

A new species of the genus *Pheropsophus* (Coleoptera: Carabidae: Brachininae) from northern Australia

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ABSTRACT – A new species of the brachinine genus *Pheropsophus* Solier is described from far northern and north-western Australia: *P. windjanae* sp. nov. The new species which previously was not discriminated from *P. verticalis* (Dejean) is distinguished from that species by short and wide, posteriad considerably widened elytra, more cordiform pronotum, almost completely black base of the head, absence of a distinct yellow apical elytral margin, narrower aedeagus the apex of which is slightly sinuate on the left side, and the narrow, parallel-sided sulcus on the lower surface of the aedeagus. A revised key to the Australian species of the genus *Pheropsophus* is provided.

KEYWORDS: taxonomy, morphology, beetle

INTRODUCTION

Giachino (2003) published a revision of the Australian species of the brachinine genus *Pheropsophus* Solier, 1833 and examined and identified in this paper a large number of specimens that I had collected during several collecting trips in various parts of Australia. Apart from a few species described as new in Giachino's paper, the bulk of the material was identified as *P. verticalis* (Dejean, 1825) which is the most widely distributed and most common species of the genus *Pheropsophus* in Australia. However, in northern tropical Australia, in particular in the far north of the Northern Territory and of Western Australia, this common species occurs sympatrically and at several localities also syntopically with one or another of the new species described by Giachino.

Giachino (2003) stressed that *P. verticalis* is quite variable in body size, body shape, and colouration, and indeed, at least colouration of elytra, pronotum, and head varies considerably. In particular southern specimens generally seem to be more vividly coloured than the northern ones. However, body shape is far less varied and the elytra usually are rather parallel-sided and elongate as in most other Australian species except *P. darwini* Giachino, 2003. This was confirmed by me during the examination of many specimens from throughout Australia.

While sorting and introducing some specimens into my working collection many of which were identified by Giachino as *P. verticalis* some years ago, I recognized that several specimens from far northern Western Australia and Northern Territory possess perceptibly

shorter and wider, posteriad considerably widened elytra, have a more cordiform prothorax, and differ in the colouration of the head and elytra. Dissection of the male genitalia of several specimens from a number of northern localities which possess the mentioned character states, and of a number of specimens of *P. verticalis* from various parts of Australia, now revealed also differences in the shape and structure of the aedeagus. Therefore, they corroborate the opinion that the mentioned specimens belong to a new, hitherto undescribed species which is described herein.

METHODS

This study employed methods standardly used in carabid research. The genitalia were removed from specimens which had been relaxed overnight in a jar under moist atmosphere, then cleaned for between 10 to 20 minutes in hot 10% KOH, according to the degree of sclerotization of the aedeagus. The habitus photographs were obtained with a digital camera using ProgRes CapturePro 2.6 and AutoMontage and subsequently prepared with Corel Photo Paint X4.

Measurements were taken using a stereo microscope with an ocular micrometer. Length has been measured from apex of labrum to apex of elytra. Length of pronotum was measured along midline. Length of the elytra was measured from the most advanced part of the humerus to the very apex.

The holotype of the new species will be stored in Western Australian Museum, Perth (WAM), paratypes are shared with that collection, Museum and Art

Gallery of the Northern Territory, Darwin (MAGNT), Queensland Museum, Brisbane (QM), Australian Museum, Sydney (AM), Museum Victoria, Melbourne (NMV), Australian National Insect Collection, Canberra (ANIC), and the working collection of the author in Zoologische Staatssammlung, München (CBM).

SYSTEMATICS

Family Carabidae Latreille, 1802

Subfamily Brachininae Bonelli, 1810

Genus *Pheropsophus* Solier, 1833

Pheropsophus Solier, 1833: 461; Giachino 2003: 29. See Giachino (2003) for additional references.

TYPE SPECIES

Brachinus madagascariensis Dejean, 1831, by original designation.

REMARKS

The genus *Pheropsophus* in the widest sense (Lorenz 2005) is distributed in all continents, but is by far most common in the Old and New World Tropics. At present about 130 species and a quite large number of subspecies are known (Lorenz 2005).

Six species of the genus are currently recorded from Australia (Giachino 2003), but only *P. verticalis* has been recorded from southern parts of mainland Australia, whereas most species occur in far northern parts of Northern Territory and Western Australia. From my experience, all Australian species live on the sandy, clayish, or muddy banks of rivers, lakes, and billabongs, in the south and south-west even on the shore of salt lakes, and they often aggregate in large numbers. At some localities, two or even three species occur together in mixed populations, without our knowing whether and in which way they may differ in habits and in their ecological requirements. The Australian species of *Pheropsophus* are strictly nocturnal beetles which during the daytime hide in earth cracks, in grass, under debris, and under stones. Commonly they occur together with species of the genus *Chlaenius* Bonelli, 1810 and with certain species of Odacanthini, e.g. of the genera *Porocara* Sloane, 1917, *Dicraspeda* Chaudoir, 1862, and *Eudalia* Castelnau, 1867. *Pheropsophus* species are said to feed on mole crickets and their eggs (Frank *et al.* 2009), but they also may eat other crickets, other small insects, and worms.

Pheropsophus windjanae sp. nov.

Figures 2–4

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Windjana Gorge

National Park, Lennard River, 17°24.72'S, 124°56.53'E, 103 m, 21–22 November 2007, M. Baehr (WA69) (WAM Entomology No. 82961).

Paratypes

Australia: Western Australia: 17 ♂, 14 ♀, same data as holotype (1 ♂, 1 ♀ AM; 1 ♂, 1 ♀ ANIC; 12 ♂, 9 ♀ CBM; 1 ♂, 1 ♀ NMV; 1 ♂, 1 ♀ QM; 1 ♂, 1 ♀ WAM); 1 ♂, 2 ♀, Windjana Gorge, 150 km E. of Derby, 23 November 1984, M. and B. Baehr [*Pheropsophus verticalis* (Dejean) P.M. Giachino det. 2001] (CBM); 9 ♂, 3 ♀, Willare, Fitzroy River, 17–18 June 1995, M. Baehr (WA95/29) [*Pheropsophus verticalis* (Dejean) P.M. Giachino det. 2001] (7 ♂, 1 ♀ CBM; 2 ♂, 2 ♀ WAM); 3 ♂, 4 ♀, Ord River, 135 km n. Halls Creek, 15 November 1984, M. and B. Baehr [*Pheropsophus verticalis* (Dejean) P.M. Giachino det. 2001] (CBM); 2 ♂, 2 ♀, Mary River, 115 km W. of Halls Creek, 17 November 1984, M. Baehr (WA84/28) [*Pheropsophus verticalis* (Dejean) P.M. Giachino det. 2001] (CBM); 1 ♂, Fitzroy Crossing, 18–20 November 1984, M. and B. Baehr (CBM); **Northern Territory:** 3 ♂, 6 ♀, Mary River, 110 km E. of Darwin, 1 November 1984, M. and B. Baehr [*Pheropsophus verticalis* (Dejean) P.M. Giachino det. 2001] (2 ♂, 5 ♀ CBM; 1 ♂, 1 ♀ MAGNT).

ETYMOLOGY

The name refers to the locality where most specimens were collected, Windjana Gorge at the southern margin of the Kimberley, northern Western Australia.

DIAGNOSIS

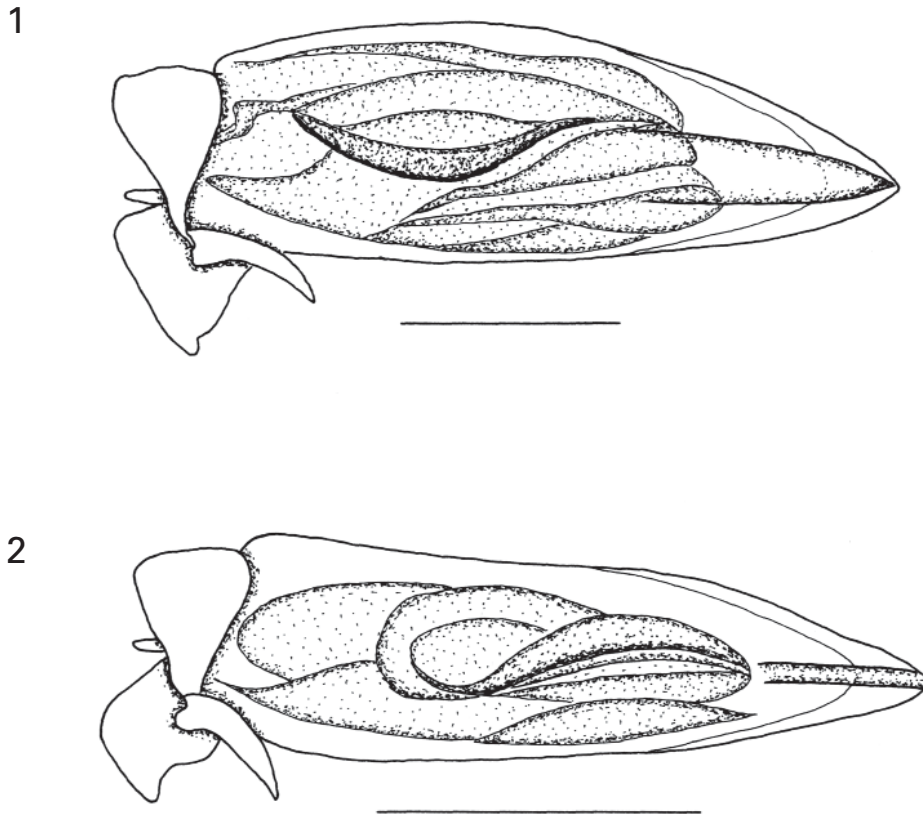
A median sized species, distinguished from most similar *P. verticalis* by the short and posteriorly widened elytra, cordiform pronotum with rather deep prebasal excision of the lateral margins, absence of a distinct yellow apical margin of the elytra, black base of the head, and rather narrow, on the left side slightly sinuate apex of the aedeagus with narrow, parallel median sulcus on the lower surface.

DESCRIPTION

Measurements: length: 10.2–13.4 mm; width: 4.4–5.5 mm. Ratio length/width of pronotum: 0.90–0.93; ratio length/width of elytra: 1.33–1.43.

Colour (Figure 4): head pale reddish; either whole base of head black, or only black in middle of posterior margin. Pronotum variously coloured from almost completely black to largely reddish with only base and apex black. Elytra black, without a pale humeral spot, with a large, irregular pale reddish spot in middle which usually reaches the 3rd interval; apex black with only fine, short, longitudinal reddish lines. Mouthparts, antennae, and legs pale reddish, base of tibiae with tiny black spots. Lower surface largely reddish, in dark-coloured specimens with some parts of prosternum, proepisternum, mesepimeron and abdomen dark, in light-coloured specimens almost the whole lower surface reddish; epipleura of elytra always reddish.

Head (Figure 3): slightly narrower than pronotum.



FIGURES 1, 2 Aedeagus, lower surface. 1, *Pheropsophus verticalis* (Dejean); 2, *P. windjanae*, sp. nov. Scale bars = 1 mm.



FIGURE 3 *Pheropsophus windjanae* sp. nov., head and pronotum.



FIGURE 4 *Pheropsophus windjanae* sp. nov., habitus of a male paratype specimen from Windjana Gorge. Body length: 11.8 mm.

Eye large, laterally moderately protruded. Base of head wide. Labrum anteriorly almost straight, with 6 setae. Mandibles rather short, apically sharply incurved, with a long seta on scrobe. Mentum with triangular, unidentate tooth. Glossa bisetose, paraglossae elongate, membranous, slightly surpassing the glossa, setose at tip. Lacinia densely setose. Maxillary palpus short and stout, sparsely setose except terminal palpomere which is glabrous, slightly widened, and transverse at apex. Labial palpus short and stout, terminal palpomere widened and transverse at apex, outer surface sparsely setose. Antenna stout but elongate, surpassing base of pronotum by almost four antennomeres. Median antennomeres about 1.8 x as long as wide. Whole antenna densely pilose. Dorsal surface finely strigose mediad of the eyes, in anterior half very finely and superficially punctate, neck very coarsely and densely punctate-rugose. Microreticulation extremely fine, isodiametric, slightly superficial. Neck laterally with fairly elongate, erect hairs. Surface moderately glossy.

Prothorax (Figure 3): large and rather wide, wider than long, markedly cordiform. Apex wide, straight to slightly concave, anterior angles rounded off. Sides regularly convex, concave in basal sixth. Basal angles rectangular, slightly obtuse at tip. Base comparatively narrow, almost straight. Lateral margin slightly raised, narrow, marginal channel very narrow. Apex and base without margin. Disk gently convex. Median line in middle slightly more impressed than anteriorly and posteriorly, neither reaching apex nor base. No transverse sulci present. Basal grooves barely indicated. Lateral margin with a single elongate seta situated slightly behind middle. Surface with few very coarse punctures and more or less distinct, finer punctures, with scattered, moderately elongate, erect hairs. Microreticulation extremely fine, slightly superficial, composed of more or less isodiametric meshes that are arranged in irregularly directed rows.

Elytra (Figure 4): short and wide, lateral margins slightly though evenly convex, distinctly widened towards the apical fourth. Humeri shortly rounded. Apex very slightly oblique-convex. Disk with 8 carinae. All interspaces of similar width. Carinae narrow, rather glossy, very finely punctate, with extremely fine, rather superficial, isodiametric microreticulation, and with a sparse row of erect hairs. Interspaces between the carinae wide, depressed, densely strigose, and with extremely fine, but distinct microreticulation, markedly opaque. 2nd interspace near 3rd carina with 3–4 longer, erect setae. Marginal pores and setae very numerous, setae of different length. Apex of elytra with a hyaline margin and a dense fringe of hairs. Elytra free, metathoracic wings fully developed.

Lower surface: prosternum with sparse, elongate erect hairs; mesosternum and metasternum with dense, less

erect setosity, abdominal sterna with dense, decumbent pilosity. Apical margins of the abdominal tergites with a fringe of stiff, moderately elongate hairs. Sternum VII in male with 4, in female with 6–8 elongate setae. Metepisternum elongate, c. 2.5 x as long as wide at apex.

Legs: tibiae densely spinose and setose, tarsi setose on upper surface. 1st – 3rd tarsomeres of male protarsus with loose, biseriate squamosity.

Male genitalia (Figure 2): rather short, curved, comparatively narrow. Apex of aedeagus triangular, though slightly sinuate on the left side (when seen from below). Median sulcus on lower surface very narrow. Internal sac with several elongate folds, some of which are slightly sclerotized at their margins. Left and right parameres odd-shaped as in other species. Genital ring wide and short, much alike those of the other species.

Female genitalia: gonocoxite 2 very narrow and elongate.

Variation. Some variation of body size (10–13.5 mm) and of relative width and length of pronotum and elytra noted. Also colour of pronotum is variable, from almost uniformly black to mostly red. In almost all specimens from Windjana Gorge the head base is completely black, in the specimens from Mary River in Northern Territory the black colour usually reaches the basal margin of the head only in the middle.

COLLECTING CIRCUMSTANCES

Most specimens were sampled in pitfall traps placed on sandy banks or in the sandy bed of large rivers, near the waters edge or around pools. A few specimens also were caught by hand under cover on sandy river banks.

DISTRIBUTION

This species is known from northern Western Australia at the southern and eastern margin of the Kimberley Division, and the northern part of Northern Territory east of Darwin.

RELATIONSHIPS

In colouration this species is most similar to *P. verticalis* (Dejean), but in the shape of the elytra it is quite unique within the Australian species, except for *P. darwini* Giachino 2003 which has comparable, apically widened elytra.

REVISED KEY TO THE AUSTRALIAN SPECIES OF *PHEROPSOPHUS*

1. Elytra with distinct light humeral spot.....2
 - Elytra without distinct humeral spot3
2. Body size usually larger, greater than 13.5 mm, rarely less; aedeagus large and elongate, apex

almost symmetric [see Giachino (2003), figures 4, 10] *P. straneoi* Giachino, 2003

Body size usually smaller, less than 12.5 mm; aedeagus small and short, apex slightly excised on the right side (when seen from lower surface) [see Giachino (2003), figures 7, 13] *P. macleayi* Sloane, 1895

3. Elytra elongate, more or less parallel-sided [see Giachino (2003), figures 1, 15, 17] 4

Elytra short, apicad distinctly widened [Figure 4; Giachino (2003), figure 21] 6

4. Pronotum always completely black, and head without any black spot *P. gregoryi* Giachino, 2003

Pronotum commonly partly yellow, rarely completely black; head always with black spot 5

5. Pronotum longer than wide; apex of aedeagus widely rounded [see Giachino (2003), figure 12] *P. alexandrae* Giachino, 2003

Pronotum as wide as long, or wider than long; apex of aedeagus obtusely triangular, with wide sulcus in middle of lower surface (Figure 1) *P. verticalis* (Dejean, 1825)

6. Black spot of head not in contact to pronotum; apex of elytra with distinct yellow margin; yellow spots of pronotum encircled by black colour [see Giachino (2003), figure 21]; pronotum narrower, as long as wide, laterally near base more elongately sinuate; elytra narrower, towards base much more narrowed [see Giachino (2003), figure 21]; apex of aedeagus regularly triangular [see Giachino (2003), figure 14] *P. darwini* Giachino, 2003

Black spot of head always in contact to pronotum, often the whole base of the head black; apex of elytra without distinct yellow margin; yellow spots of pronotum, if present, not encircled by black colour (Figure 4); pronotum wider than long, near base with distinct but shorter sinuation (Figure 3); elytra much wider, towards base less narrowed (Figure 4); apex of aedeagus slightly excised at left side (when seen from lower surface), with narrow sulcus in middle of lower surface (Figure 2) *P. windjanae*, sp. nov.

CURRENT DISTRIBUTION OF THE AUSTRALIAN *PHEROPSOPHUS*

Pheropsophus alexandrae Giachino, 2003: northern parts of Northern Territory.

Pheropsophus darwini Giachino, 2003: northern parts

of Northern Territory.

Pheropsophus gregoryi Giachino, 2003: north-western Northern Territory, northernmost Western Australia.

Pheropsophus macleayi Sloane, 1895: northernmost Northern Territory and Western Australia, old unspecified records from New South Wales and Victoria very doubtful.

Pheropsophus straneoi Giachino, 2003: tropical northern Australia, from northern Western Australia to northern Queensland, also in central Northern Territory.

Pheropsophus verticalis (Dejean, 1825): almost the whole of mainland Australia.

Pheropsophus windjanae, sp. nov.: northern parts of Northern Territory and of Western Australia

REMARKS

Although *P. windjanae* differs in the shape and colouration of the elytra from *P. verticalis*, most probably it is more closely related to that species than to any other species in Australia. *Pheropsophus darwini*, however, which has the elytra comparably distinctly widened apically, is quite different in colouration, shape of pronotum and elytra, and also in the shape of the aedeagus, from *P. windjanae*.

Apart from these differences in body shape and colouration, males of *P. windjanae* and *P. verticalis* can be clearly distinguished by the form of the sulcus on the lower surface of the aedeagus, which is wide and somewhat triangular in *P. verticalis* and narrow and almost parallel-sided in *P. windjanae*.

At several localities *P. windjanae* occurs sympatrically in mixed populations with *P. verticalis*. Both species have been sampled in the same pitfall trap, and differences in their ethology and ecology remain untested. Because in northern parts of Northern Territory *P. windjanae* may also occur sympatrically with *P. darwini*, and at several localities throughout northern Australia also *P. verticalis* and *P. straneoi* are sympatric and even syntopic in some places, the question of putative ecological differences are raised for most species of the genus.

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