitus of 1) *N. denticulatus* (WA, Pilbara, Millstream Chichester National Park, Fortescue River side branch); 2) *N. denticulatus* (NT, Kakadu N.P., Jim Jim District, Gungurul Lookout); 3) *N. flavosignatus* (WA, East Kimberley, Gibb Range, Gibb River Road, Russ Creek Crossing); 4) *N. flavosignatus* (NT, Manton Dam Recreation Area, 46 km S Darwin) (scale bar = 1 mm), (Photos: A. Riedel).



FIGURES 5–8. Habitus of 5) *Neobidessodes samkrisi* sp.n. (holotype, male); 6) *N. grossus*; 7) *N. mjobergi*; 8) *Neobidessodes bilita* (female) (scale bar = 1 mm) (Photos: A. Riedel).



FIGURES 9–12. 9) *N. thoracicus* **sp.n.** (paratype); 10) *N. thoracicus* **sp.n.** (paratype, “black specimen”); 11) *N. thoracicus* **sp.n.** (“light form”, WA, Kimberley Region, 50 km S Wyndham, Black Flag Creek); 12) *N. thoracicus* **sp.n.** (“light form”, NT, Kakadu N.P., Jim Jim District, Gungurul Lookout) (scale bar = 1 mm) (Photos: A. Riedel).

Checklist-list of *Neobidessodes* species:

NSW = New South Wales; NT = Northern Territory; QLD = Queensland; VIC = Victoria; WA = Western Australia.

Australia – epigean

<i>N. bilita</i> (Watts, 1978)	S QLD, NSW, VIC
<i>N. denticulatus</i> (Sharp, 1882)	N WA, NT, QLD, NSW
<i>N. flavosignatus</i> (Zimmermann, 1922)	N WA, NT, N QLD
<i>N. grossus</i> (Zimmermann, 1922)	N WA, NT, N QLD
<i>N. mjobergi</i> (Zimmermann, 1922)	N WA, NT, N QLD
<i>N. thoracicus</i> Hendrich & Balke sp.n.	N WA, NT, N QLD

Australia – stygobitic

<i>N. gutteridgei</i> (Watts & Humphreys, 2003)	WA (Yilgarn)
<i>N. limstonensis</i> (Watts & Humphreys, 2003)	WA (Yilgarn)

New Guinea – epigean

<i>N. samkrisi</i> Hendrich & Balke sp.n.	West Papua, Merauke, Indonesia
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Taxonomy

Neobidessodes bilita (Watts, 1978) **comb.n.**

(Figs 8, 18, 22, 27, 28, 40, 41)

Bidessodes bilita Watts, 1978: Watts (1978: 30); Watts (1985: 24); Lawrence *et al.* (1987: 335); Biström (1988: 7); Nilsson (2001: 111); Watts (2002: 31, 43); Balke & Ribera (2004: 115); Hendrich & Balke (2009: 49).

Type locality. Stanthorpe, Southeast Queensland, Australia.

Type material. Holotype. Male: “Stanthorpe Q [Queensland] Jan 1961, C W [Chris Watts leg.]” [handwritten label], “Holotype” [printed red label], “Holotype *Bidessodes bilita* C.Watts det. 1976” [white, handwritten label with red frame] (ANIC).

Paratypes. 1 male and 1 female, same data as holotype, “Paratype *Bidessodes bilita* C.Watts det. 1976” [white, handwritten label with blue frame] (SAMA); 1 female: “Cabbage Tree Creek, Canberra-coast road, New South Wales, 19.VIII.1965”, “Paratype *Bidessodes bilita* C.Watts det. 1976” [white, handwritten label with blue frame] (SAMA).

Additional material studied. 19 specimens. New South Wales. 12 exs., S NSW, 6.5 km SW Eden, Towamba Road 2 km N Nullica, 556 m, 16.XI.2006, 37.04.412S 149.51.200E, L. & E. Hendrich leg. (NSW 111), two specimens with “DNA M.Balke 1900”, “DNA M.Balke 1901” [green printed labels] (CLH, ZSM).

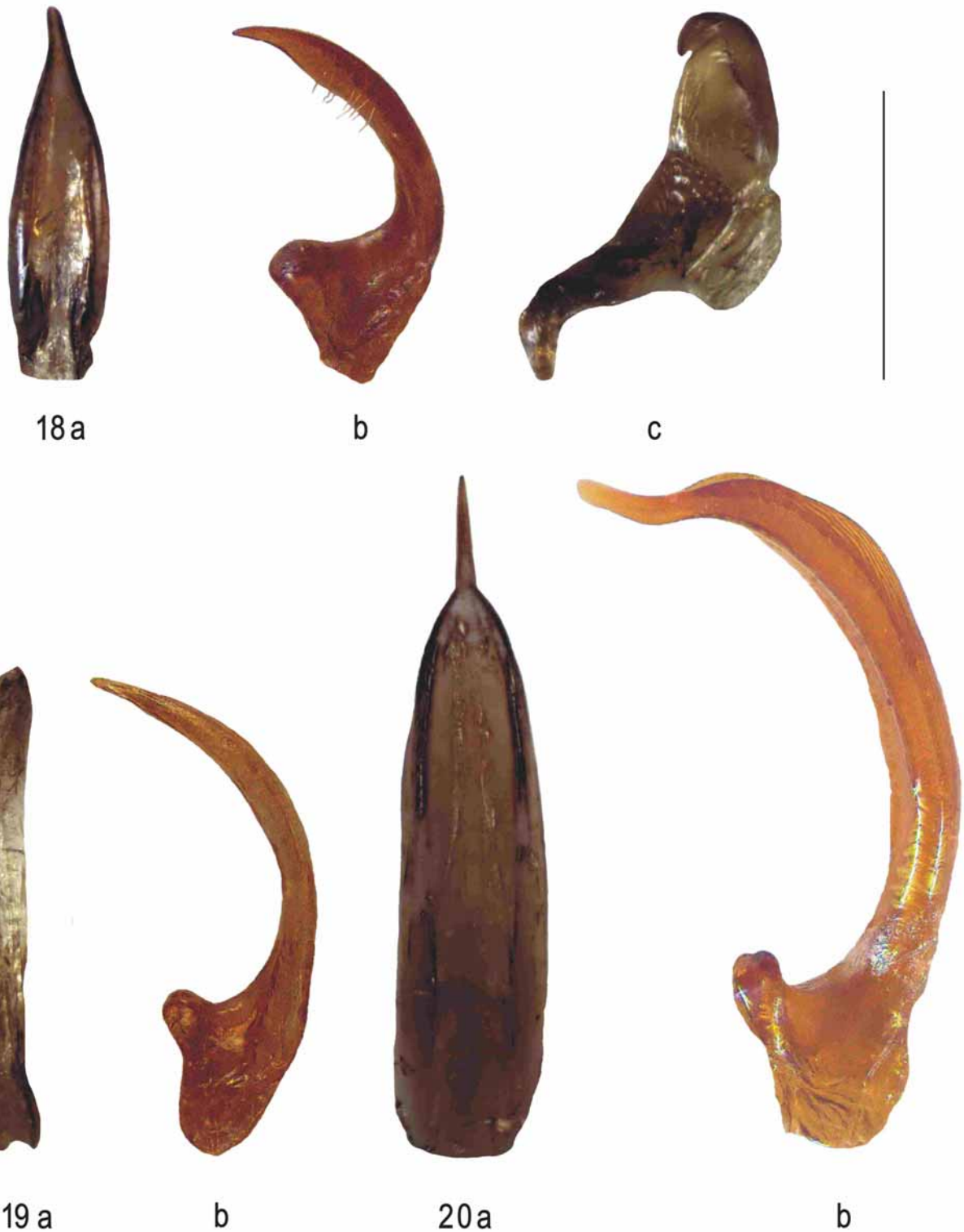
Victoria: 1 ex., S VIC, 12 km SW Orbost, Simpson Creek, 30.XI.1998, C.H.S. Watts leg. (SAMA); 3 exs., S VIC, 12 km SW Orbost, Simpson Creek, 5.XI.1997, C.H.S. Watts leg. (SAMA); 2 exs., S VIC, 12 km SW Orbost, Simpson Creek, 16.I.1997, C.H.S. Watts leg. (SAMA); 1 ex., S VIC, Simpsons Creek 12 km SW Orbost at Princess Hwy, 31 m, 18.XI.2006, 37.45.095S 149.20.436E, L. & E. Hendrich leg. (VIC 116) (CLH).

Re-description. Measurements. TL = 2.20–2.25 mm, TL-H = 2.00–2.05 mm; MW = 1.00–1.05 mm.

Colour: Antennae and palpi yellowish, head testaceous, somewhat darkened near eyes, pronotum testaceous. Elytron dark brown with some rather vague sublateral and lateral oblong yellow markings (Fig. 8). Ventral side, including legs and epipleura, testaceous, prosternal process and metacoxal plates somewhat darkened.



FIGURES 13–17. Median lobe of aedeagus in ventral (a) and lateral view (b), and right paramere in lateral view (c): 13) *Neobidessodes thoracicus* **sp.n.** (paratype); 14) *N. thoracicus* **sp.n.** (“light form”); 15) *N. flavosignatus*; 16) *N. mjobergi* and 17) *N. samkrisi* **sp.n.** (scale bar = 0.5 mm) (Photos: L. Hendrich).



FIGURES 18–20. Median lobe of aedeagus in ventral (a) and lateral view (b), and right paramere in lateral view (c): 18) *Neobidessodes bilita*; 19) *N. denticulatus* and 20) *N. grossus* (scale bar = 0.5 mm) (Photos: L. Hendrich).

Sculpture and structure. Elongate oblong. Head with relative strong punctures particularly at base. Pronotum and elytron with rather dense, medium-sized punctures and weakly to moderately microreticulate, finely pubescent. Pronotal striae deep and well marked, length 1/4 to 1/3 of that of pronotum, weakly incurved. Elytra lacking basal and sutural striae. Elytron with a weak subapical flange or bulge. Underside

with a few moderately large weak punctures at sides, midline with moderately dense smaller punctures. Metacoxal lines raised, well separated, weakly diverging anteriorly.

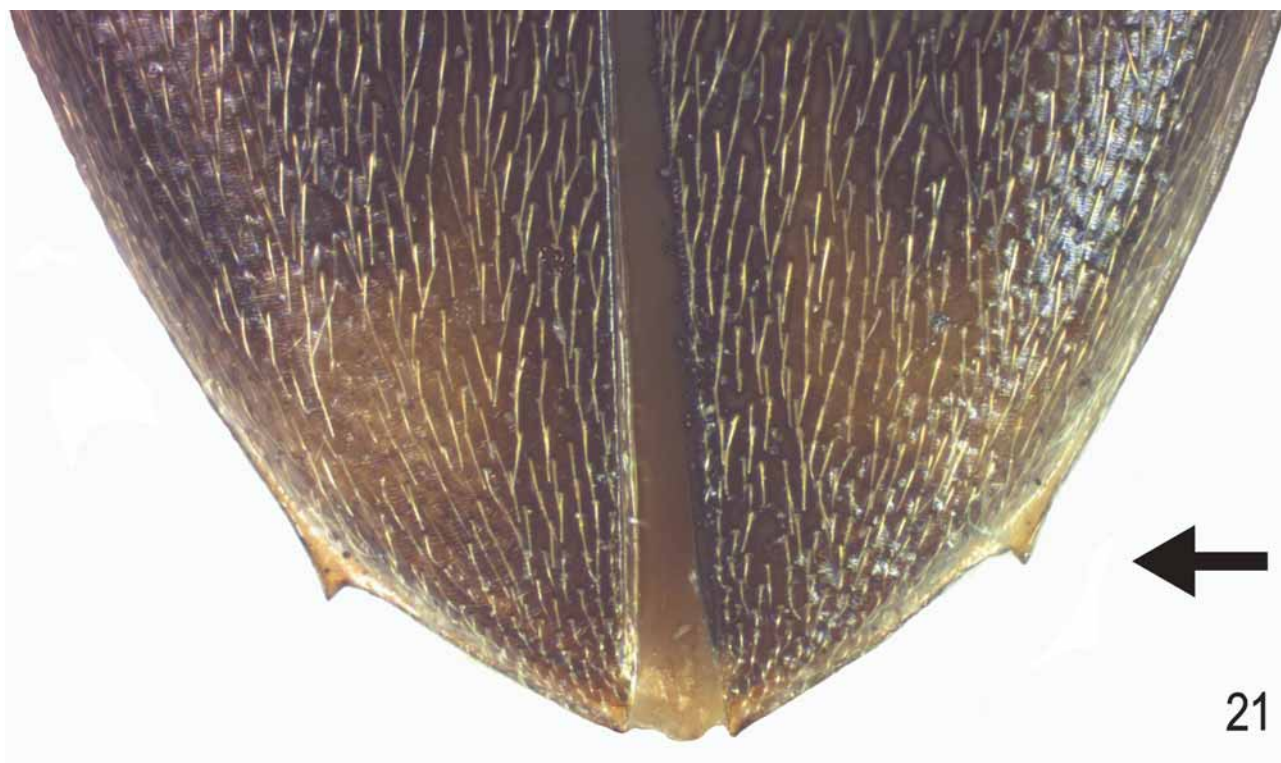
Male. Pro- and mesotarsi weakly expanded. Mesotibia quite strongly curved especially on inner edge. Median lobe of aedeagus (Fig. 18a, b) and right paramere (Fig. 18c).

Female. Pro- and mesotarsi simple. Inner edge of mesotibia nearly straight.

Affinities. The small size, the almost unicolorous dorsal surface, the slightly flanged subapical part of elytra, the well marked pronotal striae, and the strongly curved male tibiae distinguish *N. bilita* from all other known Australian *Neobidessodes*. Furthermore, the form of the median lobe and parameres are very distinctive (Fig. 18a, b, c).

Distribution. Victoria, New South Wales and Southeast Queensland (Watts 1985, Lawrence *et al.* 1987) (Fig. 22).

Habitat. A rarely collected species. *Neobidessodes bilita* inhabits rest pools of smaller intermittent streams and creeks, mainly in wet forested areas, with peaty water and at least partly shaded by dense stands of shrubs and emergent vegetation. The only new records are known from two lowland creeks in the southeastern border region between New South Wales and Victoria. At Eden (Fig. 40) *N. bilita* is associated with the dytiscids *Antiporus femoralis* (Boheman, 1858), *Chostonectes sharpi* Sharp, 1882, *Exocelina australiae* (Clark, 1863), *Hyphydrus elegans* (Montrouzier, 1860), *Limbodessus gemellus* (Clark, 1862), *Necterosoma penicillatum* (Clark, 1862), *Platynectes* spec., *Rhantus suturalis* (W.S. Macleay, 1825), *Sternopriscus hansardii* (Clark, 1862) and *S. tarsalis* Sharp, 1882. At Simpson Creek (Fig. 41) the species co-occurs with *A. femoralis*, *Chostonectes gigas* (Boheman, 1858), *C. sharpi*, *Hydrovatus opacus* Sharp, 1882, *Hyphydrus elegans*, *Limbodessus compactus* (Clark, 1862), *L. gemellus*, *N. penicillatum*, *N. undecimlineatum* (Babington, 1841), *R. suturalis*, *Sternopriscus clavatus* Sharp, 1882, *S. mouchampsi* Hendrich & Watts, 2004 and *S. tarsalis*. Contrary to all other species of the genus, except *N. grossus*, it seems that at most sites the population density is quite low as it was not possible to collect large series of specimens.



FIGURES 21. Denticulate tip of elytra in *Neobidessodes denticulatus* (Photo: L. Hendrich).

***Neobidessodes denticulatus* (Sharp, 1882) comb.n.**

(Figs 1, 2, 19, 21, 22, 27, 28, 31, 32, 37, 38, 39)

Bidessus denticulatus Sharp, 1882: Sharp (1882: 359); Zimmermann (1920: 62).

Bidessodes denticulatus (Sharp, 1882): Watts (1978: 32); Watts (1985: 24); Lawrence *et al.* (1987: 335); Biström (1988: 7); Larson (1993: 50); Weir (1998: 311); Hendrich (1997: 107); Larson (1997: 274); Nilsson (2001: 111); Watts (2002: 31, 43); Hendrich (2003: 51, 56).

Type locality. Rockhampton, Queensland, Australia.

Type material. Lectotype. Male: “Lectotype”, “Type”, “Type 97”, “Rockhampton”, “Queensland Australia”, “australia n.sp.”, “*Bidessus denticulatus*”, “*Bidessus denticulatus* det. C. Watts 1979” (NHML).

Paralectotype. “Lectotype”, “Type”, “97”, “Rockhampton”, “Queensland Australia”, “Australia”, “*Bidessodes denticulatus* (Shp) det. C. Watts 1979” (NHML).

Additional material studied. 1806 specimens. Western Australia. 103 exs., Pilbara, Millstream Chichester National Park, Fortescue River side branch, SE Visitor Centre, 21.37S 117.07E, 26.VIII.2002, leg. Hendrich (CLH, NMW); 4 exs., Pilbara, Millstream Chichester National Park, Gregory Gorge, Palm Pool at Fortescue River Crossing, 26.VIII.2002, 21.33S 117.03E, leg. Hendrich (CLH); Pilbara, Eaglehead Falls near Newman, 26.I.2007, C.H.S. Watts leg., “DNA M.Balke 1891” [green printed label] (ZSM); 13 exs., East Kimberley, Gibb River Road, Durack River Crossing, 250 m, 13.VI.1999, Hendrich leg./ Loc. 6/106 (CLH, ZSM); 59 exs., Shire of Wyndham, East Kimberley, Gibb Range, Gibb River Road, Russ Creek Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 8/108 (CLH); 285 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 9/109 (CLH); 1 ex., Shire of Wyndham, East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.VI.1999, Hendrich leg./loc. 10/110 (CLH); 16 exs., Shire of Wyndham, East Kimberley, Kalumburu Road, Meelarie Creek, 5 km N Drysdale Crossing, 350 m, 18.–19.VI.1999, L. Hendrich leg./loc. 15/115; 1 ex., Shire of Wyndham, East Kimberley, Gibb River Road 10 km W Hann River, Snake Creek 470 m, 19.VI.1999 Hendrich leg./loc. 16/116 (CLH, ZSM); 3 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Barnett River Gorge, 450 m, 19.VI.1999, Hendrich leg./loc. 17/117 (CLH); 1 ex., Drysdale River Station, Miners Pool Camp, 1.V.1992, P.J.Gullan leg. (ANIC); 10 exs., West Kimberley, Shire of Derby, Gibb River Road, Galvan’s Gorge, 420 m, 21.VI.1999, Hendrich leg./loc. 19/119 (CLH); 5 exs., West Kimberley-Shire of Derby, Gibb River Road, Saddler Spring near Iminji Aboriginal Community, 350 m, 22.VI.1999, Hendrich leg./loc. 20/120 (CLH); 1 ex., West Kimberley, Shire of Derby, Gibb River Road, Bell Gorge/Bell Creek, 340 m, 22.VI.1999, Hendrich leg./loc. 21/121 (CLH); 302 exs., Shire of Derby, West Kimberley, Fitzroy Crossing Brooking Channel, 50 m, 25.VI.1999, Hendrich leg./loc. 25/125 (CLH); 2 exs., East Kimberley, N.N. Creek 40 km W Kununurra, 50 m, 29.VI.1999, Hendrich leg./ Loc. 30/130 (CLH).

Northern Territory. 1 ex., Alligator River on road to Daly, 5.IX.2002, G.L.Challet leg. (CGC); 1 ex., Adelaide River, Australia, J.J. Walker, G.C. Champion leg., Coll. B.M. 1927-409; 1 ex., Adelaide River 92-2, 4948; 1 ex., Adelaide River 92-2, 5568; 2 exs., Australia N.Q., Koombaloomba, 10.I.1962, E.B. Britton leg. B.M. 1962-153 (NHML); 1 ex., Kakadu N.P., Nourlangie District, Gubara, 50 m, monsoonal rainforest stream, 12.50.101S 132.52.501E, 25.X.1996, Hendrich leg./loc. 1 (CLH); 4 exs., Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 13.16.218S 132.49.276E, low-gradient stream, 26. & 27.X.1996, Hendrich leg./loc. 2a (CLH); 8 exs., Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 13.16.218S 132.49.276E, floodzone pools, 26. & 27.X.1996, Hendrich leg./loc. 2b (CLH); 10 exs., Kakadu N.P., East Alligator District, Ubirr Rock Camping Area, 30 m, at Blacklight Trap, 12.26.506S 132.57.304E, 27. & 28.X.1996, Hendrich leg./loc. 4 (CLH); 2 exs., Kakadu N.P., Nourlangie District, Arnhem Highway, 12 km WNW Jabiru, 50 m, pool of intermittent creek, 12.37.937S 132.38.134E, 29.X.1996, Hendrich leg./loc. 5 (CLH); 17 exs., Kakadu N.P., Mary River District, Old Darwin Road, Black Jungle Spring, 30 m, spring fed slow flowing stream, 13.02.908S 132.09.715E, 30.X.1996, Hendrich leg./loc. 7 (CLH); 222 exs., Kakadu N.P., Jim Jim District, Old Darwin Road, Barramundi Creek, 30 m, shaded rest pool of Barramundi Creek, 12.59.652 S 132.22.928 E, 30.X.1996, Hendrich leg. (loc. 8) (CLH); 282 exs.,

Kakadu N.P., Jim Jim District, Gungurul Lookout, 50 m, 13.59.359S 132.19.904E, 1.XI.1996, Hendrich leg. (loc. 11) (CLH); 88 exs., Kakadu N.P., Muirella Park, Wasserstelle Billabong, 28.–30.VIII.1986, S. Kiener leg. (NHMB); 1 ex., Kakadu N.P., Muirella Park, Nourlangie Creek, 13.VII.1994, T. Weir & A. Roach leg. (ANIC); 6 exs., 38 km WSW Katherine, King River Bridge, 50 m, 12.V.1999, Hendrich leg./coll. Loc. 2/102 (CLH, ZSM); 1 ex., Old Stuart Hwy, Scenic Drive, Anniversary Creek south of Adelaide River, 50 m, 8.VII.1999, Hendrich leg./loc. 38/138 (CLH); 7 exs., Manton Dam Recreation Area, 46 km S Darwin, 35 m, 19.VIII.2006, 12.50.270S 131.08.050E, L. & E. Hendrich leg. (NT 1), one specimen with “DNA M.Balke 1664” [green printed label] (CLH, ZSM); 1 ex., Finnis River 10 km W Batchelor, 43 m, 20.VIII.2006, 13.01.278S 130.57.217E, L. & E. Hendrich leg. (NT 2) (CLH); 8 exs., Fenton Creek at Scenic Route, 54 km S Adelaide River, 103 m, 22.VIII.2006, 13.35.176S 131.20.544E, L. & E. Hendrich leg. (NT 10) (CLH, ZSM); 1 ex., Kakadu Hwy, Harriet Creek at Hwy Cross., 153 m, 24.VIII.2006, 13.44.512S 131.54.012E, L. & E. Hendrich leg. (NT 14) (CLH); 1 ex., Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., large pool, 20m, 24.VIII.2006, 13.38.142S 132.10.345E, L. & E. Hendrich leg. (NT 15b); 100 exs., Kakadu NP, Old Jim Jim Road, Barramundi Creek, 50 m, 26.VIII.2006, 12.59.652S 132.22.928E, L. & E. Hendrich leg. (NT 19) (CLH, ZSM); 50 exs., Magela Creek upstream, Jabiru East, 38 m, 29.VIII.2006, 12.40.458S 132.55.853E, L. & E. Hendrich leg. (NT 21) (ZSM).

Queensland. 1 ex., 43.5 km W. Kennedy Creek, pool, 7.XII.1997, G.L. Challet leg. (CGC); 1 ex., N Queensland, pond n. Caldwell, 7.XII.1997, G.L. Challet leg. (CGC); 2 exs., N Queensland, Hann River 110 km S of Coen, 27.VI.1970, J.C. Le Souef leg. (NMV); 2 exs., SE Queensland, 60 km S Brisbane, 10 km NNW Canungra, 27°57'18.1''S 153°08'56''E, 25.VIII.2004, leg. M. Jäch (AU 11) (NMW); 21 exs., Lakefield NP, unnamed tributary of Normanby River, S 15.11 E 144.24, 27.VII.1998, A.A. Calder leg. (ANIC); 11 exs., Mungkan Kandiju NP, Langi Lagoon, S 13.27 E 142.42, 29.VI.–5.VII.1998, T. Weir leg. (ANIC); 4 exs., Lakefield NP, 6.5 km ESE New Laura Ranger Station, S 15.11 E 144.25, at light, 26.–29.VII.1998, A.A. Calder leg. (ANIC); 1 ex., N Queensland, 28 km N by E Musselbrook Camp, S 18.21 E 138.11, at light, 12.V.1995, I.D. Naumann leg. (ANIC); 1 ex., N Queensland, 13 km SE Mt. Carbine, 15.XI.1990, D.J. Larson leg. (ANIC); 4 exs., N Queensland, Luster Creek, 15 km SE Mt. Carbine, 15.XI.1990, D.J. Larson leg. (ANIC); 2 exs., N Queensland, 43.5 km W Kennedy Creek pool, 7.XII.1997, G.L. Challet leg. (ANIC); 2 exs., N Queensland, pond near Cardwell, 7.XII.1997, G.L. Challet leg. (ANIC); 2 exs., N Queensland, Mulgrave River near Hwy, small pool, 9.XI.1990, D.J. Larson leg. (ANIC); 1 ex., N Queensland, Nicolas Creek near Molanda, 6.XI.1990, D.J. Larson leg. (ANIC); 1 ex., N Queensland, Saddle Bag Creek SE Mt. Carbine, 15.XI.1990, D.J. Larson leg. (ANIC); 2 exs., N Queensland, Lake Mitchell R., 40 km N Mareeba, 21.IX.1990, D.J. Larson leg. (ANIC); 1 ex., Batavia Downs Homestead, 17.–23.VI.1992, at light, T.A. Weir leg. (ANIC); 1 ex., Bertie Creek Xing, 12 km SW Heathlands, 15.–26.I.1992, T.A. Weir & I.D. Naumann leg. (ANIC); 1 ex., Bertiehaugh Creek, 13.VIII.1993, water sweep, P. Zborowski & J. Balderson leg. (ANIC); 1 ex., Capsize Creek, 17.VI.1993, water sweep, P. Zborowski & I.D. Naumann leg. (ANIC); 1 ex., Cardstone, 29.XII.1965, E Gaz, K. Hyde leg. (ANIC); 1 ex., Catfish Ck. Lakefield NP (Catfish waterhole), 29.X.1992, waterhole with water lilies, T.A. Weir & P. Zborowski leg. (ANIC); 1 ex., Coleman River, 26.VI.1993, water sweep, P. Zborowski & I.D. Naumann leg. (ANIC); 1 ex., Edward River, 14.IX.1993, water sweep, P. & S.O. Shattuck leg. (ANIC); 1 ex., Hann River, 14.I.1994, at light, P. Zborowski & E.D. Edwards leg. (ANIC); 1 ex., Heathlands, 15.–26.I.1992, at light, T.A. Weir & I.D. Naumann leg. (ANIC); 1 ex., Holroyd River, 13.IX.1993, by hand, P. Zborowski & S.O. Shattuck leg. (ANIC); 1 ex., Jardine River Xing, 19.X.1992, flowing river edge, T.A. Weir & P. Zborowski leg., (ANIC); 1 ex., Kennedy River, 24.IV.1994, water sweep, P. Zborowski leg. (ANIC); 1 ex., Kennedy River Xing, 16.VI.1992, temporary pool in dry river bed, sandy base T.A. Weir leg. (ANIC); 1 ex., Mary Creek, 4.XII.1968, at light, E.B. Britton & S. Misko leg. (ANIC); 1 ex., Moonlight Creek, 22.VI.1993, water sweep, P. Zborowski & I.D. Naumann leg. (ANIC); 3 exs., Moreton, 10.XII.1992, at light, Riverine forest, P. Zborowski & W. Dressler leg. (ANIC); 1 ex., Moreton [Telegraph Station], 10.XI.1993, at light, P. Zborowski & M. Horak leg. (DPIM); 1 ex., Myall Creek, 25.V.1993, water sweep, P. Zborowski & A. Roach leg. (ANIC); 1 ex., Pappan Creek, 18.II.1994, at light, P. Zborowski (ANIC); 1 ex. Pretender Creek, 14.IX.1993, lagoon, P. Zborowski & S.O. Shattuck leg. (ANIC); 1 ex., Rokeby Homstead, 23.VI.1993, light, I.D. Naumann, & P. Zborowski leg. (ANIC); 1 ex., Saltwater Creek,

Lakefield NP, 28.X.1992, stagnant pools with debris, T.A. Weir & P. Zborowski leg. (ANIC); 1 ex., St. George River, 17.XI.1993, water sweep, P. Zborowski & M. Horak leg. (ANIC); 1 ex., Wenlock River Stone Crossing, 14.VIII.1993, P. Zborowski & J. Balderson leg. (ANIC); 1 ex., Wheeler Creek, 11.IX.1993, light, P. Zborowski & S.O. Shattuck leg. (DPIM); 1 ex., N QLD, 3 km E Little Mulgrave, Atherton Road at Mulgrave River Crossing, 100 m, 19.IX.2006, 17.08.369S 145.44.384E, L. & E. Hendrich leg. (QLD 37) (CLH); 45 exs., C QLD, 19 km S Ayr, Bannister Lagoon at Bruce Hwy, swamp, 20 m, 21.IX.2006, 19.33.403S 147.15.078E, L. & E. Hendrich leg. (QLD 43) (CLH, ZSM); 3 exs., C QLD, 10 km S Mizani, Lake Kinchant, seepage, 48 m, 24.IX.2006, 21.11.580S 148.53.522E, L. & E. Hendrich leg. (QLD 46), one specimen with "DNA M.Balke 1769" [green printed label] (CLH, ZSM); 2 exs., Australia: C QLD, Mackay, 33 km S Sarina, Bolingbroke Road at Railway Cross., 221 m, 24.IX.2006, 21.38.378S 149.08.183E, L. & E. Hendrich leg. (QLD 48), "DNA M.Balke 1699" and "DNA M.Balke 2000" [green printed labels] (ZSM); 25 exs., S QLD, N Brisbane, Caboolture/Beerburrum road, near King John Creek, 29 m, 9.X.2006, 27.03.014S 152.57.021E, L. & E. Hendrich leg. (QLD 62) (CLH, ZSM); 12 exs., S QLD, 8 km SE Miriam Vale, road to Agnes Water, Oyster Creek, 18 m, 25.IX.2006, 24.20.393S 151.46.436E, L. & E. Hendrich leg. (QLD 50) (CLH, ZSM); 11 exs., S QLD, 15 km S Agnes Water, entrance Errimbula NP, 15 m, 25.IX.2006, 24.15.193S 151.49.222E, L. & E. Hendrich leg. (QLD 51) (CLH, ZSM); 1 ex., S QLD, 30 km NW Bundaberg, Yandaran Road, swampy meadow near creek, 58 m, 26.IX.2006, 24.42.291S 152.08.333E, L. & E. Hendrich leg. (QLD 55) (CLH); 1 ex., S QLD, 20 km SE Maryborough, Little Tuan Creek, 14 m, 28.IX.2006, 25.39.520S 152.50.551E, L. & E. Hendrich leg. (QLD 58) (CLH).

New South Wales. 3 exs., N NSW, 23 km SE Grafton, Pillar Valley, Pillar Valley Creek, 21 m, 14.X.2006, 29.45.364S 153.07.352E, L. & E. Hendrich leg. (NSW 73) (CLH).

Re-description. Measurements. TL = 2.80–2.90 mm, TL-H = 2.50–2.60 mm; MW = 1.30–1.40 mm.

Colour: Antennae, palpi and head testaceous with two darkened spots on clypeus anteriorly. Pronotum testaceous with thin blackish band basally. Elytron dark red-brown with some well marked elongate yellow markings (Figs 1, 2). Ventral side, including legs and epipleura, reddish-yellow, prosternal process and metacoxal plates somewhat darkened.

Sculpture and structure. Elongate oblong. Head quite strongly punctate behind, punctures smaller and weaker anteriorly. Pronotum and elytron moderately microreticulate and with moderately dense strong punctures. Length of pronotal striae 1/3 to 1/2 of that of pronotum, a little incurved, finely but usually clearly impressed. Elytra lacking basal and sutural striae. Elytron with a subapical flange, terminating in a small but marked tooth. Underside laterally with scattered moderate to strong punctures, midline with dense small punctures. Metacoxal lines raised, well separated, diverging slightly in anterior half.

Male. Median lobe of aedeagus (Fig. 19a, b). Protarsus a little expanded, mesotarsus less so. Inner edge of mesotibia a little curved.

Female. Tarsi slim, mesotibia straight on inner edge.

Affinities. The denticulate elytra (Fig. 21) readily distinguish this species from all others. Furthermore, *N. denticulatus* can be separated by the shape of the median lobe from all other species of the genus (Fig. 19).

Distribution. Northern Australia (NT, QLD), along the east coast south to northern NSW. In Western Australia from the Kimberley region, the Pilbara south to Geraldton (Watts 1985, 2002; Lawrence *et al.* 1987, Weir 1998, Larson 1997, Hendrich 2003) (Fig. 22).

Habitat. The most widespread species of the genus and also one of the commonest dytiscids in tropical northern Australia during the dry season. Mainly collected from isolated pools of seasonal rivers and creeks without any aquatic vegetation but collections of single specimens or small numbers of beetles were made from almost all habitat types. The bottom of these habitats consisted of gravel, sand and a thin layer of decaying vegetation, mainly leaves. In the Pilbara, the Kimberley region and in Kakadu the species was collected in slow flowing streams with seasonally inundated fringing *Melaleuca* woodland and numerous isolated, shallow and shaded pools (up to 20 cm depth) in river or creek beds. The species seems to be quite resistant to habitat degradation and nitrification as larger series were obtained from eutrophic and shallow cattle holes (10 m²) in temporary and partly shaded creeks without any aquatic vegetation (Figs 31, 32, 37, 38,

39). *Neobidessodes denticulatus* shared its habitat with all other *Neobidessodes* distributed in tropical northern Australia. The species is also frequently attracted to light.

***Neobidessodes flavosignatus* (Zimmermann, 1922) comb.n.**

(Figs 3, 4, 15, 23, 27, 28, 31, 37)

Bidessus flavosignatus Zimmermann, 1922: Zimmermann (1922: 3).

Bidessodes flavosignatus (Zimmermann, 1922): Watts (1978: 33); Watts (1985: 24); Lawrence *et al.* (1987: 335); Biström (1988: 7); Larson (1993: 50); Larson (1997: 274); Nilsson (2001: 111); Watts (2002: 31, 43); Hendrich (2008: 317).

Type locality: Cape York Peninsula, Queensland, Australia.

Type material. Lectotype (by present designation). Male, “Queensl. Mjöberg”, “Cape York”, “sept.”, “4292 E91 +” [printed blue label], “Naturhistoriska Riksmuseet Stockholm” [printed green label], “LECTOTYPE *Bidessus flavosignatus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed], “*Neobidessodes flavosignatus* (Zimmermann, 1922) Hendrich & Balke det. 2009” [white printed label] (NHRS).

Paralectotypes. 1 male, “Queensl. Mjöberg”, “Cape York Penins.”, “sept.”, “134 65” [printed red label], “4292 E91 +” [printed blue label], “flavosignatus Zimm.”, “Naturhistoriska Riksmuseet Stockholm” [printed green label], “PARALECTOTYPE *Bidessus flavosignatus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (NHRS); 1 ex., “Cape York”, “Queensl. Mjöberg”, “Type”, “Typus” [red label, unauthorized designation], “Zool. Staatsslg. München” [printed blue label], “PARALECTOTYPE *Bidessus flavosignatus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (ZSM); 1 ex., “Cape York Penins.”, “Queensl. Mjöberg”, “Type”, “Zool. Staatsslg. München” [printed blue label], “PARALECTOTYPE *Bidessus flavosignatus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (ZSM). All paralectotypes are provided with white and printed identification labels: “*Neobidessodes flavosignatus* (Zimmermann, 1922) Hendrich & Balke det. 2009”.

Additional material studied. 401 specimens. Western Australia. 23 exs., Shire of Wyndham, East Kimberley, Gibb Range, Gibb River Road, Russ Creek Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 8/108 (CLH); 154 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 9/109 (CLH); 5 exs., Shire of Wyndham, East Kimberley, Mitchell Plateau, Surveyors Pool, 150 m, 17.VI.1999, Hendrich leg./loc. 12/112 (CLH); 7 exs., Shire of Wyndham, East Kimberley, Mitchell Plateau, Port Warrender Road/Kalumburu Road, Lowya Creek, 290 m, 18.VI.1999, Hendrich leg./loc. 13/113 (CLH); 22 exs., Shire of Wyndham, East Kimberley, Mitchell Plateau, Kalumburu Road, 25 km NW King Edward Homestead, N.N. Creek, 370 m, 18.VI.1999, Hendrich leg./loc. 14/114 (CLH); 4 exs., Shire of Wyndham, East Kimberley, Kalumburu Road, Meelarie Creek, 5 km N Drysdale Crossing, 350 m, 18.–19.VI.1999, L. Hendrich leg./loc. 15/115; 3 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Barnett River Gorge, 450 m, 19.VI.1999, Hendrich leg./loc. 17/117 (CLH); 9 exs., East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.VI.1999, Hendrich leg./loc. 10/110 (CLH); 6 exs., Shire of Wyndham, East Kimberley, Gibb River Road 10 km W Hann River, Snake Creek 470 m, 19.VI.1999 Hendrich leg./loc. 16/116 (CLH, ZSM); 2 exs., Shire of Derby, West Kimberley, Gibb River Road, Manning Gorge, 400 m, 20.–21.VI.1999, Hendrich leg./loc. 18/118 (CLH); 26 exs., Shire of Derby, West Kimberley, Victoria Hwy, 90 km W Fitzroy Crossing, flooded forest, 50 m, 25.VI.1999, Hendrich leg./loc. 24/124 (CLH); 2 exs., Shire of Derby, West Kimberley, Fitzroy Crossing Brooking Channel, 50 m, 25.VI.1999, Hendrich leg./loc. 25/125 (CLH); 1 ex., East Kimberley, N.N. Creek 40 km W Kununurra, 50 m, 29.VI.1999, Hendrich leg./loc. 30/130 (CLH).

Northern Territory. 1 ex., Howard River at Gunnpoint Road, 12.IX.2002, G.L. Challet leg. (CGC); 1 ex., 57 km W of Kakadu NP, pond at Arnhem Hwy, 3X.1992, G.L. Challet leg. (CGC); 4 exs., 6.5 km from Douglas Hot Springs, on road to Butterfly Gorge, 16.IX.2002, G.L. Challet leg. (CGC); 1 ex., Edith Falls,

pond, turnoff of Hwy 1, 6.IX.2002, G.L. Challet leg. (CGC); 3 exs., Adelaide River 92-2, 4949-4951 (NMHL); 4 exs., Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 13.16.218S 132.49.276E, floodzone pools, 26. & 27.X.1996, Hendrich leg./loc. 2b (CLH); 20 exs., Kakadu N.P., East Alligator District, Ubirr Rock Camping Area, 30 m, at Blacklight Trap, 12.26.506S 132.57.304E, 27. & 28.X.1996, Hendrich leg./loc. 4 (CLH); 45 exs., 38 km WSW Katherine, King River Bridge, 50 m, 12.V.1999, Hendrich leg./coll. Loc. 2/102 (CLH, ZSM); 3 exs., Kakadu N.P., Nourlangie District, Arnhem Highway, 12 km WNW Jabiru, 50 m, pool of intermittent creek, 12.37.937S 132.38.34E, 29.X.1996, Hendrich leg./loc. 5 (CLH); 6 exs., Kakadu N.P., Jim Jim District, Gungurul Lookout, 50 m, 13.59.359S 132.19.904E, 1.XI.1996, Hendrich/loc. 11 (CLH); 1 ex., Kakadu N.P., Nawurlandja 27.II.2004, C.H.S. Watts leg. (SAMA); 1 ex., Gregory National Park, Bullita Stock Road, 60 km S of Victoria Hwy, Limestone Creek, 40 m, 2.VII.1999, Hendrich leg./loc. 31/131 (CLH); 1 ex., NT, Georgetown Billabong, 7 km NbyW Mt. Brockman, 12.VIII.1981, P. Outridge leg. (NTM); 1 ex., Kakadu N.P., Magela Creek, ARR OSS Site/009, 12.42S 132.57E, Wells & Webber leg. (NTM); 1 ex., Kakadu NP, Anbangbang Billabong, 8 km E Mirray Mt. Cahill, 13.VII.1994, T. Weir & A. Roach leg. (ANIC); 2 exs., Kakadu NP, CSIRO Kapelga Station UV light, 12.XII.1993, S. Peck leg. (ANIC); 2 exs., Kakadu NP, Alligator River, Gungaree Rainforest, 22.XII.1993, S. & J. Peck leg. (ANIC); 1 ex., Wildman River, 11.XI.1989, Malipartil leg. (ANIC); 5 exs., Kakadu NP, Georgetown Billabong, Magela Creek, 12.41S 132.56E, 11.VII.1994, T. Weir & A. Roach leg. (ANIC); 6 exs., Manton Dam Recreation Area, 46 km S Darwin, 35 m, 19.VIII.2006, 12.50.270S 131.08.050E, L. & E. Hendrich leg. (NT 1), one specimen with “DNA M.Balke 1610” [green printed label] (CLH, ZSM); 1 ex., Nitmiluk NP, Edith Falls, Upper Pool, 123m, 23.VIII.2006, 14.10.573S 132.11.537E, L. & E. Hendrich leg. (NT 12), “DNA M.Balke 2148” (ZSM); 7 exs., Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., large pool, 20m, 24.VIII.2006, 13.38.142S 132.10.345E, L. & E. Hendrich leg. (NT 15b), “DNA M.Balke 2118”, “DNA M.Balke 2133” (ZSM); 5 exs., Cullen River n. Cullen, at Stuart Hwy, 102 m, 23.VIII.2006, 14.02.052S 131.56.561E, L. & E. Hendrich leg. (NT 13) (CLH, ZSM); 1 ex., Kakadu NP, Plum Tree Creek, road to Gunlom 71 m, 25.VIII.2006, 13.30.516S 132.27.550E L. & E. Hendrich leg. (NT 18) (CLH).

Queensland. 1 ex., N Queensland, Cooktown, VII.1910, T.G.S. leg. (NMV); 7 exs., N Queensland, Hann River 110 km S of Coen, 27.VI.1970, J.C. Le Souef leg. (NMV); 2 exs., Mungkan Kandiju NP, Langi Lagoon, 13.27S 142.42E, 29.VI.–5.VII.1998, T. Weir leg. (ANIC); 1 ex., 20 km N Mareeba, 20.IX.1990, D. & M. Larson leg. (ANIC); 1 ex., 15 km W Mareeba, W Barron Storage, 15.X.1990, D.J. Larson leg. (ANIC); 2 exs., 5 km NW Mareeba, Biboohra Storage, 3.X.1990, D.J. Larson leg. (ANIC); 1 ex., Lakefield NP, unnamed tributary of Normanby River, 15.11S 144.24E, 27.VII.1998, A.A. Calder leg. (ANIC).

Re-description. Measurements. TL = 2.35–2.65 mm, TL-H = 2.15–2.50 mm; MW = 1.15–1.25 mm.

Colour. Antennae, palpi and head yellowish, two darkened spots on clypeus anteriorly, pronotum completely testaceous. Elytron dark brown with a wide subbasal band and two subapical yellow patches (Figs 3, 4). Ventral side, including legs and epipleura, reddish-yellow, prosternal process and metacoxal plates somewhat darkened.

Sculpture and structure. Narrowly oblong. Head sparsely punctured, punctures weaker anteriorly. Pronotum and elytron moderately to strongly microreticulate and without or with only a vague trace of a subapical flange, quite densely and evenly covered with moderately strong punctures. Pronotal striae very weakly impressed, almost 1/4 length of pronotum, a little incurved. Elytra lacking basal and sutural striae. Underside with sparse small to moderate punctures, denser in midline. Metacoxal lines raised, weakly diverging in anterior half.

Male. Pro- and mesotarsi a little expanded. Median lobe of aedeagus (Fig. 15a, b). Inner edge of mesotibia straight.

Female. Tarsi slim. Inner edge of mesotibia straight.

Affinities. *Neobidessodes flavosignatus* greatly resembles the “light form” of *N. thoracicus* **sp.n.** (Figs 11, 12) and smaller specimens of *N. mjobergi*. From the latter it can be easily distinguished by its yellowish pronotum which is never dark at base (Figs 3, 4, 7), and the vague traces of pronotal striae. From *N. thoracicus* **sp.n.** it differs by its more elongated body, different shape of median lobe (Figs 13, 14) and the

absence of any pronotal striae. Furthermore, most specimens of *N. flavosignatus* are less microreticulated on dorsal surface and more shiny than *N. thoracicus* **sp.n.**

Distribution: Northern Australia (NT, QLD), from the Kimberley region, Arnhemland, Kakadu National Park to northern Queensland (Watts 1985, 2002; Lawrence *et al.* 1987, Weir 1998, Larson 1997, Hendrich 2003) (Fig. 23).

Habitat: In northern Australia all specimens were found in isolated pools and puddles of seasonal rivers and creeks. Only occasionally found in larger billabongs. Bottom consisted of gravel and coarse sand, in one situation covered with a thin layer of decaying vegetation. The habitats were mainly partly shaded by riverine eucalypt trees (Figs 31, 37). *Neobidessodes flavosignatus* shared its habitat with all other *Neobidessodes* distributed in tropical northern Australia. The species is more common during the wet season and the beginning of the dry season. At the end of the dry season the species seems to be quite rare. The species is also frequently attracted to light.

Neobidessodes grossus (Zimmermann, 1922) **comb.n.**

(Figs 6, 20, 24, 28, 33, 34, 35)

Bidessus grossus Zimmermann, 1922: Zimmermann (1922: 2).

Bidessodes grossus (Zimmermann, 1922): Watts (1978: 29); Watts (1985: 24); Lawrence *et al.* (1987: 335); Biström (1988: 7); Nilsson (2001: 112); Watts (2002: 31, 43); Hendrich (2008: 317).

Type locality. Cape York Peninsula, Queensland, Australia.

Type material. Lectotype (by present designation). Female, “Cape York Penins.,” “Queensl. Mjöberg”, “Type”, “sept.,” “*Bidessus grossus* n.sp. det. A. Zimmermann”, “136 65” [printed red label], “*grossus* Zimm.,” “Naturhistoriska Riksmuseet Stockholm” [printed green label], “LECTOTYPE *Bidessus grossus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed], “*Neobidessodes grossus* (Zimmermann, 1922) Hendrich & Balke det. 2009” [white printed label] (NHRS). **Paralectotypes.** Male (median lobe missing), “Queensl. Mjöberg”, “Cape York Penins.,” “sept.,” “135 65” [printed red label], “4299 E91 +” [printed blue label], “Naturhistoriska Riksmuseet Stockholm” [printed green label], “PARALECTOTYPE *Bidessus grossus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (NHRS); male, “Cap York Penins.,” “Queensl Mjöberg”, “Type”, “Sammlung A. Zimmermann”, “Typus” [red label, unauthorized designation], “Zool. Staatsslg. München” [printed blue label], “PARALECTOTYPE *Bidessus grossus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed]; female, “Cap York Penins.,” “Queensl Mjöberg”, “Type”, “Sammlung A. Zimmermann”, “Zool. Staatsslg. München” [printed blue label], “PARALECTOTYPE *Bidessus grossus* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (ZSM). All paralectotypes are provided with white and printed identification labels: “*Neobidessodes grossus* (Zimmermann, 1922) Hendrich & Balke det. 2009”.

Additional material studied. 36 specimens. Western Australia. 5 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 9/109 (CLH); 7 exs., Shire of Wyndham, East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.VI.1999, Hendrich leg./loc. 10/110 (CLH).

Northern Territory. 1 ex., Litchfield NP, Shady Creek, Florence Falls, 92 m, 20.VIII.2006, 13.06.116S 130.47.195E, L. & E. Hendrich leg. (NT 3) (CLH); 4 exs., Kakadu Hwy, Bowerbird Cr., 5 km W Mary River Roadh., small puddle, 20 m, 24.VIII.2006, L. & E. Hendrich leg./loc. 15a (CLH, ZSM), one specimen with “DNA M.Balke 1663” [green printed label] (ZSM); 1 ex., Kakadu N.P., Nourlangie District, Arnhem Highway, 12 km WNW Jabiru, 50 m, pool of intermittent creek, 12.37.937S 132.38.134E, 29.X.1996, Hendrich leg./loc. 5 (CLH); 1 ex., Kakadu N.P., Jim Jim District, Gungurul Lookout, 50 m, 13.59.359S 132.19.904E, 1.XI.1996, Hendrich/loc. 11 (CLH); 1 ex., East Jabiru, Georgetown Billabong, 7 km NbyW Mt. Brockman, 12.VIII.1981, P. Outridge leg. (NTM); 4 exs., NT, 6 km E Humpty Doo, 6.–19.XII.1990, Storey leg. (ANIC); 1 ex., Georgetown Billabong 7 km NbyW Mt. Brockman, 12.VIII.1981, P. Outridge leg.

(ANIC); 1 ex., Georgetown Billabong 7 km NbyW Mt. Brockman, 16.X.1981, P. Outridge leg. (ANIC); 3 exs., Nitmiluk NP, Edith Falls, Upper Pool, 123 m, 23.VIII.2006, 14.10.573S 132.11.537E, L. & E. Hendrich leg. (NT 12), one specimen with "DNA M.Balke 2147" [green printed label] (CLH, ZSM); 1 ex., 38 km WSW Katherine, King River Bridge, 50 m, 12.V.1999, Hendrich leg./coll. Loc. 2/102 (CLH); 1 ex., Kakadu Hwy, Harriet Creek at Hwy Cross., 153 m, 24.VIII.2006, 13.44.512S 131.54.012E, L. & E. Hendrich leg. (NT 14) (CLH); 1 ex., Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., large pool, 20 m, 24.VIII.2006, 13.38.142S 132.10.345E, L. & E. Hendrich leg. (NT 15b) (CLH).

Queensland. 1 ex., N Queensland, 24 miles S Musgrave [Musgrave Homestead], 20.V.1972, at light, J.G. Brooks leg. (ANIC); 1 ex., N Queensland, Holroyd River, 13.IX.1993, by hand, P. Zborowski. & S.O. Shattuck leg. (ANIC); 1 ex., N Queensland, Kennedy River Xing, 16.VI.1992, temporary pool in dry river bed, sandy base, T.A. Weir leg. (ANIC); 1 ex., N Queensland, Pretender Creek, 14.IX.1993, lagoon, P. Zborowski. & S.O. Shattuck leg. (ANIC).

Re-description. Measurements (N = 4). TL = 3.70–3.85 mm, TL-H = 3.25–3.55 mm; MW = 1.70–1.80 mm.

Colour. Antennae, palpi and head reddish yellow with two darkened spots on clypeus anteriorly. Pronotum reddish yellow with thin darkened band basally. Elytron red-brown with three very indefinite, often scarcely recognizable, reddish spots at side. The first and middle spots coalescent laterally, the middle and posterior spots are pointed behind (Fig. 6). Ventral side, including legs and epipleura, reddish-yellow, prosternal process and metacoxal plates somewhat darkened.

Sculpture and structure. Narrowly elongate-oval. Head very sparsely and extremely finely microreticulate with some strong punctures. Punctures on prothorax moderately dense, uniformly distributed and of substantial size on disc, those on elytra denser and stronger than on pronotum. Pronotal striae on pronotum absent. Apical third of elytra slightly flanged laterally (see Watts 1978: 31). Elytra lacking basal and sutural striae. Pronotum and elytron with short pubescence and, due to a fine microreticulation, weakly shiny; base of prothorax light brown. Punctures on midline of metasternum and abdomen faint and sparse, those on the central part of metacoxa and first ventral segment stronger and denser. Metacoxal lines raised, weakly diverging in anterior half.

Male. Median lobe (Fig. 20a, b) very large and robust, in ventral view very elongated, strongly tapered at tip (Fig. 20a). Parameres more elongated than in the other species of the genus. Protarsus somewhat expanded. Mesotarsus less so. Inner edge of mesotibia straight.

Female. Tarsi simple.

Affinities. The large size, the almost unicoloured red-brown dorsal surface, the shape of the median lobe (Fig. 20a, b), and the slightly flanged elytra distinguish *N. grossus* from all other known Australian *Neobidessodes*.

Distribution. Northern Australia (WA, NT, QLD), from the Kimberley region, Arnhemland, Kakadu National Park to northern Queensland (Watts 1985, 2002, Lawrence *et al.* 1987, Weir 1998, Larson 1997, Hendrich 2003) (Fig. 24).

Habitat. A more lentic species than other *Neobidessodes* (Figs 33, 34, 35). In the Kakadu area the specimens were found in isolated, eutrophic pools of an otherwise dry bed of a creek, with a bottom consisting of gravel and coarse sand. At Edith Falls it was found among debris and roots at the edge of a slow flowing creek with sandy and gravelly bottom. In the East Kimberley region it was obtained from mats of floating roots and organic debris of paperbark trees, in the slow flowing and shallow Drysdale river (50 m width, up to 20 cm depth), with a bottom consisting of fine sand. It seems to be a rare species during the dry season but possibly more common in lowland floodplains just after the rainy season.

***Neobidessodes mjobergi* (Zimmermann, 1922) comb.n.**
(Figs 7, 16, 25, 27, 28, 31, 32, 37)

Bidessus mjobergi Zimmermann, 1922: Zimmermann (1922: 3).

Bidessodes mjobergi (Zimmermann, 1922): Watts (1978: 30); Watts (1985: 24); Lawrence *et al.* (1987: 335); Biström (1988: 7); Weir (1998: 311–316); Hendrich (1997: 107); Larson (1993: 50); Larson (1997: 272–274); Nilsson (2001: 112); Watts (2002: 31, 43), Balke & Ribera (2004: 115); Hendrich (2008: 317); Hendrich & Balke (2009: 49).

Type locality. Cape York Peninsula, Queensland, Australia.

Type material. Lectotype (by present designation). Male, “Queensl. Mjöberg”, “Cape York”, “143 65” [printed red label], “sept.”, “4326 E91 +” [printed blue label], “Naturhistoriska Riksmuseet Stockholm” [printed green label], “LECTOTYPE *Bidessus mjobergi* Zimmermann, 1922 Hendrich des. 2006” [red label, printed], “*Neobidessodes mjobergi* (Zimmermann, 1922) Hendrich & Balke det. 2009” [white printed label] (NHRS). **Paralectotypes.** 1 male, “Cape York”, “Queensl. Mjöberg”, “Type”, “Sammlung Zimmermann”, “Typus” [red label, unauthorized designation], “Zool. Staatsslg. München” [printed blue label], “PARALECTOTYPE *Bidessus mjobergi* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (ZSM); 2 exs., “Cap York Penins.”, “Queensl [Queensland] Mjöberg”, “Type”, “Sammlung A. Zimmermann”, “Zool. Staatsslg. München” [printed blue label], “PARALECTOTYPE *Bidessus mjobergi* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] (ZSM); 7 exs. same data as lectotype but “PARALECTOTYPE *Bidessus mjobergi* Zimmermann, 1922 Hendrich des. 2006” [red label, printed] and “138 65”, “139 65”, “140 65”, “141 65”, “142 65”, “144 65”, “145 65” (NHRS). All paralectotypes are provided with white and printed identification labels: “*Neobidessodes mjobergi* (Zimmermann, 1922) Hendrich & Balke det. 2009”.

Additional material studied. 928 specimens. Western Australia. 21 exs., East Kimberley, Gibb River Road, Durack River Crossing, 250 m, 13.VI.1999, Hendrich leg./loc. 6/106 (CLH); 38 exs., Shire of Wyndham, East Kimberley, Gibb Range, Gibb River Road, Russ Creek Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 8/108 (CLH); 134 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.VI.1999, Hendrich leg./loc. 9/109 (CLH); 210 exs., East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.VI.1999, Hendrich leg./loc. 10/110 (CLH); 4 exs., Shire of Wyndham, East Kimberley, Mitchell Plateau, Mitchell Falls, 300 m, 15.VI.1999, Hendrich leg./loc. 11a/111a (CLH); 1 ex., East Kimberley, Mitchell Plateau, Surveyors Pool, 150 m, 17.VI.1999, Hendrich leg./loc. 12/112 (CLH); 11 exs., Shire of Wyndham, East Kimberley, Mitchell Plateau, Port Warrender Road/Kalumburu Road, Lowya Creek, 290 m, 18.VI.1999, Hendrich leg./loc. 13/113 (CLH); 6 exs., Shire of Wyndham, East Kimberley, Mitchell Plateau, Kalumburu Road, 25 km NW King Edward Homestead, N.N. Creek, 370 m, 18.VI.1999, Hendrich leg./loc. 14/114 (CLH); 75 exs., Shire of Wyndham, East Kimberley, Kalumburu Road, Meelarie Creek, 5 km N Drysdale Crossing, 350 m, 18.–19.VI.1999, L. Hendrich leg./loc. 15/115; 8 exs., Shire of Wyndham, East Kimberley, Gibb River Road 10 km W Hann River, Snake Creek 470 m, 19.VI.1999, Hendrich leg./loc. 16/116 (CLH, ZSM); 25 exs., Shire of Wyndham, East Kimberley, Gibb River Road, Barnett River Gorge, 450 m, 19.VI.1999, Hendrich leg./loc. 17/117 (CLH); 4 exs., Shire of Derby, West Kimberley, Gibb River Road, Manning Gorge, 400 m, 20.–21.VI.1999, Hendrich leg./loc. 18/118 (CLH); 7 exs., Shire of Derby, West Kimberley, Gibb River Road, Galvans Gorge, 420 m, 21.VI.1999, Hendrich leg./loc. 19/119 (CLH); 25 exs., Shire of Derby, West Kimberley, Gibb River Road, Saddler Spring near Iminji Aboriginal Community, 350 m, 22.VI.1999, Hendrich leg./loc. 20/120 (CLH); 19 exs., Shire of Derby, West Kimberley, Gibb River Road, Bell Gorge/Bell Creek, 340 m, 22.VI.1999, Hendrich leg./loc. 21/121 (CLH).

Northern Territory. 1 ex., Howard River at Gunpoint Road, 12.IX.2002, G.L. Challet leg. (CGC); 1 ex., 6.5 km from Douglas Hot Springs, on road to Butterfly Gorge, 10.IX.2002, G.L. Challet leg. (CGC); 3 exs., Edith Falls, pond, turnoff of Hwy 1, 6.IX.2002, G.L. Challet leg. (CGC); 1 ex., Alligator River, on road to Daly, 5.IX.2002, G.L. Challet leg. (CGC); 1 ex., Port Darwin 92-2, 4645 (NHML); 3 exs., Adelaide River 92-49 (NHML); 2 exs., Adelaide River N.W. Australia, J.J. Walker leg. (NHML); 2 exs., Kakadu N.P., Nourlangie District, Gubara, 50 m, monsoonal rainforest stream, 12.50.101S 132.52.501E, 25.X.1996, Hendrich leg./loc. 1 (CLH); 7 exs., Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 13.16.218S 132.49.276E, low-gradient stream, 26. & 27.X.1996, Hendrich leg./loc. 2a (CLH); 25 exs., Kakadu N.P., Jim Jim District, Jim Jim Falls Camping Area, Jim Jim Creek, 60 m, 26. & 27.X.1996, 13.16.218S 132.49.276E, floodzone pools, Hendrich leg./loc. 2b (CLH); 1 ex., Kakadu N.P., Jim Jim District,

1 km S Jim Jim Falls, 70 m, isolated rock pools, 13.16.718S 132.49.490E, 26.X.1996, Hendrich leg./loc. 3 (CLH); 17 exs., Kakadu N.P., East Alligator District, Ubirr Rock Camping Area, 30 m, at Blacklight Trap, 12.26.506S 132.57.304E, 27. & 28.X.1996, Hendrich leg./loc. 4 (CLH); 2 exs., Kakadu N.P., Nourlangie District, Arnhem Highway, 12 km WNW Jabiru, 50 m, pool of intermittent creek, 12.37.937S 132.38.134E, 29.X.1996, Hendrich leg./loc. 5 (CLH); 22 exs., Kakadu N.P., Mary River District, Old Darwin Road, Black Jungle Spring, 30 m, spring fed slow flowing stream, 13.02.908S 132.09.715E, 30.X.1996, Hendrich leg./loc. 7 (CLH); 2 exs., Kakadu N.P., Jim Jim District, Old Darwin Road, Barramundi Creek, 30 m, shaded rest pool of Barramundi Creek, 12.59.652S 132. 22.928E, 30.X.1996, Hendrich leg./loc. 8 (CLH); 42 exs., Kakadu N.P., Jim Jim District, Gungurul Lookout, 50 m, 13.59.359S 132.19.904E, 1.XI.1996, Hendrich/loc. 11 (CLH); 5 exs., Kakadu N.P., Mary River District, 3 km ESE Gunlom Camping Area. South Alligator River, 50 m, 13.27.276S 132.26.268E, 2.XI.1996, Hendrich leg./loc. 14 (CLH); 1 ex., Kakadu N.P., Mary River District, Gunlom Camping Area, 50 m, 13.26.082S 132.24.929E, 3.XI.1996, Hendrich leg./loc. 15 (CLH); 2 exs., Gregory National Park, Bullita Stock Road, 60 km S of Victoria Hwy, Limestone Creek, 40 m, 2.VII.1999, Hendrich leg./loc. 31/131 (CLH); 1 ex., Kakadu NP, Georgetown Billabong, Magela Creek, 11.VII.1994, T. Weir & A. Roach leg. (ANIC); 12 exs., Kakadu NP, Jabiru, at light, 11.–15.VII.1994, T. Weir & A. Roach leg. (ANIC); 1 ex., Daly River Road, hot springs, 19.VII.1994, flowing stream, with shaded pools in closed forest, T. Weir & A. Roach leg. (ANIC); 12 exs., 6 km E Humpty Doo, 6.–19.XII.1990, R. Storey leg. (ANIC); 6 exs., Wildman River, 11.XI.1989, Malipartil leg. (ANIC); 1 ex., Litchfield NP, rainforest, 8.–30.XII.1993, S. & J. Peck (ANIC); 1 ex., Darwin City Holmes Jungle Reserve, 12°23'56.04" S 130°55'54.31" E, 20 m, 11.VI.1999, Hendrich leg./coll. Loc.1/101 (CLH); 2 exs., 38 km WSW Katherine, King River Bridge, 50 m, 12.V.1999, Hendrich leg./coll. Loc. 2/102 (CLH); 2 exs., Old Stuart Hwy, Scenic Drive, 15 km W Hayes Creek, Bridge Creek, 50 m, 7.VII.1999, Hendrich leg./coll. Loc. 35 /135 (CLH); 3 exs., Old Stuart Hwy, Scenic Drive, Robin Falls, Creek, 50 m, 7.VII.1999, Hendrich leg./Loc. 37/137 (CLH); 2 exs., Darwin, Holmes Jungle Reserve, uv light, 2.XII.1993, S. Peck leg. (ANIC); 1 ex., Darwin, Casuarina Coast Reserve, 3.XII.1993, UV trap, S. Peck leg. (ANIC); 6 exs., Kakadu NP, Alligator River, Gungaree Rainforest, 22.XII.1993, S. & J. Peck leg. (ANIC); 1 ex., Butterfly Gorge Nature Park, 1.X.1992, large pond, G.L. Challet leg. (ANIC); 1 ex., Butterfly Gorge Nature Park, Douglas River, 19.VII.1994, at light, T. Weir & A. Roach leg. (ANIC); 1 ex., Banka Banka, Station, 12.VII.1969, J.C. LeSouef leg. (NMV); 1 ex., Darwin, 19.VI.1969, J.C. LeSouef leg. (NMV); 13 exs., Manton Dam Recreation Area, 46 km S Darwin, 35 m, 19.VIII.2006, 12.50.270S 131.08.050E, L. & E. Hendrich leg. (NT 1), one specimen with "DNA M.Balke 1656" [green printed label] (CLH, ZSM); 5 exs., Finnis River 10 km W Batchelor, 43 m, 20.VIII.2006, 13.01.278S 130.57.217E, L. & E. Hendrich leg. (NT 2) (CLH); 7 exs., Old Stuart Hwy, Scenic Drive, Anniversary Creek south of Adelaide River, 50 m, 8.VII.1999, Hendrich leg./loc. 38/138 (CLH); 1 ex., Litchfield NP, Shady Creek, Florence Falls, 92 m, 20.VIII.2006, 13.06.116S 130.47.195E, L. & E. Hendrich leg. (NT 3), "DNA M.Balke 2208" [green printed label] (ZSM); 2 exs., Litchfield NP, Creek near Wanggi Falls, 191 m, 20.VIII.2006, 13.11.221S 130.43.327E, L. & E. Hendrich leg. (NT 4), "DNA M.Balke 2192", "DNA M.Balke 2193" [green printed labels] (ZSM). 4 exs., Anniversary Creek, 12 km S Adelaide River Scenic Route, 43 m, 22.VIII.2006, 13°19.252 S 131°08.271 E, L. & E. Hendrich leg. (NT 7) (CLH, ZSM); 8 exs., Cullen River n. Cullen, at Stuart Hwy, 102 m, 23.VIII.2006, 14°02.052 S 131°56.561 E, L. & E. Hendrich leg. (NT 13) (CLH, ZSM); 11 exs., Kakadu Hwy, Harriet Creek at Hwy Cross., 153 m, 24.VIII.2006, 13.44.512S 131.54.012E, L. & E. Hendrich leg. (NT 14) (CLH); 5 exs., Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., large pool, 20 m, 24.VIII.2006, 13.38.142S 132.10.345E, L. & E. Hendrich leg. (NT 15b); 4 exs., Magela Creek upstream, Jabiru East, 38 m, 29.VIII.2006, 12.40.458S 132.55.853E, L. & E. Hendrich leg. (NT 21) (ZSM); 1 ex., Kakadu NP, Nawurlandja, 27.III.2004, C.H.S. Watts leg., "DNA Voucher 2" (SAMA).

Queensland. 2 exs., N Queensland, Cooktown, X.1910, T.G.S. leg. (NMV); 55 exs., N Queensland, Iron Range, Cape York, V.1961, J. Kerr., B.M. 1962-153 (NHML); 5 exs., Leichart Creek, 8 km N of Bluewater, XII.2003, C.H.S. Watts leg., 2 specimens with "DNA Voucher # 1" and "DNA Voucher # 2" (SAMA); 2 exs., Mungkan Kandiju NP, Langi Lagoon, 13.27 S 142.42 E, 29.VI.–5.VII.1998, T.Weir leg. (ANIC); 1 ex., N Queensland, 2 km N Rokeby, 13.39 S 142.40 E, 26.X.–16.XI.1993, Flight Intercept Trap, P. Zborowski & M.

Horak leg. (ANIC); 5 exs., Leichart Creek, 8 km N of Bluewater, XII.2003, C.H.S. Watts leg. (SAMA); 4 exs., Queensland, White Mts. National Park, Rugged Gorge, 9 km NW of RGSQ Base Camp, 20°23'S 114°47'E, III.–IV.2000, T.A. Weir leg. (ANIC); 9 exs., N Queensland, 4 km NW Cardwell, Ellerbeck Road, 13 m, 19.IX.2006, 18.14.520S 145.58.458E, L. & E. Hendrich (QLD 38) (CLH, ZSM); 1 ex., N QLD, 5 km NW Cardwell, street to Carruchan, 7 m, 20.IX.2006, 18.14.316S 145.59.257E, L. & E. Hendrich leg. (QLD 39), “DNA M.Balke 2507” (ZSM).

Re-description. Measurements. TL = 2.55–2.65 mm, TL-H = 2.30–2.45 mm; MW = 1.20–1.25 mm.

Colour. Antennae, palpi and head reddish-brown, posterior angles of head, near eyes and base of pronotum in middle broadly dark brown. Elytron dark brown with some small vague yellow spots subbasally and subapically (Fig. 7). Ventral side, including legs and epipleura, reddish-brown, prosternal process and metacoxal plates somewhat darkened.

Sculpture and structure. Narrowly oval. Head with scattered fine punctures and a few larger ones near base. Pronotum usually as broad as base of elytra. Outline of junction of pronotum and elytra smooth, sides of pronotum evenly curved, maximum width at posterior angles. Pronotum and elytron weakly microreticulate, punctures moderately dense but rather small and weakly impressed, particularly weak on disc of pronotum. Lacking any pronotal striae. Elytra lacking basal and sutural striae. Underside laterally with scattered weak to moderate punctures, denser in midline. Metacoxal lines raised, very weakly diverging anteriorly.

Male. Median lobe (Fig. 16a, b). Parameres thin, slender and very elongate, only slightly bifid anteriorly. Similar to *N. samkrisi* **sp.n.** but larger. Protarsus somewhat expanded. Mesotarsus less so. Inner edge of mesotibia straight.

Female. Tarsi simple.

Affinities. The lack of pronotal striae and the black base of the pronotum distinguish *N. mjobergi* from most other *Neobidessodes* (Fig. 7) except *N. thoracicus* **sp.n.** (Figs 9–12). From the latter *N. mjobergi* can be distinguished by the smooth outline of the junction of the pronotum and the elytra, the evenly curved sides of pronotum with a maximum width at posterior angles, and its generally smaller size. In *N. mjobergi*, the pronotum is shinier and the microreticulation and punctures on pronotum are weaker and less dense than in *N. thoracicus* **sp.n.** The median lobes of both species are almost the same size but in *N. thoracicus* **sp.n.**, in lateral view, the median lobe is broadened at the tip (Figs 13, 14, 16). In our *cox1* tree (Fig. 28) all specimens of *N. mjobergi* were grouped together and are well separated from the *N. thoracicus* **sp.n.** cluster.

Distribution. Northern Australia, from the Kimberley region, Arnhemland, Kakadu National Park to northern Queensland (Watts 1985, 2002; Lawrence *et al.* 1987, Weir 1998, Larson 1997, Hendrich 2003) (Fig. 25).

Habitat. One of the commonest dytiscids in tropical northern Australia during the dry season. Mainly collected from isolated pools of seasonal rivers and creeks without any aquatic vegetation but collections of single specimens or small numbers of beetles were made from almost all habitat types. The bottom of these habitats consisted of gravel, sand and a thin layer of decaying vegetation, mainly leaves. *Neobidessodes mjobergi* shared its habitat with all other *Neobidessodes* distributed in tropical northern Australia (Figs 31, 32, 37). The species is also frequently attracted to light.

Neobidessodes samkrisi* Hendrich & Balke **sp.n.*

(Figs 5, 17, 24, 27, 28)

Type locality. Merauke, Wasur Reserve, West Papua, Indonesia.

Type material. Holotype. Male: “DNA M.Balke 2843” [green printed label], “Indonesia, West Papua, Merauke, Wasur Reserve, November 2006, K. Tindige leg.”, “Holotype *Neobidessodes samkrisi* sp. n. Hendrich & Balke des. 2009” [red printed label] (ZSM). **Paratypes.** 1 male with “DNA M.Balke 2844” [green printed label] and 2 females with same data as holotype but without DNA label (ZSM, CLH). All paratypes are provided with a red printed paratype label.

Description. Measurements. **Holotype:** TL = 2.00 mm, TL-H = 1.80 mm; MW = 0.9 mm. **Paratypes:** TL = 2.00–2.05 mm, TL-H = 1.80–1.85 mm; MW = 0.9–1.00 mm.

Colour. Antennae, palpi and head pale reddish-brown, posterior angles of head and near eyes darkened anteriorly. Pronotum pale reddish-brown with thin blackish band basally. Elytron dark brown with some well marked elongate yellow markings (Fig. 5). Ventral side, including legs and epipleura, reddish-yellow, prosternal process and metacoxal plates somewhat darkened.

Sculpture and structure. Elongate oval. Head with scattered fine punctures and a few larger ones near base. Pronotum and elytron weakly microreticulate and with moderately dense but rather small, and weakly impressed punctures, particularly weak on disc of pronotum. Pronotal striae short but well marked, 1/4 of length of pronotum, weakly incurved. Elytra lacking basal and sutural striae. Underside laterally with scattered weak to moderate punctures, denser in midline. Metacoxal lines raised, very weakly diverging anteriorly.

Male. Median lobe (Fig. 17a, b). Parameres thin, slender and very elongate, only slightly bifid anteriorly (17c). Much smaller than the parameres of *N. thoracicus* sp.n. and *N. mjobergi*. Protarsus somewhat expanded. Mesotarsus less so. Inner edge of mesotibia slightly incurved.

Female. Tarsi simple.

Etymology. The species is dedicated in memory to our late colleague and friend Samkris Tindige († 20.8.2007), Indonesian naturalist and conservationist from Manokwari, West Papua.

Affinities. *Neobidessodes samkrisi* sp.n. is much smaller than almost all other species of the genus, except *N. bilita* from SE Australia, but can be very easily distinguished from the latter by the form of the male genitalia and the colour of the dorsal surface (Figs 5, 8). From its colouration it is close to *N. flavosignatus* (Figs 3, 4) and the “light form” of *N. thoracicus* sp.n. (Figs 11, 12) but can be separated from both species by its smaller size and the transverse basal marking on the elytra which is very narrow compared to the other species. The form of the median lobe (Fig. 17b) distinguished *N. samkrisi* sp.n. from all other species.

Distribution. Only known from the few type specimens collected near Merauke, southern coast of West Papua (New Guinea), Indonesia (Fig. 24). Probably more widespread in wet savannah areas along the southern coast of West Papua and Papua New Guinea.

Habitat. Nothing is known about the life habitat. The specimens were obtained from the Wasur Reserve, a low-lying wetland in the monsoon climate zone of southern New Guinea with intertidal mudflats and coastal mangroves with extensive seasonally inundated grasslands, savannas, reed swamps, and swamp and monsoon forests. The specimens were collected with the dytiscids *Hydroglyphus basalis* (W.J. Macleay, 1871), *H. godeffroyi* (Sharp, 1882), *Laccophilus cingulatus* Sharp, 1882, *L. clarki* Sharp, 1882, *L. seminiger* Fauvel, 1883 and *L. transversalis transversalis* Régimbart, 1877, and the noterid *Notomicrus tenellus* (Clark, 1863) which indicate a more lotic environment such as a slow flowing and well vegetated stream or an oxbow lake (billabong) in the floodzone of a larger river.

***Neobidessodes thoracicus* Hendrich & Balke sp.n.**

(Figs 9, 10, 11, 12, 13, 14, 26, 28, 30, 35, 36, 37)

Type locality. Cullen River [14.02.052S 131.56.561E], Northern Territory, Australia.

Type material. Holotype. Male: “Australia: NT, Cullen River n. Cullen, at Stuart Hwy, 102m, 23.VIII.2006, 14.02.052S 131.56.561E, L. & E. Hendrich leg. (NT 13)” “Holotype *Neobidessodes thoracicus* sp. n. Hendrich & Balke des. 2009” [red printed label] (SAMA).

Notes. In the following listing of the paratypes we present those specimens separately which have reduced yellowish pattern of the surface and, thus, in part are even almost black (see details under “Colour” in the description).

Paratypes (1866 specimens). Western Australia. 33 exs., “AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Great Northern Hwy 50 km S Wyndham, Black Flag Creek 50 m, 13.6.1999, Hendrich leg./Loc. 4/

104" (CLH, SAMA, ZSM); 107 exs., "AUSTRALIA/WA/East Kimberley, Gibb River Road, Durack River Crossing, 250 m, 13.6.1999, Hendrich leg./coll./ Loc. 6/106" (CLH, ZSM); 50 exs., "AUSTRALIA/WA/East Kimberley, Gibb River Road, Dawn Creek Crossing, 300 m, 13.+14.6.1999 Hendrich leg./coll. Loc. 7/107" (CLH, SAMA, ZSM); 29 exs., "AUSTRALIA/WA/East Kimberley, Gibb Range, Gibb River Road, Russ Creek Crossing, 380 m, 14.6.1999, Hendrich leg./coll. loc. 8/108" (CLH); 46 exs., "AUSTRALIA/WA/East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.6.1999, Hendrich leg./coll./loc. 9/109" (CLH); 16 exs., "AUSTRALIA/WA/East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.6.1999, Hendrich leg./coll./ Loc. 10/110" (CLH); 44 exs., "AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Mitchell Falls, 300 m, 15.6.1999, Hendrich leg. Loc. 11a/111a" (CLH); 5 exs., "AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Surveyors Pool, 150 m, 17.6.1999, Hendrich leg./coll./loc. 12/112" (CLH); 20 exs., "AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Port Warrender Road/Kalumburu Road, Lowya Creek, 290 m, 18.6.1999, Hendrich leg./loc. 13/113" (CLH); 2 exs., "AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Kalumburu Road, 25 km NW King Edward Homestead, N.N. Creek, 370 m, 18.VI.1999, Hendrich leg./loc. 14/114" (CLH); 79 exs., "AUSTRALIA/WA/Shire of Wyndham East Kimberley, Kalumburu Road, Meelarie Creek, 5 km N Drysdale Crossing, 350 m, 18.-19.VI.1999, L. Hendrich leg./loc. 15/115" (CLH); 78 exs., "AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Road 10 km W Hann River, Snake Creek 470 m, 19.VI.1999 Hendrich leg./ COLL./ Loc. 16/116" (CLH, ZSM); 65 exs., "AUSTRALIA/WA/East Kimberley, Gibb River Road, Barnett River Gorge, 450 m, 19.6.1999, Hendrich leg./loc. 17/117" (CLH); 276 exs., "AUSTRALIA/WA/Shire of Derby-West Kimberley, Gibb River Road, Galvans Gorge, 420 m, 21.6.1999, Hendrich leg./coll. Loc. 19/119" (CLH); 60 exs., "AUSTRALIA/WA/West Kimberley, Gibb River Road, Saddler Spring near Iminji Aboriginal Community, 350 m, 22.6.1999, Hendrich leg./coll. Loc. 20/120" (CLH); 27 exs., "AUSTRALIA/WA/West Kimberley, Gibb River Road, Bell Gorge/Bell Creek, 340 m, 22.6.1999, Hendrich leg./coll. loc. 21/121" (CLH); 2 exs., "AUSTRALIA/WA/Shire of Derby - West Kimberley, Fitzroy Crossing Brooking Channel, 50 m, 25.6.1999, Hendrich leg. loc. 25/125" (CLH); 9 exs., "AUSTRALIA/WA/Shire of Derby - West Kimberley, Garunji Creek, n. Geikie Gorge, 350 m, 26.6.1999, Hendrich leg/coll. Loc. 26 / 126" (CLH, ZSM); 19 exs., "AUSTRALIA/WA/Shire of Halls Creek, 15 km E Halls Creek, 350 m, Caroline Pool, 26.VI.1999, Hendrich leg./Coll./Loc. 27/ 127" (CLH, ZSM); 9 exs., "AUSTRALIA/WA/Shire of Halls Creek, Old Halls Creek, Elvire River, 310 m, 27.6.1999, Hendrich leg. Loc. 28/128" (CLH); 74 exs., "AUSTRALIA/WA/Shire of Halls Creek, Purnululu N. P., Cathedral Gorge, Piccaninny Creek, 200 m, 28.6.1999, Hendrich leg. Loc. 29/ 129" (CLH); 123 exs.: "AUSTRALIA/WA/East Kimberley, N.N. Creek 40 km W Kununurra, 50 m, 29.6.1999, Hendrich leg./ Loc. 30/130" (CLH); 9 exs., "16.VII.1998 West Australia: Kimberleys: El Questro", "S 015°58'19.3" Pentecoste River E 127°56'41.9'", "Dr. Wolfgang ULLRICH leg." (NMB); 5 exs., "AUSTRALIA: No. W. A. Yearling Creek, 30 km W Kununurra on Vic. Hiway, Sept. 8, 2002, G.L.Challet" (CGC); 3 exs., "AUSTRALIA: W.A. Mc Phee Creek Great Nor. [Northern] Hiway [Highway] 5 km N Doon Doon IX-8-2002, G.L.Challet" (CGC); 2 exs., "23.VII.1998 Austral Northern Territory Timber Creek", "S 015°39'42.1" Dr. W. Ullrich leg. E 130°28'54.0'" (NMW); 1 ex., "19.VII.1998 West Australia Gibb River Road", "Silent Grove Bell Gorge Dr. W. Ullrich leg.", "S 017°00'36.3" E 125°13'25.3'" (NMW).

Northern Territory. 43 exs., "Australia/NT/38 km WSW Katherine, King River Bridge, 50 m, 12.V.1999, Hendrich leg./coll. Loc. 2/102" (CLH); 68 exs., "AUSTRALIA/NT/ Gregory National Park, Bullita Stock Road, 60 km S of Victoria Hwy, Limestone Creek, 40 m, 2.7.1999, Hendrich leg./Coll./ Loc. 31/ 131" (CLH); 2 exs., "AUSTRALIA/NT/Victoria Hwy 170 km W Katherine, N.N. Creek, 50 m, 2.7.1999, Hendrich leg./Coll./ Loc. 32 / 132" (CLH); 5 exs., "AUSTRALIA/ NT/Old Stuart Hwy, Scenic Drive, 15 km W Hayes Creek, Bridge Creek, 50 m, 7.7. 1999, Hendrich leg./coll. Loc. 35/135" (CLH); 6 exs., "AUSTRALIA: No.Terr. Skull Creek minor at Victoria Hwy, Sept. 7, 2002 G.L.Challet" (CGC); 2 exs., "AUSTRALIA: No.Terr. pond at Edith Falls turn off on Hiway 1, Sept. 6, 2002 G.L.Challet" (CGC); 1 ex., "AUSTRALIA: No. [Northern] Terr. [Territory] Howard River at Gunnpoint Road, September 12.2002 G.L.Challet leg." (CGC); 2 exs., "Australia: NT, Anniversary Creek, 12 km S Adelaide River Scenic Route,

43m, 22.VIII.2006, 13.19.252S 131.08.271E, L. & E. Hendrich leg. (NT 7)” (ZSM); 36 exs., “Australia: NT, Fenton Creek at Scenic Route, 54 km S Adelaide River, 103m, 22.VIII.2006, 13.35.176S 131.20.544E, L. & E. Hendrich leg. (NT 10)” (CLH, ZSM); 1 ex., “Australia: NT, Creek on track to Umbrawarra Gorge, 62m, 23.VIII.2006, 13.51.528S 131.49.216E, L. & E. Hendrich leg. (NT 11)” (ZSM); 385 exs., “Australia: NT, Cullen River n. Cullen, at Stuart Hwy, 102m, 23.VIII.2006, 14.02.052S 131.56.561E, L. & E. Hendrich leg. (NT 13)”, 1 specimen with “DNA M.Balke 1667” [green printed label] (CLH, ZSM); 7 exs., “Australia: NT, Kakadu Hwy, Harriet Creek at Hwy Cross., 153m, 24.VIII.2006, 13.44.512S 131.54.012E, L. & E. Hendrich leg. (NT 14)” (CLH, ZSM); 85 exs., “Australia: NT, Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., large pool, 20m, 24.VIII.2006, 13.38.142S 132.10.345E, L. & E. Hendrich leg. (NT 15b)”, 2 specimens with “DNA M.Balke 2126”, “DNA M.Balke 2127” [green printed labels] (CLH, ZSM). 2 exs., “Australia: NT, Kakadu NP, small creek on the road to Gunlom, 101m, 25.VIII.2006, 13.30.422S 132.26.191E, L. & E. Hendrich leg. (NT 16)” (CLH, ZSM); 3 exs., “Australia: NT, Kakadu NP, Plum Tree Creek, road to Gunlom 71m, 25.VIII.2006 13.30.516S 132.27.550E L. & E. Hendrich leg. (NT 18)” (CLH); 1 ex., “AUSTRALIA, N.T. Near Phillip Creek on Stuart Highway, 331 m S19°18′343″ E 134°11′104″”, “Hungarian Entomological Expedition in Australia leg. G. Hangay, I. Rozner, A. Podlussány, 2.XI.2000” (TDMB).

Queensland. 2 exs., “Australia:No. Qld. Emu Creek near Petford dec 4, 1997 G.L. Challet” (CGC); 1 ex., “Australia:No. Qld pond E. of Annan River Dec. 9, 1997 G.L.Challet” (CGC); 1 ex., “Australia: No. Qld. Pond on Development rd. 2km S. Cookshire line Dec9, 1997G.Challet” (CGC); 2 exs., “Australia: N QLD, 20 km NE Mareeba, Hodzic Road, 361m, 12.IX.2006, 16.49.556S 145.27.211E, L. & E. Hendrich leg. (QLD 28)”, “DNA M.Balke 2061”, “DNA M.Balke 2062” [green printed labels]; 1 ex., “Australia: N QLD, 17 km NE Mareeba Hodzic Road, 362m, 12.IX.2006, 16.51.209S 145.25.503E, L. & E. Hendrich leg. (QLD 29)” (CLH). All paratypes are provided with a red printed paratype label.

Specimens with extended black colouration (65 specimens). Western Australia. 6 exs., “AUSTRALIA/WA/East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.6.1999, Hendrich leg./coll./ Loc. 10/110” (CLH); 1 ex., “AUSTRALIA/WA/East Kimberley, Gibb River Raod, Barnett River Gorge, 450 m, 19.6.1999, Hendrich leg./loc. 17/117” (CLH).

Northern Territory. 1 ex., “Australia N.T./Kakadu N.P. Gubara, 50 m, 25.10.1996 L.Hendrich leg. / Lok. 1” (CLH); 5 exs., “NT 1km W Gubara 17/3/98 C.H.S. Watts” (SAMA); 2 exs., “NT 2 K S Buley Rockhole Litchfield Nat Pk 29/3704 CHS Watts”, “one specimen with “DNA voucher 1.” (SAMA); 4 exs., “NT Nawurlandja, Kakadu Nt Pk 27/3/04 CHS Watts”, “DNA Voucher 1.” (SAMA); 7 exs., “NT 5 km SE Mt Borradaile station 27.5.1999 C.Watts” (SAMA); 17 exs., “NT 5 km SE Mt Borradaile station 8.10.1998 C.Watts”, 8 specimens with “Shallow rock pool, dead leaves” (SAMA); 5 exs., “AUSTRALIA:No. Terr. Alligator River on road to Daly, Sept. 5, 2002, G.L.Challet (CGC)”; 2 exs., “Australia: NT, Litchfield NP, Shady Creek, Florence Falls, 92m, 20.VIII.2006, 13.06.116S 130.47.195E, L. & E. Hendrich leg. (NT 3)”, “DNA M.Balke 2209”, “DNA M.Balke 2210” [green printed labels] (ZSM); 4 exs., “Australia: NT, Litchfield NP, Creek near Wanggi Falls, 191m, 20.VIII.2006, 13.11.221S 130.43.327E, L. & E. Hendrich leg. (NT 4)”, “DNA M.Balke 2194”, “DNA M.Balke 2195”, “DNA M.Balke 2196”, “DNA M.Balke 2197” [green printed labels] (ZSM); 3 exs., “Australia: NT, Nitmiluk NP, Edith Falls, Upper Pool, 123m, 23.VIII.2006, 14.10.573S 132.11.537E, L. & E. Hendrich leg. (NT 12)”, “DNA M.Balke 2161”, “DNA M.Balke 2162”, “DNA M.Balke 2163” [green printed labels] (ZSM); 2 exs., “Australia: NT, Kakadu NP, small creek on the road to Gunlom, 101m, 25.VIII.2006, 13.30.422S 132.26.191E, L. & E. Hendrich leg. (NT 16)” (CLH, ZSM); 6 exs., “Australia: NT, Kakadu NP, Gunlom Waterfall Area, 72m, 25.VIII.2006, 13.26.026S 132.25.141E, L. & E. Hendrich leg. (NT 17)”, one specimen with “DNA M.Balke 1670” [green printed label] (CLH, ZSM). All paratypes are provided with a red printed paratype label.

Notes. According to our study of the complete material of *N. thoracicus* **sp.n.**, two different complexes of specimens can be recognized: at almost each locality listed under "paratypes" we have found specimens (often in huge number) which are neither “normally coloured” (Fig. 9) nor blackish to some extent (Fig. 10), but belong to what we have preliminarily called “light form” (Figs 11, 12; more details under “colour of "light

form”). So far no intergrades between normally or blackish coloured *N. thoracicus* **sp.n.** (Figs 9, 10) and the “light form” have been found, and we must state that the latter can easily be separated from the others. For some time we even have been strongly tempted to describe those of the second complex as another new species.

On the other hand we have not been able to find any constant external morphological character—except of the colouration—which allows a safe separation of both complexes, and also the shapes of the male genitalia are more or less the same (Figs 13, 14). In addition, in our *Cox1* maximum likelihood tree (Fig. 28) specimens of both complexes are grouped in one and the same clade. However, further studies might reveal that indeed two species complexes are involved, and this is why at present the specimens of the “light form” complex shall be treated under *N. thoracicus* **sp.n.**, but not included in the paratype series and, thus, are listed as “additional material studied” below.

Additional material studied. “Light form” (1243 specimens), Western Australia. 21 exs., “AUSTRALIA/ WA/Shire of Wyndham – East Kimberley, Great Northern Hwy 50 km S Wyndham, Black Flag Creek 50 m, 13.6.1999, Hendrich leg./Loc. 4/104” (CLH, ZSM); 5 exs., “AUSTRALIA/WA/East Kimberley, Gibb River Road, Durack River Crossing, 250 m, 13.6.1999, Hendrich leg./coll./ Loc. 6/106” (CLH, ZSM); 11 exs., “AUSTRALIA/WA/East Kimberley, Gibb Range, Gibb River Road, Russ Creek Crossing, 380 m, 14.6.1999, Hendrich leg./coll. Loc. 8/108” (CLH); 57 exs., “AUSTRALIA/WA/East Kimberley, Gibb River Road, Drysdale River Crossing, 380 m, 14.6.1999, Hendrich leg./coll./loc. 9/109” (CLH); 32 exs., “AUSTRALIA/WA/East Kimberley, Gibb River Road, King Edward River Crossing, 280 m, 15.6.1999, Hendrich leg./coll./ Loc. 10/110” (CLH); 45 exs., “AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Mitchell Falls, 300 m, 15.6.1999, Hendrich leg./coll. loc. 11a/111a” (CLH); 47 exs., “AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Surveyors Pool, 150 m, 17.6.1999, Hendrich leg./coll./loc. 12/112” (CLH); 17 exs., “AUSTRALIA/WA/East Kimberley, Mitchell Plateau, Port Warrender Road/Kalumburu Road, Lowya Creek, 290 m, 18.6.1999, Hendrich leg./coll. Loc. 13/113” (CLH); 1 ex., “AUSTRALIA/WA/Shire of Wyndham - East Kimberley, Mitchell Plateau, Kalumburu Road, 25 km NW King Edward Homestead, N.N. Creek, 370 m, 18.6.1999, Hendrich leg./loc. 14/114” (CLH); 2 exs., “AUSTRALIA/WA/Shire of Wyndham East Kimberley, Kalumburu Road, Meelarie Creek, 5 km N Drysdale Crossing, 350 m, 18.-19.VI.1999, L. Hendrich leg./loc. 15/115” (CLH); 241 exs., “AUSTRALIA/WA/Shire of Wyndham – East Kimberley, Gibb River Road 10 km W Hann River, Snake Creek 470 m, 19.VI.1999 Hendrich leg./ COLL./ Loc. 16/116” (CLH, ZSM); 58 exs., “AUSTRALIA/ WA/East Kimberley, Gibb River Road, Barnett River Gorge, 450 m, 19.6.1999, Hendrich leg./loc. 17/117” (CLH); 142 exs., “AUSTRALIA/WA/West Kimberley, Gibb River Road, Galvans Gorge, 420 m, 21.6.1999, Hendrich leg./coll. loc. 19/119” (CLH); 106 exs., “AUSTRALIA/WA/West Kimberley, Gibb River Road, Saddler Spring near Iminji Aboriginal Community, 350 m, 22.6.1999, Hendrich leg./coll. Loc. 20/120” (CLH); 5 exs., “AUSTRALIA/WA/West Kimberley, Gibb River Road, Bell Gorge/Bell Creek, 340 m, 22.6.1999, Hendrich leg./coll./ Loc. 21/121” (CLH); 4 exs., “18.VII.1998 West Australia: Mt. Barnett: Manning River”, “S 016°39’22.1’’ Dr. W. Ullrich leg. E 125°55’43.5’’” (NMB); 66 exs.: “AUSTRALIA/WA/East Kimberley, N.N. Creek 40 km W Kununurra, 50 m, 29.6.1999, Hendrich leg./ Loc. 30/130” (CLH).

Northern Territory. 5 exs., “AUSTRALIA/NT/Old Stuart Hwy, Scenic Drive, 15 km W Hayes Creek, Bridge Creek, 50 m, 7.7. 1999, Hendrich leg./coll. Loc. 35 /135 (CLH, ZSM); 67 exs., “Australia/NT/Kakadu N.P., Jim Jim District, Gungurul Lookout, Creek ca. 50 m, S 13°59.359’ E 132°19.904’, 1.11.1996, L. Hendrich/Lok. 11” (CLH, ZSM); 136 exs., “Australia/NT/38 km WSW Katherine, King River Bridge, 50 m, 12.V.1999, Hendrich leg./coll. Loc. 2/102” (CLH); 2 exs., “AUSTRALIA/ NT/ Old Stuart Hwy Scenic Drive, 25 km WNW Hayes Creek near Burrell Creek, 50 m, 7.VII.1999 Hendrich leg. COLL. HENDRICH, Loc. 36/136” (CLH); 10 exs., “Australia: NT, Fenton Creek at Scenic Route, 54 km S Adelaide River, 103m, 22.VIII.2006, 13.35.176S 131.20.544E, L. & E. Hendrich leg. (NT 10)” (CLH, ZSM); 28 exs., “Australia: NT, Cullen River n. Cullen, at Stuart Hwy, 102m, 23.VIII.2006, 14.02.052S 131.56.561E, L. & E. Hendrich leg. (NT 13)” (CLH, ZSM); 7 exs., “Australia: NT, Kakadu Hwy, Harriet Creek at Hwy Cross., 153m, 24.VIII.2006, 13.44.512S 131.54.012E, L. & E. Hendrich leg. (NT 14)” (CLH, ZSM); 107 exs., “Australia:

NT, Kakadu Hwy, Bowerbird Creek, 5 km W Mary River Roadh., large pool, 20m, 24.VIII.2006, 13.38.142S 132.10.345E, L. & E. Hendrich leg. (NT 15b)”, 2 specimens with “DNA M.Balke 2131”, “DNA M.Balke 2132” [green printed labels] (ZSM); 3 exs., “Australia: NT, Kakadu NP, Old Jim Jim Road, Barramundi Creek, 50m, 26.VIII.2006, 12.59.652S 132.22.928E, L. & E. Hendrich leg. (NT 19)“, 1 specimen with “DNA M.Balke 1666” [green printed label] (CLH); 1 ex., “Australia: NT, Magela Creek upstream, Jabiru East, 38m, 29.VIII.2006, 12.40.458S 132.55.853E, L. & E. Hendrich leg. (NT 21)” (ZSM).

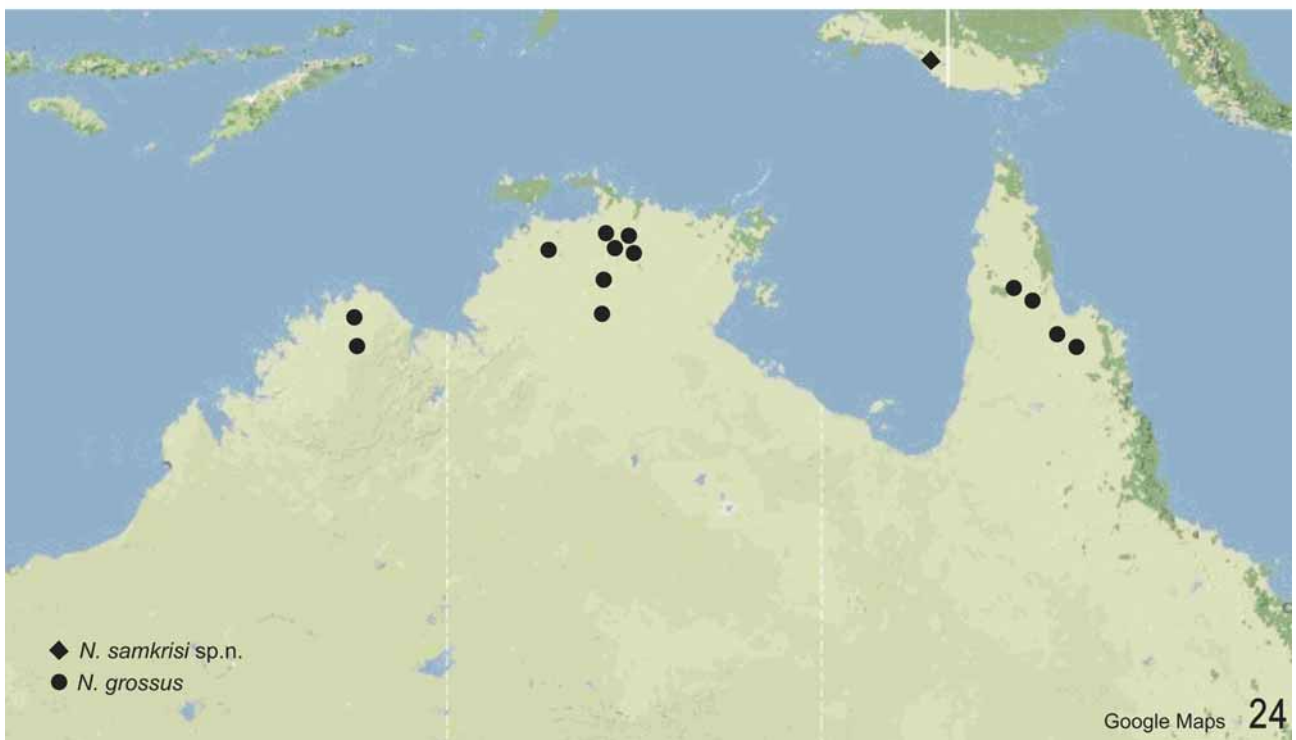
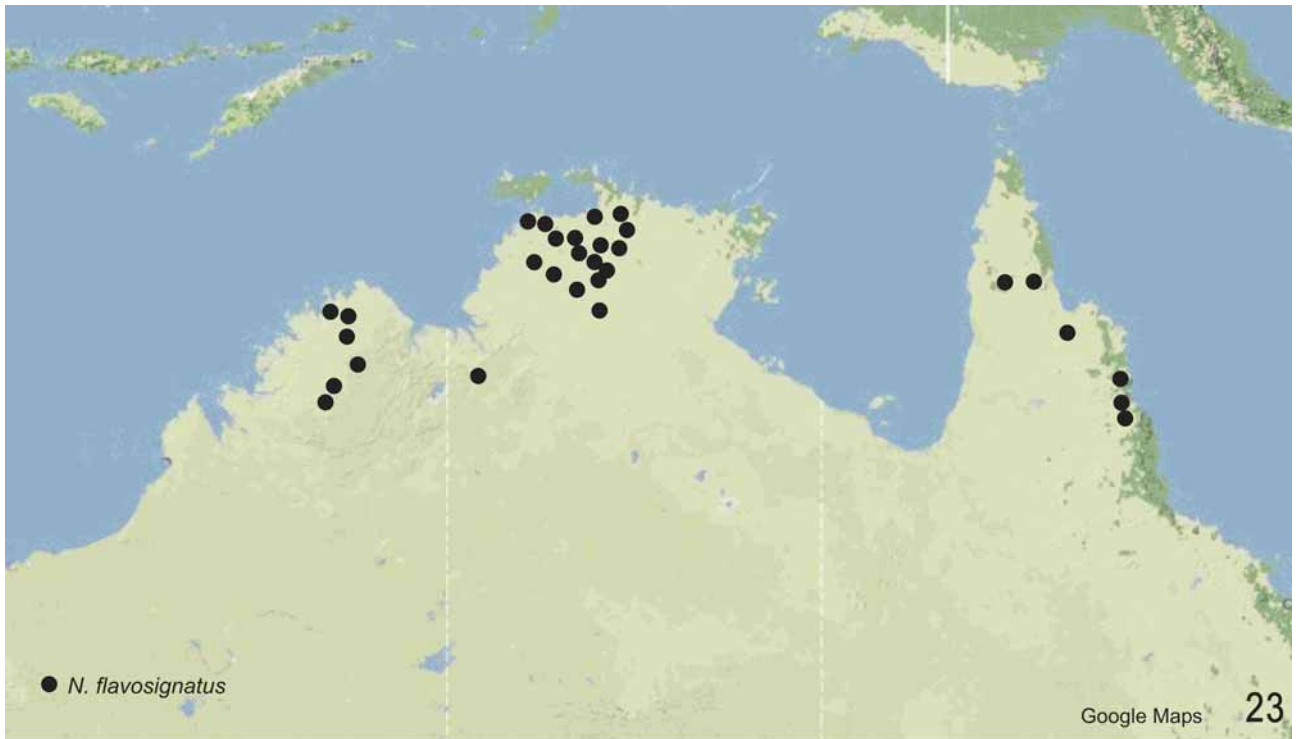
Queensland. 1 ex., “Australia: No.Qld. Bismarck Creek @Hwy Dec. 4, 1997 G.L.Challet” (CGC); 1 ex., “Australia: No. Qld. Pond on Development rd. 2km S. Cookshire line Dec9, 1997G.Challet” (CGC); 7 exs., “QLD Leichart Creek 8 km N of Bluewater CHS Watts Dec. 2003”, 2 specimens with “DNA Voucher #3” and “DNA Voucher #4” (SAMA); 3 exs., “Qld. Petford 20 km W 28/3/96 C.Watts” (SAMA); 1 ex., “Qld. Babinda 5 km S 1/4/96 C.Watts” (SAMA); 3 exs., “Australia: N QLD, 20 km NE Mareeba, Hodzic Road, 361m, 12.IX.2006, 16.49.556S 145.27.211E, L. & E. Hendrich leg. (QLD 28)”, “DNA M.Balke 2066”, “DNA M.Balke 2067”, “DNA M.Balke 2068” [green printed labels] (ZSM); 2 exs., “Australia: N QLD, 4 km NW Cardwell, Ellerbeck Road, 13m, 19.IX.2006, 18.14.520S 145.58.458E, L. & E. Hendrich (QLD 38)” (CLH). All paratypes are provided with a red printed paratype label.

Description. Measurements. **Holotype:** TL = 2.80 mm, TL-H = 2.55 mm; MW = 1.30 mm. **Paratypes:** TL = 2.75–2.90 mm, TL-H = 2.50–2.60 mm; MW = 1.30–1.35 mm.



FIGURES 22. Distribution of *Neobidessodes*: 22) *N. bilita* (squares) and *N. denticulatus* (dots).

Colour. Antennae, palpi and head reddish-brown, posterior angles of head, near eyes and base of pronotum in middle broadly dark brown to black, in some specimens totally blackish-brown. Elytron dark brown or black with distinct yellowish markings basally, subbasally and subapically (Fig. 9). Ventral side, including legs and epipleura, reddish-brown, prosternal process and metacoxal plates somewhat darkened. In several specimens yellowish pattern reduced to variable extent, thus, sometimes head, pronotum and elytron almost totally black, lacking yellowish markings on pronotum and elytra except two small spots apically (Fig. 10).



FIGURES 23–24. Distribution of *Neobidessus*: 23) *N. flavosignatus*; 24) *N. samkrisi* **sp.n.** (square) and *N. grossus* (dots).



FIGURES 25–26. Distribution of *Neobidessodes*: 25) *N. mjobergi*; 26) *N. thoracicus* **sp.n.**.

Colour of “light form”. Antennae, palpi and head testaceous with two darkened spots on clypeus anteriorly. Pronotum testaceous with thin blackish band basally. Elytron dark red-brown with some well marked elongate yellow markings (Figs 11, 12). Ventral side, including legs and epipleura, reddish-yellow, prosternal process and metacoxal plates somewhat darkened.

Sculpture and structure. Elongate oval. Head with scattered fine punctures and a few larger ones near base. Outline of junction of pronotum and elytra slightly sinuate, maximum width of pronotum somewhat

before base. Pronotum and elytron microreticulate, and with moderately dense but rather small and well impressed punctures, weaker on disc of pronotum. Lacking any pronotal striae. Elytra lacking basal and sutural striae. Underside laterally with scattered weak to moderate punctures, denser in midline. Metacoxal lines raised, very weakly diverging anteriorly.

Male. Median lobe (Figs 13, 14). In some specimens of the “light form”, the median lobe is a bit larger (Fig. 14b). Parameres thin, slender and very elongate, only slightly bifid anteriorly. Similar to *N. samkrisi* **sp.n.** but larger. Protarsus somewhat expanded. Mesotarsus less so. Inner edge of mesotibia straight.

Female. Tarsi simple.

Etymology. The adjective “*thoracicus*” refers to the comparatively broad thorax and pronotum of the new species.

Affinities. A variable species. In colouration the holotype and most of the paratypes of *N. thoracicus* **sp.n.** (Fig. 9) very much resemble *N. mjobergi* (Fig. 7) but can be distinguished by its generally larger size and the broad pronotum which is usually as broad as maximum width of elytra. Microreticulation and punctures on pronotum are coarser and denser than in *N. mjobergi*. The median lobe is of same size and shape as in *N. mjobergi* but in lateral view more elongated at the tip (Figs 13, 14, 16). The “light form” of *N. thoracicus* **sp.n.** (Figs 11, 12) very much resembles *N. flavosignatus* (Figs 3, 4) but can be distinguished by its generally larger size and broad pronotum which is usually as broad as the maximum width of the elytra. Furthermore, the pronotal striae in *N. thoracicus* **sp.n.** are completely absent. The median lobes of *N. flavosignatus* and *N. thoracicus* **sp.n.** are of the same size but in ventral view the form of the aedeagus of *N. thoracicus* **sp.n.** is more slender and tapered at the tip (Figs 13a, 14a, 15a).

Remarks. It is notable that “black specimens” of *N. thoracicus* **sp.n.** (Fig. 10) are restricted to smaller streams and intermittent creeks in monsoonal rainforest pockets in Litchfield and Kakadu National Park. The “light form” is found all over the species distribution range.

Distribution. Northern Australia (WA, NT, QLD), from the Kimberley region, Kakadu National Park, Arnhemland to northern Queensland (Fig. 26).

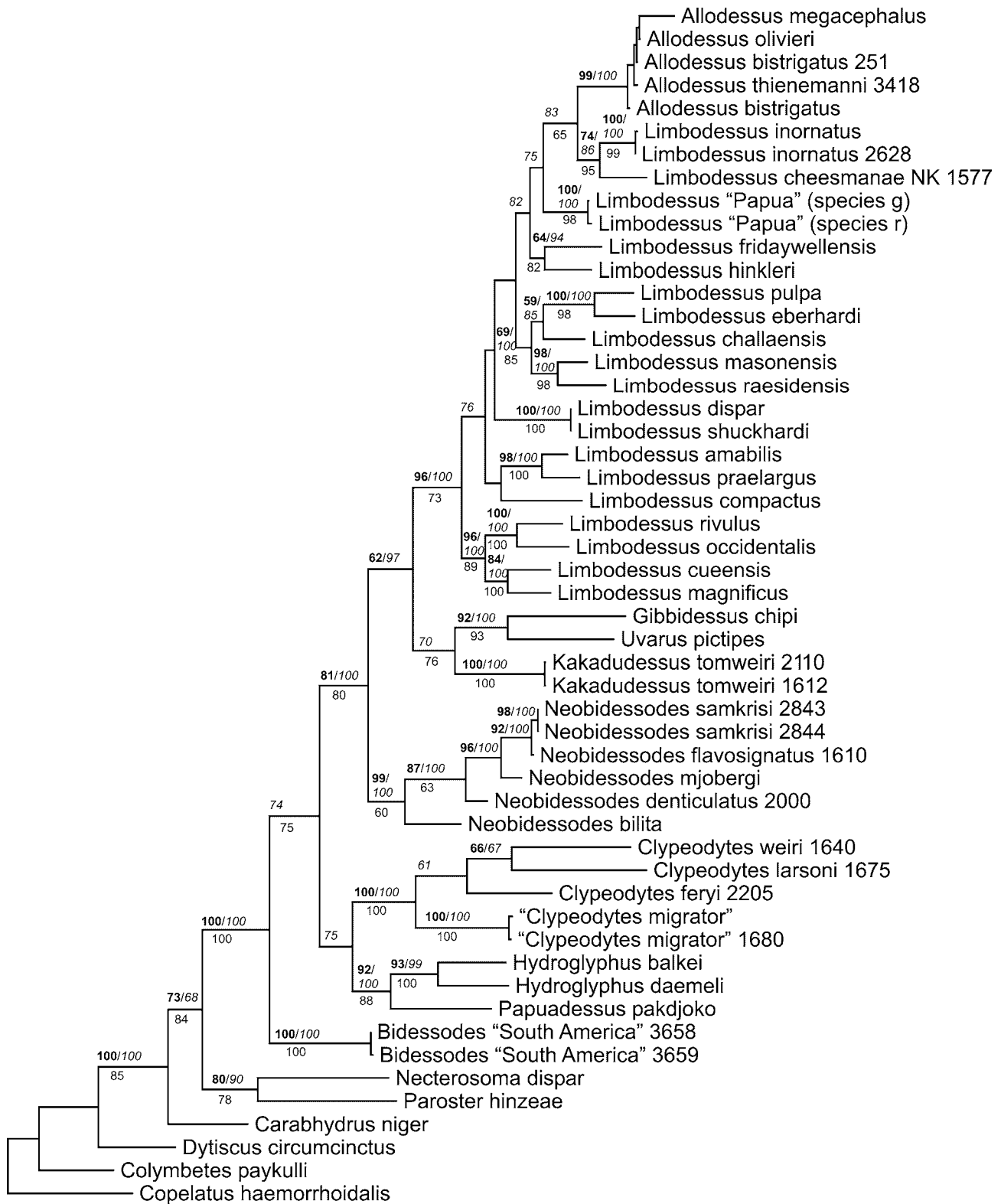
Habitat. The habitat is similar to that of *N. denticulatus*, *N. flavosignatus* and *N. mjobergi* with which it usually occurred (Figs 30, 35, 36, 37).

DNA taxonomy or barcoding

What can mitochondrial DNA sequence data do to speed up and/or support traditional taxonomy in this particular case? Such data are now widely used for this purpose (Balke 2008; but also Monaghan *et al.* 2006), see e.g. the Barcoding of Life website (www.barcodinglife.org) where a *c.* 650 bp long fragment of the cytochrome *c* oxidase is used to “tag” or “barcode” species. We focus on the epigeal *Neobidessodes* because the two underground water species are genetically rather divergent and thus well delineated genetically (Leys *et al.* 2003; our Fig. 28).

Our *Neobidessodes* tree (Fig. 28) and divergence analyses with Taxon DNA software reveal: the morphologically *a priori* delineated species *N. bilita* (intraspecific divergence: 0%), *N. denticulatus* (0–1.28%), *N. grossus* (0.14%), *N. samkrisi* (0.12%), *N. flavosignatus* (0%), *N. thoracicus* (0–0.76%) and *N. mjobergi* (0–0.25%) each forms as separate clades. The principal clades shown in Fig. 27 were recovered by maximum likelihood as well as parsimony analysis, see support values on the tree.

However, interspecific *p*-distances can be as low as 0.85–1.14% between *N. samkrisi* and *N. flavosignatus* or 2.12–2.66% between *N. mjobergi* and *N. thoracicus*. Thus, clustering at higher *a priori* defined thresholds would merge such species, which are morphologically very distinct. Because of the idiosyncratic structure of the present dataset, there is no clustering threshold that would retrieve all the species at the same time (Fig. 29). Therefore, while all species were retrieved as monophyletic, they cannot easily be delineated based on a preset sequence divergence threshold. In short, there is no obvious gap between interspecific and intraspecific divergence.



— 50 changes

FIGURE 27. Phylogram of the tree obtained using GARLI and *cox1* and 16S data for Australasian Bidessini, Neotropical *Bidessodes* and outgroups. Node support, when above 50%: bold (GARLI bootstrap), italics (MrBayes posterior probabilities >0.5, x100), normal font (TNT jackknife values). Note: “*Clypeodytes migrator*” will be transferred to *Leiodytes* in a forthcoming revision (Hendrich *et al.* in prep.).

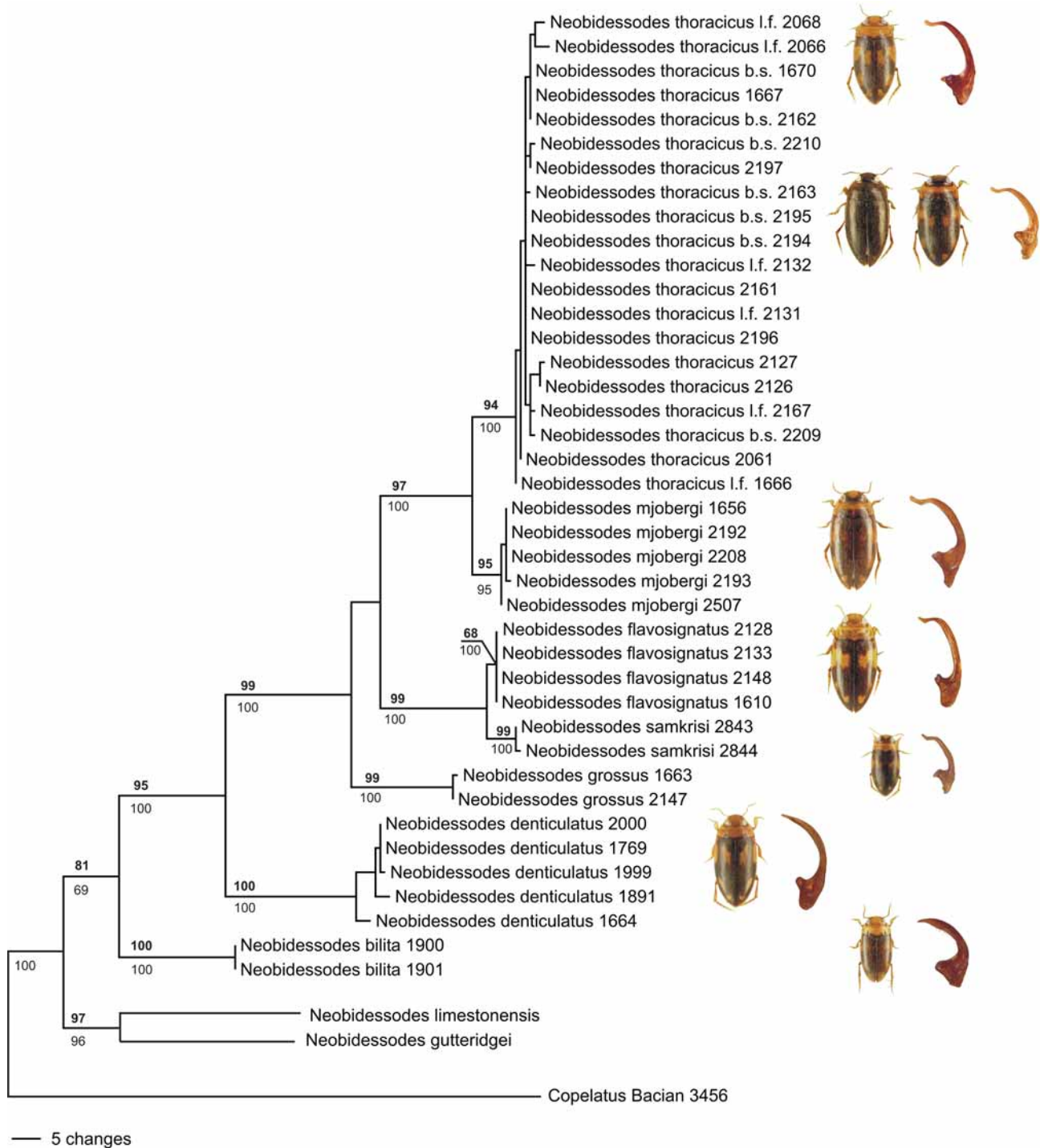


FIGURE 28. Phylogram of the tree obtained using GARLI and with *coxI* data for *Neobidessodes* alone. Node support, when above 50%: bold (GARLI bootstrap), normal font (TNT parsimony jackknife values). Abbreviations behind *N. thoracicus* sp.n.: “b.s.” = black specimens; “I.f.” = “light form”.

The perhaps most interesting finding here is that the two morphologically very distinct species *N. samkrisi* and *N. flavosignatus* are genetically less divergent from each other (0.85–1.14%) than individuals within *N. denticulatus* which diverge from each other by 0–1.28%.

This means that all *Neobidessodes* species can be identified based on mtDNA sequence data, and on tree topology. Clustering however in cases like *Neobidessodes* will be problematic due to the lack of a coherent gap between infraspecific and interspecific divergence. A sound taxonomy and dense taxon sampling is the

essential prerequisite to assemble DNA sequence databases if they are to sustainably aid molecular species identification.

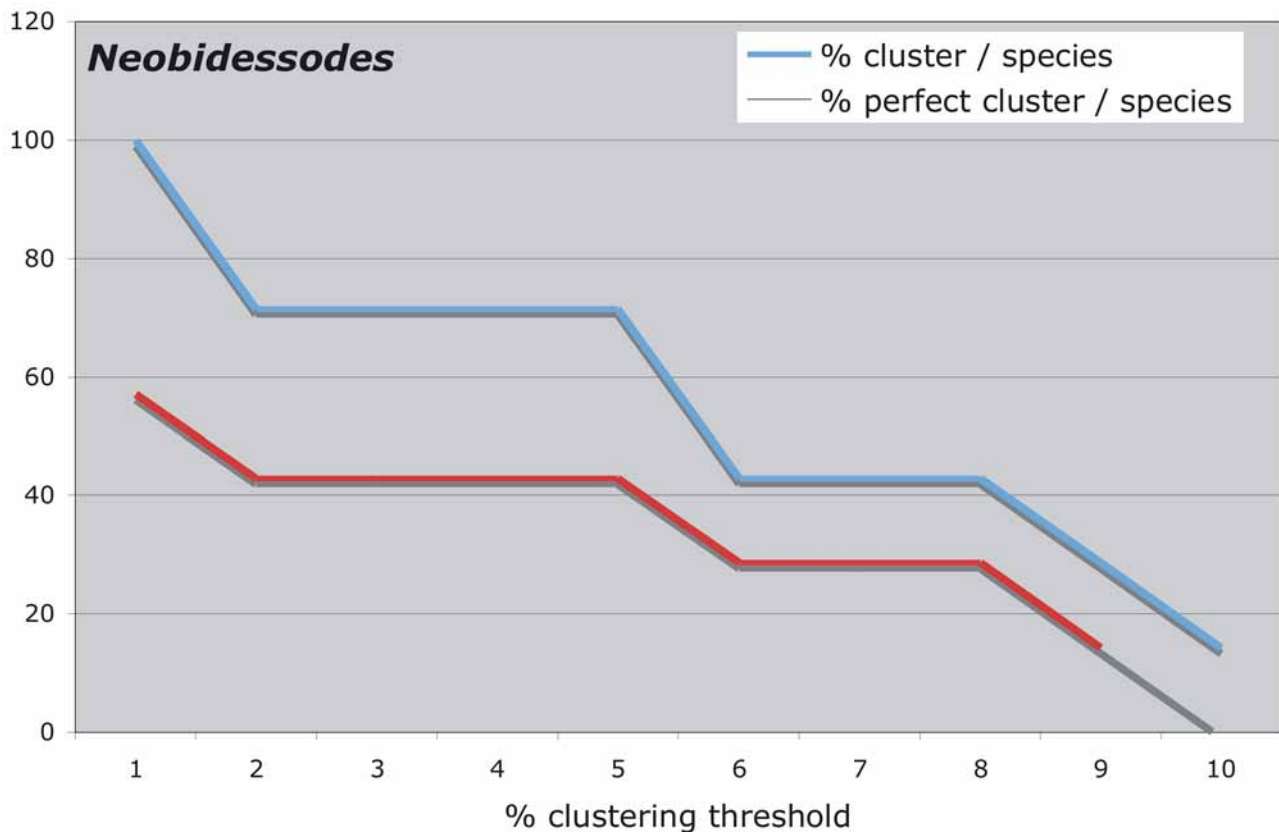


FIGURE 29. Performance of clustering in *Neobidessodes*. The blue graph indicates the number of clusters relative to the number of *a priori* identified morphospecies, found at 1–10% preset clustering distance in SpeciesIdentifier software. The red graph depicts the percentage of clusters that contain one and only one *a priori* identified morphospecies relative to the number of *a priori* identified morphospecies. Perfect clustering performance would see both graphs at 100% at least in one interval (e.g. 3%).

Online resources / Cybertaxonomy

We believe that taxonomic resources should be disseminated as widely as possible. Therefore, we provide easily accessible online contents, lately often referred to as Cybertaxonomy infrastructure (see e.g. Wheeler 2007, Zhang 2008, la Salle *et al.* 2009, <http://species.asu.edu/>).

DNA sequence data are available from “GenBank” (<http://www.ncbi.nlm.nih.gov/> or <http://www.ebi.ac.uk/embl/>). Our accession numbers are listed in Table 1. Illustrations of morphological characters were deposited online in different repositories: In a Google Picasa Web Album at http://picasaweb.google.com/ZSMKaefer/ZSM_AustralianBidessini#, in the Australian Bidessini Album. Such a picture set was also uploaded to Flickr’s Encyclopaedia of Life group pool (www.flickr.com), and wikispecies (<http://species.wikimedia.org>, earlier example: <http://species.wikimedia.org/wiki/Kakadudessustomweiri>) species pages for *Neobidessodes* **gen.n.** will be created immediately after publication of the new names suggested here. Via harvesting, all of that information will eventually become available in the Encyclopaedia of Life project (www.eol.org). The website of Michael Balke at www.zsm.mwn.de/col/michaelbalke.htm can be used as another entrance to access digital materials on *Neobidessodes* **gen.n.**. Thus, we opted for a simplistic but fast approach to widely disseminate materials relevant for species identification. Finally,

material on each species can simply be located entering the species name in Google's image search machine at www.google.com.



FIGURES 30–35. Habitats of *Neobidessodes*: 30) Slow flowing stream and rest pool in monsoonal rainforest at Gubara (Kakadu NP, NT), habitat of “black specimens” of *Neobidessodes thoracicus* **sp.n.**; 31) NT, Manton Dam Recreation Area, 46 km S Darwin (NT 1), habitat of *N. denticulatus*, *N. flavosignatus* and *N. mjobergi*; 32) NT, Finnis River 10 km W Batchelor (NT 2), habitat of *N. mjobergi* and *N. denticulatus*; 33) NT, Litchfield NP, Shady Creek, Florence Falls (NT 3), habitat of *N. grossus*; 34) NT, Nitmiluk NP, Edith Falls, Upper Pool (NT 12), habitat of *N. grossus*; 35) NT, Kakadu Hwy, Harriet Creek at Hwy Crossing (NT 14), habitat of *N. grossus* and *N. thoracicus* **sp.n.** (Photos: L. Hendrich).



FIGURES 36–41. Habitats of *Neobidessodes*: 36) NT, Kakadu NP, Creek on the way to Gunlom (NT 16), habitat of black specimens and the typical form of *Neobidessodes thoracicus* **sp.n.**; 37) Restpools in river at Gungurrul Lookout in Kakadu NP, October 1996, habitat of *N. denticulatus*, *N. flavosignatus*, *N. mjobergi* and *N. thoracicus* **sp.n.**; 38) S QLD, 8 km SE Miriam Vale, road to Agnes Water, Oyster Creek (QLD 50), habitat of *N. denticulatus*; 39) S QLD, N Brisbane, Caboolture/Beerburrum road, near King John Creek (QLD 62), shallow roadside swamp, habitat of *N. denticulatus*; 40) S NSW, 6.5 km SW Eden, Towamba Road 2 km N Nullica, 556 m (NSW 111), habitat of *N. bilita*; 41) S VIC, Simpsons Creek 12 km SW Orbost at Princess Hwy (VIC 116), habitat of *N. bilita* (Photos: L. Hendrich).

Habitats and faunistics

The seven epigeal species of the genus are more or less rheophilic, they appear to be restricted to slow flowing rivers and streams and their backwaters, or to pools and puddles which form in their beds in the dry season (Figs 29–40). In the dry season the adults are found in standing water such as rest pools of intermittent streams and in larger billabongs. An exception is *N. grossus* which seems to be more common during and just after the rainy season in standing water (e.g. billabongs). In these habitats up to five species of the genus are often abundant and aggregations of several hundred specimens are not unusual. Two species are stygobitic. The genus is distributed with five species in the northern half of Australia and with one species in south-eastern Australia. A single species is known from the west savannah area of southern New Guinea. Most probably more intensive studies will reveal further species occurring along the lowland coastal areas of that island. Two stygobitic species are endemic in the Three Rivers calcrete in the Yilgarn, Western Australia (Watts & Humphreys 2003). The genus is absent so far from Tasmania. The Kimberley region, the river systems of the Darwin and Kakadu area, the Arnhemland and Cape York appear to be centres of speciation. All epigeal species occur in lowland or coastal areas and hilly or low mountain ranges from 0–300 m. The larvae of all species are still undescribed. All epigeal species seem to be capable of flight, at least five species were obtained by operating light traps.

Colouration

All but two (*N. bilita* and *N. grossus*) of the epigeal species of the genus studied have a strong contrasting black/yellow surface making the beetles inconspicuous against the ground. The ground pattern of these species includes various yellow or reddish spots. A similar colour pattern is also present in some lotic Laccophilinae (e.g. almost all species of *Neptosternus* Sharp, all *Philaccolilus* Guignot, some species of *Laccophilus* Leach, Balke *et al.* 1997, Hendrich & Balke 1997), Australian *Clypeodytes* (Hendrich & Wang 2006), *Sternopriscus hansardii*-group sensu Hendrich & Watts (2004), and some lentic Dytiscinae such as *Sandracottus* Sharp and *Thermonectus* Dejean (Larson 1996). As discussed in previous publications (Larson 1996, Hendrich & Watts 2004), the variegated colour pattern has evolved convergently several times within the Dytiscidae, especially among lotic species. The dark surface colour combined with contrasting yellow pattern may help to disrupt the body outline of beetles on gravelly or sandy bottom when viewed by visually hunting predators such as birds, lizards specializing on aquatic invertebrate prey, toads (*Bufo marinus* L.) and fish.

Key to epigeal species of *Neobidessodes*

1. Length > 3.7 mm. Elytron with a subapical lateral flange, pronotal striae very weak, N WA, NT, N QLD ... *grossus*
- Length < 3.7 mm..... 2
2. Elytron with a subapical lateral tooth (Fig. 21), pronotal striae well marked, WA, NT, QLD, N NSW.... *denticulatus*
- Elytron lacking lateral tooth; pronotal striae present or absent 3
3. Pronotal striae absent 4
- Pronotal striae present..... 5
4. Length 2.55–2.65 mm, outline of junction of pronotum and elytra smooth, sides of pronotum evenly curved, maximum width at posterior angles, dorsal colour pattern usually diffuse (Fig. 7), N WA, NT, N QLD..... *mjobergi*
- Length 2.75–2.9 mm, outline of junction of pronotum and elytra slightly sinuate, maximum width of pronotum somewhat before base. Dorsal colour pattern strongly varying, when present, usually well marked (Fig. 9). In some specimens pronotum yellow (Figs 11, 12) in others pronotum and elytra all black (Fig. 10), N WA, NT, N QLD.....
..... *thoracicus* **sp.n.**
5. Males with mesotarsus curved. Pronotal striae moderately marked, dorsal colour pattern usually diffuse (Fig. 8), length 2.2–2.25 mm, VIC, NSW, S QLD..... *bilita*

- Males with mesotarsus straight, contrasting yellowish markings on black elytra (Figs 3, 4, 5) 6
- 6. Pronotal striae short but well marked (Fig. 5), smallest species of the genus (length 2.0 mm), West Papua, Indonesia *samkrisi* **sp.n.**
- Pronotal striae extremely weak and faint (Figs 3, 4), length 2.35–2.65 mm, N WA, NT, N QLD..... *flavosignatus*

Acknowledgements

We are indebted to Tom Weir (ANIC, Canberra, Australia), Christine Taylor (BMNH, London, England), Andrew Short (Kansas, USA), Bert Viklund (NHRS, Stockholm, Sweden) and Michel Brancucci (NMB, Basel, Switzerland) for lending type material and specimens, to Alexander Riedel (Karlsruhe, Germany) for the excellent habitus photos, and to Hans Fery (Berlin, Germany), Olof Biström (Helsinki, Finland), Chris H.S. Watts and Remko Leijs (Adelaide, Australia) for critical reading the manuscript. The Department of Environment and Conservation in Western Australia is acknowledged for giving permission to conduct scientific research in the Pilbara [Permit numbers: SF 003017 and NE 002348], and the Parks and Wildlife Commission of the Northern Territory, the Australian National Parks & Wildlife Service in Darwin and the Kakadu National Park is thanked for giving permission to conduct scientific research in the Northern Territory (Permit Number: 23929 and RK- 400/ RK- 660). The Department of Environment and Conservation in New South Wales [Scientific Licence No. S12040] and the Department of Sustainability and Environment in Victoria [Research Permit No. 10003840] are acknowledged for giving permission to conduct scientific research in National and State Parks. This work was supported by grants to Michael Balke: Deutsche Forschungsgemeinschaft (BA 2152/4-1, 6-1 and 7-1), and to Lars Hendrich: Deutsche Forschungsgemeinschaft (HE 5729/1-1). Michael Balke thanks Samkris Tidige (†) and Shita Prativi for their help and friendship. Finally Lars Hendrich warmly thanks his wife Emma Hendrich and Ingo Weckwerth (Berlin, Germany) for their patience, assistance and enthusiastic encouragement during several field trips.

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