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**A REVISION OF THE WORLD SPECIES OF QUADRSTICHODELLA
GIRAULT, WITH DESCRIPTIONS OF FOUR NEW SPECIES
(HYMENOPTERA, EULOPHIDAE)**

EIJI IKEDA ¹⁾

Abstract

IKEDA, E. 1999. A revision of the world species of *Quadrastichodella* Girault, with descriptions of four new species (Hymenoptera, Eulophidae). *Ins. matsum. n. s.* 55: 13–35, 57 figs.

Six species of the genus *Quadrastichodella* Girault, *Q. nova* Girault, *Q. aenea* Girault, *Q. bella* Girault, *Q. boudiennyi* Girault, *Q. candida* (Girault), *Q. cyaneiviridis* (Girault) are redescribed mostly on the basis of the type material. Four species, *Q. neglectae* sp. n. from Australia, *Q. pilosa* sp. n. from New Zealand, *Q. gracilis* sp. n. from Japan, and *Q. hirsuta* sp. n. from the Malay Peninsula are described. A key to the females of these species except for *Q. boudiennyi* Girault is provided. Two species-groups, the *bella*- and *gracilis*-groups, are proposed.

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Contents. Introduction — Genus *Quadrastichodella* Girault — Key to the species of *Quadrastichodella* Girault — *Quadrastichodella nova* — *Q. bella* — *Q. aenea* — *Q. boudiennyi* — *Q. candida* — *Q. cyaneiviridis* — *Q. neglectae* sp. n. — *Q. pilosa* sp. n. — *Q. gracilis* sp. n. — *Q. hirsuta* sp. n. — Acknowledgements — References.

1) Research Fellow of the Japan Society for the Promotion of Science.

INTRODUCTION

The genus *Quadrastichodella* was erected by Girault in 1913, and 6 species have hitherto been recognized. Members of this genus are easily diagnosed by a unique feature, the strongly raised rasp-like reticulation on the inner surfaces of the scape and pedicel. They are known to be associated with *Eucalyptus* and all distributed in Australia. Only *Q. nova* was introduced into USA, southern Europe, and South Africa with *Eucalyptus* (Bouček, 1977, 1988).

Although the biology (Flock, 1957) and morphology (Timberlake, 1957; De Santis, 1957; LaSalle, 1994) of *Q. nova* have been relatively well studied, the other 5 species of this genus have not been fully examined. In this paper I redescribe the 6 known species mainly on the basis of the type material, and describe 4 new species from Australia, New Zealand, Japan, and Malaysia. The two of them which are from Japan and Malaysia are rather remarkably different from the Australasian species in their morphology. Moreover, the Japanese species is associated not with *Eucalyptus* but with *Ulmus davidiana* var. *japonica*. I propose 2 species-groups in *Quadrastichodella* on the basis of a morphological and a biological gap between the Asian and Australasian species.

Specimens in the following institutions are examined (abbreviations in parentheses). Australian National Insect Collection, Canberra, Australia (ANIC). Entomological Laboratory, Faculty of Agriculture, Kyûshû University, Fukuoka, Japan (ELKU). National Institute of Agro-Environmental Sciences, Tsukuba, Ibaraki, Japan (NIAES). Queensland Museum, South Brisbane, Australia (QM). South Australian Museum, Adelaide, Australia (SAM). Systematic Entomology, Faculty of Agriculture, Hokkaidô University, Sapporo, Japan (SEHU).

I generally follow Graham's (1987) terminology in this study. The length of the pronotum is measured when the dorsal surface of the mesoscutum is horizontal.

Genus *Quadrastichodella* Girault

Quadrastichodella Girault, 1913b: 69. Type species: *Quadrastichodella bella* Girault (original designation).

Quadrastichodes Girault, 1913b: 68. Type species: *Quadrastichodes cyaneiviridis* Girault (original designation). Synonymized by Bouček, 1988: 668.

Flockiella Timberlake, 1957: 109. Type species: *Flockiella eucalypti* Timberlake (= *Q. nova* Girault) (original designation). Synonymized by Bouček, 1977: 25.

Diagnosis.

Inner surfaces of scape and pedicel with strongly raised rasp-like reticulation (Figs. 22, 23), or with many short spines instead of reticulation (Figs. 45, 46). Occiput with a transverse groove or narrow depression which is crossing foramen magnum at level of upper margin of foramen magnum (Figs. 43, 44). Antenna with 4 anelli and 3-segmented funiculus in female (Figs. 7, 8), with 3 anelli and 4-segmented funiculus in male (Fig. 31). Scrobal groove (Figs. 1, 18) deep and smooth. Face with 2 longitudinal grooves between toruli and clypeus. Gena weakly to strongly swollen. Malar sulcus weakly to strongly curved. Anterior margin of clypeus (Figs. 3, 21) weakly bilobed. Axilla (Figs. 4, 25) strongly advanced. Scutellum (Figs. 5, 26) with distinct submedian and sublateral lines. Submarginal vein of forewing (Figs. 13, 32) with 2 or more dorsal setae. Postmarginal vein of forewing about half as long as stigmal vein. Cercal setae (Fig. 6) subequal in length.

The 2 species-groups proposed, the *bella*- and *gracilis*-groups, are diagnosed as follows:

The *bella*-group

Diagnosis.

Scape and pedicel with strongly raised rasp-like reticulation on the inner surfaces. Clava 3-segmented. Ocellar triangle (Figs. 2, 20) surrounded by groove at least anteriorly and laterally. Gena strongly swollen. Malar sulcus strongly to weakly curved. Propodeum (Figs. 5, 27) at most as long as dorsellum, usually shorter, without paraspiracular carina; spiracle large, with outer rim of spiracle covered by lobe of callus; area around propodeal spiracle at least weakly depressed and smooth. Speculum of forewing (Figs. 13, 32) open. Hind coxa very weakly engraved-reticulate, almost smooth. Petiole (Figs. 27) short and indistinct.

Host. Members of the *bella*-group are associated with *Eucalyptus*, and probably phytophagous (Bouček, 1988).

The *gracilis*-group

Diagnosis.

Scape and pedicel with many short spines (Figs. 45, 46) or rasp-like raised-reticulation (Fig. 55) on the inner surfaces. Clava 1- or 2-segmented. Ocellar triangle (Figs. 41, 56) not surrounded by groove. Gena (Fig. 42) weakly swollen. Malar sulcus weakly curved. Propodeum (Figs. 51, 57) longer than dorsellum, with paraspiracular carina; spiracle small, with whole rim exposed. Speculum of forewing (Fig. 54) closed. Hind coxa (Figs. 51, 57) distinctly raised-reticulate. Petiole (Fig. 57) distinct, wider than long.

Host. One species of this species-group, *Q. gracilis* sp. n., was reared from flowering branches of *Ulmus davidiana* var. *japonica*.

DISCUSSION

I place the 2 new species of the *gracilis*-group, *Q. gracilis* sp. n. and *Q. hirsuta* sp. n., in the genus *Quadrastichodella* on the basis of some characteristics common to the *bella*-group, which are mentioned in the diagnosis of the genus. The morphological gap between the *gracilis*-group and the *bella*-group, however, is fairly large, especially in the propodeum, petiole, clava, and forewing. The features on the propodeum and petiole of the *gracilis*-group are more similar to those seen in the genus *Mischotetrastichus* Graham than to those in the *bella*-group. Moreover, the *bella*-group is associated with *Eucalyptus*, whereas no species of *Eucalyptus* is distributed in Japan and Malaysia. Further investigations of the Asian fauna of Tetrastichinae are needed to confirm the position of the *gracilis*-group.

Key to the species of *Quadrastichodella* Girault
(females)

Q. bouidiennyi Girault is not included in this key, because the head and antennae of the type are missing and no other specimen of this species is available.

1. Propodeum (Figs. 51, 57) longer than dorsellum, with paraspiracular carina; spiracle small, with whole rim exposed. Speculum of forewing (Fig. 54) closed. Hind coxa (Figs. 51, 57) distinctly raised-reticulate. Petiole (Fig. 57) distinct (the *gracilis*-group). 2.
 - Propodeum (Figs. 5, 27, 39) at most as long as dorsellum, without paraspiracular carina; spiracle moderate to large, with outer rim covered by lobe of callus. Speculum of forewing (Figs. 13, 32) open. Hind coxa smooth to only weakly engraved-reticulate. Petiole (Figs. 27, 28) indistinct (the *bella*-group). 3.
2. Mesoscutum (Fig. 49) with a few pairs of adnotaular setae. Callus (Fig. 51) with 2 setae. Pronotum (Fig. 49) 0.6–0.8 times as long as mesoscutum. Mouth about 1.6 times as long as malar space. *Q. gracilis* sp. n.
 - Mesoscutum (Fig. 57) with scattered setae on the whole surface; callus with 10 setae. Pronotum 0.3 times as long as mesoscutum. Mouth (Fig. 56) 1.1 times as long as malar space. *Q. hirsuta* sp. n.
3. Clava (Figs. 7, 9) with distinct terminal spine. 4.
 - Clava (Figs. 8, 11) without terminal spine. 5.
4. F1 (Fig. 7) 0.9–1.0 times as long as wide. *Q. nova* Girault.
 - F1 (Figs. 9, 10) 1.3–1.4 times as long as wide. *Q. aenea* Girault.
5. F1 (Fig. 12) 1.5–1.7 times as long as wide. Pronotum (Fig. 17) short, about 0.1 times as long as mesoscutum. *Q. cyaneiviridis* (Girault)
 - F1 (Figs. 8, 11) at most 1.3 times as long as wide. Pronotum (Figs. 14, 15, 16, 25) long, at least 0.3 times as long as mesoscutum, except for *Q. pilosa* sp. n. 6.
6. Anterior surface of fore coxa and posterior surface of fore femur (Fig. 40) with 15–25 long setae. Femora pale brown. Pronotum (Figs. 36, 37) 0.1–0.3 times as long as mesoscutum. *Q. pilosa* sp. n.
 - At least posterior surface of fore femur without long setae. Femora predominantly dark brown. 7.
7. Mesoscutum (Fig. 16) without median line. F1 (Fig. 11) wider than long. *Q. candida* (Girault).
 - Mesoscutum (Figs. 14, 15) with distinct median line. F1 (Figs. 8, 30) longer than wide. ...8.
8. Eye 1.3–1.4 times as high as malar space length. Mouth 1.1–1.3 times as long as malar space. Gaster 1.9–2.0 times as long as wide, 1.2 times as long as thorax. *Q. bella* Girault.
 - Eye (Figs. 18, 19) 1.6–2.0 times as high as malar space length. Mouth 1.5–1.7 times as long as malar space. Gaster (Fig. 24) 2.4–2.7 times as long as wide, 1.4–1.5 times as long as thorax. *Q. neglectae* sp. n.

The bella-group

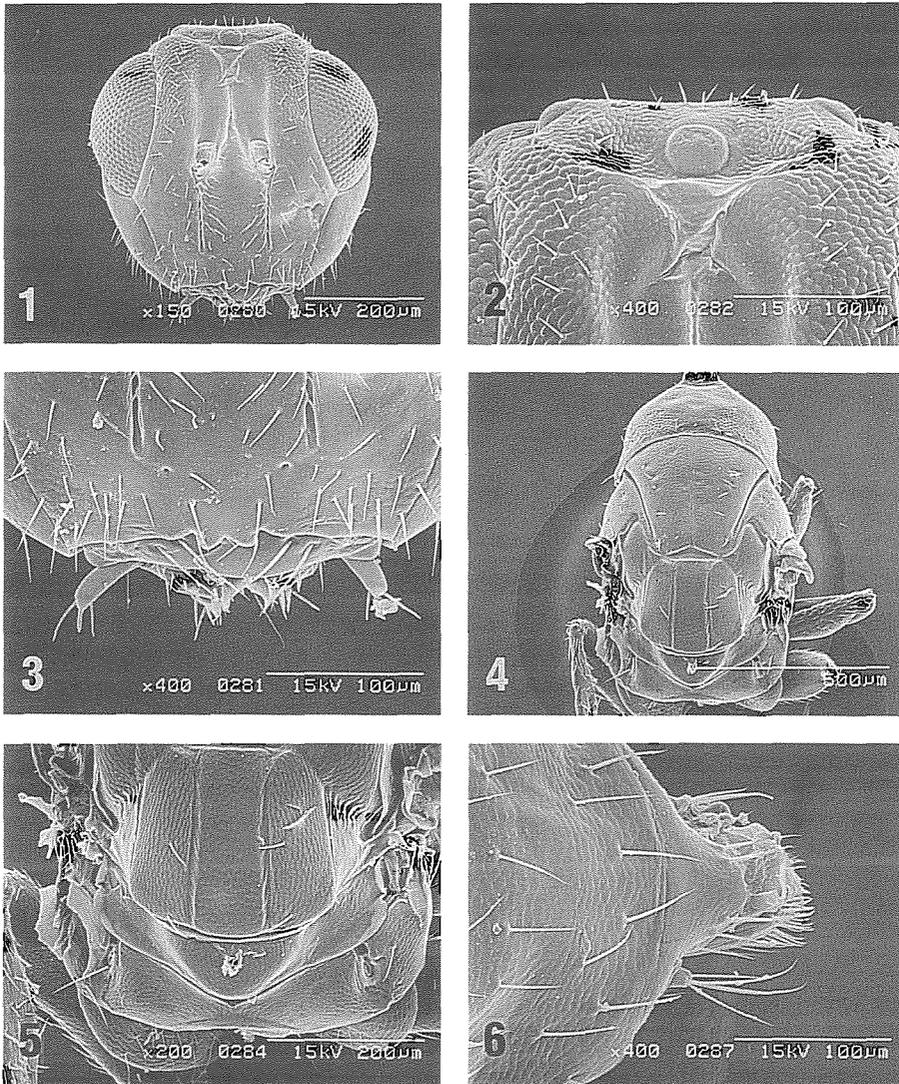
Quadrastichodella nova Girault
(Figs. 1–7)

Quadrastichodella nova Girault, 1922: 40–41.

Flockiella eucalypti Timberlake, 1957: 110. Transferred to *Quadrastichodella* by Bouček, 1977:

25. Synonymized with *Quadrastichodella nova* by Bouček, 1988: 669.

Flockiella eucalypti Timberlake; Flock, 1957: 153–155. Biology.



Figs. 1–6. *Quadrastichodella nova* Girault, ♀, specimen from California, Riverside Co., Riverside.
— 1. Head; 2. Vertex; 3. Mouth; 4. Thorax; 5. Scutellum, dorsellum, and propodeum; 6. Apex of gaster.

Quadrastichodella obscurata DeSantis, 1957: 65–68. Synonymized with *Quadrastichodella eucalypti* by Bouček, 1977: 25.

Quadrastichodella nova Girault; Dahms, 1986: 355. — Bouček, 1988: 669. — LaSalle, 1994: 193.

Diagnosis (female)

F1 (Fig. 7) 0.9–1.0 times as long as wide. Clava without terminal spine. Mesoscutum (Fig. 4) with distinct median line. Propodeum (Fig. 5) with weak and indistinct median carina. Callus (Fig. 5) with 2–3 setae. Femora predominantly dark brown.

Redescription

Female. Body length 1.4–2.3 mm. Head and thorax dark metallic green tinged with copper and red. Gaster dark brown tinged with metallic green and copper. Scape pale brown, apically dark brown; pedicel and flagellum dark brown. Coxae dark brown; hind coxa tinged with green; femora predominantly dark brown; tibiae and tarsi pale brown; fourth tarsal segment infuscate. Wings hyaline.

Head (Fig. 1) 1.0–1.1 as wide as high, 1.6–1.7 times as wide as long, 0.9–1.1 times as wide as thorax. POL 3.7–3.8 times, OOL 0.8–1.0 times as long as median ocellus diameter. Ocellar triangle (Fig. 2) surrounded by groove anteriorly and laterally. Frons weakly raised- or engraved-reticulate. Face smooth. Eye 1.4–1.6 times as high as malar space length. Malar sulcus strongly curved. Mouth 1.2–1.5 times as long as malar space. Antenna (Fig. 7): scape 2.6–3.0 times as long as wide, not reaching vertex; combined length of pedicel and flagellum 0.7–0.8 times as long as head width; pedicel 0.7–0.8 times as long as scape; F1 about as long as wide, 0.3–0.4 times as long as pedicel; F2 0.6–0.8 times as long as wide, 0.8–1.0 times as long as F1; F3 0.5–0.7 times as long as wide, 0.7–1.2 times as long as F2; clava 1.7–2.3 times as long as wide, 3.0–5.0 times as long as F3, without terminal spine.

Thorax (Fig. 4) 1.4–1.6 times as long as wide, weakly engraved-reticulate. Pronotum about 0.4 times as long as mesoscutum, distinctly raised-reticulate. Mesoscutum 1.0–1.5 times as long as scutellum, sometimes weakly raised-reticulate, with distinct median line and 4–6 pairs of adnotaular setae. Scutellum (Fig. 5) about 0.9 times as long as wide; anterior pair of setae situated in or slightly before the middle of scutellum. Propodeum (Fig. 5) 0.4–0.6 times as long as dorsellum, very weakly sculptured, sometimes almost smooth, with weak and indistinct median carina and very small anteromedian fovea; diameter of spiracle about as long as propodeum; callus with 3, rarely 2, setae. Forewing 2.3–2.4 times as long as wide; submarginal vein with 3 dorsal setae; costal cell:marginal vein:stigmatal vein:postmarginal vein=5.1–5.3:3.8–4.0:1.0:0.7.

Gaster 1.4–2.4 times as long as wide, 1.1–1.6 times as long as thorax; apex of hypopygium situated before the middle of gaster.

Male. Unknown.

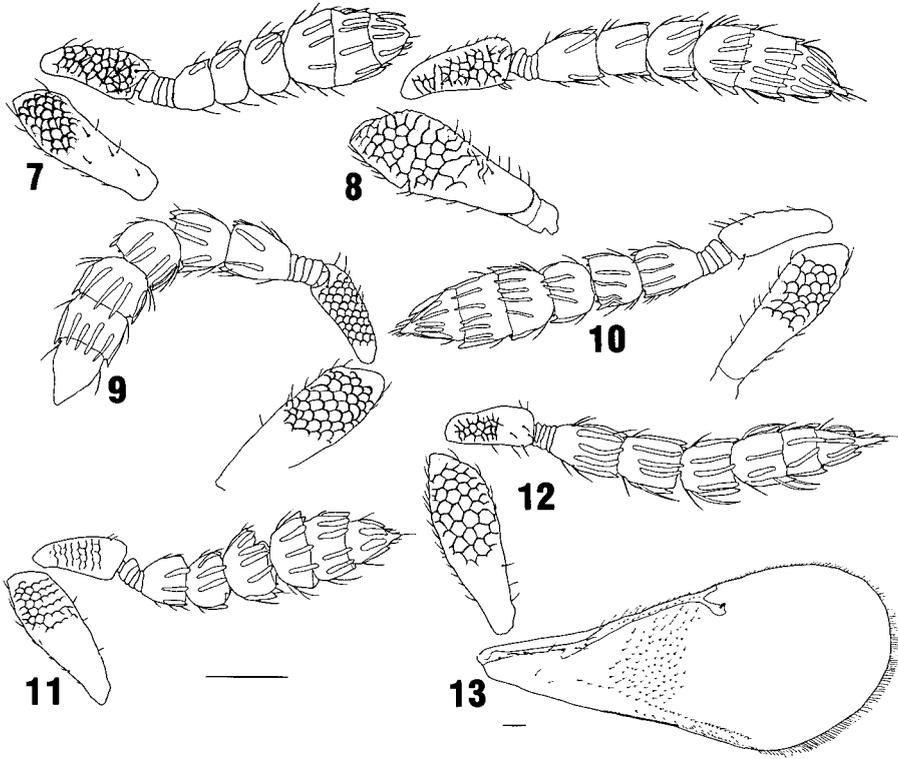
Type material. The holotype (♀) without the head (see below) is mounted on a card and in good condition. The right forewing is separated from the body. Both antennae and fragments of the head are mounted on a slide. One antenna has the scape separated. The antennae are generally in good condition, but most parts of the head are missing. For other data, see Dahms, 1986: 355. The holotype is deposited in the Queensland Museum.

Additional material examined. Australia: Queensland: Coomera river, Lamington National Park, 1200', 1 ♀, 28. V. 1966 (Z. Liepa) (ANIC). USA: California: Riverside Co., Riverside, 12 ♀, 1–7.

IV. 1984 (J. LaSalle), ex. seed pods *Eucalyptus* (QM) / 25 ♀, 15–22. IV. 1984 (J. LaSalle), ex. seed pods *Eucalyptus* (SEHU).

Distribution. Australia (Queensland, Victoria) (Bouček, 1988), Argentina (De Santis, 1957), Spain, Italy, South Africa (Bouček, 1977), USA (Timberlake, 1957; LaSalle, 1994). Bouček (1988) states that *Q. nova* was introduced with seeds of *Eucalyptus* into various countries from Australia.

Hosts. This species is phytophagous and makes galls in young flower buds of *Eucalyptus umbellata* (Timberlake, 1957) and *Eucalyptus resinifera* (Bouček, 1977). The biology of this species in California, USA, is described by Flock (1957).



Figs. 7–13. — 7. *Quadrastichodella nova* Girault, ♀, holotype, antenna; 8. *Q. bella* Girault, ♀, holotype, antenna; 9. *Q. aenea* Girault, ♀, holotype, antenna. The structures of the apex of the flagellum and the basal part of the scape were not able to be observed; 10. Ditto, ♀, antenna of the specimen examined. The pedicel has rasp-like reticulation, but it is not distinct under the microscope; 11. *Q. candida* (Girault), ♀, holotype, antenna; 12. *Q. cyaneiviridis* (Girault), ♀, paralectotype, antenna; 13. Ditto, ♀, lectotype, forewing. Setae on the apical half are not shown. Scale: 0.1 mm.

Quadrastichodella bella Girault
(Figs. 8, 14)

Quadrastichodella bella Girault, 1913a: 237; 1913b: 69–70. — Dahms, 1983: 120. — Bouček, 1988: 669.

Diagnosis (female)

F1 (Fig. 8) 1.2–1.3 times as long as wide. Clava with terminal spine. Eye 1.3–1.4 times as high as malar space length. Mouth 1.1–1.3 times as long as malar space. Mesoscutum (Fig. 14) with distinct median line. Callus with 4–6 setae. Fore coxa and femora pale brown. Gaster 1.9–2.0 times as long as wide, 1.2 times as long as thorax.

Redescription

Female. Body length 2.0–2.8 mm. Head dark green: vertex blackish; frons tinged with copper, in the holotype with yellow spot below median ocellus; face brownish along mouth. Thorax metallic green tinged with red and copper; tegula pale brown. Gaster dark green tinged with red and copper. Scape and pedicel pale brown; flagellum dark brown. Legs pale brown; mid coxa dark brown; hind coxa dark green; tips of tarsi infusate. Wings hyaline.

Head about as wide as high, 1.5–1.6 times as wide as long, 0.9 times as wide as thorax, weakly engraved-reticulate. POL 3.0–4.0 times as long as median ocellus diameter; OOL as long as that diameter. Ocellar triangle surrounded by groove except posteriorly. Eye 1.3–1.4 times as high as malar space length. Malar sulcus strongly curved. Mouth 1.1–1.3 times as long as malar space. Antenna (Fig. 8): scape 2.4–2.6 times as long as wide, reaching vertex; combined length of pedicel and flagellum about as long as head width; pedicel about 0.6 times as long as scape; F1 1.2–1.3 times as long as wide, 0.5–0.6 times as long as pedicel; F2 0.7–1.0 times as long as wide, 0.7–0.8 times as long as F1; F3 0.6–0.9 times as long as wide, 0.9–1.0 times as long as F2; clava 2.4–2.6 times as long as wide, 3.3–4.3 times as long as F3, with distinct terminal spine.

Thorax (Fig. 14) 1.6–1.7 times as long as wide, weakly engraved-reticulate. Pronotum 0.4–0.5 times as long as mesoscutum, distinctly engraved-reticulate. Mesoscutum 1.2–1.3 times as long as scutellum, with distinct median line. Scutellum 0.9–1.0 times as long as wide; anterior pair of scutellar setae situated before the middle. Propodeum 0.6 times as long as dorsellum, with distinct median carina; diameter of spiracle about two-thirds length of propodeum; callus with 4–6 setae. Forewing 2.1–2.5 times as long as wide; submarginal vein with 5 dorsal setae; costal cell:marginal vein:stigmatal vein:postmarginal vein = 4.0–6.1:3.3–6.3:1.0:0.4–0.8.

Gaster 1.9–2.0 times as long as wide, 1.2–1.7 times as long as thorax; apex of hypopygium situated slightly or distinctly behind the middle.

Male. Unknown.

Type material. The holotype (♂) without antennae and left wings is mounted on a card, with the left forewing and both antennae mounted on a slide. All are preserved in good condition. For other data of the holotype, see Dahms, 1983: 120. The holotype is deposited in the South Australian Museum.

Additional material examined. Australia: Queensland: Mt. Tambourine, 1 ♀, (A. M. Lea) (SAM) (lacks both antennae). According to Dahms (1983), this specimen is probably the paratype; 2 miles west of Redoliffe, 1 ♀, 23. V. 1966 (Z. Liepa) (ANIC).

Distribution. Australia (Queensland, New South Wales).
Host. Unknown.

Quadrastichodella aenea Girault
(Figs. 9, 10)

Quadrastichodella aenea Girault, 1913a: 237. — Dahms, 1983: 12–13. — Bouček, 1988: 669.

The holotype lacks the thorax, and no other specimen is available except for one crushed head mounted on a slide; therefore, it is difficult to diagnose this species at present. However, at least in the antenna, *Q. aenea* has a few diagnostic characteristics as given below.

Diagnosis (female)

F1 (Figs. 9, 10) 1.3–1.4 times, F3 0.8–0.9 times as long as wide; F2 about as long as wide. Clava without distinct terminal spine.

Redescription

Female. Gaster brownish metallic green, tinged with copper and red; ovipositor sheath pale brown. Forewing hyaline.

Face smooth. Vertex and frons along eye weakly engraved-reticulate. Scrobal groove smooth. Malar sulcus weakly curved. Antenna (Figs. 9, 10): scape 3.0–3.1 times as long as wide; pedicel 0.5–0.6 times as long as scape; F1 1.3–1.4 times as long as wide, 0.6–0.7 times as long as pedicel; F2 about as long as wide, about 0.8 times as long as F1; F3 0.8–0.9 times as long as wide, 0.9–1.0 times as long as F2; clava 2.3–2.6 times as long as wide, 3.0–3.8 times as long as F3, without distinct terminal spine.

Forewing: costal cell:marginal vein:stigmatal vein:postmarginal vein=4.6:6.0:1.0:0.8.

Gaster 1.4 mm in length, 2.7 times as long as wide. Apex of hypopygium situated in the middle of gaster. Ovipositor sheath slightly swollen apically.

Male. Unknown.

Type material. The gaster, one hind wing, and two legs of the holotype (♀) are mounted on a card. The head crushed with an antenna is mounted on a slide. For other data, see Dahms, 1983: 12–13. The holotype is deposited in the Queensland Museum.

Additional material examined. I examined a female identified by Girault, which is deposited in the Queensland Museum. The head is mounted on a slide. It is crushed into two pieces, each of which has one antenna, are mounted on a slide. For other data, see Dahms, 1983: 12–13.

Distribution. Australia (Queensland).

Host. Unknown.

Quadrastichodella boudiennyi Girault
(Fig. 15)

Quadrastichodella nova Girault, 1929: 329–330. Preoccupied by *nova* Girault, 1922.

Quadrastichodella boudiennyi Girault, 1937. 3pp. Replacement name. — Dahms, 1983: 146. — Dahms, 1986: 355. — Bouček, 1988: 669.

Two syntypes available in this paper have no head and antenna; therefore, I could not

check the features of those parts. In this paper, however, I prefer to treat it as a distinct species on the basis of the thoracic characteristics.

Diagnosis (female)

Pronotum (Fig. 15) long, 0.7–0.8 times as long as metanotum. Callus with 3–5 setae. Mesoscutum with distinct median line. Femora predominantly dark brown.

Redescription

Female. Body length presumably 1.7–2.3 mm (without head 1.5–2.0 mm). Body metallic red tinged with green. Coxae dark brown; femora predominantly dark brown; tibiae and tarsi brown; tips of tarsi infusate. Wings hyaline.

Thorax (Fig. 15) 1.8–1.9 times as long as wide, weakly engraved-reticulate. Pronotum 0.7–0.8 times as long as mesoscutum, distinctly raised-reticulate. Mesoscutum 1.0–1.1 times as long as scutellum, very weakly raised-reticulate, with distinct median line and a row of adnotaular setae. Scutellum about 0.8 times as long as wide. Propodeum about 0.6 times as long as dorsellum, with very weak median carina. Forewing 2.1 times as long as wide; costal cell:marginal vein:stigmatal vein:postmarginal vein=1.1–1.2:3.1–4.0:1.0:0.4–0.6.

Gaster 1.9–2.0 times as long as wide, 1.3–1.4 times as long as thorax.

Male. Unknown.

Lectotype (♀) and paralectotype (♀) (here designated). This species was described from 3 females. Two females deposited in Australian National Insect Collection are mounted on a card which is labelled: “S. Austr”, “*Quadrastichodella nova* Girault, ♀”, and “on permanent loan from Macleay Museum, University of Sydney”. One of them lacks the head, and its body length is 1.5 mm. The other specimen lacks the head and the left forewing, and the body length is 2.0 mm. I designate the former specimen as lectotype, and the latter as paralectotype. The third female once deposited in the South Australian Museum, is lost. For other data, see Dahms, 1986: 355.

Distribution. Australia (South Australia).

Host. Unknown.

Quadrastichodella candida (Girault)

(Figs. 11, 16)

Neotetrastichodes candidus Girault, 1913a: 228–229. — Dahms, 1983: 163.

Quadrastichodella candida (Girault); Bouček, 1988: 669.

The holotype (♀) is mounted on a card in good condition, with the antennae and head mounted on a slide. The head is crushed into 2 parts and in a rather bad condition; therefore, I was not able to observe the characters of the head. The antennae are in rather good condition.

Diagnosis (female)

F1 (Fig. 11) about 0.9 times as long as wide. Clava with distinct terminal spine. Callus with 7 setae. Mesoscutum (Fig. 16) without median line. Fore coxa and femora pale brown.

Redescription

Female. Body length presumably 1.8 mm (1.6 mm, exclusive head). Thorax metallic green, partially tinged with copper; tegula pale brown. Gaster brownish green tinged with copper and red. Legs pale brown; mid coxa dark brown; hind coxa green; tips of tarsi

infusate. Wings hyaline.

Antenna (Fig. 11): scape 2.9 times as long as wide; pedicel 0.5 times as long as scape; F1 0.9 times as long as wide, 0.5 times as long as pedicel; F2 0.7 times as long as wide, 0.9 times as long as F1; F3 1.1 times as long as F2; clava 1.8 times as long as wide, 3.0 times as long as F3, with distinct terminal spine.

Thorax (Fig. 16) 1.6 times as long as wide, weakly engraved-reticulate. Pronotum 0.5 times as long as mesoscutum, distinctly engraved-reticulate. Mesoscutum 1.2 times as long as scutellum, without median line. Scutellum 0.8 times as long as wide; sublateral line weak; anterior pair of setae situated in the middle of scutellum. Propodeum 0.7 times as long as dorsellum, with weak median carina; callus with 7 setae.

Gaster 1.5 times as long as wide, as long as thorax.

Male. Unknown.

Type material. The holotype (♀) is deposited in the Queensland Museum. For other data of the holotype, see Dahms, 1983: 163.

Distribution. Australia (Queensland).

Host. Unknown.

Remarks. The adnotaular setae and hypopygium of the holotype were not able to be observed.

Quadrastichodella cyaneiviridis (Girault)
(Figs. 12, 13, 17)

Quadrastichodes cyaneiviridis Girault, 1913a: 234, 251; 1913b: 68.

Quadrastichodella cyaneiviridis (Girault); Boucek, 1988: 669.

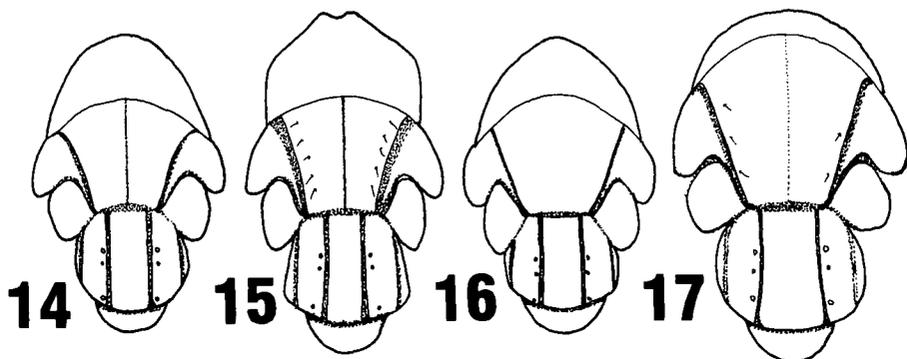
Diagnosis (female)

F1 (Fig. 12) 1.5–1.7 times as long as wide. Clava with distinct terminal spine. Pronotum (Fig. 17) about 0.1 times as long as mesoscutum. Callus with 12–15 setae. Mesoscutum with very weak median line. Propodeum with weak median carina. Mesoscutum, scutellum, and dorsellum very weakly engraved-reticulate, almost smooth. Femora predominantly dark brown.

Redescription

Female. Body length 2.3 mm. Body metallic green: head metallic blue to green; occiput green; vertex copper; face brownish along mouth. Tegula dark to pale brown. Scape pale brown, apically black; pedicel and F1 dark brown to black. Coxae dark brown; hind coxa greenish; basal half of fore femur, mid femur, and basal two-thirds of hind femur dark brown; tips of tarsi infusate; remaining legs pale brown. Wings hyaline.

Head 0.9 times as wide as high, 1.8 times as wide as long, 0.9 times as wide as thorax. Occiput distinctly engraved-reticulate; vertex very weakly so. POL 2.7 times as long as median ocellus diameter. Ocellar triangle surrounded by groove. Face smooth. Frons distinctly engraved-reticulate. Eye 1.7 times as high as malar space length. Malar sulcus strongly curved. Mouth 1.4 times as long as malar space. Antenna (Fig. 12): scape 2.9–3.1 times as long as wide; pedicel about 0.5 times as long as scape; F1 1.5–1.7 times as long as wide, about 0.8 times as long as pedicel; F2 about 1.3 times as long as wide, 0.9–1.0 times as long as F1; F3 1.1–1.3 times as long as wide, 0.8–0.9 times as long as F2; clava about 3.5 times as long as wide, 3.0–3.3 times as long as F3, with distinct terminal spine.



Figs. 14–17. — 14. *Quadrastichodella bella* Girault, ♀, specimen from Mt. Tambourine, thorax; 15. *Q. boudiennyi* Girault, ♀, lectotype, thorax; 16. *Q. candida* (Girault), ♀, holotype, thorax; 17. *Q. cyaneiviridis* (Girault), ♀, lectotype, thorax.

Thorax (Fig. 17) about 1.4 times as long as wide, very weakly engraved-reticulate, almost smooth. Pronotum short, about 0.1 times as long as mesoscutum, distinctly engraved-reticulate. Mesoscutum 1.5 times as long as scutellum, with very weak median line which is posteriorly indistinct, with 3 pairs of adnotaular setae. Scutellum 0.8 times as long as wide; anterior pair of setae situated before the middle. Propodeum about as long as dorsellum, with weak median carina and small anteromedian triangular fovea; diameter of spiracle about 0.4 length of propodeum; callus with 12–15 setae. Forewing (Fig. 13) 2.3–2.4 times as long as wide; submarginal vein with 3–4 dorsal setae; costal cell:marginal vein:stigmatal vein:postmarginal vein=4.2–5.2:3.5–4.3:1.0:0.3–0.7.

Gaster about 2.2 times as long as wide, 1.1–1.2 times as long as thorax; apex of hypopygium situated in the middle of gaster.

Male. Unknown.

Lectotype (♀) and paralectotype (♀) (here designated). There are 2 specimens mounted on different cards pinned together. One of them mounted on the upper card does not have the right wings, left antenna, and right flagellum except for F1. The other specimen mounted on the lower card does not have the head and wings. I designate the former as lectotype, and the latter as paralectotype. One forewing, the head, and one antenna mounted on a slide are also available. These parts are probably from the latter specimen; therefore, I designate them as parts of the paralectotype. All the specimens are deposited in the South Australian Museum. For other data, see Dahms, 1983: 206.

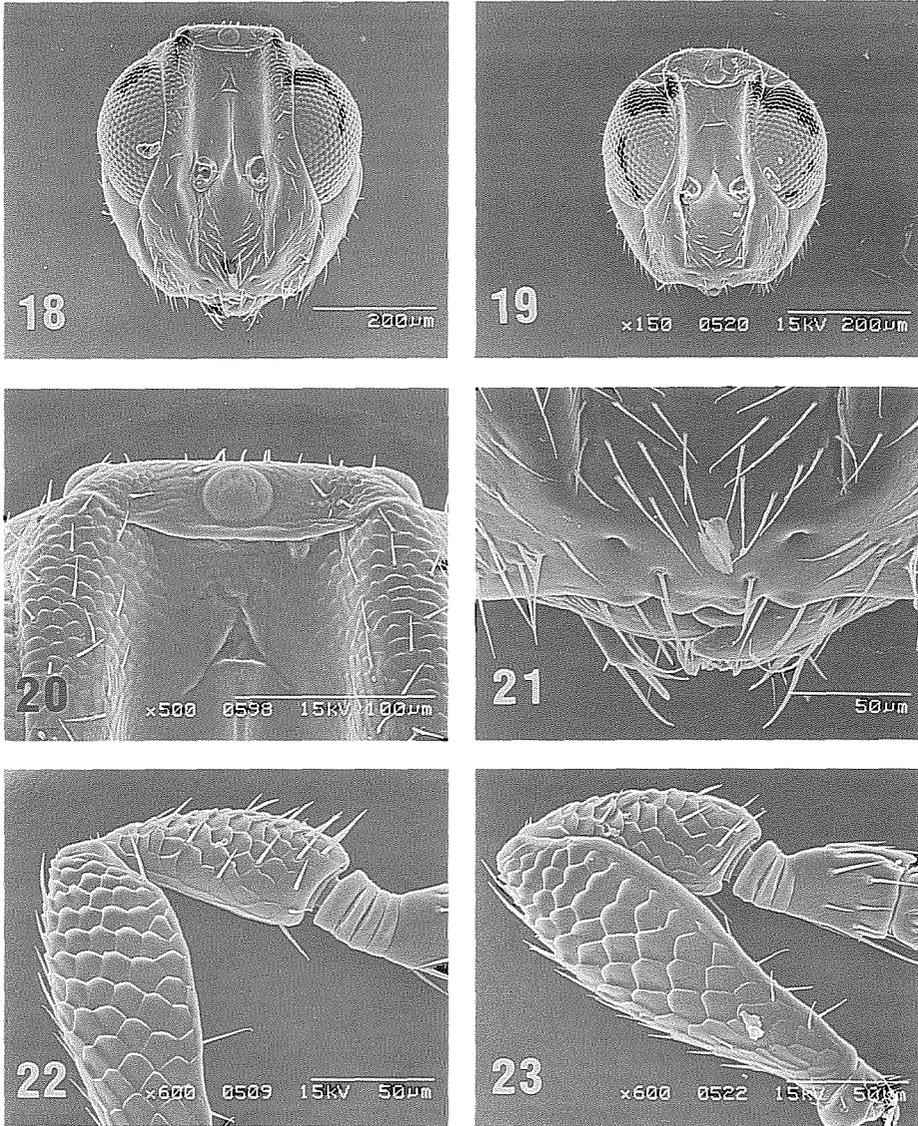
Distribution. Australia (South Australia).

Host. Unknown.

Quadrastichodella neglectae sp. n.
(Figs. 18–32)

Diagnosis (female and male)

F1 (Figs. 30, 31) 1.2–1.3 times, F2 0.8–1.0 times, F3 0.7–0.9 times as long as wide. Clava with distinct terminal spine. Eye (Figs. 18, 19) 1.6–2.0 times as high as malar space length. Mouth 1.5–1.7 times as long as malar space. Mesoscutum (Figs. 25, 29) almost smooth, with distinct median line. Fore coxa and femora pale brown. Callus (Fig. 27) with 4–9 setae. Gaster (Fig. 24) 2.4–2.7 times as long as wide, 1.4–1.5 times as long as thorax.

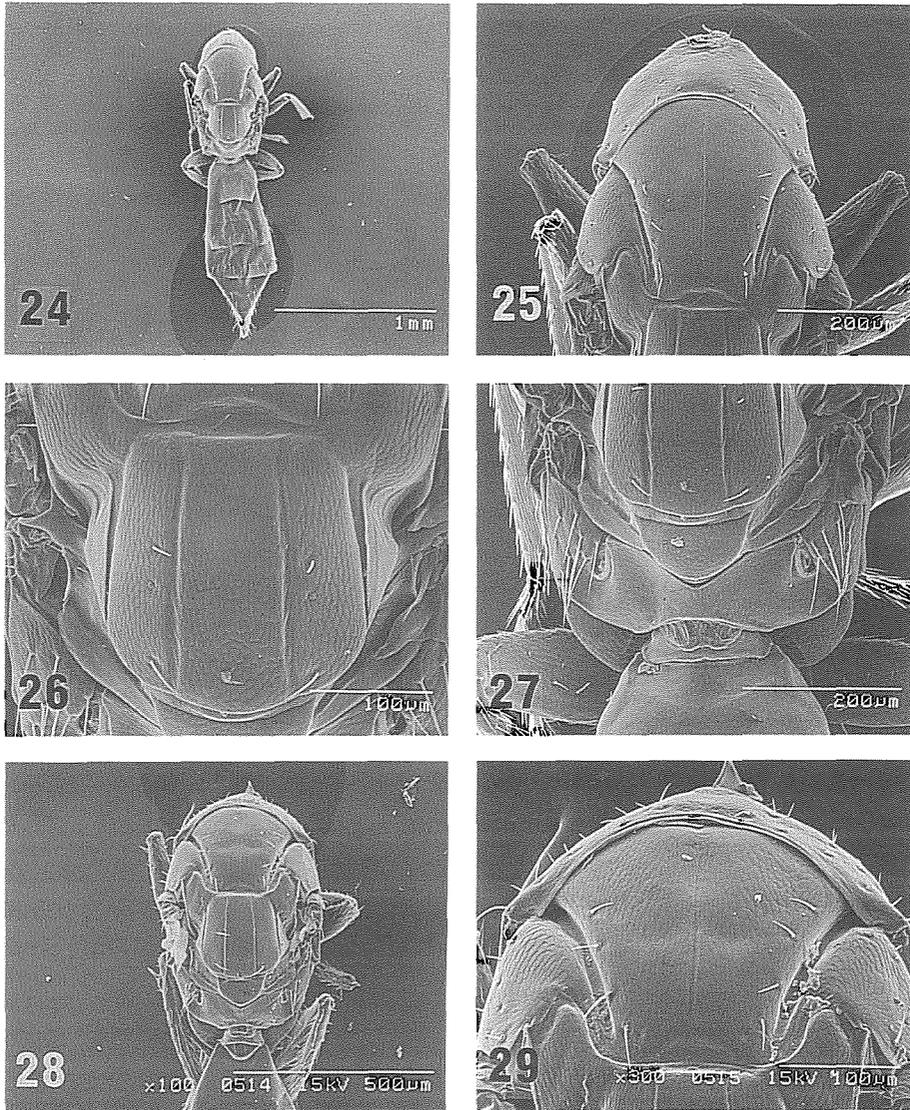


Figs. 18–23. *Quadrastichodella neglectae* sp. n., paratypes. — 18. ♀, head; 19. ♂, head; 20. ♀, vertex; 21. ♀, mouth; 22. ♀, scape, pedicel, and anelli; 23. ♂, scape, pedicel, and anelli.

Description

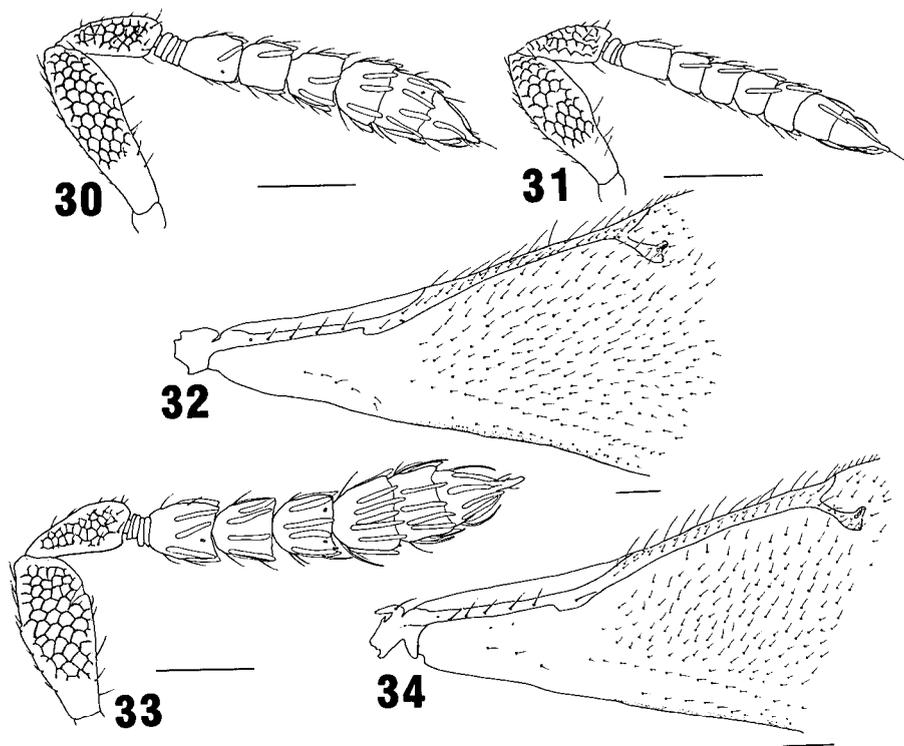
Female. Body length 1.4–2.3 mm. Head dark green tinged with blue and copper: vertex blackish; face brownish along mouth. Thorax metallic green tinged with copper and red. Gaster dark green tinged with red, copper, and blue. Scape pale brown, apically dark brown; pedicel and flagellum dark brown. Mid coxa dark brown; hind coxa dark green tinged with blue; tips of tarsi infuscate; remaining parts of legs pale brown. Wings hyaline.

Head (Fig. 18) about as wide as high, about 1.6 times as wide as long, 0.9–1.0 times as



Figs. 24–29. *Quadrastichodella neglectae* sp. n., paratypes. — 24. ♀, body; 25. ♀, pronotum and mesoscutum; 26. ♀, scutellum; 27. ♀, dorsellum and propodeum; 28. ♂, thorax; 29. ♂, pronotum and mesoscutum.

wide as thorax, very weakly engraved-reticulate. POL about 3.5 times as long as median ocellus diameter; OOL about as long as that diameter. Ocellar triangle (Fig. 20) surrounded by groove except for posteriorly. Eye 1.6–2.0 times as high as malar space length. Malar sulcus weakly curved. Mouth 1.5–1.7 times as long as malar space. Antenna (Figs. 22, 30): scape about 3.0 times as long as wide: combined length of pedicel and flagellum 1.0–1.1 times as long as head width; pedicel about 0.5 times as long as scape; F1 1.2–1.3 times as long as wide, 0.5–0.6 times as long as pedicel; F2 0.8–1.0 times as long as wide, 0.7–1.0



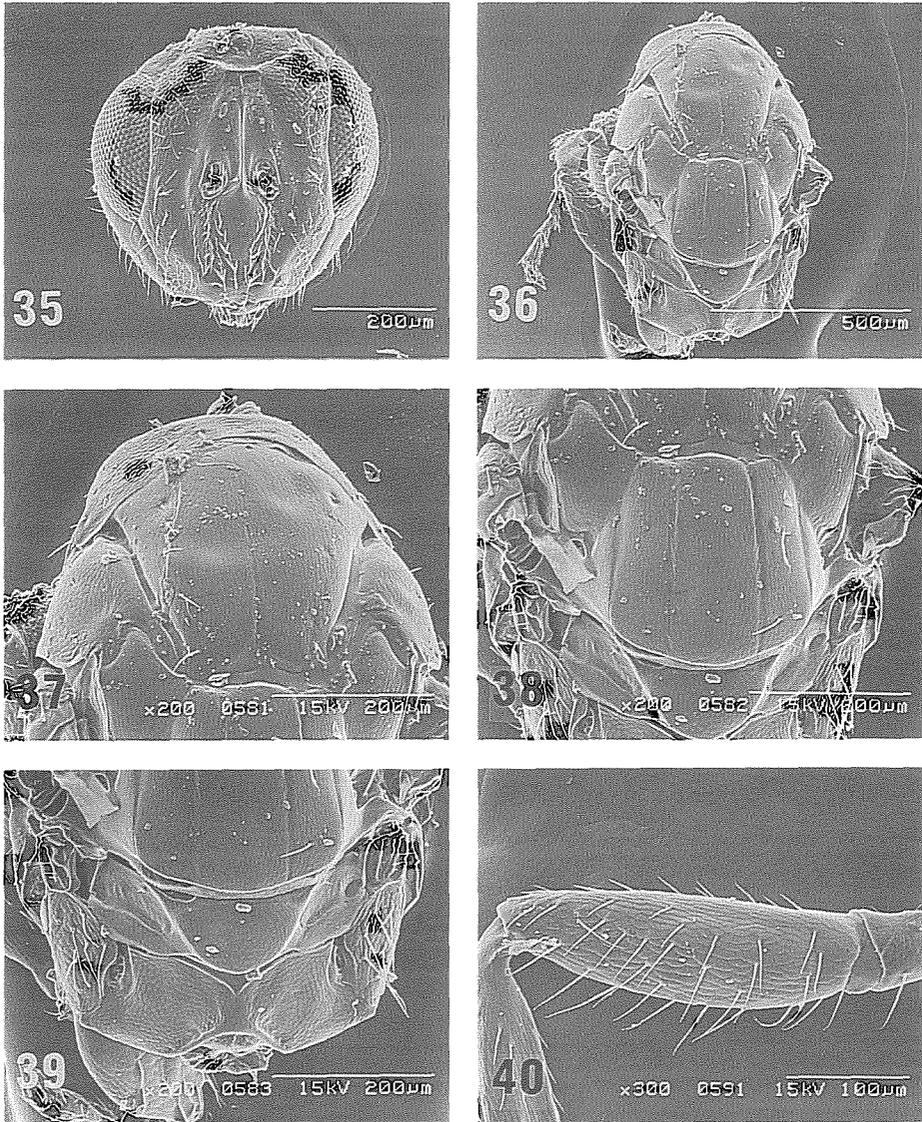
Figs. 30–34. — 30. *Quadrastichodella neglectae* sp. n., ♀, paratype, antenna; 31. Ditto, ♂, paratype, antenna; 32. Ditto, ♀, paratype, forewing; 33. *Q. pilosa* sp. n., ♀, paratype, antenna; 34. Ditto, ♀, paratype, forewing. Scale: 0.1 mm.

times as long as F1; F3 0.7–0.9 times as long as wide, 0.8–1.2 times as long as F2; clava 2.0–2.6 times as long as wide, 2.8–3.6 times as long as F3, with distinct terminal spine.

Thorax (Fig. 24) 1.7–1.8 times as long as wide. Pronotum (Fig. 25) 0.3–0.4 times as long as mesoscutum, distinctly engraved-reticulate. Mesoscutum 1.2–1.3 times as long as scutellum, with extremely fine engraved-reticulation, almost smooth, with distinct median line and 4–5 pairs of adnotaular setae. Scutellum (Fig. 26) slightly wider than long, weakly engraved-reticulate; anterior pair of setae situated in or before the middle of scutellum. Dorsellum (Fig. 27) almost smooth. Propodeum 0.5–0.7 times as long as dorsellum, with extremely fine engraved-reticulation, almost smooth, with very weak median carina; diameter of spiracle about as long as propodeum; callus 4–9 setae. Hind coxa weakly engraved-reticulate. Forewing (Fig. 32) 2.4–2.5 times as long as wide; submarginal vein 3–5 dorsal setae; costal cell:marginal vein:stigmatal vein:postmarginal vein=4.3–4.4:4.0–4.4:1.0:0.6–0.8.

Gaster 2.4–2.7 times as long as wide, 1.4–1.5 times as long as thorax; apex of hypopygium situated in the middle of gaster.

Male. Differs from female as follows. Antenna (Figs. 23, 31) yellow; F4 about 0.5 times as long as wide, about 0.8 times as long as F3; clava 2.0–2.3 times as long as wide, 4.0–4.7 times as long as F4. Pronotum (Figs. 28, 29) short, about 0.1 length of mesoscutum.



Figs. 35–40. *Quadrastichodella pilosa* sp. n., ♀, paratype. — 33. Head; 34. Thorax; 35. Pronotum and mesoscutum; 36. Scutellum; 37. Dorsellum and propodeum; 38. Fore femur.

Gaster 1.5–1.6 times as long as wide, 0.9–1.0 times as long as thorax.

Holotype (♀). Australia: Victoria: Spring Ck., Cobungra nr. Omeo, c.3000', 18. I. 1972 (L. R. Adams), ex seed *Eucalyptus neglecta* Maiden. Paratypes. 37 ♀ 14 ♂, with same data as holotype. The type-series is deposited in the Australian National Insect Collection.

Non-type material. Australia: Queensland: Mt. Nebo, 2 ♀, 24. IX. 1970 (S. R. Monteith) (ANIC); Clarke Range Lookout, Cathu state Forest, MEQ open forest, 1 ♀, 20. IV. 1979 (E. Dahms) (QM).

Distribution. Australia (Queensland, Victoria).

Host. This species was reared from seeds of *Eucalyptus neglecta* Maiden.

Remarks. This species is similar to *Q. bella*, but differs from the latter in the characters mentioned in the key.

Quadrastichodella pilosa sp. n.

(Figs. 33–40)

Diagnosis (female)

Anterior surface of fore coxa and posterior surface of fore femur (Fig. 40) each with 15–25 long setae. F1 (Fig. 33) 1.2–1.3 times as long as wide. F2 and F3 about as long as wide. Mesoscutum (Fig. 37) almost smooth. Callus (Fig. 39) with 7–14 setae. Femora predominantly dark brown.

Description

Female. Body length 1.5–2.2 mm. Body metallic green tinged with blue, copper, and red; vertex blackish; face brownish along mouth. Scape predominantly dark brown in basal half, predominantly pale brown in apical half; pedicel and flagellum dark brown. Fore coxa pale brown, basally dark brown tinged with green; mid and hind coxae dark green; femora predominantly dark brown; tibiae and tarsi pale brown; tips of tarsi infuscate. Wings hyaline.

Head (Fig. 35) about as wide as high, about 1.6 times as wide as long, about as wide as thorax, weakly engraved-reticulate. Ocellar triangle surrounded by groove except for posteriorly. Eye about 1.8 times as high as malar space length. Face smooth. Mouth about 1.4 times as long as malar space. Antenna (Fig. 33): scape about 2.3 times as long as wide; combined length of pedicel and flagellum about 1.1 times as long as head width; F1 1.2–1.3 times as long as wide, 0.6–0.7 times as long as pedicel; F2 as long as wide, 0.8–0.9 times as long as F1; F3 as long as wide, 1.0–1.2 times as long as F2; clava 2.5–3.0 times as long as wide, 2.9–3.5 times as long as F3, with distinct terminal spine.

Thorax (Fig. 36) 1.4–1.7 times as long as wide, very weakly engraved-reticulate. Pronotum 0.1–0.3 times as long as mesoscutum, distinctly engraved-reticulate. Mesoscutum (Fig. 37) 1.2–1.5 times as long as scutellum, with distinct median line and 4–5 pairs of short adnotaular setae. Scutellum (Fig. 38) 0.9–1.0 times as long as wide; anterior pairs of setae situated before the middle of scutellum; sublateral line weak. Propodeum (Fig. 39) 0.8–1.0 times as long as dorsellum, with wide and short anteromedian triangular fovea, with weak median carina; diameter of spiracle about half as long as propodeum; callus with 7–14 setae. Anterior surface of fore coxa and posterior surface of fore femur (Fig. 40) each with 15–25 relatively long setae. Forewing (Fig. 34) about 2.2 times as long as wide; submarginal vein with 3–4 dorsal setae; costal cell:marginal vein:stigmatal vein:postmarginal vein=3.8–4.2:3.7–4.2:1.0:0.3–0.4.

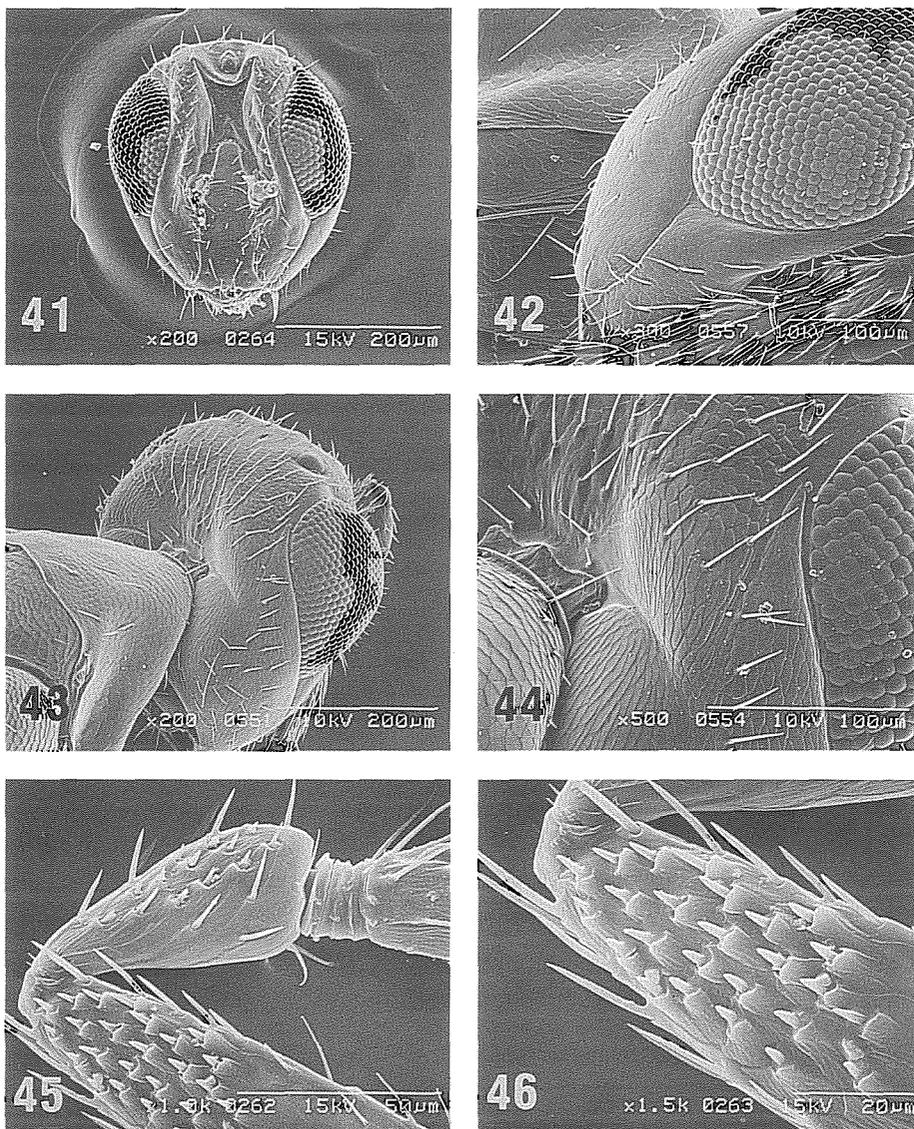
Gaster 1.9–2.0 times as long as wide, 1.2–1.3 times as long as thorax; apex of hypopygium situated behind the middle of gaster.

Male. Unknown.

Holotype (♀). New Zealand: Rakaia, 21. VIII. 1960, (Dumbleton), ex seed capsule of *Eucalyptus* sp. Paratypes. 18 ♀, with same data as holotype. All types are deposited in the Australian National Insect Collection.

Distribution. New Zealand.

Host. This species was reared from seeds of *Eucalyptus* sp.



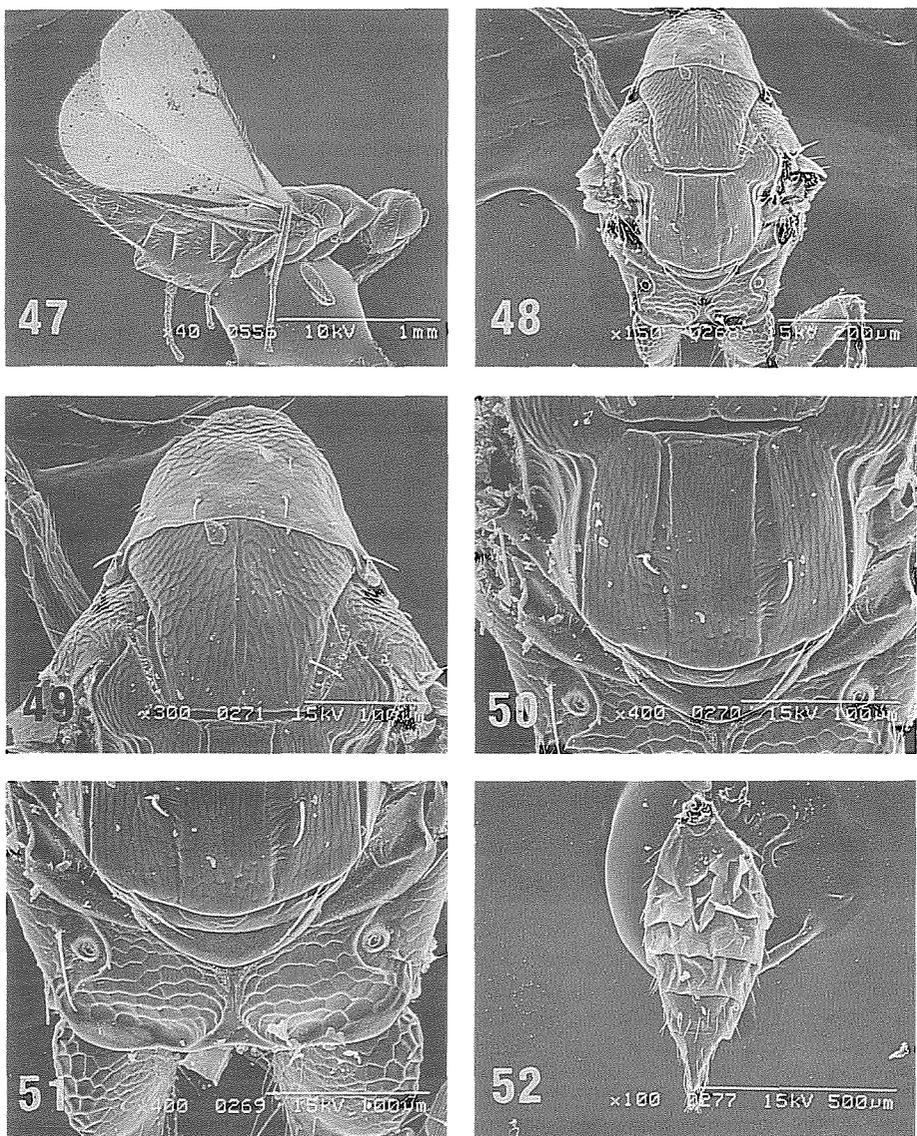
Figs. 41–46. *Quadrastichodella gracilis* sp. n., ♀, paratypes. — 41. Head; 42. Head in lateral view; 43. Head in posterolateral view; 44. Occiput in lateral view; 45. Scape, pedicel, and anelli; 46. Spines of scape.

The *gracilis*-group

Quadrastichodella gracilis sp. n. (Figs. 41–54)

Diagnosis (female)

Inner surfaces of scape and pedicel (Figs. 45, 46) with many short spines. Clava (Fig. 53) 2-segmented. Mesoscutum (Fig. 49) with a few pairs of adnotaular setae. Callus (Fig. 51) with 2 setae. Mouth 1.3–1.6 times as long as malar space length. Pronotum (Fig. 49)



Figs. 47–52. *Quadrastichodella gracilis* sp. n., ♀, paratypes. — 47. Body in lateral view; 48. Thorax; 49. Pronotum and mesoscutum; 50. Scutellum; 51. Dorsellum and propodeum; 52. Gaster.

0.6–0.8 times as long as mesoscutum.

Description

Female. Body length 1.4–2.4 mm. Body blackish green tinged with blue, copper, and red, to bright green. Antenna dark brown: flagellum rarely pale brown. Coxae usually of the same colour as thorax, rarely dark brown or pale brown; femora usually dark brown to black, rarely pale brown; tibiae pale brown to dark brown with apical parts pale brown; tarsi pale to dark brown; tips of tarsi infusate. Wings hyaline.

Head (Fig. 41) about 1.1 times as wide as high, about 1.8 times as wide as long, about as wide as thorax, very weakly engraved-reticulate. Occiput (Fig. 43) with many short setae. POL about 4.0 times, OOL 1.1–1.2 times as long as median ocellus diameter; vertex and scrobal groove almost smooth. Eye 1.9–2.3 times as high as malar space length. Malar sulcus (Fig. 42) with small and shallow triangular fovea at most half length of malar space. Mouth 1.3–1.6 times as long as malar space. Antenna (Figs. 45, 46, 53): scape 3.3–4.0 times as long as wide, with many short spines on inner surface; combined length of pedicel and flagellum about 1.5 times as long as head width; pedicel 0.4–0.5 times as long as scape, with several short spines on inner surface; F1 2.0–3.0 times as long as wide, 1.0–1.5 times as long as pedicel; F2 2.0–2.4 times as long as wide, about as long as F1; F3 1.8–2.3 times as long as wide, about as long as F2; clava 2-segmented, 2.6–3.5 times as long as wide, 1.5–2.3 times as long as F3; without terminal spine.

Thorax (Fig. 48) 1.6–1.9 times as long as wide. Pronotum (Fig. 49) 0.6–0.8 times as long as mesoscutum, raised- or engraved-reticulate. Mesoscutum (Fig. 49) 1.0–1.2 times as long as scutellum, distinctly raised-reticulate, with distinct median line and 2–4 pairs of adnotaular setae. Scutellum (Fig. 50) 0.8–1.0 times as long as wide, weakly engraved-reticulate; submedian line relatively wide; sublateral line deep; anterior pair of setae situated in the middle of scutellum. Dorsellum (Fig. 51) weakly engraved-reticulate. Propodeum (Fig. 51) 1.3–1.8 times as long as dorsellum, weakly raised-reticulate, with narrow and shallow anteromedian fovea at most half length of propodeum, with median carina and weak paraspiracular carina; spiracle separated from metanotum by 1.0–1.5 times its diameter; area between paraspiracular carina and callus depressed; callus with 2 setae. Hind coxa (Fig. 51) distinctly raised-reticulate. Forewing (Fig. 54) about 2.3 times as long as wide; submarginal vein with 2–4 dorsal setae, rarely with 1; speculum closed; costal cell:marginal vein:stigmatal vein:postmarginal vein=3.2–3.3:3.3–3.8:1.0:0.3–0.4.

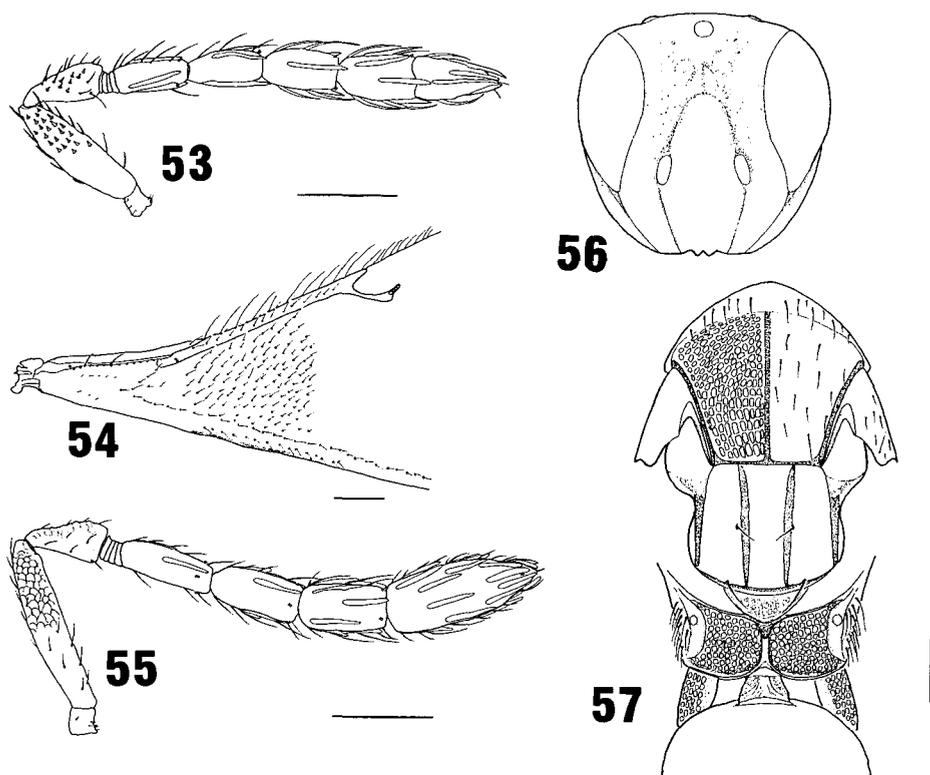
Petiole 0.4–0.5 times as long as propodeum, with weak irregular carinae. Gaster (Fig. 52) 1.8–4.0 times as long as wide, 1.2–1.6 times as long as thorax; apex of hypopygium situated in or before the middle of gaster.

Male. Unknown.

Holotype (♀). Japan: Honshû: Higashiyamato, Tokyo, 6. V. 1984 (K. Kamijo). The holotype is deposited in the collection of the Laboratory of Systematic Entomology, Faculty of Agriculture, Hokkaidô University. Paratypes. Japan: Hokkaidô: Campus of Hokkaidô Univ., Sapporo, 6 ♀, em. 21. V. 1996 (E. Ikeda) (SEHU, CNCI). Honshû: Okegawa, Saitama-ken, 7 ♀, 23. IV. 1964 (A. Habu) (NIAES); Misawa, Saitama-ken, 3 ♀, 1. V. 1957 (A. Habu) (NIAES); Higashiyamato, Tokyo, 1 ♀, 23. V. 1983 (K. Kamijo) (SEHU) / 1 ♀, 6. V. 1984 (K. Kamijo) (SEHU). Kyûshû: Hirao, Fukuoka-shi, 1 ♀, 2. V. 1954 (Y. Murakami) (ELKU); Tsushima, Izuhara, 1 ♀, 31. X. 1962 (S. Miyamoto) (ELKU). Thailand: Nakhon Prov., Nakhon, 1 ♀, 15. X. 1986 (K. Maeto) (SEHU).

Distribution. Japan (Hokkaidô, Honshû, Kyûshû) and Thailand.

Host. Unknown. The specimens collected in the Campus of Hokkaidô Univ., Sapporo, were reared from flowering branches of *Ulmus davidiana* var. *japonica* (Ulmaceae). It is, however, uncertain whether it is associated with any insects on the tree or the tree itself.



Figs. 53–57. — 53. *Quadrastichodella gracilis* sp. n., ♀, paratype, antenna; 54. Ditto, ♀, paratype, forewing; 55. *Q. hirsuta* sp. n., ♀, holotype, antenna; 56. Ditto, ♀, holotype, head; 57. Ditto, ♀, holotype, thorax. Scale: 0.1 mm.

Quadrastichodella hirsuta sp. n.
(Figs. 55–57)

Diagnosis (female)

Differs from *Q. gracilis* sp. n. as follows: scape and pedicel (Fig. 55) with rasp-like reticulation on the inner surfaces; clava (Fig. 55) solid; mesoscutum (Fig. 57) with scattered setae on the whole surface; callus with 10 setae; mouth (Fig. 56) 1.1 times as long as malar space; pronotum 0.3 times as long as mesoscutum.

Description.

Female. Body length 1.9 mm. Body dark green tinged with blue: gaster tinged with red and copper. Scape and pedicel pale brown; flagellum dark brown. Fore and mid coxae black tinged with green; hind coxa green; fore and mid femora black; remaining legs pale brown; tips of tarsi infusate. Wings hyaline.

Head (Fig. 56) as wide as high, 1.9 times as wide as long, as wide as thorax. Occiput with many short setae. POL 3.2 times, OOL 1.3 times as long as median ocellus diameter. Eye 2.4 times as high as malar space length. Mouth 1.1 times as long as malar space. Antenna (Fig. 55): scape 5.0 times as long as wide, with rasp-like reticulation on inner surface; combined length of pedicel and flagellum 1.3 times as long as head width; pedicel

0.4 times as long as scape, with weak rasp-like reticulation on inner surface; F1 2.8 times as long as wide, 1.3 times as long as pedicel; F2 2.3 times as long as wide, 0.9 times as long as F1; F3 1.8 times as long as wide, as long as F2; clava solid, 2.7 times as long as wide, 1.8 times as long as F3; without terminal spine.

Thorax (Fig. 57) 1.5 times as long as wide. Pronotum 0.3 times as long as mesoscutum, distinctly engraved-reticulate. Mesoscutum 1.3 times as long as scutellum, distinctly raised-reticulate, with scattered setae on the whole surface. Scutellum 0.9 times as long as wide, anteriorly raised-reticulate, posteriorly engraved-reticulate. Dorsellum weakly raised-reticulate. Propodeum 1.3 times as long as dorsellum, strongly raised-reticulate, with deep anteromedian fovea 0.3 length of propodeum, with median carina; paraspiracular carina strong; spiracle separated from metanotum by 1.5 times its diameter; callus with 10 setae. Hind coxa strongly raised-reticulate. Forewing 2.4 times as long as wide; submarginal vein with 3 dorsal setae; costal cell:marginal vein:stigmatal vein:postmarginal vein=3.4:3.2:1.0:0.3.

Petiole (Fig. 57) 0.6 times as long as propodeum. Gaster 2.1 times as long as wide, 1.5 times as long as thorax; apex of hypopygium situated slightly before the middle of gaster.

Male. Unknown.

Holotype (♀). Malaysia: Peninsula Malaysia, Negeri Sembilan, Pasoh Forest Reserve, 25. III-2. IV. 1993, fine Malaise trap (K. Konishi & K. Maeto). The holotype is deposited in the Forest Research Institute Malaysia, Kuala Lumpur.

Distribution. Malaysia (Malay Peninsula).

Host. Unknown.

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