

REVISION OF THE GENUS *NESOXYPILUS* BEIER (MANTODEA: AMORPHOSCELIDAE: PARAOXYPILINAE)

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## Abstract

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Two species of the ant mimicking genus *Nesoxypilus* Beier are recognized and described: *N. albomaculatus* Werner (with its new junior synonym *N. antennatus* Beier) and *N. pseudomyrmex* sp. nov. The genus is redefined and a key to the species is given. Relationships and aspects of biology are discussed.

## Introduction

The genus *Nesoxypilus* contains small, ground dwelling, paraoxypiline mantids in which the female and nymphal stages, and to a lesser extent the male, closely resemble ants. Its known distribution is across the tropical north of Australia and in south-western Papua New Guinea.

Beier (1965) described *Nesoxypilus* to contain a single species, *N. antennatus*, from a male and a female specimen from Prince of Wales Island. Werner (1933) described a species of *Paraoxypilus*, *P. albomaculatus*, from two male specimens from Burnside, Northern Territory. I have examined the type material of both species and find that *P. albomaculatus* belongs to *Nesoxypilus* and, after examination of a number of other specimens, that *N. antennatus* is a synonym of *N. albomaculatus*. The genus *Nesoxypilus* is here redefined and *N. albomaculatus* is redescribed. An additional species, *N. pseudomyrmex* sp. nov., is described.

In describing the male genitalia the interpretation and terminology of La Greca (1953–1954) is followed. For study purposes the genitalia were removed from the relaxed specimen and soaked in 10% KOH for approximately 1 hour. After washing, the genitalia were transferred to 70% alcohol and the soft internal tissues teased out. They are preserved in glycerol and contained in microvials attached to the specimen pin of dry specimens. For wet preserved specimens they are preserved in 70% alcohol in glass microtubes contained in the specimen tube.

All drawings were done by the author using a Wild M4A binocular microscope with camera lucida attachment.

The following abbreviations are used for institutions where material is lodged: ANIC, Australian National Insect Collection, Canberra; BPBM, Bernice P. Bishop Museum, Honolulu, Hawaii; NMV, Museum of Victoria, Melbourne; NMB, Naturhistorisches Museum, Basel; NTM, Northern Territory Museum, Darwin; QM, Queensland Museum, Brisbane; UQ, University of Queensland, Brisbane; WAM Western Australian Museum, Perth.

*Nesoxypilus* Beier

*Nesoxypilus* Beier, 1965: 449. Type species *Nesoxypilus antennatus* Beier, by original designation.

**Diagnosis.** Small; male macropterous, female apterous. Head wider than pronotum, without paraocular spines or other projections, apical margin moderately arched, apex higher than eyes; frontal shield transverse, moderately arched transverse ridge running between bases of antennae; antennae setose, elongate in male, shortened in female, distinctly thickened, especially in female where segments are short and thickset, almost discoid.

Pronotum short and thickset with strongly defined, rounded and unarmed supracoxal expansion; margins narrowly lamellate; metazone strongly constricted at about two-thirds distance from supracoxal groove, with fine median keel raised into a lobe near caudal margin; meso- and metanotum with similar median keel and caudal lobe; lobes less strongly developed in male. Tegmina of male subopaque.

Forecoxa with anterior margin sparsely setose and in the female very finely denticulate; fore-



femur with 3 discoidal spines, the second long and powerful; foretibia with smooth outer ventral margin, inner ventral margin finely denticulate on distal half. Mid and hind legs relatively long, the metatarsus of the latter considerably longer than the remaining segments together; genicular spine absent.

Abdomen without lateral projections, slender in mature male, strongly broadened in female and nymphs; 3rd abdominal tergite with more or less well developed median lobe on caudal margin; supraanal plate an elongate, blunt tipped triangle in female, shorter and more rounded in male; cerci short, cylindrical. Male genitalia

with distal process of ventral phallomere bearing two short, rather widely spaced, projections, right hand one curving dorsally. Dorsal lamina of left phallomere setose; apical process moderately long and sharply bent to the left; membranous lobe short, broad, tip finely shagreened; anterior process extending a short distance into body of membranous lobe; phalloid apophysis fused with anterior process. Apical area of main lobe of right phallomere setose; ventral plate fused to main body of phallomere, strongly sclerotized, finely shagreened ventrally; ventral sclerified process forming stout, blunt tipped, hook, surface finely shagreened.

#### Key to species of *Nesoxypilus*

1. Median lobe on caudal margin of 3rd abdominal tergite (Figs 4, 5, 6, 8) well developed ..... *N. albomaculatus*
- Median lobe on caudal margin of 3rd abdominal tergite (Figs 7, 9) poorly developed, almost absent ..... *N. pseudomyrmex*

#### *Nesoxypilus albomaculatus* (Werner) comb. nov.

Figures 1–6, 8, 10–13, 15–20

*Paraoxypilus albomaculatus* Werner, 1933: 444.

*Nesoxypilus antennatus* Beier, 1965: 450. Syn. nov.

**Material examined.** Lectotype male, here designated, of *Paraoxypilus albomaculatus*, Burnside, NT, Apr 1931, Handschin. Second handwritten label: *Paraoxypilus albomaculatus* ♂ type Wern. Paralectotype male, here designated, Burnside, NT, May 1932. Bears second handwritten label: *Paraoxypilus albomaculatus* ♂ paratype Wern., (both NMB).

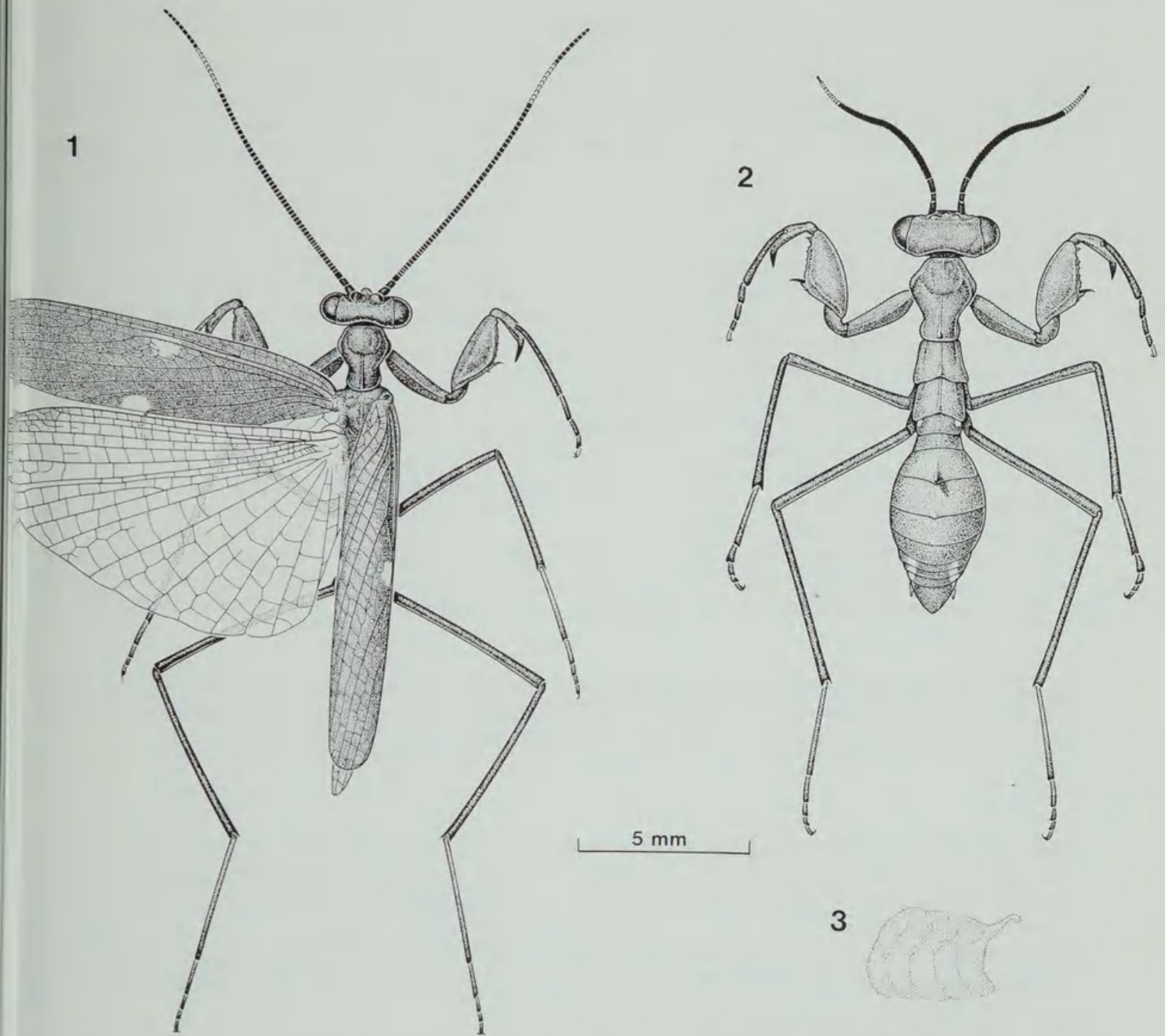
Holotype male of *Nesoxypilus antennatus*, Prince of Wales Is., Cape York Islands, 25 Jul 1920, J.A. Kutsche. Allotype female, Prince of Wales Is., Cape York Islands, 3 Aug 1920, J.A. Kutsche, (both BPBM).

Other specimens examined (35 ♂, 34 ♀, 12 nymphs). Queensland. 1 ♀, near Dimbulah 17°05'S, 145°05'E, 26 Jun 1971, R.W. Taylor and J. Feehan; 1 ♀, 15°03'S, 145°07'E, 4 km SW of Casurina Hill, near Cooktown, 30 Apr–2 May 1981, D.C.F. Rentz; 1 ♀, 15°03'S, 145°09'E, 3 km NE of Mt Webb, 30 Apr–3 May 1981, J.E. Feehan; 1 ♀, Mareeba, Sep 1932, H. Hill; 1 ♀, 1 nymph, Forty Mile Scrub National Park, 13–14 Feb 1986, B.P. Moore; 1 nymph, 18°05'S, 144°52'E, Forty Mile Scrub National Park, 52 km SSW of Mount Garnet, 22 Jul 1986, D.C.F. Rentz; 3 ♂, 17°25'S, 145°04'E, 15 km W of Irvinebark, 27–28 Nov 1981, J. Balderson; 2 ♂, 1 ♀, 5 km W of Innot Hot Springs, 5 Jan 1984, D. Rugg; 1 ♂, Mt Norman, Norman R., Gregory Range, 8 May 1980, D. Frith; 1 ♂, 15 km S of Barcaldine, 1 May 1957, Key and Chinnick; 1 ♂, 5 km WSW of Camel Creek Homestead, W of Ingham, 5 Apr 1962, K.H.L. Key and E.L. Corby, (all ANIC); 1 ♂, 2 ♀, Lockerbie,

Cape York, 6–10 Jun 1969, G.B. Monteith; 3 ♂, 25 km SW of Normanton, 25 May 1972, G.B. and S.R. Monteith; 1 ♂, Walker Creek, 42 km SE of Karumba, 28 May 1972, G.B. and S.R. Monteith; 1 ♂, 22 km SW Palmer River, Cooktown Highway, 16–22 May 1975, R.T. Storey; 1 ♀, 1 nymph, 2 km E of Wild River Crossing, near Innot Hot Springs, 10 Jan 1981, G. and A. Daniels, (all UQ); 1 ♀, Lakefield National Park, 75 km N of Laura, 15–28 Jun 1980, G.B. Monteith; 1 ♀, Lockerbie Scrub, Cape York, 14–18 Apr 1973, G.B. Monteith; 1 ♀, 10 km N of Hann. Crossing, Cape York Peninsula, 27 Jun 1975, G.B. Monteith; 2 ♂, 1 ♀, 5 km WSW of St Pauls, Moa (Banks) Is. Torres Strait, 16 Jul 1977, G.B. Monteith and D. Cook; 2 ♂, Sandstone Outcrops 30 km W of Fairview, via Laura, 22–24 Jun 1976, G.B. and S.R. Monteith; 1 ♂, Hughenden, H.H. Batchelor (all QM); 1 ♂, Prince of Wales Is., Torres Strait, 27 May 1969, A. Neboiss; 1 nymph, 17.15°S, 145.17°E, 1 km NNE of Collins Weir, W of Atherton, 10 Feb 1989, G. Milledge; 1 nymph, 17.19°S, 144.58°E, 5 km NE of Petford, 12 Feb 1989, G. Milledge (all NMV).

Northern Territory. 4 ♂, Tindal, 13 km ESE of Katherine, 14°31'S, 132°22'E, 30 Nov–20 Dec 1967, W.J.M. Vestjens; 1 ♂, 4 ♀, 5 km W of Jabiru, 7–10 Feb 1983, H.B. Gill and J.C. Wombey; 1 ♀, 3 nymphs, 1 ootheca, 12°17'S, 133°20'E, Cooper Creek, 11 km SW of Nimbuwah Rock, 2 Jun 1973, K.H.L. Key; 3 ♀, Jabiru, 7 km SSE of Mudginberri Homestead, 29 Aug 1981, H.B. Gill and J.C. Wombey; 1 ♀, Kakadu Headquarters, 6 km SSE of Mudginberri Homestead, 6 Sep 1981, H.B. Gill; 2 ♂, Jabiru, 7 km SSE of Mudginberri Homestead, 30 Aug 1981, H.B. Gill; 1 ♀, 13°07'S, 130°38'E, c. 4 km N of Wangi Homestead, W of Batchelor, 3 Jul 1982, G. van de Klassorst; 3 ♂, 11°01'S, 136°45'E, Rimbaja Is., Wessel Is., 19 Feb 1977, Barrett and Bakker; 1 ♂, 12°43'S, 132°54'E, 14 km SE of Mudginberri Homestead, 12 Jun 1973, M.S.





Figures 1–3. *Nesoxypilus albomaculatus* (Werner). Fig. 1, male dorsal. Fig. 2, female dorsal. Fig. 3, ootheca dorsolateral.

Upton and J.E. Feehan; 1 ♀, 12°50'S, 132°51'E, 16 km NE of Mt Cahill, 30 Oct 1972, K.H.L. Key; 1 ♀, 12°17'S, 133°20'E, Cooper Creek, 11 km SW of Nimbuwah Rock, 2 Jun 1973, K.H.L. Key; 1 nymph, 12°17'S, 133°20'E, Cooper Creek, 11 km SW of Nimbuwah Rock, 2 Jun 1973, R.L. Kitching; 1 ♂, 2 ♀, 1 ootheca, 12°23'S, 132°57'E, 5 km NNW of Cahills Crossing, East Alligator R., 28 May 1973, K.H.L. Key et al., 1 ♀, 1 km NE of Cahills Crossing, 12°25'S, 132°58'E, 11 Nov 1972, R.W. Taylor and J.E. Feehan; 1 ♂, Brocks Creek, 28 Mar 1936, T.G. Campbell; 1 ♂, Brocks Creek, 10 Jun 1933, T.G. Campbell (all ANIC); 1 ♂, 1 nymph, Darwin, May 1979, G. Milledge; 2 ♀, Kakadu National Park, Oct 1987, A.N. Andersen (all

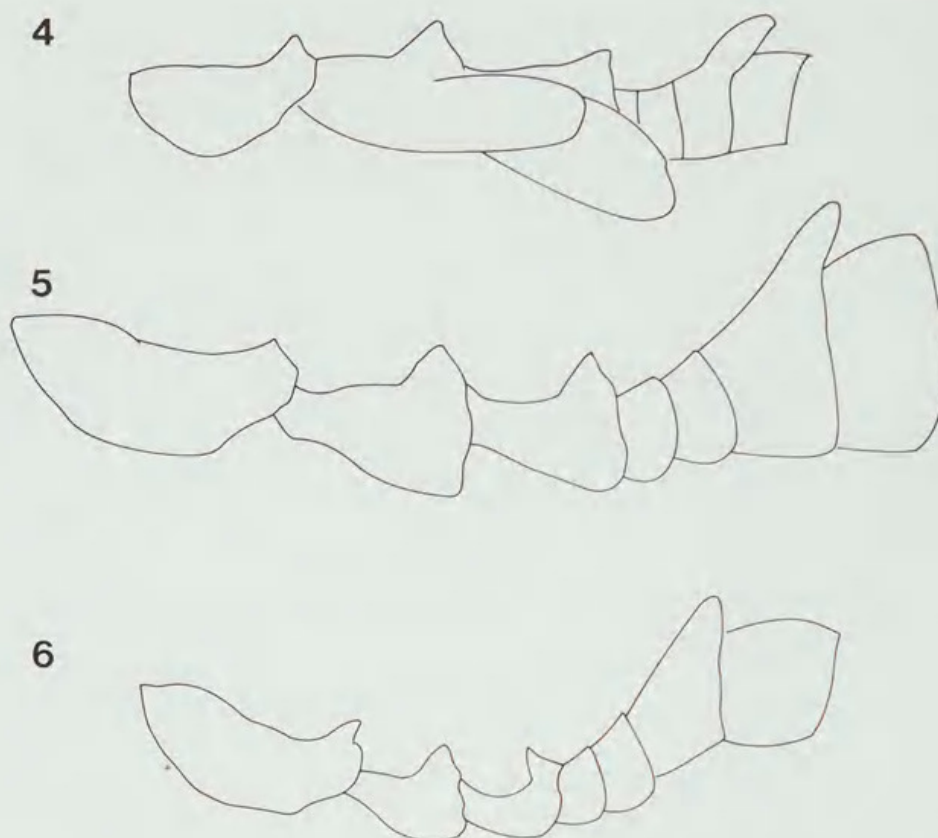
NMV); 1 ♀, Gove Peninsula, 24–29 Jun 1982, J. Major (NTM).

Western Australia. 2 ♂, Wyndham, 28 Jul 1960, G.F. Mees (WAM).

Papua New Guinea. 1 ♀, 2.8 km ENE of Morehead, Western District, 30 Apr 1971, Balderson and Baker; 2 ♀, 4 nymphs, 8°42'S, 141°40'E, 3 km ENE of Morehead, Western District, 27 Sep 1972, Balderson and Stibick (all ANIC).

**Description.** Body colour of dry specimens yellowish, reddish or blackish brown, antennae with short whitish section subapically; thoracic nota with distinct median triangular lobe near





Figures 4–6. *Nesoxypilus albomaculatus* (Werner). Fig. 4, male nymph nota and abdominal terga 1–4 lateral (3 km ENE of Morehead PNG). Fig. 5, female nota and abdominal terga 1–4 lateral (Forty Mile Scrub National Park). Fig. 6, female nota and abdominal terga 1–4 lateral (16 km NE Mt Cahill, NT).

caudal margin, somewhat variable in shape (Figs 4–6, 8); mesothorax with white blotch on trochantin, lower corner of episternum and sometimes basisternum; metathorax similar but white blotch extends across basisternum forming a band; fifth tarsal segment of foreleg whitish; costal and discoidal areas of male tegmen sub-opaque brown, discoidal area with white spot at mid anterior and posterior margins, anal area hyaline; wings with slight pearly iridescence, darkly flushed apically, remainder hyaline; first abdominal tergite with white blotch in anterior corner (not always apparent in male); third abdominal tergite with a distinct, dorsoposteriorly directed, median lobe on posterior margin, variable in size (Figs 4–6, 8), always smaller in male; 5th abdominal sternite of female with broad white band on anterior margin; 7th, 8th and 9th abdominal tergites of female with white patch near outer margin, 10th whitish on lateral margin, forming short white band; cerci whitish. Male genitalia (Figs 12, 13, 15–19) with spiny, knob-like projection on upper right margin of phalloid apophysis, situated ventrally relative to membranous lobe.

**Measurements** (in mm). Length of body, ♂ 10.0–11.8, ♀ 9.4–11.8. Length of pronotum, ♂ 1.7–2.1, ♀ 2.0–2.4. Width of pronotum, ♂ 1.3–1.5, ♀ 1.6–1.8. Length of tegmina, ♂ 9.0–16.0. Length of wing, ♂ 9.0–15.0. Length of hind femur, ♂ 4.0–5.4, ♀ 4.6–5.6. Length of hind tibia, ♂ 4.0–5.4, ♀ 5.0–5.6.

**Immature stages.** Nymphal stages of both sexes similar to adult female in appearance except that late instar male has large wing buds (Fig. 4). Dorsal lobes present from first instar (Fig. 11). Ootheca (Fig. 3) small, pale buff coloured, short, double row of almost upright cells, thin projection at posterior end.

**Distribution.** Northern parts of the Northern Territory, Western Australia and Queensland and Papua New Guinea (Fig. 20).

**Remarks.** The form of the dorsal lobes in the female is slightly variable but the abdominal lobe is always distinct (Figs 4–6). Although the abdominal lobe is shorter and more delicate in the male it is always present (Fig. 8). However i



may be folded down or broken off in dry specimens.

The distal process of the male genitalia shows some slight variation but a pattern is not apparent (Figs 15–19). The form of the phalloid apophysis is quite uniform in those specimens examined.

This species can be distinguished from *N. pseudomyrmex* sp. nov. by the possession of a distinct median lobe on the caudal margin of abdominal tergite 3, generally brownish colour, and a spiny knob-like projection on the phalloid apophysis in the male.

***Nesoxypilus pseudomyrmex* sp. nov.**

Figures 7, 9, 14, 20

*Material examined* (4 ♂, 1 ♀).

Holotype: ♂, 14°49'S, 125°50'E, Mining Camp, Mitchell Plateau, Kimberley District, WA, 9–19 May 1983, D.C.F. Rentz and J. Balderson (ANIC).

Paratypes: ♂, same locality as holotype; ♂, 15°19'S, 126°32'E, Old Doongan, Kimberley District, WA, 2 Jul 1975, Common and Upton; ♀, Cape Bougainville,

Kimberley District, WA, 14°05'S, 126°08'E, 7 Jun 1988, A.N. Andersen; ♂, 14°25'S, 126°36'E, CALM site 13.4, 12 km S of Kalumburu Mission, WA, 7–11 Jun 1988, T.A. Weir; 2 nymphs, 14°25'S, 126°40'E, CALM site 4.3, 14 km SE of Kalumburu Mission, WA, 3–6 Jun 1988, T.A. Weir (all ANIC).

**Diagnosis.** Body colour of dry specimens black, antennae with short whitish section subapically; thoracic nota with fairly well developed median lobe near caudal margin (Figs 7, 9); mesothorax sometimes with white blotch on trochantin; metathorax with whitish band on trochantins, lower corner of episternum and basisternum; fifth tarsal segment of foreleg white, other tarsal segments of all legs becoming pale proximally; tegmen of male with costal area black, discoidal area black except for white patch on mid anterior and posterior margins, anal area hyaline; wing with slight pearly iridescence, apex flushed blackish, remainder hyaline; 1st abdominal tergite with white spot near anterior corner (not apparent in male); 3rd abdominal tergite with very small, hardly noticeable, mid dorsal lobe at

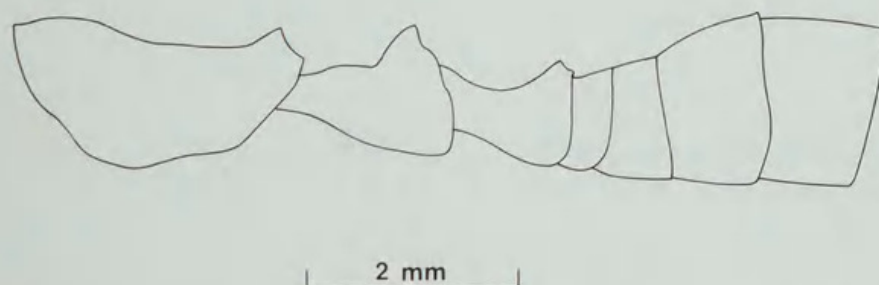


Figure 7. *Nesoxypilus pseudomyrmex* sp. nov., female nota and abdominal terga 1–4 lateral (Cape Bougainville, WA).

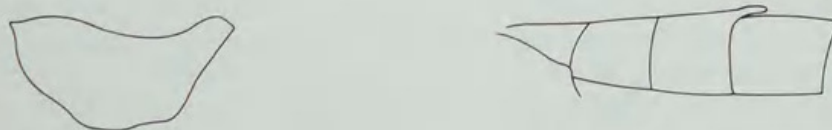
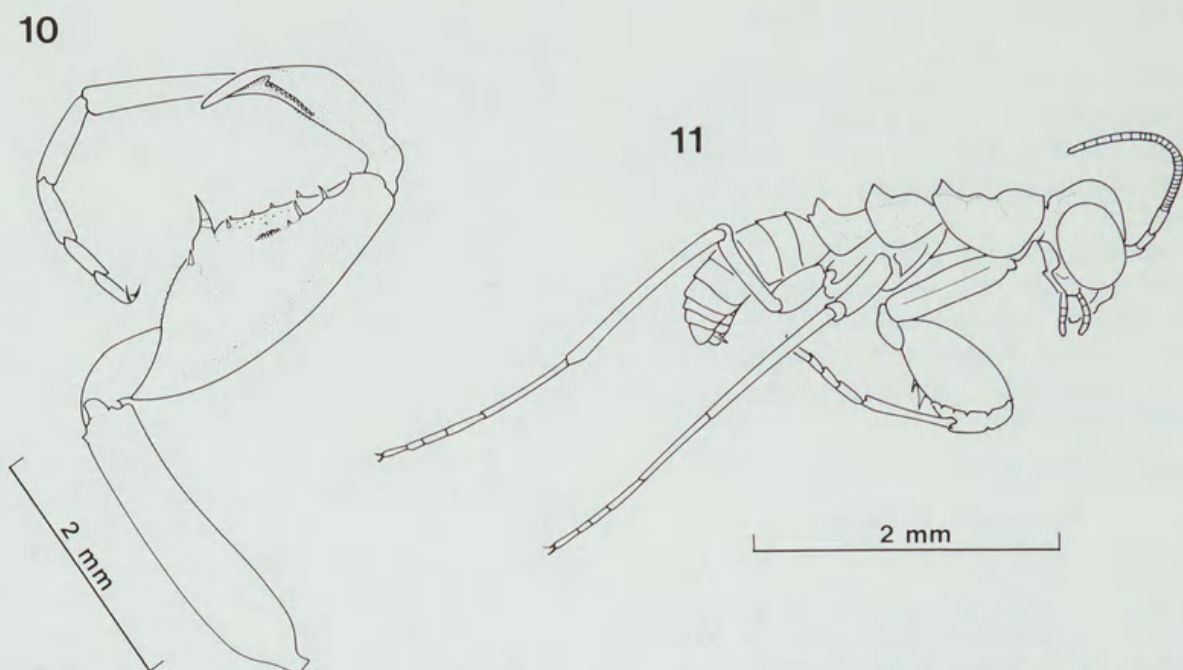


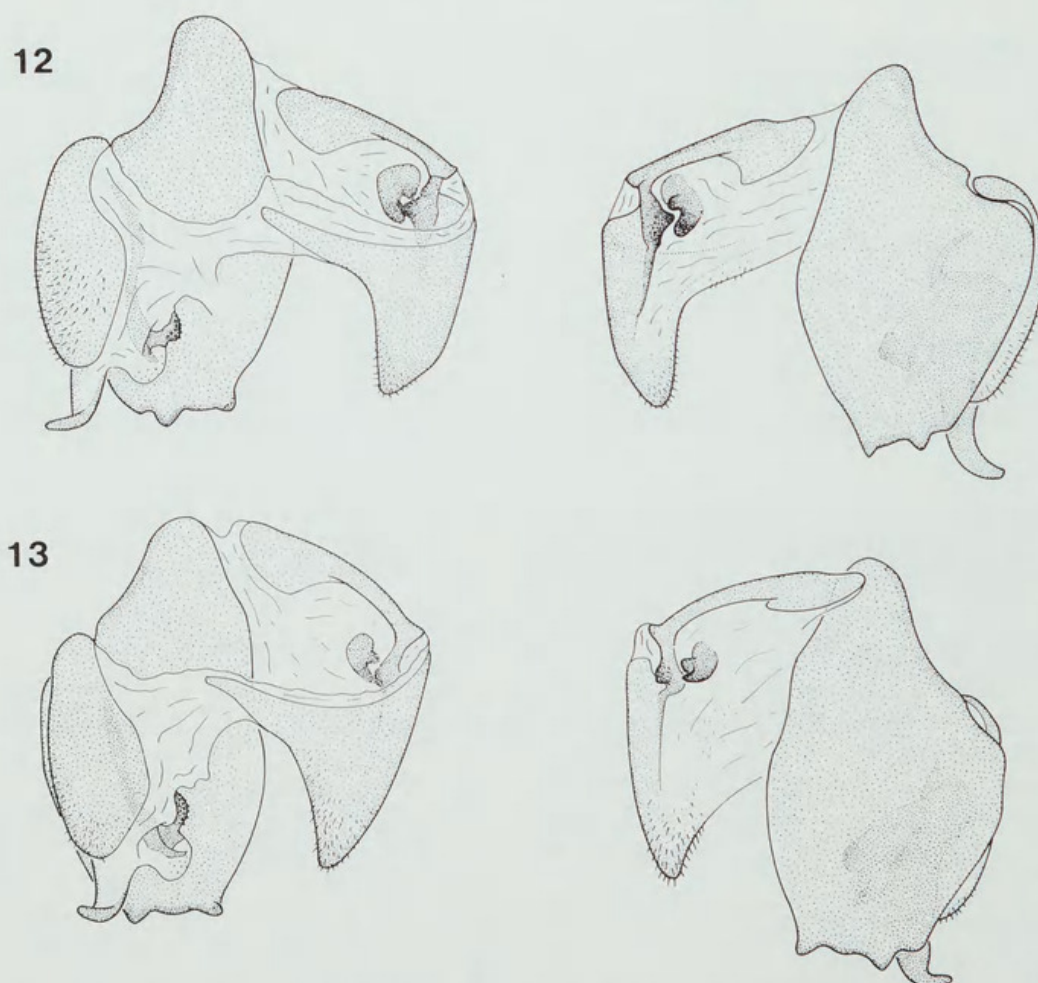
Figure 8. *Nesoxypilus albomaculatus* (Werner), male pronotum and abdominal terga 1–4 lateral (13 mi. SW of Palmer R., Cooktown Highway, Qld).



Figure 9. *Nesoxypilus pseudomyrmex* sp. nov., male pronotum and abdominal terga 1–4 lateral (Old Doongan, Kimberley District, WA).



Figures 10, 11. *Nesoxypilus albomaculatus* (Werner). Fig. 10, inside face of foreleg female. Fig. 11, 1st instar nymph lateral.



Figures 12, 13. *Nesoxypilus albomaculatus* (Werner). Fig. 12, male genitalia dorsal (left) and ventral (right) (5 km NNW of Cahills Crossing, NT). Fig. 13, male genitalia dorsal (left) and ventral (right) (Prince of Wales Is., Qld).



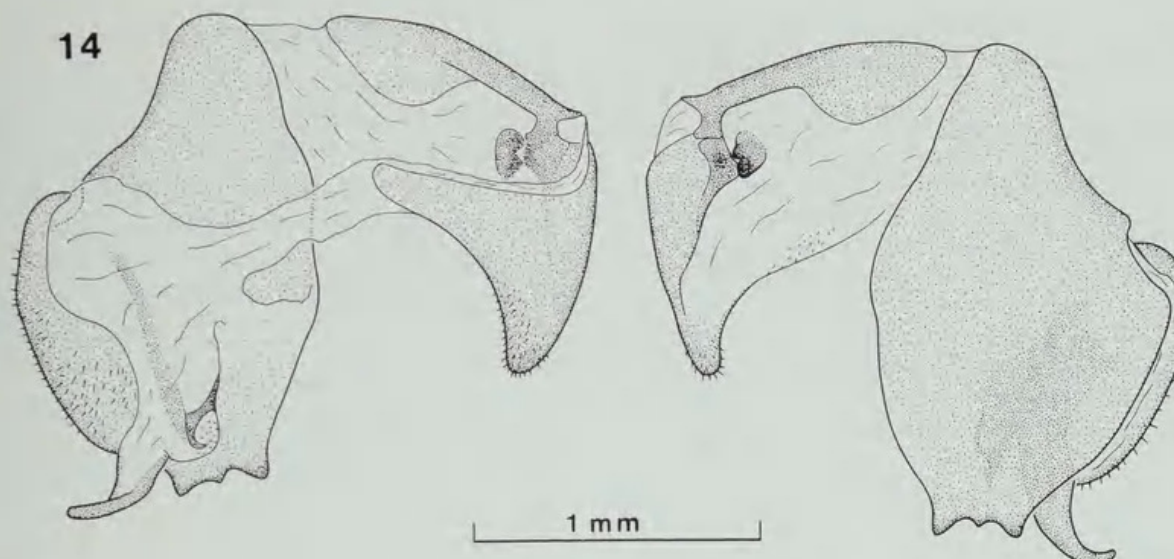


Figure 14. *Nesoxypilus pseudomyrmex* sp. nov.; male genitalia dorsal (left) and ventral (right) (Old Doongan Kimberley District, WA).



Figures 15-19. *Nesoxypilus albomaculatus* (Werner), distal process of male genitalia dorsal. Fig. 15, 8 mi. ESE of Tindal, NT. Fig. 16, Rimbija Is., NT. Fig. 17, 9 mi. S of Barcaldine, Qld. Fig. 18, 5 km W of Innot Hot Springs, Qld. Fig. 19, 15 km W of Irvinebank, Qld.

caudal margin (Figs 7, 9); 5th abdominal sternite of female apparently lacking white band on anterior margin; 7th, 8th and 9th abdominal tergites of female with whitish patch near outer margin, 10th whitish on lateral margin, forming short whitish band; cerci whitish. Male genitalia with phalloid apophysis lacking projections (Fig. 14).

**Measurements** (in mm). Length of body ♂ 10.6-10.8, ♀ 11.8. Length of pronotum, ♂ 2.0-2.1, ♀ 2.7. Width of pronotum, ♂ 1.4-1.5, ♀ 2.0. Length of tegmen, ♂ 10.6-11.0. Length of wing, ♂ 9.2-9.6. Length of hind femur, ♂ 5.2-5.5, ♀ 6.0. Length of hind tibia, ♂ 5.2-6.2, ♀ 6.5.

**Immature stages.** Late instar nymphs similar to adult female in appearance except that male has large wing buds. Ootheca unknown.

**Etymology.** Specific epithet from the Greek *pseudos* meaning false and *myrmex* meaning ant.

**Distribution.** Recorded only from the Kimberley district in Western Australia (Fig. 20).

**Remarks.** This species is very similar to *N. albomaculatus* but can be distinguished by the

extreme reduction of the third abdominal dorsal lobe, black colouration and lack of any projections on the phalloid apophysis of the male. The measurements indicate that the mid and hind legs are relatively longer. However, more specimens are needed to judge whether this is a constant feature.

### Discussion

Members of this genus are sometimes found running on the ground close to the foraging trails of ants of the genus *Rhytidoponera*. Their resemblance to these ants, both physical and behavioural, is quite remarkable. It is probable that this resemblance is an advantage to *Nesoxypilus*, enabling them to hunt actively without being attractive to potential predators. It seems unlikely that they actually feed on the ants as their raptorial forelegs appear too small to handle them, but they may benefit by preying on smaller insects disturbed by the foraging ants.

The white markings on the body of *Nesoxypilus* are curious as the ants, presumably the models, do not have corresponding markings. Matthews (1976) suggested these markings mimic the highlights on the body surface of the



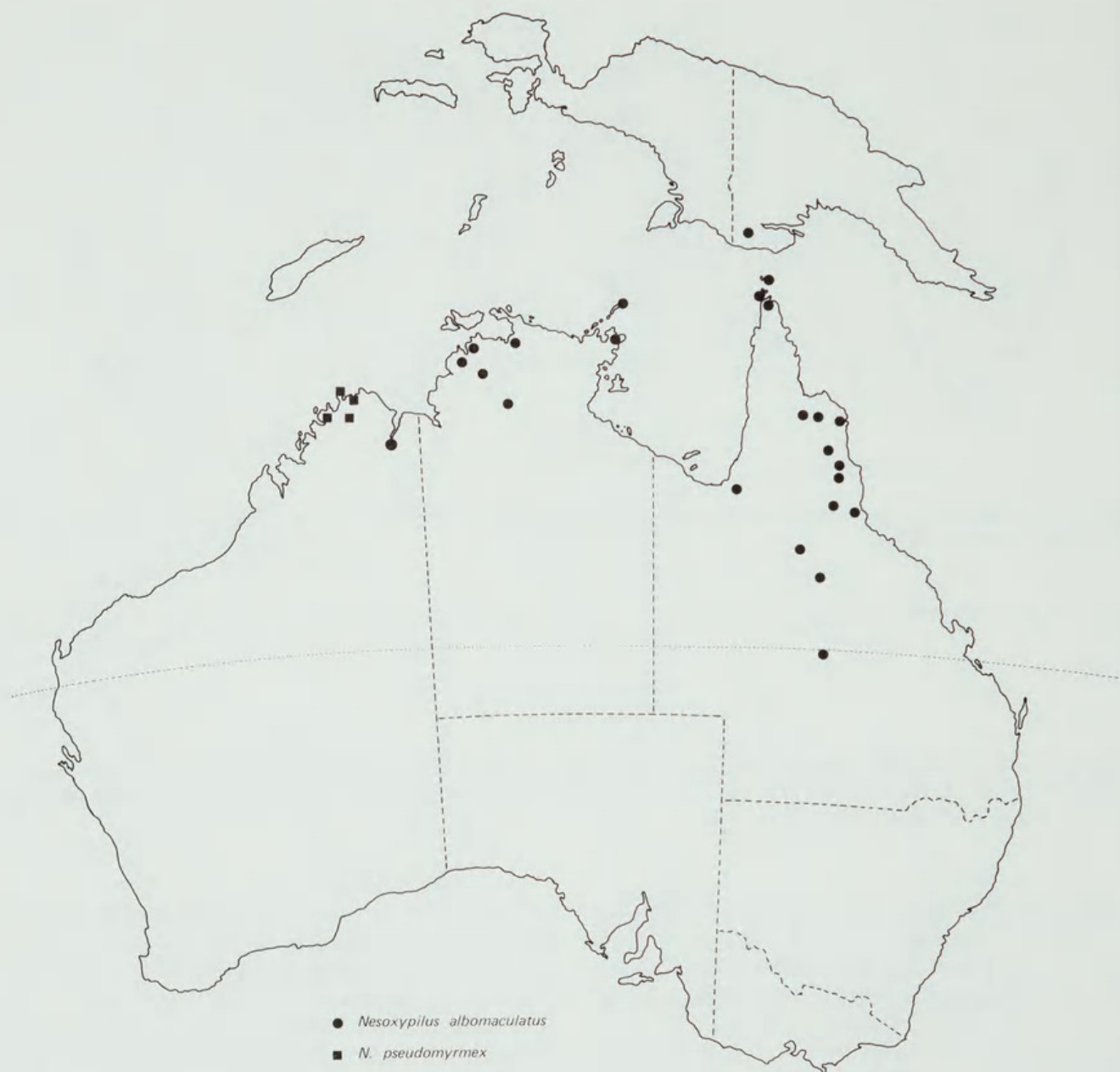


Figure 20. Distribution of *Nesoxyphilus* species.

ant. This may be true for the dorsal abdominal markings although they possibly also serve to camouflage the cerci. It is more likely that the thoracic, ventral abdominal and tegminal white markings serve to give the body a more distinctly segmented appearance, similar to that of ants. The white band on the antennae may serve to attract attention to the ant like movements of these organs.

Beier (1965) stated that this genus belonged to the paraoxyphiline genus group with unarmed forecoxae and that its closest relative was the principally Australian genus *Phthersigena* Stål without giving any reasons for this judgement. While this is likely, a more thorough study of the

Paraoxyphilinae is required before the relationships of *Nesoxyphilus* can be arrived at with any certainty.

Giglio-Tos (1913) described another apparent ant mimic paraoxyphiline genus, *Myrmecomantis*, from Australia, which has similar, though less well developed, features to *Nesoxyphilus* giving it an ant-like appearance. However it can be distinguished from *Nesoxyphilus* by the pronotum which has the margins distinctly tubercled or spined, by the anterior margin of the forecoxa being armed and the forefemur distinctly expanded and by both of these being coloured yellowish on the internal face.



### Acknowledgements

I would like to thank Dr M. Brancucci (NMB) and Mr Gordon Nishida (BPBM) for the loan of type material, Mr John Balderson (ANIC), Mr Ted Dahms (QM), Dr M. Malipatil (NTM), Mr Terry Houston (WAM) and Miss M. Schneider (UQ) for the loan of specimens, Dr A. Andersen for specimens and Dr M. Harvey for reading the manuscript.

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