*Invertebr. Taxon.*, 1992, **6**, 583–604

# Revision of the Genera *Gollumiella* Hedqvist and *Anorasema* Bouček (Hymenoptera: Eucharitidae)

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*Abstract*

*Gollumiella* Hedqvist (type species: *G. longipetiolata* Hedqvist, 1978) is resurrected from synonymy with *Losbanus* Ishii, and *Losbanus* (type species: *L. uichancoi* Ishii, 1932) is synonymised with *Orasema* Cameron. *Gollumiella* is revised and a key is provided to distinguish the six species in the Indo–Pacific region. Three new species of *Gollumiella* are described: *G. guineensis* (New Guinea), *G. infuscata* (Borneo) and *G. neopetiolata* (Borneo, New Guinea and the Philippines). New character states for *Anorasema* Bouček are presented and a new species, *A. manii* (India), is described. Phylogenetic relationships among *Gollumiella*, *Anorasema* and other Eucharitidae are discussed.

## Introduction

As many as five subfamilies of Eucharitidae (Hymenoptera: Chalcidoidea) have been recognised (Bouček 1988), with the majority of species being found in two ant-parasitic subfamilies, the Oraseminae and Eucharitinae (Heraty and Darling 1984; Heraty 1985, 1990). Eucharitidae are poorly known in the Old World tropics, and new taxa that share a number of character states found in both subfamilies are making it increasingly difficult to define the higher groups. *Gollumiella* Cameron and *Anorasema* Bouček are found only in the Indo–Pacific region. Both genera share several unusual character states that place them within the Eucharitinae and as the sister group to the remainder of the subfamily. A clear definition of character states found in these genera is necessary to define relationships between genera in the Oraseminae and Eucharitinae.

In this paper, an examination of type material and review of the species of *Gollumiella* and *Anorasema* results in synonymy of the name *Losbanus* Bouček with *Orasema* Cameron (Oraseminae). Six species of *Gollumiella* and two species of *Anorasema* are recognised, and phylogenetic relationships with other Eucharitidae are discussed.

## Materials and Methods

Terminology follows Heraty (1985, 1990) for external characters and details of length measurements, and Heraty (1989) for internal morphology of the mesosoma. The following abbreviations are used in the text: F1–F11, antennal flagellomeres; $Ms_2$, second metasomal sternite or basal gastral sternite; OOL, minimum distance between lateral ocellus and margin of eye; POL, minimum distance between lateral ocelli; SSS, scutoscutellar sulcus. Numbering of flagellomeres is based on the plesiomorphic state of F1 and F2 separated, with F1 equivalent to the anellus described for most Chalcidoidea. Even when fused in *Gollumiella*, the basal two flagellomeres can usually be distinguished under transmitted light.

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Measurements were taken from an image projected through a camera lucida, on a Wild M5 stereomicroscope, onto a Numonics 2200 digitising pad. Data were processed to metric distances with software developed by R. E. Strauss (University of Arizona). Ranges of ratios are based on measurements of all specimens whose sex was accurately determined. Label data for holotypes of new species are quoted exactly and presented in quotes at the beginning of each description. Question marks in specimen lists denote individuals of which the sex could not be determined accurately.

Material referred to in the text was borrowed from the following institutions (curator's names appear last): American Entomological Institute, Gainesville, Florida, U.S.A. (AEI, D. Wahl); Australian National Insect Collection, Canberra, A.C.T., Australia (ANIC, I. D. Naumann); The Natural History Museum, London, England (BMNH, J. S. Noyes); Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. (BPBM, K. Arakaki); Biosystematics Research Centre, Ottawa, Canada (CNC, G. Gibson); John Heraty, personal collection (JMH); Kyushu University, Fukuoka, Japan (KUEC, Y. Hirashima); Museum of Comparative Zoology, Cambridge, Massachusetts, U.S.A. (MCZ, S. Shaw); National Institute of Agro-Environmental Sciences, Tsukuba, Japan (NIAS, K. Konishi); Queensland Museum, Brisbane, Australia (QMB, E. C. Dahms); Taiwan Agricultural Research Institute, Wufeng, Taiwan (TARI, L.-y. Chou); Texas A&M University, College Station, Texas, U.S.A. (TAMU, H. R. Burke); University of Queensland, Brisbane, Australia (UQIC, M. Schneider); United States National Museum, Washington, District of Columbia, U.S.A. (USNM, E. E. Grissell); Zoologisk Museum, Copenhagen, Denmark (ZMUC, B. Peterson).

## Genus *Gollumiella* Hedqvist, stat. rev.

*Gollumiella* Hedqvist, 1978: 230.
*Losbanus*.—Bouček, 1988: 521–522 (not *Losbanus* Ishii, 1932).

Type species: *Gollumiella longipetiolata* Hedqvist, 1978 by original designation.

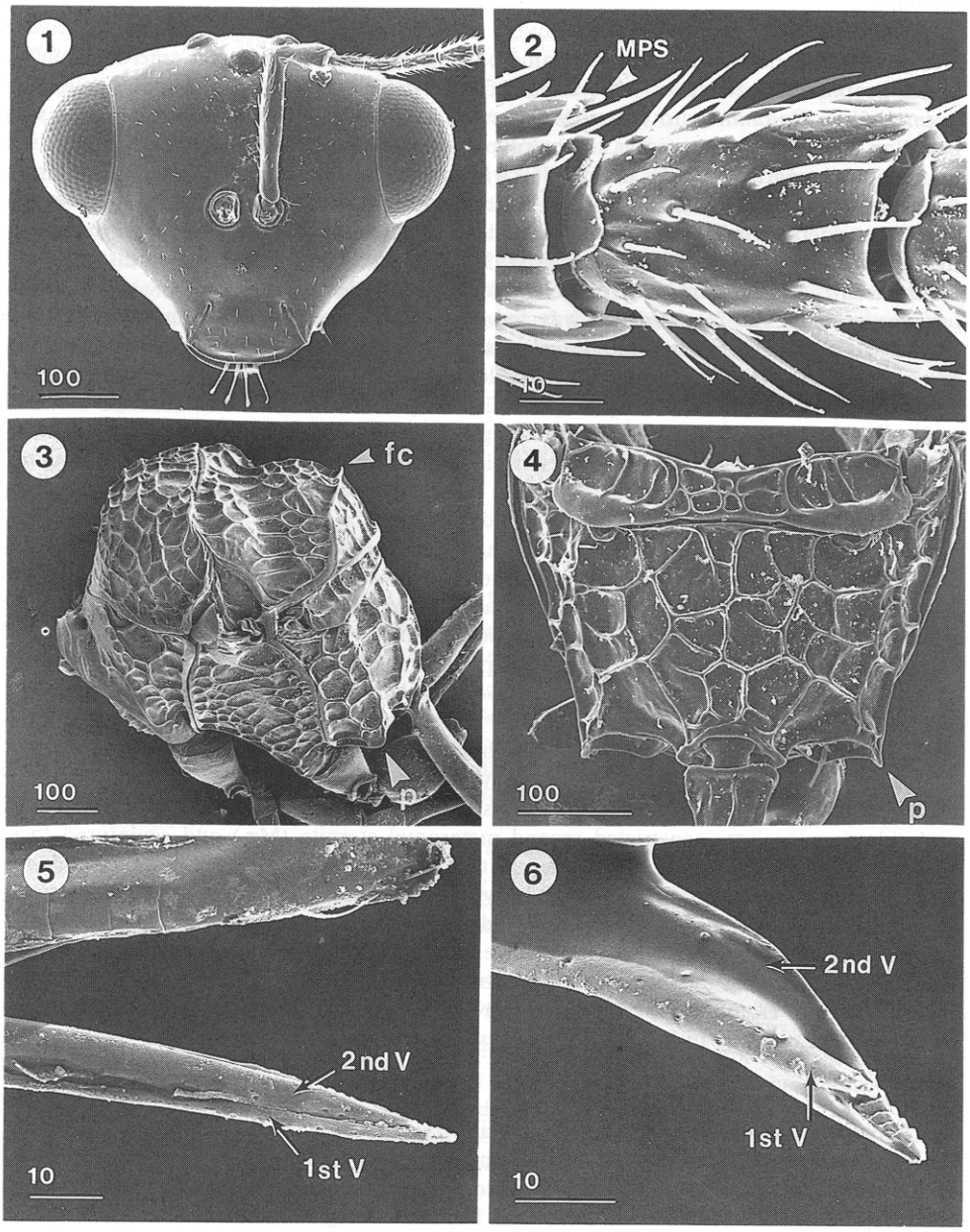
### *Description*

Head 1·2–1·6× as broad as mesosoma, face including vertex and gena smooth and polished, scrobal depression shallow and poorly defined, not including median ocellus; occiput transverse, occipital carina absent or represented by few irregular weak striae; median ocellus anterior to lateral ocelli. Genal sulcus or depression absent; hypostomal carina prominent. Clypeus as long as broad, slightly shorter than supraclypeal area, epistomal sulcus usually indistinct, lateral margin of clypeus poorly defined by shallow sulcus. Labrum 4-digitate, each digit with terminal spatulate seta. Mandibles 3/2 toothed; maxillary palpus elongate and 3-segmented, labial palpus 2-segmented. Scape elongate and smooth, narrow and cylindrical basally; pedicel more than 1·5× as long as broad. Antenna 10–12-segmented (usually 11); funicular segments cylindrical, less than 2× as long as broad; F1 not anneliform, usually longer than broad and only slightly shorter than F2, F1 and F2 clearly separated or partially to completely fused; apical 2 or 3 segments fused into indistinct clava. Excluding F1, flagellomeres with distinct basal flange (Fig. 2), and pilose with scattered elongate multiporous plate sensilla in both sexes. Antenna of male generally more slender than that of female and with slightly longer pilosity.

Mesosoma generally rugose-areolate with scattered, small setae. Anterior margin of mesoscutum projecting internally as small phragma below dorsal margin of pronotum; mesoscutum as broad as long in dorsal view, flange-like along ventrolateral margin and overlapping prepectus dorsally, notauli weakly impressed. SSS diagonal, broadly impressed medially, and associated with weak V-shaped ridge internally. Axillar carina well-developed laterally. Scutellum with transverse carina separating posterior frenal area, lacking associated frenal groove; axillular sulcus absent. Metanotum well-developed, extended laterally as smooth flange overlapping base of propodeum and almost covering propodeal spiracle which is close to dorsal margin (Fig. 4). Propodeal disc evenly alveolate or rugose-alveolate, callus poorly developed and with few long hairs, postspiracular sulcus weakly developed; metepimeron not separated by carina or groove, extending ventrolaterally as small projection over base of hind coxa (*p*, Fig. 4). Mesepimeron evenly rugose-areolate, often glabrous medially, femoral groove weakly impressed or absent; ventral surface of mesepisternum flat in profile. Prepectus broad, triangular and reaching tegula, fused to pronotum but angled 30–50° to lateral edge and thus not on same plane as pronotum, alveolate; mesothoracic

spiracle narrowly enclosed dorsally by membranous cuticle. Legs, including coxae, smooth and shining; hind tibia with 2 apical spurs; hind tarsus usually 0·7× length of tibia.

Wings with upper and lower surfaces densely pilose; veins of fore and hind wing distinct. Costal cell of fore wing narrow, with scattered ventral setae, 0·4× length of fore wing; basal area and speculum bare except for few scattered hairs along impression of cubital vein; marginal vein as densely pilose as rest of wing, 0·3× length of fore wing; stigmal vein short; postmarginal vein usually short, poorly defined apically; marginal fringe present. Hind wing vein 0·6× length of hind wing, well-defined along entire length.




**Figs 1–6.** *Gollumiella* spp. *1*, head of *G. minuta*, ♂; *2*, F7 of *G. minuta*, ♂; *3*, mesosoma of *G. antennata*, ♀; *4*, propodeum of *G. minuta*, ♂; *5*, ovipositor of *G. antennata*; *6*, ovipositor of *G. longipetiolata*. 1st V, first valvula or gonapophysis 8; 2nd V, second valvula or gonapophysis 9; fc, frenal carina; MPS, multiporous plate sensillum; p, metepimeral process. Scale bars in μm.

Petiole cylindrical with small dorsal flange basally, flange more strongly developed laterally than medially, petiole 2–3 × length of hind coxa, about equal to length of gaster. Metasomal terga 2–4 glabrous; second metasomal sternite ($Ms_2$) smooth and without medial constriction; female with 2–8 long hairs along apical margin of hypopygium ($Ms_6$), male with apex of $Ms_8$ densely setose; ovipositor sheaths narrow and elongate, not fused to syntergum apically. Ovipositor acicular (Fig. 5) or broad with strong dorsal keel on second valvula (Fig. 6). Male usually with only aedeagus visible, parameres well-developed and bearing few stout setae, digitus with 4–5 stout spines (Figs 16–17).

*Remarks*

*Gollumiella* was proposed by Hedqvist (1978) to include *Gollumiella longipetiolata* Hedqvist, *Eucharis purpureoventris* Cameron and *Eucharis pallidipes* Cameron. Bouček (1988) proposed a new genus, *Anorasema*, for *E. pallidipes*, and transferred *E. purpureoventris* from *Gollumiella* to *Orasema* Cameron. The description of *G. longipetiolata* was based on a female (designated as the holotype) and three males. Bouček (1988) recognised that one of the paratype males (at ZMUC) was conspecific with *E. pallidipes*, and different from the holotype of *G. longipetiolata*, which is a male (holotype male, ZMUC). Bouček (1988) considered *Gollumiella* to be congeneric with the monotypic *Losbanus* based on the description of *L. uichancoi* by Ishii (1932). I regard *L. uichancoi* to be distinct, and *Gollumiella* is here resurrected from synonymy with *Losbanus*.

Type material for *L. uichancoi* was found in a series of 10 slide mounts labelled as 'eucharid', '*Schizaspidia*' or '*Psilogaster*' in the National Institute of Agro-Environmental Sciences (NIAS). These slides are attributable to Ishii's (1932) paper treating, respectively, species of *Parapsilogaster* Girault, *Kapala* Cameron and *L. uichancoi*. Although the slide labels do not correspond to species names presented in Ishii (1932), the material exactly corresponds with Ishii's published descriptions and figures. No further point-mounted material was located in the NIAS collection (Dr Kazuhiko Konishi, NIAS, personal communication). For each species, there is a slide mount of a pair of wings and an antenna, and one or more slides of planidia. The wings and antenna of *Losbanus uichancoi* (slides labelled as *Psilogaster*) are identical to those of two point-mounted specimens in the American Entomological Institute identified as *L. uichancoi* by Dr Clare Baltazar, and these correspond almost perfectly to the original description in Ishii (1932). The following set of characters are provided in the original description or figures of *Losbanus uichancoi* (quotes from Ishii 1932; see generic diagnosis of *Gollumiella* for alternate states): 'antennae 11-jointed *exclusive* or ring segment', 'pedicel as long as wide at apex', 'head ... foveate-reticulated', 'parapsides ... smooth and shining', (and from the figures) speculum of fore wing absent, and stigmal vein distinctly Y-shaped. Additionally, the material I have attributed to this species has a free prepectus, distinct ring segment, sub-apically expanded and ridged ovipositor, constricted second metasomal sternite ($Ms_2$) and sculptured face. These character states place this species in the genus *Orasema* (Oraseminae) as *Orasema uichancoi* (Ishii), **comb. nov.**, and result in synonymy of the name *Losbanus* with *Orasema*, **syn. nov.** A more detailed description and additional specimen records will be presented in a future paper on the genera of Oraseminae.

The description of *Losbanus* provided by Bouček (1988) is accurate for the species included here in *Gollumiella*, and, except for *O. uichancoi*, species of *Gollumiella* will run to the genus *Losbanus* in his key to the Australasian genera.

*Distribution*

*Gollumiella* is confined to the Indo-Pacific region, with species in the Indo-Chinese, Malayan, Philippine, Papuan and Australian subregions as defined by Gressitt (1956) and Schuh and Stonedahl (1986) (Fig. 41). Northern Queensland has a fauna that is distinct from the rest of Australia and is included in the Papuan subregion (Gressitt 1956). No species have been collected in the Sulawesi subregion. *G. antennata* is known only from the islands of Ambon in the Papuan region and Java in the Malayan region, and otherwise has a widespread continental distribution shared with *G. infuscata*. *G. longipetiolata* also has a widespread continental distribution but is more common in the Philippine subregion

and northern islands from Taiwan to Japan in the Indo-Chinese subregion. *G. neopetiolata* is found in the Philippine and Malayan (Borneo only) subregions, although distinct populations from each are recognised. *G. minuta* is found in the Papuan subregion of Queensland (Australia) and extends south along the eastern coast of Australia to the Grampians in Victoria. This species and *G. guineensis* (Papuan) are part of the most highly derived group of species in *Gollumiella* (Fig. 41) and probably evolved from an ancestor more widespread in the Oriental region.

*Biology*

Little biological information is known for this group. Bouček (1988) reported collections of *G. longipetiolata* on the leaves of *Mangifera indica* L. (Anacardiaceae) in India, and *G. antennata* on a shrub with soft leaves in Guangzhou, China. In Malaysia, I collected specimens of *G. antennata* on *Eugenia* sp. (Myrtaceae), and *G. longipetiolata* on *Ficus* sp. (Moraceae) and *Garcinia* sp. (Clusiaceae). Clausen (1940) observed oviposition of *G. antennata* on leaves of *M. indica* and *Erythrina* sp. (Leguminosae).

For *G. antennata*, Clausen (1940) observed oviposition only in association with eggs of the thrip *Solenothrips rubrocinctus* (Giard) (Thysanoptera: Thripidae), which was common on mango and *Erythrina* foliage. Females deposited their eggs 'vertically, regularly spaced and in numbers up to 100, in the immediate vicinity of freshly deposited thrip eggs' (Clausen 1940). The eggs of the thrips and eucharitids hatched simultaneously and the planidia attached to the immature thrips. The relationship between the thrips intermediate and ant host was not resolved. The ant host is unknown.

## Key to Species of *Gollumiella*

The following key to species of *Gollumiella* is based on males and females. Few unique characters separate species; each species is based on a combination of character states which are more thoroughly discussed under Remarks and Variation.

1. Petiole curved ventrally in profile and completely smooth (Fig. 13); head subcircular in frontal view (Fig. 7); antenna and legs including coxae white to honey-yellow; F1 broader than long, less than half length of F2, F1 and F2 distinctly separated (Figs 18, 25); submarginal vein usually bare dorsally (Fig. 29); ovipositor acicular (Indo-Chinese, Malayan and Papuan subregions) ..... *G. antennata* (Gahan)

   Petiole straight in profile, carinate at least in basal third (Figs 14, 15); head subtriangular in frontal view (Figs 8–12); colour variable, coxae and petiole usually dark brown; F1 longer than broad, as long as or longer than F2, F1 and F2 sometimes fused (Figs 19–24, 26–28); submarginal vein usually with dorsal setae; ovipositor usually broad with dorsal keel on second valvula, acicular in *G. infuscata* ..... 2

2. Eye small and slightly bulging in frontal view (Figs 1, 11); flagellum 1·1–1·3× height of head; apex of scape exceeding median ocellus; female petiole 1·9–2·3× as long as hind coxa (north-eastern Australia) ..... *G. minuta* (Bouček)

   Eye larger and even with margin of head (Figs 8–10, 12); flagellum 0·8–1·0× height of head (1·1 in some *G. longipetiolata*); apex of scape reaching but not exceeding median ocellus; female petiole 2·2–3·1× as long as hind coxa ..... 3

3. Hind femur dark brown with apex brownish yellow (Borneo, Philippines and New Guinea) ..... *G. neopetiolata*, sp. nov.

   Hind femur uniformly yellow or brownish yellow ..... 4

4. Proepisternum with single, prominent transverse carina; fore wing infuscate; coxae and petiole yellowish orange; scutoscutellar sulcus shallow and rugulose-alveolate; ovipositor needle-like (Borneo) ..... *G. infuscata*, sp. nov.

   Proepisternum with 3 or more transverse carinae, rarely alveolate; fore wing hyaline; coxae yellow or brown; petiole brown, apical half sometimes yellowish; scutoscutellar sulcus deeply impressed and carinate; ovipositor broad, second valvula with median keel ..... 5

5. Dorsal submarginal setae long and prominent, exceeding costal cell width, long setae continuing along marginal vein (Fig. 30); scape swollen medially, more conspicuously so in males (Figs 19, 24), apex not reaching ventral margin of median ocellus (Fig. 8); F1 and F2 distinctly separated; mesosoma broadly rugose-areolate dorsally (New Guinea) ..... ..... *G. guineensis*, sp. nov.

Dorsal submarginal setae shorter, not exceeding costal cell width, setae along marginal vein short (Fig. 32); scape cylindrical, apex usually exceeding ventral margin of median ocellus (Fig. 10) (except in some Taiwanese specimens); F1 and F2 partly or completely fused; mesosoma closely spaced areolate or rugulose dorsally (Indo-Chinese, Malayan, and Philippine subregions) ..... *G. longipetiolata* Hedqvist

## *Gollumiella antennata* (Gahan), comb. nov.

(Figs 3, 5, 7, 13, 17, 18, 25, 29)

*Psilogaster antennata* Gahan, 1940: 427–429.
*Losbanus antennatus*.—Bouček, 1988: 522.

### *Material Examined*

*Type material.* **Malaysia: Selangor:** Kuala Lumpur, Federated Malay States, Feb. 1930 (Clausen), 21♀, 1♂, slides No. 2432-9, 88-1-xi-1 (type No. 53549, USNM), holotype ♀. **Singapore:** Straits Settlements (reared in Honolulu Hawaii), 8.v.1931, on *Coelogyne* sp., 1♂ (type No. 53549, USNM).

*New material. [Typical form.]* **Bangaladesh:** Chittagong, Jan.–May 1984, 'No. 3E ex *Pulvinaria psidii* [?] C.I.E. [Commonwealth Institute of Entomology] A16198', 1♂, 1? (BMNH). **Hong Kong:** N.T. Station, 4.v.1965 (Voss and Ming), 1♂ (BPBM). **India:** North Bengal, Poro, 1–7.iv.1976 (Mani), 1♀ (USNM). **Indonesia: Ambon** [Amboina]: (Muir), 3♂, 3? (BPBM; MCZ). **Malaysia: Selangor:** Kuala Lumpur, University of Malaya, Rimba Ilma, 100 m, 13–23.vi.1990 (Heraty) on *Eugenia*, 2♀, 3♂, 1? (JMH). **People's Republic of China:** Ding-Hu Mts, 60 km W. of Guangzhou (Bouček), 1♂ (BMNH). **Thailand: Suphanburi:** Khao Yai Natl Pk, Khong Kheo Waterfall, 900 m, 30.vi.1990 (Heraty) rainforest understorey, 19♂ (JMH; TAMU); Khao Yai Natl Pk, Haew Narok Waterfall, 550 m, 2.vii.1990 (Heraty), 7♂ (JMH); Khao Yai Natl Pk, Elephant Crossing Trail, 900 m, 2.vii.1990 (Heraty) rainforest understorey, 1♀ (JMH).

*[Atypical forms.]* **Indonesia: Java:** Tjibodas, Mt Gede, Sept. [no year] (Bryant and Palmer), 14♂, 1? (USNM). **Laos: Vientianne:** Ban Van Eue, 800 m, 11.iv.1965 (Gressitt), 1♂ (BPBM). **People's Republic of China:** Guangzhou, 2–7.vi.1983 (Bouček), 9♀, 9♂ (BMNH); Hainan I., Tien Fong Mts, 17.v.1983 (Bouček), 1♀ (BMNH); **Fukien:** Shaowu, Kuhsienkieh, 16.xi.1944 (Maa) at banana, 2♀, 7♂ (TARI). **Singapore:** Singapore Botanical Gardens, 12–13.xi.1982 (Bouček), 13♂ (BMNH). **Thailand:** Prew Chanthaburi, 25.iv.1958 (Maa), 1♂ (BPBM); Hai Kha Khaeng, Feb. 1986 (Allen), 1♀ (BPBM). **Vietnam:** 20 km N. of Pleiku, 650 m, 9.v.1960 (Quate), 1♀ (BPBM).

### *Diagnosis*

Recognised by the following combination of characters: head subcircular in frontal view (Fig. 7); scape short and clearly not reaching median ocellus; F1 and F2 distinctly separated, F1 shorter than F2; venation only faintly indicated, submarginal vein almost or completely bare dorsally, stigmal and postmarginal veins short and indistinct (Fig. 29); petiole smooth, curved in profile and narrower than hind femur (Fig. 13); ovipositor acicular; antenna, petiole and legs white to pale yellow. Typical individuals of *G. antennata* are small and delicate with the petiole very narrow and white.

More-robust individuals of this species may be difficult to separate from some *G. longipetiolata*, with which they occur in sympatry, but in *G. longipetiolata* the stigmal vein is usually twice as long as broad, the fore wing 2·4–2·8× as long as broad (in *G. antennata* 2·0–2·4× as long as broad), and the ovipositor is distinctly keeled. Females of *G. antennata* have a narrow, acicular ovipositor (Fig. 5) which is shared only with *G. infuscata*.

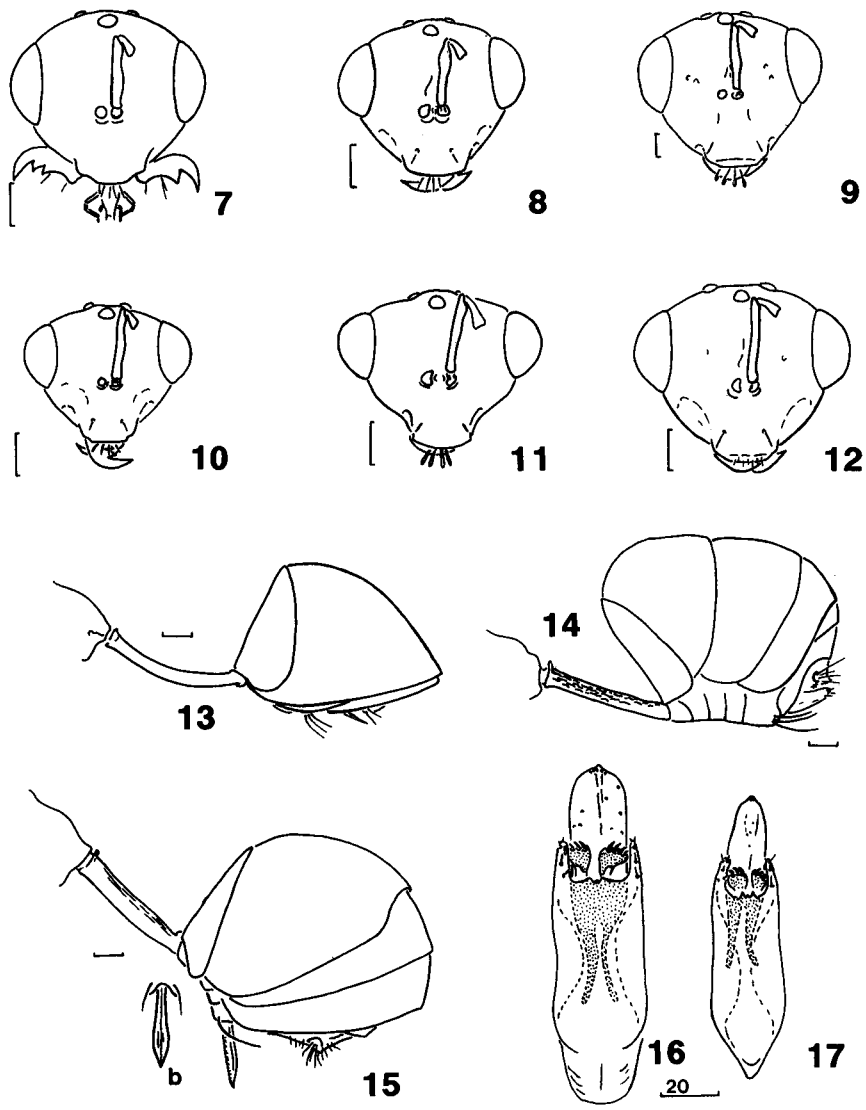
### *Description*

#### *Female*

Length 1·8–2·2 mm. Dark brown to black, head darker with faint metallic reflections; antenna, legs and petiole white to pale yellow, coxae white to pale brown. Wings hyaline, venation clear (uncoloured).

Head subcircular, 1·1–1·2× as broad as high (Fig. 7). POL 1·2–1·6× LOL. Face broadly rounded, gena rounded in frontal view; occiput glabrous, dorsal angle with vertex broadly rounded. Clypeus rounded apically, narrow anteclypeus with row of fine apical setae directed over mouthparts. Eyes separated by 1·6–1·9× their height. Malar space 0·6–0·8× height of eye. Antenna 11-segmented (Fig. 18); scape cylindrical, reaching 0·8× distance to median ocellus; 8 funicular segments; F1 less than half length of F2, F1 and F2 distinctly separated; flagellum 0·7–0·9× height of head, moderately setose with long decumbent setae.

Mesosoma with shallow, rugose-alveolate sculpture (Fig. 3); SSS narrow, transversely carinate; scutellum as broad as long, frenal carina shallowly to deeply emarginate medially. Proepisternum with several weak transverse striae. Coxae smooth and globose, hind coxa




**Figs 7–17.** *Gollumiella* spp. *7–12*, frontal view of head: *7*, *G. antennata*, ♀; *8*, *G. guineensis*, ♀; *9*, *G. infuscata*, ♀; *10*, *G. longipetiolata*, ♂; *11*, *G. minuta*, ♀; *12*, *G. neopetiolata*, ♀. *13–15*, metasoma of female: *13*, *G. antennata*; *14*, *G. longipetiolata*; *15*, *G. minuta* (b, ventral view of ovipositor). *16–17*, male genitalia: *16*, *G. minuta*; *17*, *G. antennata*. Scale bars 100 μm unless marked otherwise.

only slightly longer than broad; hind femur sparsely setose dorsally, tibia moderately setose. Fore wing 2·1–2·6× as long as broad, 2·6–2·8× as long as mesothorax (dorsal length of mesoscutum + scutellum); speculum open basally; veins poorly defined; submarginal vein usually bare dorsally but sometimes with few minute setae in proximal third; stigmal vein short and as long as broad; postmarginal vein relatively short and indistinct, only slightly longer than stigmal vein (Fig. 29).

Petiole 2·5–3·3× as long as hind coxa, narrow, ventrally curved in lateral view, glabrous over entire length. Hypopygium with 6–8 long hairs along apical margin. Ovipositor very thin, acicular and smooth (Fig. 5).

*Male*

Length 1·7–2·1 mm. Agrees with female except as follows: antenna usually more slender, densely setose, and F1 and F2 subequal in length (Fig. 25); eyes separated by 1·5–1·8× their height; malar space 0·6–0·9× height of eye. Genitalia as in Fig. 17.

*Variation*

Material examined was grouped into typical and atypical forms. The typical form is described above. *Gollumiella antennata* occurs sympatrically with *G. longipetiolata* at several locations although individuals may be strongly micro-allopatric (spatially close but on different plant hosts). Specimens listed as atypical differ by one or more obvious features from the description, but these differences are unique and are usually not repeated in other samples. For example, specimens from the single series collected in Java all have brown coxae and the petiole is about one-third longer than the typical form. The series collected from Guangzhou has the apical tarsomere completely black and F1 is cylindrical and as long as broad. At one locality in Khao Yai National Park (Thailand), all specimens have a medial swelling on the male scape but are otherwise identical to other, typical *G. antennata*. The remaining atypical forms generally have a stouter and more linear petiole. These few atypical collections are not considered here to warrant species status.

*Distribution*

Widely distributed in continental areas of the Indo-Chinese and Malayan subregions. Two collections are known from Java and Ambon in the Malayan and Papuan subregions.

*Biology*

Oviposition habits were well documented by Clausen (1940) and are discussed earlier in this paper under biology of the genus. Clausen observed oviposition on leaves of *Mangifera indica* and *Erythrina*. The male paratype that was associated with *Coelogyne* (Orchidaceae) (Gahan 1940) is a late pupal stage (pupal exuvia attached to face and antennae), and was probably associated with ants in the quarantine shipment from Singapore that was reared in Hawaii. I collected specimens on *Eugenia* from a botancial garden in Malaysia and from broadleaf understorey plants in rainforests of Thailand, but no oviposition was observed. Adults were collected from leaves of two trees of the same species that were close together, and from no other trees in the botanical gardens. The association with *Pulvinaria* (Hemiptera: Coccidae) from Bangladesh is regarded as erroneous and adults were probably collected along with the host plant. The host ant is unknown.

## *Gollumiella guineensis*, sp. nov.

(Figs 8, 19, 24, 30)

*Material Examined*

*Holotype.* ♀, labelled 'PAPUA NEW GUINEA/Mt Hagen 1600 m,/17.XII.82, Bouček' '♂ Losbanus/det. Z. Bouček, 1986'. Red label 'HOLOTYPE/Gollumiella/guineensis Heraty', in BMNH.

*Paratypes.* **Papau New Guinea:** Mt Hagen, 1600 m, 17–19.xii.1982 (Bouček), 2♀, 2♂, 1? (BMNH); W. Highlands, Baiyer R., 1150 m, 18.x.1958 (Gressitt), 1♂ (BPBM); Dreikikir, Sepik District, 350 m, 23.vi.1961 (Gressitt), 1♂, (BPBM); Papua, Daradae, 500 m, 80 km N. to Port Moresby, 6.ix.1959, sweeping (Maa), 1♂ (BPBM); **Bismarck Archipelago:** Manus I., Momote, 24.xii.1959 (Maa), 1♀, 1♂

(BPBM). **Indonesia: Irian Jaya:** Genjam, 40 km W. of Hollandia, 100–200 m, 1–10.iii.1960 (Maa), 1♂ (BPBM); Oranabari, N. Geelvink Bay, 10.ii.1963, light trap (Straatman), 1♂ (BMNH).

*Diagnosis*

Recognised by the following combination of characters: scape in female slightly swollen and not reaching median ocellus, in male strongly swollen and bulging and reaching top of median ocellus; F1 and F2 distinctly separated, F1 equal or slightly subequal in length to F2; petiole straight and basally carinate; mesosoma with widely spaced rugose-areolate sculpture; submarginal setae exceeding width of costal cell (Fig. 30); legs and antenna yellow.

*Description*

*Female*

Length 1·9–2·1 mm. Dark brown to black; antenna and legs light yellow to brownish yellow, flagellum darker apically, coxae yellow or brown; petiole completely brown or with apex yellow. Wings hyaline, venation pale brown.

Head subtriangular, 1·2× as broad as high (Fig. 8). POL 1·4–1·6× LOL. Face broadly rounded; gena straight in frontal view, slightly sunken next to clypeus (Fig. 8); occiput glabrous, dorsal angle with vertex abrupt. Clypeus rounded apically, anteclypeus weak with sparse marginal setae. Eyes separated by 1·7–1·8× their height. Malar space 0·9–1·0× height of eye. Antenna 11-segmented (Fig. 19); scape with distinct median bulge, not reaching median ocellus (Figs 8, 19); 8 funicular segments; F1 equal to or slightly shorter than F2, F1 and F2 distinctly separated; flagellum 0·8–1·0× height of head, setae of flagellum dense, long and semi-erect.

Mesosoma with rugose-areolate sculpture, interstices of areolae appearing transversely carinate across mesoscutal midlobe and longitudinally carinate on scutellum; SSS broadly impressed, transversely carinate; scutellum slightly longer than broad; frenal carina truncate medially and broadly emarginate laterally in frontal view. Proepisternum transversely carinate or with few striae in alveolate pattern. Fore coxa elongate, mid and hind coxae semi-globose and about twice as long as broad; hind femur sparsely setose, tibia moderately setose. Fore wing 2·2–2·4× as long as broad; 3·4–3·8× as long as mesothorax; speculum enclosed by sparse band of setae basally; veins distinct; submarginal vein with several long dorsal setae, these exceeding width of costal cell and continuous along marginal vein (Fig. 30); stigmal vein slightly longer than broad and angled posteriorly; postmarginal vein 3× length of stigmal vein.

Petiole 2·4–2·7× as long as hind coxa, linear in profile, weakly carinate dorso-basally. Hypopygium with 8 long hairs along apical margin. Ovipositor broad, second valvula with distinct median keel.

*Male*

Length 1·9–2·7 mm. Agrees with female except as follows: generally darker in colour with coxae and petiole usually completely brown, hind femur may be infuscate and darker than tibia; antenna 11- or 12-segmented; scape long and reaching top of median ocellus, bulbous area of scape associated with minute circular weakenings in cuticle (Fig. 24), visible only on slide mounts and not on SEM preparations; F1 equal in length to F2; head 1·1–1·2× as broad as high; POL 1·1–1·8× LOL; eyes separated by 1·6–2·0× their height; malar space 0·7–1·0× height of eye; flagellum 0·8–1·0× height of head; petiole 2·2–3·1× length of coxa.

*Variation*

Some specimens have a less-pronounced enlargement of the scape, the coxae and apex of the petiole brownish yellow, and the dorsal sculpture of the mesosoma more deeply impressed. All specimens share the long setae along the marginal and submarginal veins, and have a similar flagellum. An unplaced male from Brunei (BMNH) is similar to the light-coloured form and possesses elongate setae along the submarginal vein. It differs by having a slender scape, shallow sculpture on the mesosoma and short stigmal vein.

*Distribution*

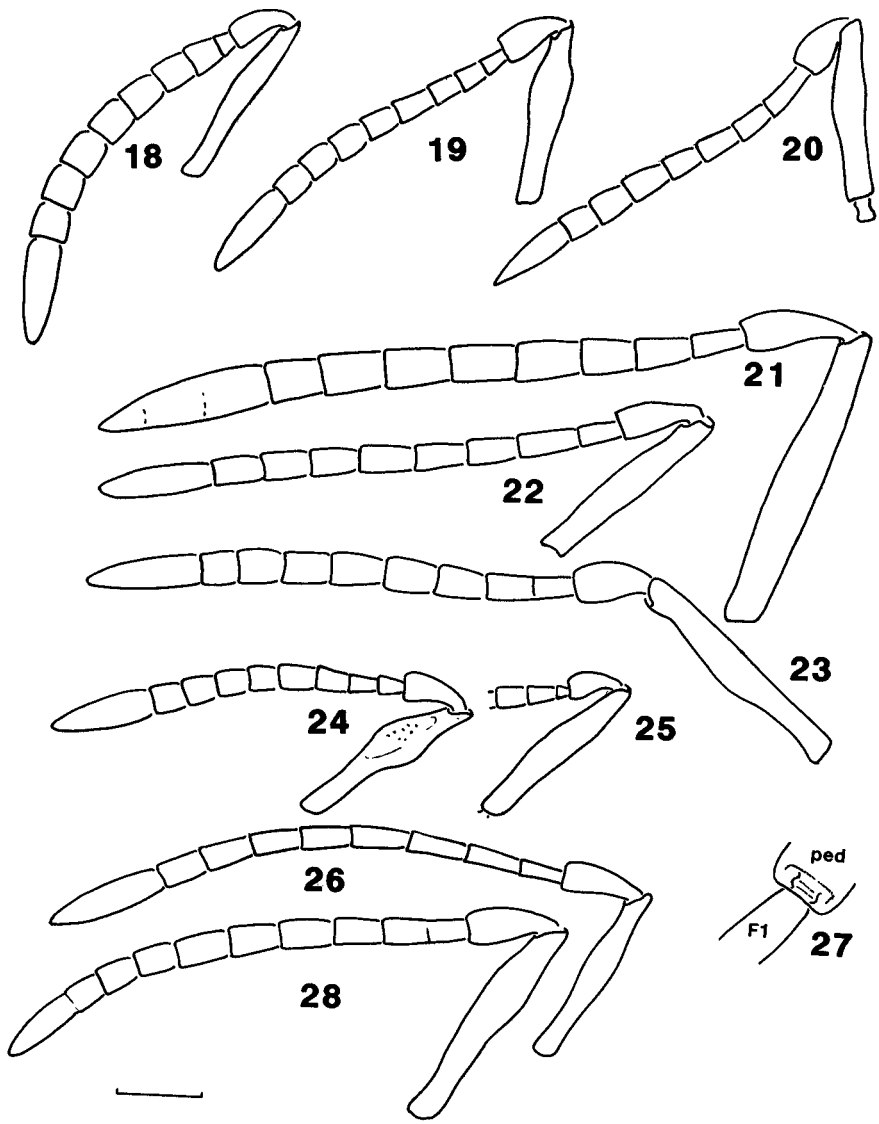
New Guinea including the Bismarck Archipelago within the Papuan subregion.

***Gollumiella infuscata***, sp. nov.

(Figs 9, 21, 31)

*Material Examined*

*Holotype.* ♀, labelled 'SARAWAK/Gunong Mulu Nat Pk./iii.1978/N. M. Collins' '♀ (Gollumiella)/=LOSBANUS/det. Z. Bouček, 1986'. Red label 'HOLOTYPE/Gollumiella/infuscata Heraty', in BMNH.




**Figs 18–28.** *Gollumiella* spp. *18–23*, female antenna: *18*, *G. antennata*; *19*, *G. guineensis*; *20*, *G. longipetiolata*; *21*, *G. infuscata*; *22*, *G. minuta*; *23*, *G. neopetiolata*. *24–28*, male antenna: *24*, *G. guineensis*; *25*, *G. antennata*; *26*, *27*, *G. minuta* (ped, pedicel; F1, first flagellomere); *28*, *G. neopetiolata*. Scale bar 100 μm for *18–26* and *28*.

*Diagnosis*

Recognised by the following combination of characters: head subtriangular (Fig. 9); scape reaching median ocellus; F1 distinct and as long as broad (Fig. 21); wings infuscate, submarginal vein bare, stigmal vein more than twice as long as broad (Fig. 31); proepisternum with single transverse carina; petiole linear in profile; petiole and coxae yellowish orange. Ovipositor acicular, as in *G. antennata*.

*Description*

*Female*

Length 2·7 mm. Dark brown, head black with faint greenish reflections; antenna, legs including coxae, and petiole yellowish orange with apex of ultimate tarsomere darker. Wings infuscate, venation pale brown.

Head subtriangular, 1·2× as broad as high (Fig. 9). POL 2·0× LOL. Face broadly rounded, gena slightly rounded in frontal view; occiput with weak transverse striae, dorsal angle with vertex abrupt. Clypeus broadly truncated apically; anteclypeus distinct and sharply angled to mandibles in profile, without distinct line of marginal setae. Eyes separated by 1·7× their height. Malar space 0·8× height of eye. Antenna 11-segmented (Fig. 21); scape cylindrical, reaching base of median ocellus; 8 funicular segments; F1 twice as long as broad, equal in length to F2, F1 and F2 distinctly separated; flagellum 0·9× height of head, moderately setose.

Mesosoma with rugulose-alveolate sculpture; SSS completely rugulose-alveolate; scutellum slightly longer than broad, frenal carina slightly emarginate medially, Proepisternum with single prominent transverse carina and few additional weak striae. Fore and hind coxae semi-globose and smooth except for few basal striae; hind femur with few very small setae dorsally, tibia with sparse, short setae. Fore wing 2·7× as long as broad, 3·6× length of mesothorax; speculum open basally; veins distinct, submarginal vein without dorsal setae, stigmal vein twice as long as broad; postmarginal vein well defined, 4× length of stigmal vein (Fig. 31).

Petiole 2·5× as long as hind coxa, linear in profile, glabrous except for few short basal striae. Hypopygium with 6 long hairs along apical margin. Ovipositor acicular.

*Male*

Unknown.

*Distribution*

Borneo in the Malayan subregion.

### *Gollumiella longipetiolata* Hedqvist

(Figs 6, 10, 14, 20, 32)

*Gollumiella longipetiolata* Hedqvist, 1978: 230.
*Losbanus longipetiolatus.*—Bouček, 1988: 521–522.

*Material Examined*

*Type material.* **Philippines: Palawan:** Mantaligajan Togembring, 1150 m, 19.ix.1961, Noona Dan Expedition 91-62, holotype ♂ (misidentified as ♀ in original description) (ZMUC).

*New material.* **India: Uttar Pradesh:** Dehra Dun, 20.x.1979 (Bouček), 2♂ (BMNH); North Bengal, Poro, 6–24.iv.1976 (Mani), 1♀ (USNM). **Indonesia: Java:** Tjibodas, Mt Gede, 2500 m (Bryant and Palmer), 1♂ (USNM); Pekulongan (Muir), 1♂ (USNM). **Japan: Honshu:** Gumma Prefecture, Takamine Tableland, 1950 m, 19.vii.1980 (Smetana), 1♀, 1♂ (CNC); **Kyushu:** Kamiozoegawa, Fuji, Saga Prefecture, 4.vii.1973 (Yamagishi), 1♂ (KUEC). **Malaysia: Selangor:** Kuala Lumpur, Univ. of Malaya, Rimba Ilma, 100 m, 12.vi.1990 (Heraty) on *Garcinia*, 4♂ (JMH); same data, on *Ficus*, 1♀ (JHM). **Nepal:** Kathmandu, Pulchauk, 4125 m, 21–27.viii.1967, Malaise Trap, Canadian Expedition, 1♀ (CNC); 27°58′N.,85°00′E., 6937 m, 5.vi.1967, Canadian Expedition, 1♂ (CNC). **People's Republic of China:** Hainan I., Tien Fong Mts, 13,16,20.v.1983 (Bouček), 3♀, 3♂ (BMNH); Guangzhou, 7.vi.1983 (Bouček), 1♀ (BMNH). **Philippines: Mindanao:** Zamboanga, 1927 (Baker),

1♂ (USNM). **Singapore:** Singapore Botanical Garden, 10–11.xii.1958 (Maa), 2♀, 5♂ (BPBM); Singapore to Kuala Tembeling, 11–12.xii.1958 (Maa), 1♀, 1♂ (BPBM). **Thailand:** Banna, 5–10.iv. 1958 (Maa), 2♂ (BPBM); Chiangdao, 5–11.iv.1958 (Maa), 1♂ (BPBM); Hai Kha Khaeng, Feb. 1986 (Allen), 1♂ (BMNH). **Taiwan: Nantou Hsien:** Tungpu, 1200 m, 20–24.vi.1983 (Chou and Wong), 1♀, 2♂, 3? (TARI); Tungpu, 1200 m, 20–22.vi.1980 (Chen), 1♂ (TARI); Tungpu, 1200 m, 19–23.vii.1982 (Chou and Lin), 1♀, 2? (TARI); Lienluachi, 650 m, 23–26.v.1980 (Lin and Chen), 1? (TARI).

*Diagnosis*

Recognised by the following combination of characters: head subtriangular in frontal view (Fig. 10); scape usually reaching or exceeding median ocellus; F1 and F2 partly or completely fused; petiole straight and dorsally carinate; femora completely yellow or brownish yellow; ovipositor broad with distinct median keel on the second valvula (Fig. 6).

*Description*

*Female*

Length 1·5–1·9 mm. Dark brown to black; antenna and legs yellow or brownish yellow, coxae and petiole yellow or brown. Wings hyaline, venation pale brown.

Head subtriangular, 1·2–1·3× as broad as high (Fig. 10). POL 1·1–1·9× LOL. Face broadly rounded to relatively flattened, gena slightly sunken in frontal view; occiput weakly aciculate, dorsal angle with vertex abrupt or broadly rounded. Clypeus truncate apically; anteclypeus pronounced with irregular row of marginal setae directed over mouthparts. Eyes separated by 1·7–2·1× their height. Malar space 0·7–1·0× height of eye. Antenna 10–11-segmented (Fig. 20); scape cylindrical, usually reaching or exceeding median ocellus, sometimes reaching 0·9× distance to median ocellus; 7–8 funicular segments; F1 equal in length to F2, F1 and F2 partially or completely fused (shown as fused in Fig. 20); flagellum 0·8–1·1× height of head, setae dense, long, semi-erect.

Mesosoma with areolate or rugulose-areolate sculpture; SSS deeply impressed and carinate; scutellum as long as or slightly longer than broad, frenal carina poorly developed and broadly rounded or weakly emarginate dorsally. Proepisternum with few to several transverse striae. Coxae smooth, semi-globose, hind coxa more than 1·5× as long as broad; hind femur with sparse inclinate setae, tibia sparsely setose. Fore wing 2·4–2·8× as long as broad, 3·0–3·3× as long as mesothorax; speculum not enclosed basally; veins poorly defined; submarginal vein usually with few short setae dorsobasally; stigmal vein elongate, more than 1·5–2·0× as long as broad; postmarginal vein more than 2× length of stigmal vein (Fig. 32).

Petiole 2·2–3·1× length of hind coxa, straight in profile, completely carinate dorsally or weakly aciculate with few longitudinal striae near base. Hypopygium with 6–8 long hairs along apical margin. Ovipositor broad, second valvula with distinct median keel (Fig. 6).

*Male*

Length 1·5–2·0 mm. Agrees with female except as follows: head 1·1–1·3× broad as high, POL 1·1–1·8× LOL; eyes separated by 1·5–1·9× their height; malar space 0·7–0·9× height of eye; flagellum 0·7–1·0× height of head; fore wing 2·3–2·7× as long as broad; petiole 2·2–3·4× as long as hind coxa.

*Redescription of holotype male*

Occiput slightly rounded at vertex, occiput very lightly aciculate; F1 and F2 partially fused; mesoscutum alveolate, SSS carinate; proepisternum smooth; dorsal setae on submarginal vein lacking; stigmal vein relatively long, twice as long as broad. The following proportions pertain to the holotype (in same order as in description): length 2·3 mm; head height:head width, 1·2; POL:LOL, 1·3; interocellar distance:eye height, 1·8; gena length:eye height, 0·9; flagellum length:head height, 0·9; fore wing length:fore wing width, 2·7; petiole length:hind coxal length, 2·8.

*Variation*

This species is morphologically very variable over its broad geographical range. Three recognisable forms may represent different species but insufficient material is available for adequate interpretation of the significance of variation within each group. A southern form, which includes the holotype of *G. longipetiolata*, has the dorsal sculpture of the mesosoma alveolate with broadly spaced septa, and the stigmal vein relatively small (about twice as long as broad). A second male collected from the Philippines is almost identical to the type but has an areolate proepisternum. The smooth proepisternum of the holotype appears to be atypical and other *G. longipetiolata* are finely carinate. A second northern form is represented by the Taiwanese and Japanese specimens which have closely spaced rugulose sculpture, reduced frenal carina, and the stigmal vein more than 3× as long as broad. In this group, the ratio of flagellar length to head height is large (0·92–1·1 compared with 0·84–0·94), and the petiole length to hind coxa length is shorter (2·2–2·4 compared with 2·3–3·1 in females, and 2·2–2·7 compared with 2·3–3·4 in males). A third form is represented by three females collected from Tungpu (Taiwan, 19–23.vi.1982) in which the mesosoma is lightly coloured, the head and gaster are black, submarginal setae are absent, the petiole is curved in profile, and the head is circular. These specimens are similar to *G. antennata* except for a more abrupt vertex and the second valvula of the ovipositor with a distinct keel. Males collected from the same locality are indistinguishable from other *G. longipetiolata*. Ratios of this last group that are not in common with the Taiwan/Japan forms are shared with southern forms, and the fore wing length to width ratio is smaller than the other forms (2·3–2·4 compared with 2·4–2·5 in females).

*Distribution*

Widely distributed in the Indo-Chinese, Malayan (continental) and Philippine subregions.

***Gollumiella minuta*** (Bouček), comb. nov.

(Figs 1, 2, 4, 11, 15, 16, 22, 26, 27, 33)

*Losbanus minutus* Bouček, 1988: 522.

*Material Examined*

*Paratypes.* **Australia: Queensland:** Eungella Natl Pk, 8.iv.1974 (Galloway), 2♂ (BMNH); Landsborough Shire, 200 m, 8.iii.1984 (Masner), 1♀ (BMNH).

*New material.* **Australia: Queensland:** Landsborough Shire, 200 m, 8.iii.1984 (Masner), 1♀ (CNC); Cooloola Natl Pk, 30 m, 7.iii.1984 (Masner), 3♂ (1♂ dissected for internal morphology) (CNC); Granite Ck, Bulburin State Forest via Many Peaks, 3.v.1975 (Naumann) sweeping low vegetation, sub-tropical forest, 1♀ (UQIC); Myora Springs, N. Stradbroke I., 15.iii.1975 (Naumann), 4♂ (UQIC); **New South Wales:** Lindsay State Forest 400–500 m, via Woodenbong, 10.xi.1974 (Naumann), 1♂ (UQIC); **Victoria:** Grampians, Rose's Gap, 17–21.xii.1990 (Wharton), 1♀ (JMH).

*Holotype (not examined)*

**Australia: Queensland:** Mt Tambourine, 6.iii.1981 (Galloway), ♀ (QMB).

*Diagnosis*

Recognised by the following combination of characters: subtriangular head with eyes small and bulging in frontal view (Fig. 11); flagellum 1·1–1·3× height of head; apex of scape exceeding median ocellus; petiole relatively short, 1·9–2·3× longer than hind coxa in females, 2·0–2·2× longer in males (*v.* females 2·2–3·3× and males 2·2–3·4 in other species); ovipositor broad with dorsal keel on the second valvula).

*Description*

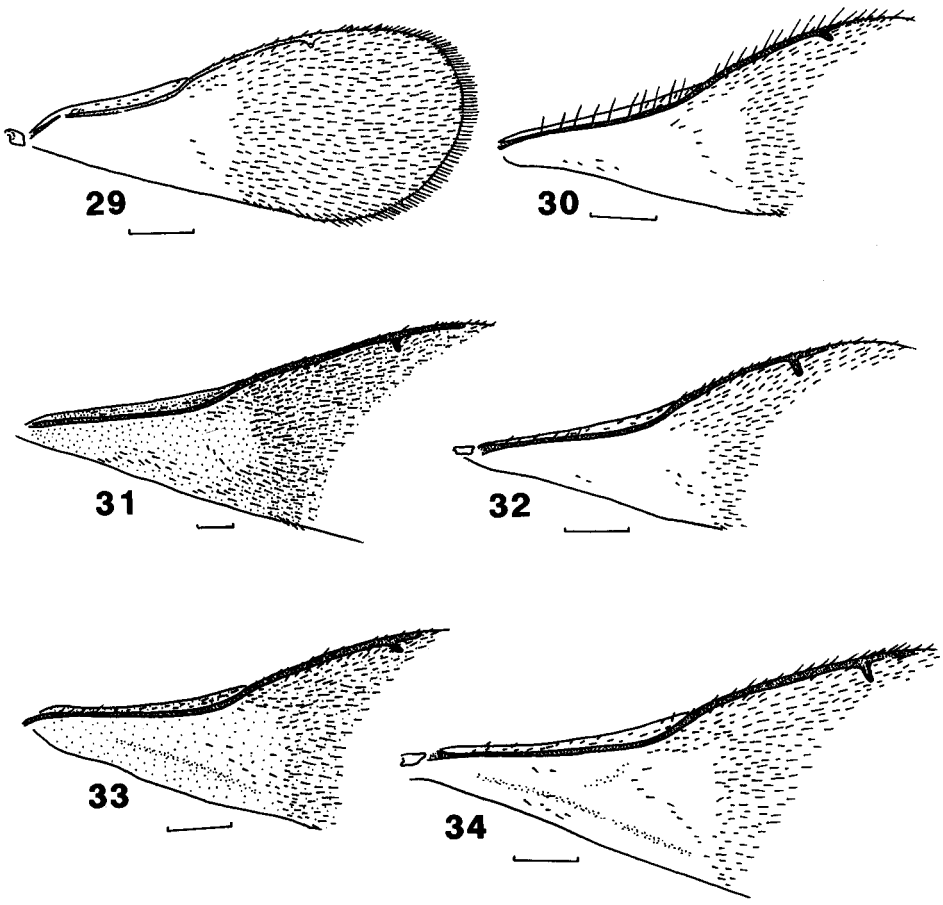
*Female*

Length 1·8–2·3 mm. Dark brown to black; antenna, coxae and rest of legs brownish yellow, femora sometimes darker medially. Wings slightly infuscate, venation pale brown.

Head subtriangular, eyes bulging in frontal view, 1·2–1·3× as broad as high (Fig. 11). POL 1·7–2·0× LOL. Face relatively flat, gena slightly sunken lateral to clypeus; occiput glabrous; dorsal angle with vertex semi-abrupt. Clypeus rounded apically, anteclypeus narrow with sparse minute setae along apical margin. Eyes separated by 1·9–2·1× their height. Malar space equal to height of eye. Antenna 10–11-segmented (Fig. 22); scape narrow and exceeding median ocellus by more than scape diameter; 7–8 funicular segments; F1 0·7× length of F2, F1 and F2 separate or fused; flagellum 1·1–1·3× height of head, moderately setose.

Mesosoma with shallow broadly rugose-alveolate sculpture; SSS broadly impressed and transversely carinate; scutellum as long as broad; frenal carina truncate medially. Proepisternum with single, transverse carina medially. Coxae glabrous or with few weak striae at base, semi-globose and all about equal in size, hind coxa 1·8–2·0× as long as broad; hind femur moderately setose apically, tibia densely setose ventrally. Fore wing 2·6–2·7× as long as broad, 3·1–3·2× length of mesothorax; speculum not enclosed basally; veins distinct; submarginal vein with few small setae basally; stigmal vein as long as broad; postmarginal vein short, poorly defined and less than 4–5× length of stigmal vein (Fig. 33).

Petiole 1·9–2·3× as long as hind coxa, linear in profile, coarsely carinate dorsally and smooth ventrally (Figs 4, 15). Hypopygium with 2–6 long hairs at apex. Ovipositor broad with strong dorsal keel on second valvula.




**Figs 29–34.** Fore wing: *29*, *G. antennata*, ♀; *30*, *G. guineensis*, ♂; *31*, *G. infuscata*, ♀; *32*, *G. longipetiolata*, ♀; *33*, *G. minuta*, ♂; *34*, *G. neopetiolata*, ♀. Scale bars 100 μm.

*Male*

Length 1·7–2·3 mm. Agrees with female except as follows: generally darker in colour; eyes separated by 1·7–2·0× their height; malar space 0·8–1·1× height of eye; flagellum 1·2–1·3× height of head; fore wing 2·4–2·8× as long as broad; petiole 2·0–2·2× as long as hind coxa. Genitalia as in Fig. 16.

*Distribution*

Eastern Australia (Australian subregion) and north into Queensland, which is included in the Papuan subregion.

***Gollumiella neopetiolata***, sp. nov.

(Figs 12, 23, 28, 34)

*Material Examined*

*Holotype.* ♀, labelled 'PHILIPPINES: MOUNTAIN/PROV., Abatan, Buguias/60 km S of Bontoc, 1800/–2000 m, 13.V.1964', 'H.M. Torrevillas/Light Trap/BISHOP'. Red label 'HOLOTYPE /Gollumiella/neopetiolata Heraty', in BPBM.

*Paratypes.* **Philippines: Luzon: Mountain Prov.:** same locality and collector as holotype [the words 'light trap' are either crossed out or not present on these labels and should probably be disregarded on the holotype] 17–19.v.1964, 25.v.1964, 31.v–2.vi.1964, 9.vi.1964, 9–12.vi.1964, 2♀, 3♂ (BPBM); **Mayoyao:** Ifuagao, 1200–1500 m, 19.ix.1966 (Torrevillas), 1♂ (BPBM); **Camarines Sur:** Mt Iriga, 100 m, 23.iii.1962 (Torrevillas), 1♀, (BPBM); **Mindanao:** Surgao del Norte: Taganak [? = Tagana-an], 24.ii.1957 (Kondo), 1♀ (BPBM). **Malaysia: Sarawak:** Kapit District, Merirai Valley, 28–31.vii.1958 (Maa), 2♀, 5♂ (BPBM); Kapit District, Merirai Valley, 30–300 m, 1–6.vii.1958 (Maa), 2♂ (BPBM); Nanga Pelagus near Kapit, 180–585 m, 7–14.viii.1958 (Maa), 1♂ (BPBM); Bau District, Bidi, 90–240 m, 3.ix.1958 (Maa), 1? (BPBM); 3♂, 1?, Bau District, Pangkalan Tebang, 300–450 m, 5.ix.1958 (Maa), 3♂, 1? (BPBM); same locality, June–Sept. 1958 (Maa), 1♂ (BPBM); 4th Division, Long Teru, 3°52'N.,114°15'E., 20–22.x.1976, 1♂ (BPBM). **Indonesia: Irian Jaya:** Vogelkop, Fak Fak, south coast of Bomberai, 10–100 m, 12.vi.1959 (Maa), 1♂ (BPBM).

*Diagnosis*

Recognised by the following combination of characters: F1 and F2 partially to completely fused (usually fused and antenna 10-segmented); sculpture of the mesosoma dorsally is shallow, widely spaced alveolate; femora dark brown with apices brownish yellow; petiole linear and carinate dorsally; submarginal vein with several prominent setae along dorsal margin.

*Description*

*Female*

Length 2·0–2·6 mm. Dark brown; scape, tibia, tarsi and apex of femora brownish-yellow; flagellum, pedicel and most of femora brown. Wings hyaline, may be infuscate along impressions of cubital and basal veins; venation pale brown.

Head subtriangular, 1·2–1·3× as broad as high (Fig. 12). POL 1·6–2·0× LOL. Face broadly rounded, gena rounded in frontal view; occiput smooth or with weak transverse striae, dorsal angle with vertex abrupt. Clypeus broadly rounded apically, anteclypeus weak with row of fine apical setae directed over mouthparts. Eyes separated by 1·8–2·1× their height. Malar space 0·8–0·9× height of eye. Antenna 10–11-segmented (Fig. 23); scape cylindrical, apex slightly below or reaching median ocellus; 7–8 funicular segments; F1 only slightly shorter than F2, F1 and F2 partially to completely fused; flagellum 0·8–0·9× height of head, moderately setose.

Mesosoma with shallow, widely spaced, rugose-alveolate sculpture; SSS transversely carinate; scutellum as long as broad; frenal carina in frontal view truncate to weakly emarginate medially. Proepisternum with several transverse striae. Fore coxa elongate and may be weakly carinate basally, hind coxa smooth and semi-globose, 1·6–1·7× as long as broad; hind femur with few short inclinate setae, denser apically; tibia sparsely setose. Fore wing 2·3–2·6× as long as broad, 3·2–3·3× length of mesothorax; speculum enclosed

basally by row of sparse setae; wing veins distinct; submarginal vein with several setae equal in length to width of costal cell; stigmal vein equal to or slightly longer than broad; postmarginal vein weakly developed but elongate, about 5× length of stigmal vein (Fig. 34).

Petiole 2·4–3·1× as long as hind coxae, linear in profile, completely carinate or carinate only basodorsally. Hypopygium with 4–6 long hairs along apical margin. Ovipositor stout, dorsoventrally compressed with pronounced dorsal keel on second valvula.

*Male*

Length 2·2–2·4 mm. Agrees with female except as follows: head 1·1–1·4× as broad as high; eyes separated by 1·6–1·8× their height; malar space 0·6–0·9× height of eye; flagellum 1·0× height of head; fore wing 2·4–2·8× as long as broad; petiole 2·6–3·3× as long as hind coxa.

*Variation*

Specimens from Borneo are distinct from those from the northern Philippines in their smaller size (1·7–1·9 mm), larger POL:LOL ratio (2·0–2·1), smaller eye separation to height ratio (1·7–1·8), and shorter antennal flagellum in males (0·8–0·9× head height). A single specimen from Mindanao is intermediate in these characteristics, suggesting that the two forms are extremes of geographical variation. The single specimen from Irian Jaya is morphologically identical to specimens from Borneo.

*Distribution*

Philippine, Malayan (Borneo) and Papuan subregions.

## Genus *Anorasema* Bouček

*Anorasema* Bouček, 1988: 522.

Type species: *Eucharis pallidipes* Cameron, 1909, by original designation.

A brief redescription of *Anorasema* is provided here to present additional characters for direct comparisons with *Gollumiella*. The description of a new species from India slightly alters the concept of this genus as initially provided, but does not affect the key to genera provided in Bouček (1988). The illustration of the antenna of *A. pallidipes* in Bouček (1988) is of a female, not a male as mentioned in that publication.

The following description lists only those character states that are different from *Gollumiella*.

*Generic Description*

Head 1·6× as broad as mesosoma (Fig. 35), scrobal depression strongly impressed medially with deep pit just below median ocellus; occiput broadly emarginate, occipital carina present, angle at vertex abrupt. Face smooth, genal region below eye relatively flat, sulcus or depression absent. Labrum also 4-digitate. Mandibles 3/3 toothed; maxillary palpus 2-segmented; labial palpus absent. Scape strongly swollen in proximal half, length strongly exceeding median ocellus; pedicel globose. Antenna 12–13-segmented; funicular segments without basal flange, more than 3× longer than broad and cylindrical (longer in males); F1 anelliform and minute; terminal segments variably fused, 7 funicular segments in female, 8–9 funicular segments in male. Excluding F1, flagellomeres pilose, only females with multiporous plate sensilla, males with setae raised on prominent papillae.

Mesosoma: frenal groove broadly or narrowly impressed dorsally and separating frenal area, lacking associated dorsal carina. Callus weakly separated from metepisternum, dorsal posterior margin developed as small prominence next to spiracle; metepimeron even ventrally and not extending ventrolaterally over base of hind coxa. Mesepimeron swollen laterally, no femoral groove. Hind tarsus 0·5× as long as hind tibia.

Wings: upper and lower surfaces densely pilose, basal area bare or pilose; venation distinct; postmarginal vein long and extending almost to wing apex (Fig. 40).

Petiole elongate and cylindrical, without basal flange (Fig. 37). Metasomal terga 2–4 with weak adpressed setae dorsally; second metasomal sternite ($Ms_2$) with weak medial constriction; female with 16–18 elongate hairs along apical margin of hypopygium ($Ms_6$) and encircling ovipositor (Fig. 37); $Ms_8$ of male rounded with dense hairs; ovipositor sheath broad along entire length. Ovipositor broad and cylindrical, first valvula smooth, second valvula with minute row of small teeth dorsally. Male genitalia as in Fig. 39, parameres broad with 4–5 elongate setae.

*Distribution*

The two species of *Anorasema* are found in the Indo-Chinese, Malayan, and Philippine subregions of the Indo-Pacific (Fig. 41).

*Biology*

No biological information is known for the genus. The structure of the ovipositor is broad and cylindrical which suggests that females deposit their eggs into incisions made in plant tissue. I collected females of *A. pallidipes* in Malaysia on short broadleaf plants and grasses along an open road in a rainforest.

### *Anorasema manii*, sp. nov.

(Figs 35, 36, 38–40)

*Material Examined*

*Holotype.* ♂, labelled 'SCHOOL OF ENTOMOLOGY / ST. JOHN'S COLLEGE / AGRA-282002, INDIA / 16.1 ALIPUR DUAR / M.S. MANI & PARTY / 1–19.IV.1976 / NORTH-BENGAL SURVEY'. Red label 'HOLOTYPE / Gollumiella / manii Heraty', right antenna missing after F5, in USNM.

*Paratype.* **India:** same data as holotype, 1♂ (USNM).

*Diagnosis*

Distinguished from *A. pallidipes* by the elongate 13-segmented antenna (Fig. 35), sparse short erect setae on the head (including eyes) (Fig. 35), and mesosoma and tibiae with dense semi-erect setae.

*Description*

*Male*

Length 2·2–2·4 mm. Dark brown; antenna, mandibles, coxae and legs yellow. Wings hyaline, venation pale brown.

Head 1·6× as broad as high (Figs 35, 36). POL 1·8× LOL. Face broadly rounded with moderate covering of elongate erect setae; occiput smooth, carinate. Clypeus rounded apically, lateral margins deeply impressed at tentorial pits; anteclypeus broad with short setae; lateral margins of supraclypeal area weakly impressed. Eyes large and sparsely setose, separated by 2·2× their height. Malar space equal to height of eye. Antenna 13-segmented (Fig. 38); flagellum 3·8× height of head, with dense covering of elongate setae.

Mesosoma dorsum areolate-rugose with elongate erect setae; notauli weakly impressed, lateral lobes evenly rounded and not strongly swollen. Axillae areolate-rugose; SSS deep and crenulate; scutellum evenly rounded in profile; frenal groove narrowly impressed dorsally. Propodeum areolate-rugose, callus sparsely setose. Prepectus rugose-areolate. Proepisternum with several transverse carinae. Coxae setose ventrally, hind coxa 2·5× as long as broad; femora elongate with sparse semi-erect setae; tibiae densely covered with elongate semi-erect setae. Fore wing 2·6–2·8× as long as broad, 3·5–3·9× as long as mesothorax; basal area completely and densely pilose; submarginal vein setose; stigmal vein 3–4× as long as broad (Fig. 40).

Petiole 2·8–3·1× as long as hind coxa, finely carinate and slightly expanded near apex. Gaster as described for genus. Genitalia as in Fig. 39.

*Female*

Unknown.

*Distribution*

Northern India in the Indo-Chinese subregion.

*Etymology*

Named in honour of Dr M. S. Mani.

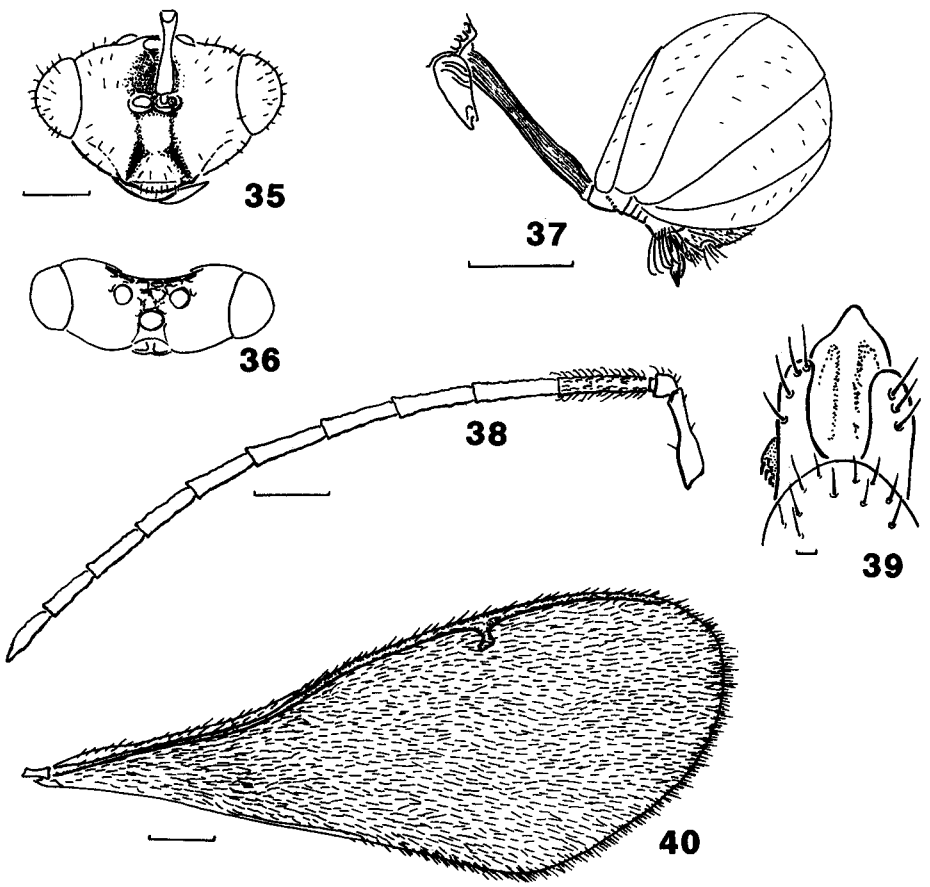
### *Anorasema pallidipes* (Cameron)

(Fig. 37)

*Eucharis pallidipes* Cameron, 1909: 232.

*Gollumiella longipetiolata* (part). – Hedqvist, 1978: 230, fig. 10. [Male paratypes incorrectly associated with holotype and belong to this species (Bouček 1988).]

*Anorasema pallidipes*. – Bouček, 1988: 522.




**Figs 35–40.** *Anorasema* spp. *35*, *36*, head of *A. manii*, ♂: *35*, frontal view; *36*, dorsal view. *37*, gaster of *A. pallidipes*, ♀. *38–40*, *A. manii*, ♂: *38*, antenna; *39*, genitalia, ventral view; *40*, fore wing. Scale bars 100 μm.

*Material Examined*

*Holotype.* **Malaysia: Sarawak:** Kuching, Borneo. Lectotype designated by Bouček (1988), ♀ (BMNH).

*New material.* **Malaysia: Sarawak:** Santubang, 3–4.i.1978 (Bendell), 3♂ (CNC); West Coast Residency, Ranau, 5 km N. of Paring Hot Springs, 500 m, 8–11.x.1958 (Maa), 2♀ (BPBM); Sandakan (Baker), 1♂ (MCZ); Sandakan Bay, Sepilok For. Res., 1–10 m, 29.x.1957 (Gressitt), 1♂ (BPBM); Kampong Tapuh, 300–450 m, 10.vii.1958 (Maa), 1♂ (BPBM); **Selangor:** 25·6 km E. of Gombak, 300 m, University of Malaya Forest Study Centre, 15.vi.1990 (Heraty), forest trail, 3♂ (JMH); 20·8 km E. of Gombak, 300 m, 24.vi.1990 (Heraty), rainforest trail, 5♀, 1♂ (JMH; TAMU). **Vietnam:** Karyu Danar, 200 m, 13–28.ii.1961 (Spencer), 1♂ (BPBM).

*Comments and Diagnosis*

Bouček (1988) correctly assigned the male paratype of *Gollumiella longipetiolata* (at ZMUC) to this species. Two additional male paratypes of this species in Hedqvist's collection were not examined but probably also belong here. *Anorasema pallidipes* can be separated from *A. manii* by the following combination of characters: pedicel brown or brownish yellow, flagellum dark brown to black, scape dark brown; absence of setae on eyes and mesosomal dorsum; mesosomal dorsum with shallow rugose-areolate sculpture, notauli deeply impressed, mesoscutal lateral lobes strongly swollen; frenal groove broad dorsally and scutellum appearing double-humped in profile; coxae bare, femora with sparse adpressed setae, tibiae with dense adpressed short setae. The colour of the femora and tibiae range from completely yellow (as in lectotype) to dark brown in some specimens from Sarawak. The male antenna is 11-segmented with the clava formed of two incompletely fused flagellomeres (7 funicular segments). Specimens collected from peninsular Malaysia all have darkened legs and the male antenna is 11–12-segmented with the clava consisting of a single segment only slightly longer than the preceding flagellomere (7–8 funicular segments). Otherwise, the Malaysian population is identical to other specimens examined.

*Distribution*

Malayan (continental and Borneo) and Philippine subregions.

## Phylogenetic Relationships

*Anorasema* and *Gollumiella* are included in Eucharitinae because the prepectus is fused to the posterior margin of the pronotum and the mesothoracic spiracle is internally enclosed by a narrow band of sclerotised cuticle (Fig. 41: character state $1^0$) (see Heraty 1989). The prepectus in *Anorasema* and *Gollumiella* is fused to the pronotum on a different plane ($1^1$). Other Eucharitinae have the prepectus fused to the pronotum on the same plane ($1^2$), an anterior mesoscutal ridge internally ($2^1$), the scutoscutellar sulcus transverse and associated with an internal ridge or phragma ($3^1$), and the basal flagellomere (F1 or anellus) absent ($4^1$) (Heraty 1989, 1990). *Anorasema* and *Gollumiella* differ from other Eucharitinae by having the following character states that are considered plesiomorphic and shared with Oraseminae: small first phragma on the anterior margin of the mesoscutum ($2^0$); scutoscutellar sulcus in both genera diagonal, weakly associated with an internal ridge and broadly joining the transscutal articulation medially ($3^0$); and basal antennal flagellomere (F1) present ($4^0$).

A sister-group relationship between *Anorasema* and *Gollumiella* is supported by fusion of the prepectus and pronotum in different planes ($1^1$), and presence of a marginal row of hairs on the hypopygium ($5^1$). Neither character state is an absolute indicator of relationships. Fusion of the prepectus on a different plane may be transitional to the state found in other Eucharitinae (thus $1^0 = 1^1$, and $1^1$ would be plesiomorphic for Eucharitinae), and a similar band of 8–10 hypopygial hairs is also found in *Orasema theocles* (Walker) (thus homoplasious within Eucharitidae). *Gollumiella* and *Anorasema* are morphologically similar but have several major differences (i.e. occipital carina, swollen scape, wing shape and pilosity, postmarginal vein) which indicate that they probably do not share an immediate common ancestor within Eucharitinae. *Anorasema* shares character states with some species

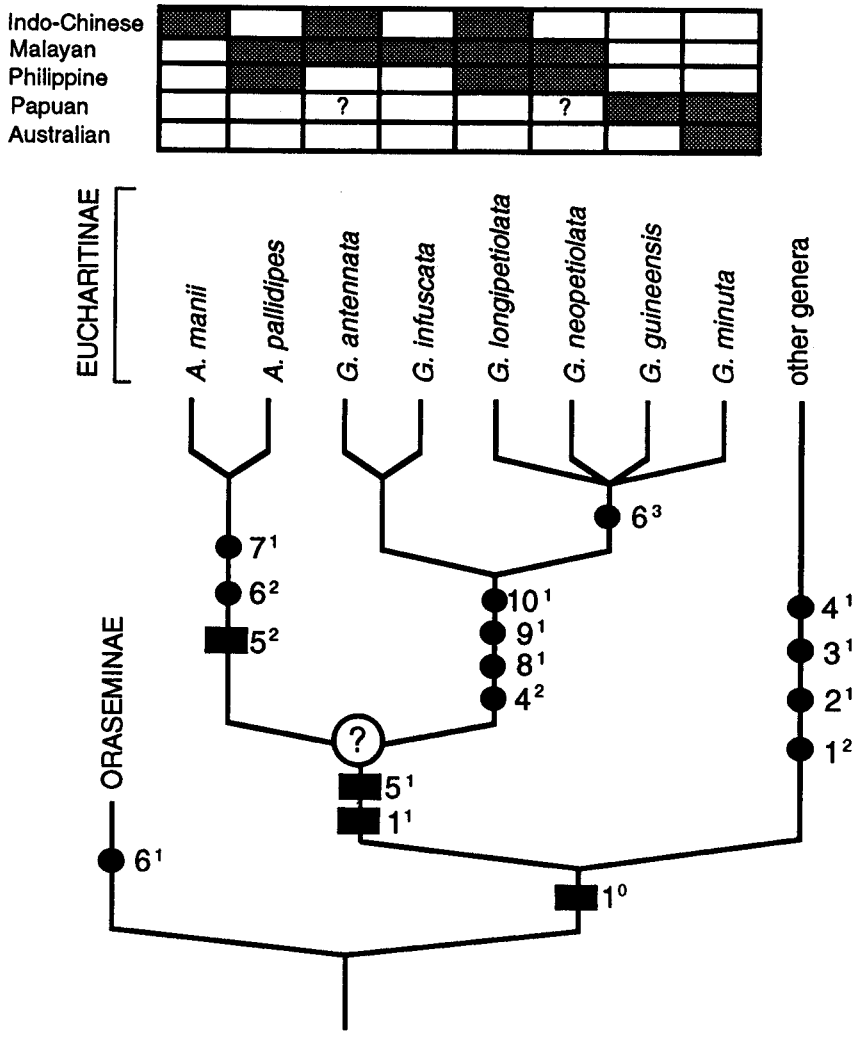



**Fig. 41.** Phylogenetic hypothesis and biogeographic summary for *Anorasema* and *Gollumiella*. Solid circles represent independently derived character states, squares indicate uncertain placement. Geographic subregions based on Gressitt (1956); shaded areas indicate presence in region, plus marks indicate disjunct single collections. Numbers refer to derived character states as follows (brackets refer to superscript values): 1, fusion of prepectus to pronotum (0 = fused, 1 = in different plane, 2 = same plane); 2, mesoscutal ridge (0 = absent); 3, scutoscutellar sulcus transverse with associated internal ridge (0 = diagonal); 4, anellus (0 = present, 1 = absent; 2 = elongate); 5, band of hypopygial hairs (0 = short or absent, 1 = 6–8, 2 = 16–18 hairs); 6, enlarged ovipositor (0 = acicular, 1 = curved with strong ridges, 2 = broad and cylindrical, 3 = broad with dorsal keel); 7, ventrally swollen scape (0 = cylindrical); 8, frenal carina (0 = groove); 9, secondary segmentation at base of funicular segments (0 = absent); 10, lateral projection over hind coxae (0 = absent). See text for discussion.

of *Orasema*, which may suggest a closer relationship with members of the Oraseminae than with members of Eucharitinae: 13-segmented antenna, anelliform F1, entirely pilose fore wing, elongate postmarginal vein, and weak constriction of the first gastral sternite. The polarity of these character states needs to be better assessed within Eucharitidae, but I regard them here as either homoplasious or plesiomorphic states and not important in assessing relationships. I do not consider the derivation of enlarged ovipositors found in Oraseminae ($6^1$) (see Heraty 1985, 1990; Bouček 1988), *Anorasema* ($6^2$) and some *Gollumiella*

($6^3$) to be homologous, although each may be used for inserting eggs into plant tissue as in Oraseminae.

Monophyly of *Anorasema* is supported by the swollen basal region of the scale ($7^1$), both mandibles with three teeth (*v.* 3/2), maxillary palpus 2-segmented (*v.* 3), labial palpus absent, and absence of multiporous plate sensilla on the male flagellomeres. Additional characters that are known only for one of the two species include presence of 16–18 hypopygial hairs ($5^2$) and enlarged cylindrical ovipositor ($6^2$). The larger number of hairs is considered to be derived from an ancestral state of 6–8 hairs ($5^1$), as found in *Gollumiella* and some *Orasema*. There are several diagnostic character states for *Anorasema* that are found in other genera of Eucharitidae, but these states occur in a unique combination in *Anorasema*.

Monophyly of *Gollumiella* is supported by the elongate first flagellomere (Figs 18–28; state $4^2$), distinct frenal carina (Fig. 3; state 8), secondary segmentation of the antennal segments ($9^1$), and lateral projection of the metepimeron over the base of the hind coxa ($10^1$). The elongate F1 (homologous to anellus in Chalcidoidea), frenal carina, and metepimeral projection are unique in Eucharitidae. The acicular ovipositor found in *G. antennata* and *G. infuscata* is plesiomorphic. Four species, *G. guineensis*, *G. longipetiolata*, *G. minuta* and *G. neopetiolata*, form a monophyletic group within *Gollumiella* based on having a broad ovipositor with a distinct median keel along the second valvula ($6^3$), which is unique in Eucharitidae. Other characters are not considered to be useful in delimiting species relationships any further.

*Gollumiella antennata* is the only species in the Eucharitinae known to have an intermediate host association with thrips. Such an association is also known for several species of *Orasema* (Wilson and Cooley 1972; Johnson *et al.* 1986). An association with an intermediate host in Oraseminae and Eucharitinae may indicate a primitive behavioural character for Eucharitidae and would be important in postulating an evolutionary history for the group. Adult characters alone are not enough to understand the relationships of these genera with Eucharitinae. Larvae and ant hosts are unknown for both of these taxa and would be useful in determining their relationships to other Eucharitidae.

## Acknowledgments

I thank Jim Woolley, Bob Wharton (both from Texas A&M University), Gary Gibson, John Huber (both from Biosystematics Research Institute, Ottawa) and Zdeněk Bouček (Natural History Museum, London) for their comments on earlier drafts of this manuscript. This work was supported in part by a Snodgrass Memorial Research Grant and a Natural Sciences and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowship to the author, a United States National Science Foundation Dissertation Improvement Grant (BSR 8914680) to the author and J. B. Woolley, and an NSERC grant to Stewart Peck at Carleton University.

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Manuscript received 14 August 1991; accepted 31 January 1992