INVESTIGATION ON THE ALPHA SYSTEMATICS OF PLATYGASTROIDEA (HYMENOPTERA) OF KERALA STATE

THESIS SUBMITTED TO THE UNIVERSITY OF CALICUT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ZOOLOGY

R. USHA KUMARI

DEPARTMENT OF ZOOLOGY
UNIVERSITY OF CALICUT
KERALA - 673635
INDIA

MAY 2002

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Date: 28/5/2002

CERTIFICATE

This is to certify that this thesis is an authentic record of the work carried out by Mrs **R. USHA KUMARI** from May 1999 to May 2002 under my guidance and supervision in partial fulfilment of the requirements of the Degree of Doctor of Philosophy in Zoology, under the Faculty of Science of the University of Calicut. No part of the thesis has been presented before for any other degree.

It is further certified that the candidate has passed the Ph.D. qualifying examination of the University of Calicut held in December, 2000.

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DECLARATION

I hereby declare that this thesis is an authentic record of the work carried out by me under the supervision of Professor T.C. Narendran, Department of Zoology, University of Calicut and no part of this has previously formed the basis for the award of any degree or diploma as stipulated in the statutes of Calicut University.

Date: 28.5.2002

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R. USHA KUMARI

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Dedicated

to my

Ammachi

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INTRODUCTION

Hymenoptera is the most diverse and species rich of the insect orders. It contains the more beneficial species than any other insect order. They are having direct economic importance in the biological control of agricultural and forest pests, the pollination of flowering plants and the production of commercial products such as honey and wax. The greatest diversity of parasitoids is found in the Hymenoptera. The number of parasitic species is unknown and speculative ranging from an estimate of 8,00,000 to as many as 25 per cent of all insects. Currently there is over 1,15,000 described species of Hymenoptera (Lasalle and Gauld, 1992).

Parasitic Hymenoptera are the most important groups of biological control agents. They are responsible for the majority of substantial economic and environmental benefit, which are produced through biological control programmes. They also play a major role in the balance of ecosystem through their ability to regulate population of phytophagous insects (Lasalle and Gauld, 1992). Greathead (1986) listed 393 species of parasitoids established in classical biological control programmes of which 344 species were parasitic hymenopterans.

In order to have a deep knowledge on biological diversity of parasitic Hymenoptera, it is necessary to undertake systematic study of the various families belonging to Hymenoptera Parasitica. No research work is meaningful without taxonomy, since all other studies concerning biology, ecology, conservation, genetics etc. rely upon the foundation of good systematics. Despite their importance their biology and taxonomy remain poorly known and their identification is difficult. Any advance knowledge of the taxonomy and biology of parasitic Hymenoptera is of potential practical value.

The most species rich group of Hymenoptera are parasitic hymenopterans, and are common and abundant in all terrestrial ecosystems. Repeated biological control success have proved that hymenopteran parasitoids can play a crucial role in pest population regulation and have an equally important role in the natural regulation of phytophagous insect. Debach and Rosen (1991) discussed many biological control successes involving parasitic Hymenoptera viz., purple scale, wooly whitefly and walnut aphid in California, oriental fruit fly in Hawaii, citrus black fly in Cuba, cereal leaf beetles in Fiji and spiny black fly in Japan.

The Order Hymenoptera is composed of two suborders Symphyta and Apocrita. The suborder Apocrita is further subdivided into Aculeata (primary bees, social wasps etc.) and Parasitica of which nearly all the taxa are parasitic. Most of them are microscopic and act as keystone parasitoids important for maintenance of diversity. Parasitica include 48 families under 10 superfamilies. Superfamily Platygastroidea is one among the ten that include the families Platygastridae and Scelionidae. The family Platygastridae contains about 1100 described species in the world.

Adult platygastrids occur in most habitats and predominantly parasitoids of egg or larvae of gall midges (Cecidomyidae). The platygastrids of gall forming cecidomyids parasitize the host egg but develop only after prepupal or pupal stage of the host. Some platygastrids are primary parasitoids in the eggs of some Coleoptera, Homoptera and young ones of Coccoidea and Aleyrodidae.

Masner and Huggert (1989) recognized two sub families of Platygastridae namely Sceliotrachelinae and Platygastrinae. About 20 genera occur in Sceliotrachelinae and 40 genera in Platygastrinae around the world.

The majority of Platygastridae are parasitic in larvae of Cecidomyidae. Species of *Amitus* parasitize Aleyrodidae, and those of *Allotropa* are probably the dominant parasitoids of *Pseudococcus* in Asia. Occasional species were recorded from Hymenoptera, Coleoptera and Lepidoptera.

The systematic studies on Indian Platygastridae are still in an infant stage. Vlug (1995) published a catalogue of the Platygastridae of the world in which he mentioned 1090 species under 79 genera. Out of this only 44 species representing 15 genera are reported from India.

Among those who contributed much to the taxonomy of Indian Platygastridae are Ashmead, Austin, Brues, Cameron, Mani and Sharma, Mukerjee and Rao. There is mention about the presence of platygastrids in the paddy fields by Beevi *et al.* (2000) and Ambika Devi (1998) at Thrissur and Mancompu respectively. But the Platygastridae of Kerala state has not been systematically studied so far.

The present study will help to explore the platygastrid fauna of Kerala and thus will provide the fundamental information on the systematics. The knowledge thus gained can be effectively utilized in faunal, host parasite relation, ecological and biological studies.

During the present study, specimens were collected from various localities of Kerala, coming under families Platygastridae and Scelionidae. Those localities include forests, grasslands, paddy fields, botanical gardens etc. Since it is not feasible to include all the subfamilies of Platygastridae and Scelionidae for the study, only eight genera under the two subfamilies of Platygastridae were selected for detailed systematic analysis.

Many species of this family are primary parasitoids of several insect pests of agricultural importance. Kobayashi and Kudagamage (1994) reported wide distribution of *Platygaster oryzae* in gall midge infested paddy fields in Sri Lanka, with 21 per cent parasitism by the parasitoid. A larval-pupal platygastrid parasitoid viz. *Amitus* species was found dominating and suppressing the population of sugarcane white fly (Charernsom *et al.*, 2000). The potentiality of the platygastrid parasitoids is not fully exploited in our country. Since this includes parasitoids of agricultural importance, the detailed studies and research can be effectively exploited in the biological control to reduce the population of insect pests especially the gall forming dipteran pests. Few species have been deployed in biological control. *Miscocyclops marchali* Kieffer was imported into New Zealand from Europe in 1925, and reportedly caused a significant reduction in density of the pear midge, *Perrisia pyri* Bouché (Clausen, 1940/1962)

Kerala being a small natural land and considering its rich and unique flora, a large number of species could be expected. The objective of the present study is to investigate the systematics of various species of Platygastridae of Kerala and to give keys to their identification.

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CHAPTER-I

REVIEW OF LITERATURE

The first description of a platygastrid was made by SCHRANK (1781) who described *Platygaster phragmitis* under the name *Cynips phragmitis*. Some 110 generic and 1100 species names have been used over the past 200 years. The catalogue on Platygastridae HALIDAY (1833) listed 1066 specific names of which 987 have been recognized as valid species and 123 generic names of which 82 are valid. In 1837 CURTIS published a list of 115 species of Platygastridae of Great Britain and Ireland. The world fauna known at that time was about 140 described species. The "Catalogues Hymenoptera Europe" (KIRCHNER, 1867) listed 159 species, slightly fewer than were actually known at that time. MARSHALL (1873) published a catalogue of British Hymenoptera in which only 111 species were listed.

The key figure in the history of the classification of Platygastrid wasps is William Harris Ashmead. He published his monograph of North American Proctotripidae in 1893. He interpreted Platygastrid wasps as a subfamily within the family Proctotrypidae and attempted the subdivision into two tribes, the Inostemmatini and Platygastrini. DALLA TORRE (1898) published his well-known catalogue of Hymenoptera of the world and listed 375 species of Platygastridae. In 1903 ASHMEAD arbitrarily elevated the tribes into subfamilies Inostemmatinae and Platygastrinae as parts of the family Platygastridae. Ashmead used the presence or absence of the submarginal vein in the forewing as the only criterion for his groups. All subsequent authors with additions or slight modification basically followed this concept.

BRUES (1908) added the subfamily Sceliotrachelinae but classified it in the Scelionidae. In 1919 a small report on a collection of Indian parasitic Hymenoptera was given by GAHAN. HILL reported a Platygastrid parasitoid of

Hessian fly *Platygaster vernalis* Meyers in 1923. In 1926 he described another parasitoid *Platygaster hiemalis* parasitizing Hessian fly. KIEFFER (1926) published his comprehensive work on the Scelionidae of the world and recognized 55 genera with a total of 560 species in the Platygasterinae. The Platygastridae were at that time treated as a subfamily of Scelionidae. He transferred *Sceliotrachelus* to the Platygastrinae. He did not study Brue's type and expressed the opinion that *Sceliotrachelus* was closely related to Chalcidoidea, based on the description and schematic drawing. Kieffer divided the single family Scelionidae into five subfamilies with Platygastrinae as one of them. The long post Kiefferian period is characterized by considerable stagnation in suprageneric classification.

HILL and EMERY (1937) studied the biology of another Platygastrid parasitoid of Hessian fly viz. *Platygaster herrickii.* A new genus *Platystasius* belonging to the subfamily Platygastrinae was erected by NIXON (1937). MANI (1939) made descriptions of new records of some known chalcidoid and other hymenopteran parasitoids of India. In 1941 MANI prepared a catalogue of Indian Insects. Four species of platygastrid parasitoids of gall midges from India were described by RAO (1950). They were *Platygaster salvadorae, Proleptacis fici, Proleptacis oryzae* and *Platygaster ramachandrai.*

MUSEBECK (1954) described three new mealy bug parasitoids of the Genus *Allotropa* viz. *A. citri, A. merrilli* and *A. scutellata.*

MASNER (1957) proposed the tribe Iphitrachelini within Inostematinae. He gave emphasis on the tetramerus tarsi, the shape of the foretibial spur and shape of the clypeus in *Iphitrachelus*. In 1959 (SZABO) recognized the family Platygastridae and divided it into four tribes, viz. Iphitrachelini, Inostematini, Amitini and Platygastrini. The new tribe Amitini was based on the absence of veins in the forewing and the structure of metasoma.

MASNER (1960) attempted a revision of the African species of the Genus *Leptacis* Foerster. MASNER (1964) examined the type of *Sceliotrachelus braunsi* Brues and confirmed its placement in the Platygastridae. In 1966 BAITAZAR prepared a catalogue of Phillipine Hymenoptera with a bibliography from 1758-1963. A new species of *Metanopedias* from Great Britain was reported by JACKSON (1966a) viz. *M. brittannius*. It is a junior synonym of *M. lasiopterae*. JACKSON in 1966b again reported a Nearctic species of *Iphitrachelus* Haliday, viz. *I. foutsi*. A key to the known species of this genus was also prepared.

A new species of *Trichacoides* Dodd from India namely *T. indicus* was reported in 1968 by JACKSON. MASNER and MUESEBECK (1968) published a list of the types of Proctotrupoidea in the United States National Museum. In 1969 JACKSON discussed new characters for the generic separation in the *Synopeas-Leptacis* complex.

KOZLOV (1970) introduced an entirely new concept and infrastructure of the Platygastrid wasps. He considered that Platygastridae was derived from the Diapridae because of the similarity of major hosts in these two families i.e. the Order Diptera. He tried to employ some new characters like the structure of the antennae, propodeum and metasoma. However he considered the presence and absence of submarginal vein in the forewing as a main criterion for the infrastructure of the Platygastridae. He recognized three subfamilies within in Platygastridae viz. Inostematinae, Sceliotrachelinae and Platygastrinae. The Inostematinae was further subdivided into seven tribes: Metacliseini, Inostemmatini, Platystasini, Aphanomerini, Pseudaphanomerini, Allotropini and Iphitrachelini. The subfamily Sceliotrachelinae is subdivided into two tribes: Fidiobini and Sceliotrachelini and subfamily Platygastrinae into two tribes: Platygastrini and Synopeadini.

MUESEBECK (1970) described and figured a new mealy bug parasite *Allotropa subclavata* from Japan. A new species of *Platygaster* Latreille reproducing by thelytokous parthenogenesis was described by DAY (1971). Two new species of *Platygaster* showing high rates of parasitism on balsam gall midge, *Dasineura balsamicola* (Diptera: Cecidomyidae) was described and illustrated by MACGOWN and OSGOOD (1971). The species described were *P. abicollis* and *P. mainensis*.

In the taxonomical studies on Platygastrinae by HUGGERT (1973) *Hypocampsis compressicornis* and *H. hyalinata* are redescribed and transferred to *Platygaster*. The new species, *P. lamellicornis* was described and illustrated and *P. longiventris* redescribed. *Parallelogaster* subgenus was erected for *P. lamellicornis* and *P. compressiventris*. *P. longiventris, P. pini* and *P. laticeps* are given the new names a*shmeadiana, foutsi* and *latiforms* respectively. *Misocyclops crevecoeuri* Maneval is a new synonym of *M. ruborum* Kieffer, which is transferred to *Platygaster*. He also designated lectotypes for *H. compressicornis, H. hyalinata* and *P. longiventris*.

FABRICIUS (1974) reported for the first time the Sceliotrachilinae represented by *Fidiobia rugosifrons* Crawford from Romania. In 1974a HUGGERT studied the taxonomy of the species belonging to *Urocyclops* Maneval. He concluded that the Genus *Urocylops* is a subgenus of *Platygaster* and *U. bettyae* Maneval, *U.roosevelti* Debauche and *U. humboldti* Fabricius and *Grelimann* are new synonyms of *Platygaster (U) depressiventris* Thomson. The previously unknown male of this species described and illustrated are *Aspilota kempel* and *Orthostigma lokei*. A revision of the European species of the Genus *Anopedias* Foerster was made in 1974b by HUGGERT.

MACGOWN and OSGOOD (1974) described two new species, viz. *Synopeas osgoodi* associated with *Dasineura balsamicola* (Diptera:

Cecidomyidae) and *Platygaster Kimballi* associated with *Cirsium* (Compositae). A new species of *Platygaster*, *P. taylori* parasitic on *Lasioptera nodula* (Diptera: Cecidomyidae) in black berry was described by MACGOWN (1974). A list of Platygastridae associated with black berry in USA is also included. In 1975 a description of Platygastridae from Sweden was published by HUGGERT.

MANI (1975) reported eight new species of Platygastridae from India viz., *Inostema berijama, Sacepalus indicus, Synopeas indopeninsularis, Synopeas indicus, Trichacis khajjiara, Isocybus indicus, Platygaster panchaganii* and *Platygaster satara.*

CROMWELL (1976) made additions and corrections in the British list of Proctotrupoidea and Ceaphronoidea. *Platygaster contorticonis* Ratzeburg and *Iphitrachelus gracilis* Masner (both Platygastridae) were added new to the British list.

In 1976 HUGGERT made descriptions and illustrations of three new species of Platygastridae from Zaire. *Iphitrachelus africanus, Leptacis mitratus, Holocoelia debaucheella*, and male of *L. aranea* were described and illustrated. A key to 4 known species of *Iphitrachelus* is presented. The genus *Miramblyaspis* Dodd is regarded as a new junior synonym of *Leptacis* Foerster and the type species *M. mirabilis* is transferred to *Leptacis* and redescribed. The Nearctic species of *Iphitrachelus* Walker, with a key to world species was published by MASNER (1976).

VLUG (1976) described a new species of *Synopeas, S. talhouki,* a parasite of *Odinadiplosis amygdali* (Dip: Cecidomyidae). Its biology and distribution are also included.

Allotropa kamburovi a new species of *Allotropa* Foerster parasitic on citrus mealy bug, *Planococcus citri* (Risso) was described and illustrated by ANNECKE and PRINSLOO (1977). The occurrence of *Anopedias lacustris* new for Canada was reported in 1977 by HUGGERT. It is the first species of the genus to be recorded outside of Europe. Intraspecific variability in *A. lacustris* was also described.

SZABO (1977) described four new *Trichacis* species: *T. hungrica, T. afurcata, T. pannonica* and *T. tatika* extracted from soil samples by the help of Moczarsky-Wrinkler apparatus in Hungary.

A taxonomic review of *Amitus* (Platygastridae) of the western hemisphere was made by MACGOWN and NEBEKER (1978).

Description of some new and records of known Platygastridae from India was published by MUKERJEE (1978). He reported fifteen species of Platygastridae. Thirteen species are described new. One known species is a new record for India and for the other known species additional distributional data are included.

ALEKSEYEV (1979) described a new species *Isolia longistriata* from middle Asia. A key to males of the genus is also given. Systematic studies on Proctotrupoid and Chalcidoid parasitoids of gall midges injurious to Pinus and Cryptomeria in Japan and Korea were conducted by YOSHIDA and HIRASHIMA (1979). Seven species of parasitic wasps on three species of Cecidomyidae (Dip.) are discussed. *Inostemma matsutama, Platygaster matsutama, P. sugitama, Synopeas zaitama* are the new species reported and *Isostasius seoulis* Ko is transferred to *Inostemma.*

Taxonomical studies on some genera and species of Platygastrinae of Proctotrupoidea were conducted by HUGGERT (1980). MASNER (1980) described six new species of *Acerotella* Masner. The generic diagnosis of *Acerotella* and key to Nearctic species are given. He also discussed the higher classification, species group and world distribution of *Acerotella* species. YAMAGISHI (1980) described and illustrated five species of *Platygaster* parasitic on willow gall midges in Japan. He also discussed its host parasitic relationship and life histories.

HUGGERT (1981) suggested the new name for *Holocoelia* Huggert 1976, as *Holocoeliella* since the former is preoccupied. A revision of the Nearctic species of *Metaclisis* Foerster was attempted by MASNER (1981). MUKERJEE (1981) described 40 new species of Proctotrupoidea from India. The following genera: *Fidiobia* Ashmead, *Platygastoides* Dodd and *Isostasius* Foerster of Platygastridae were reported for the first time from India.

MANI and SHARMA (1982) prepared a review of Proctotrupoidea from India. This review presents a critical, annotated and illustrated catalogue, which summarises all the available information on the taxonomy of Proctotrupoidea from India. Over 170 species, belonging to 69 genera, and a series of undescribed species of these genera are dealt with. Synoptic keys to families, subfamilies, tribes, genera and species with notes on diagnostic characters and distribution are included.

KOPONEN and HUGGERT (1982) gave an annotated list of the 33 Platygastridae species found in Finland. *Misocyclops ruborum* Kieffer is regarded as a new synonym of *Platygaster apicalis* Thomson and *Misocyclops pini* Kieffer was synonymised with *Platygaster compressicornis* (Thomson). *Prosactogaster leteocoxalis* Kozlov is transferred to *Platygaster* Latreille. The same authors (KOPONEN and HUGGERT) stated that Kozlov is the author of *Fidiobia hofferi*

and not Masner. The same authors reported sixteen species for the first time from Finland.

A revision of the Nearctic species of *Trichacis* Foerster was given by MASNER (1983). *T. alticola, T. bison, T. celticola, T. dracula, T. huberi, T. mandibulata, T. pyramidialis* and *T. striata* are the Nearctic species.

AUSTIN (1984) described five new species of Platygastridae associated with mango pests in India. They are *Synopeas procon, S. temporale, S. mangiferae* and *Inostemma oculare* which parasitize mango leaf gall midges *Procontarina* sp. (Cecidomyidae), while *Inostemma apsyllae* is associated with the Psyllid, *Apsylla cistellata* (Buckt). A key to separate these parasitoids, their biology and distribution are also presented.

JOSHI *et al.* (1984) observed a brown *Platygaster* sp. attacking midge on *Panicum* sp. at Cuttack, Orissa and described it to be different from the black *Platygaster oryze* Cameron commonly found in rice gall midge, *Orseolia oryzae.*

Survey of the types of Platygastridae described by Haliday and Walker from British Isles preserved at the British Museum (Natural History and the National Museum of Ireland) have been studied with regard to the types of pins, characteristics of mounting and labels. Lectotypes are designated for all species. VLUG (1985) reported that *Eurostemma* Szelenyi is a junior synonym of *Allotropa* Foerster.

MASNER and HUGGERT (1989) reassigned the taxa of subfamily Inostemmatinae to the subfamily Platygastrinae and Sceliotrachelinae. Forty-one genera are treated of which 15 are classified in the subfamily Platygastrinae and 25 are classified in the subfamily Sceliotrachelinae. These 41 genera are keyed, with separate keys to world genera, genera of America and North Mexico. The authors

provided generic diagnosis, taxonomic remarks, bibliography and list of species described since Kieffer (1926). AUSTIN (1990) attempted a revision of the old works of *Parabaeus* Kieffer, a highly modified parasitoid inhabiting litter.

VIGGIANI and EVANS (1992) described three species belonging to the Genus *Amitus* Alderman from whiteflies. *A. Bennett* and *A. aleuroglanduli* are parasitoids of *Bemisia tabaci* and *Aleuroglandulus malangae* respectively. *A. sculpturatus* is described from specimens reared from *Tetraleurodes mori* collected in Maryland, USA.

BUHL (1995) described two European species of *Platygaster* Latreille viz. *P. criceti* Rondani and *P. nottoni*. In 1995 themselves VLUG made a major contribution by publishing a catalogue of the Platygastridae of the world. The catalogue provides information of fauna, type localities, described sex, lectotype designations and institutions where types are deposited. All genera and species are supported by a reference list of the most important papers up to 1993. Host data is given as a separate list. VLUG (1995) mentioned *Fidiobia coorgensis* Mukerjee a synonym of *Leptacis coorgensis*. Five new species of *Inostemma* and a key to known Indian species are presented. Under the genus *Isostasius* the only species reported is *Isostasius poroicus* Mukerjee. Six new species of *Leptacis* and a key to the known species of *Leptacis* of India is presented. A new species viz. *Platygastoides indicus* is described. Two new *Synopeas* species and a key to the known *Synopeas* from India are also included.

VIGGIANI (1996) discovered the male of *Amitus fuscipennis* MacGown as a parasitoid of *Trialeurodes vaporariorum* (Westwood) at Nebeker.

Parasitoid communities of 8 selected gall midges (Cecidomyidae) on *Salix* sp. were analyzed by AMENDT (1997). He recorded 11 species of Platygastroidea dominated by 10 species of Platygastridae.

In 1997a BHUL described 35 new species of Platygastrinae. In the same year (1997b) he studied the species of Platygastrinae reared from *Xylodiplosis praecox* (Winnertz) (Diptera: Cecidomyidae). Females of the Platygastrines *Metanopedias lasiopterae* (Kieffer), *Leptacis nydia* (Walk.), *Synopeas jasius* (Walk.) and *Amblyaspis* have been reared from this cecidomyid.

Three species of *Inostemma* Haliday are reported as new to Denmark by DROMPH (1997). It consists of *I. foersteri* Kieffer, *I. hispo* Walker and *I. spinulosum* Kieffer. BUHL (1998a) described and illustrated two new species of Platygastrinae from Europe namely *Platygaster hera* and *Synopeas hansseni* male. Again in 1998b BUHL designated and redescribed 11 N.W European species of Platygastridae. Fourteen species are described as new to science viz. *Fidiobia polita, Leptacis coryphe, Platygaster aberrans, P. borealis, P. danielssoni, P. germanica, P. lyneborgi, P. soederlundi, P. striatidorsum, P. transversiceps, P. vulgaris, Synopeas acutispinus, S. autumnalis* and *S. frontalis*. The hitherto unknown females of *Ceratacis flavipes* Thomson and *Platygaster rugosiceps* Buhl were also described.

A new species of Platygastridae was reared out from an aleyrodid *Aleurotrachelus socialis* on cassava in Columbia, viz. *Amitus macgowni* by EVANS and CASTILLO, (1998). *Synopeas larides* (Walker) was reported from two Italian gall midges (Diptera, Cecidomyidae) by RIZZO and MASSA (1998).

BHUIYA *et al.* (1999) recorded four species of parasitic Hymenoptera from aleyrodid hosts on citrus in the Chittagong University Botanical Garden. Among them, *Allotropa* sp. and *Amitus* sp. were primary parasitoids and are new records from Bangladesh.

CHARERNSOM *et al.* (2000) surveyed the parasitoids of sugarcane whitefly in Thailand. The field effectiveness, biology of important species and

population dynamics of the whitefly and parasitoids were carried out. The study showed that among the other parasitoids *Amitus* sp. was important larval pupal parasitoids and was dominant in the later stages.

BUHL (2001) described 20 species of Platygastridae viz. *Amblyaspis caramba* (from Honduras), *A. ecuadoriensis* (from Ecuador), *A. glistrupi* (from Honduras), *A. thoracica* (from Malaysia), *A. whitmani* (from South Africa), *Fidiobia danielssoni* (from South Africa), *Inostemma productum* (from Malaysia), *Piestopleura nigra* (from Honduras), *Platygaster dentata* (from Honduras), *P. macgowni* (from USA), *Synopeas bifurcatus* (from Malaysia), *S. royi* (from S. Africa), *S. solidus* (from Malaysia), *Trichacis denudata* (from S. Africa) and *T. laticornis* (from Honduras).

INVESTIGATION ON THE ALPHA SYSTEMATICS OF PLATYGASTROIDEA (HYMENOPTERA) OF KERALA STATE

THESIS SUBMITTED TO THE UNIVERSITY OF CALICUT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ZOOLOGY

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CHAPTER-II

MATERIALS AND METHODS

A. SOURCE OF MATERIALS STUDIED

The materials of this study were procured from different parts of Kerala by conducting survey during the period from November 1998 to December 2001. The collections were made from Wyanad (Muthanga, Sultanbettery), Kasaragode, Kannur, Calicut, Malappuram (Ponnani), Thrissur (Vellanikkara, Kolazhy, Peechi, Mannuthy, Nettissery), Palghat (Pattambi, Nelliampathy), Ernakulam (Muvattupuzha), Kottayam (Kanakkary, Chirakkadavu), Pathanamthitta (Thatta, Arattupuzha, Adoor, Kulanada), Alleppey (Mancompu, Mavelikkara, Kollakadavu), Quilon (Quilon town, Kundara, Kottarakkara), and Thiruvananthapuram (Vellayani, Vettinadu, Vempayam).

Materials were also received from the collections of my research guide Prof. T.C. Narendran and from my friends.

Study area

Kerala the land of natural resources extends north south between Lakshadweep Sea and the Western Ghats. It is located between $8^0 18'$ latitude and $74^0 52'$ and $77^0 22'$ E longitude. The climate of Kerala is unusually equable with an annual temperature range between a maximum of 35.9^0 C and a minimum of 23.8^0C.The mean relative humidity ranges from 60-90 per cent.

Kerala may be divided into three geographical regions: (1) Highlands (2) Middlelands and (3) Lowlands. The Highlands slope down from the Western Ghats which rise to an average height of 900m with a number of peaks well over 1800m in height. This is the area of major plantations like tea, coffee, rubber, cardamom and other spices. The Middle lands, lying between the mountains and lowlands, are made up of undulating hills and valleys. This is an area of intensive

cultivation. The Lowlands or the coastal area, is made up of the river deltas, backwaters and shore of the Arabian Sea, is essentially the land of coconuts and paddy.

B. COLLECTION

1. Materials required for collection

Insect net for collection of insects, ethyl acetate for killing insects, small vials with 70 per cent alcohol to store dead insects, aspirators, malaise trap and yellow pan trap.

2. Collection techniques

a) By sweeping b) By using traps and c) By rearing

a) By sweeping

Sweeping is found to be the most efficient method of collecting the platygastrids, since a relatively good diversity of species can be collected within a short time.

The type of net used for sweeping is of a particular design. The net used in the present investigation is a modified model of the type designed by Noyes (1982). The sweep net essentially consists of a net bag attached on a triangular frame, which in turn is connected to a cylindrical handle (Fig.2). The triangular frame of the net is made up of 2 mm aluminium flat of sides measuring 480 x 460 x 480 mm. The triangular shape increases the surface area of net in contact with the ground while sweeping. The net handle is made up of 2 mm thick aluminium tube of outside diameter 15 mm and 1060 mm long. The long handle allows the net to be used as far away from the body as possible, making sweeping underneath low, overhanging bushes, and extends the area of each individual sweep. The net bag is 600 mm long and is made up of a thin white cotton cloth, which allows easy passage of air and prevents the escape of minute insects. The top of the bag that fits

around the frame is made up of canvas. The bag is attached to the frame by strong wire threaded alternately through the bag and the holes drilled at intervals through the frame.

For sweeping it is important to choose an area where the vegetation is as diverse as possible. A grassy land with a good variety of flowering plants surrounded by several kinds of bushes and trees is found to be an excellent location for collection.

The sweeping was done as described by Noyes (1982). The specimens were prevented from escaping, by lapping the bag quickly over the rim. The platygastrids caught were immediately sucked into an aspirator.

Aspirator (Fig.3)

It is a simple suction apparatus used for collecting small insects. It consists of a glass or plastic vial fitted with a two-holed cork holding two glass tubes. A rubber tube is attached to one end of the tube for sucking through the mouth. The other end of this tube remained in the vial is covered with a piece of fine muslin cloth to prevent insects from entering the tube. The second glass tube is opened at both ends. By suction, the vacuum created inside the vial draws the desired insect into it through the entry tube.

The specimens thus collected were killed by placing a piece of cotton soaked with few drops of ethyl acetate in the entry tube. The dead insects were then transferred to 70 per cent alcohol with the help of a fine brush.

b) By using traps

Malaise trap

This trap was originally designed by Dr.R.Malaise and later modified by Townes (1972). It is used to collect large numbers of flying insects. Most of the

insects collected by this method are Hymenoptera-Parasitica and Diptera. It consists of a tent made up of fine mesh terelene gauze with a specially adapted collecting bottle at the top. The trap is about 1830 mm wide, 1067 mm high at one end and 1980 mm at the other end. The insects when fly into the sides of the trap by chance, crawl upwards to the roof and enter the collection tube containing 70-90 per cent alcohol. There are several variations of the original Malaise Trap and the latest model prepared by Messers Harris House Net's England was used in the present work.

Yellow pan or Moericke trap

This trap consists of a shallow tray of 30 mm square and about 600-750 mm deep, which is, painted yellow inside and black outside. The tray was filled with water to which few drops of detergent were added to break surface tension. It was then set in a grassy land. The trapped insects were washed with fresh water and then transferred to 70 per cent alcohol.

c) By rearing

The galls of cecidomyids, immature stages such as egg mass, larvae and pupae of other suspected hosts were collected and placed in plastic containers. The emerged out parasitoids were collected and stored in 70 per cent alcohol.

C. PRESERVATION

a) Unmounted material

The unmounted specimens were preserved in 70 per cent alcohol in small vials and stored in refrigerator.

b) Relaxing

For relaxing, specimens were kept in an atmosphere of acetic acid for 6-8 hours. This method is suitable for relaxing specimens that had been killed

using ethyl acetate or other killing agents. It helped to prevent breakage of specimens when they were being card mounted. A clear plastic box with a tight fitting lid was taken and covered the bottom with a thick layer of cotton wool. A few drops of glacial acetic acid were added and a layer of cotton placed over it. Specimens to be relaxed were then placed on a piece of tissue paper in a glass dish and were kept in the box and were then closed.

c) Mounting

Card mounting

For mounting the specimen the procedure adopted by Boucek and Noyes (Noyes, 1982) was followed. The specimen was mounted on a rectangular card of size 14 mm in length and 5 mm in width. The specimen was mounted on the card, tilted slightly on its side at about 45° to the plane of the card in such a way that the face and mandibles are clearly visible.

For mounting, the specimen was placed on filter paper (absorbent piece of card) with few drops of alcohol. The wings, legs, and antennae were then correctly positioned by using a wet brush. Using a fine pointed pin a tiny drop of glue (approximately 2/3rd the volume of mesosoma of the specimen) was put on the card. Then a fine brush was moistened with a little alcohol and the specimen was picked up by touching the brush at the mesopleural region. It was then positioned with the midpoint of the mesosoma on the glue with the body lying lengthwise. The specimen was pressed gently and firmly with the brush for good adhesion.

The specimens thus mounted were held on entomological pins (Asta Insect Pins No.3, 38 mm x 0.53 mm made by Newy Goodman and Co., England), labelled and kept in insect boxes for detailed systematic study. Naphthalene balls were placed in the boxes to protect it from insect attack and thymol crystals to protect from fungus.

Mounting on microslides

For detailed studies of antennae, legs and wings slides were prepared. The required parts were first removed from the specimen. Heavily sclerotised parts were soaked in 10 per cent KOH solution for 24-48 hours for clearing. When the parts are sufficiently cleared, it was washed with glacial acetic acid followed by distilled water and then dehydrated through alcohol grades. The processed materials were then mounted in DPX on glass slides.

D. LABELLING AND REGISTERING

Temporary labels were written in the field at the time of collecting specimens. The mounted specimens were permanently labelled, indicating the name of the country, state, and name of the collector and date of collection. Registering of specimens was done after they have been identified up to generic level. The entries made in the Register include (1) serial number (2) collection number (3) scientific name (4) name of locality (5) date of collection (6) name of the host (7) name of collector and (8) remarks.

E. IDENTIFICATION OF THE MATERIAL

The collected specimens were identified by running through the available keys. The identity was confirmed after comparing with the original description and illustration in the literature. The specimens, which could not be assigned to the already described taxa, were described new.

For sorting and mounting the stereoscopic Binocular microscope Olympus was used. For studying the morphological characters of the mounted specimens the stereoscopic Binocular microscope Nikon SMZ-10A was used. The specimens were measured using micrometer under Nikon SMZ-10A. Illustrations of the specimens were made by Camera Lucida attachment of wild M_3Z stereoscopic Binocular microscope. The figures thus obtained were enlarged using KB enlarger of the model B_2M. The scale of magnifications are indicated near the illustrations.

SYSTEMATIC STATUS AND DIAGNOSIS OF FAMILY PLATYGASTRIDAE

Foerster (1856) erected the Family Platygastridae. Formerly Platygastridae was treated as a family under the superfamily Proctotrupoidea. Masner (1993) recognized the superfamily Platygastroidea and included the families Scelionidae and Platygastridae. An opinion about the special position of these two families was expressed some time ago (Masner, 1956).

Muesebeck in Krombein *et al.* (1979) recognized Platygastridae as a subfamily within three subfamilies viz. Inostemmatinae, Sceliotrachelinae and Platygastrinae.

Masner and Huggert (1989) reassigned the genera of subfamily Inostemmatinae to the subfamily Platygastrinae or Sceliotrachelinae.

Thus the systematic status of the family Platygastridae is as follows:

Order	- Hymenoptera
Suborder	- Apocrita (Parasitica)
Superfamily	- Platygastroidea
Family	- Platygastridae
Subfamilies	- Sceliotrachelinae and Platygastrinae

Diagnostic characters: Body predominantly 1-2 mm long, rarely up to 4 mm, slender; usually black, rarely yellowish, with no metallic colour. Head transverse; eyes large, generally naked; ocelli usually in a triangle; mandibles generally long, bidentate at tip; palpi slender, maxillary palpi with two segments, labial palpi one or two segmented; antennae inserted close to clypeus, strongly elbowed, usually with 8, and rarely with less than 5-7 flagellomeres; male flagellomere two, rarely one modified; mesosoma long, mostly narrower than

head; notauli present or absent; scutellum usually semicircular, but sometimes with an apical spine, or conical in shape. Forewing usually veinless, if submarginal vein developed then only very rarely reaching anterior margin of wing; stigmal and postmarginal veins absent; hind wing with a short stub of marginal vein; legs slender, tarsi five segmented; propodeum with 1-2 dentate lamellar projection; metasoma dorsoventrally flattened with petiole usually transverse, rarely fused with second segment, acute laterally; six tergites in female and seven in males.

Comments: Family Platygastridae contains about 1100 described species around the world. In the oriental region 15 genera and 54 species are reported, out of this 39 species are from India. Members of Platygastridae are minute internal parasitoids mainly attacking eggs and larvae of gall midges (Cecidomyidae: Diptera). Some are primary solitary parasitoids of Coleoptera and Homoptera.

KEY TO THE SUBFAMILIES OF PLATYGASTRIDAE

1. Forewing with submarginal vein tubular, long, distinct and knobbed 2
- Forewing with submarginal vein not tubular, short, not distinct and without knob or sometimes absent 3
2. Antenna with three clavomeres, abrupt or clavomeres completely or partly fused into a single solid clavomere, male antenna subclavate . . . . . Sceliotrachelinae.
3. Antenna with 4 or 5 clavomeres, with clavomeres clearly separated, male flagellum thread like . . . . . Platygastrinae.

MORPHOLOGY AND MEASUREMENTS

(Figs.4-9)

Morphological terms and abbreviations followed here are those used by Masner and Huggert (1989) with slight modifications.

Acetabular carina (ac) - transverse carina on anteroventral part of mesepisternum (behind forecoxa)

Ad median lines (al) - two abbreviated parallel lines in anteromedian part of mesoscutum (msc), often reduced to mere pits.

Anterior ocellus (ao) - middle ocellus in ocellar triangle.

Anterior pits on T_2 (ap T_2) - paired, oval or circular depressions situated anteriolaterally on T_2, often filled with dense pilosity.

Axilla (ax) - subtriangular or very narrow region of mesonotum (msn) situated anterolaterally of scutellar disc (sd), sometimes as parts of scutellaxillar pits.

Clava (cv) - incrassate distal antennal segments (clavomeres) in female antenna bearing 1-2 sensilla each; clava termed abrupt if most proximal clavomere is distinctly larger than preceding antennal segment; clava termed segmented if clavomeres clearly separated by gaps; clava termed subcompact if clavomeres separated only by fine sutures but no gaps; clava termed compact if no sutures visible between original clavomeres, synonym-club.

Clypeus (cl) - region of head between toruli (tr) and labrum (concealed in Platygastridae); in Platygastridae clypeus more or less divided into 2 parts viz. clypeus proper (cl) and anteclypeus (acl).

Epicnemium (ec) - narrow sclerite, usually strongly reduced vertically, situated between posteriolateral margin of pronotum (pn) and anterior margin of mesopleuron (mpl).

Epomium (ep) - anterovertical keel on side of pronotum (pn)

Foamy structures - whitish or yellowish structures usually on propodeum (pr), rarely on T_1, S_1 or S_2.

Fore spur (fs) - apical spur on fore tibia; spur termed bifid if with 2 prongs, trifid if with 3 prongs, combed if with multiple prongs.

Frenal hooks (fh) - hooks on anterior margin of hind wing for coupling with frenal gutter (fg) of forewing.

Frons (fr) - region of head between inner orbits of eyes (io), lower margin of toruli (tr) and anterior ocellus (ao)

Funicular segments (F_1-F_8)- all antennal segments excluding scape (se) and pedicel (p).

Hyperoccipital carina (hc) - transverse carina on top of head behind posterior ocelli (po), sometimes merging laterally with outer orbit of eye without joining occipital carina (oc)

Interantennal process (ip) - sharp projection on lower most part of frons (fr) between toruli (tr) and clypeus (cl), rarely overlapping latter.

Lamella (la) - transparent, sharp edge on apex of scape (se) partly housing the base of pedicel (p) from both sides.

Laterotergite (lt) - flexed lateral part of tergite (lt_1, lt_2, lt_3 . . . . .)

Lower orbit of eye (lo) - lowermost arc of eye margin.

Malar sclcus (ms) - furrow on cheek (ch) between lower orbit of eye (lo) and mandibular base (mb); synonyms-genal sulcus, subocular suture.

Marginal cilia (mc) - fringe of hairs around periphery of fore wing and hind wing.

Median keel(s) of propodeum (mk) - usually 2, rarely 3 longitudinal keels in middle part of propodeum (pr), or the 2 keels strongly approximated to form a single keel; in some Platygastridae keels may be covered with foamy structures.

Mesonotum (msn) - dorsal sclerite of mesothorax comprising mesoscutum (msc) and scutellum (sc).

Mesopleural depression (md) - declivity on mesopleuron (mpl) above sternaulus (st), often reduced to sulcus or pits.

Mesoscutum (msc) - anterior region of mesonotum (msn) between pronotum (pn) and scutellum (sc); often divided into middle and lateral lobes by notauli (nt).

Mesosoma - thorax and propodeum (pr) combined.

Metanotum (mtn) - dorsal sclerite of metathorax.

Metapleuron (mp2) - lateral region of metathorax.

Metasoma - abdomen posterior to propodeum (pr).

Notauli (nt) - paramedial longitudinal furrows on mesoscutum (msc); often incorrectly termed parapsidial furrows; notauli termed percurrent if complete between pronotum (pn) and transcutal suture (ts), notauli abbreviate if not complete.

Occipital carina (oc) - transverse ridge on posterior part of head dividing vertex (vx) from occiput (ot)

Occiput (ot) - region of head posterior to occipital carina

Ocellar ocular line (OOL) - shortest distance on vertex (vx) between outer margin of posterior ocellus (po) between inner margins of posterior ocelli (po) and inner orbit of eye (io)

Parapsidial lines (pl) - posterior admedian lines or ridges on lateral lobes of mesoscutum (msc)

Pedicel (p) - second antennal segment

Posterior ocellus (po) - paired outer ocelli of the ocellar triangle; synonym-lateral ocelli.

Posterior ocellar line (POL) - shortest distance on vertex (vx) between inner margins of posterior ocelli (po)

Pronotum (pn) - dorsal sclerite of prothorax, sides reaching to tegula (tg) and forecoxa (cxl)

Propodeum (pr) - apparent segment of mesosoma posterior to metanotum (mtn); originally first abdominal tergite fused with thorax.

Radicle (ra) - connective joint between (A1) and torulus (tr).

Scape (se) - first antennal segment

Scutellar suture (scs) - suture between anterolateral part of scutellar disc (sd) and axilla (ax).

Scutellaxillar pits - more or less well defined anteriolateral pits on scutellum (sc) composed of axilla (ax); scutellar suture (scs), and anterior edge of scutellar disc (sd).

Scutellar rim (sr) - differentiated posterior margin of scutellum, often distinctly foveolate or crenulate.

Scutellum (ds) - median, usually specialized part of metanotum (mtn); synonym-metascutellum.

Submarginal vein (sm) - first apparent tubular vein in forewing of some Platygastridae, also homologous to rudiment of sub marginal vein in hind wing.

Tarsomere - any tarsal segment of all 3 pairs of legs.

Tegula (tg) – sclerite covering base of forewing.

Temple (te) - region of head posterior to eye in dorsal view measured longitudinally.

Tergite (T_1. T_6.) - dorsal sclerite of metasoma.

Toruli (tro) - paired circular openings above clypeus (cl) housing proximal ends of radicle (ra), synonym-antennal sockets.

Transcutal suture (ts) - transverse furrow dividing mesoscutum (msc) from axilla (ax) and scutellar disc (sd).

Vertex (vx) - dorsal region of head between anterior ocellus (ao) and occipital carina (oc)

GENERAL ABBREVIATIONS

OOL- Ocellar Ocular Line

POL- Posterior Ocellar Line

sm- submarginal vein

DZCU- Department of Zoology Calicut University

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CHAPTER-III

OBSERVATIONS AND RESULTS

During the present study specimens belonging to the superfamily Platygastroidea were collected from different parts of Kerala. Since it will be beyond the scope of the present thesis programme to include the families Scelionidae and Platygastridae, only Platygastridae was selected for the investigation. Under this family 38 species and 8 genera were identified. Among this, 34 species are new to the science. Out of the 38 species reported, 37species are new to Kerala. All the new species were described in detail. In case of the known species with inadequate description, redescription are provided.

A dichotomous key to the Indian genera of Platygastridae and key to the species under each genus are presented. In addition a checklist of the genera and species of Platygastridae of India is also provided.

DIAGNOSIS OF SUBFAMILY PLATIGASTRINAE AND SCELIOTRACHELINAE

SUBFAMILY PLATYGASTRINAE

Diagnostic characters: Mostly slender to very elongate species. In females the antennal club is cylindrical and has four or five clavomeres, with the clavomeres clearly separated; in males, the flagellum is usually thread like. The forewing is with a short submarginal vein or is absent. The laterotergites are usually narrow and tightly appressed against the sternites, making the metasoma more compact.

Comments: Platygastrinae members are closely associated with gall midges (Cecidomyidae: Diptera). The female parasitize the host egg but develop only in the prepual or pupal stage. About 40 genera occur around the world, with

temperate zones as speciose as tropics and their dominance in Chile and New Zealand is remarkable.

SUBFAMILY SCELIOTRACHELINE

Diagnostic characters: Mostly plump species. In females antennal club usually abrupt with three clavomeres, or the clovomere partly or completely fused into a single solid clavomere; in males the antenna is often subclavate. The forewing has a tubular submarginal vein knobbed apically. Laterotergites are relatively wide and overlap the sterna loosely.

Comments: Most members complete their entire development in one stage of the host. They are found parasitising eggs of various insects such as Curculionidae and Cerambycidae (Coleoptera) and Flattidae, Pseudococcidae and Aleyrodidae (Homoptera). About 20 genera occur around the world but the southern hemisphere especially Chile, Australia and Southern Africa seems to be the centre of diversity.

KEY TO THE INDIAN GENERA OF PLATIGASTRIDAE

1. Forewing with distinct tubular submarginal vein and distally forming knob (Fig.3) 2

- Forewing without distinct vein; often with only trace of sm and distally without knob or sm absent 5

2. Hump or horn of various length on petiole (Fig.160); horn often long and curved leaning on mesosoma, reaching or surpassing vertex of head in females (in males horn absent) ..... ***INOSTEMA*** Haliday

- Hump or horn absent 3

3. Antenna 10 segmented; forewing rather short ..... ***ISOSTASIUS*** Foerster

- Antenna 9 segmented, forewing not short. 4

4. Notauli complete; scutellum strongly flattened and nearly rectangular; scape with remarkably expanded lamella (Fig.161); forewing without marginal cilia . . . . ***PLUTOMERUS*** Masner and Huggert

- Notauli absent; scutellum slightly convex and semicircular; lamella short; forewing with marginal cilia long . . . . ***ALLOTROPA*** Foerster

5. Antenna 8 or 9 segmented 6

- Antenna 10 segmented 7

6. Antenna 8 segmented with compact ovoid clava, with two faint suture on the clava (male antenna thread like); epicnemium well developed . . . . ***AMITUS*** Haldeman

- Antenna 9 segmented, three segmented clava with separate clavomeres; epicnemium not developed . . . . ***FIDIOBIA*** Ashmead

7. Scutellum with sharp sublate spine (Figs. 88, 152).. 8

- Scutellum without sublate spine 9

8. Metasomal petiole and base of second tergite hairy that do not form tuft; vertex with transverse carina and angled; second metasomal stenite never sac like . . . . ***LEPTACIS*** Foerster

- Metasomal petiole and base of second tergite with tuft of white hairs; vertex without transverse carina and not angular; second metasomal sternite generally sac like (Figs 151, 155). . . . . ***SYNOPEAS*** Foerster

9. Antennal club four segmented 10

- Antennal club five segmented 13

10. Scutellum triangular 11

- Scutellum not triangular 12

11. Scutellum with tuft of hairs at the tip and convex . . . . ***TRICHASIS*** Foerster

- Scutellum without tuft of hairs at the tip and strongly arched . . . . ***SACESPALUS*** Kieffer

12. Notauli present or absent; scutellum arched or sometimes flat . . . . . ***PLATYGASTER*** Latreille

- Notauli absent; scutellum always flat, rounded and not projecting over metanotum . . . . . ***ANOPEDIAS*** Foerster

13. Scutellum conical with apical half bearing long hairs that form a spine like or beard appearance; notauli absent. . . . . ***AMBLYASPIS*** Foerster

- Scutellum rounded and without beard like hairs; notauli complete . . . . ***ANECTADIUS*** Kieffer

14. Antennal club six segmented; scape without lamella, scutellum with two grooves at the sides behind . . . . . ***ISOCYBUS*** Foerster

Genus *AMBLYASPIS* Foerster

Amblyaspis Foerster, 1856a. *Hymenopterologische Studien. Heft II. Chalcidiae und Proctotrupii*, Aachen. 152 pp. Type species: *Platygaster tritici* Walker, 1835

Diagnostic characters: Scutellum conical, apical 0.50 with long dense hairs that form spine like structure; propodeum with tuft of hairs on the lateral sides arranged in such a way as to form a triangular appearance and two dorsomedially placed carina; metasomal petiole with sparse scattered hairs; ninth and tenth antennal segments of females often almost fused, separated only by suture.

Distribution: Palaearctic, Neotropical, Australian

Biology: Unknown

Remarks: 40 species reported over the world; only one species reported from India.

Amblyaspis ashokai sp. nov.

(Figs.10-13)

Female: Length 1.01 mm; dark brown to black; antenna with club forming segments dark brown and others yellowish brown; eyes white with a brownish tint; ocelli glassy with black tint; mandible brown; tegula brown; wings subhyaline with pilosity brown; legs brown with last tarsal segment dark brown; body pubescence white.

Head: Frons and vertex finely reticulate without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.12) length to width 41:58; head width in dorsal view about 3.38x its medium length; POL about 2.12x OOL; scrobe indistinct; inter antennal projection distinct; malar groove absent; posterior margin of gena ecarinate; hyperocciptal carina distinct; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 5x malar space. Antenna (Fig.11) 10 segmented; relative length of antenna: body length 76: 100. Relative length: width of antennal segments: scape – 64:14; pedicel – 12: 7; F_1 - 7: 6; F_2 - 10: 7; F_3 – 7: 6; F_4 – 12: 9; F_5 - 10: 10; F_6 - 12: 11; F_7 - 12:11; F_8 – 17: 9.

Mesosoma: Finely reticulate, humped; notauli absent; mesoscutum as long as wide; scutellum broadly conical; finely sculptured with beard like hairs converging to a point and without spine; scutellum width about 1.5x its maximum length, lateral margin hairy; propodeum with tuft of hairs on lateral sides arranged in such a way as to form a point and two dorsomedially placed carina; propleuron partially reticulate; meso and metapleuroa smooth; metapleuron hairy; Forewing (Fig.10) length 2.3x its maximum width, sm short, straight and not touching wing margin and without a distal knob; marginal fringe short; wing lamina densely hairy; hind coxa length 1.6x its maximum width; hind femur 2.54x length of trochanter, about 3.11x its own maximum width and shorter than hind tibia; hind

tibial length 2.92x length of metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, brown, hairy on its ventral and lateral sides; metasoma longer than mesosoma but shorter than combined length of head and mesosoma; metasomal length 2.44x its maximum width; second metasomal tergite smooth and shiny, posterior tergites finely sculptured; posterior ventral end of metasoma slightly concave.

Male: unknown.

Host: unknown.

Etymology: The species is named after Ashoka the king of ancient India.

Materials Examined: Holotype: Female, INDIA: Kerala, Chalikkara, 17-i-1995, Coll.Rajmohana (DZCU).

Discussion: This species resembles *Amblyaspis dalhousianus* Mukerjee in having five segmented antennal club and flat scutellum. However it differs from *A. dalhousianus* in having: notauli absent (notauli present in *A. dalhousianus*); scutellum broadly conical with beard like hairs converging to a point (in *A. dalhousianus* scutellum semicircular).

Genus *AMITUS* Haldeman

Amitus Haldeman, 1850. *Amer. Jour. Sci.* **9**:109. Type species: *Amitus aleurodinis* Haldeman, by monotypy.

Zacrita Foerster, 1878. *Verh. nat. Ver. pr. Rheinl. Westf.* 42-47. Type species: *Zacrita longicornis* Foerster, by original designation. Synonym by Kieffer (1929).

Elaptus Forbes, I884. In *Catalogue of the Platygastridae.*15pp

Alaptus Cresson, 1887. *Trans. American Ent. Soc.* Suppl.vol.,1-314

Passalida Brethes, 1914. *Nunquam otiosus* 2p. Type species: *Passalida spinifera* Brethes, by original designation. Synonym by De Santis (1941)

Diagnostic characters: Short stocky, head subellipsoidal; vertex rounded; occipital carina and occiput not developed; head in lateral view somewhat opistognathous; antennal formula 8-10; female antenna with abrupt, compact, spindle shaped to ovoid clava resulting from fusion of F_8 to F_{10}; antenna with specialized paddle shaped area on F_4; epicnemium well developed; propodeum partly covered with foamy structures.

Mesosoma short, broad, clearly wider than high; pronotal shoulders clearly visible in dorsal view, in some species almost angularly protruding; mesoscutum considerably flattened; notauli usually percurrent, non crenulate, usually distinctly dilated posteriorly and admedian lines very weak; scutellum convex to flattened, broadly semicircular to subrectangular; axillae rather distinct; forewing long with short rudiment of submarginal vein; marginal cilia in forewing very long; tibial formula 1-1-1, fore spur bifid.

Metasoma short, subsessile, strongly depressed dorsoventrally; in female with six and in male with eight visible tergites; T_1 in both sexes strongly trapezoidal, transverse; usually longitudinally costate; T_2 in both sexes with two small, shallow pits anteromedially, usually with longitudinal fan of striae anterolaterally starting from pits.

Distribution: Nearctic, Neotropical, Oriental, Palaearctic,

Biology: Parasites of whiteflies

Remarks: 125 species known, seven species reported from India.

Amitus keralensis sp. nov.

(Figs.14-17)

Male: 1.26 mm; black; antenna brown except scape which is yellowish brown; pedicel short; eyes silvery white to grey; ocelli white grassy; mandible dark brown; tegula black; wing hyaline with pilosity brown; all legs brown except last tarsal segment which is more darker; body pubescence white.

Head: Finely reticulate; without pubescence; eyes bare; antennal sockets close to elypeal border. Head viewed in front (Fig.16) length: width 37: 60; head width in dorsal view about 1.7x its median length; POL about 4x OOL; malar groove absent; scrobe and interantennal projection not distinct; hyperoccipital carina only slightly distinct; more rounded appearance for vertex; occipital carina distinct; occiput narrow; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.3x malar space. Antenna (Fig.15) 10 segmented; relative length of antenna: body length 80.76: 100. Relative length: width of antennal segments: scape - 32: 8; pedicel - 8: 5; F_1- 2: 4, F_2 - 15: 8; F_3 - 11: 5; F_4 - 16: 4; F_5 - 28: 6; F_6 - 18: 6; F_7 - 18: 5; F_8 - 21: 6.

Mesosoma: Shiny, finely reticulate at the anterior lateral margin; notauli absent; scutellum rounded and profusely hairy and notched; giving a kidney shaped appearance; propodeum with a median process and conically arranged hairs on its lateral corners; propleuron partially reticulate and shiny; mesopleuron smooth and shiny; metapleuron hairy. Forewing (Fig.14) length 2.74x its maximum width; sm short brown and distinct, not touching wing margin and without distal knob; marginal fringes on upper and lower margins moderately long and apical margin with slightly long hairs; wing lamina densely hairy; hind coxa length 1.66x its maximum width; hind femur 3.2x length of trochanter and about

4.83x its own maximum width and shorter than hind tibia; hind tibia 1.66x length of hind metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole distinct, its width 1.4x its maximum length, anterior margin more rounded and with longitudinal carina; second tergite smooth shiny and posterior tergites with punctures almost in the middle; metasoma slightly longer than mesosoma, but distinctly shorter than combined length of head and mesosoma; metasomal length 1.87x its maximum width.

Female - Unknown

Host - Unknown

Etymology - The species is named after the locality

Materials Examined: Holotype: male, INDIA: Kerala, Kannur, 2.ii.1995 Coll. T.C.Narendran and party (DZCU). Paratype: 2 males, INDIA: Kerala, Kollakadavu, 16-viii-1999, Coll. R.Usha Kumari, 1 male, INDIA: Kerala, Muthanga, 6-V-2000, Coll. R.Usha Kumari.

Discussion: The new species resembles *A. longicornis* Foerster in having: long antennal segments and head and thorax equal in width. However it differs from *A. longicornis* in having: second metasomal segment smooth, shiny without longitudinal striations. (*A. longicornis* with longitudinal striations along anterior margin).

Genus *ANOPEDIAS* Foerster

Anopedias Foerster, 1856. Hym. Stud., 2:108. Type species: *Anopedias lacustris* Kieffer

Diagnostic characters: Head angled; lateral ocelli widely separated from eyes; antenna 10 segmented with four segmented clava. In female third segment small; notauli absent; mesoscutum and scutellum flat and mirror like with

no visible hairs or sculpture on flattened parts; scutellum rounded and not projecting over metanotum; metasoma not longer than mesosoma.

Distribution: Palaearctic, Oriental, Nearctic and Neotropical.

Biology: Parasites of Cecidomyidae.

Remarks: Only five species reported over the world

KEY TO SPECIES OF *ANOPEDIAS* FOERSTER

1. Second funicular segment longer than first and third funicular segments 2

- Second funicular segment longer than first and shorter than third funicular segment 3

2. Ovipositor exserted; metapleuron with few longitudinal carinae at its posterior end; scape 5.08 its width; wing lamina moderately hairy . . . . . ***A. aquilus*** sp. nov.

3. Ovipositor not exserted; metapleuron without longitudinal carina; scape 4x its width; wing lamina thinly hairy . . . . . ***A. novissimus*** sp. nov.

Anopedias aquilus sp. nov.

(Figs.18-21)

Female: Length 0.93 mm; black; antenna with scape, pedicel and first four funicular segments brown and four segmented club dark brown; eyes black; ocelli glassy with black tint; mandible brown; tegula black; all legs with coxa dark brown to black, fore, middle and hind femur dark coloured at its apical end; hind tibia distal end dark brown and rest of the segments light brown; wings subhyaline with pilosity dark brown to black; body pubescence white.

Head: Weakly reticulate, without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.20) length to width

58:70; head width in dorsal view about 1.2x its median length; POL about 5.3x OOL; malar groove absent; scrobe not distinct; interantennal projection only slightly distinct; posterior margin of gena ecarinate; occipital carina distinct; hyperoccipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.6x malar space. Antenna (Fig.19) 10 segmented; relative length of antenna: body length 56.25: 100. Relative length: width of antennal segments: scape - 58: 11; pedicel – 14: 6; F_1 - 4: 4; F_2 - 7: 5; F_3 - 5: 3; F_4 - 4: 4; F_5 – 10: 2; F_6 - 7: 12; F_7 - 8:13; F_8 – 14:11.

Mesosoma: Weakly reticulate; sparsely hairy; notauli absent; mesonotum length 1.4x its width; scutellum semicircular, hairy on its margin; scutellar groove distinct; scutellum width about 2x its maximum length; propodeum laterally hairy and with a median process; propleuron partially reticulate; mesopleuron smooth and shiny; metapleuron with a few transverse carinae and posterior end hairy. Forewing (Fig.18) length 2.55x its maximum width; sm short, indistinct, faint, straight, not touching the wing margin and without distal knob; marginal fringe much shorter; wing lamina moderately hairy; hind coxa length subequal to its maximum width; hind femur 2.5x length of trochanter and about 3.33x its own maximum width and shorter than hind tibia; hind tibia 2.4x length of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole short, transverse, 4x as wide as its length, densely hairy, hence not distinctly visible; second tergite long, smooth, its anterior margin with tuft of white hairs; posterior tergites punctate; metasoma longer than mesosoma, but distinctly shorter than combined length of head and mesosoma; metasomal length 1.7x its maximum width.

Male: unknown

Host: unknown

Etymology: The species name is from Latin meaning dark coloured.

Materials Examined: Holotype: Female, INDIA: Kerala, Thiruvanathapuram, 25-vi-1999, Coll. R.Usha Kumari (DZCU).

Discussion: As there is no report of *Anopedias* from Indian sub continent the new species is not compared with any other species.

Anopedias novissimus sp. nov.

(Figs.22-25)

Female: Length 0.8 mm; dark brown to black; antenna yellowish brown except club which is four segmented and dark brown; eyes black; ocelli glassy with a black tint; tegula dark brown; wings subhyaline with pilosity dark brown; all legs brown; body pubescence white.

Head: Weakly reticulate; without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.24) length to width 48:66; head width in dorsal view about 1.37x its median length; POL about 4.25x OOL; malar groove absent; scrobe not distinct; interantennal projection only slightly distinct; hyperoccipital carina distinct; vertex angled; occipital carina slightly distinct; posterior margin of gena ecarinate; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.25x malar space; Antenna (Fig.23) 10 segmented; relative length of antenna: body length 62: 100. Relative length: maximum width of antennal segments: scape - 40:10; pedicel – 11: 5; F_1 - 4: 4; F_2 - 5: 5; F_3 - 10: 5; F_4 - 5: 7; F_5 – 12: 10; F_6 - 8: 10; F_7 - 9: 10; F_8 – 15:10.

Mesosoma: Finely reticulate, sparsely hairy; notauli absent; scutellum flat and hairy, its width about 1.4x its maximum length; scutellar groove distinct with anterior marginal hairs; propodeum hairy on its lateral side and a median process; propleuron partially reticulate; mesopleuron smooth and shiny; posterior

end of metapleuron with white silvery tuft. Forewing (Fig.22) length 2.7x its maximum width, sm short, distinct, straight, not touching the wing margin and without distal knob, marginal fringe short; wing lamina thinly hairy; hind coxa length 1.25x its maximum width; hind femur 2.5x length of trochanter and about 3.33x its own maximum width and shorter than hind tibia; hind tibia 2.8x length of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, hairy, 3.25x as wide as its length; second tergite smooth, its dorsal anterior margin and ventral side hairy; posterior tergites finely punctate; metasoma slightly longer than mesosoma but distinctly shorter than combined length of head and mesosoma; metasomal length 2x its maximum width.

Male: unknown

Host: unknown

Etymology: The species name is from Latin meaning new.

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 3-xii-1994, Coll. S. Sheela (DZCU).

Discussion: As there is no report of *Anopedias* from Indian subcontinent the new species is not compared withany other species.

Genus *FIDIOBIA* Ashmead

Fidiobia Ashmead, 1894. *J. Cincinn. Soc. Nat. Hist.* **17**:170-172.Type species: *Fidiobia flavipes* Ashmead, by monotypy.

Rosneta Brues, 1908. *Bull. Wis. Nat. Hist. Soc.* **6**:157. Type species: *Rosneta tritici* Brues, by original designation.

Triclavus Brethes, 1916. *Ann. Mus. Nat. Hist. Buenos Aires* **27**: 401- 430. Type species: *Triclavus bonariensis* Brethes, by monotypy. Synonym by Masner (Muesebeck and Masner in Krombein and Burks [1967]).

Fahringeria Kieffer, 1921. *Broteria, Rev. Luso Braziliera, Zool.* **19**: 68-69. Type species *Fahringeria synergorum* Kieffer, by monotypy, New synonym.

Platyllotropa Szelenyi, 1938b. *Ann. Hist. Nat. Mus. Natl. Hung.* **31**:126. Type species: *Platyllotropa gallicola* Szelenyi.

Diagnostic characters: Squat, stocky and elongate, spindle like species with body slightly to considerably depressed dorsoventrally, usually melanic, rarely xanthic, often with bright coloured appendages; vertex rounded, temples rather long; posterior ocellus in most species very close to inner orbit; antenna of most species with three segmented clava, clava less abrupt in males; mesoscutum considerably flattened; notauli (if developed) abbreviate anteriorly, gradually dialated posteriorly, rarely notauli not dialated but strongly converging posteriorly or notauli not developed; axillae reduced to minute depressions; scutellar disc strongly flattened, transverse to subrectangular with simple transcutal suture; scutellar rim not developed; propodeum with foamy structures and with two short median keels; forewing in most species with short tubular submarginal vein and with marginal cilia moderately long, minute or absent; tibial spur formula 1-2-2; T_2 of most species with two depressions anteriolaterally but no striae anteriomedially; felt fields on S_2 not developed.

Distribution: Nearctic, Neotropical, Oriental and Palaearctic.

Biology: Primary solitary endoparasites in eggs of weevil (Curculionidae) and leaf beetles (Chrysomelidae).

Remarks: Only 9 species reported over the world.

Fidobia keralensis sp. nov.

(Fig.26)

Female: Length 0.93 mm; dorsoventrally flat; black; antenna yellowish brown except the brown claval segments; eyes black; ocelli glassy white; teguladark brown; all legs yellowish brown; wing subhyaline with pilosity brown; body pubescence silky white.

Head: Distinctly punctured; eyes bare; antennal socket close to clypeal border; head width in dorsal view about 2.46x its median length; POL 3.75x OOL; posterior margin of gena ecarinate; hyperoccipital carina not distinct; occipital carina distinct; head wider than mesosoma. Antenna (Fig.27) 9 segmented with three segmented clava; relative length of antenna: body length 50: 112; relative length: maximum width of antennal segments: scape - 35: 10; pedicel - 10: 6; F_1 - 6: 3; F_2 - 5: 3; F_3 - 4: 5; F_4 - 4: 7; F_5 – 9:14; F_6 - 8: 9; F_7 - 14: 11.

Mesosoma: Finely reticulate; notauli present, having an inverted 'V' shape; mesosoma width 1.6x its length; scutellum flat, broadly semicircular, its width 2.7x its medium length; forewing (Fig.26) length 2.48x its maximum width; sm short, straight not touching wing margin and without a distal knob; marginal fringe short; propodeum with longitudinal carina, its posterior and lateral side with uniform sized short tuft of hairs.

Metasoma: Petiole trapezoidal, reddish brown, its maximum width 2x its median length; second metasomal tergite smooth shiny with 'V' shaped markings on its anterior end; posterior segments transverse and with punctures; metasoma longer than mesosoma but slightly shorter than combined length of head and mesosoma, its length 1.58x its maximum width.

Male: unknown

Host: unknown

Etymology: The species name is after Kerala.

Materials Examined: Holotype: Female, INDIA: Kerala, Munthanga, 6-v-2000, Coll. R.Usha Kumari (DZCU).

Discussion: As there is no report of *Fidiobia* species from India, the new species *F. keralensis* is compared with *F.rugosifrons* having Holarctic distribution. The new species *F.keralensis* resembles *F. rugosifrons* in having: abbreviate triangular shaped notauli; broadly semicircular scutellum; large trapezoidal T2 and more transverse posterior tergites. However it differs from *F. rugosifrons* in having: propodeum margin with hairs arranged in a lace like manner (hairs absent in *F. rugosifrons*); presence of V shaped marking on petiole (in *F. rugosifrons* V shaped marking absent) and anterior pits absent (anterior pits present in *F. rugosifrons*).

Genus *ISOSTASIUS* Foerster

Isostasius Foerster, 1856b. *Hym. Stud.* **2**:106,109. Type species: *Platygaster punctifer* Nees, 1834, by monotypy.

Monocrita Foerster, 1856b. *Hym. Stud.* **2**:106,109. Type species: *Inostemma atinas* Walker 1835, by monotypy. Synonym by Masner 1965.

Trisinostemma Kieffer, 1914a. *In Andre. Spec. Hym. Eur. Alg.* **11**: 357. Type species: *Inostemma braesia* Walker 1839, by monotypy and original designation. Synonym by Masner (1965).

Diagnostic characters: Moderately elongate but stout, melanic species; OOL subequal to or longer than LOL; antenna of both sexes 10 segmented, antenna in female with semiabrupt three to five segmented clava, male antenna short, subclavate to strongly clavate and five to seven segmented, mesosoma strongly arched dorsally; scutellum considerably arched, pillow shaped, convex, rarely conical or

flat; scutellaxillar pits large, hairy, metapleuron and sides of propodeum densely hairy, scutellar rim well developed, rounded; forewing rather short, with tubular submarginal vein terminating in round knob; marginal cilia moderate; metasoma considerably convex both dorsally and ventrally; female with three and males with eight visible tergites; lateral edges of metasoma weak to indistinct; felt fields on S_2 well developed.

Distribution: Australian, Oriental, Palaearctic, Nearctic and Neotropical.

Biology: The members with known biology parasitize gall midges (Cecidomyidae)

Remarks: 14 species reported, only one from India.

KEY TO THE INDIAN SPECIES OF *ISOSTASIUS* FOERSTER

1. Antennal club abrupt 2

- Antennal club subabrupt 3

2. Tenth clavomere small and triangular (Fig.37); lateral ocelli more closer to eyes (Fig36); notauli percurrent ..... ***I. vayalarensis*** sp. nov.

- Tenth clavomere broad and somewhat semicircular (Fig.29); lateral ocelli widely separated from eyes (Fig.28); notauli abbreviate ..... ***I. indicus*** sp. nov.

3. Head triangular shaped and eyes conical (Fig.34); scutellum broadly semicircular and flat ..... ***I. malabaricus*** sp. nov.

- Head not triangular, eyes rounded; scutellum slightly bulging ..... ***I. poroicus*** Mukerjee.

Isostasius indicus sp. nov.

(Figs.28-31)

Female: Length 1.17mm; black; antenna dark brown to black except proximal and distal end of scape which is brown; eyes black; ocelli glassy and black; tegula black; wings subhyaline with pilosity dark brown; all legs with coxa and middle portion of femur black to dark brown in colour; distal end of mid and hind tibiae with a darker shade; fore tibia without any colour shade; all tarsal segments except last tarsal segment reddish brown and last tarsal segment dark brown; pubescence on body white.

Head: Distinctly reticulate; vertex rounded; eyes bare; antennal sockets close to clypeal border; head viewed in front (Fig.30) length to width 35: 39; head width in dorsal view about 2.72x its median length; POL about 1.5x OOL. Malar groove absent; interantennal projection slightly distinct; posterior margin of gena ecarinate; hyperoccipital carina absent; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3x malar space. Antenna (Fig.29) 10 segmented; relative length of antenna: body length 40.27:100; Relative length: maximum width of antennal segments: scape - 48: 11; pedicel - 12: 7; F_1 - 10: 6; F_2 - 9: 4; F_3 – 4: 4; F_4 - 5: 4; F_5 – 6: 9; F_6 - 7: 9; F_7 - 7: 9; F_8 - 8: 8.

Mesosoma: Distinctly reticulate; notauli distinct; mesocutum length 1.16x its width; scutellum flat, somewhat trapezoidal, in between the notauli wrinkled; scutellar groove with carina dividing it into fovea, anterior end of scutellum margined and carinate; propodeum with a shallow ridge; propleuron distinctly punctuate; mesopleuron with few transverse carinae on anterior region and middle of mesopleuron with a smooth fovea; metapleuron finely punctate and sparsely hairy. Forewing (Fig.28) length 2.34x its maximum width; sm about 30

per cent of wing length and with a terminal rounded knob, not touching wing margin; marginal fringe much shorter; wing lamina moderately hairy; hind coxa as long as wide; hind femur 2.4x length of trochanter, about 3x its own maximum width and shorter than hind tibia; hind tibia 2.07x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole trapezoidal, rounded and with longitudinal carina, sparsely hairy on its upper and lower anterior margin of second tergite with wrinkled lines and rest smooth; posterior metasomal segments punctate and sparsely hairy; metasoma 1.72x length of mesosoma and as long as combined length of head and mesosoma; metasomal length about 2.17x its maximum width.

Male: unknown

Host: unknown

Etymology: The species is named after the country of origin.

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 14-vii-2001, Coll. T.C. Narendran and party (DZCU). Paratype: 1 Female, INDIA: Kerala, Calicut University Campus, 15-ii-2001, Coll. T.C. Narendran and party

Discussion: This species resembles *Isostasius poroicus* Mukerjee in the following characters: antennal segments 1-1-4-4; presence of complete notauli; scape without lamellar expansion; scape 4.35x longer than wide and petiole completely and second tergite basally with longitudinal striations. However it differs from *Isostasius poroicus* in having: distinct four segmented antennal club (in *I. poroicus* antennal club not distinct); scutellum flat (In *I. poroicus* scutellum slightly bulging) and ovipositor not exserted (ovipositor slightly exserted in *I. poroicus)*.

Isostasius malabaricus sp. nov.

(Figs.32-35)

Female: Length 1.9 mm; black; antenna brown with three terminal clavomeres dark brown and scape reticulate; eyes dark brown to black, conical; tegula black; petiole reddish brown, all legs brown except coxa which is dark brown to black; femur reticulate; wing hyaline with pilosity light brown and less hairy; body pubescence short and white.

Head: Frons, vertex and occiput distinctly sculptured, shiny without pubescence; eyes bare conical; antennal sockets close to clypeal border; head viewed in front (Fig.34) somewhat triangular shaped, its length to maximum width 41: 49; head width in dorsal view about 2x its median length; POL about 4.2x OOL; scorbe and interantennal projection indistinct; malar groove absent, malar space sculptured; posterior margin of gena carinate dark brown; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye about 2.25x malar space. Antenna (Fig.33) 10 segmented; relative length of antenna: body length 40.7: 100.Relative length: width of antennal segments: scape – 44: 7; pedicel - 10: 5; F_1 - 8: 6; F_2 - 7: 4; F_3 – 4: 4; F_4 - 4: 5; F_5 – 6: 6; F_6 - 8: 8; F_7 - 7: 8; F_8 - 13: 7.

Mesosoma: Distinctly sculptured; notauli well distinct and complete; mesoscutum width 1.8x its length, longitudinal carina on posterior margin of mesoscutum. Scutellum not convex, distinctly punctuate, small fovea on upper and lower margin. Scutellum width 2.7x its length; propodeum coarse, somewhat circular lobes on lateral sides and longitudinal carina in between; pro, meso and metapleura sculptured; metapleuron carry few hairs. Forewing (Fig.32) length 2.4x its maximum width; sm long, brownish with a distal knob; marginal fringe absent; wing lamina only sparsely hairy; hind coxa length 1.3x its width; hind femur 2.8x

length of trochanter about 3.25x its own maximum width and shorter than hind tibia; femur weakly reticulate; hind tibial length 2x length of metatarsus and as long as combined length of hind tarsal segments; hind tarsal segments with circlet of short dark spines at the base of each segment.

Mesosoma: Petiole narrower towards anterior and broader posteriorly, about 1.8x wide as its length, with longitudinal carina; second tergite smooth, with short longitudinal carina on anterior margin and posterior tergites with minute punctures; metasoma longer than mesosoma, but shorter than head and mesosoma combined, a little less than 2x its width in dorsal view.

Male: unknown

Host: unknown

Etymology: The species is named after the locality.

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 25-v-1998, Coll. T.C.Narendran and party (DZCU).

Discussion: There is only one species namely *Isostasius poroicus* Mukerjee reported from India and the new species resembles *I. poroicus* in having: complete and well distinct notauli. However it differs from *I. poroicus* in having: triangular shape of head and conical eyes (head rounded in *I. poroicus* and eyes not conical); scutellum flat (*in I. poroicus* scutellum slightly bulging) and ovipositor not exserted (ovipositor slightly exserted in *I. poroicus*).

Isostasius vayalarensis sp. nov.

(Figs.36-39)

Female: Length 1.41 mm; dark brown to black; antenna dark brown except scape which is brown; eyes with a brownish tint; ocelli yellowish and glassy; tegula brown; legs with coxa dark brown and rest of the segments except

last tarsal segment reddish brown, last tarsal segment brown; wings hyaline with pilosity light brown; body pubescence white.

Head: Finely reticulate; vertex rounded; eyes bare; antennal sockets close to clypeal border; head viewed in front (Fig.38) length: width 34: 51; head width in dorsal view about 2.37x its median width; POL about 4.25x OOL; scrobe and interantennal projection distinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 1.8x malar space. Antenna (Fig.37) 10 segmented; relative length of antenna: body 42.24: 100. Relative length: width of antennal segments: scape - 38: 8; pedicel -10: 6; F_1 - 9: 5; F_2 - 7: 4; F_3 - 4: 5; F_4 - 4: 6; F_5 – 6: 8; F_6 – 7: 9; F_7 - 7: 8; F_8 – 6: 5; terminal clavomere conical.

Mesosoma: Matt; notauli present, abbreviate; width of mesosoma 1.2x its length; scutellum trapezoidal, flat, broad with short carina on lower marginal ridge, its width 1.6x its length including ridge; upper margin of transcutal suture foveolate. Forewing (Fig.36) length 2.32x its maximum width, with tubular submarginal vein terminated in rounded knob; marginal fringe not distinct, very much short; pro and metapleura punctate, metapleuron with fine hairs; mesopleuron shiny with few transverse striations on upper side; propodeum with fine hairs; hind coxa as long as broad; hind femur 2.7x of trochanter and length about 3.16x its maximum width and shorter than hind tibia; hind tibia 2.16x of hind metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, its maximum width 1.9x its length, with longitudinal carina and fine hairs; second tergite with fine longitudinal lines and posterior segments with punctures; metasoma length 2x its maximum width, slightly longer than mesosoma and distinctly shorter than combined length of head and mesosoma.

Male: unknown

Host: unknown

Etymology: The species is named after the locality.

Materials Examined: Holotype: Female, INDIA: Kerala, Vayalar, 22-ii-1989, Coll. T.C.Narendran and party (DZCU).

Discussion: There is only one species viz. *Isostasius* poroicus Mukerjee so far known from India and the new species resembles *I. poroicus* in having: notauli complete and four segmented antennal club. However it differs from *I. poroicus* in having: scutellum flat (in *I. poroicus* scutellum slightly bulging); antennal club distinct (antennal club not distinct in *I. poroicus*) and ovipositor not exserted (in *I. poroicus* ovipositor exserted).

Genus*LEPTACIS* Foerster

Leptacis Foerster, 1856b. *Hym. Stud.,* **2**:107. Type species: *Ichneumon tipulae* Kirby, 1798

Miramblyaspis Dodd, 1914. *Ent. News Philad.*, **25**:455-456. Type species: *Miramblyaspis mirabilis* Dodd, 1914.

Xestonotidea Gahan, 1919. *Proc. U.S. Nat. Mus.,* **56**:524; Kieffer, 1926, *Das Tierreich*, **48**:625 (*Axestonotus* = *Xestonotus* Foerster). Type species: X*estonotidae foersteri* Gahan, 1919.

Prosamblyaspis Kieffer, 1926. *Das Tierreich,* **48**:1-885. Type species: *Amblyaspis flavosignata* Kieffer, 1912 by monotypy.

Diagnostic characters: Body smooth and shiny; vertex with fine transverse carina behind; ocellocular space less than front ocellar space; antenna 10 segmented with four segmented club; notauli absent or present or with only faint traces; scutellum usually elongates gradually into sharp sublate spine, which often

extends beyond base of petiole. Petiole and base of second tergite hairy that do not form tuft like structure.

Distribution: Afrotropical, Australian, Nearctic, Neotropical, Oriental and Palaearctic.

Biology: Parasites of Cecidomyidae.

Remarks: 69 species reported over the world, out of this only four species from India.

KEY TO THE INDIAN SPECIES OF *LEPTACIS* FOERSTER - FEMALE

1. Scutellum with a long spine (Figs.63, 67). 2

- Scutellum with a short straight or upcurved spine (Figs.47, 51).. 15

2. Notauli absent, marginal fringe conspicuously longer (Fig.64) 3

- Notauli present, marginal fringe moderate to short and rarely long 4

3. Scutellar spine broad, brown, third and fourth funicular segment unequal; body length: antennal length-100: 72.7 . . . . . *L. keralensis* sp. nov.

- Scutellar spine slender, dark brown, third and fourth funicular segment subequal; body length: antennal length - 100: 53.5 . . . . . *L. malabarensis* sp. nov.

4. Marginal fringe long, third and fourth funicular segment unequal; scape six times its width; fourth club segment elliptically ovate . . . . . *L. yercaudensis* Mukerjee

- Marginal fringe moderate or short; antennal character not as above 5

5. Marginal fringe moderate 6

- Marginal fringe short 8

6. Third and fourth funicular segment subequal . . . . . *L. brachyceras* Mukerjee

- Third and fourth funicular segment unequal 7

7. Ovipositor well exserted ..... ***L. Konkanensis*** Mukerjee

- Ovipositor not exserted ..... ***L. coorgensis*** Mukerjee

8. Third and fourth funicular segment unequal; ovipositor slightly exserted .... ***L. thanensis*** Mukerjee

- Third and fourth funicular segment subequal; ovipositor not exserted ..... ***L. bengalensis*** Mukerjee

9. Scutellum with short straight spine (Figs.55, 71) 10

- Scutellum with short upcurved spine (Figs.51, 47) 15

10. Scutellum semicircular 11

- Scutellum triangular 14

11. Antennal length >60% of body length 12

- Antennal length <60% of body length 13

12. Vertex deeply angled (Fig.59); scutellum with nipple like black spine giving a median ridge like appearance for the scutellum (Fig.56); length of insect 1.21 mm ..... ***L. diversus*** sp. nov.

- Vertex rounded; scutellum with a sharp black point like spine (Fig.83) and not ridge like, length of insect 0.65 mm ....***L. nuperus*** sp. nov.

13. Bluntly rounded black spine (Fig.72); body length: antennal length 100: 59; scape length 5.25x its width ..... ***L. mustus*** sp. nov.

- Pointed black spine (Fig.43); body length: antennal length 100: 50.95; scape length 3.6x its width ..... ***L. aeros*** sp. nov.

14. Scutellum narrowly triangular (Fig.52); scutellar spine triangular and with tuft of hairs at the tip; vertex rounded; body length: antennal length - 100: 55 ..... ***L. benazeer*** sp. nov.

- Scutellum broadly triangular (Fig.68); scutellar spine pen nib like without tuft of hairs at the tip; body length: antennal length - 100:76 ..... ***L. manni*** sp. nov.

15. Second funicular segment longer than third funicular segment 16

- Second funicular segment shorter than third funicular segment 17

16. Antennal club forming segments elongate (Fig.45); ovipositor not exserted; body length: antennal length - 100: 60.78 . . . . . ***L. alus*** sp. nov.

- Antennal club forming segments broad (Fig.85); ovipositor exserted; body length: antennal length - 100: 52.2 . . . . . ***L. scaposus*** sp. nov.

17. Third funicular segment larger in length and width than second funicular segment; antennal club forming segments more elongate; ovipositor exserted . . . . . ***L.asiaticus*** sp.nov.

KEY TO THE INDIAN SPECIES OF *LEPTACIS* FOERSTER - MALE

1. Notauli present; marginal fringe short; scape length 7x its width . . . . . ***L. indicus*** Mukerjee

- Notauli absent; marginal fringe long; scape length <7x its width 2

2. Metasoma with anterior pits; marginal cilia on anterior and posterior margin, short and apical margin long 3

- Metasoma without anterior pits; marginal cilia moderately long to much longer.....5

3. Antennal segments more elongate; third funicular segment with a spiny process towards half the length. . . . . ***L. narendraii*** sp. nov.

- Antennal segments slightly broader; third funicular segment without a spiny process . . . . . ***L. thrissurensis*** sp. nov.

4. First funicular segment subglobose; ocellocular space subequal to ocellar diameter; marginal cilia moderately long . . . . . ***L. atturensis*** Mukerjee

- First funicular segment 1.5x longer than thick; ocellocular space 0.50 of ocellar diameter; marginal cilia long . . . . . ***L. maldarensis*** Mukerjee

Leptacis aeros sp. nov.

(Figs.40-43)

Female: Length 0.9 mm; black; antenna yellowish brown except the terminal club forming segments which is dark brown; eyes black; ocelli glassy white; mandible brown; legs with coxa and last tarsal segment dark brown and others yellowish brown; wings hyaline with pilosity dark brown; body pubescence white.

Head: Frons and vertex matt; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.42) length to width 32: 47; head width in dorsal view about 2.6x its median length; POL about 5x OOL; scrobe and interantennal projection indistinct; malar groove absent; hyperoccipital carina distinct; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3.25x malar space. Antenna (Fig.41) 10 segmented; relative length of antenna: body length 49:100. Relative length: width of antennal segments: scape – 33: 9; pedicel – 13: 7; F_1 - 5: 4; F_2 - 6: 4; F_3 – 5: 3; F_4 – 5: 4; F_5 - 7: 9; F_6 - 7:12; F_7 - 6:12; F_8 – 10: 9.

Mesosoma: Finely reticulate; notauli absent; mesoscutum width slightly more than its length; scutellum slightly convex with few hairs, somewhat semicircular and ends in a short black spine; scutellum length up to the tip of spine as long as wide; propleuron partially reticulate; mesopleuron smooth and shiny; metapleuron with white hairs on its posterior margin. Forewing (Fig.40) length 3x its maximum width, sm not distinct, marginal fringes much shorter; propodeum hairy on its lateral side; hind coxa as long as wide; hind femur 2x length of trochanter, about 3x its own maximum width and shorter than hind tibia; hind tibia

dilated at its distal end and 2.5x length of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.8x as wide as its length, tuft of hairs present on its lateral side, longitudinal grooves on petiole; second tergite smooth; posterior tergites finely punctate; metasoma length 2.5x its maximum width and tapering.

Male: unknown

Host: unknown (probably paddy pests)

Etymology: This species name is an arbitrary combination of letters.

Materials Examined: Holotype: female, INDIA: Kerala, Arattupuzha, 27-viii -1999, Coll. R. Usha Kumari (DZCU).

Discussion: This species comes near *Leptacis thanensis* in the key to species of *Leptacis* by Mukerjee (1978). It resembles *L. thanensis* in having: second funicular segment much longer than the first; marginal fringes of forewing short and fourth funicular segment shorter than the third. However it differs from the species *L. thanensis* Mukerjee in having: notauli absent (notauli present in *L. thanensis*); scutellum with a short black spine (very long spine and apically with tuft of hairs in *L. thanensis*); length of insect 0.9 mm (*L. thanensis* 1.52 mm in length); scape length 4x its maximum width (in *L. thanensis* 5x longer than thick); scutellum with hairy tuft on propodeum and petiole (not like this in *L. thanensis*) and ovipositor not exserted (ovipositor exserted in *L. thanensis*).

Leptacis alus sp. nov.

(Fig.44-47)

Female: Length 0.85 mm; black; antenna with all segments except scape dark brown; scape brown; eyes black, ocelli glassy with black tint; mandible

dark brown; tegula brown; legs with coxa dark brown to black; distal region of hind femur and tibia swollen and dark brown and its basal half yellowish brown; wings hyaline with pilosity dark brown; pubescence on body white.

Head: Frons and vertex finely reticulate; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.46) length to width 33: 42; head width in dorsal view 2.16x its median length; POL about 4.66x OOL; hyperoccipital carina distinct and vertex angled; malar groove absent; scrobe not distinct; interantennal projection slightly distinct; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 8.5x malar space. Antenna (Fig.45) 10 segmented; relative length of antenna: body length 60.78:100. Relative length: width of antennal segments: scape – 50: 12; pedicel – 13: 5; F_1 - 4: 4; F_2 - 9: 4; F_3 – 5: 3.5; F_4 – 5: 4; F_5 - 9: 8; F_6 - 10: 9; F_7 - 9: 10; F_8 – 14: 8.

Mesosoma: Finely reticulate; notauli absent; mesoscutum length as long as its width; sparsely hairy and somewhat humped. Scutellum hairy and with an up curved pointed short black spine; scutellar length including the spine as long as its maximum width; propodeum with tuft of white hairs on its lateral side and lateral ridges; propleuron partially and finely reticulate; mesopleuron smooth and shiny; metapleuron hairy on its distal end. Forewing (Fig.44) length 2.5x its maximum width; sm short, straight, not reaching wing margin and without distal knob; marginal fringe short; hind coxa length as long as wide; hind femur 1.9x length of trochanter, about 3.16x its own maximum width and shorter than hind tibia; hind tibia length about 1.95x length of metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, its width about 2.5x its length, lateral margin with tuft of hairs; posterior end of second tergites and rest of the tergites finely punctured; metasoma longer than mesosoma but distinctly shorter than head

and mesosoma combined, its length about 2.12x its maximum width in dorsal view.

Male: unknown

Host: unknown (probably paddy pests)

Etymology: Species name is an arbitrary combination of words.

Materials Examined: Holotype: Female, INDIA: Kerala, Thrissur, 24-viii -1998, Coll. R. Usha Kumari (DZCU).

Discussion: This species comes near *Leptacis konkanensis* Mukerjee in the key to species by Mukerjee (1978). It resembles *L. konkanensis* in having: second funicular segment much longer than the first; marginal fringes of forewing short and fourth funicular segment not shorter than the third. However it differs from *L. konkanensis* in the following characters: scutellum with an upcurved pointed short black spine (long spine in *L. konkanensis*); notauli absent (in *L. konkanens* notauli present); body size 0.85 mm (*L. konkanensis is* 1.16mm); scape length 4.16x its maximum width (5.52x longer than thick in *L. konkanensis*); legs with coxa dark brown to black, hind femur and distal region of tibia dilated and dark brown and basal half yellowish brown (in *L. konkanensis* legs brown) and ovipositor not exserted (ovipositor exserted in *L. konkanensis*).

Leptacis asiaticus sp. nov.

(Figs.48-51)

Female: Length 1.24 mm; black; antenna except scape is dark brown; scape brown; eyes dark brown; front and back ocelli glassy with yellow tint; mandible dark brown; legs with coxa and last tarsal segment dark brown; wings hyaline with pilosity dark brown; body pilosity white.

Head: Matt; eyes bare; antennal sockets close to clypeal border; head viewed in front (Fig.50) length to width 32: 50; head width in dorsal view about 2.69x its median length; POL about 5.66 x OOL; scrobe and inter antennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head slightly wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 2.14x malar space. Antenna (Fig.49) 10 segmented; relative length of antenna: body length 66:100. Relative length: width of antennal segments: scape - 47: 9; pedicel – 11: 5; F_1 - 6: 4; F_2 - 7: 4; F_3 – 13: 7; F_4 – 7: 6; F_5 - 11: 8; F_6 - 12: 9; F_7 – 11:10; F_8 – 18:9. Third funicular segment length 2x that of first funicular segment and 1.5x its width.

Mesosoma: Matt; notauli absent; scutellum somewhat conical with a short up curved spine; scutellum width about 1.27x its length including length of spine; propleuron finely reticulate; meso and metapleuron smooth, posterior margin of metapleuron hairy. Forewing (Fig.48) length 2.66x its maximum width; sm short, not reaching wing margin and without distal knob; marginal fringe short; propodeum with a median ridge and lateral tuft of hairs giving a triangular appearance; hind coxa, distal end of hind femur, tibia and last tarsal segment dark brown; hind femur and tibia dilated at its distal end; first and second femora distally not dark brown; hind coxa only slightly longer than its width; hind femur 2.3x length of trochanter and about 3.5x its own maximum width and shorter than hind tibia; hind tibia 2.8x length of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, 3x as wide as its length, hairy, which cover anterior margin of second tergite; second tergite smooth; posterior tergites punctate; metasoma more compressed, slightly longer than mesosoma but shorter than combined length of head and mesosoma, its length 1.6x its maximum width; ovipositor exserted.

Male: unknown

Host: unknown

Etymology: The species is named after Asia.

Materials Examined: Holotype: Female, INDIA: Kerala, Thrissur, 6-iii-1995, Coll.T.C.Narendran and party (DZCU).

Discussion: This species comes near *L. brachycerus* Mukerjee in the key to species by Mukerjee (1978). It resembles *L. brachycerus* in having: second funicular segment much longer than first funicular segment and notauli absent. However it differs from *L. brachycerus* in having: third funicular segment larger in length and width than the fourth funicular segment (third funicular segment short in *L. brachycerus)*; short upcurved black spine for scutellum (long spine in *L. brachycerus*).

Leptacis benazeer sp. nov.

(Figs.52-55)

Female: Length 1.17 mm; reddish brown; antenna dark brown except scape which is reddish brown; eyes glassy with a light red tint; ocelli glassy and brown; mandible reddish brown; tegula brown; all legs reddish brown; wings opaque with pilosity dark brown; body pubescence white.

Head: Frons and vertex reticulate; vertex rounded; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.54) length to width 39: 41; head width in dorsal view about 1.9x its median length; POL about 4.3x OOL; scrobe indistinct; interantennal projection distinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct, head slightly narrower than

mesosoma in dorsal view; maximum diameter of eye in lateral view about 6 x malar space. Antenna (Fig.53) 10 segmented; relative length of antenna: body length 55: 100; relative length: width of antennal segments: scape - 32: 9; pedicel – 11: 5; F_1 - 6: 5; F_2 - 6: 5; F_3 – 5: 5; F_4 – 7: 4; F_5 - 9: 8; F_6 - 6:10; F_7 – 6: 8; F_8 – 9: 7.

Mesosoma: Matt; notauli absent; scutellum somewhat triangular, with an apical small brown spine, hairy, hairs arranged like a beard at its tip; pro, meso and metapleuron finely reticulate, metapleuron with backwardly arranged hairs. Forewing (Fig.52) length 2.64x its maximum width; marginal fringes rudimentary; wing lamina thickly hairy, sm indistinct; propodeum hairy, hairs arranged in such a way as to give a spine like appearance, a median ridge present; hind coxa as long as wide; femur 1.9x length of trochanter and its length about 3.8x its own maximum width and shorter than hind tibia; hind tibia about 2.7x of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Compressed; petiole transverse, its maximum width 1.8x its length, hairy; second tergite smooth and posterior tergites with minute punctures; metasoma slightly longer than mesosoma as long as combined length of mesosoma and head; its length about 1.8x its maximum width.

Female: unknown

Host: unknown

Etymology: The species name is taken from the Urdu word benazeer meaning 'beautiful'.

Materials Examined: Holotype: Female, INDIA: Kerala, Kurarkutty, 6-v-1989, Coll.T.C.Narendran and party (DZCU).

Discussion: This species resembles *Leptacis brachycerus* Mukerjee in the key to *Leptacis* by Mukerjee (1978) in having: second funicular segment much longer than first funicular segment and in absence of notauli. However it differs

from *L. brachurus* in having: body colour reddish brown (in *L. brachurus black)*; vertex more rounded (vertex strongly margined in *L. brachurus)*; scutellum triangular with beard like hairs; (scutellum without tuft of hairs at its tip in *L. brachurus*); and metasoma elongate, compressed and slightly curved upwards (metasoma more convex in *L. brachurus*).

Leptacis diversus sp. nov.

(Figs.56-59)

Female: Length 1.21; black; antenna reddish brown with four segmented club; eyes dark brown to black; ocelli black glassy; tegula black; all legs reddish brown with coxa and last tarsal segment dark brown; distal onefourth of tibia and femur dark brown; wings opaque with pilosity reddish brown; body pubescence white.

Head: Finely reticulate, sparsely pubescent; vertex deeply angled; hyperoccipital carina well distinct; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.58) length: width 30: 49; head width in dorsal view about 3x its median length; POL about 4.25x OOL; scrobe indistinct and inter antennal projection distinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3.6x malar space. Antenna (Fig.57) 10 segmented; relative length of antenna; body length 69: 100. Relative length: width of antennal segments: scape – 48: 8; pedicel- 13: 5; F_1 – 4.5: 4; F_2 – 11: 5; F_3 – 5: 3; F_4 – 5: 3; F_5 – 9: 7; F_6 – 8: 9; F_7 – 8: 8, F_8 – 13: 8.

Mesosoma: Finely reticulate; notauli absent; scutellum somewhat semicircular with a short bluntly rounded nipple shaped dark brown process that

extends to the proximal end as a median smooth ridge; except the ridge scutellum is hairy; pro, meso and metapleura matt; metapleuron with hairs on its posterior end; scutellum length including tip of process 1.36x its maximum width; scutellar suture well distinct with bristle like hairs on its anterior margin. Forewing (Fig.56) length 2.68 x its maximum width; sm much shorter, not reaching the wing margin and without a knob; marginal fringe much shorter; propodeum with two median process; lateral side carry hairs arranged in a triangular pattern; hind coxa length 1.37x its maximum width; hind femur 2.75x length of trochanter and about 2.75x of its own maximum width and shorter than hind tibia; hind tibia 3.6x length of hind metatarsus and shorter than the combined length of hind metatarsus; distal end of femur and tibia dilated.

Metasoma: Petiole transverse, its width about 3.25x its length, hairy with longitudinal carina; second metasomal tergite matt and posterior segments with minute punctures; metasoma longer than mesosoma but shorter than combined length of head and mesosoma, its length about 1.67 x its own maximum width.

Male : unknown

Host : unknown

Etymology : The species name is taken from Latin meaning different.

Materials examined: Holotype: female; INDIA: Kerala, Eravikulam, 28-11-1993; Coll.T.C.Narendran and party (DZCU)

Discussion: This species comes near *L. coorgensis* in the key to species of Mukerjee (1978). It resembles *L. coorgensis* in having: second funicular segment much longer than first, and fourth funicular segment not shorter than third; second funicular segment 3x longer than thick; head and metasoma finely reticulate and hairy tuft on petiole. However it differs from *L. coorgensis* in having: notauli absent (notauli present in *L. coorgensis*); scutellum passing into a

short nipple like spine which extends dorsomedially to the posterior end as a ridge(in *L. coorgensis* scutellar spine long); colour of antennae reddish brown (antenna black except brownish scape and marginal fringe of forewing much shorter (marginal fringe moderate in *L. coorgensis*).

Leptacis keralensis sp. nov.

(Figs.60-63)

Female: Length 0.73 mm; black; antenna brown except terminal four funicular segments which are dark brown; eyes black; ocelli glassy with a black tint; mandible dark brown; tegula brown; all legs brown; wings subhyaline with pilosity brown; pubescence on body white.

Head: Frons smooth and shiny, vertex weakly reticulate without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.62) length to width 32: 40; head width in dorsal view about 1.38x its median length; POL about 4.3x OOL; malar groove absent; scrobe and interantennal projection indistinct; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3.2x malar space. Antenna (Fig.61) 10 segmented; relative length of antenna: body length 72.7: 100. Relative length: width of antennal segments: scape – 40: 8; pedicel – 11: 5; F_1 - 7: 3; F_2 - 12: 3.5; F_3 – 6: 4; F_4 – 5: 3; F_5 - 11: 9; F_6 - 10: 10; F_7 - 11: 10; F_8 – 14: 9.

Mesosoma: Finely reticulate, shiny; notauli absent; mesoscutum length 1.2x its maximum width; scutellum somewhat triangular, long and gradually passing into a long brown spine behind; scutellar length about 1.4x its maximum width, few hairs on its lateral margin; propodeum with tuft of white hairs on the

lateral sides; pro and mesopleura partially punctate, shiny; metapleuron smooth with tuft of white hairs on its posterior margin. Forewing (Fig.60) length 3.25x its maximum width; sm short, straight, not touching wing margin and without distal knob; anterior and posterior marginal fringe shorter and apical fringe longer; wing lamina densely hairy. Hind coxa length as long as wide; hind femur 2.85x length of trochanter, about 4x its own maximum width and shorter than hind tibia; hind tibia 2.45x length of metatarsus and as long as combined length of hind tarsal segments; all femur and tibia swollen apically.

Metasoma: Petiole transverse, 1.37x wide as its length, longitudinal carina on petiole, tuft of white silvery hairs present on ventral side; dorsolateral region of second metasomal tergite with anterior pits; metasoma little longer than mesosoma but shorter than combined length of head and mesosoma and about 1.78x its maximum width in dorsal view. Posterior metasomal tergites weakly punctuate.

Male: unknown

Host: unknown

Etymology: This species is named after its locality.

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 18-vi-2000, Coll. T.C.Narendran and party (DZCU).

Discussion: In the key to Indian *Leptacis* by Mukerjee (1978) it comes closer *to L.yercaudensis* Mukerjee in having: the second funicular segment longer than the first and third and fourth funicular segments unequal; marginal fringes of forewing conspicuously long and forewing length to width 100:31. However it differs from this species in having: notauli absent (in *L.* yercaudensis notauli present) and second metasomal tergite with oval shaped anterior pits (without oval shaped anterior pits in *L. yercaudensis*).

Leptacis malabarensis sp. nov.

(Figs.64-67)

Female: Length 0.95 mm; black; antenna black except brown basal one fourth of scape; eyes black; ocelli white glassy; mandible yellowish brown; tegula dark brown; all legs with coxa brown, dilated portion of femur and tibia dark brown and basal narrow cylindrical portion light brown, tarsal segments light brown; wings subhyaline with pilosity dark brown; body pubescence silvery white.

Head: Frons, vertex and occiput punctate, shiny without pubescence; eyes bare; antennal sockets close the clypeal border. Head viewed in front (Fig.66) length to width 32:43; head width in dorsal view about 2.4x its median length; hyperoccipital carina not distinct; POL about 3.66x OOL; maximum diameter of eye in lateral view about 2.66x malar space. Antenna (Fig.65) 10 segmented; relative length of antenna: body length 53.5: 100. Relative length: maximum width of antennal segments: scape – 42: 9; pedicel – 11: 5; F_1 - 7: 3.5; F_2 - 12: 3; F_3 – 5: 3; F_4 – 5: 3; F_5 - 10: 9; F_6 - 8: 10; F_7 - 9: 11; F_8 – 11: 11.

Mesosoma: Weakly reticulate, shiny, sparsely hairy; notauli absent; mesoscutum length 1.1x its maximum width; scutellum somewhat triangular, flat, sparsely hairy and is produced into a slender long brown spine, length of scutellum with spine 1.3x its maximum width, lateral margin with few hairs; propodeum with white tuft of hairs almost converging to a point; propleuron smooth, shiny and upper part partially reticulate; mesopleuron shiny and upper part with weak transverse carina; metapleuron smooth, shiny, and distal end with white silvery tuft of hairs. Forewing (Fig.64) length 2.9x its maximum width, sm short, straight, not touching wing margin and without distal knob; apical marginal fringe longer and anterior and anal marginal fringes much shorter; femur and tibia dilated apically, hind coxa length 2x its maximum width; hind femur 2x length of

trochanter and about 3.6x its own maximum width; hind tibial length 1.77x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole as long as wide with white silvery hairs on its sides; second tergite smooth with line of hairs on its anterior margin; posterior metasomal tergites weakly punctate; metasoma little longer than mesosoma but shorter than combined length of head and mesosoma; its length about 1.79x its maximum width in dorsal view.

Male: unknown

Host: unknown

Etymology: The species named after Malabar the region of collection.

Materials Examined: Holotype: Female, INDIA: Kerala, Muthanga, 6-v-2000, Coll. R. Usha Kumari (DZCU).

Discussion: This species comes near *Leptacis yercaudensis* Mukerjee in the key to species by Mukerjee (1978). This species resembles *L. yercaudensis* in having: second funicular segment longer than the first and marginal fringes longer. However it differs from this species in having: notauli absent (in *L. yercaudensis* notauli present); third and fourth funicular segments subequal (unequal in *L. yercaudensis*); scutellum somewhat triangular which ends in a narrow, slender and brown scutellar spine (scutellum long gradually passing into a long spine).

Leptacis manii sp. nov.

(Fig.68-71)

Female: Length 1.24 mm; dark brown to black; antenna dark brown; eyes black; ocelli black; mandible brown; tegula black; legs with coxa, femur, tibia and last tarsal segment dark brown, other tarsal segments light brown; wings opaque with pilosity brown; body pubescence white.

Head: Frons and vertex finely reticulate and without pubescence; eyes bare; antennal sockets close to clypeal border; head viewed in front (Fig.70) length to width 27:41; head width in dorsal view about 3.09x its median length; POL about 3.66x OOL; malar groove absent; malar space less; scrobe indistinct and interantennal projection distinct; posterior margin of gena ecarinate; hyperoccipital carina distinct; head wider than mesosoma in dorsal view. Antenna (Fig.69) 10 segmented; relative length of antenna: body length 100: 79; relative length: width of antennal segments: scape – 42: 7; pedicel – 11: 5; F_1 - 4: 3; F_2 - 8: 4; F_3 – 4: 3; F_4 – 7: 4; F_5 - 8: 7; F_6 – 9: 7; F_7 – 7: 8; F_8 – 10: 7.

Mesosoma: Finely reticulate; notauli absent; mesoscutum as long as wide; scutellum broadly triangular, with a pen-nib like knob at apex and sparsely hairy; scutellar width including spine 1.5x its length; propodeum with hairs on its side and with a median ridge; propleuron finely reticulate; meso and metapleura smooth and metapleuron with few hairs at its posterior end. Forewing (Fig.68) length 2.6x its maximum width; sm short, straight, not touching wing margin and without distal knob; marginal fringe short and wing lamina densely hairy; hind coxa length 1.5x its maximum width; hind femur length 2.2x length of trochanter and about 3.3x its own maximum width and shorter than hind tibia; hind tibia 2.75x length of metatarsus and longer than combined length of hind tarsal segments.

Metasoma: Petiole transverse, 2.5x as wide as its length, few hairs present; metasoma more compressed; metasoma little longer than mesosoma but shorter than combined length of head and mesosoma and its length about 1.74x its maximum width in dorsal view; second metasomal tergite smooth and shiny and rest of the segments finely punctate.

Male: unknown

Host: unknown

Etymology: The species named after Prof.M.S.Mani for his significant contribution to the study of parasitic hymenoptera.

Materials Examined: Holotype: Female, INDIA: Kerala, Eranakulam, 28-ii -1998, Coll.T.C.Narendran and party (DZCU).

Discussion: This species resembles *Leptacis konkanensis* Mukerjee in having: second funicular much longer than first and longest; marginal fringe of forewing short; fourth funicular segment not shorter than third and second funicular segment about 2x longer than thick. However it differs from *L. konkanensis* in having: notauli absent (notauli present in *L. konkanensis)*; scape length 7x its maximum width (in *L. konkanensis* scape 5.52x longer than thick); scutellum with short pen-nib like spine (scutellar spine long in *L. konkanensis)* and ovipositor not exserted (ovipositor exserted in *L. konkanensis*).

Leptacis mustus *sp.nov.*

(Figs.72-75)

Female: Length 1.19 mm; black; antenna with scape, pedicel and first to fourth funicular segment brown and four segmented club dark brown; eyes black; ocelli glassy and white; mandible dark brown; tegula dark brown to black; all legs with coxa dark brown; mid, hind femur and distal end of hind tibia dark

brown; all the other segments yellowish brown; wings subhyaline with pilosity brown; body pubescence white.

Head: finely reticulate without pubescence; eyes bare; antennal sockets close to clypeal border; vertex angular. Head viewed in front (Fig.74) length to width 42: 51; head width in dorsal view about 3x its median length; POL about 6.5x OOL; malar groove absent; scrobe indistinct; interantennal projection slightly distinct; hyperoccipital carina distinct; posterior margin of gena ecarinate; mandible well developed; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.6x malar space. Antenna (Fig.73) 10 segmented; relative length of antenna: body length 59: 100. Relative length: width of antennal segments: scape - 42: 8; pedicel- 12: 4; F_1 - 4: 3; F_2 - 8: 5; F_3 - 5: 5; F_4 - 3: 3; F_5 - 9: 9; F_6 - 9: 10; F_7 - 9: 10, F_8 - 10: 9.

Mesosoma: Finely reticulate and sparsely hairy; notauli absent; mesoscutum as long as wide; scutellum somewhat semicircular, finely punctate, hairy, and ends in a small spine like process; scutellar length to the tip of spine 1.6x shorter than its maximum width; scutellar groove deep with hairs on its anterior margin; propodeum with, white hairs on its lateral side and a median ridge; propleuron finely reticulate; mesopleuron smooth and metapleuron hairy on its posterior margin. Forewing (Fig.72) length 2.4x its maximum width; sm short, straight, not touching the wing margin and without a distal knob, marginal fringe much shorter and wing lamina moderately hairy; hind coxa length 1.5x its maximum width; hind femur 2.4x length of trochanter and 3.6x its own maximum width and shorter than hind tibia; hind tibia length 2.4x length of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, hairy and not distinctly visible because of hairy tuft; second tergite smooth and posterior segments punctate; metasoma

slightly shorter than mesosoma but longer than combined length of head and mesosoma.

Male: unknown

Host: unknown

Materials Examined: Holotype: Female, INDIA: Kerala, Eravikulam, 25-ii-1995, Coll.T.C.Narendran and Party (DZCU).

Etymology: The species name is taken from Latin meaning new.

Discussion: This species comes near *L. thanensis* Mukerjee in the key to species by Mukerjee (1978). It resembles *L. thanensis* in having: second funicular segment much longer than first; fourth funicular segment shorter than third; marginal fringe short; and antenna with four segmented club. However it differs from *L. thanensis* in having: notauli absent (notauli present in *L. thanensis*); scutellum semicircular ending in a small process (in *L. thanensis* scutellum long gradually passing into a long spine); body size small-1.19 mm (*L. thanensis* is 1.52 mm); petiole transverse and not distinctly visible because of the hairy tuft (petiole transverse with only few hairs); ovipositor not exserted (ovipositor slightly exserted in *L. thanensis*).

Leptacis narendraii sp.nov.

(Figs.76-79)

Male: Length 0.98 mm; dark brown to black; antenna elongate; slender and brownish; eyes brown to black; ocelli glassy with an yellowish tint; mandible brown; tegula dark brown; all legs brownish and long; distal end of hind tibia reddish brown; wings hyaline with pilosity dark brown; body pubescence white.

Head: Frons and vertex finely reticulate without pubescence; somewhat globular, vertex rounded; eyes bare; antennal sockets close to clypeal border; head viewed in front (Fig.78) length to width 32:46; head width in dorsal view about

3.36x its median length; POL about 6.3x OOL; malar groove absent; scrobe indistinct; interantennal projection distinct; posterior margin of gena ecarinate; mandible well developed; hyperoccipital carina not distinct; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.5x malar space. Antenna (Fig.77) long, 10 segmented; second funicular segment elongate with a spiny appearance; relative length of antenna: body length 96.5: 100. Relative length: width of antennal segments: scape – 53: 9; pedicel- 10: 7; F_1 – 7: 5; F_2 – 22: 4; F_3 – 11: 5.5; F_4 – 20: 4; F_5 – 15: 5; F_6 – 20: 6; F_7 – 17: 6, F_8 – 26: 6.

Mesosoma: Finely reticulate; notauli absent; mesoscutum as long as wide; scutellum somewhat triangular and gradually passing into a long and stout brown spine; scutellum length including spine 1.9x its maximum width; scutellum without spine as long as scutellar spine and sparsely hairy; propodeum with short hairs on its side and with a median ridge; propleuron finely reticulate; mesopleuron with a few transverse striations on upper region; metapleuron smooth, shiny and with tuft of white short silvery hairs at its posterior margin. Forewing (Fig.76) length 3.09x its maximum width; sm short; marginal fringe long and wing lamina thinly hairy; hind coxa length 1.37x its maximum width; hind femur 3.12x length of trochanter, about 3.57x its own maximum width and shorter than hind tibia; hind tibia length 2.33x length of metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole brown, transverse, 1.66x wide as its length and with short hairs. Metasoma more convex on its dorsal side; second metasomal tergite smooth, anterior pits present; metasoma as long as mesosoma but shorter than combined length of head and mesosoma; metasomal length 2x its maximum width; posterior metasomal segments weakly punctate.

Female: unknown

Host: unknown

Materials examined: Holotype: Female, INDIA: Kerala, Thiruvannur, 21-xi-1994, Coll. T.C.Narendran and party (DZCU).

Etymology: The species name is in honour of Prof.T.C.Narendran for his significant contribution to the study of taxonomy of parasitic Hymenoptera.

Discussion: In the key to Indian *Leptacis* by Mukerjee (1978) this species resembles *L. maldarensis* in having: third and fourth funicular segments unequal and elongate; head finely reticulate and marginal fringe long; first funicular segment 1.6x longer than thick; long brown spine on scutellum; notauli absent and funicular segments with long hairs. However it differs from *L. maldarensis* in having: head more rounded (vertex angled in *L. maldarensis)*; wing lamina thinly hairy and small anterior pits on second metasomal tergite (not indicated in *L. maldarensis).*

Leptacis nuperus sp. nov.

(Figs.80-83)

Female: Length 0.65 mm; dark brown to black; antenna with scape, pedicel and first four funicular segment yellowish brown and the four segmented club brown; eyes grey to black; ocelli black and glassy; tegula dark brown; coxa of all legs dark brown, first femur brown, second and third femur dark brown and distal end of hind tibia brown and others yellowish brown; wing subhyaline with pilosity dark brown; body pubescence white.

Head: Frons and vertex finely reticulate sparsely pubescent; eyes bare; antennal sockets close to clypeal border; vertex not distinctly angular; head viewed in front (Fig.82) length to width 39:54; head width in dorsal view about 3x its median length; POL about 7x OOL; malar groove absent; scrobe indistinct;

interantennal projection slightly distinct; hyperoccipital carina not distinct; occipital carina slightly distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.3x malar space. Antenna (Fig.81) 10 segmented; relative length of antenna: body length 62: 100. Relative length: width of antennal segments: scape – 35: 8; pedicel – 11: 6; F_1 - 4: 3; F_2 - 6: 4; F_3 - 3: 3; F_4 – 4: 3; F_5 - 5: 6; F_6 – 5: 7; F_7 – 7: 6; F_8 – 13: 6.

Mesosoma: Finely reticulate, sparsely hairy; notauli absent; mesoscutum slightly wider than its length; scutellum somewhat semicircular, hairy; scutellum in its lateral view with a black sharp point; transcutal suture with hairs on its anterior margin; propleuron partially reticulate; mesopleuron smooth; metapleuron with transverse carina and posterior margin hairy; propodeum hairy on its lateral side, arranged in a triangular pattern and with a median ridge. Forewing (Fig.80) length 2.4x its maximum width; sm not distinct; marginal fringe much shorter and wing lamina moderately hairy; hind coxa length 1.5x its maximum width; hind femur 1.6x length of trochanter, about 3x its own maximum width and shorter than hind tibia; hind tibia length 2.4x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole not distinctly visible as it is hairy, hairs extends to the anterior margin of second tergite; metasoma as long as mesosoma but distinctly shorter than the combined length of head and mesosoma; second tergite smooth; posterior segments finely punctate.

Male: unknown

Host: unknown

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 3-xii-1994, Coll. T.C.Narendran and party (DZCU).

Etymology: The species name is taken from Latin meaning new.

Discussion: This species comes near *L. konkanensis* Mukerjee in the key to *Leptacis* species by Mukerjee (1978). It resembles *L. ko*nkanens*is* in having: second funicular segment much longer than first; fourth funicular segment not shorter than third; second funicular segment about 2x longer than thick (1.5 x longer than thick) and scape 5.6x longer than wide. However it differs from *L. konkanensis* in having: notauli absent (present in *L. konkanensis*); scutellum with a short black spine (in *L. konkanensis* long scutellar spine); body size small 0.65 mm (*L. konkanensis* is 1.16 mm); legs with coxa dark brown, first femur brown, second and third femur dark brown and distal end hind tibia brown and others yellowish brown (in *L. konkanensis* all legs brown); antenna with scape, pedicel and first four funicular segments yellowish brown and the four segmented club brown (antenna dark brown except for the light brown scape in *L. konkanensis*); ovipositor not exserted (in *L. konkanensis* ovipositor exserted)

***Leptacis scaposus* sp.nov.**

(Figs.84-87)

Female: Length - 0.91 mm; black; antenna with four segmented dark brown club, rest of segments light brown; eyes black; ocelli glassy with a black tint; mandible brown; tegula brown; coxa of all legs, distal end of middle, hind femur, hind tibia and last tarsal segment dark brown; foreleg and second tibia light brown; wings hyaline with pilosity dark brown; body pubescence scarce and white.

Head: Frons and vertex finely reticulate without pubescence; eyes bare; antennal sockets close to clypeal border; vertex angular. Head viewed in front (Fig.86) length to width 51: 65; head width in dorsal view about 2.5 x its median length; POL about 4.8 x OOL; malar groove absent; scrobe indistinct; interantennal projection slightly distinct, posterior margin of gena ecarinate;

hyperoccipital carina distinct; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3.6x malar space. Antenna (Fig.85) 10 segmented; relative length of antenna: body length 52.2: 100. Relative length: width of antennal segments: Scape - 46: 11; pedicel- 12: 6; F_1 - 5: 4; F_2 - 7: 3; F_3 - 4: 4; F_4 - 5: 4; F_5 - 8: 8; F_6 - 6: 10; F_7 - 7: 12, F_8 - 12: 9.

Mesosoma: finely reticulate, sparsely hairy; notauli absent; mesoscutum slightly wider than its length, scutellum somewhat triangular, hairy with a small up curved spine; scutellum length to the tip of spine as long as its base; Scutellar groove hairy on its margin; propodeum with a medium ridge like process; propleuron weakly reticulate, meso and metapleura smooth and shiny; mesopleuron with a few transverse carinae. Forewing (Fig.84) length 2.8x its maximum width; sm short; straight, not touching the wing margin and without a distal knob; marginal fringe much shorter and wind lamina moderately hairy; hind coxa length 1.37x its maximum width; hind femur 2.3x length of trochanter, about 3x its own maximum width and shorter than hind tibia; hind tibia length 2.8x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: petiole short transverse, 4x wide as its length; second tergite larger; posterior tergites punctate; metasoma slightly longer than mesosoma but distinctly shorter than combined length of head and mesosoma; metasomal length 1.56x its own maximum width.

Male: unknown

Host: unknown

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 3-xii-1994, Coll. T.C.Narendran and party (DZCU).

Etymology: The species is named after relatively short antennal scape.

Discussion: This species comes near *L. konkanensis* Mukerjee in the key to species by Mukerjee (1978). It resembles *L. konkanensis* in having: second

funicular segment much longer than first; fourth funicular segment not shorter than third; second funicular segment 2x longer than thick (2.6 x longer than thick) and ovipositor exserted. However it differs from *L. konkanensis* in having: scape only 3.8x longer than thick (in *L. konkanensis* 5.52x longer than thick); notauli absent (notauli present in *L. konkanensis*) and scutellum somewhat triangular ending in a small up curved spine (in *L. konkanensis* scutellum long, gradually passing into a more or less long spine).

Leptacis thrissurensis sp. nov.

(Figs.88-91)

Male: Length 0.716 mm; dark brown to black; antenna dark brown except for the brownish scape; front and hind ocelli white glassy; mandible brown; all legs brown; tegula dark brown; wings hyaline with pilosity brown; body pubescence silvery white.

Head: Frons smooth; vertex weakly reticulate, shiny without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.90) length to width 31:46; head width in dorsal view about 2x its median length; POL about 3.75x OOL; scrobe indistinct; interantennal projection distinct; hyperoccipital carina distinct; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 6x malar space. Antenna (Fig.89) 10 segmented, long hairs; relative length of antennna: body length 94.18: 100. Relative length: width of antennal segments: scape – 42: 6; pedicel – 10: 6; F_1 - 7: 4; F_2 - 14: 5; F_3 - 9: 5; F_4 - 11: 6; F_5 - 12: 6; F_6 - 14: 5; F_7 - 12: 6; F_8 - 19:5.

Mesosoma: Finely reticulate, shiny, sparsely hairy; notauli absent; mesoscutum length 1.14x its width; scutellum somewhat triangular, with a stout long dark brown spine; scutellum length upto tip of spine 2x its maximum width, hairy on its lateral and dorsal side; pro, meso and metapleura smooth and shiny; posterior end of metapleuron hairy. Forewing (Fig.88) length 2.7x its maximum width; sm short, straight, not touching wing margin and without distal knob; wing lamina thinly hairy; forewing with moderately long fringes of hairs on upper and lower margin and with much longer fringes on apical lower margin. Propodeum laterally hairy, hairs arranged converging to a point and a median carina. Hind coxa length 1.28x its width; hind femur swollen and 3.2x length of trochanter, about 3.8x its own maximum width and shorter than hind tibia; hind tibia dilated at its distal end, its length 3x length of hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.3x as wide as its length, few hairs on its lateral side and longitudinal carina; second tergite smooth, shiny with paired oval depression situated anteriolaterally and with dense small hairs; ventral side with white silvery hairs; metasoma little shorter than mesosoma and distinctly shorter than combined length of head and mesosoma, a little less than 2x its width in dorsal view; metasoma more convex dorsally.

Male: unknown.

Host: unknown (probably paddy pests)

Etymology: The species is named after its locality.

Materials Examined: Holotype: Male, INDIA: Kerala, Thrissur, 15-x-1998, Coll. R. Usha Kumari (DZCU).

Discussion: This species comes near *Leptacis maldarensis* Mukerjee in the key to species by Mukerjee (1978). It resembles *L. maldarensis in* in having: long second funicular segment of antennae and presence of long hairs on the segments; absence of notauli and presence of long brown scutellar spine. However

it differs from *L. maldarensis* in having: marginal fringes of wing being moderately long on the upper and lower margin and much long on the lower portion of apical margin (in *L. maldarensis* marginal hairs long); petiole with longitudinal carina (not indicated in *L. maldarensis*) and small oval shaped anterior pits on second metasomal tergite (not indicated in *L. maldarensis*)

Genus *PLATYGATER* Latreille

Scelio (ex parte) (Latreille, 1805). *Histoire naturelle, generale et particuliere des crustaces et des insectes.* Vol.13.F. Dufart, Paris 432pp. Type species: *Scelio rugosulus* Latreille, designated by Latreille (1810).

Platygaster Latreille,1809. *Gen.crust.Ins.*,**4**:31.Type species *Platygaster ruficornis* Latreille,1805

Rhacodia Panzer, 1838. *Fauna insec. Ger. Deitsch. Insect.*1-90. Type species: *Diapria striolata* Nees ab Esenbeck, 1834

Hypocampsis Foerster, 1856b. *Hym. Stud.,* **2**:107. No type species included.

Polygnotus Foerster, 1856. *Hym. Stud.,* **2**: 107. Type species *Platygaster striolatus* Nees ab Esenbeck,1834.

Aneurhynchus Provancher, 1887. *Canada Hym.*p.7. Type species: *Platygaster aneurus.*

Coelopelta Ashmead, 1893. *Bull U.S. Nat. Mus.,* **44**:1-472. Type species: *Coelopelta mirabilis* Ashmead, 1893.

Aneuron Brues. 1910. Broteria, (S. Zool) **9**: 150-158. Type species: *Platygaster anormis* Brues.

Triplatygaster Kieffer, 1914b. *Das Tierreich* **42**:1-237. Type species: *Platygaster contorticornis* Ratzeburg, 1844.

Xestonotidea Gahan, 1919. *Proc. Ent. Soc. Washington* **21**:121-123. Type species: *Xestonotidae foersteri* Gahan,1919.

Parepimeces Kieffer, 1926. *Das Tierreich* 48:1-885. Type species: *Epimecus ensifer* Westwood, 1833

Diagnostic characters: Antenna 10 segmented, clavate; eyes naked; mandibles bidentate; maxillary palp two segmented; labial palp with one segment, scutellum arched, rounded, unarmed and sparsely hairy; notauli present or absent; wings with sm only trace or absent; metasoma more or less convex; petiole transverse; sixth metasomal tergite only slightly longer than fifth tergite; fifth and sixth tergite usually transverse.

Distribution: Afro tropical, Nearctic, Neotropical, Oriental and Palaearctic.

Biology: Parasites of Cecidomyidae.

Remarks: Total 319 species reported out of this 14 species are reported from India.

KEY TO THE INDIAN SPECIES OF *PLATYGASTER* LATREILLE

1. Antennal club five segmented 2

- Antennal club four or six segmented 12

2. Notauli present 3

- Notauli absent 8

3. Submarginal vein absent 4

- Submarginal vein present 5

4. Notauli complete and well developed; occiput transversely striate ..... ***P. satara*** Mani

- Notauli developed but not converging behind, occiput not striate ..... ***P. panchganii*** Mani

5. Scutellum flat; body length: antennal length -100: 73.09; hyperoccipital carina not distinct; tibia as long as combined length of tarsal segments ..... ***P. tanus*** sp. nov.

- Scutellum slightly convex 6

6. Notauli weak; marginal fringe moderately long (Fig.116). ..... ***P. minimus*** (Mukerjee)

- Notauli distinct 7

7. Second metasomal tergite with distinct longitudinal fovea on each side of the middle and a shallow lower median one ..... ***P. foersteri*** (Gahan)

- Second metasomal tergite without longitudinal fovea but with longitudinal carina on its anterior region ..... ***P. sasii*** sp. nov.

8. Scutellum flat, circular; marginal fringe moderate ..... ***P. coorgensis*** (Mukerjee)

- Scutellum convex 9

9. Body translucent; yellow coloured; mesopleura more convex; body length:antennal length - 100: 85 ..... ***P. galbus*** sp. nov.

- Body not translucent, black 10

10. Submarginal vein present; marginal fringe moderate ..... ***P. malabaricus*** (Mukerjee)

- Submarginal vein absent; marginal fringe absent ..... ***P. ramachandrai*** (Rao)

11. Antennal club four segmented 13

- Antennal club six segmented 17

12. Notauli absent; scutellum flat; metasoma elongate, tapering with tuft of hairs on petiole and second metasomal tergite ..... ***P. intermedius*** sp. nov.

- Notauli present; scutellum convex, metasoma not as above..... 13

13. Submarginal vein absent; notauli weak or not distinct; scutellum rounded at apex ..... ***P. oryzae*** (Cameron)

- Submarginal vein present; notauli distinct; scutellum semicircular. 14

14. Scutellum flat, metasoma slightly depressed; tibia shorter than combined length of hind tarsal segments ..... ***P. zandanus*** sp. nov.

- Scutellum slightly convex 15

15. Marginal fringe short; scape 5.21x longer than thick; first funicular segment short ..... ***P. indicus*** Mukerjee

- Marginal fringe moderately long (Fig120); Scape and first funicular segment character not as above 16

16. Hind tibia shorter than combined length of hind tarsal segments; hyperoccipital carina distinct; body length: antennal length - 100: 72.4; scape 4.1x as long as its width ..... ***.P.nigrocoxatus*** sp.nov.

- Hind tibia as long as combined length of hind tarsal segments; hyperoccipital carina not distinct; body length: antennal length - 100: 62; scape only 3.5x as long as its width ..... ***P. keralicus*** sp. nov.

17. Notauli present, highly convex scutellum (Fig.99); wing lamina with only few hairs; body length: antennal length - 100: 65 ..... ***P. ferus*** sp. nov.

- Notauli absent; other characters not as above 18

18. Submarginal vein absent; very short marginal fringe; scape 3.5x longer than wide ..... ***P. salvadorae*** Rao

- Submarginal vein present; marginal fringe moderate; scape 4.33x longer than wide ..... ***P. inderdaadi*** Mukerjee

Platygaster coorgensis Mukerjee

(Figs.92-95)

Anopedias coorgensis Mukerjee,1978. *Mem.Sch. Ent.*, **5:** 67-98

Platygaster coorgensis (Mukerjee) (Masner transferred to *Platygaster,* pers. comm. to Mukerjee) cited in the *Catalogue of the Platygastridae (Platygastroidea) of the World (Insecta : Hymenoptera*), Vlug, 1995. p.51

Female: Length 0.76 mm; black; antenna with scape, pedicel and first three clavomeres light brown and rest of segments dark brown; eyes grey; hind and front ocelli glassy white; tegula brown; all legs light brown except darker last tarsal segment; wings hyaline with pilosity brown; body pubescence white.

Head: Frons and vertex weakly reticulate, shiny without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.94) length to width 45: 79; head width in dorsal view about 2.8x its median length; POL about 3x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 2.3x malar space, malar space carinate. Antenna (Fig.93) 10 segmented; relative length of antenna: body length 72: 90. Relative length: width of antennal segments: scape – 45: 9; pedicel – 14: 9; F_1 - 7: 4; F_2 - 6: 4; F_3 – 6: 5; F_4 – 9: 5; F_5 - 8: 5; F_6 - 12: 9; F_7 - 12: 9; F_8 - 12: 9.

Mesosoma: finely reticulate, shiny, notauli absent; mesoscutum as wide as long; scutellum width 1.3x its length, scutellum flat, longitudinal carina present; propodeum with ridge on either side, surface coarse; propleuron finely and partially reticulate; mesopleuron smooth and shiny; metapleuron sculptured and densely hairy. Forewing (Fig.92) length 2.7x its maximum width, sm very short,

straight, not touching wing margin and without distal knob; marginal fringe short, apical fringe moderately long; hind coxa length 1.2x its width; hind femur 2.5x length of trochanter, about 3.3x its own maximum width and shorter than hind tibia; hind tibial length 1.8x length of metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Compressed; petiole brown, transverse, 2x wide as its length, with few hairs on its sides; second tergite smooth and shiny; posterior tergites with fine punctures; metasoma as a long as mesosoma, distinctly shorter than combined length of head and mesosoma, about 1.4x longer than its maximum width in dorsal view.

Male: unknown.

Host: unknown.

Materials Examined: Plesiotype: Female, INDIA: Kerala, 28-viii-1998, Coll. R.Usha Kumari (DZCU).

Discussion: It resembles *P. malabaricus* Mukerjee in having: five segmented antennal club and absence of notauli. However it differs from *P. malabaricus* in having: scutellum strongly convex (in *P. coorgensis* scutellum is flat.)

Platygaster ferus sp. nov.

(Figs.96-99)

Female: length 1.27 mm; black; antennal scape brown, basal part of pedicel yellowish brown and rest of segments dark brown; eyes grey; ocelli glassy white; mandible brown; tegula dark brown to black; legs with coxa dark brown,

distal end of hind femur and tibia and hind tarsal segments dark brown; wings hyaline with pilosity light brown; body pubescence white.

Head: Frons and vertex finely reticulate without pubescence; eyes bare; antennal socket close to clypeal border. Head viewed in front (Fig.98) length to width 32:49; head width in dorsal view about 3.08x its median length; POL about 3.2x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; hyperoccipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 2.2x malar space; malar space with transverse carina. Antenna (Fig.97) 10 segmented; relative length of antenna: body length 65:100. Relative length: width of antennal segments: scape – 39: 9; pedicel – 9: 5; F_1 - 5: 6; F_2 - 6: 7; F_3 – 7: 8; F_4 – 8: 9; F_5 - 7: 9; F_6 - 7: 10; F_7 - 7: 10; F_8 – 14: 9.

Mesosoma: Finely reticulate and sparsely hairy; notauli present and distinct when viewed at certain angles; scutellum semicircular, highly convex and with few hairs; mesoscutum length 1.09x its maximum width; scutellum width 1.55x its maximum length; propodeum with two lateral process and short hairs on its lateral side. Forewing (Fig.96) length 2.23x its maximum width; sm short, straight, not touching wing margin and without distal knob; marginal fringe short; hind coxa as long as wide; hind femur 1.8x length of trochanter, about 2.57x its maximum width and shorter than hind tibia; hind tibial length 2.66x hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole somewhat trapezoidal, its maximum width about 1.75x its median length, longitudinal carina present; second metasomal tergite shiny, anterior region with longitudinal striations; metasoma narrowly conical; its length longer than mesosoma and much shorter than combined length of head and mesosoma; its length about 2.29x its maximum width in dorsal view.

Male: unknown.

Host: unknown.

Etymology: The species name is taken from Latin meaning wild.

Materials Examined: Holotype: Female, INDIA: Coorg, 6-iii-1994, Coll. T.C.Narendran and party (DZCU). Paratype: 1Female, INDIA: Kerala, Vellanikkara (Thrissur), 26-xi-2001, Coll. R. Usha Kumari.

Discussion: This species resemble *Platygaster tubulosa* Brues in having: presence of notauli and highly convex scutellum. However the new species differs from *P. tubulosa* in having: wing lamina thinly hairy (in *p. tubulosa* wings densely hairy) and metasoma with 3-6 segments externally visible. (3-6 metasomal segments completely telescoped inside in *p. tubulosa*).

Platygaster galbus sp. nov.

(Figs.100-103)

Female: Length 0.85 mm; body including head and mesosoma pale yellowish brown; mandible brown; hind and front ocelli black; tegula light brown; metasoma brown with a black tint; body sutures more darker; all legs except last tarsal segment light brown, last tarsal segment black; wings subhyaline with pilosity brown; body pubescence white.

Head: Frons reticulate and vertex with fine punctures, shiny without pubescence; eye bare; antennal sockets close to clypeal border. Head viewed in front (Fig.102) length to width 38:55; head width in dorsal view about 3.5x its median length; scrobe and interantennal projection indistinct; malar groove absent; malar space with carina; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view 1.6x malar space. Antenna (Fig.101) 10 segmented; relative length of

antenna: body length 85: 100. Relative length: width of antennal segments: scape - 52: 10; pedicel - 15: 7; F_1 - 8: 7; F_2 - 10: 10; F_3 - 10: 9; F_4 - 9: 11; F_5 - 13: 10; F_6 - 10: 11; F_7 - 12: 10; F_8 - 22: 10.

Mesosoma: smooth, sparsely hairy; notauli absent; mesoscutum width 1.3x its length; scutellum bulging, its width 1.3x its length; propodeum with longitudinal carina; pro and mesopleura smooth, shiny, mesopleuron more convex; metapleuron hairy. Forewing (Fig.100) length 2.7x its maximum width; sm short, straight, not touching wing margin and without distal knob; marginal fringe short, apical fringe moderate; hind coxa length 1.2x its maximum width; hind femur 2.5x length of trochanter, about 4.1x its own maximum width; hind tibial length 2x length of metatarsus, distinctly shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.5x wide as its length, two longitudinal black lines present and with few hairs; tergites smooth; metasoma little longer than mesosoma but distinctly shorter than length of head and mesosoma combined; about 1.7x longer than wide in dorsal view.

Male: unknown.

Host: unknown.

Etymology: The species name taken from Latin word 'galbus' meaning yellow.

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 10-xi-1998, Coll. T.C.Narendran and party (DZCU). Paratype: 4 Females, INDIA: Kerala, Calicut University Campus, collected on 12-x-1999, 5-iv-2000, 18-iv-2000 and 19-v-2000, Coll. T.C.Narendran and party.

Discussion: This species resembles *P. minimus* Mukerjee in having: five segmented antennal club and antennal scape 4x its width. However it differs from *P. minimus* in the following characters: notauli absent (in *P. minimus* notauli

present); size of body 0.85 mm. (*P. minimus*-1 mm); colour of body with head and mesosoma pale yellowish brown and metasoma brown with a black tint (*P. minimus* is dark brown to black); and all legs except last tarsal segment light brown (all legs brown except for darker coxa in *P. minimus*).

Platygaster inderdaadi (Mukerjee)

(Figs.104-107)

Eritrissomerus indicus Mukerjee, 1978. *Mem. Sch. Ent.*,**5:** 78-80.

Platygaster inderdaadi (Mukerjee) *Eritrissomerus indicus* placed in *Platygaster* by Masner (pers. comm. to Mukerjee). Preoccupied, *Platygaster indicus* Mukerjee, cited in the *Catalogue of the Platygastridae (Platygastroidea) of the World (Insecta: Hymenoptera)*, Vlug, 1995. p.55

Male: Length 0.88 mm; black; antenna brown with scape pale brown; eyes pale grey; hind ocelli brown, front ocelli glassy and black; tegula black; all legs pale brown with last tarsal segment dark brown coloured; wings hyaline with pilosity brown; pubescence on body silvery white.

Head: Frons and vertex finely reticulate, shiny without pubescence; eye bare; antennal sockets close to clypeal border. Head viewed in front (Fig.106) length to width 34: 41; head width in dorsal view about 2.7x its median length; POL subequal to OOL; scrobe and interantennal projection indistinct; malar groove absent; malar space with carina; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 2.2x malar space. Antenna (Fig.105) 10 segmented; relative length of antenna: body length 74: 100. Relative length: width

of antennal segments: scape - 23: 55; pedicel - 6: 3; F_1 - 2: 2; F_2 - 6: 5; F_3 - 3: 3.5; F_4 - 3: 4; F_5 - 3.5: 3; F_6 - 3: 3.5; F_7 - 4: 4; F_8 - 9: 4.

Mesosoma: Finely reticulate, shiny, notauli absent; mesoscutum width 1.3x its width; scutellum slightly bulging, sparsely hairy, scutellum width 1.2x its length; propodeum with two submedian ridge, surface coarse and with few hairs; propleuron finely reticulate; mesopleuron smooth; metapleuron coarse and densely hairy. Forewing (Fig.104) length 2.8x its maximum width, sm short, straight, not touching wing margin and without a distal knob; marginal fringe moderately long, apical fringe much longer; hind coxa length somewhat equal to width; hind femur 2.1x length of trochanter, about 3.5x its own maximum width and shorter than hind tibia; hind tibial length 3.3x length of hind metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.6x as wide as its length, brown with few hairs; second tergite smooth, shiny, posterior tergites with very minute punctures; metasoma shorter than mesosoma, its length about 1.6x its width in dorsal view; postpetiolar segment slightly larger; posterior end of metasoma concave.

Male: unknown

Host: unknown (probably paddy parts)

Materials Examined: Plesiotype: Female, INDIA: Kerala, Kollam, 28-viii-1999, Coll.R.Usha Kumari (DZCU).

Discussion: *P. interdaadi* (Mukerjee) resembles *P. salvadorae* Rao in having: six segmented antennal club and convex scutellum. However it differs from *P. salvadorae* in having: presence of submarginal vein (submarginal vein absent in *P. salvadorae*); marginal fringe moderate (In *P. salvadorae* marginal fringe very short) and scape 4.33x longer than wide (scape 3.5x longer than wide).

Platygaster intermedius sp. nov.

(Figs.108-111)

Female: Length 1.1mm; black; antenna with scape yellowish brown, pedicel and clava dark brown; eyes black; front and back ocelli black and glassy; mandible brown; tegula black; all legs yellowish brown with last tarsal segment black; wings hyaline with pilosity black, body pubescence silvery white.

Head: Frons and vertex distinctly reticulate, somewhat shiny and without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.110) length to width 35: 52; head width in dorsal view about 2.4x its median length; POL about 6x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 2.5x malar space. Antenna (Fig.109) 10 segmented; relative length of antenna: body length 48.46: 100; Relative length: width of antennal segments: scape - 39: 7; pedicel- 19: 6; F_1 - 7: 5; F_2 - 6: 4; F_3 - 7: 4; F_4 – 6: 4; F_5 - 8: 7; F_6 - 7: 10; F_7 - 6: 10; F_8 - 12: 7.

Mesosoma: Distinctly reticulate, shiny; notauli absent; mesoscutum as wide as long and humped; scutellum distinctly sculptured, flat with fine hairs; propodeum with forwardly directed tuft of white silvery hairs, surface coarse; propleuron sculptured, mesopleuron smooth and metapleuron with white silvery tuft of hairs. Forewing (Fig.108) length 3x its maximum width; sm absent; marginal fringe short, apical fringe moderately long; hind coxa as long as wide; hind femur 2.1x length of trochanter; about 3.5x its own maximum width, swollen medially; and shorter than tibia; hind tibial length 2.2x length of metatarsus and shorter than combined length of hind metatarsal segments.

Metasoma: Elongate, tapering; petiole not visible because of the tuft of hairs encircling petiole and anterior margin of second tergite, shiny; distinct punctures on posterior tergites; metasoma distinctly longer than combined length of head and mesosoma, more than 3.7x its maximum width in dorsal view.

Male: unknown.

Female: unknown.

Etymology: Since it shows resemblance to the genus *Synopeas* in having tuft of hairs on petiole and second tergite the name *intermedius* (from Latin) is given.

Materials Examined: Holotype: Female, INDIA: Kerala, Arattupuzha, 27-viii-1999, Coll. R.Usha Kumari (DZCU).

Discussion: This species resembles *P.oryzae* Cameron in having: four segmented club and absence of submarginal vein. However it differs from *P. oryzae* in having: scutellum flat (scutellum convex and rounded at the apex in *P.oryzae*) and petiole elongate and tapering, with tuft of hairs encircling petiole and anterior region of second tergite (in *P.oryzae* petiole not tapering and without tuft of hairs).

Plastygaster keralicus sp. nov.

(Figs.112-115)

Female: Length 0.8 mm; black; antenna black; eyes black; ocelli black; mandible brown; tegula black; all legs black except for the light brown first four tarsal segments; last tarsal segment black; wings hyaline with pilosity black; body pubescence scarce and white.

Head: Frons smooth; vertex with fine transverse reticulate striations, shiny without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.114) length to width 34: 54; head width in dorsal view about 2.2x its median length; POL about 3x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3.2x malar space. Antenna (Fig.113) 10 segmented; relative length of antenna: body length 62.5:100. Relative length: maximum width of antennal segments: scape - 41: 11; pedicel - 11: 6.5; F_1 - 5: 4; F_2 - 7: 7; F_3 - 6: 6; F_4 - 5: 5; F_5 - 8: 7; F_6 - 10: 10; F_7 - 11: 10; F_8 - 14: 9.

Mesosoma: Finely reticulate, shiny; notauli present and distinct; mesoscutum width 1.12x its length; scutellum width 1.4x its length, scutellum slightly convex; propodeum with lateral carina on either side; surface coarse; propleuron with punctures; mesopleuron smooth and shiny; metapleuron coarsely sculptured and hairy. Forewing (Fig.112) length 2.7x its maximum width; sm short, straight, not touching wing margin and without distal knob; marginal fringe moderate except apical margin where it is longer; hind coxa length 1.1x its width; hind femur 3x length of trochanter, about 2.5x its own maximum width and shorter than hind tibia; hind tibial length 3.2x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.2x wide as its length, with few hairs on sides; tergites smooth; metasoma a little longer than mesosoma, but distinctly shorter than combined length of head and mesosoma, a little less than 2x its maximum width in dorsal view.

Male: unknown

Host: unknown

Materials Examined: Holotype: Female, INDIA: Kerala, Vellanikkara, 23-ix-1998, Coll. R.Usha Kumari (DZCU).

Etymology: The species named after Kerala state.

Discussion: This species resembles *Platygaster indicus* Mukerjee in having: four segmented antennal club; presence of notauli and slightly bulging scutellum. However it differs from this species in having: small body size- 0.8 mm. (*P. indicus* - 1.68 mm); all legs black except for the first four tarsal segments which is brown (in *P. indicus* all legs brown except for the dark brown coxa and femur and apical tibia); scape length 3.5x its width (in *P. indicus* 5x its width).

Platygaster minimus (Mukerjee)

(Figs.116-119)

Anopedias minimus Mukerjee,1978. *Mem. Sch. Ent.*, **5**: 67-98.

Platygaster minimus (Mukerjee) (Masner transferred to *Platygaster*, pers. comm.to Mukerjee) cited in the *Catalogue of the Platygastridae (Platygastroidea) of the World (Insecta: Hymenoptera)*, Vlug, 1995. p.58

Female: Length 1.3 mm; dark brown to black; antennal scape brown; pedicel and clavomeres dark brown; front and back ocelli glassy white; mandible brown; tegula black; all legs yellowish brown with last tarsal segment darker; wings hyaline with pilosity dark brown; body pubescence white.

Head: Frons smooth; vertex reticulate, shiny without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.118) length: width 42:59; head width in dorsal view about 3.25x its median length; POL about 3.2x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider

than mesosoma in dorsal view; maximum diameter of eye in laterl view 2.8x malar space. Antenna (Fig.117) 10 segmented; relative length of antenna: body length 69:100. Relative length: maximum width of antennal segments: scape - 44:11; pedicel - 17:9; F_1 - 6:6; F_2 - 8:5; F_3 - 7:5; F_4 - 9:9; F_5 - 11:10; F_6 - 9:10; F_7 - 12:9; F_8 - 18:9.

Mesosoma: Finely reticulate, shiny; notauli present, weak; mesoscutum width 1.28x its length; scutellum width 2.5x its length, slightly bulging, sculptured and hairy; propodeum with lateral brown process on both sides, surface with punctures and hairy; pro and mesopleura smooth and shiny, mesopleuron more convex; metapleuron sculptured and hairy. Forewing (Fig.116) length 2.5x its maximum width; sm short, light brown, straight, not touching wing margin and without distal knob; marginal fringe short except apical margin which is more longer; hind coxa length 1.1x its maximum width; hind femur 2.3x length of trochanter, about 2.8x its own maximum width and shorter than hind tibia; hind tibial length 2.3x length of hind metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.6x wide as its length and with few hairs; second tergite shiny, smooth; posterior tergites with weak punctures; metasoma length a little longer than mesosoma but shorter than combined length of head and mesosoma.

Male: unknown

Host: unknown

Materials Examined: Plesiotype: Female, INDIA: Kerala, Thrissur, 14-xi -1998, Coll. R.Usha Kumari (DZCU).

Discussion: *P.minimus* (Mukerjee) resembles *P. malabaricus* (Mukerjee) in having: five segmented antennal club and bulging scutellum. However it differs from *P. malabaricus* in having: notauli present (in *P. malabaricus* notauli absent).

Platygaster nigrocoxatus sp. nov.

(Figs.120-123)

Female: Length 0.88 mm; black; antennal scape brown, pedicel and clava dark brown; eyes grey; hind and front ocelli red; tegula black; coxa black, all other leg segments except last tarsal segment brown, last tarsal segment darker; wings hyaline with pilosity brown; body pubescence more and silvery white.

Head: Frons smooth and finely reticulate, vertex angled, shiny with sparsely arranged hairs; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.122) length to width 45:61; head width in dorsal view about 2.7x its median length; POL about 2.2x OOL; scrobe and interantennal projection indistinct, malar groove absent; posterior margin of gena ecarinate; mandible bidentate; head wider than mesosoma in dorsal view; maximum diameter of eye in later view about 2x malar space. Antenna (Fig.121) 10 segmented; relative length of antenna: body length 72.4:100. Relative length: width of antennal segments scape – 50:12; pedicel – 13:6; F_1 - 8:6; F_2 - 8:6; F_3 - 8:5; F_4 – 7:5; F_5 - 9:6; F_6 - 10:8; F_7 - 10:8; F_8 - 15:8.

Mesosoma: Finely reticulate, shiny; notauli distinct; mesoscutum width 1.1x its length; scutellum width 1.2x its length; scutellum slightly bulging and hairy; propodeum with lateral process, surface with coarse punctures; pro and mesopleura smooth; propleuron sparsely hairy and metasoma densely hairy. Forewing (Fig.120) length 2x its maximum width; sm short, straight, not touching wing margin and without distal knob; marginal fringe moderate, apical fringe longer; coxa black, hind coxa length 1.2x its maximum width; hind femur 2.4x length of trochanter, about 3.1x its own maximum width; hind tibial length 2.3x length of hind metatarsus and shorter than combined length of hind tarsal segments; tibia densely hairy.

Metasoma: Petiole transverse, 1.27x as wide as its length, tuft of hairs present; second tergite smooth; posterior segments with minute punctures; metasoma longer than mesosoma but distinctly shorter than combined length of head and mesosoma; metasomal length 2x its own maximum width in dorsal view; postpetiolar segment largest.

Male: unknown.

Female: unknown.

Etymology: The species is named after the black coxa.

Materials examined: Holotype: Female, INDIA: Kerala, Kollakadavu, 26-vii-1999, Coll. R.Usha Kumari (DZCU).

Discussion: This species resembles *Platygaster indicus* Mukerjee in having: four segmented antennal club; presence of notauli and slightly bulging scutellum. However it differs from *P. indicus* in having: small size 0.88 mm. (*P. indicus* - 1.68 mm); coxa black and all leg segments except last tarsal segment brown (in *P. indicus* all legs brown except for the dark brown coxa, femur and apical region of tibia).

Platygaster oryzae Cameron

(Figs.124-127)

Cameron, (1891). *Mem. Proc. Manchester Lit. Philos. Soc.*, **4:** 182-194.

Female: Length 0.86 mm; dark brown to black; antenna with scape, pedicel and first funicular segment brown and rest of segments dark brown; eyes grey; ocelli glassy with a black tint; mandible brown; tegula brown; all legs brown and long; wings hyaline with pilosity dark brown; body pubescence silvery white.

Head: Frons transversely striate at its base and weakly striate at upper portion; vertex with transverse striation, without pubescence; eyes bare; antennal sockets close to clypeal border; vertex angular. Head viewed in front (Fig.126) length to width 47:69; head width in dorsal view about 2.6x its median length; POL about 2.6x OOL; malar groove absent; scrobe not distinct; inter antennal process slightly distinct; posterior margin of gena ecarinate; hyperoccipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3x malar space. Antenna (Fig.125) 10 segmented relative length of antenna: body length 74:100. Relative length: width of antennal segments: scape - 49:10; pedicel - 14:6; F_1 - 4:5; F_2 – 10:5; F_3 – 7:4; F_4 - 8:8; F_5 – 20:9; F_6 – 20:11; F_7 – 11:12; F_8 - 18:11.

Mesosoma: Weakly reticulate on upper margin, sparsely hairy; notauli absent; mesoscutum as long as wide; scutellum more or less elongate somewhat triangular and hairy; scutellar length slightly less than its maximum width; scutellar groove well distinct with few bristle like hairs on upper margin of groove; propodeum with a shallow ridge; propleuron weakly reticulate; mesopleuron smooth; metapleuron with few transverse carina. Forewing (Fig.124) length 2.8x its maximum width; sm absent; marginal fringe short; wing lamina thickly hairy; hind coxa length 1.57x its maximum width and slightly shorter than hind tibia; hind tibia length 2.25x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole distinct, longitudinal carina present, a rim on its anterior region; metasoma longer than mesosoma but distinctly shorter than combined length of head and mesosoma; second metasomal segment smooth; posterior segments with punctures.

Male: Unknown

Host: Rice gall fly

Materials Examined: Plesiotype: Female, INDIA: Kerala, Kollakadavu, 26-vii-1999, Coll. R.Usha Kumari (DZCU).

Discussion: *P. oryzae* Cameron resembles *P. indicus* in having: convex scutellum. However it differs from *P. indicus* in having: four segmented antennal club (in *P. indicus* antennal club five segmented); submarginal vein absent (submarginal vein present in *P. indicus*).

Platygaster sasii sp. nov.

(Figs.128-131)

Female: Length 1.4 mm; black, antenna with scape pedicel and first funicular segment yellowish brown, rest of the segments dark brown; eyes black; hind and front ocelli yellow and glassy; mandible brown; tegula black with lower margin brown; all legs yellowish brown with coxa black; wings hyaline with pilosity brown; body pubescence white.

Head: Frons smooth; vertex with distinct transverse carina, without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.130) length to width 54: 79; head width in dorsal view about 3.7x its median length; POL about 2.8x OOL; scrobe and interantennal projection indistinct; malar groove absent, malar space without carina; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 3.5x malar space. Antenna (Fig.129) 10 segmented; relative length of antenna: body length 68.7: 100. Relative length: width of antennal segments: scape - 71: 13; pedicel - 16: 8; F_1 - 10: 6; F_2 - 13: 7; F_3 - 13: 7; F_4 - 11: 7; F_5 - 12: 8; F_6 - 14: 10; F_7 - 13:10; F_8 - 22: 11.

Mesosoma: Finely and partially reticulate, shiny; notauli well distinct; mesoscutum length 1.4x its maximum width; scutellum width 1.3x its length,

scutellum slightly bulging and hairy; propodeum with two blunt process, surface coarsely sculptured; propleuron partially sculptured; mesopleuron smooth; metapleuron pubescent. Forewing (Fig.128) length 4.75x its maximum width, sm short, straight not touching wing margin and without distal knob; marginal fringe moderate, apical fringe long; coxa black, hind coxa length 2.5x its maximum width; hind femur 1.9x length of trochanter, about 3x its own maximum width and shorter than hind tibia; hind tibia 1.8x length of hind metatarsus and shorter than combined length of hind tarsal segments.

Metasoma: Petiole as wide as long, black, cylindrical, longitudinal carina present; second tergite smooth shiny with longitudinal carina at its anterior margin; posterior tergites with fine punctures; metasoma length slightly longer than mesosoma but distinctly shorter than combined length of head and mesosoma, its length about 1.5x its maximum width in dorsal view.

Male: unknown.

Female: unknown.

Etymology: The species named after my husband M.N.Sasi who collected the holotype.

Materials Examined: Holotype: Female, INDIA: Kerala, Thrissur, 27-ix-1998, Coll.M.N.Sasi (DZCU).

Discussion: This species resembles *Platygaster indicus* Mukerjee in having: four segmented antennal club; scape length 5x its width; notauli present; slightly bulging scutellum. However it differs from *P. indicus* in having: antenna with scape, pedicel and first funicular segment yellowish brown and rest of the segments dark brown (in *P. indicus* antenna black except for the tip of second and third segments which are paler); all legs yellowish brown with coxa black (all legs brown except for the dark brown coxa, femur of legs and apical end of tibia in *P. indicus*) and hyperoccipital carina distinct (not indicated *in P. indicus)*

Platygaster tanus sp. nov.

(Figs.132-135)

Female: Length 0.9 mm; black; antennal scape brown, pedicel and clava dark brown; eyes black; ocellus black glassy; tegula black; all legs brown with last tarsal segment darker; wings hyaline with pilosity black; body pubescence white.

Head: Frons smooth; vertex reticulate, shiny without pubescence; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.134) length to width 41: 63; head width in dorsal view about 2.2x its median length; POL about 6x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; mandible dark brown; occipital carina distinct; head as wide as mesosoma in dorsal view; maximum diameter of eye in lateral view about 5x malar space. Antenna (Fig.133) 10 segmented, hairy; relative length of antenna: body length 73.09:100. Relative lengths: maximum width of antennal segments: scape - 45: 9; pedicel - 11: 7, F_1 - 5: 4; F_2 - 12: 6; F_3 - 10: 5.5; F_4 - 7: 6; F_5 - 7: 9; F_6 - 7: 9; F_7 - 8: 9; F_8 - 16: 10.

Mesosoma: Finely reticulate, shiny, notauli present and distinct; mesoscutum as wide as its length, punctures on the sides of tegula and scutellum; scutellum as wide as its length, flat and hairy; propodeum coarse and sparsely hairy laterally; propleuron partially sculptured; mesopleuron smooth and shiny; metapleuron coarse and hairy. Forewing (Fig.132) length 2.5x its maximum width; sm straight, short, not touching wing margin and without distal knob; marginal fringe short but apical fringes moderately longer; hind coxa as long as wide; hind femur 2.5x length of trochanter, about 4x its own maximum width and shorter than hind tibia; hind tibial length 2.9x length of metatarsus and as long as combined length of tarsal segments; legs hairy.

Metasoma: Petiole transverse, 1.4x wide as its length, with few hairs on sides; tergites shiny, smooth except posterior tergites, which are finely punctured; metasoma length a little longer than mesosoma but distinctly shorter than combined length of head and mesosoma.

Male: unknown

Host: unknown

Etymology: The species name is an arbitrary combination of litters.

Materials examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 23-VI-2000, Coll. T.C.Narendran and party (DZCU).

Discussion: This species comes near *Platygaster indicus* Mukerjee in having: four segmented antennal club and presence of notauli. However it differs from this species in having: small size (0.9 mm) (*P. indicus* - 1.68 mm); flat and hairy scutellum (highly convex scutellum in *P. indicus.*); all legs brown with the last tarsal segment more darker (in *P. indicus* all legs brown except for the dark brown coxa, femur and apical part of tibia.); second funicular segment larger sized and lateral region of mesonotum distinctly punctuate.

Platygaster zantanus sp. nov.

(Figs.136-139)

Female: Length 0.77 mm; black; scape brown; pedicel and clava dark brown; eyes black; front and back ocelli black; tegula brown; all leg segments except femur and last tarsal segment brown, femur and last tarsal segment dark brown; wings hyaline with pilosity brown; body pubescence white.

Head: Frons smooth, vertex finely reticulate, shiny without pubescence; antennal sockets close to clypeal border. Head viewed in front (Fig.138) length to width 36:52; head width in dorsal view about 2.5x its median length; POL about

3.5x OOL; scrobe and interantennal projection indistinct; malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 1.8x malar space. Antenna (Fig.137) 10 segmented; relative length of antenna: body length 66.55: 100. Relative length: width of antennal segments: scape – 38: 8; pedicel – 10: 6; F_1 - 5: 4; F_2 - 6: 5; F_3 - 5: 5; F_4 – 7: 4; F_5 - 7: 7; F_6 - 9: 8; F_7 - 9: 6; F_8 - 13: 7.

Mesosoma: Finely and partially reticulate, shiny; notauli distinct; mesoscutum as wide as long; scutellum width 1.2x its length; scutellum not bulging; propodeum coarse with longitudinal carina; pro and mesopleura smooth shiny; metapleuron hairy. Forewing (Fig.136) length 2.5x its maximum width, sm short, straight, not touching wing margin and without basal knob, marginal fringe moderate; hind coxa as wide as long; hind femur 3x length of trochanter, about 3.6x its own maximum width; hind tibial length 1.9x length of hind metatarsus and less than the combined length of hind tarsal segments.

Metasoma: Petiole transverse, 1.3x as wide as its length; second tergite smooth and shiny, posterior tergites with fine punctures; metasoma little longer than mesosoma but distinctly shorter than combined length of head and mesosoma, a little less than 2x its width in dorsal view.

Male: unknown.

Host: unknown.

Etymology: The species name is an arbitrary combination of letters.

Materials Examined: Holotype: Female, INDIA: Kerala, Calicut University Campus, 10-x-1999, Coll.T.C.Narendran and party (DZCU).

Discussion: This species resembles *Platygaster indicus* Mukerjee in having: four segmented antennal club and presence of notauli. However it differs from this species in having: Small body size 0.77 mm. (*P. indicus* - 1.68 mm); antennal scape brown, pedicel and clava dark brown (antenna black except for the

tip of the second and third segment which are paler in *P. indicus*); scutellum flat(scutellum slightly bulging in *P. indicus*) and all leg segments except femur and last tarsal segment dark brown in colour (all legs brown except for the dark brown coxa, femur of legs and apical region of tibia in *P. indicus*).

Genus *SYNOPEAS* Foerster

Synopeas Foerster, 1856b. *Hym. Stud.*, **2**:108. Type species: *Platygaster sosis* Walker, 1835

Ectadius Foerster, 1856b. *Hym. Stud.*, **2**:108, 113, 114, 144. Type species: *Platygaster craterus* Walker, 1835.

Sactogaster Foerster, 1856b. *Hym. Stud.*, **2**:108, 113. Type species: *Sactogaster pisi* Foerster, 1856.

Polymecus Foerster, 1856b. *Hym. Stud.*, **2**:108-113. Type species: *Platygaster craterus* Walker, 1835

Dolichotrypes Crawford and Bradley, 1911. *Proc. ent. Soc. Wash.*, **13**:124-126. Type species: *Dolichotrypes hopkinsi* Crawford and Baradley, 1911.

Diagnostic characters: Head rounded; vertex not angular and without transverse carina; antenna 10 segmented with four segmented club; maxillary palp one segmented; hind margin of mesonotum separated from scutellum by deep groove; scutellum semicircular, broad, rounded behind, usually with a short spine; spine rarely reaches base of abdominal petiole; scutellum rarely without spine; notauli absent or faintly developed; petiole and base of second tergite with dense white hairs forming tuft like structure; second sternite of females some times forms saccate process or fourth to sixth metasomal segments of females highly elongated.

Distribution: Afro tropical, Australian, Nearctic, Neotropical, Oriental, Palaearctic.

Biology: Parasites of Cecidomyidae

Remarks: 125 species known, seven species reported from India.

KEY TO THE INDIAN SPECIES OF *SYNOPEAS* FOERSTER

1. Notauli present 2

- Notauli absent 13

2. Antennal club five segmented 3

- Antennal club four segmented 4

3. Notauli complete; posterior four metasomal segments tail like (Fig. 148) . . . . . ***S. atturensis*** Mukerjee

- Notauli faint; posterior metasomal segments not tail like (Fig. 140) . . . . . ***S. carinatus*** sp. nov.

4. Third and fourth funicular segments subequal 5

- Third and fourth funicular segments unequal 9

5. Head triangular; temples extended laterally into carinate flanges that protrudes (Fig. 160) well over the eyes . . . . . ***S. temporale*** Austin

- Head not triangular and temple character not as above 6

6. Scape 4x as long as wide . . . . . ***S. indicus*** Mani

- Scape > 4x as long as its width 7

7. Notauli complete . . . . . ***S. nepalensis*** Mukerjee

- Notauli abbreviate 8

8. Hind tibia slightly shorter than combined length of hind tarsal segments; wing lamina thinly hairy; body length: antennal length 100: 57 . . . . . ***S. ignotus*** sp. nov.

- Hind tibia as long as combined length of tarsal segments; wing lamina thickly hairy on its apical margin and thinly hairy on its basal region; body length: antennal length 100: 47.6 ..... ***S. lepidus*** sp. nov.

9. Scutellum with cone like structure, which is excavated dorsally, with serrate or spinous margin ..... ***S. procon*** Austin

- Scutellum not cone like and without serrate margin. 10

10. Ovipositor distinct 11

- Ovipositor not distinct 12

11. Antennal club dark brown ..... ***S. bengalensi*** Mukerjee

- Antennal club reddish brown ..... ***S. chamoliana*** Mukerjee

12. Scape 7x as long as wide ..... ***S. indopeninsulari*** Mani.

- Scape 4x as long as wide ..... ***S.secus*** sp. nov.

13. Second funicular segment elongate; as wide as first and third funicular segment; scutellum smoothly rounded; anteromedial area of scutellum raised and continued posteriorly as a broad distinct ridge without central spine or sharp point, size of insect 1.2 mm ..... ***S. mangiferae*** Austin.

- Second funicular segment not so elongate; longer and wider than second and third funicular segment; scutellum somewhat triangular, with a small brownish coloured spine with the tip dark brown; size of insect only 0.7 mm . ..... ***S. curiosus*** sp. nov.

Synopeas carinatus sp. nov.

(Figs.140-143)

Female: length 0.85 mm; black; antenna dark brown except light brown basal one fourth of scape; mandible brown; eyes grey with a black tint; ocelli glassy white; tegula black; all legs brown except hind leg; hind coxa dark brown; hind femur and tibia with distal dilated part brown and proximal narrow portion

light brown and last tarsal segment dark brown; wings hyaline with pilosity dark brown; body pubescence silvery white.

Head: Frons and vertex clearly sculptured; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.142) length to width 33: 50; head width in dorsal view about 2.66x its median length; POL about 3.25x OOL; interantennal projection slightly distinct malar groove absent; posterior margin of gena ecarinate; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 5x malar space. Antenna (Fig.141) 10 segmented; relative length of antenna to body length 61.76: 100. Relative length: width of antennal segments: scape - 38: 10; pedicel – 9: 6; F_1 - 5: 4; F_2 - 10: 7; F_3 - 4: 4; F_4 - 9: 6; F_5 – 8: 7; F_6 - 8: 8; F_7 - 9: 9; F_8 – 14: 7.

Mesosoma: Reticulate, shiny; notauli faint; mesoscutum as long as wide. Scutellum somewhat semicircular, slightly convex with a short nipple like process, slightly sculptured and with hairs on the dorsal and lateral side; scutellar length including apical process only slightly longer than its width; propodeum with tuft of hairs on sides and with a median carina; propleuron reticulate; meso and metapleura smooth and shiny, posterior margin of metapleuron with tuft of white silvery hairs. Forewing (Fig.140) length 1.7x its maximum width, sm short, straight, not touching wing margin and without distal knob; marginal hairs much shorter; lower region of wing lamina thinly hairy than upper region; hind coxa length 1.25x its maximum width; hind femur 2x length of trochanter, about 3.3x its own maximum width and shorter than hind tibia; hind tibial length 3x length of metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole transverse, hairy tuft on sides, hence petiole not clearly distinct; second tergite smooth, anterior lateral margin with white hairy tuft; posterior tergites with weak punctures; metasoma length a little longer than mesosoma but shorter than combined length of head and mesosoma; its length 2x its maximum width in dorsal view.

Male: unknown

Host: unknown

Etymology: Species is named after the carina of scutellum.

Materials Examined: Holotype: female, INDIA: Kerala, Muthanga, 6-v-2000, Coll. R.Usha Kumari (DZCU). Paratype: 1 female, India, Kerala, Muthanga, 6-v -2000, Coll. R.Usha Kumari.

Discussion: This species resembles species *Synopeas tehriensis* Mukerjee in having: scutellum with a bluntly pointed tip; notauli not reaching front margin and trans scutellar suture narrow. However this species differs from *S. tehriensis* Mukerjee in having: absence of long silvery white hairs at the posterior border of lateral lobes of mesoscutum and scutellar suture not deep and with longitudinal carina (In *S. tehriensis* long silvery white hairs present at the lateral lobes of mesoscutum and scutellar suture narrow without longitudinal carina).

Synopeas curiorus sp. nov.

(Figs.144-147)

Female: Length 0.7 mm, plumpy; black; antenna with scape, pedicel and two funicular segments yellowish brown and others brown; eyes black; ocelli glassy white; mandible light brown; tegula black; legs yellowish brown, hind leg with the dilated portion of femur and tibia and last tarsal segment brown; wings hyaline with pilosity dark brown; body pubescence silvery white; apical spine of scutellum brown with its tip darker.

Head: Frons and vertex reticulate; hyperoccipital carina well distinct and vertex angled; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig.146) length to width 31: 45; head width in dorsal view about 2.5x its median length; POL about 2.7x OOL; scrobe and interantennal projection

indistinct; malar groove absent; posterior margin of gena ecarinate; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 6x malar space. Antenna (Fig.145) 10 segmented; relative length of antenna: body length 66.6: 100. Relative length: width of antennal segments: scape - 40: 9; pedicel - 12: 6; F_1 - 5: 4; F_2 - 7: 4; F_3 - 4: 4; F_4 - 6: 5; F_5 - 7: 9; F_6 - 7: 10; F_7 - 7: 10; F_8 - 14: 10.

Mesosoma: Distinctly reticulate; notauli absent; mesoscutum as long as wide; scutellum somewhat triangular with a small spine at apex; scutellum length up to tip of spine 1.2x its maximum width; transcutal suture with stout bristle like hairs; scutellar pits well defined, scutellum with hairs on dorsal side and lateral side; propleuron reticulate, meso and metapleura smooth; metapleuron with tuft of white slivery hairs on its posterior margin. Forewing (Fig.144) length 2.4x its maximum width sm not distinct, marginal fringe shorter; propodeum with tuft of white hairs and hence propodeum not clearly distinct in dorsal view; hind coxa about 1.28x its own maximum width; hind femur 2.5x length of trochanter, about 3.3x its own maximum width and slightly shorter than hind tibia; hind tibial length 2.87x length of metatarsus and slightly shorter than combined length of tarsal segments.

Metasoma: Petiole transverse, with hairy tuft and hence not visible in its dorsal view; second tergite hairy on its anterior margin; metasoma as long as mesosoma but shorter than combined length of head and mesosoma; metasoma length 1.4x its maximum width in dorsal view.

Male: unknown

Host: unknown

Materials Examined: Holotype: Female, INDIA: Kerala, Arattupuzha, 28-iv-2000, Coll. R.Usha Kumari (DZCU), Paratype: 1 Female, INDIA: Kerala, Arattupuzha, 28-iv -2000, Coll. R.Usha Kumari, 1 Female, INDIA: Kerala, Ambayathode, 2-ii-1995, Coll. T.C.Narendran and party, 1 Female, INDIA:

Kerala, Malappuram, 27-xi-1998, Coll. R.Usha Kumari, 1 Female, INDIA: Kerala, Arattupuzha, 28-iv -2000, Coll. R.Usha Kumari, 1 female, INDIA: Kerala, Calicut University Campus, 23-v-2000, Coll. T.C.Narendran and party.

Etymology: The species name is taken from Latin meaning strange.

Discussion: The new species do not agree with any species, in the key to *Synopeas* by Mukerjee (1981).

Synopeas ignotus sp. nov.

(Figs. 148-151)

Female: Length 1.3 mm; black; antenna with scape and basal three fourth of first funicular segment yellowish brown and rest of segments dark brown; eyes black; ocelli glassy and white; mandible brown; tegula dark brown to black; all legs yellowish brown; wings hyaline with pilosity brown; body pubescence white.

Head: Frons and vertex finely reticulate; eye bare; antennal sockets close to clypeal border; head viewed in front (Fig.150) length to width 36: 49; head width in dorsal view about 2.53x its median length; POL about 2.41x OOL; malar groove absent; scrobe not distinct; interantennal projection slightly distinct; posterior margin of gena ecarinate; hyperoccipital carina not distinct; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 1.7x malar space. Antenna (Fig. 149) 10 segmented, relative length of antenna: body length 57: 100. Relative length: width of antennal segments: scape - 47: 10; pedicel - 12: 7; F_1 - 5: 5; F_2 - 9: 7; F_3 - 5: 4; F_4 - 4: 5; F_5 - 7: 10; F_6 - 10: 12; F_7 - 7: 13; F_8 - 17: 13.

Mesosoma: Reticulate, sparsely hairy; notauli abbreviate; mesoscutum as long as wide; scutellum somewhat hemispherical, finely sculptured, hairy on its lateral margin and ends in a bluntly rounded short finger like projection; scutellar length including projection as long as wide; scutellar groove distinct; propodeum with laterally arranged tuft of hairs and median carina; propleuron reticulate; mesopleuron smooth with few longitudinal carina towards upper margin; metapleuron hairy on its posterior end. Forewing (Fig.148) length 2.51x its maximum width; sm short, straight, not touching wing margin and without distal knob; marginal fringe short; wing lamina thinly hairy; hind coxa length 1.25x its maximum width; hind femur about 2x trochanter and shorter than hind tibia; hind tibia length 2.7x hind metatarsus and slightly shorter than combined length of hind tarsal segments.

Metasoma: Petiole transverse, not distinctly visible because of the white hairy tuft and about 4.33x wide as its length; second tergite smooth, shiny, broad and ventrally dilated; rest of segments finely punctate; metasoma larger than mesosoma but as long as combined length of head and mesosoma, its length 2.52x its maximum width in dorsal view.

Male: unknown

Host: unknown

Etymology: The species name is taken from Latin meaning strange or unknown.

Materials Examined: Holotype: Female, INDIA: Kerala, Kundara (Kollam), 28-viii-1999, Coll. R.Usha Kumari (DZCU).

Discussion: In the key to Indian *Synopeas* by Mukerjee (1981) the new species comes closer to *Synopeas indicus* Mukerjee in having: antennal formula 1-1-4-4,scape without lamellar expansion and distinctly clavate antenna and second metasomal segment saccate. However it differs from *S. indicus* in having: notauli abbreviate (notauli percurrent in *S. indicus)*; all legs yellowish brown (in

S. indicus all coxae and femora brownish black to black, tibiae brown darkened in the apical half, tarsi brown with the last tarsal segment dark brown) and scape and basal three fourth of first funicular segment yellowish brown and rest of the segments dark brown.(scape, pedicel and 1-4 funicular segments reddish brown and club black in *S. indicus*).

Synopeas lepidus sp. nov.

(Figs. 152-155)

Female: Length 1.56 mm; black; antenna dark brown except brown scape; eyes black; ocelli glassy with a black tint; mandible dark brown; tegula black; wings hyaline with pilosity dark brown; legs with coxa dark brown; distal end of hind femur, tibia and last tarsal segment dark brown and remaining portion yellowish brown; middle legs similar to hind pair; foreleg brown without any colour variation; body pubescence white.

Head: Frons and vertex finely reticulate; without pubescence; vertex rounded; eyes bare; antennal sockets close to clypeal border. Head viewed in front (Fig. 154) length to width 39: 52; head width in dorsal view about 3x its median length; POL about 2.83x OOL; malar groove absent; scrobe in distinct; interantennal projection distinct and brown; posterior margin of gena ecarinate; mandible well developed; hyperoccipital carina not distinct; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 4.33x malar space. Antenna (Fig.153) 10 segmented; relative length of antenna: body length 47.6: 100; Relative length: width of antennal segments: scape - 42: 10; pedicel - 13: 7; F_1 - 4: 5; F_2- 8: 5; F_3 - 4: 5.5; F_4 - 4: 5; F_5 – 7: 9; F_6 - 8: 14; F_7 - 8: 14; F_8 17: 12.

Mesosoma: Finely reticulate; notauli present; mesoscutum as long as wide; scutellum finely sculptured which ends in a finger like projection, hairy; scutellar groove distinct, with hairs on its upper margin; propodeum with laterally arranged tuft of hairs; mesosoma and metasoma closely approximated; propleuron finely reticulate; mesopleuron smooth and shiny; metapleuron short, longitudinal carina present and lateral margin with white hairs. Forewing (Fig. 152) length 2.75x its maximum width, sm short, straight, not touching wing margin and without distal knob; marginal fringe much shorter; wing lamina thickly hairy at apical margin and thinly hairy on basal region; hind coxa length as long as wide; hind femur length 2.1x length of trochanter and shorter than hind tibia; hind tibia 2.90x hind metatarsus and as long as combined length of hind tarsal segments.

Metasoma: Petiole narrow, somewhat trapezoidal, not distinctly visible because of the hairy tuft; anterior margin of second tergite with fine sculpture, smooth and shiny and ventrally dilated to give a sac like appearance; posterior segments narrow, elongate and finely punctate; metasoma a little longer than mesosoma but shorter than combined length of head and mesosoma.

Male: unknown

Host: Unknown

Etymology: This species name is taken from Latin meaning fine, elegant.

Materials Examined: Holotype: Female, INDIA: Kerala, 27-ix-1998, Coll. R. Usha Kumari (DZCU). Paratype: 1 Female, INDIA: Kerala, Calicut University Campus, 5-i-2000, Coll. T.C.Narendran and Party, 1 Female, INDIA: Kerala, Arattupuzha (Pathanamthitta), 28-iv-2000, Coll. R.Usha Kumari.

Discussion: In the key to species to *Synopeas* by Mukerjee this new species comes near *S. nepalensis* Mukerjee in having: presence of notauli; antennal segmentation 1-1-4-4; shorter marginal fringe for wings; saccate second metasomal tergite and somewhat same size and colour. However it differs from *S. nepalensis*

in having: distal end of hind femur tibia and last tarsal segment dark brown and remaining portion yellowish brown (in *S. nepalensis* hind legs black except for the brown tibia and brown one to four tarsal segments) and sixth metasomal tergite not elongate and ovipositor not exserted (in *S. nepalensis* sixth tergite elongate and ovipositor exserted).

Synopeas secus sp. nov.

(Figs. 156-159)

Female: Length 1.0 mm; black; antenna with scape reddish brown and rest of the segments dark brown; ocelli black glassy, eyes dark grey; tegula black; all legs with femur and tibial distal end reddish brown and with a darker tint at the dialated portion; wing hyaline with pilosity dark brown; body pubescence white.

Head: Frons and vertix finely reticulate; antennal sockets close to elypeal border. Head viewed in front (Fig. 158) length to width 36:48; head width in dorsal view about 2.5x its median length; POL about 4.5x OOL; malar groove absent; scrobe not distinct; interantennal projection not distinct; occipital carina distinct; head wider than mesosoma in dorsal view; maximum diameter of eye in lateral view about 5.6x malar space. Antenna (Fig. 157) 10 segmented; relative of length of antenna: body length 60: 100. Relative length: width of antennal segments: scape - 41: 9; pedicel - 14: 6; F_1 - 6: 5; F_2 - 6: 4; F_3 - 4: 4; F_4 - 4; F_5 - 8: 9; F_6 - 9: 10; F_7 - 7: 11; F_8 - 14:9.

Mesosoma: Finely reticulate; notauli present abbreviate; scutellum semicircular ending in a finger like process; scutellar groove narrow; scutellum length including the process 1.3x its width; pro, meso and metapleura smooth shiny; metapleuron hairy on its posterior end. Forewing (Fig. 156) length 2.5x its

maximum width; sm short and without distal knob; marginal fringe short; wing lamina moderately hairy; hind coxa as long as wide; hind femur length 3x trochanter and 3.5x its own maximum width; hind tibia 2.3x hind metatarsus and as long as combined length of hind tarsal segments; propodeum hairy.

Metasoma: Petiole short, transverse and not distinctly visible because of the hairy tuft; second tergite smooth; third and fourth transverse and fifth and sixth elongate; posterior tergites finely sculptured; ovipositor exserted.

Male: Unknown

Host: Unknown

Etymology: Species is named from Latin meaning different

Materials examined: Holotype: Female, INDIA: Kerala, Calicut, 28-iv-2000, Coll. Dr. Rajmohana (DZCU). Paratype: 5 Females, INDIA: Kerala, Kannur, 28-v-2000, Coll. R.Usha Kumari.

Discussion: The new species do not agree with any species in the key to *Synopeas* by Mukerjee (1981).

CHECK LIST OF INDIAN PLATYGASTRIDAE

Genus 1. *AMBLYASPIS* Foerster, 1856

A. dalhousianus (Mukerjee, 1978)	- India (Ahla)
A. ashokai sp. nov.	- India (Kerala)

Genus 2. *AMITUS* Haldeman, 1850

A. aleurolobi Mani, 1939	- India (New Delhi)
A. keralensis sp. nov.	- India (Kerala)

Genus 3. *ANECTADIUS* Kieffer, 1905

A. bengalensis Kieffer, 1905	- India (Bengal)
A. striolatus Kieffer, 1905	- India (Bengal)

Genus 4. *ANOPEDIAS* Foerster, 1856

A. aquilus sp. nov.	- India (Kerala)
A. novissimus sp. nov.	- India (Kerala)

Genus 5. *FIDIOBIA* Ashmead, 1894

F. keralensis sp.nov.	- India (Kerala)

Genus 6. *INOSTEMMA* Haliday, 1833

I. anamalaianus Mukerjee, 1981	- India (Tamil Nadu)
I. apsyllae Austin, 1984	- India (Sitapur)
I. berijamum Mani, 1975	- India (Kodaikanal hills)
I. coorgensis Mukerjee, 1981	- India (Coorg)
I. dalhousianus Mukerjee, 1981	- India (Delhousi)
I. indicus Mukerjee, 1941	- India (Tanjore)
I. nelgiensis Mukerjee, 1941	- India (Coorg)
I. oculare Austin, 1984	- India (Varanasi)
I. shencottahensis Mukerjee, 1981	- India (Tamil Nadu)

Genus 7. *ISOCYBUS* Foerster, 1856

I. dhenkudensis Mukerjee, 1978	- India (Dhenkund)
I. indicus Mani, 1975	- India (Mahabaleshwar)

Genus 8. *ISOSTASIUS* Foerster, 1856

I. indicus sp. nov.	- India (Kerala)
I. malabaricus sp. nov.	- India (Kerala)
I. poroicus Mukerjee, 1981	- India (Bengal)
I. vayalarensis sp. nov.	- India (Kerala)

Genus 9. *LEPTACIS* Foerster, 1856

L. aeros sp. nov.	- India (Kerala)
L. alus sp. nov.	- India (Kerala)
L. asiaticus sp. nov.	- India (Kerala)
L. benazeer sp. nov.	- India (Kerala)
L. coorgensis (Mukerjee, 1981)	- India (Karnataka)
L. diversus sp. nov.	- India (Kerala)
L. indicus Mukerjee, 1978	- India (Poona)
L. keralensis sp. nov.	- India (Kerala)
L. konkanensis Mukerjee, 1978	- India (Mahabaleswar)
L. malabarensis sp. nov.	- India (Kerala)
L. manii sp. nov.	- India (Kerala)
L. mustus sp. nov.	- India (Kerala)
L. narendraii sp. nov.	- India (Kerala)
L. novissimus sp. nov.	- India (Kerala)
L. nuperus sp. nov.	- India (Kerala)
L. scaposus sp. nov.	- India (Kerala)
L. thanensis Mukerjee, 1978	- India (Bombay)

Genus 10. *METANOPEDIAS* Brues, 1910

M. vidhyensis (Mukerjee, 1978)	- India (Manipur)

Genus 11. *PLATYGASTER* Latreille, 1809

P. ashokai sp. nov.	- India (Kerala)
P. coorgensis (Mukerjee, 1978)	- India (Coorg)
P. ferus sp. nov.	- India (Kerala)
P. foersteri (Gahan, 1919)	- India (Coimbatore)
P. galbus sp. nov.	- India (Kerala)
P. inderdaadi (Mukerjee, 1978)	- India (Kodaikanal)
P. intermedius sp. nov.	- India (Kerala)
P. keralicus sp. nov.	- India (Kerala)
P. malabaricus (Mukerjee, 1978)	- India (Moozhiar)
P. minimus (Mukerjee, 1978)	- India (Cardamom hills)

P. oryzae Cameron, 1981 - India
P. panchganii Mani, 1975 - India (Mahabaleshwar)
P. ramachandrai (Rao, 1950) - India (Coimbatore)
P. salvadorae (Rao, 1950) - India (Agra)
P. sasii sp. nov. - India (Kerala)
P. satara Mani, 1975 - India (Western Ghats)
P. tibialis Kieffer, 1905 - India (Kurseong)
P. zandanus sp. nov. - India (Kerala)

Genus 12. *PLUTOMERUS* Masner and Huggert, 1989

P. indicus (Mukerjee, 1981) - India (Chota Nagpur)

Genus 13. *PROLEPTACIS* Kieffer, 1926

P. fici Rao, 1950 - India (Agra)
P. oryzae Rao, 1950 - India (Cuttack)

Genus 14. *SACESPALUS* Kieffer, 1917

S. indicus Mani, 1975 -India (Mahabaleshwar)

Genus 15. *SYNOPEAS* Foerster, 1856

S. atturensis Mukerjee, 1981 - India (Karnataka)
S. bengalensis Mukerjee, 1978 - India (Jaldhapura)
S. carinatus sp. nov - India (Kerala)
S. chamoliana Mukerjee, 1992 - India
S. curiosus sp. nov - India (Kerala)
S. ignotus sp. nov - India (Kerala)
S. indicus Mani, 1975 - India (Kelghar Meta)
S. indopeninsularis Mani, 1975 - India (Mahabaleshwar)
S. lepidus sp. nov - India (Kerala)
S. mangiferae Austin, 1984 - India (Lucknow)
S. nepalensis Mukerjee, 1981 - India (Nilgiri hills)
S. procon Austin, 1984 - India (Lucknow)
S. secus sp. nov. - India (Kerala)
S. temporale Austin, 1984 - India (Lucknow)

Genus 16. *TETRABAEUS* Kieffer, 1912

T. bhowaliensis Mani and Mukerjee, 1976 - India

Genus 17. *TRICHACIS* Foerster, 1856

T. khajjiara Mani, 1975 - India (N.W. Himalayas)

Genus 18. *TRICHACOIDES* Dodd, 1914

T. indicus Jackson, 1968 - India (Anad)

INVESTIGATION ON THE ALPHA SYSTEMATICS OF PLATYGASTROIDEA (HYMENOPTERA) OF KERALA STATE

THESIS SUBMITTED TO THE UNIVERSITY OF CALICUT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ZOOLOGY

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MAY 2002

SUMMARY

The thesis entitled "Investigation on the alpha systematics of Platygastroidea (Hymenoptera) of Kerala State" is an attempt to revise the taxa and to explore the Platygastrid fauna of Kerala. The present systematic study reveals for the first time the diversity exhibited by this group in Kerala, as no systematic work has been conducted before on this group in Kerala. The Platygastrid fauna of Kerala include eight genera and 38 species. They have been studied and analyzed systematically.

Out of the 18 genera reported from India, in the present investigation eight genera were identified from Kerala viz. *Anopedias, Amblyaspis, Amitus, Fidiobia, Isostasius, Leptacis, Platygaster* and *Synopeas* (Fig.1). In this study a total of 38 species have been described of which 34 species are reported new to science. Out of the 38 species, except *P. oryzae,* all the other 37 species are being reported for the first time from Kerala. The following table illustrates the total number of new species reported from Kerala.

Name of general	No. of species	No. of new species	New combination
1. *Amblyaspis*	1	1	0
2. *Amitus*	1	1	0
3. *Anopedias*	2	2	0
4. *Fidiobia*	1	1	0
5. *Isostasius*	3	3	0
6. *Leptacis*	13	13	0
7. *Platygaster*	12	8	0
8. *Synopeas*	5	5	0

The summary of the platygastrid species belonging to eight genera of Platygastridae of Kerala is given below:

Genus 1. Amblyaspis Foerster

1. *A. ashokai* sp.nov.

Genus 2. Amitus Haldeman

1. *A. keralensis* sp.nov.

Genus 3. Anopedias Foerster

1.*A. aquilus* sp.nov.

2. *A. novissimus* sp.nov.

Genus 4. Fidiobia Ashmead, 1894

1. *F. keralensis* sp.nov.

Genus 5. Isostasius Foerster, 1856

1. *I. indicus* sp.nov.

2. *I. malabaricus* sp.nov.

3. *I. vayalarensis* sp.nov.

Genus 6. Leptacis Foerster, 1856

1. *L. aeros* sp.nov.

2. *L. alus* sp.nov.

3. *L. asiaticus* sp.nov.

4. *L. benazeer* sp.nov.

5. *L. diversus* sp.nov.

6. *L. keralensis* sp.nov.

7. *L. malabarensis* sp.nov.

8. *L. manii* sp.nov.

9. *L. mustus* sp.nov.

10. *L. narendraii* sp.nov.

11. *L. nuperus* sp.nov.

12. *L. scaposus* sp.nov.

13. *L. thrissurensis*

Genus 7. Platygaster Latreille, 1809

1. *P. coorgensis* (Mukerjee)

2. *P. ferus* sp.nov.

3. *P. galbus* sp.nov.

4. *P. inderdaadi* (Mukerjee)

5. *P. intermedius* sp.nov.
6. *P. keralicus* sp.nov.
7. *P. minimus* (Mukerjee)
8. *P. nigrocoxatus* sp.nov.
9. *P. oryzae* Cameron
10. *P. sasii* sp.nov.
11. *P. tanus* sp.nov.
12. *P. zandanus* sp.nov.

Genus 8. Synopeas Foerster, 1856

1. *S. carinatus* sp.nov.
2. *S. curiosus* sp.nov.
3. *S. ignotus* sp.nov.
4. *S. lepidus* sp.nov.
5. *S. secus* sp.nov.

In the present study specimens were collected from different parts of Kerala. The taxa belonging to family Platygastridae have been studied systematically in this work. All the species were properly identified and described. Redescriptions were given in the case of already known but poorly described species. Apart from this, key to the subfamilies, genera and species under each of the genus found in Kerala are also provided. A checklist of genera and species of Platygastridae of India, dealt in this work is prepared. All the type materials are kept in the collection of Department of Zoology, University of Calicut.

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REFERENCES

Alekseyev, V.N. 1979. A new species of the genus *Isolia* (Hymenoptera, Platygastridae) from middle Asia. *Zoologichesky Zhurnal* **58**: 763-764

Ambikadevi, D. 1998. Natural enemies of rice pests in Kuttanad, Kerala. *Insect Envt.* **4:** 81-82

Amendt, J. 1997. Species richness and species composition of parasitoid complexes of selected gall midges (Diptera: Cecidomyidae) on *Salix* spp. (Salicaceae). *Proceedings of the German society for General and Applied Entomology*, Bayreuth, Germany, 18-22 March, 1977, **11:** 513-516

Annecke, D.P. and Prinsloo, G.I. 1977. A new species of *Allotropa* Foerster (Hymenoptera: Platygastridae) parasitic in the citrus mealy bug, *Planococcus citri* (Risso) (Homoptera: Pseudococcidae). *J. Entomol. Soc. Sth. Africa.* **40**: 105-108

Ashmead, W.H. 1893. A monograph of North American Proctotrypidae. *Bull. U.S. Nat. Mus.* **44**: 1-472

Ashmead, W.H. 1894. A new genus and species of Proctotrypidae and new species of *Brachysticha*, bred by Prof.F.M.Webster. *J. Cincinn. Soc. nat. Hist.* **17**: 170-172

Ashmead,W.H. 1903. Classification of the pointed-tailed wasps, or the superfamily Proctotrupoide (II and III). *J. New York ent. Soc.* **11**: 28-35 and 86-99

Austin, A.D. 1984. New species of Platygastridae (Hymenoptera) from India which parasitize pests of mango, particularly *Procontarina* spp. (Diptera: Cecidomyidae). *Bull. ent. Res.* **74**: 549-557

Austin, A.D. 1990. A revision of old world *Parabaeus* Kieffer (Hymenoptera: Platygastridae), a highly modified apterous parasitoids inhabiting litter. *Invertebr. Taxon.* **3**: 647-659

Baitazar, C.R. 1966. A catalogue of Phillipine Hymenoptera (with a bibliography 1758-1963). *Pacific Insects Monograph* **8**: 1-490

Beevi, S.P., Lyla, K.R. and Narendran, T.C. 2000. Hymenopteran diversity in single and double-cropped rice ecosystems in Kerala, India. *IRRN,* **25:** 20-21

Bhuiya, B.A., Miah, M.I. and Begum, R. 1999. Notes on hymenopteran parasitoids attacking Aleyrodoidea (Homoptera) on citrus. *Bangladesh Journal of Entomology* **9**: 141-144

Brethes, J. 1914. Les enemies de la *Diaspis pentagona* dans la Republique Argentine. *Nunquam otiosus* **1**: 1-16

Brethes, J. 1916. Hymenopteres parasites de l' Amerique meridionale. *Ann. Mus. Nat. Hist. Buenos Aires.* **27**: 401-430

Brues, C.T. 1908. Notes and descriptions of North American Parasitic Hymenoptera VII. *Bull. Wis.Nat. Hist. Soc.* **6**: 154-163

Brues, C.T. 1910. Some new species of Platygastridae from Brazil (Hymenoptera). *Broteria* (*S. Zool.*) **9**: 150-158

Buhl, P.N. 1995. On two European species of *Platygaster* Latreille, 1809 (Hymenoptera: Platygastridae). *Frustula Entomol.* **31**: 147-152

Buhl, P.N. 1997a. On some new or little known species of Platygastrinae (Hymenoptera: Platygastridae). *Entomofauna* **18**: 429-467

Buhl, P.N. 1997b. On species of Platygastrinae (Hymenoptera: Platygastridae) reared from *Xylodiplosis praecox* (Winnertz, 1853) (Diptera: Cecidomyidae). *Entomol. Medd.* **65**: 45-57

Buhl, P.N. 1998a. Two new species of Platygastrinae from Europe (Hymenoptera: Platygastridae). *Entomofauna* **19**: 265-276

Buhl, P.N. 1998b. On some new or little known NW European species of Platygastridae (Hymenoptera, Proctotrupoidea). *Fragmenta Entomologia* **30**: 295-334

Buhl, P.N. 2001. Taxonomical notes on Platygastridae (Hymenoptera: Platygastroidea). *Entomofauna* **22**: 17-38

Cameron, P. 1891. Hymenopterological notices. *Mem. Proc. Manchester Lit. Philos. Soc.*, **4**: 182-194.

Charernsom, K. Kosol Charernsom, Allsopp, P.G. (ed.), Suasa-Ard, W. 2000. Parasite complex of sugarcane white fly, *Aleurolobus barodensis* (Maskell) (Hemiptera: Aleyrodidae) in Thailand. *Sugarcane-pest-management-in-the-New Millennium. 4th Sugarcane Entomology Workshop* – International-Society- of- Sugarcane Technologists,- Khon-Kaen, Thailand, 7-10 February, 2000. 80-84pp

Clausen, C.P. 1940/1962. *Entomophagous Insects*.Mc Graw-Hill Book Co., NY & London. 688p

Crawford, J.C. and Bradley, J.C. 1911. A new Pelicinus - like genus and species of Platygastridae. *Proc. ent. Soc. Wash.* **13**: 124-126

Cresson, T. 1887. Synopsis of the families and genera of Hymenoptera of America, North of Mexico, together with a catalogue of the described species and bibliography. *Trans.American. Ent. Soc.* Suppl.Vol.1-314

Cromwell Rd. 1976. Additions and corrections to the list of British Proctotrupoidea and Ceraphronoidea (Hym.) *Entomol. Mon. Mag.* **112**: 243-245

Curtis, J. 1837. *A guide to an arrangement of British insects*. Second edition, greatly enlarged London. I-VI: 1-294

Dalla Torre, C.G.de. 1898. Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus V. Chalcididae et. Proctotrupidae. *Leipzig*: 598pp

Day, M. 1971. A new species of *Platygaster* Latreille (Hym.Proct.Plat.), reproducing by the thelytokous pathenogenesis. *Ent. Gazette* **22**: 37- 42

DeBach, P. and Rosen, D. 1991. *Biological control by Natural enemies*. 2nd Edn. Cambridge University Press 440p

De-Santis, L. 1941. Lista de Himenopteros parasitos y predatores de los insectos de la Republica Argentina. *Bol. Soc. brasil. Agron. Rio de Janeiro*, **4**: 1-66

Dodd, A.P. 1914. A new Platygastrid genus with remarkable antennae (Hym.). *Ent. News Philad.* **25**: 455- 456

Dromph, K. 1997. Three species of the genus *Inostemma* Hailday recorded as new to Denmark (Hymenoptera, Platygastridae). *Entomol. Medd.* **65**: 36-37

Evans, G.A. and Castillo, J.A. 1998. Parasites of *Aleurotrachelus socialis* (Homoptera:Aleyrodidae) from Colombia including descriptions of two new species (Hymenoptera: Aphelinidae: Platygastridae). *Florida-Entomologist* **81**: 171-178

Fabricius, K. 1974. Sceliotrachelinae Brues 1908 (Hym., Platygastridae), new for the fauna of Romania. *Trav. Mus. Hist. Nat. Grigore Antipa.* **15**: 293-295

Foerster, A. 1856a. *Hymenopterologische studien. Heft.II Chalcidiae und Proctotrupii*. Aachen.152pp.

Foerster, A. 1856b. Proctotrupoidea: Hymenoptera. *Hym. Stud.* **2:** 106-116

Foerster, A. 1878.Kleine Monographien parasitischer Hymenopteren. *Verh. nat. Ver. pr. Rheinl. Westf.* **35:** 42-47

Forbes, S.A. 1884. (cited by Vlug, H.J. 1995). *Catalogue of the Platygastridae (Platygastroidea) of the world (Insecta: Hymenoptera)*. SPB Academic Publishing bv Amsterdam-Netherlands. 168 pp

Gahan, A.B. 1919. Report on a small collection of Indian Parasitic Hymenoptera. *Proc. U.S. Nat. Mus.* **56**: 513-524

Greathead, D.J. 1986. Parasitoids in classical biological control. *Insect Parasitoids*. Academic Press, London. 289-318 pp.

Haldeman, S.S. 1850. On four species of Hemiptera of the genera *Ploiaria, Chermes* and *Aleurodes* and two new Hymenoptera, parasitic in the last named genus. *Am. J. Sci.* **9:** 108- 111

Haliday, A.H. 1833. An essay on the classification of the parasitic Hymenoptera of Britain, which correspond with the *Ichnemons minuti* of Linnaeus. *Ent. Mag.* **1**: 259- 276

Hill, C.C. 1923. *Platygaster vernalis* Meyers, an important parasite of the hessian fly. *J. Agric. Res.* **25**: 31-42

Hill, C.C. 1926. *Platygaster hiemalis* Forbes, a parasite of hessian fly. *J. Agric. Res.* **22**: 261-275

Hill, C.C. and Emery, W.T. 1937. The biology of *Platygaster herrickii*, a parasite of the hessian fly. *J. Agric. Res.* **3**: 199-213

Huggert, L. 1973. Taxonomical studies on Platygastridae (Hym. Proct.). *Ent. Tidskr.* **94**: 97-108

Huggert, L. 1974a. Taxonomical studies on the species belonging to *Urocyclops* Maneval (Hym. Proctotrupoidea, Platygastrinae) [Platygastridae]. *Ent. Tidskr.* **95**: 58- 63

Huggert, L. 1974b. Revision of the European species of the genus *Anopedias* Foerster (Hym. Proctotrupoidea, Platygastrinae). *Ent. Scand.* **5**: 277- 288

Huggert, L. 1975. Descriptions of Platygastridae from Sweden (Hymenoptera: Platygastridae). *Ent. Scand.* **6**: 61- 66

Huggert, L. 1976. A new genus and three new species of Platygastridae from Zaire. With a key to the species of *Iphitrachelus* Walk. and supplementary descriptions of *Leptacis* spp. (Hymenoptera, Proctotrupoidea). *Ent. Scand.* **7**: 217- 229

Huggert, L. 1977. Note on the occurrence of *Anopedias lacustris* in Canada (Hymenoptera: Proctotrupoidea: Platygastrinae). *Can. Entomol.* **109**: 107-108

Huggert, L. 1980. Taxonomical studies on some genera and species of Platygastrinae (Hymenoptera: Proctotrupoidea). *Ent. Scand.* **11**: 97- 112

Huggert, L. 1981. *Holocoeliella* nom. nov. for *Holocoelia* Huggert 1976 (Preocc.) (Hymenoptera: Proctotrupoidea). *Ent. Scand.* **12**: 48

Jackson, D.L. 1966a. A new species of *Metanopedias* from Great Britain (Hymenoptera: Platygastridae). *Ann. Ent. Soc. Amer.* **59**: 734-736

Jackson, D.L. 1966b. A nearctic species of *Iphitrachelus*, with a key to the known species. *Proc. Ent. Soc. Wash.* **68**: 265-268

Jackson, D.L. 1968. A new species of *Trichacoides* from India with redescription of *Trichacoides scutellaris* Dodd. *Proc. r. ent. Soc. London* (Ser.B) **37**: 121-124

Jackson, D.L. 1969. New characters for generic separation in the *synopeas-Leptacis* complex. *Proc. ent. Soc. Wash.* **71**: 400-404

Joshi, R.C., Venugopal, M.S. and Hidaka, T. 1984. Some observations on *Platygaster* (Platygastridae: Hymenoptera) from India, a parasite of rice gall midge, *Orseolia oryzae* (Wood - Manson) (Cecidomyidae:Diptera). *Cecidol. Int.* **5**: 65-66

Kieffer, J.J. 1905. Description de nouveaux Hymenopteres. Ann. Soc. scient. Bruxelles, **30**: 113-178

Kieffer, J.J. 1912. (cited by Vlug, H.J. 1995). *Catalogue of the Platygastridae (Platygastroidea) of the world (Insecta: Hymenoptera).* SPB Academic Publishing by Amsterdam-Netherlands. 168pp

Kieffer, J.J. 1914a. In *Andre'. Spec. Hym. Eur. Alg.* **11:** 1-448

Kieffer, J.J. 1914b. Serphidae (=Proctotrupoidae) et calliceratidae (=Ceraphronidae). *Das Tierreich* **42**: 1-237

Kieffer, J.J. 1921. Un Platygastrine parasite d un cynipide. *Broteria* **19**: 68-69

Kieffer, J.J. 1926. Scelionidae. *Das. Tierreich* **48**: 1-885

Kieffer, J.J. 1929. (cited by Vlug, H.J. 1995). *Catalogue of the Platygastridae (Platygastroidea) of the world (Insecta: Hymenoptera).* SPB Academic Publishing by Amsterdam-Netherlands. 168pp

Kirby, W, 1798. History of *Tipula tritici* and *Ichneumon tipulae*, with some observations upon other insects that attend wheat, in a letter to Thomas Marsham, *Esq. Sec. L.S. Trans. Linn. Soc.*, **3**: 230-239

Kirchner, 1867. (cited by Vlug, H.J. 1995). *Catalogue of the Platygastridae (Platygastroidea) of the world (Insecta: Hymenoptera).* SPB Academic Publishing by Amsterdam-Netherlands. 168pp

Kobayashi, M. and Kudagamage, C. 1994. Hymenopterous parasitoids of the rice gall midge, *Orseolia oryzae* (Wood-Mason) in the Maha season in Srilanka. *Japan Agricultural Research Quarterly* **28**: 112-116

Koponen, M. and Huggert, L. 1982. Platygastridae (Hymenoptera, Proctotrupoidea) from Finland. *Not. Entomol.* **62**: 51-59

Kozlov, M.A. 1970. Supergeneric groupings of Proctotrupoidea(Hym.) *Revue d' Entomologie de I'URSS* **49:** 203-226

Lasalle, J. and Gauld, I.D. 1992. Hymenoptera: Their Diversity, and their Impact on the Diversity of other Organisms. *Hymenoptera and Biodiversity.* CAB International. 339pp

Latreille, P.A. 1805. *Historie naturelle. Generale et particuliere des crustaces et des insects.* Vol.3. F. Du fart, Paris. 467pp

Latreille, P.A. 1809. *Genera crustaceorum et insectorum, secundum ordinem naturalem in familias disposita, iconibus exemplisque pllurimis explicata.* Vol.4 Amand Koenig, Paris. 399pp.

Latreille, P.A. 1810. *Considerations generales sur I'ordre naturel des animaux kcomposant les classes des Crustaces, des Arachnides, et des Insects.* F. Schoell, Paris. 444pp.

MacGown, M.W. 1974. A new species of *Platygaster* (Hymenoptera: Proctotrupoidea, Platygastridae) parasite on *Lasioptera nodula* (Diptera: Cecidomyidae) in black berry (*Rubus fruticosus*: Rosaceae) stem galls. *Can. Ent.* **106**: 437-439

MacGown, M.W. and Nebeker, T.E. 1978. Taxonomic review of *Amitus* (Hymenoptera: Proctotrupoidea, Platygastridae) of the Western Hemisphere. *Can. Ent.* **110:** 275-283

MacGown, M.W. and Osgood, E.A. 1971. Two new species of *Platygaster* (Hym., Proctotrupoidea, Platygastridae) parasitic on balsam gall midge, *Dasineura balsamicola* (Dipt., Cecidomyidae).*Can. Ent.* **103:** 1143-1146

MacGown, M.W. and Osgood, E.A. 1974. Two new species of Platygastridae (Hymenoptera: Proctotrupoida). *Can. Ent.* **106**: 539-544

Mani, M.S. 1939. Descriptions of new records of some known chalcidoid and other hymenopterous parasites from India. *Ind. J. Ent.* **1**: 69-99

Mani, M.S. 1941. Serphoidea. *Cat. Indian Insects.* **26:** 1-52

Mani, M.S. 1975. On a collection of Scelionidae and Platygastridae (Hymenoptera: Proctotrupoidea) from India. *Mem. Sch. Ent.* **4**: 63-80

Mani, M.S. and Sharma, S.K. 1982. Proctotrupoidea (Hymenoptera) from India. A review of oriental insects. *Contr. Sch. Ent. Agra.* **16**: 135-258

Marshall, M.A. 1873. A catalogue of British Hymenoptera. *Oxyura. Publ. Ent. Soc. London.* 27pp

Masner, L. 1956. First preliminary report on the occurrence of genera of the group Proctotrupoidea (Hym.) in CSR. *Acta Faun. Ent. Mus. N. Pragae* **1**: 99-126

Masner, L. 1957.Remarks on the genus *Iphitrachelus* Walker, 1835 (Hym. Scelionidae). *Acta. Soc. Ent. Cechosl.* **68:** 59-63.

Masner, L. 1960. A revision of the African *species* of the Genus *Leptacis* Foerster (Hymenoptera, Platygastridae). *Rev. Zool. Bot. Afr.* **62**: 1-34

Masner, L. 1964. Remarks on the taxonomy of *Sceliotrachelus* Brues and allied genera (Hymenoptera, Platygastridae). *Psyche* **68:** 59-63

Masner, L. 1965. The types of Proctotrupoidea (Hymenoptera) in the British Museum (Natural History) and in the Hope Department of Entomology, *Oxford, Bull. Br. Mus. (Nat. Hist.)*, Suppl. **1**: 1-154

Masner, L. 1976. The Nearctic species of *Iphitrachelus* walker (Hymenoptera: Proctotrupoidea, Platygastridae), with a key to world species. *Can. Ent.* **108**: 1065-1068

Masner, L. 1980. The Nearctic species of *Acerotella* Masner (Hymenoptera, Proctotrupoidea, Platygastridae). *Can. Ent.* **112**: 1291-1303

Masner, L. 1981. Revision of the Nearctic species of *Metaclisis* Foerster (Hymenoptera, Platygastridae, Inostemmatinae). *Can. Ent.* **113**: 1069-1091

Masner, L. 1983. Revision of the Nearctic species of *Trichacis* Foerster (Hymenoptera: Proctotrupoidea: Platygastridae). *Can. Ent.* **115**: 107-1093

Masner, L. and Huggert, L. 1989. World review and key to genera of the subfamily Inostemmatinae with reassignment of the taxa to the Platygastrinae and Sceliotrachelinae (Hymenoptera: Platygastridae). *Mem. ent. Soc. Can.* **147**: 1-214

Masner, L. 1993. *Hymenoptera of the world: an identification guide to families* edited by Henroi Goulet, John T. Hubber. Cat. No.A53-1894/1993 E.ISBN 0-660-14933-8

Masner, L. and Muesebeck, C.W.F. 1968. The types of Proctotrupoidea in the United States National Museum. *Bull. U.S. natl. Mus.* **270**: 1-145

Muesebeck, C.F.W. 1954. Three new mealy bug parasites of the genus *Allotropa. Bull. Brooklyn ent. Soc.* **49**: 18-21

Muesebeck, C.F.W. 1970. A new mealy bug parasite from Japan (Hym., Platygastridae). *Proc. Entomol. Soc. Washington* **72**: 318-319

Muesebeck, C.F.W., Masner, L. in Krombain, K.V. and Burks, B.D. 1967. Proctotrupoidea. Hymenoptera of America north of Mexico. Synoptic catalog. *Agric. Monogr.* **2**(suppl.2): 285-305

Muesebeck, C.F.W. in Krombein, K.V., Hurd, P.D., Smith, D.R. and Burks, B.D. 1979. *Catalog of Hymenoptera in America North of Mexico.* **1**: 1121-1195

Mukerjee, M.K. 1978. Descriptions of some new records of known Platygastridae (Hymenoptera: Proctotrupoidea) from India. *Mem. Sch. Ent.* **5**: 67-98

Mukerjee, M.K. 1981. On a collection of scelionidae and Platygastridae (Hymenoptera: Proctotrupoidea) from India. *India Rec. Zool. Survey India, Misc. Publ.* **27**: 1-78

Nees ab Esenbeck, C.G. 1834. *Hymenopterum lehneumonibus Affinum Monographiae Genera, Europaea et species illustrantes*. Vol.2. J.G.Cotta, Stuttgart. 448pp.

Nixon, G.E.J. 1937. A new genus belonging to the subfamily Platygastrinae (Hym. Proctotrupoidea). *Ann. mag. nat. hist.* **19**: 372-376

Noyes, J.S. 1982. Collecting and preserving chalcid wasps (Hymenoptera: Chalcidoidea). *J. Nat. Hist.* **16:** 315-334

Panzer, G.W.F. 1838. (cited by Herrich-Schaffner, 1838). In: Panzer, Faunae Insectorum Germaniae Initia.Deutschlands Insekten. *Fauna insec. Ger. Deitsch. Insect.*1-90

Provancher, L. 1887. (cited by Vlug, H.J. 1995). *Catalogue of the Platygastridae (Platygastroidea) of the world (Insecta: Hymenoptera).* SPB Academic Publishing by Amsterdam-Netherlands. 168pp

Rao, S.N. 1950. Four new species of Platygastrid parasites (Hymenoptera) of gall midges from India. *Rec. Indian Mus.* **48**: 1-9

Ratzeburg, J.T.C. 1844. *Die Ichneumonen der Forstinsecten in forstlicher und entomologischer Beziehung; ein Anhang zur Abbildung and Beschreibung der Forstinsekten von Julius Theodor*. Christian Ratzeburg, Berlin, 1835, Part I. 224pp.

Rizzo, M.C. and Massa, B. 1998. On two Italian gall midges (Diptera, Cecidomyidae) and their parasitoids. *Entomologia* **32**: 121-131

Schrank, F.de.P. 1781. Enumeratio Insectorum Austriae Indigenorum. *Augustae Vindelicorum,* Klett et Franck. 548pp

Szabo, J.B. 1959. Notes on the new tribes *Amitini* with the descriptions of a new genus and some new species of the Arctogaea. *Annls. Historico-Naturales Mus. Natn. Hung.* **51:** 389-396

Szabo, J.B. 1977. Wasps of the genus *Trichacis* Foerster, 1856 captured by selections apparatus (Hymenoptera, Proctotrupoidea, Platygastridae). *Folia Entomol. Hung.* **30**: 143-145

Szelenyi, G. Von. 1938. Uber Palaarctische Scelioniden. II. Eine neue Scelionide aus Eichengallen. *Annls. hist. nat. Mus. nat. hung., parszoologica.* **31**: 126-128

Townes, H. 1972. A light weight Malaise Trap. *Ent. News.* **83**: 239-247

Viggiani, G. 1996. Discovery of the male *Amitus fuscipennis* Mac Gown at Nebeker (Hym. Platygastridae), a parasitoid of *Trialeurodes vaporariorum* (West wood) (Hom. Aleyrodidae). *Bollettino-del-Laboratorio-di-Entomologia-Agraria-'Filippo Silvestri'* **52**: 97-99

Viggiani, G. and Evans, G.A. 1992. Descriptions of three new species of *Amitus* Haldeman (Hymenoptera, Platygastridae), parasitoids of known white flies from the New World. *Bollettino-del-Laboratorio-di-Entomologia-Agraria-'Filippo-Silvestri'* **49**: 189-194

Vlug, H.J. 1976. *Synopeas talhouki* n. sp. (Hym. Platygastridae), a parasite of *Odinadiplosis amygdali* (Anagnostopoulos) (Dip. Cecidomyidae [Sic]) with notes on its distribution and biology. *Z. Angew. Entomol.* **80**: 262-266

Vlug, H.J. 1985. The types of Platygastridae (Hymenoptera, Scelionoidea) described by Haliday and Walker and preserved in the National Museum of Ireland and in the British Museum (Natural History). 2. Keys to species, redescriptons, Synonymy. *Tijdschr. Ent.* **127**: 179-224

Vlug, H.J. 1995. *Catalogue of the Platygastridae (Platygastroidea) of the world (Insecta: Hymenoptera).* SPB Academic Publishing by Amsterdam-Netherlands 168pp

Walker, F. 1835. On the species of Platygaster & C. *Ent. Mag.* **3**: 216-274

Walker, F. 1839. *Monographia chalciditum*, 2. London. 100pp.

Westwood, J.O. 1833. Further notices of the British parasitic Hymenopterous insects; together with the "Transactions of a fly with a long tail", observed by Mr.E.W. Lewis; and additional observations. *Mag. Nat. Hist. J. Zool. Bot. Min. Geol and Met.* **6**: 420-421

Yamagishi, K. 1980. Platygstrid parasites of willow gall midges in Japan (Hymenoptera, Proctotrupoidae). *Esakia* **15**: 161-175

Yoshida, N. and Hirashima, Y. 1979. Systematic studies on proctotrupoid and chalcidoid parasites of gall midges injurious to *Pinus* and *Cryptomeria* in Japan and Korea (Hymenoptera). *Esakia* **14**: 113-133

INVESTIGATION ON THE ALPHA SYSTEMATICS OF PLATYGASTROIDEA (HYMENOPTERA) OF KERALA STATE

THESIS SUBMITTED TO THE UNIVERSITY OF CALICUT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ZOOLOGY

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INDIA

MAY 2002

PLATES AND FIGURES

Collection Localities

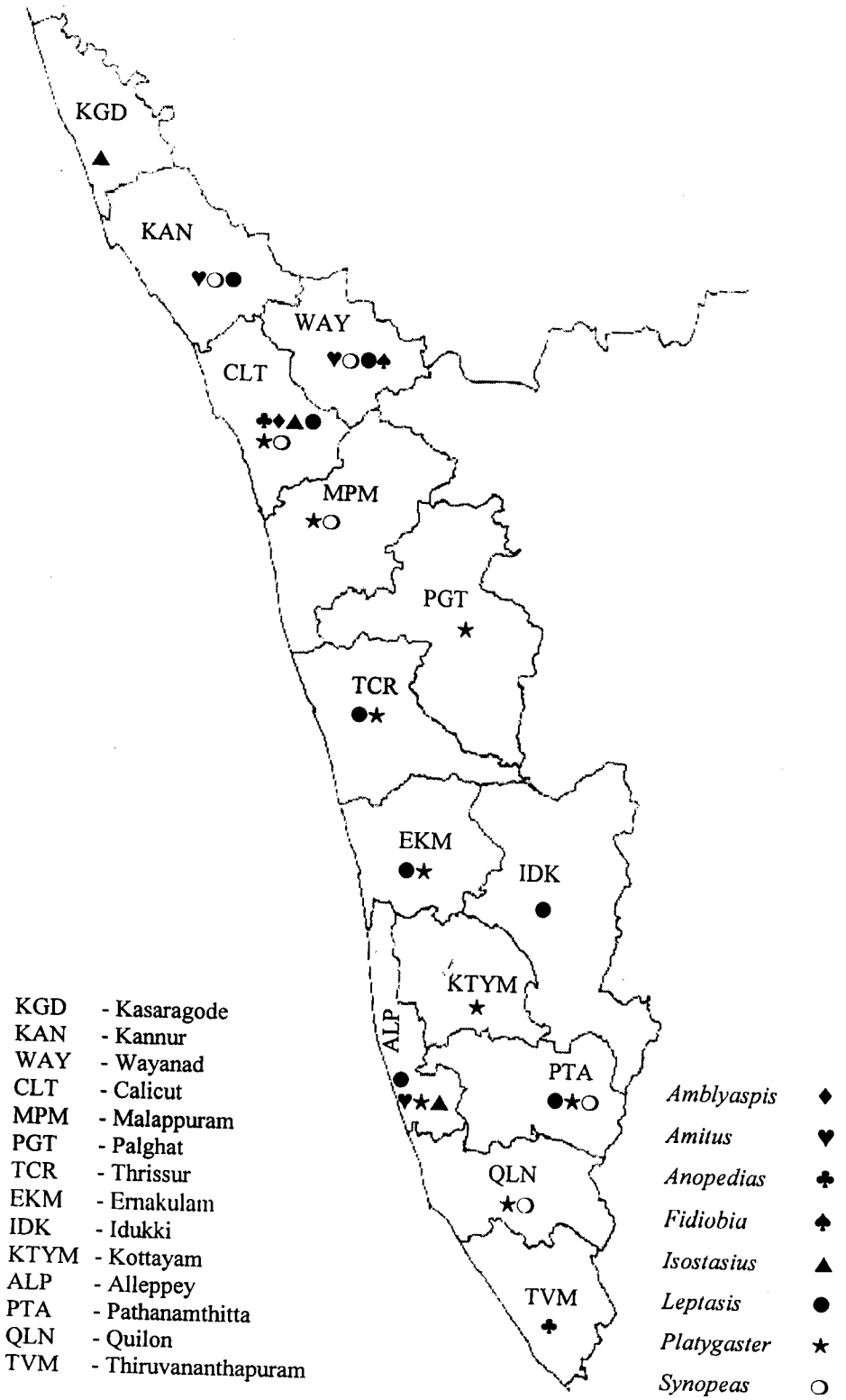
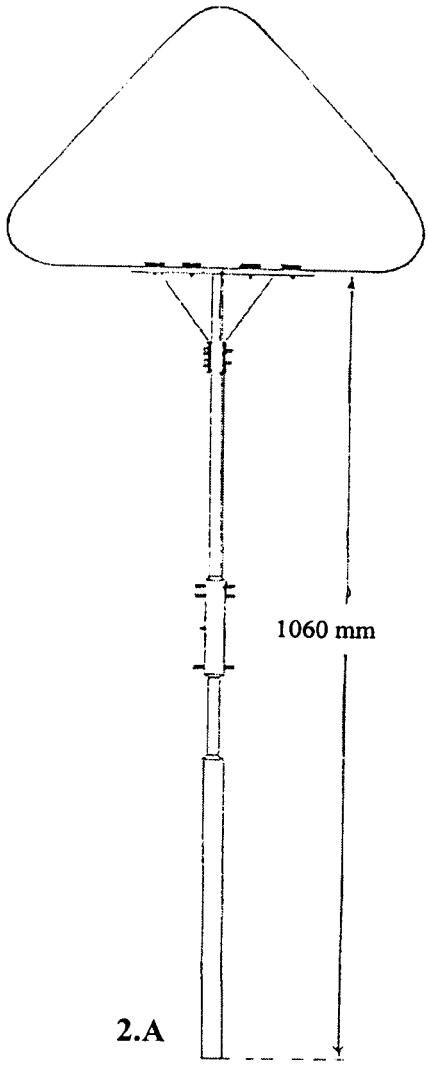


Fig. 1. Generic distribution of Platygastridae in Kerala



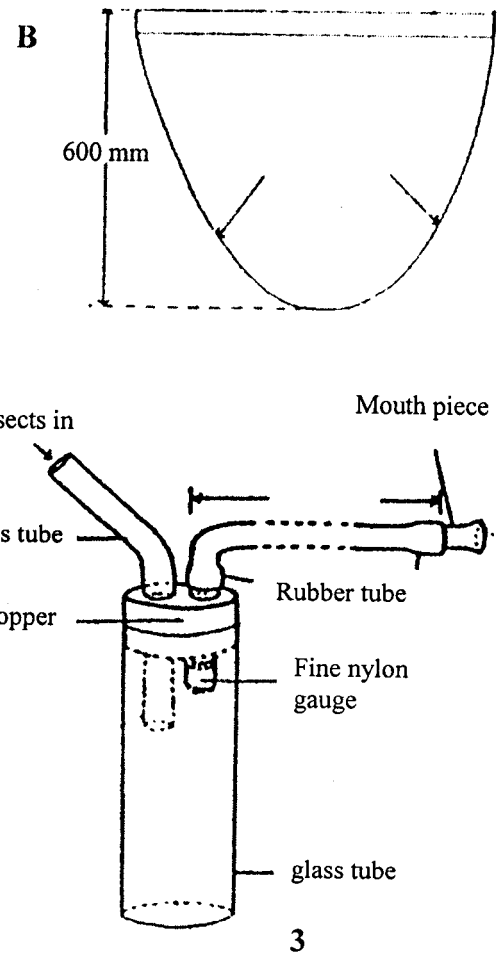
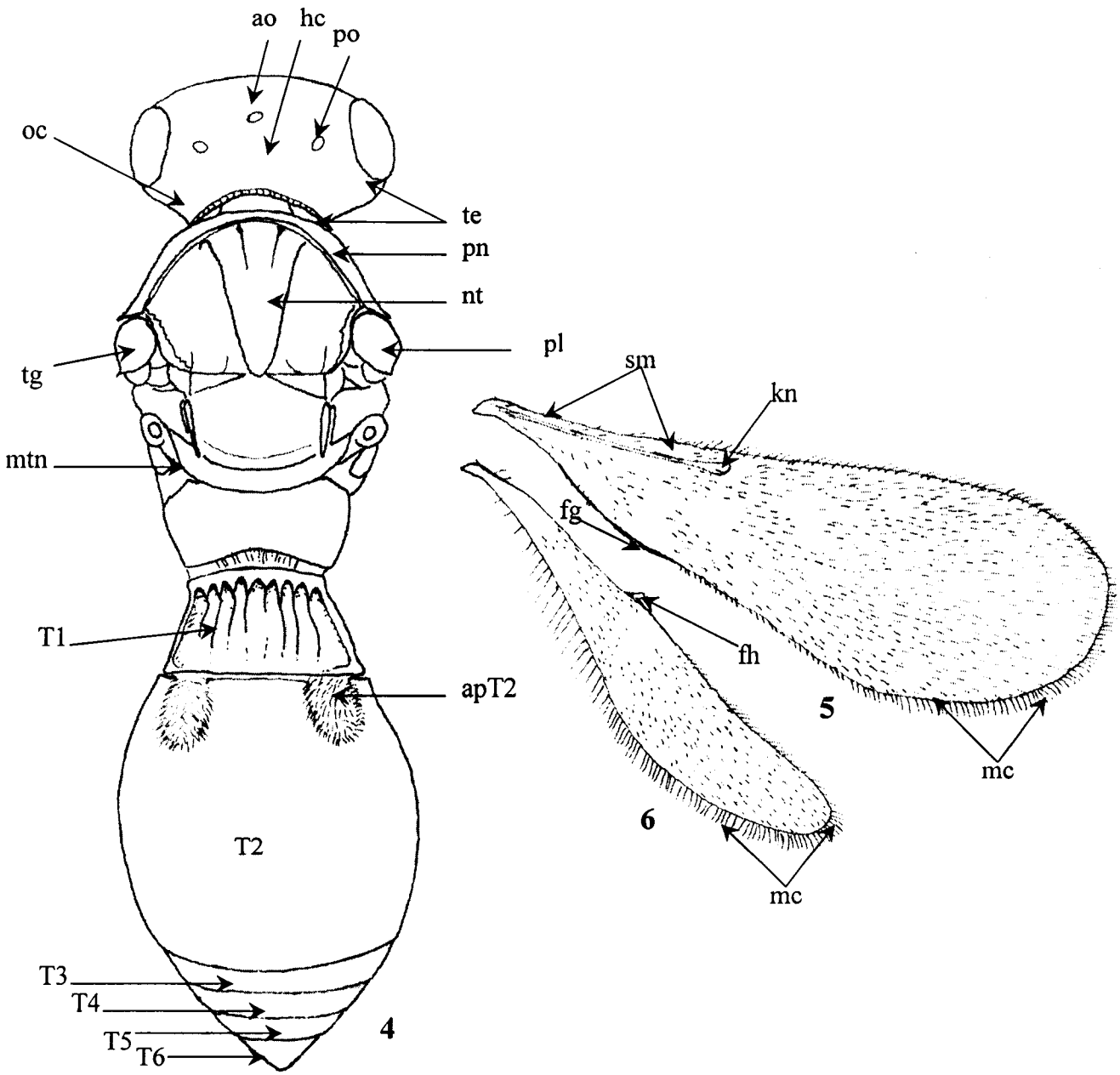


Fig. 2.A. Sweep net frame, B. Lateral view sweep net bag, Fig. 3. Aspirator

Figs. 4, 5 and 6.

al - admedian lines
ao - anterior ocellus
ApT2 - anterior pits
fg - frenal gutter
fh - frenal hooks
hc - hyperoccipital carina
mc - marginal cilia
mtn - metanotum
nt - notauli
oc - occipital carina
pl - parapsidial line
pn - pronotum
po - posterior ocellus
sm - submarginal vein
T1-T6 - dorsal sclerite of metasoma
te - temple
tg - tegula

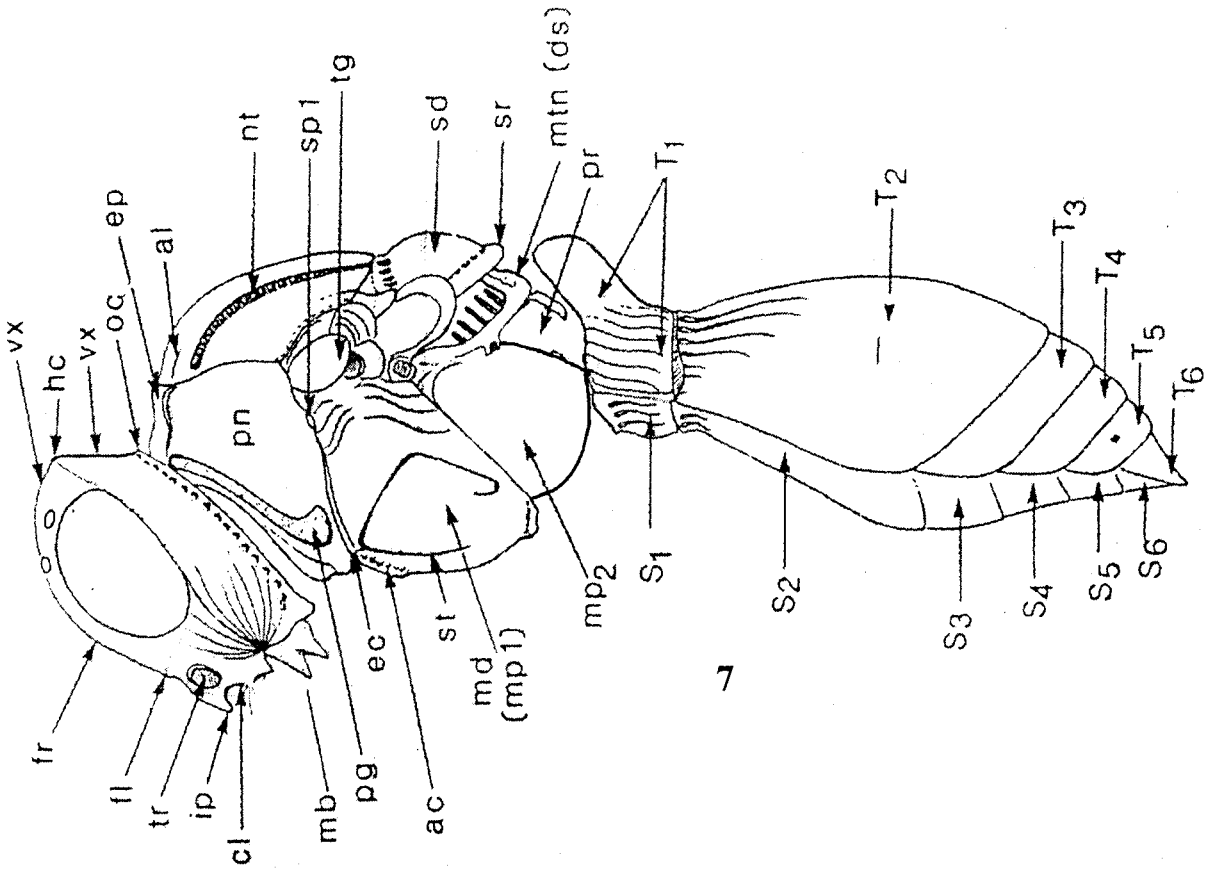


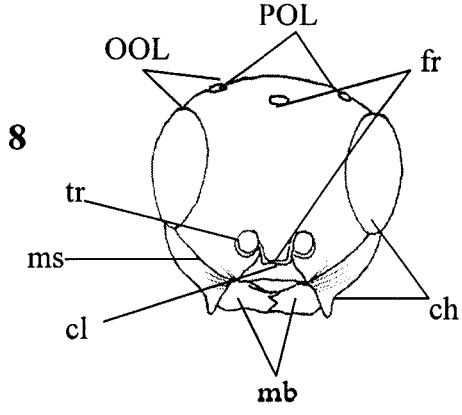
Figs. 4-9. General Morphology

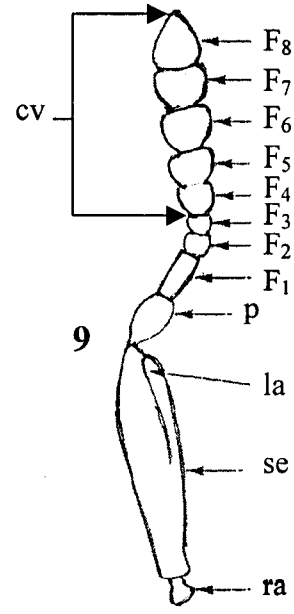
4. Body (Dorsal view) 5. Forewing 6. Hindwing

Figs. 7, 8 and 9.

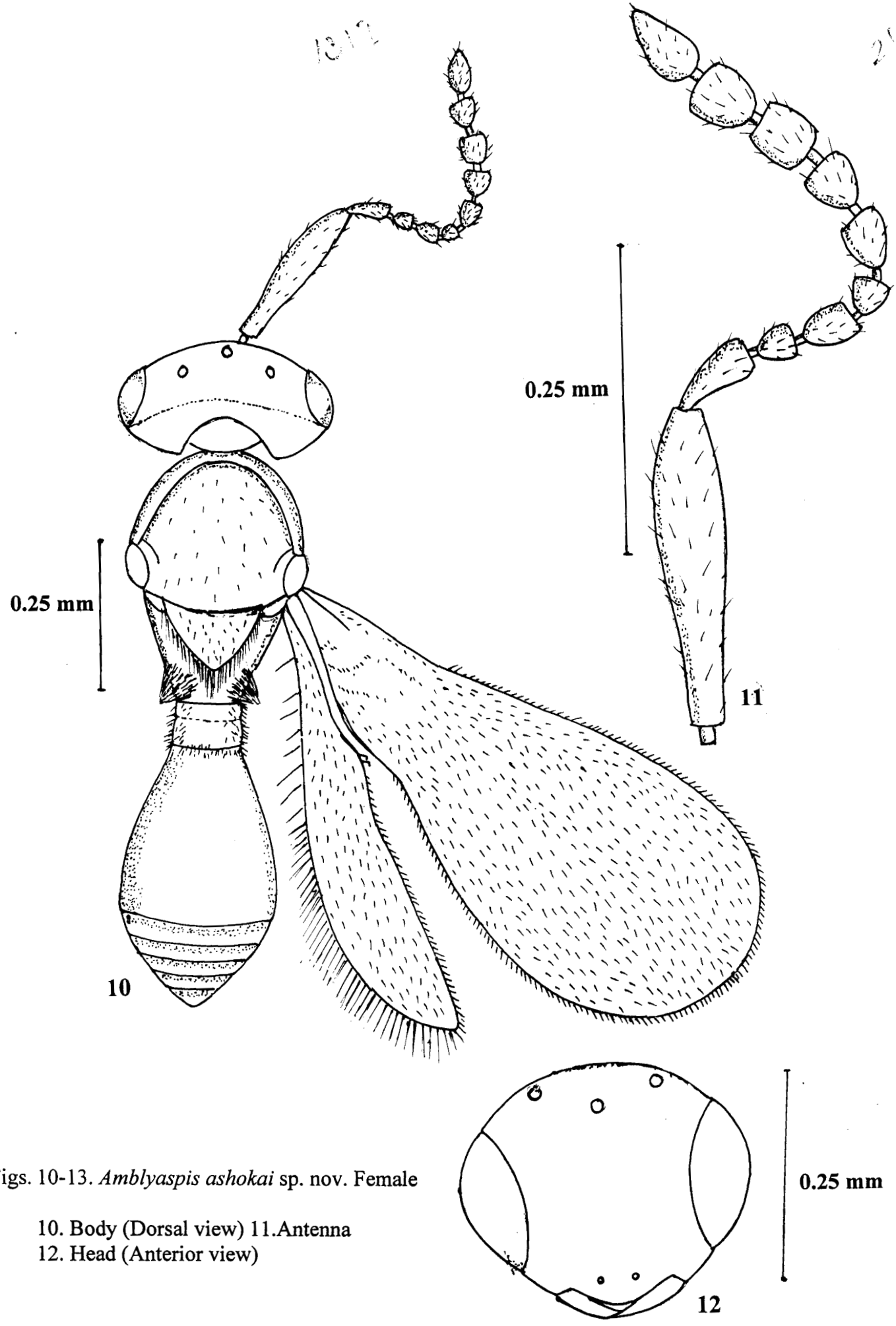
ac - acetabular carina
al - admedian line
ch - cheek
cl - clypeus
cv - clava
ec - epicnemium
ep - epomia
F1-F8 - antennal segments
fr - frons
hc - hyperoccipital carina
io - inner orbit
ip - interantennal projection
la - lamella
mb - mandible
md - mesopleural depression
mp2 - metapleuron
ms - malar sulcus
mtn - mesonotum
nt - notauli
oc - occipital carina
OOL - ocular ocellar line
p - pedicel
pg - pronotal groove
pn - pronotum
POL - ocular ocellar line
pr - propodeum
ra - radicle
S1-S6 - sternites
sd - scutellar disc
se - scape
sr - sctellar rim
st - sternaulus
T1-T6 - tergites
tg - tegula
tr - torulus
vx - vertex





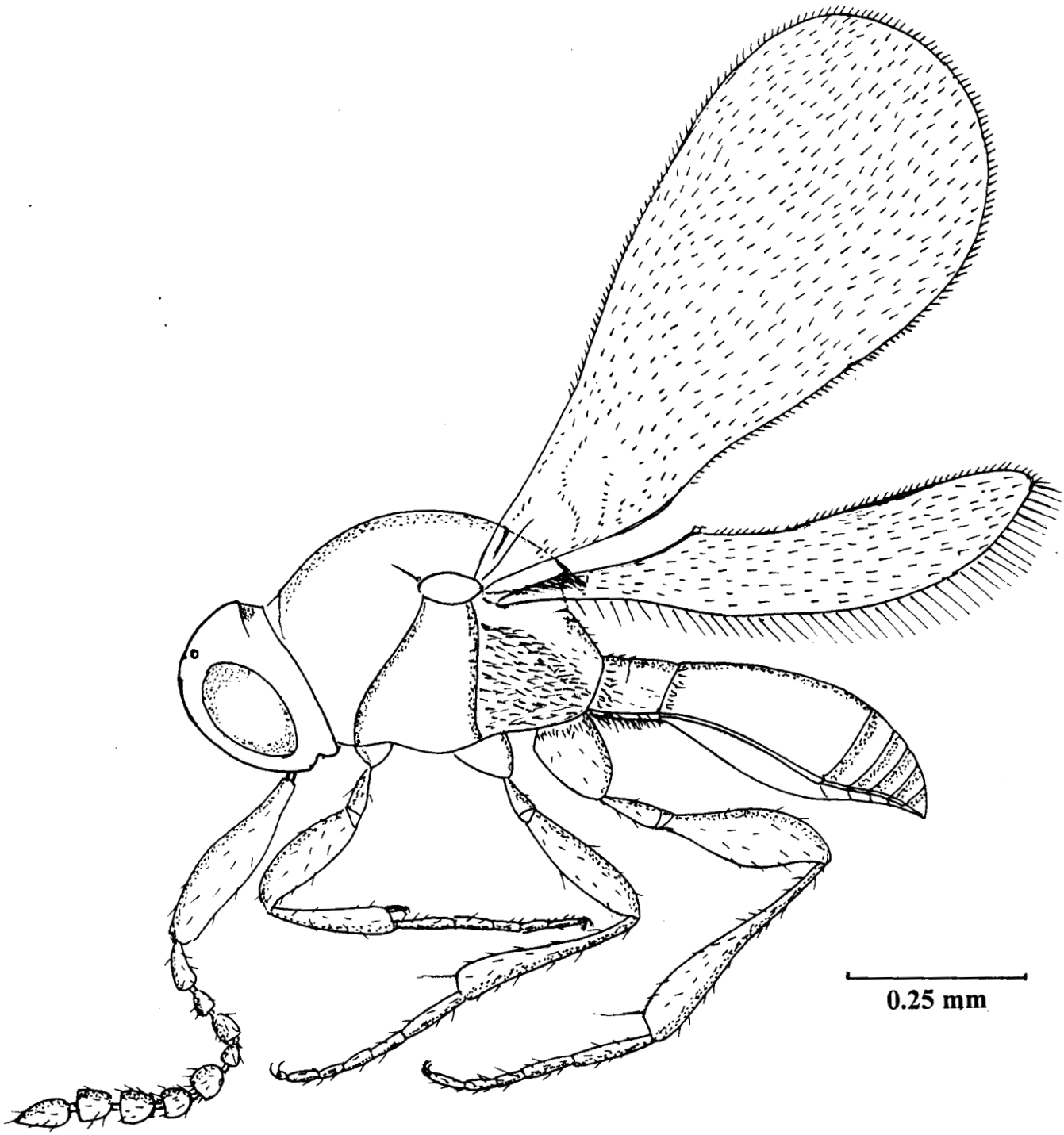


7. Body (Lateral view) 8. Head (Anterior view) 9. Antenna

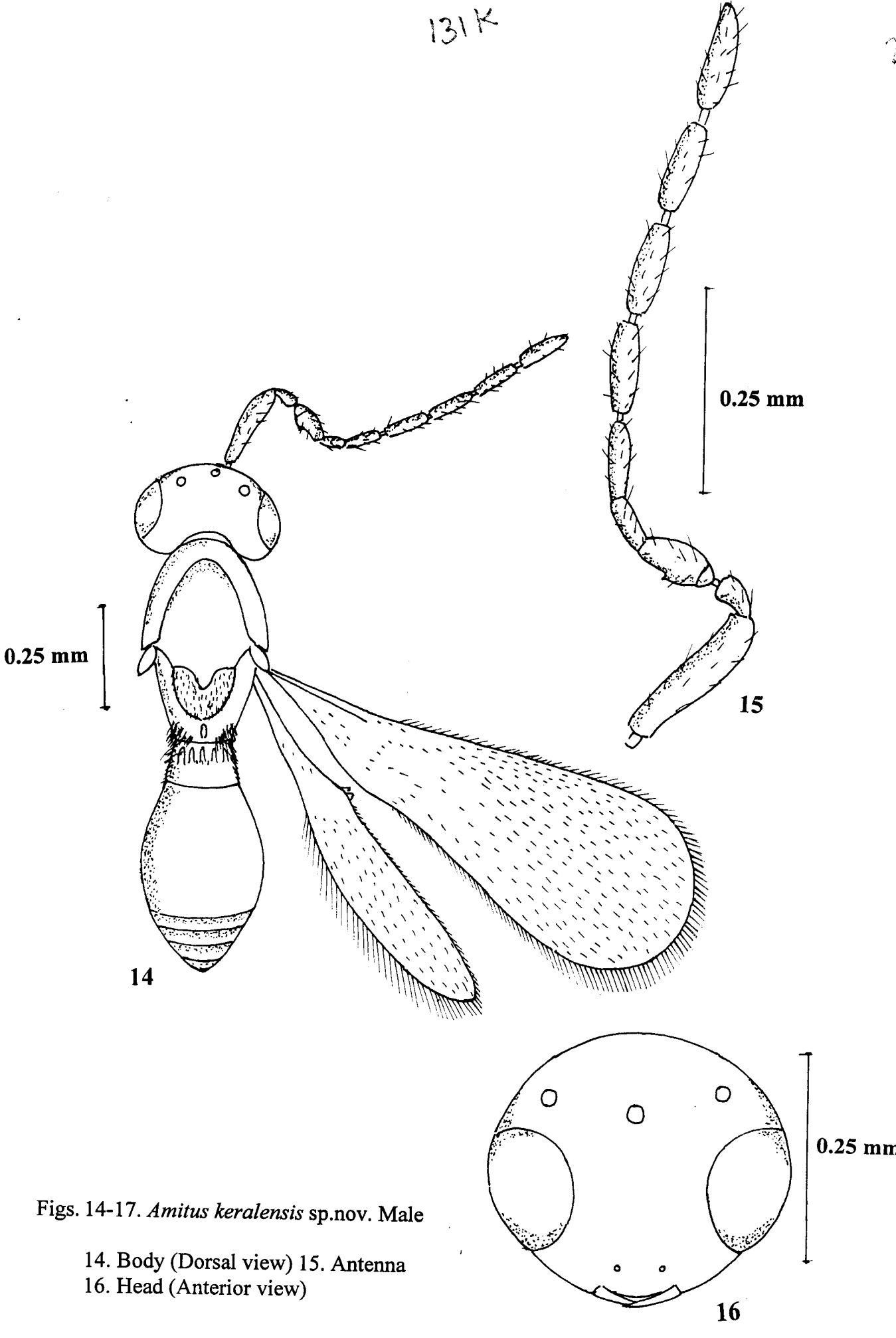


Figs. 10-13. *Amblyaspis ashokai* sp. nov. Female

10. Body (Dorsal view) 11.Antenna
12. Head (Anterior view)

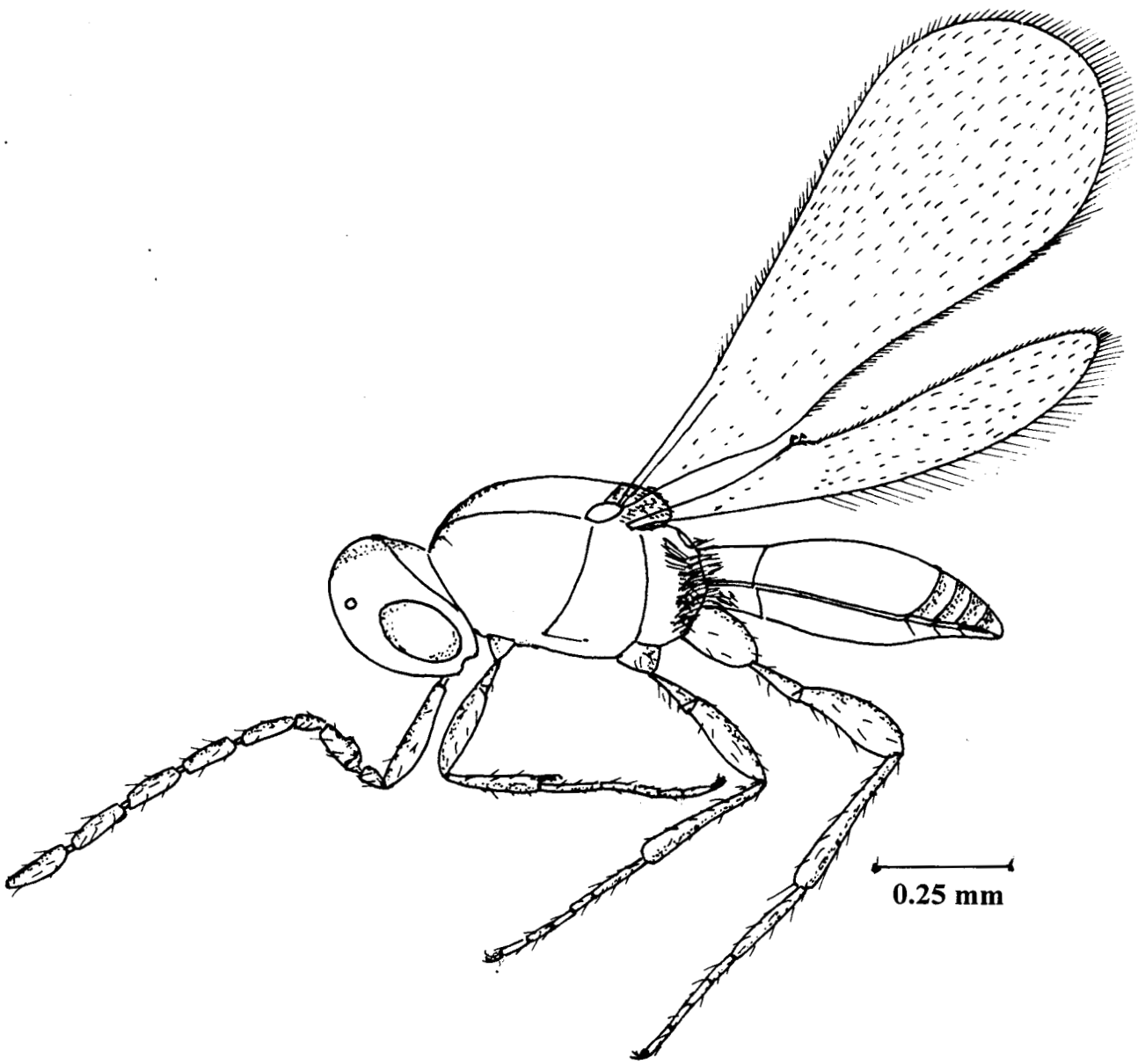


13. *Amblyaspis ashokai* sp.nov.Female (Lateral view)

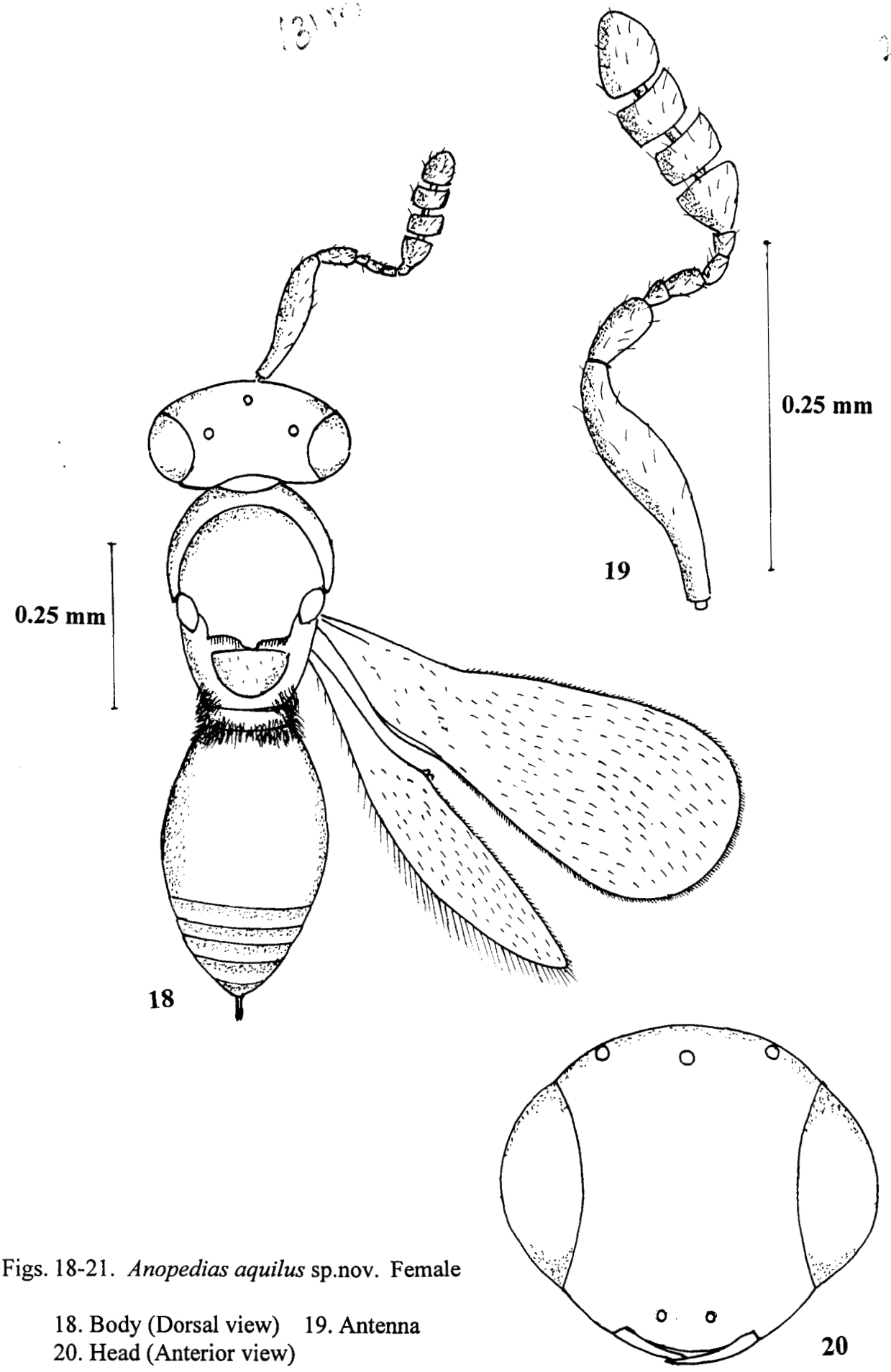


Figs. 14-17. *Amitus keralensis* sp.nov. Male

14. Body (Dorsal view) 15. Antenna
16. Head (Anterior view)

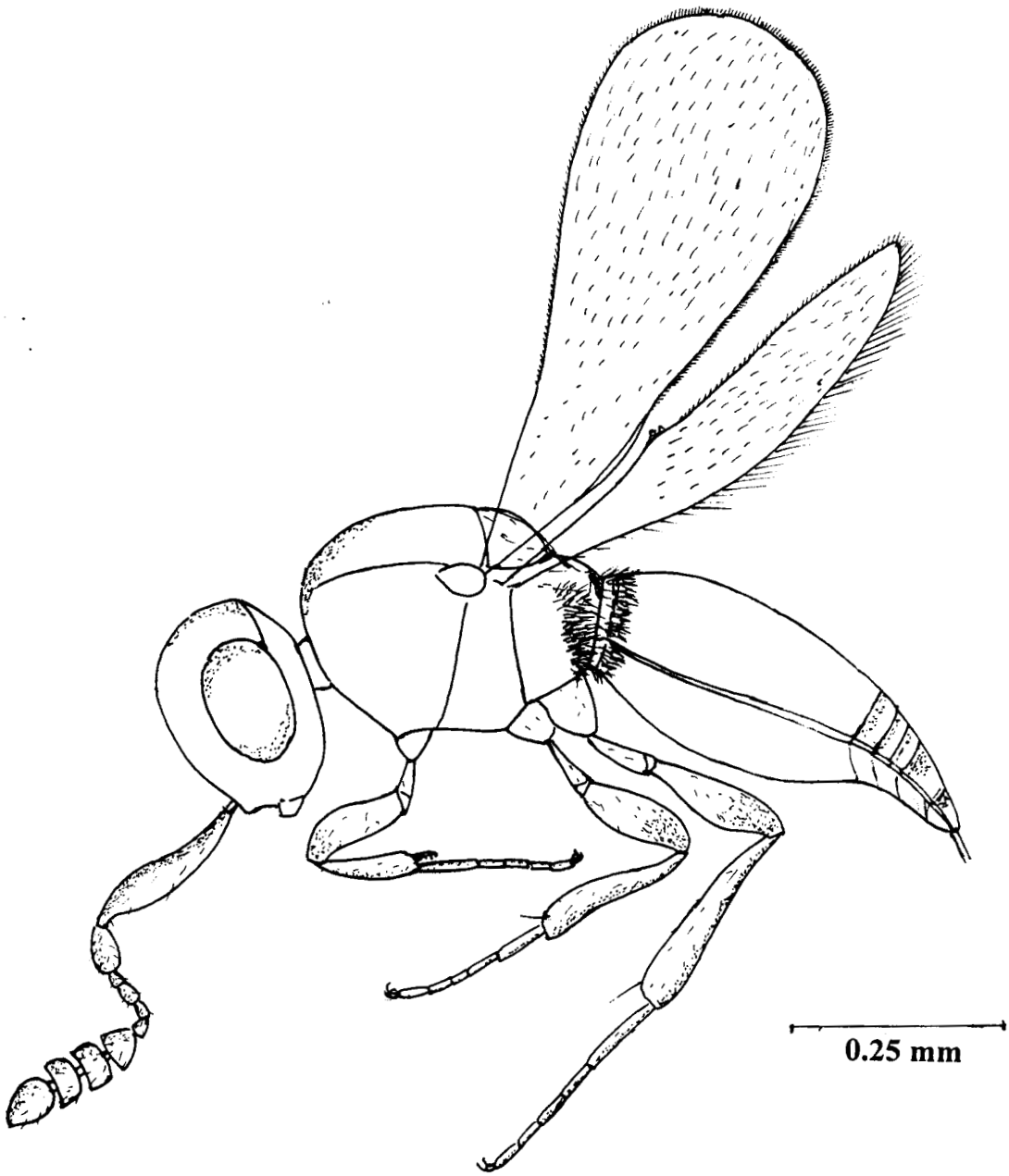


17. *Amitus keralensis* sp.nov. Male (Lateral view)

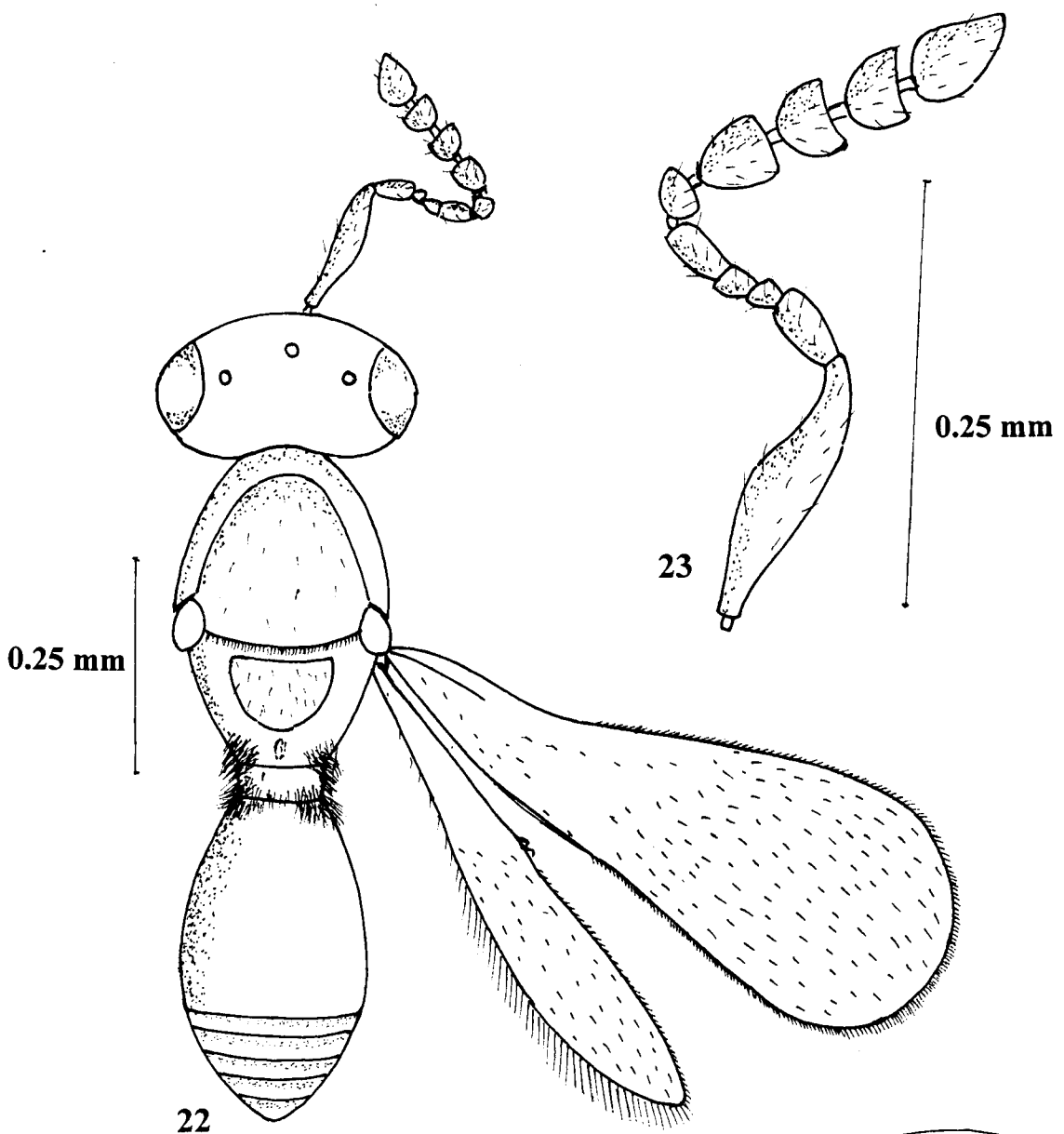


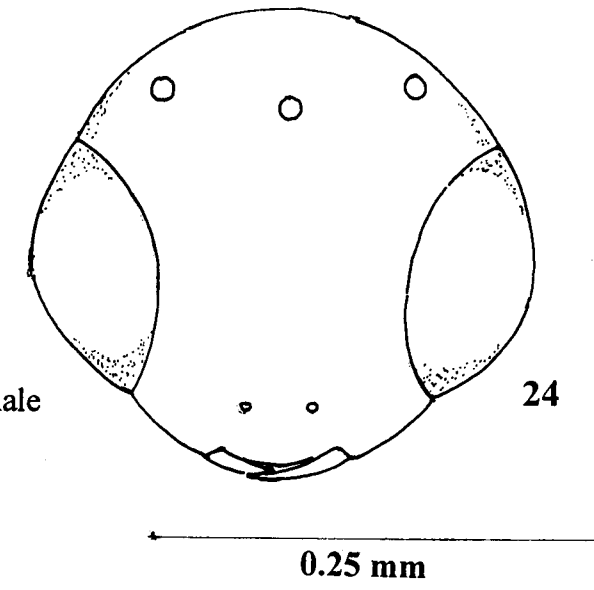
Figs. 18-21. *Anopedias aquilus* sp.nov. Female

18. Body (Dorsal view) 19. Antenna
20. Head (Anterior view)



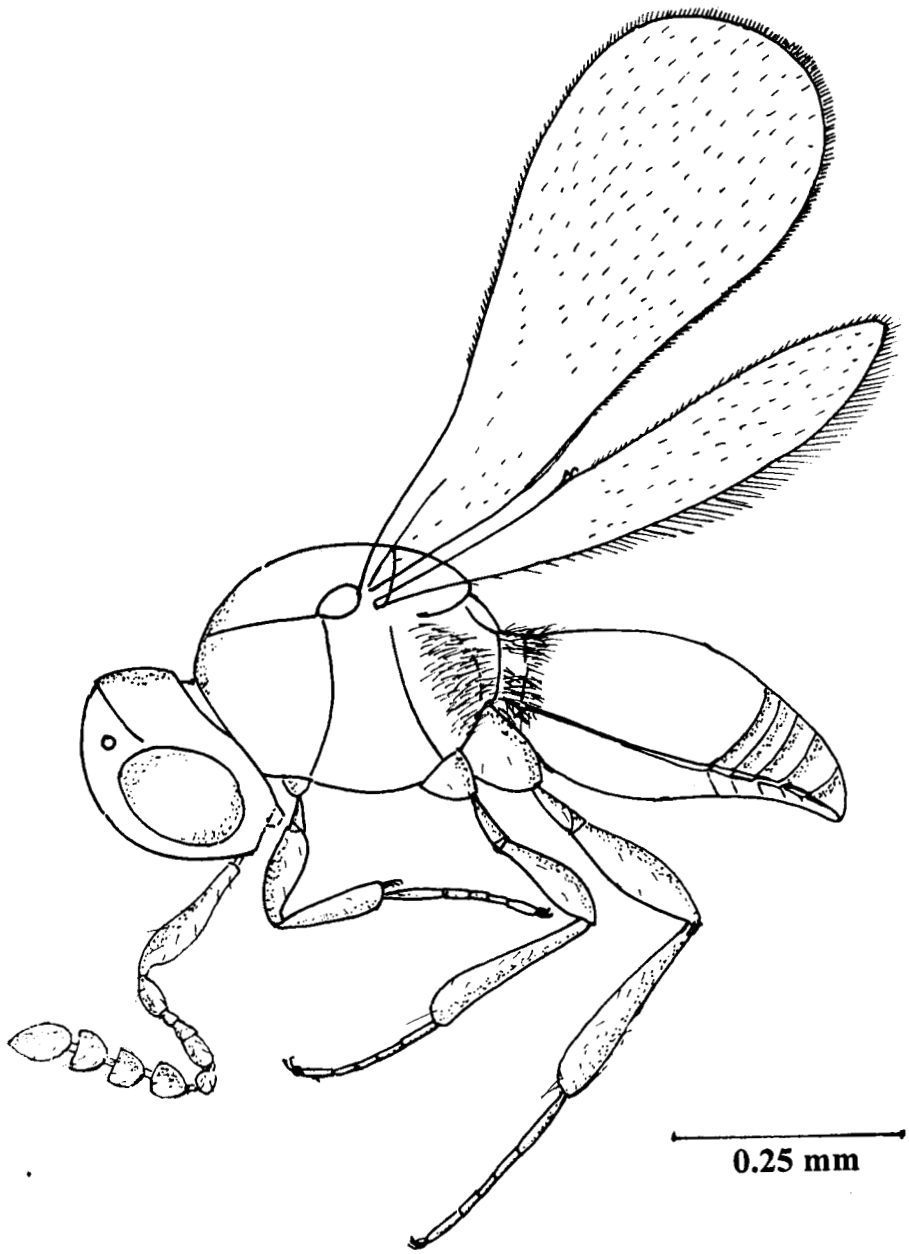
21. *Anopedias aquilus* sp.nov.Female (Lateral view)



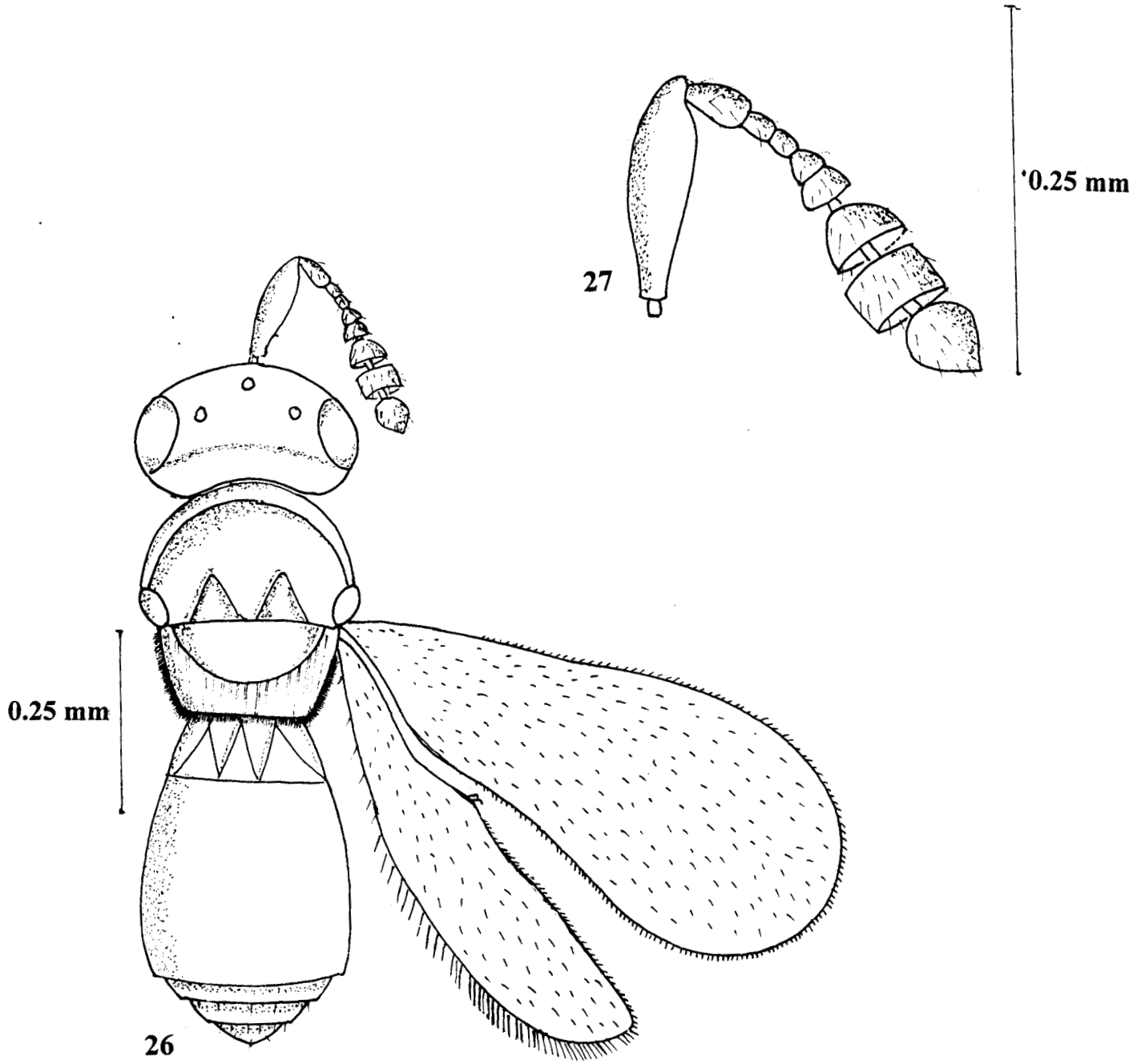


Figs. 22-25. *Anopedias novissimus* sp. nov. Female

22. Body (Dorsal view) 23. Antenna
24. Head (Anterior view)



25. *Anopedias novissimus* sp. nov. Female (Lateral view)



Figs. 26-27. *Fidiobia keralensis* sp. nov. Female

26. Body (Dorsal view) 27. Antenna

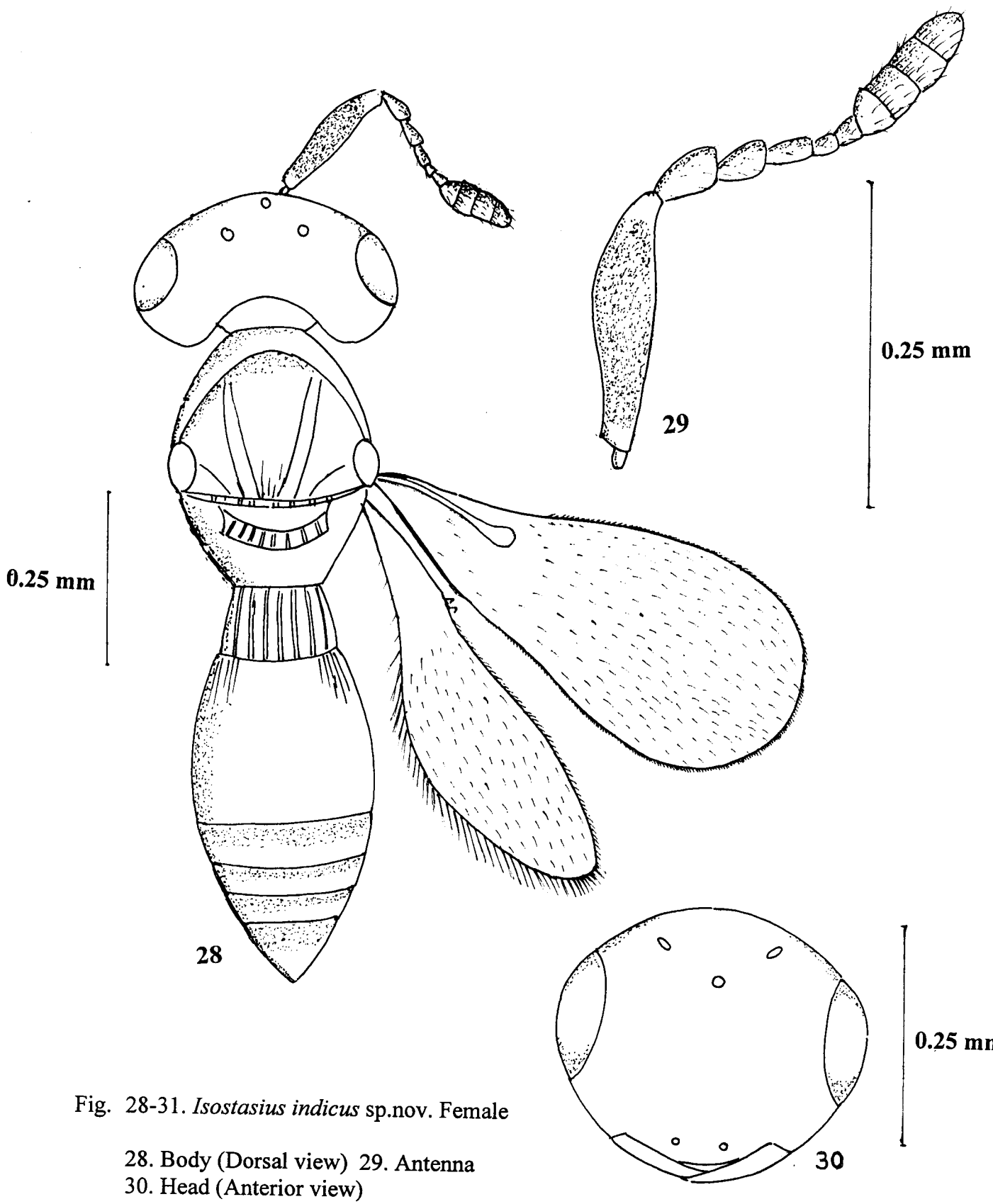
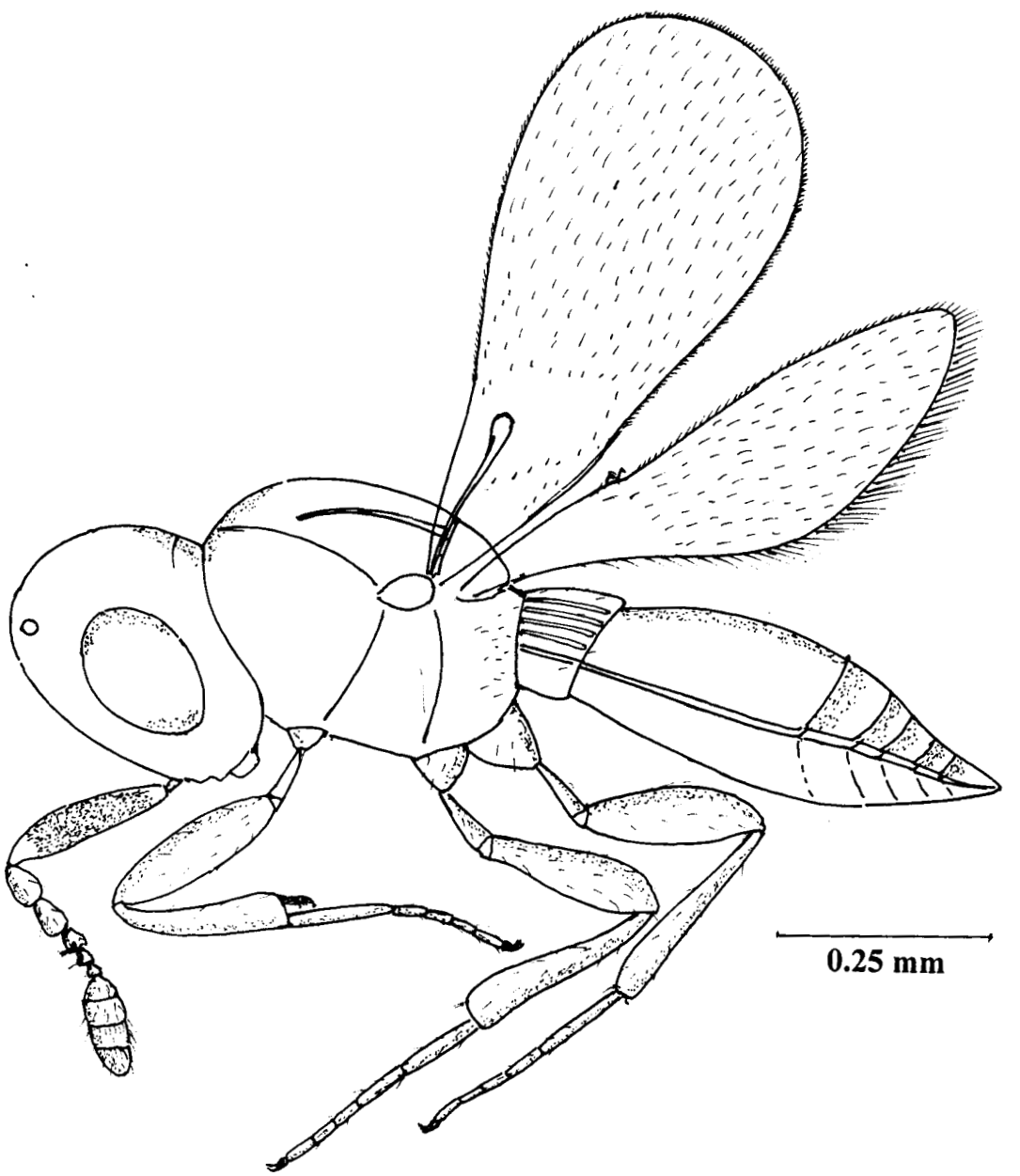
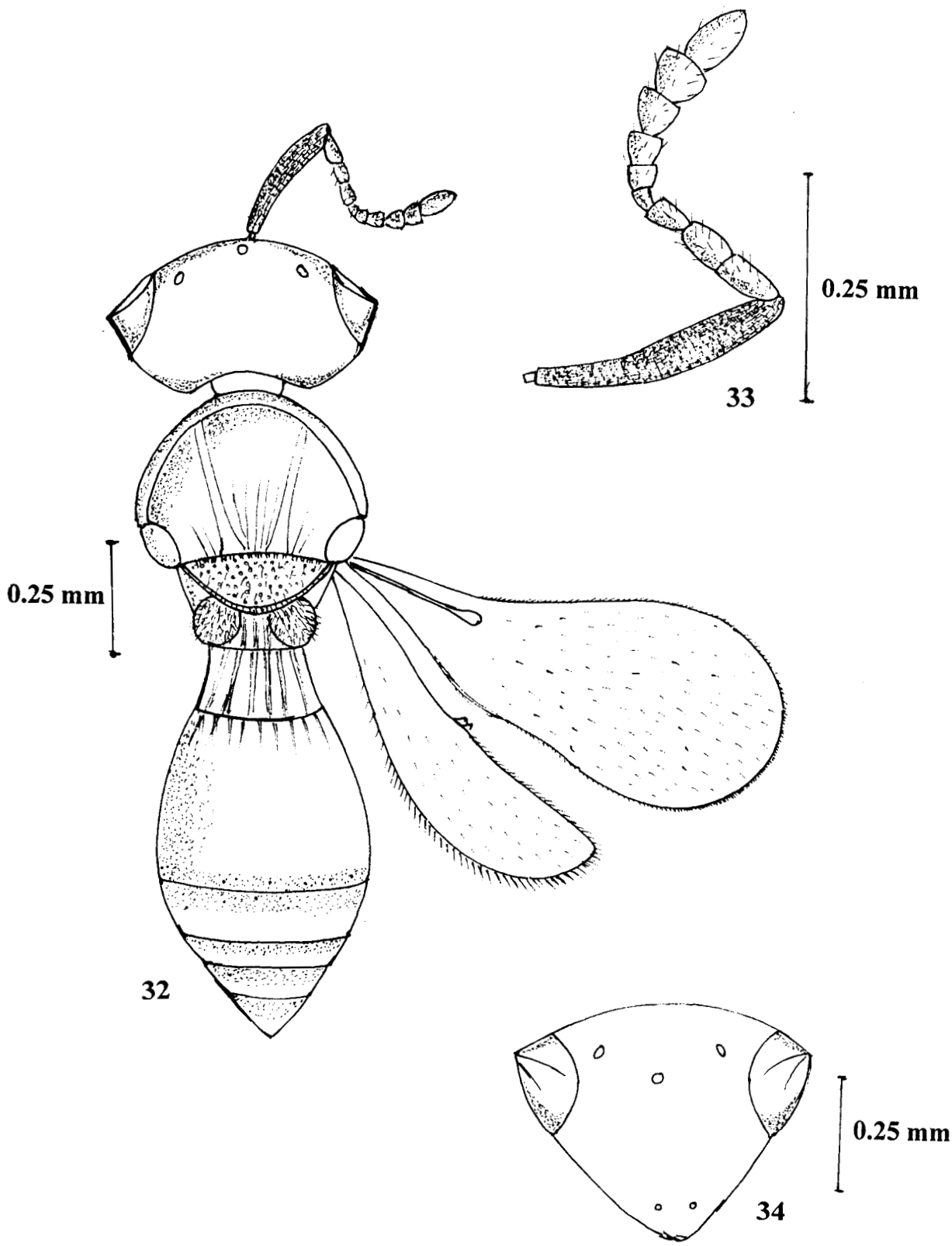


Fig. 28-31. *Isostasius indicus* sp.nov. Female

28. Body (Dorsal view) 29. Antenna
30. Head (Anterior view)

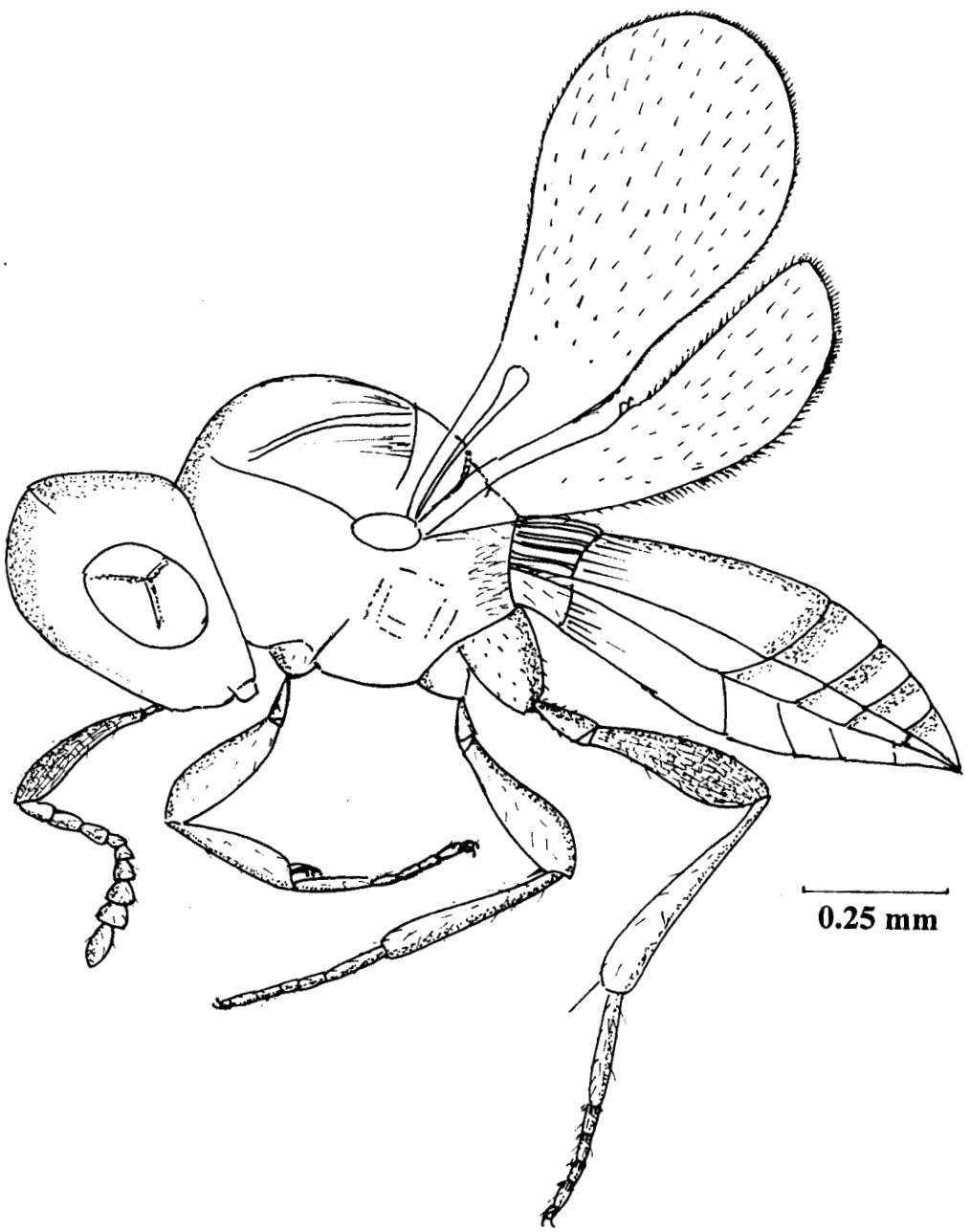


31. *Isostasius indicus* sp.nov. Female (Lateral view)

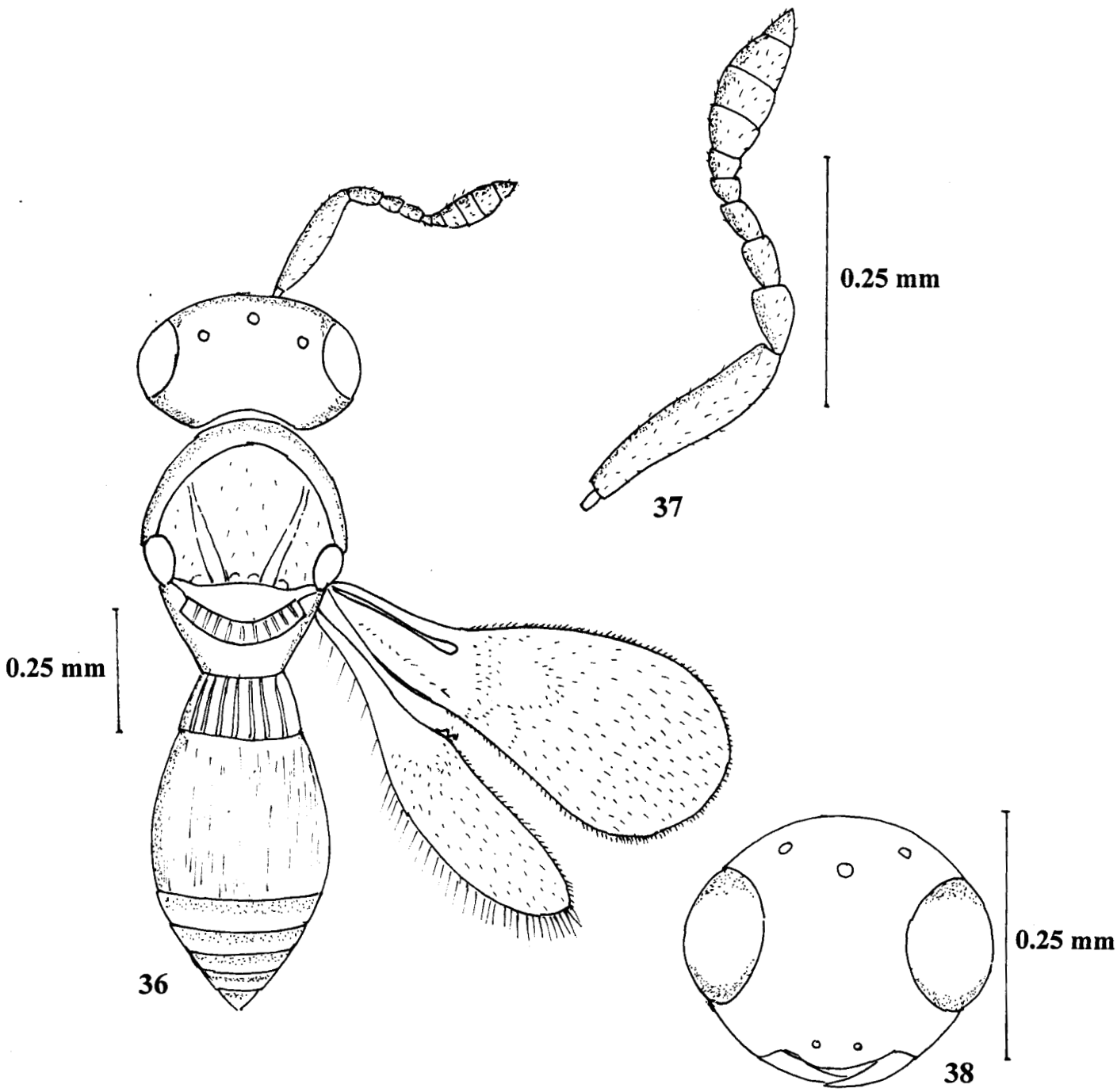


Figs. 32-35. *Isostasius malabaricus* sp.nov. Female

32. Body (Dorsal view) 33. Antenna
34. Head (Anterior view)

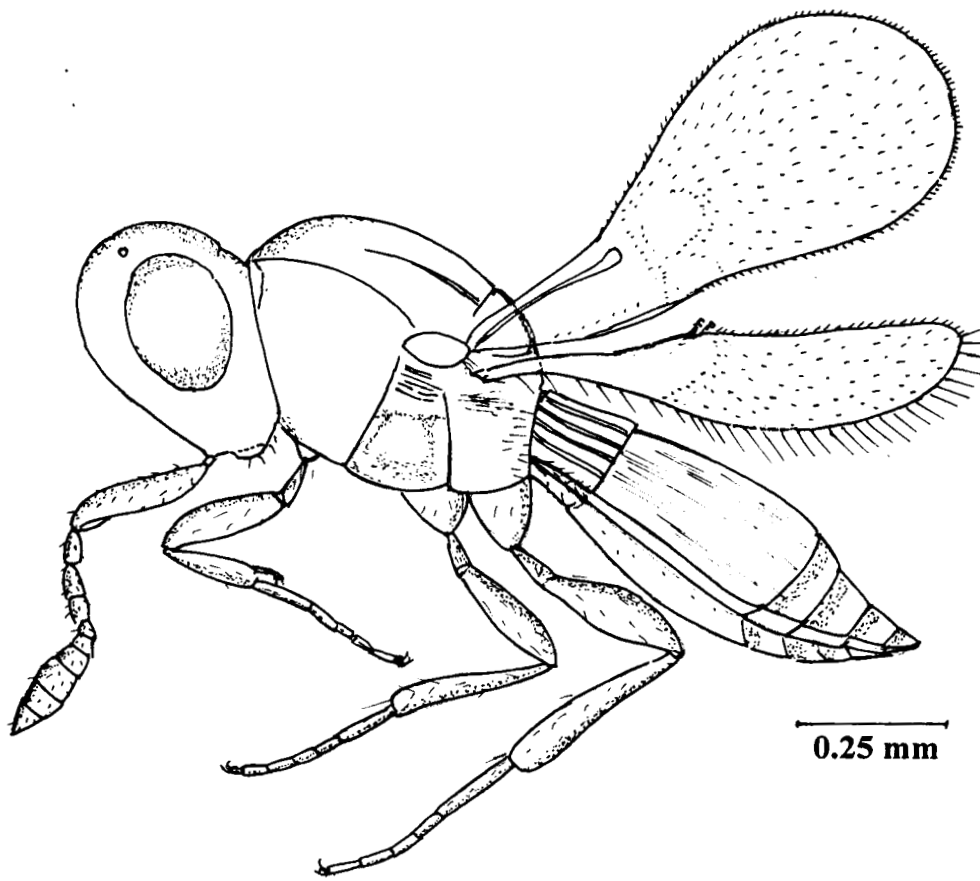


35. *Isostasius malabaricus* sp.nov. Female (Lateral view)

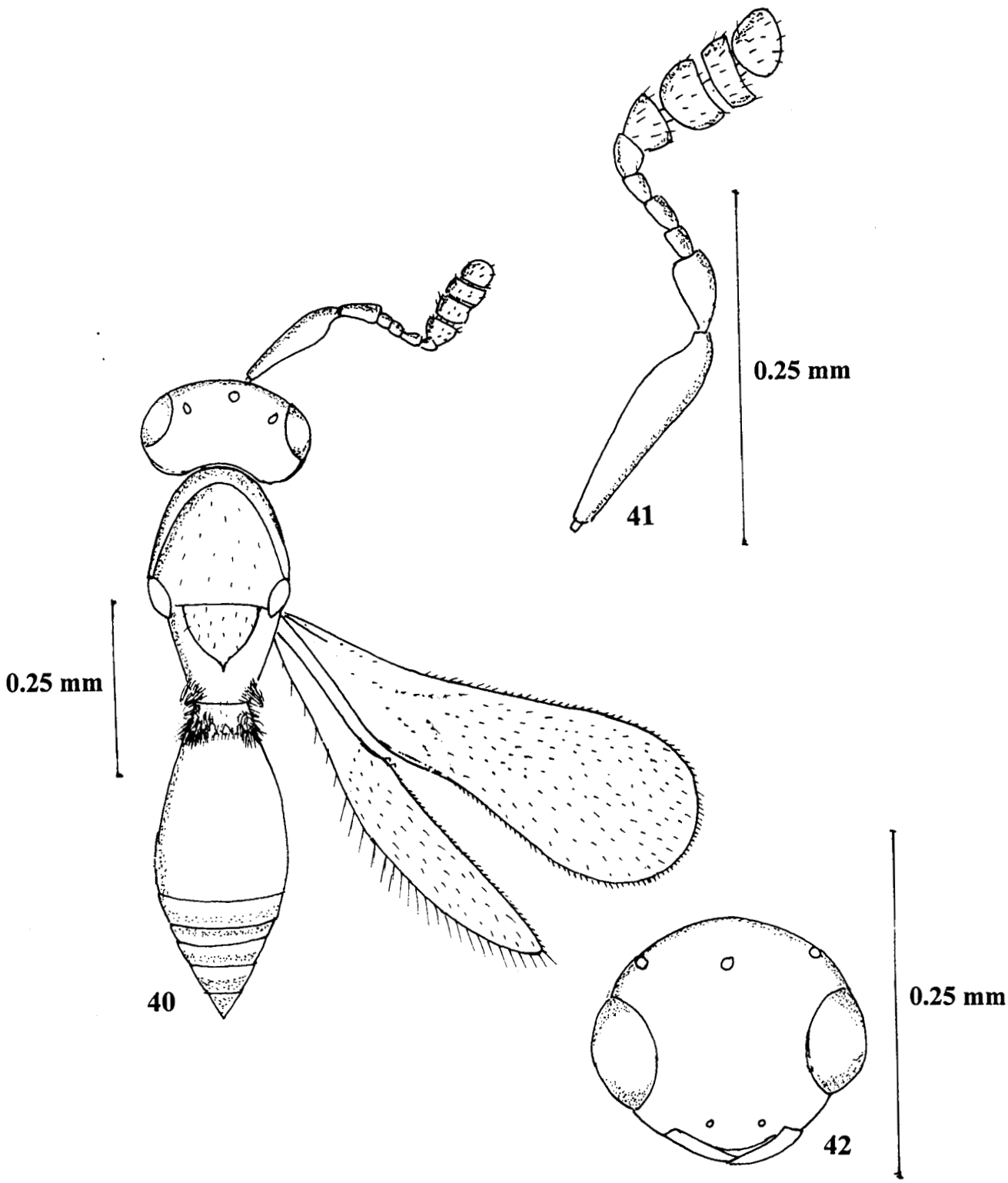


Figs. 36-39. *Isostasius vayalarensis* sp.nov. Female

36. Body (Dorsal view) 37. Antenna
38. Head (Anterior view)

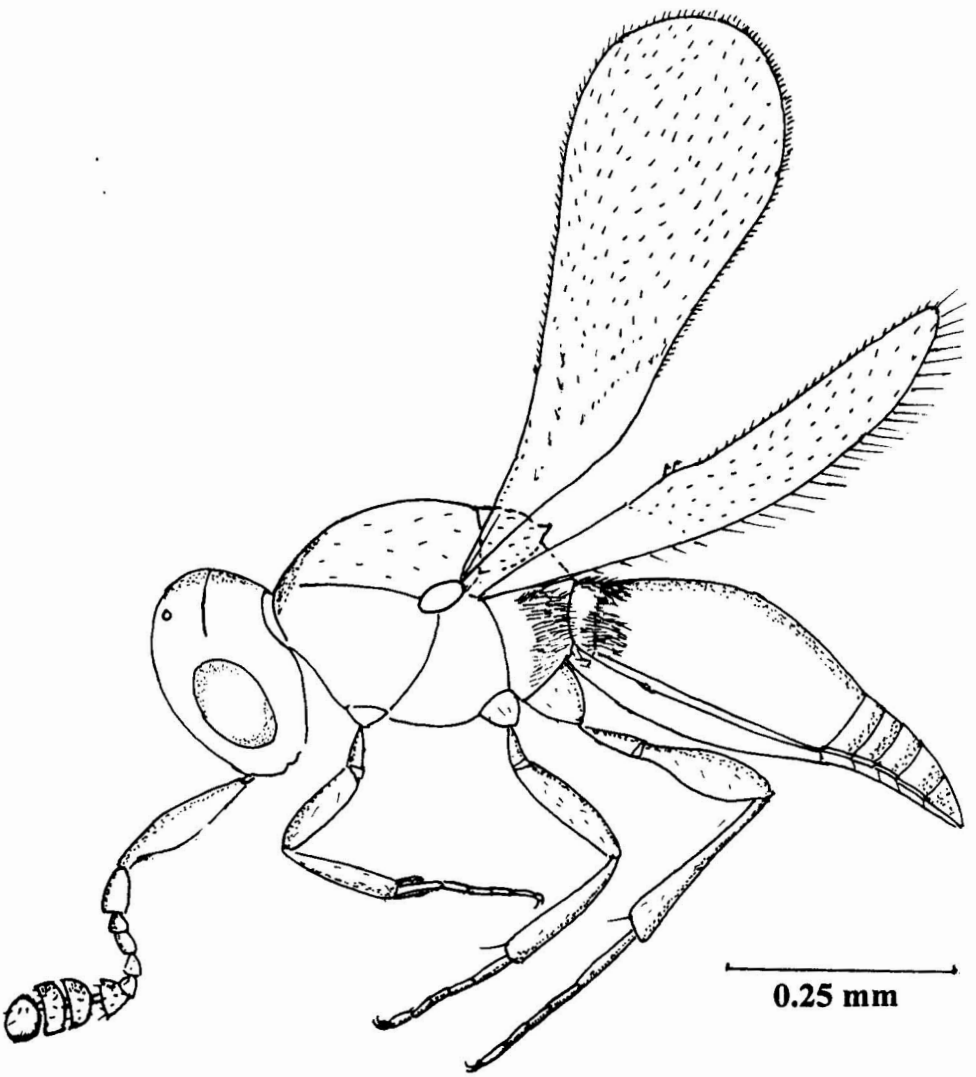


39. *Isostasius vayalarensis* sp.nov. Female (Lateral view)

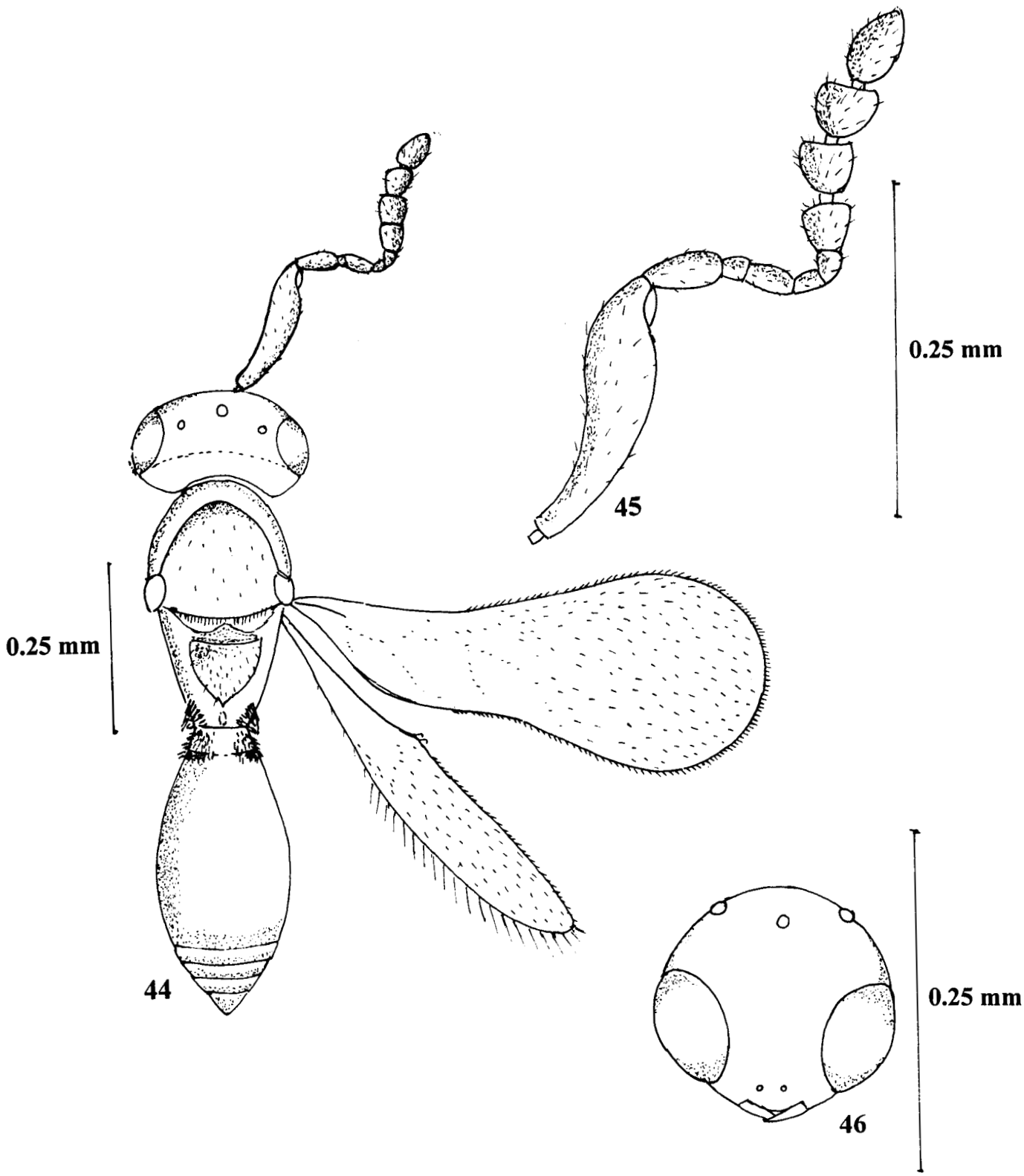


Figs. 40-43. *Leptacis aeros* sp.nov. Female

40. Body (Dorsal view) 41. Antenna
42. Head (Anterior view)

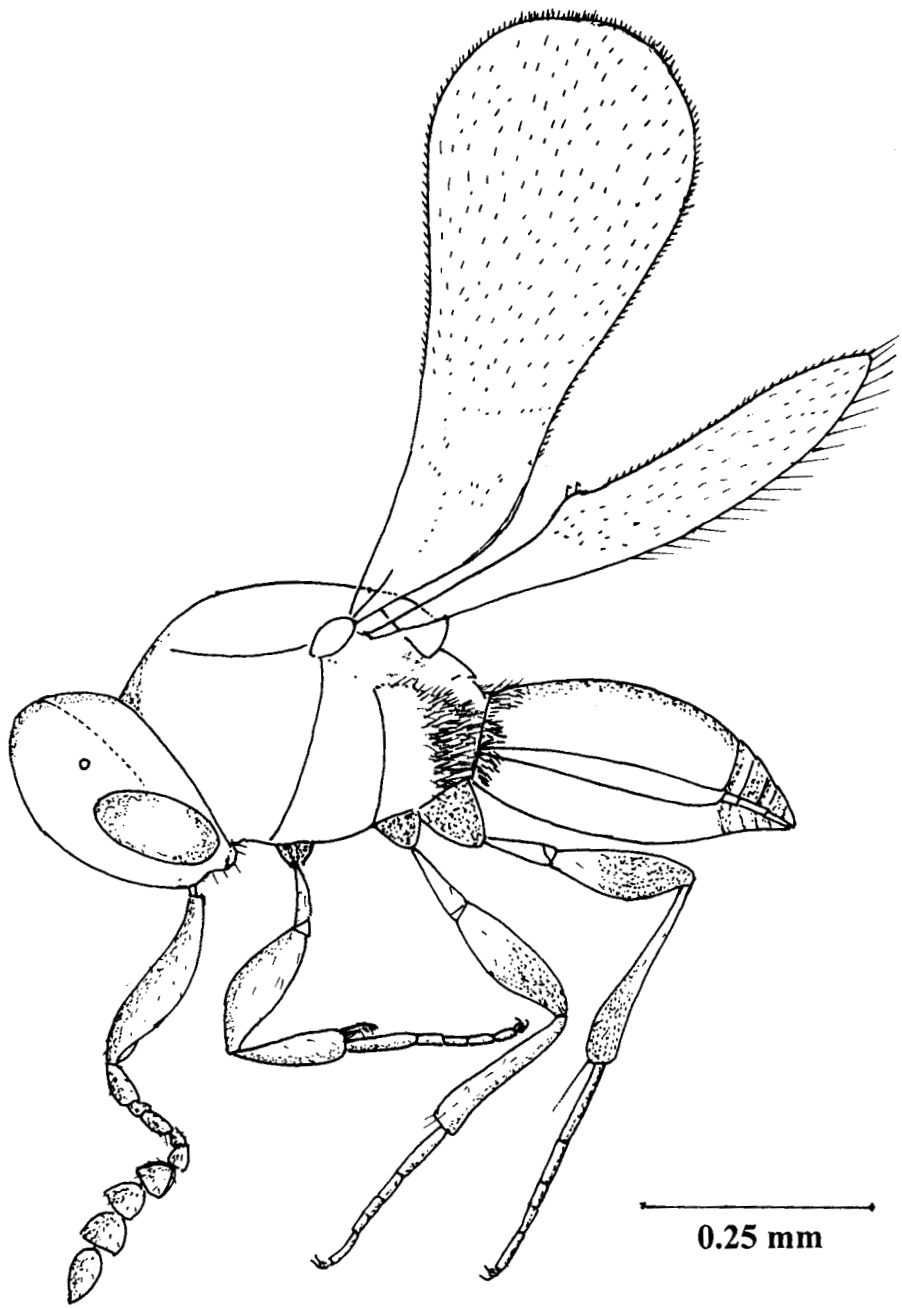


43. *Leptacis aeros* sp.nov. Female (Lateral view)

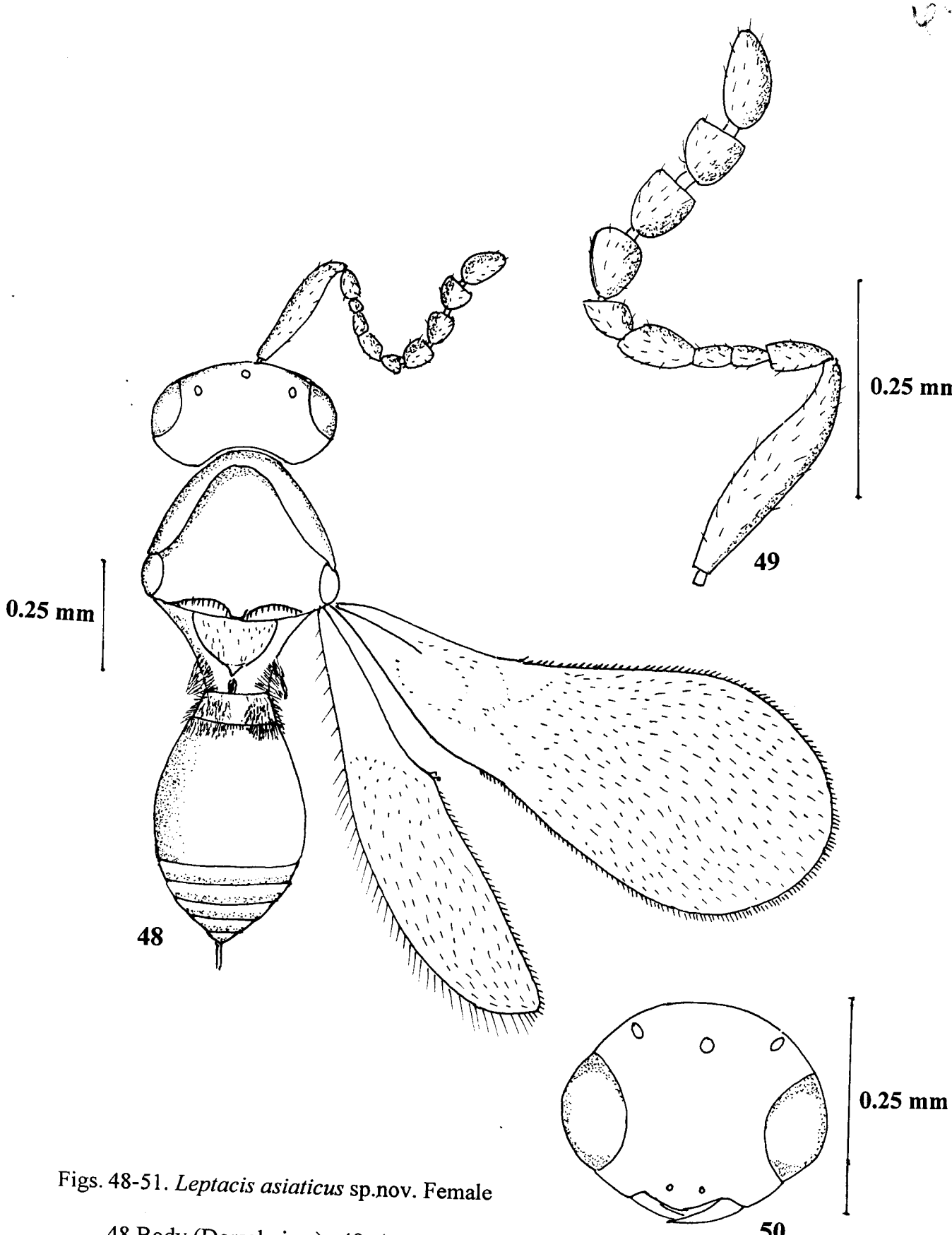


Figs. 44-47. *Leptacis alus* sp.nov. Female

44. Body (Dorsal view) 45. Antenna
46. Head (Anterior view)

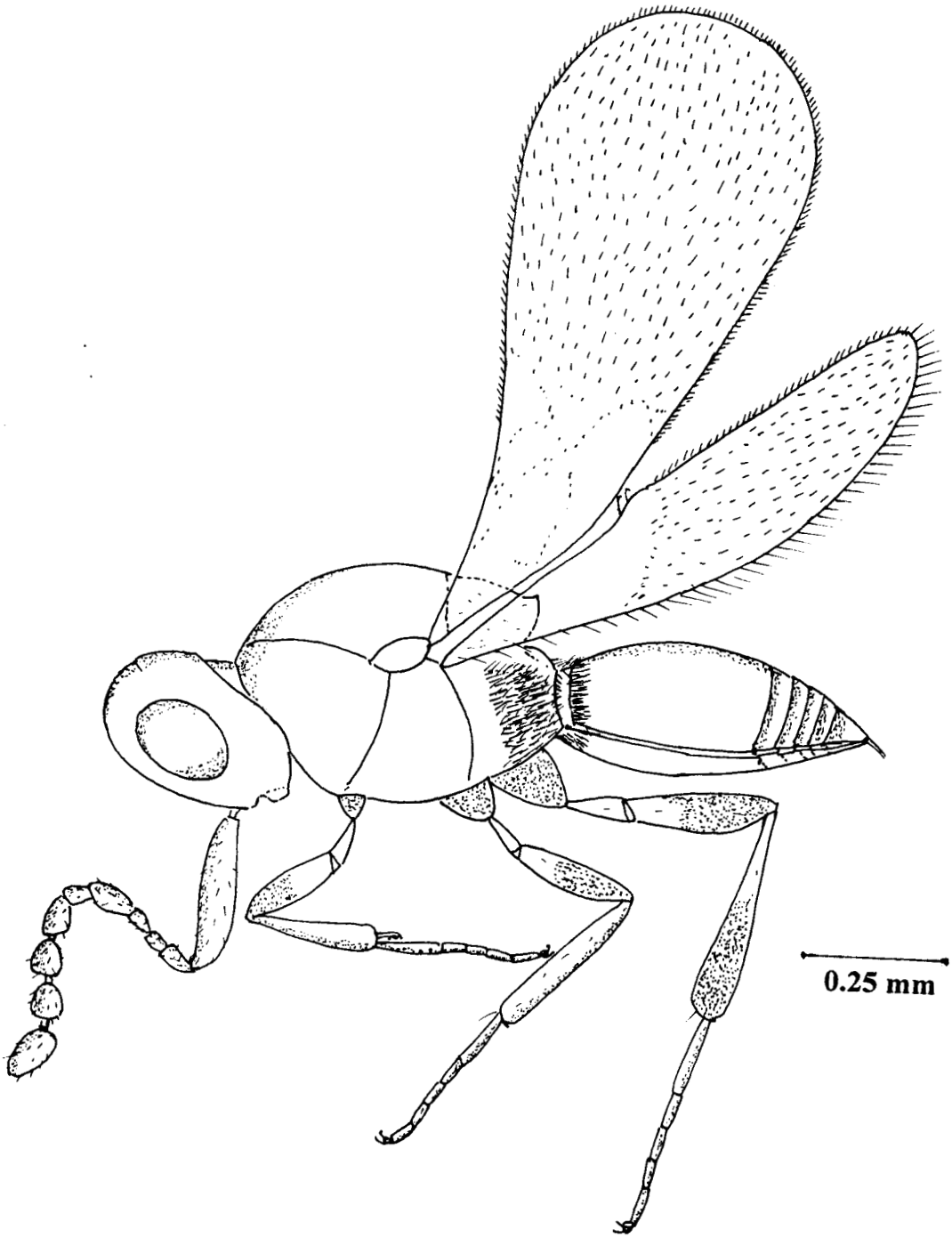


47. *Leptacis alus* sp.nov. Female (Lateral view)

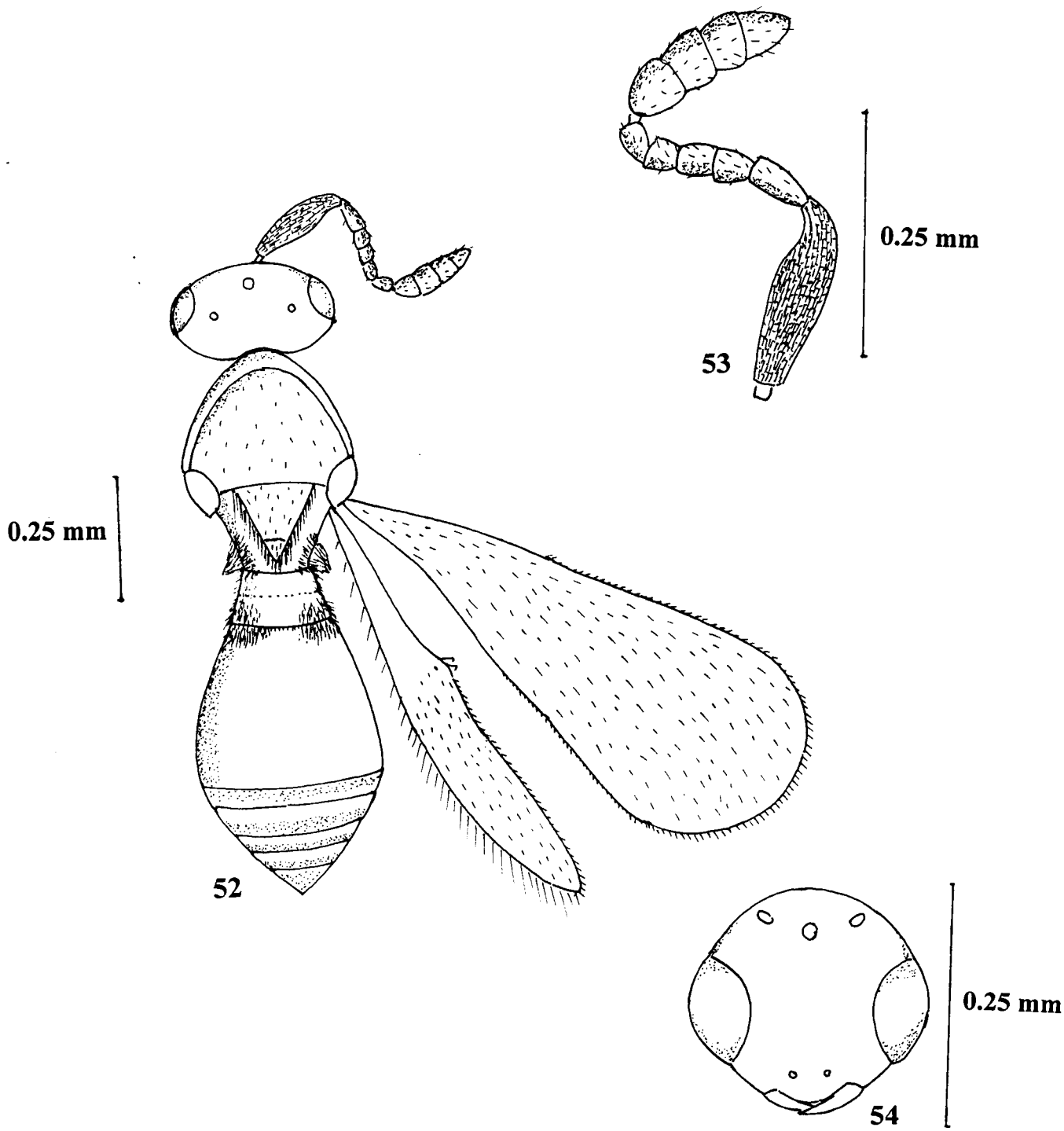


Figs. 48-51. *Leptacis asiaticus* sp.nov. Female

48.Body (Dorsal view) 49. Antenna
50.Head (Anterior view)

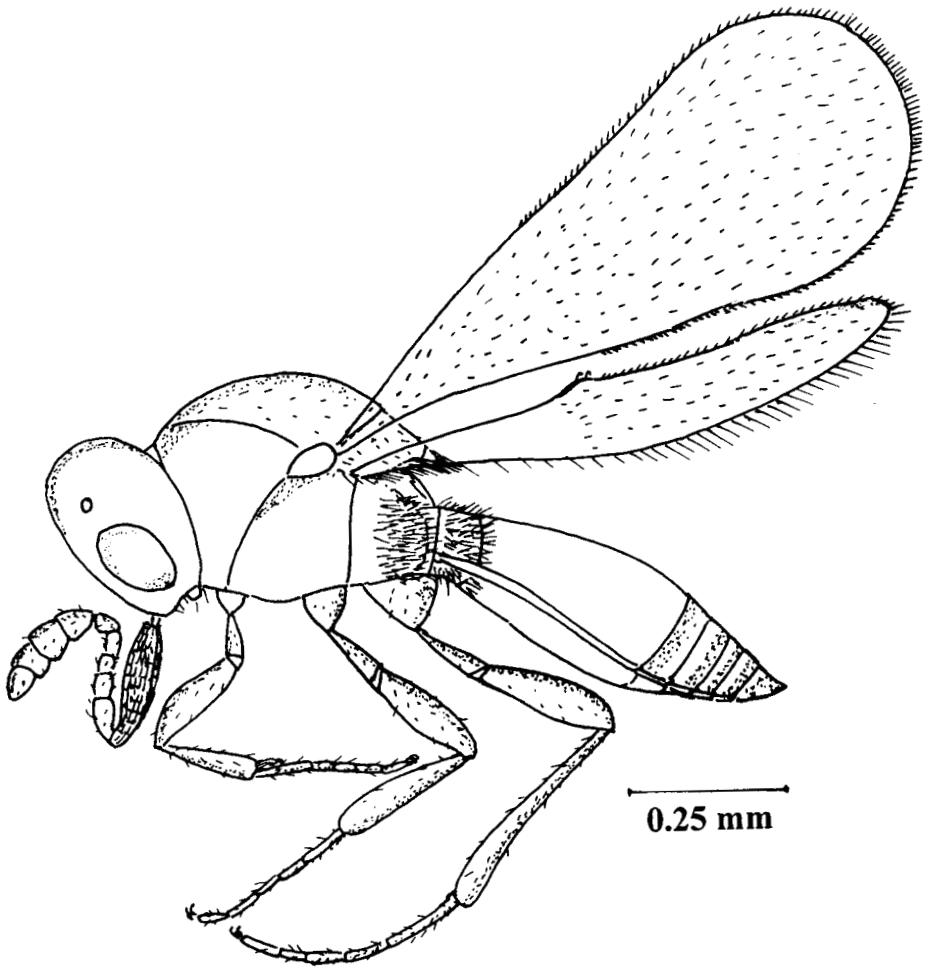


51. *Leptacis asiaticus* sp.nov. Female (Lateral view)

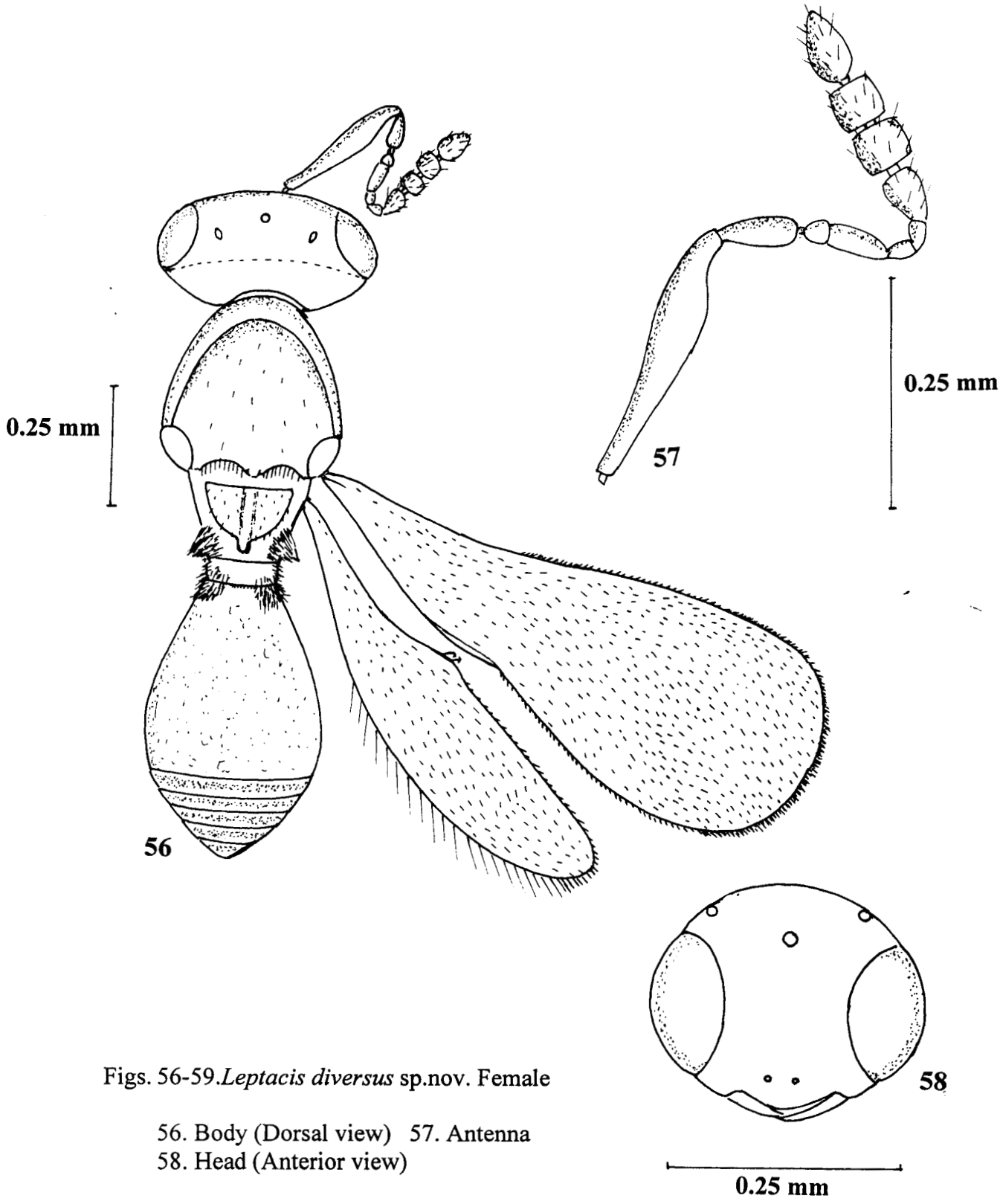


Figs. 52-55. *Leptacis benazeer* sp.nov. Female

52. Body (Dorsal view) 53. Antenna
54. Head (Anterior view)

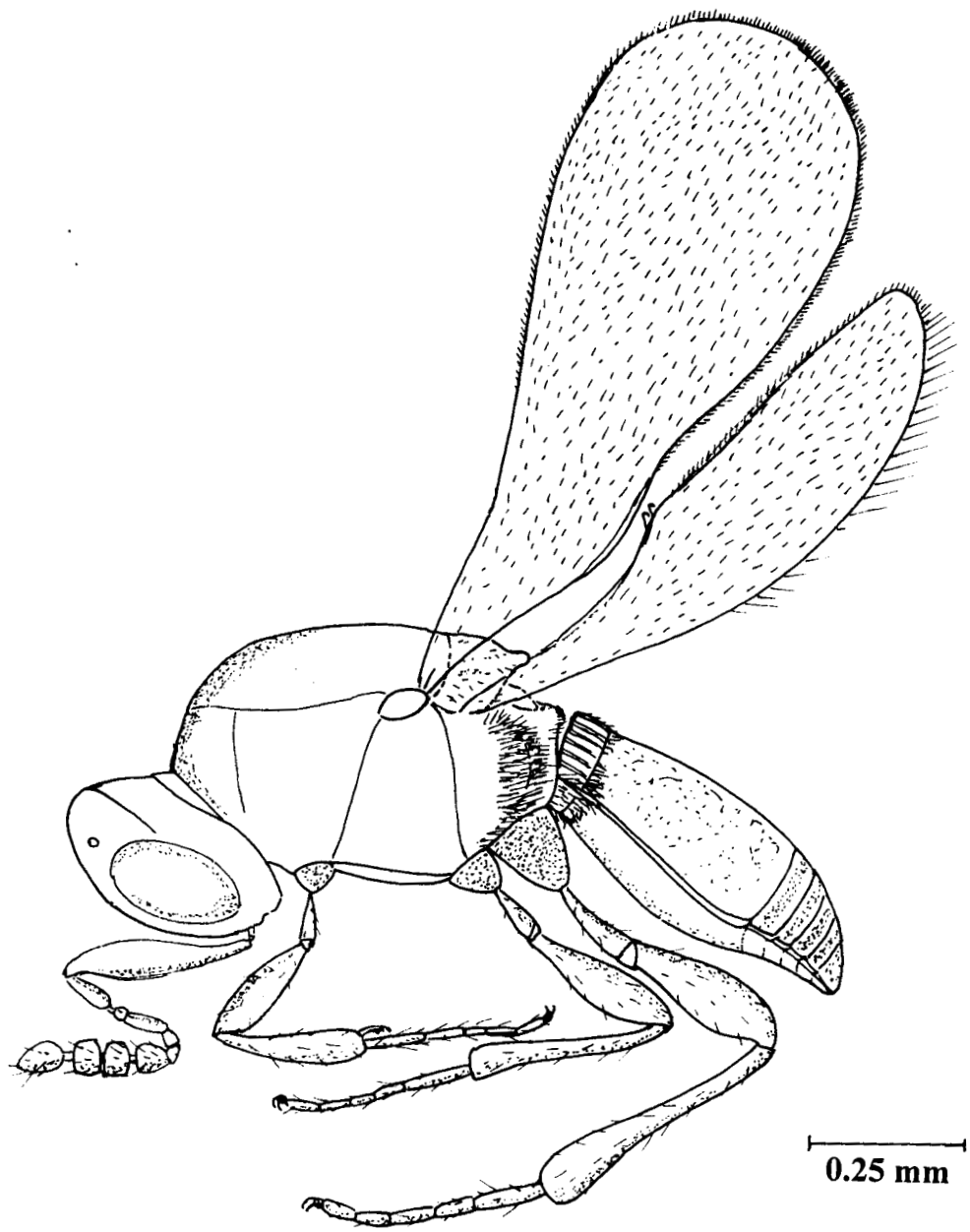


55. *Leptacis benazeer* sp.nov. Female (Lateral view)

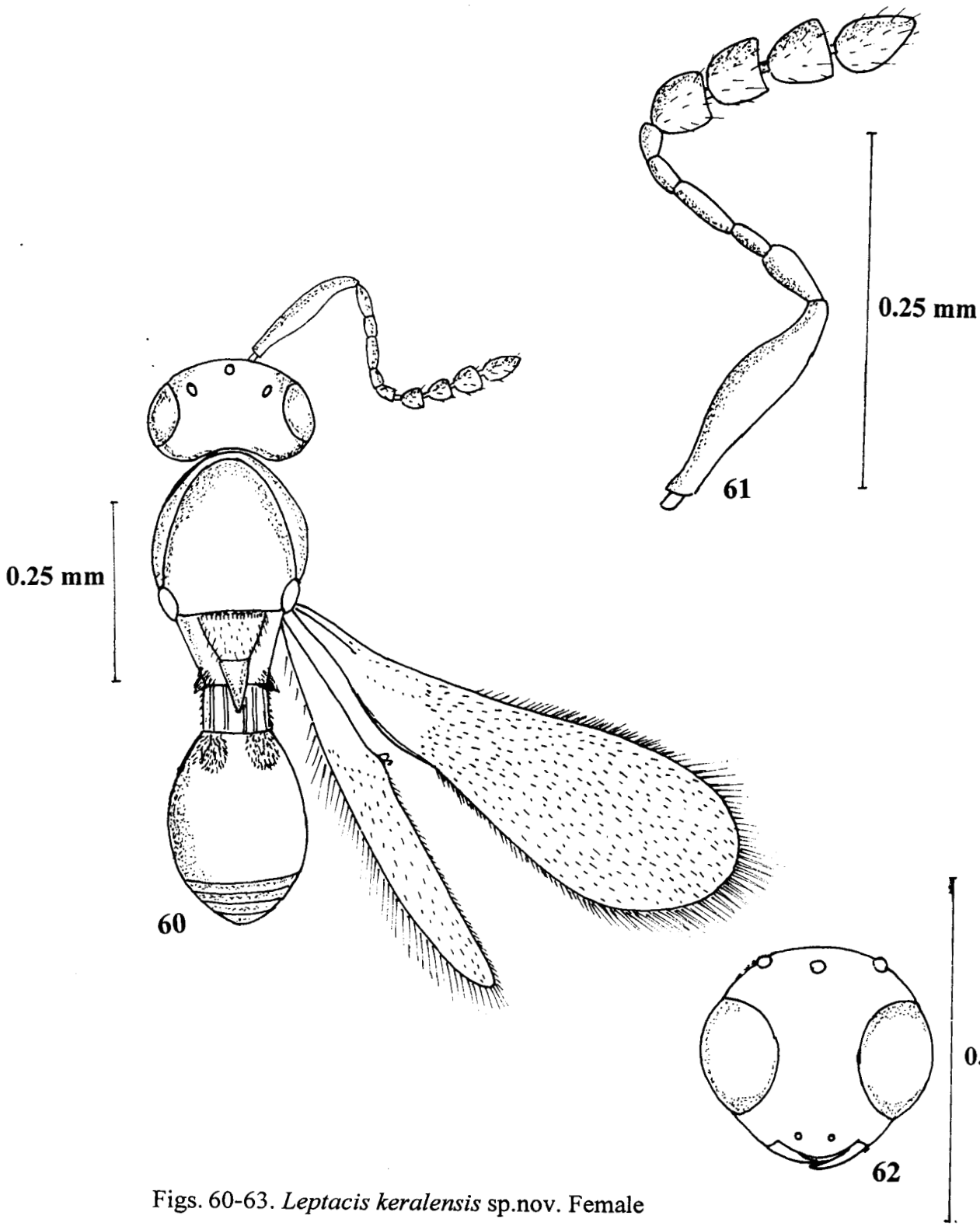


Figs. 56-59.*Leptacis diversus* sp.nov. Female

56. Body (Dorsal view) 57. Antenna
58. Head (Anterior view)

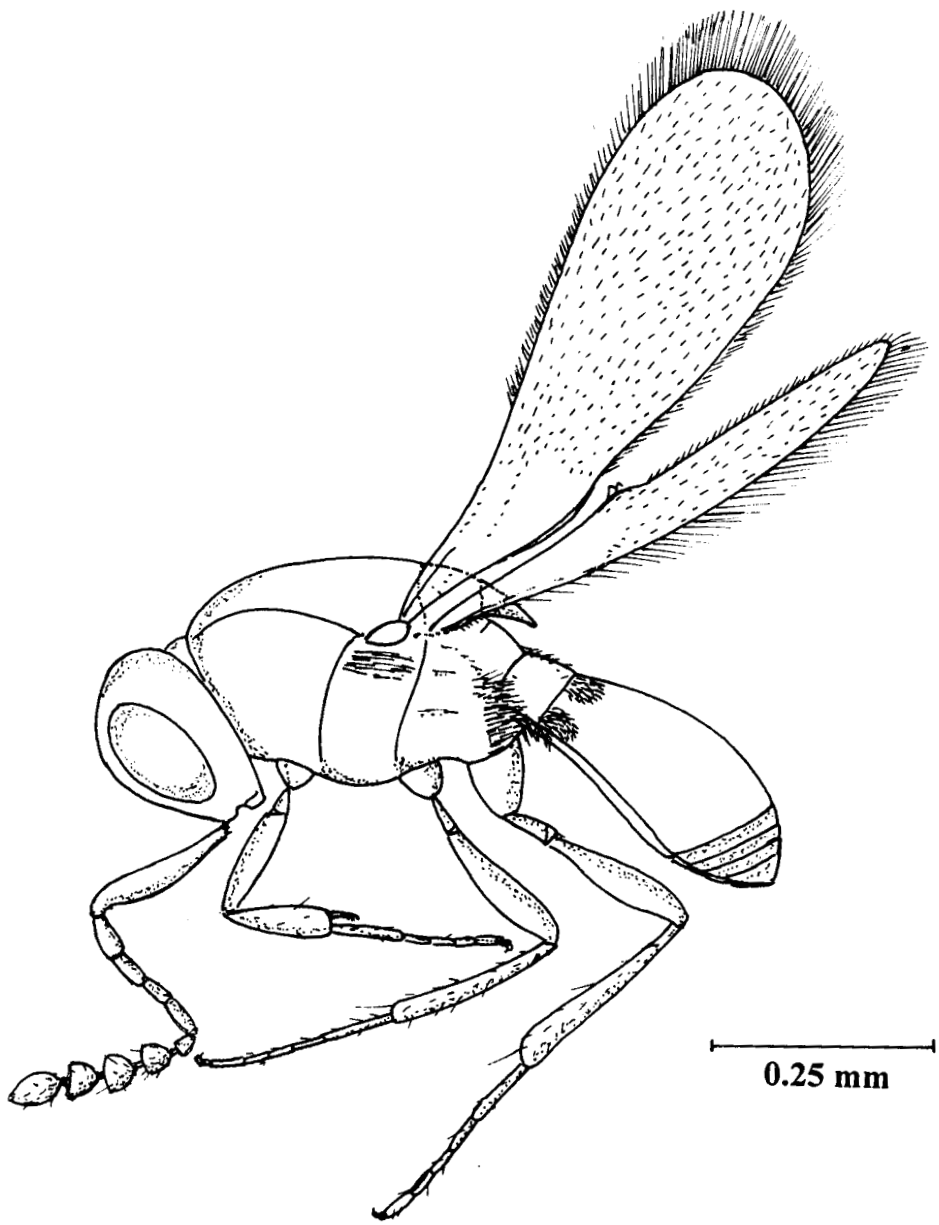


59. *Leptacis diversus* sp.nov. Female (Lateral view)

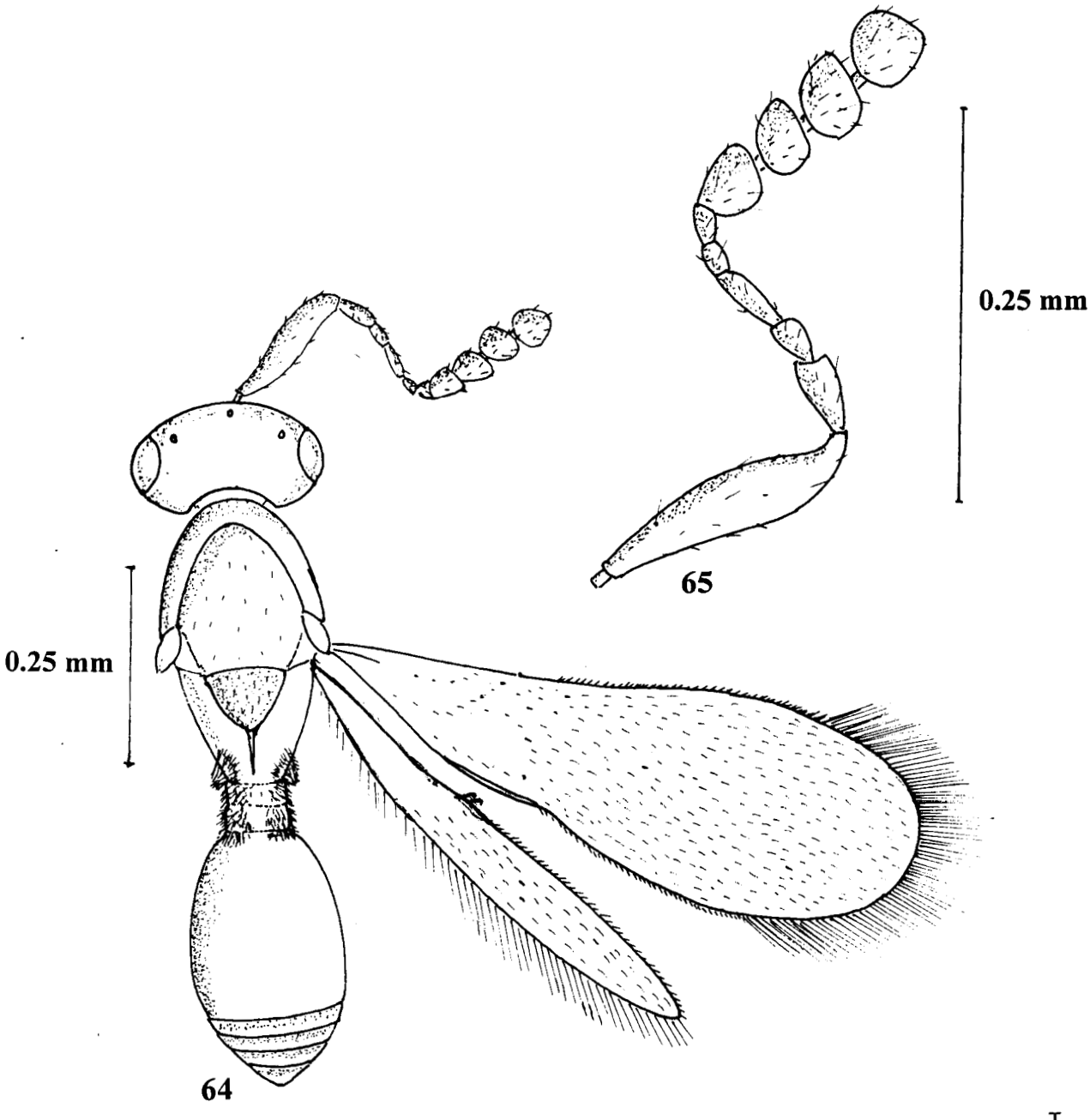


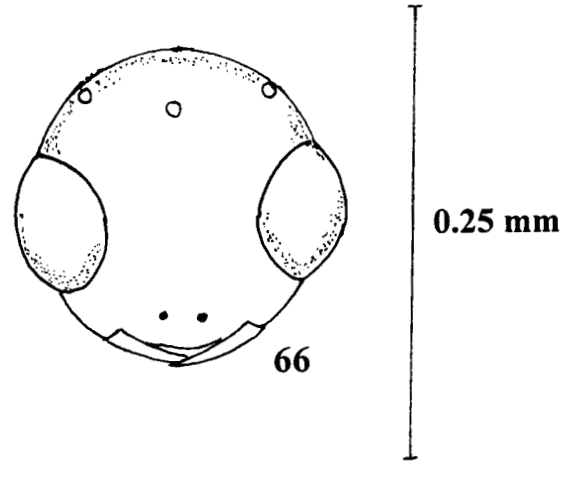
Figs. 60-63. *Leptacis keralensis* sp.nov. Female

60. Body (Dorsal view) 61. Antenna
62. Head (Anterior view)



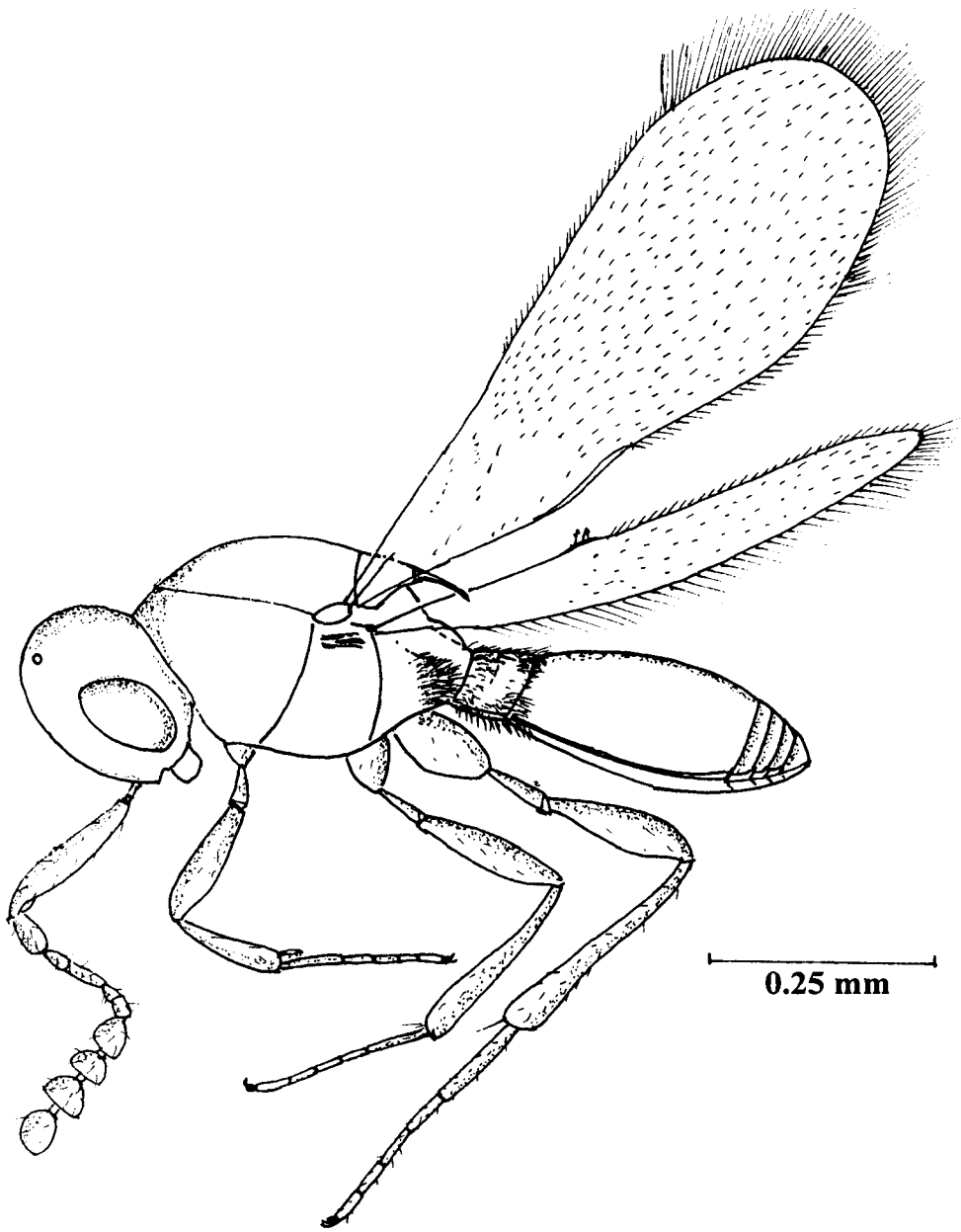
63. *Leptacis keralensis* sp.nov. Female (Lateral view)



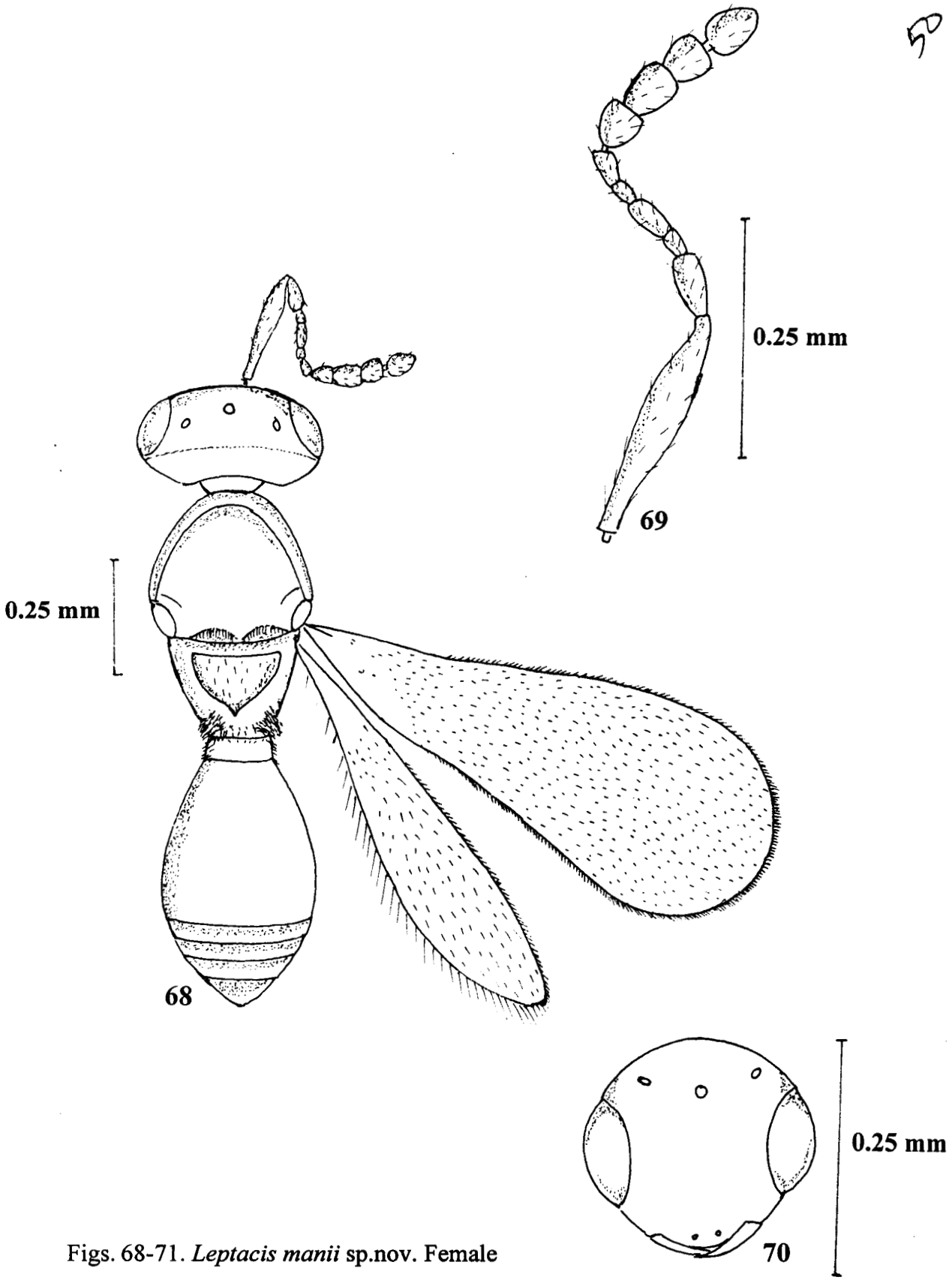


Figs. 64-67. *Leptacis malabarensis* sp.nov. Female

64. Body (Dorsal view) 65. Antenna
66. Head (Anterior view)

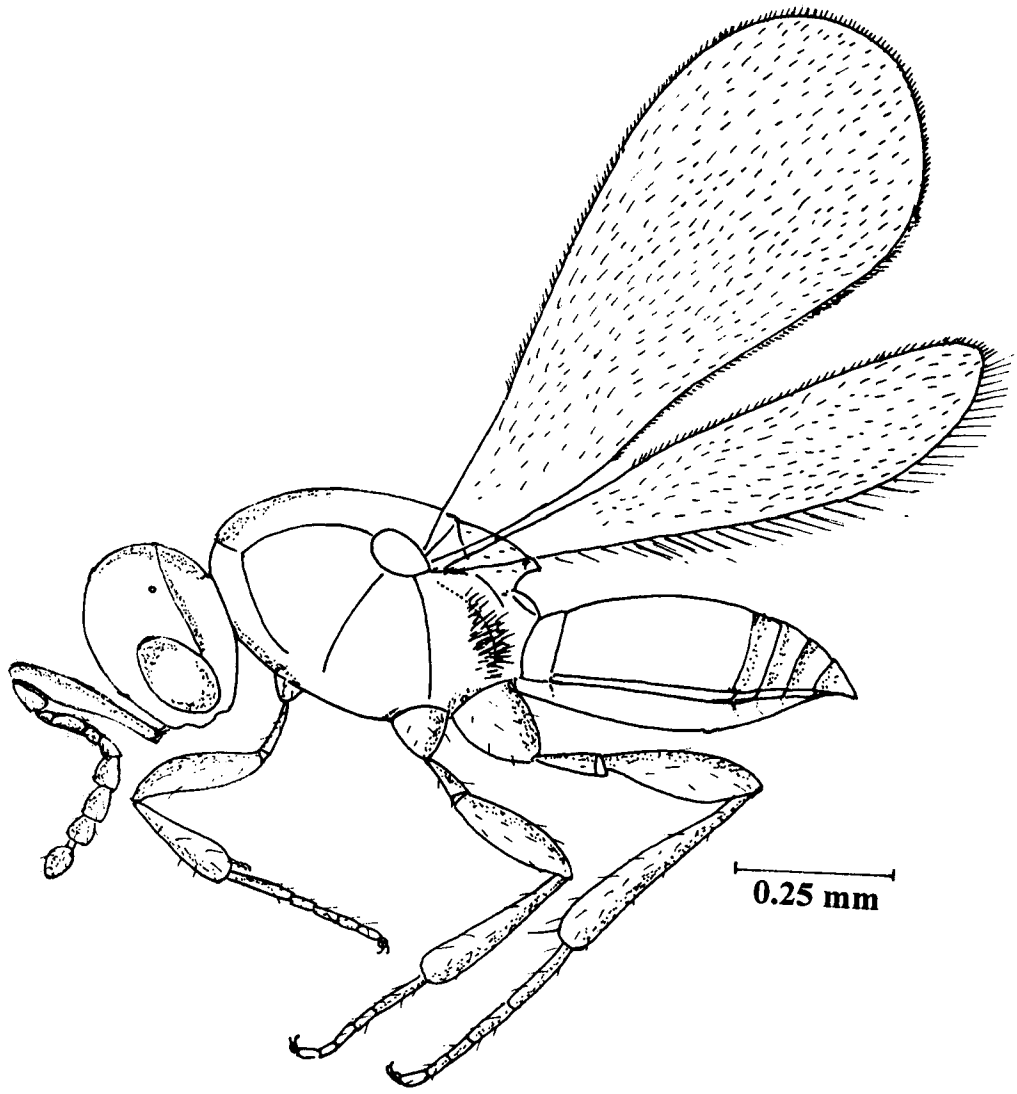


67. *Leptacis malabarensis* sp.nov. Female (Lateral view)

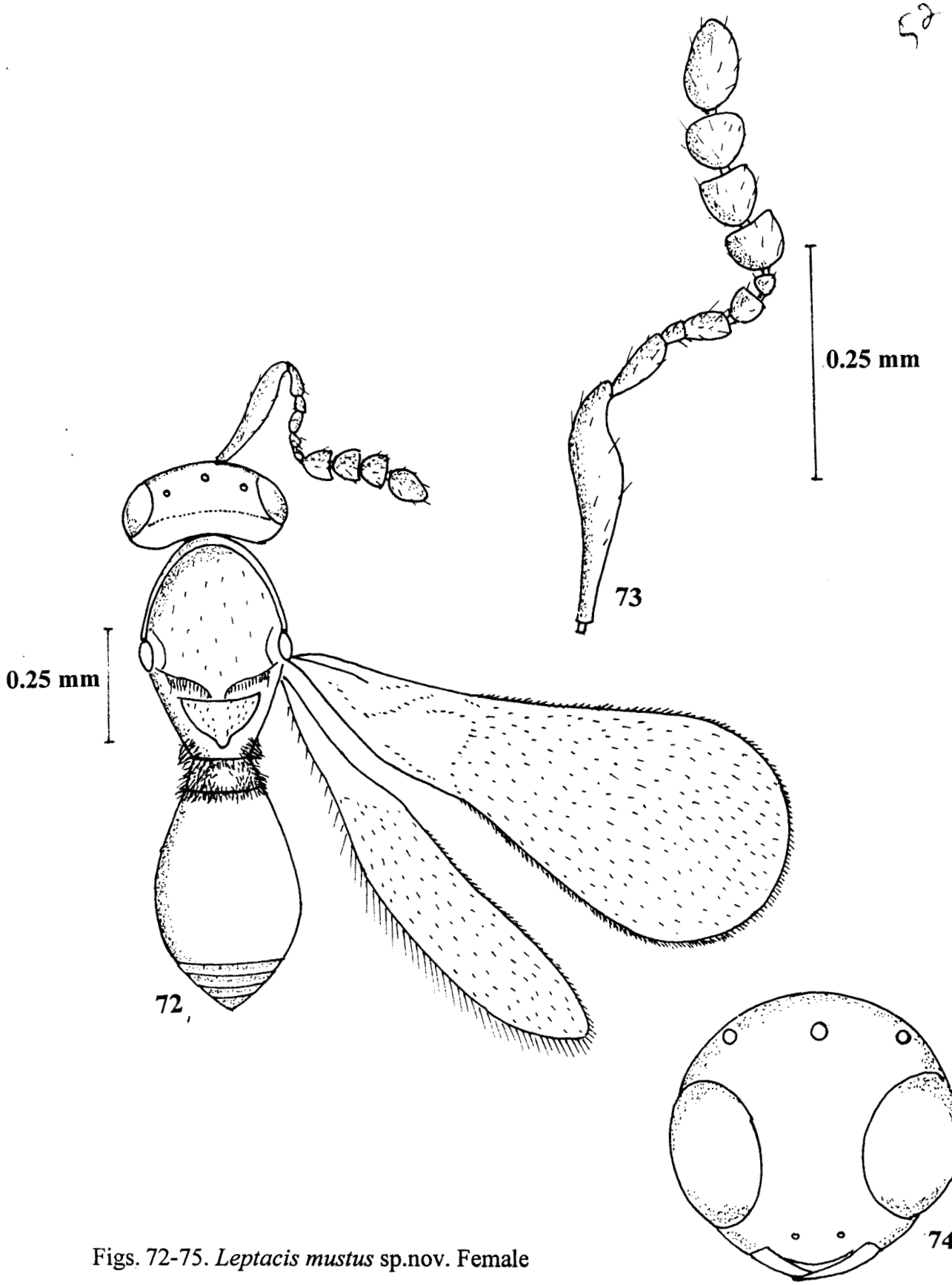


Figs. 68-71. *Leptacis manii* sp.nov. Female

68. Body (Dorsal view) 69. Antenna
70. Head (Anterior view)

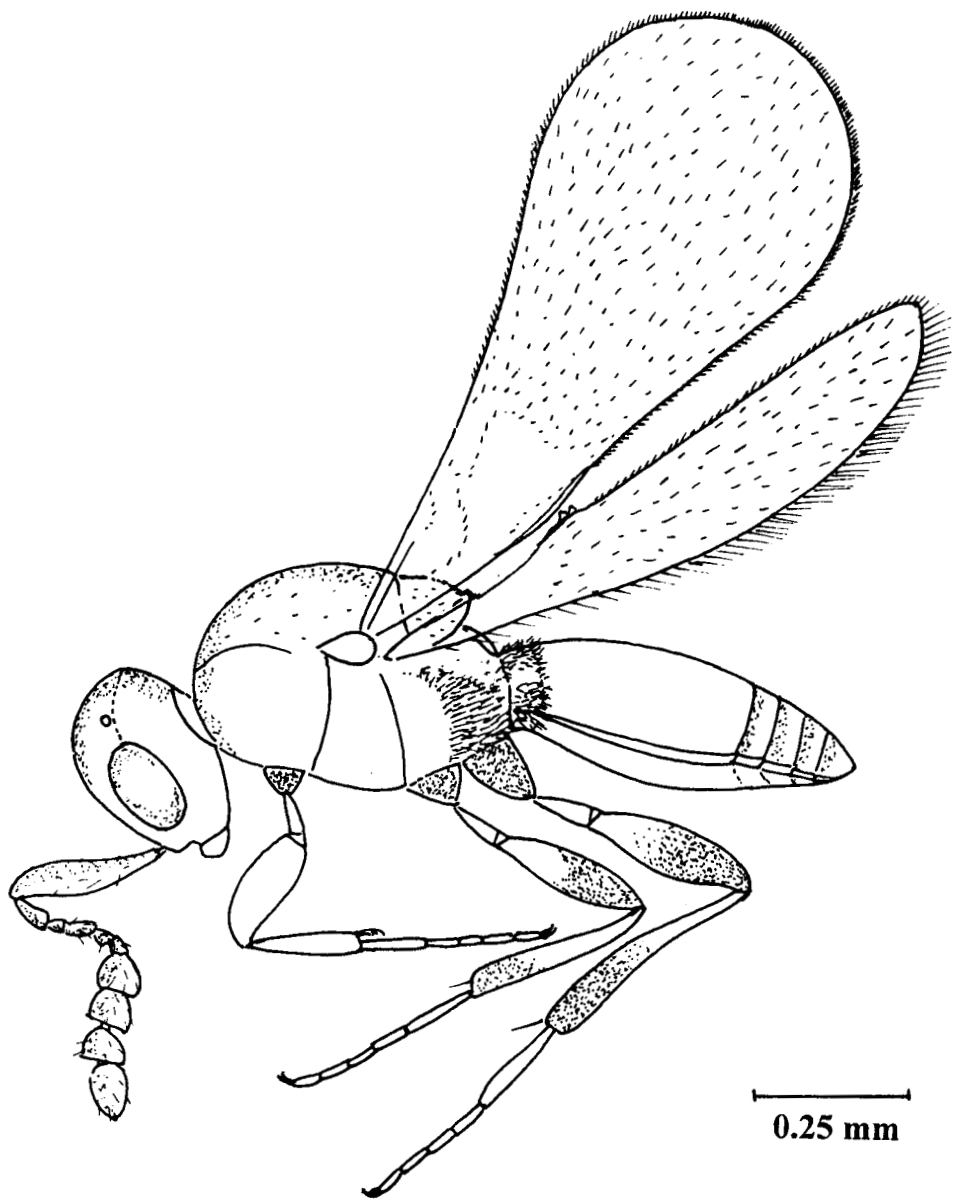


71. *Leptacis manii* sp.nov. Female (Lateral view)

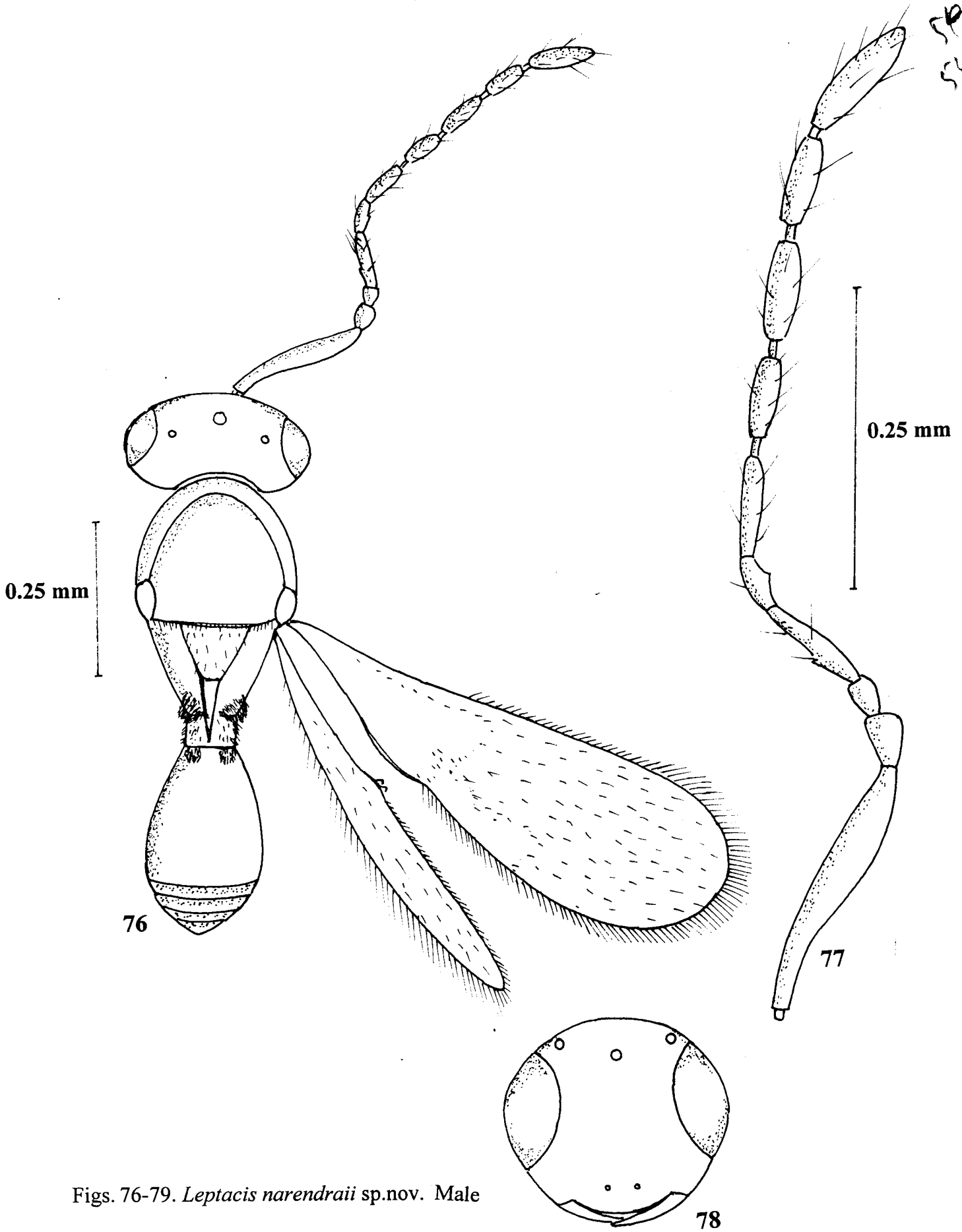


Figs. 72-75. *Leptacis mustus* sp.nov. Female

72. Body (Dorsal view) 73. Antenna
74. Head (Anterior view)

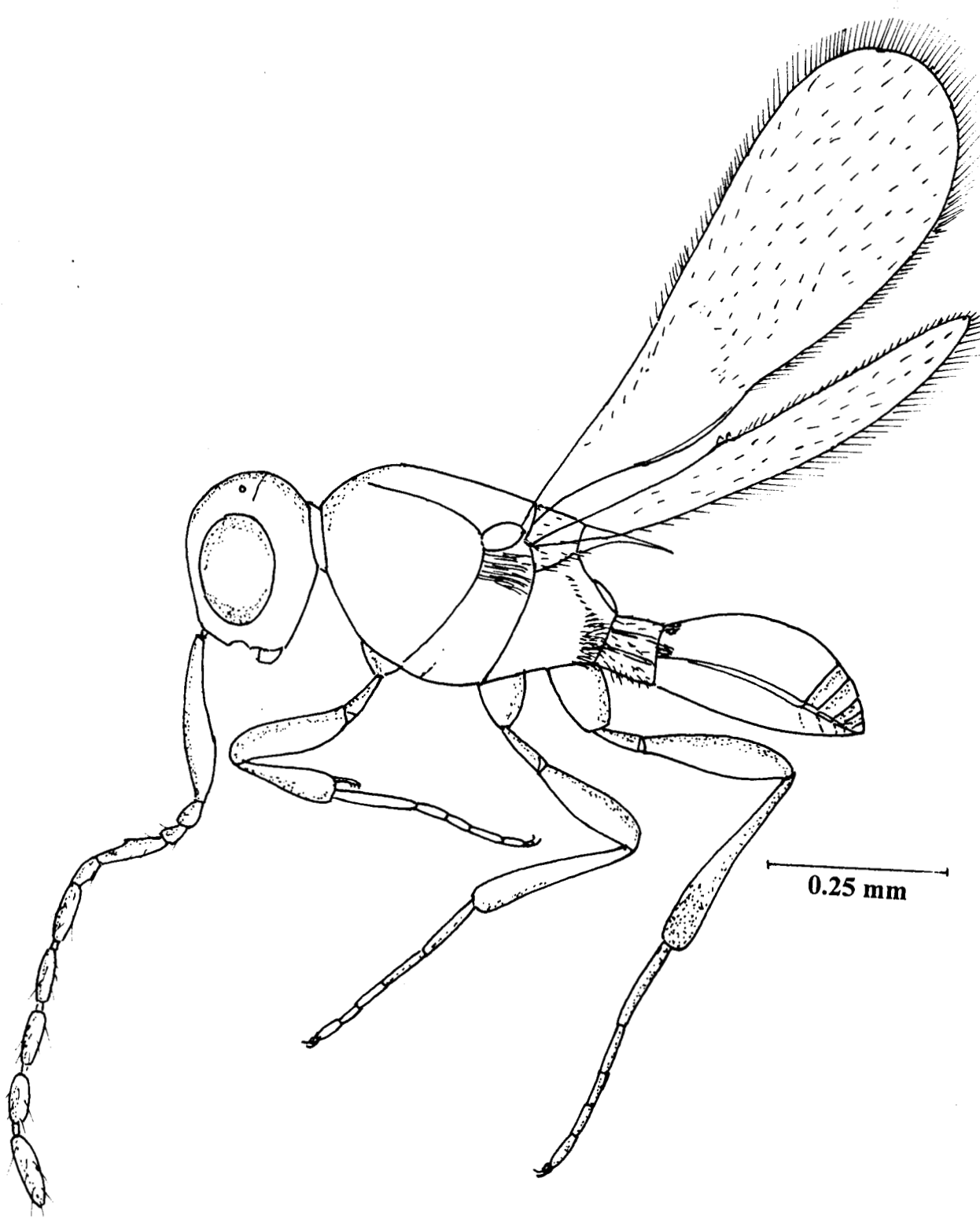


75. *Leptacis mustus* sp.nov. Female (Lateral view)

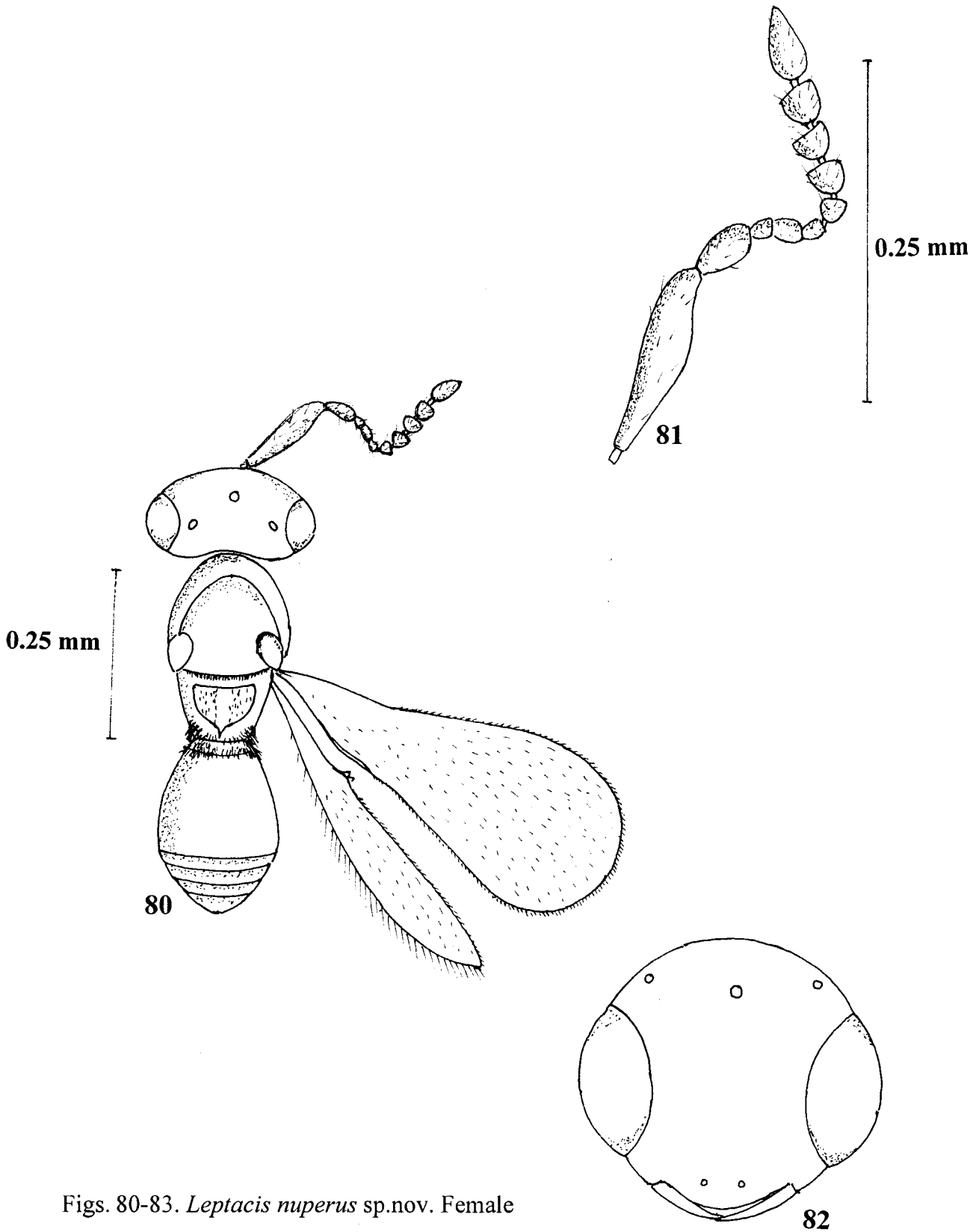


Figs. 76-79. *Leptacis narendraii* sp.nov. Male

76.Body (Dorsal view) 77. Antenna
78.Head (Anterior view)

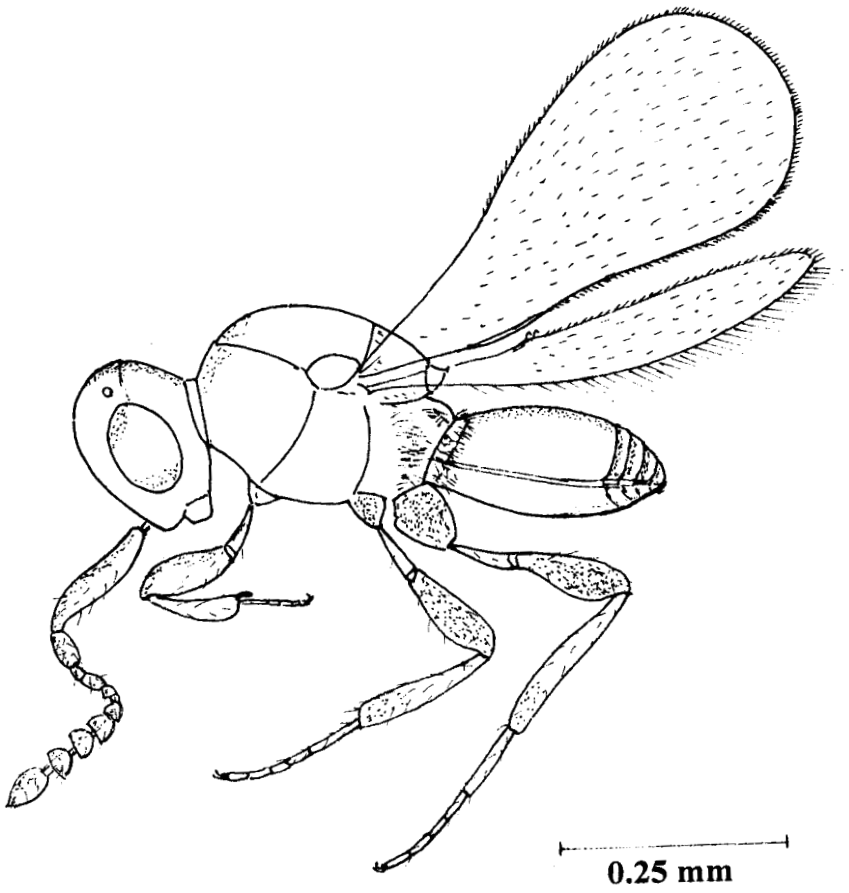


79. *Leptacis narendraii* sp.nov. Male

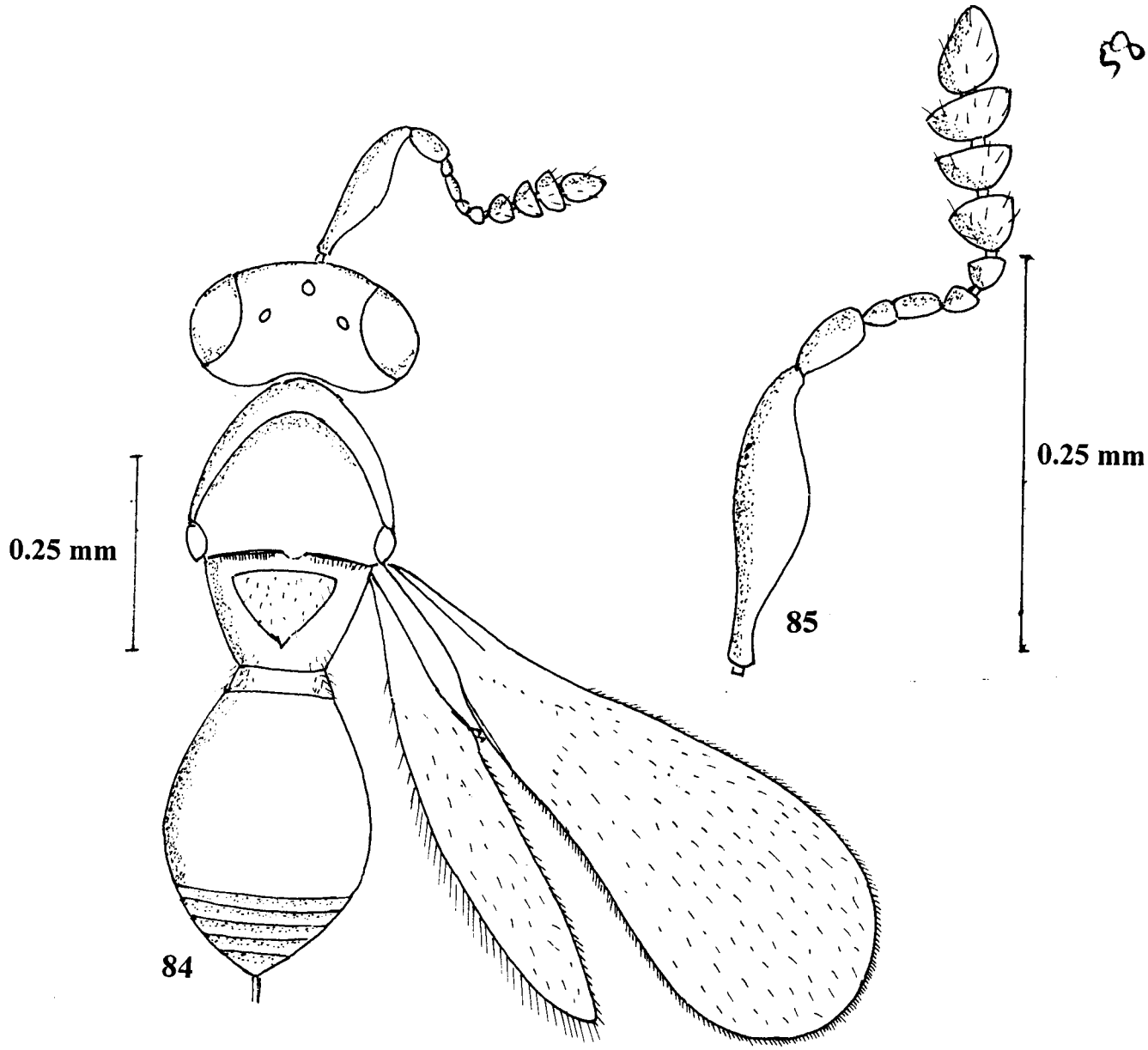


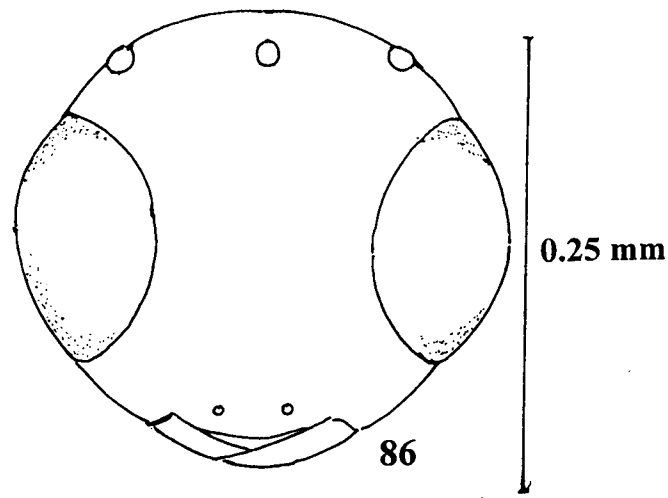
Figs. 80-83. *Leptacis nuperus* sp.nov. Female

80. Body (Dorsal view) 81. Antenna
82. Head (Anterior view)



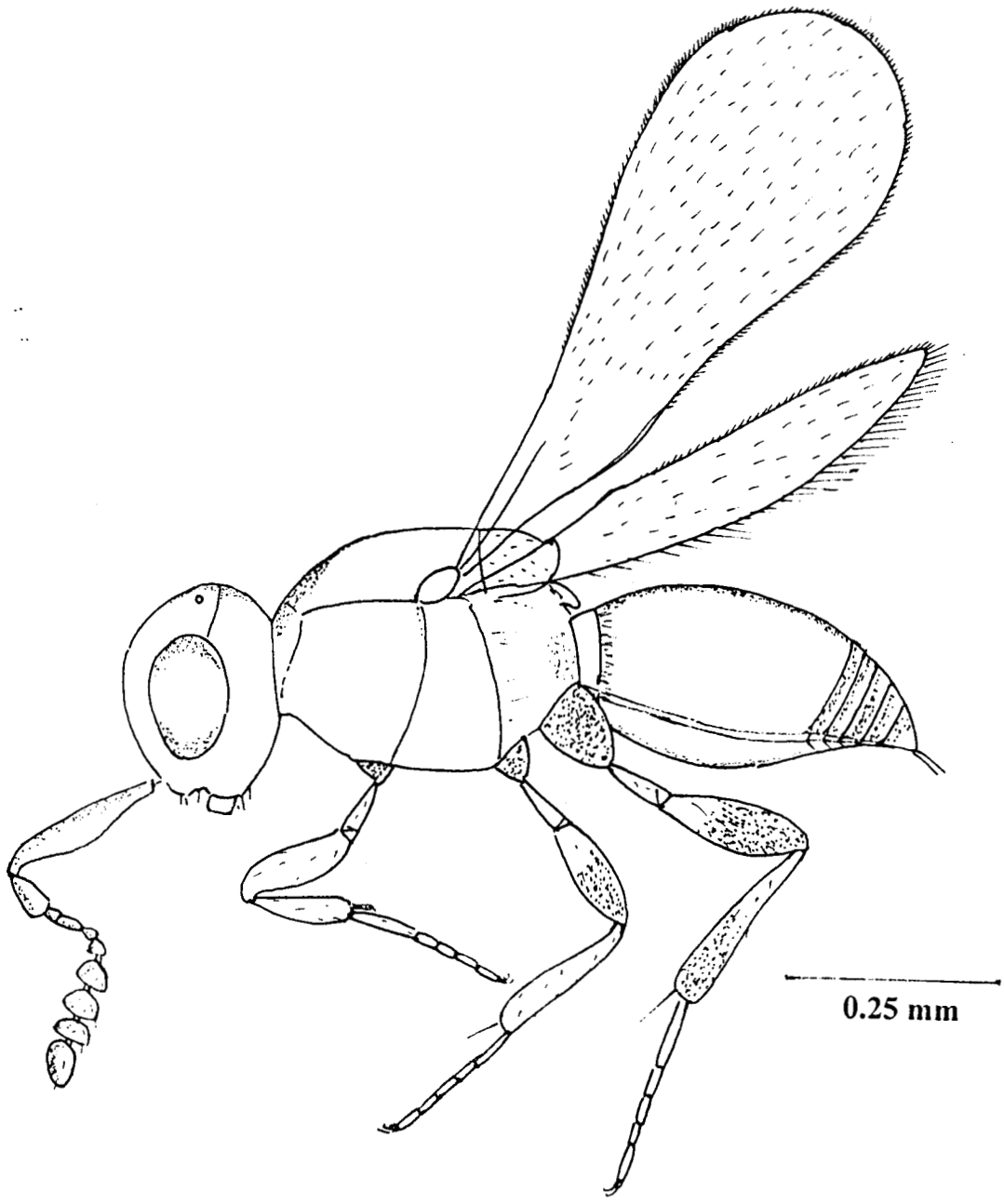
83. *Leptacis nuperus* sp.nov. Female (Lateral view)



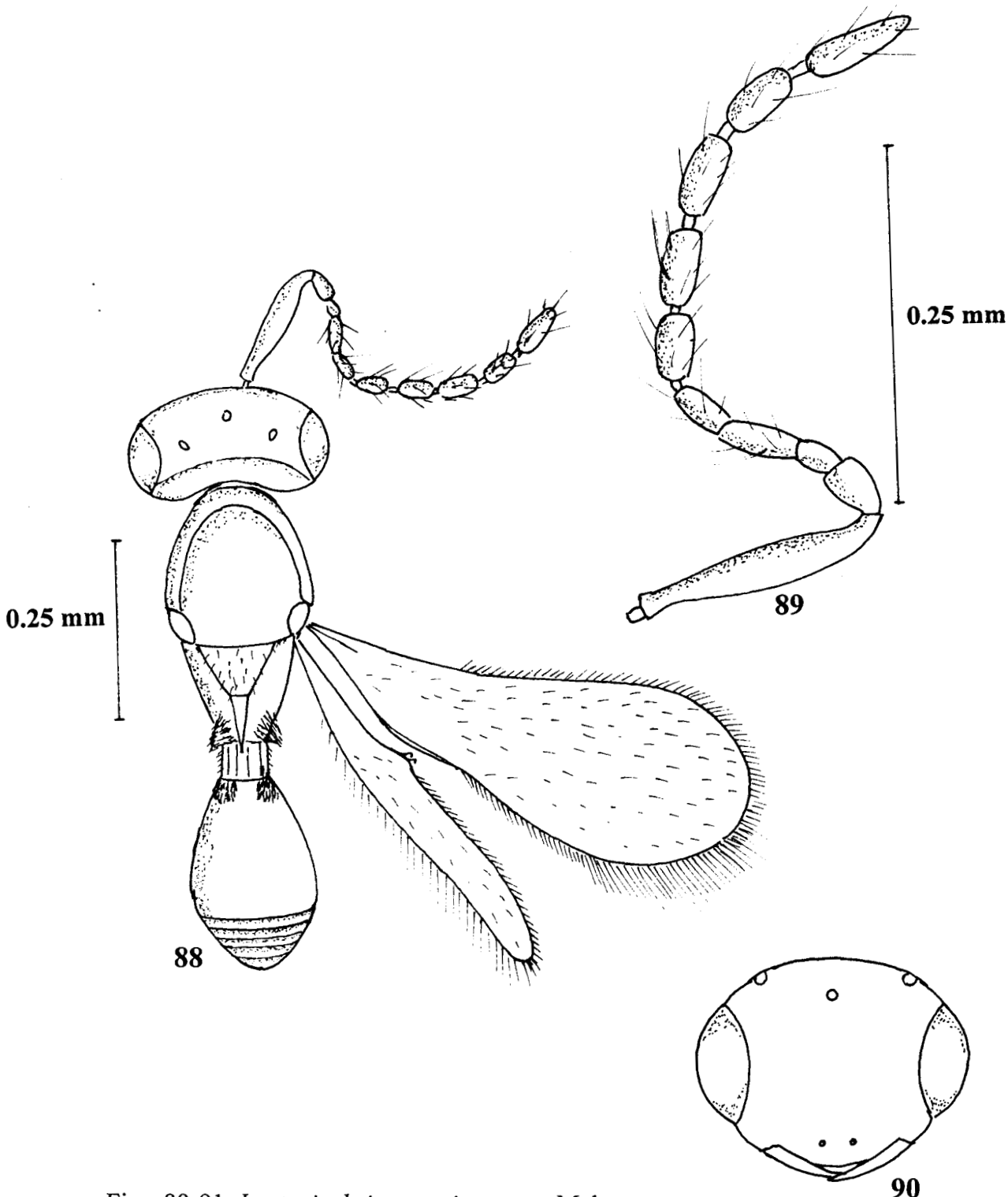


Figs. 84-87. *Leptacis scaposus* sp.nov. Female

84. Body (Dorsal view) 85. Antenna
86. Head (Anterior view)

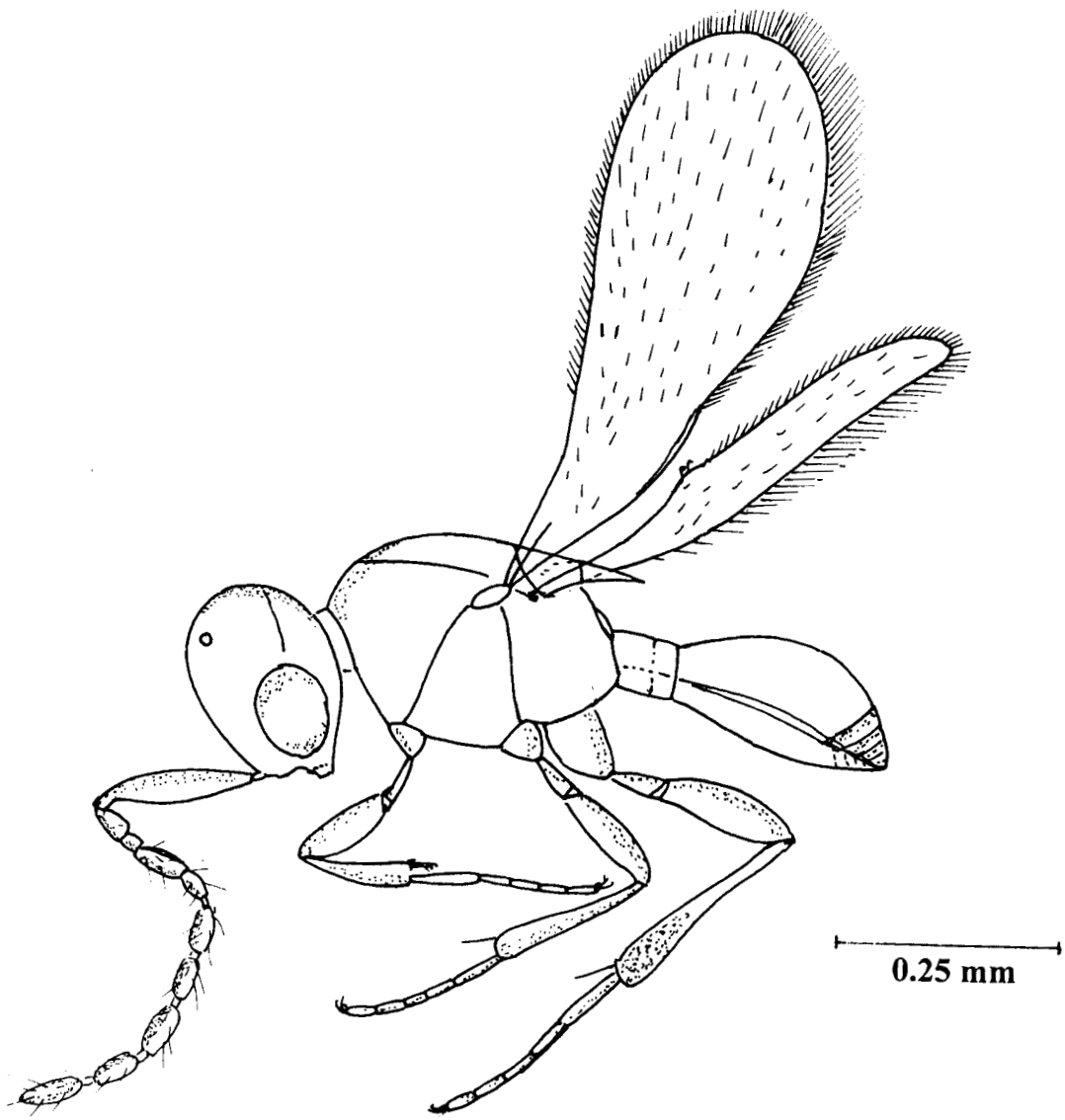


87. *Leptacis scaposus* sp.nov. Female (Lateral view)

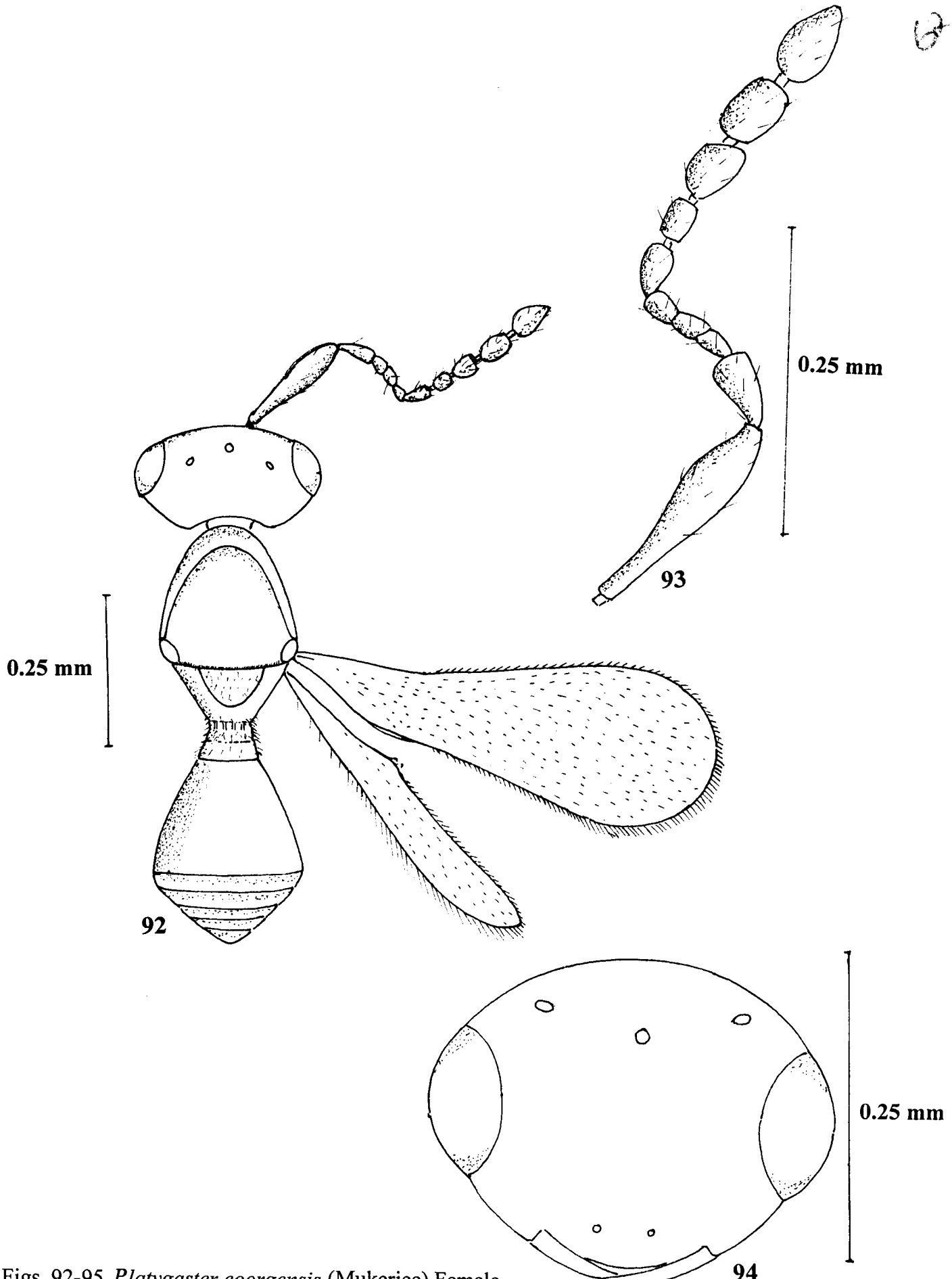


Figs. 88-91. *Leptacis thrissurensis* sp.nov. Male

88. Body (Dorsal view) 89. Antenna
90. Head (Anterior view)

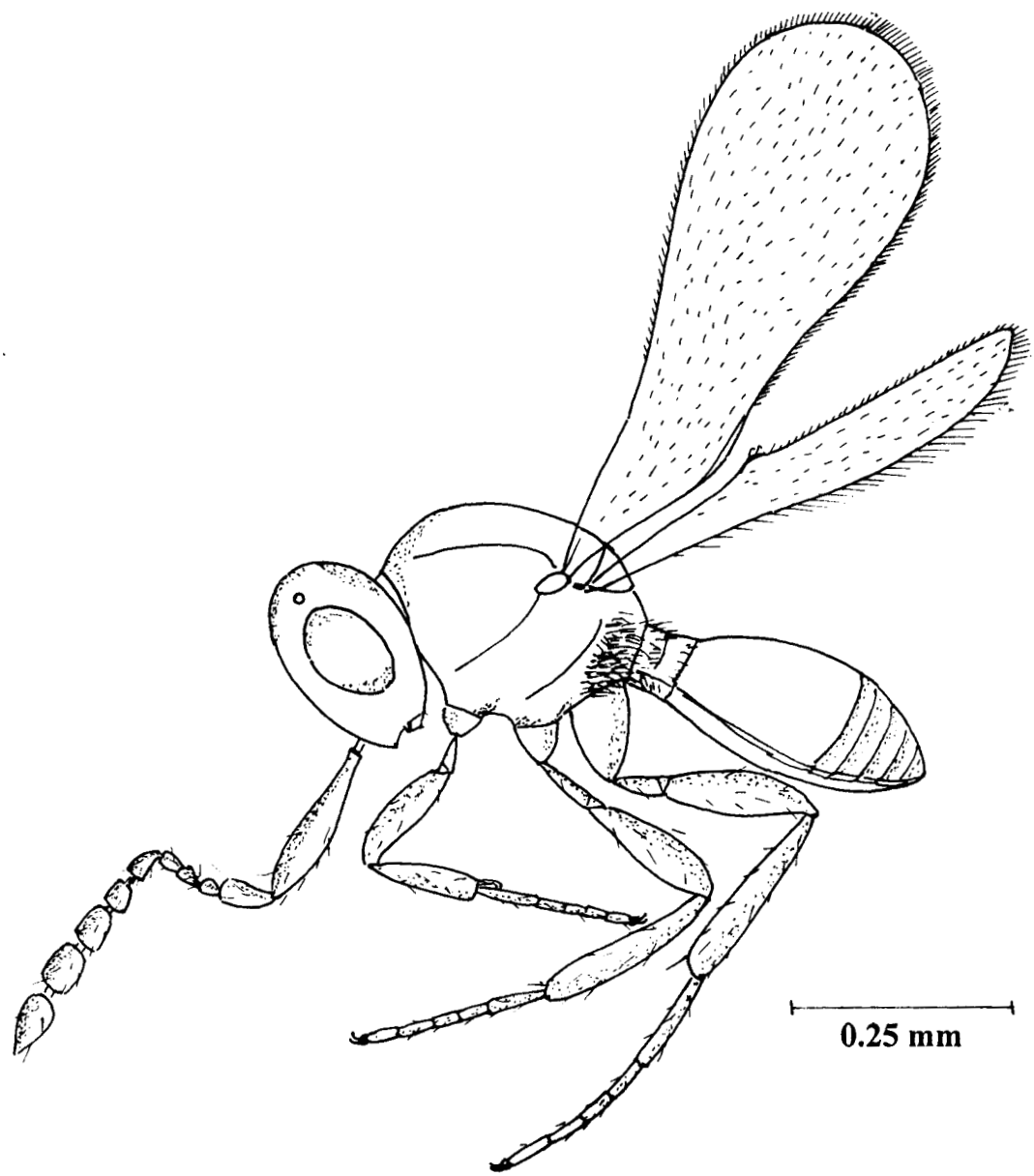


91. *Leptacis thrissurensis* sp.nov. Male (Lateral view)

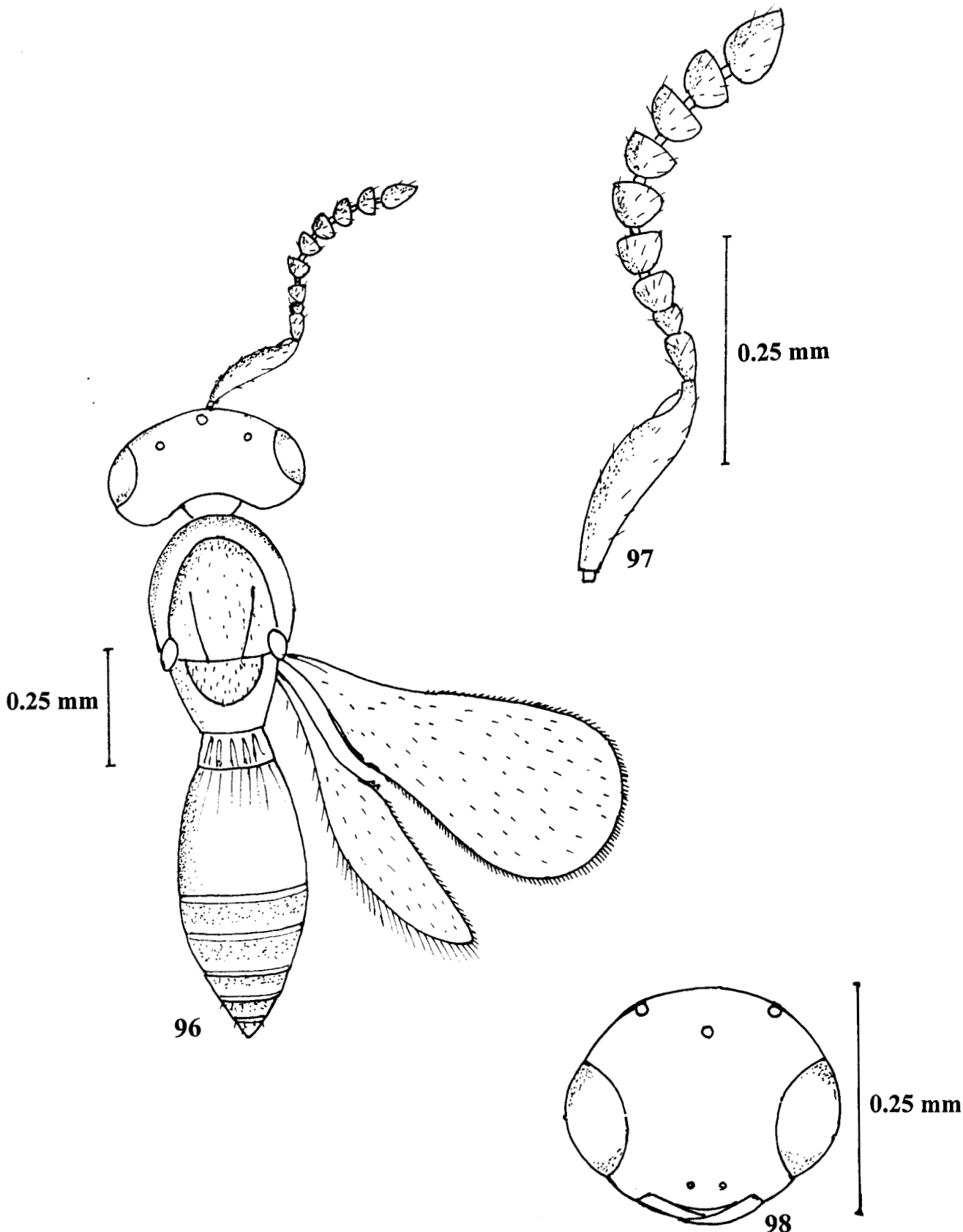


Figs. 92-95. *Platygaster coorgensis* (Mukerjee) Female

92. Body (Dorsal view) 93. Antenna
94. Head (Anterior view)

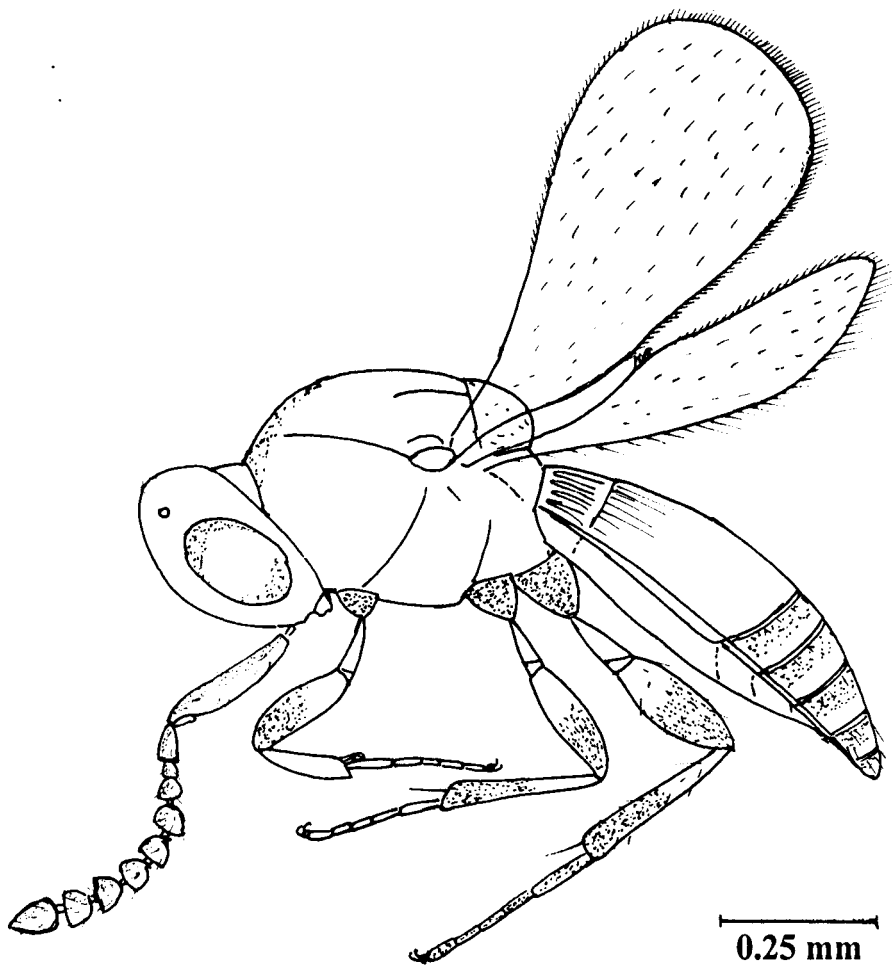


95. *Platygaster coorgensis* (Mukerjee) Female (Lateral view)

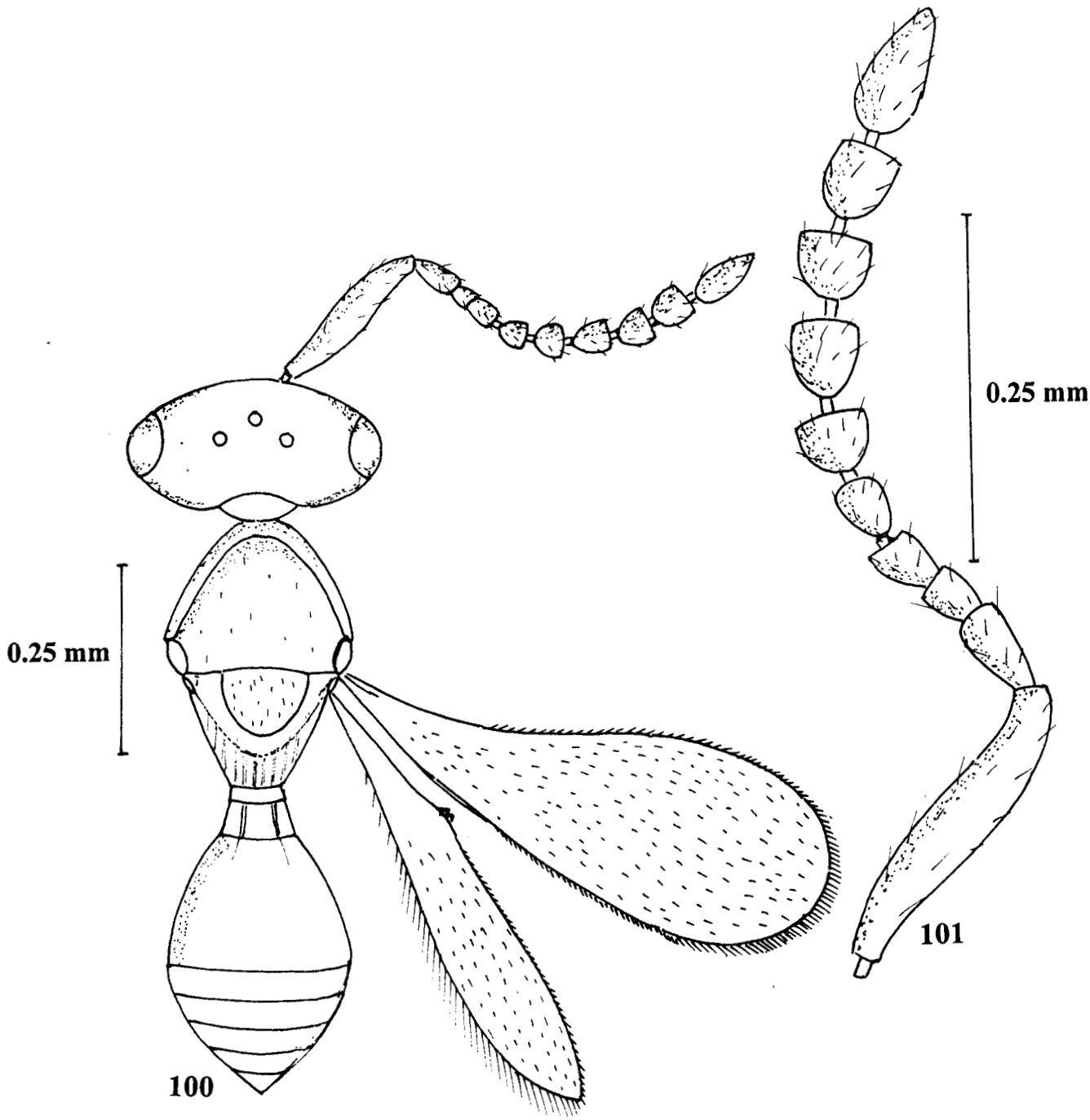


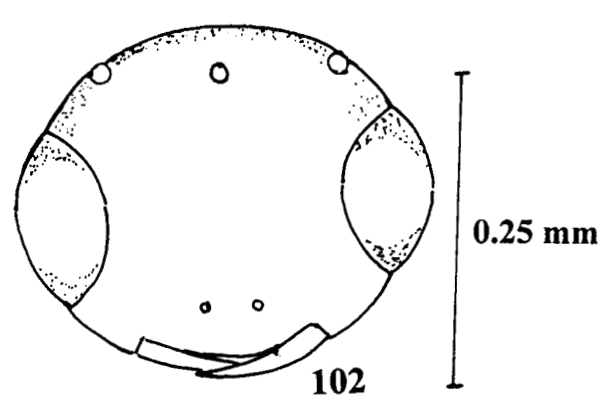
Figs. 96-99. *Platygaster ferus* sp.nov. Female

96. Body (Dorsal view) 97. Antenna
98. Head (Anterior view)



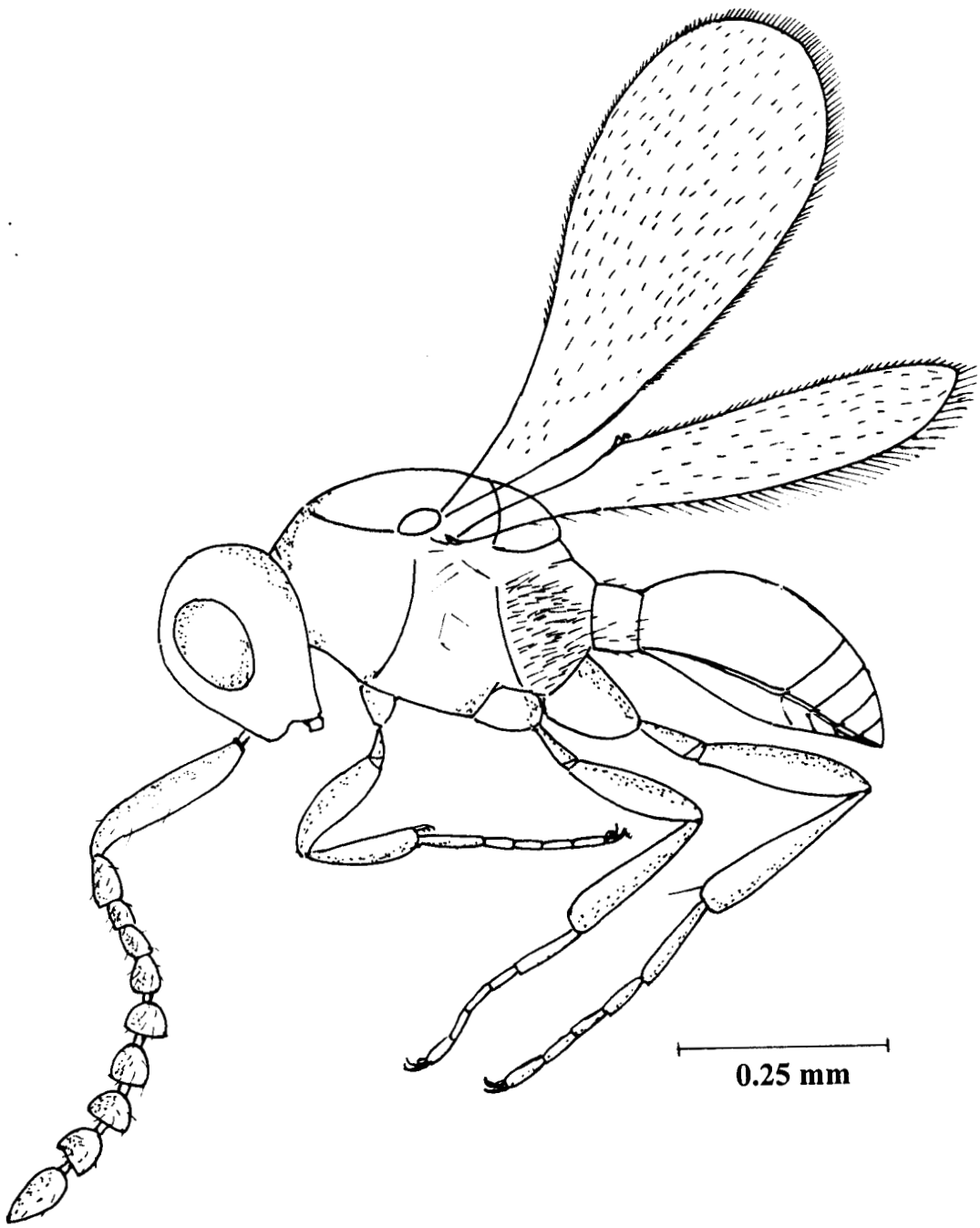
99. *Platygaster ferus* sp.nov. Female (Lateral view)



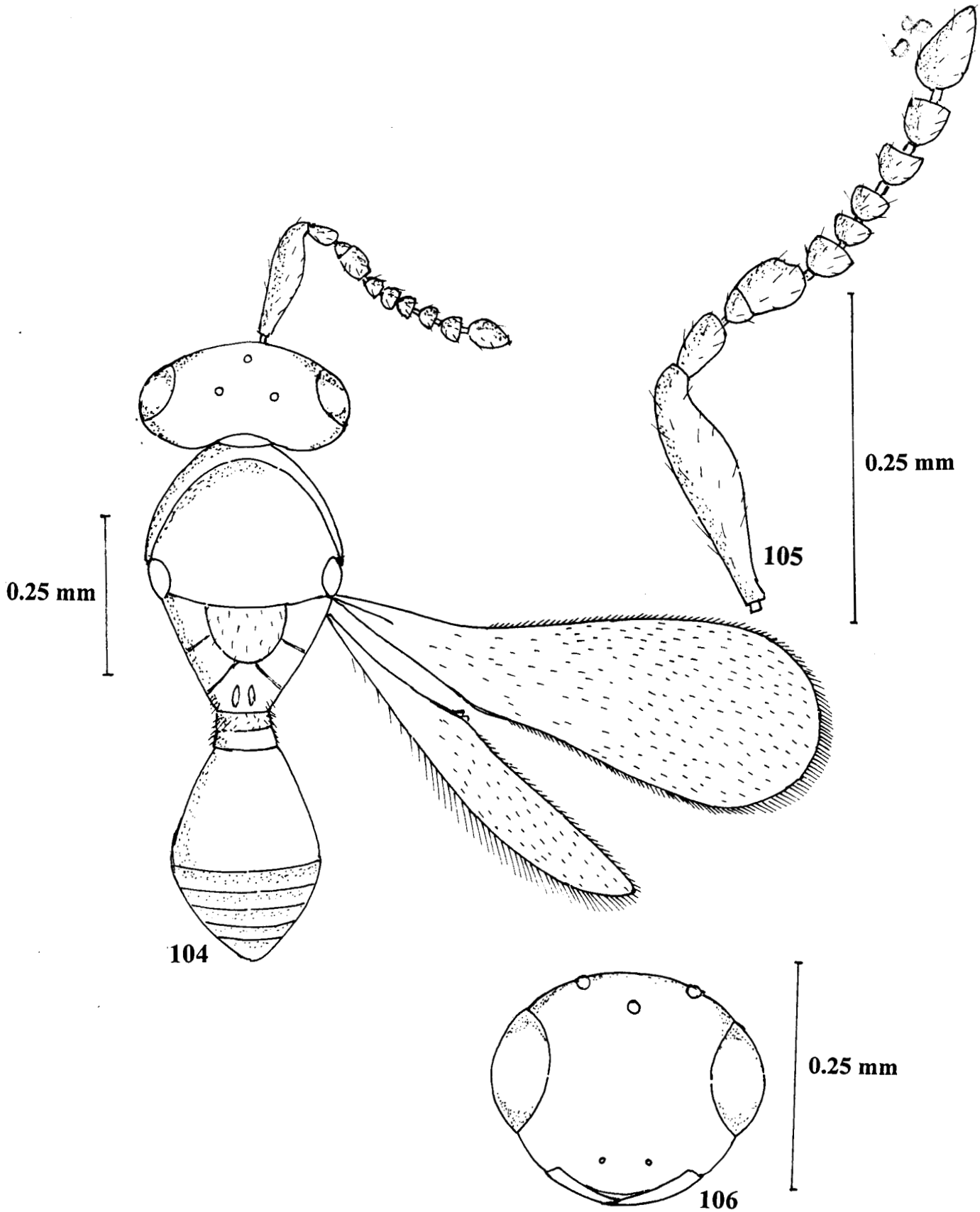


Figs. 100-103. *Platygaster galbus* sp.nov. Female

100. Body (Dorsal view) 101. Antenna
102. Head (Anterior view)

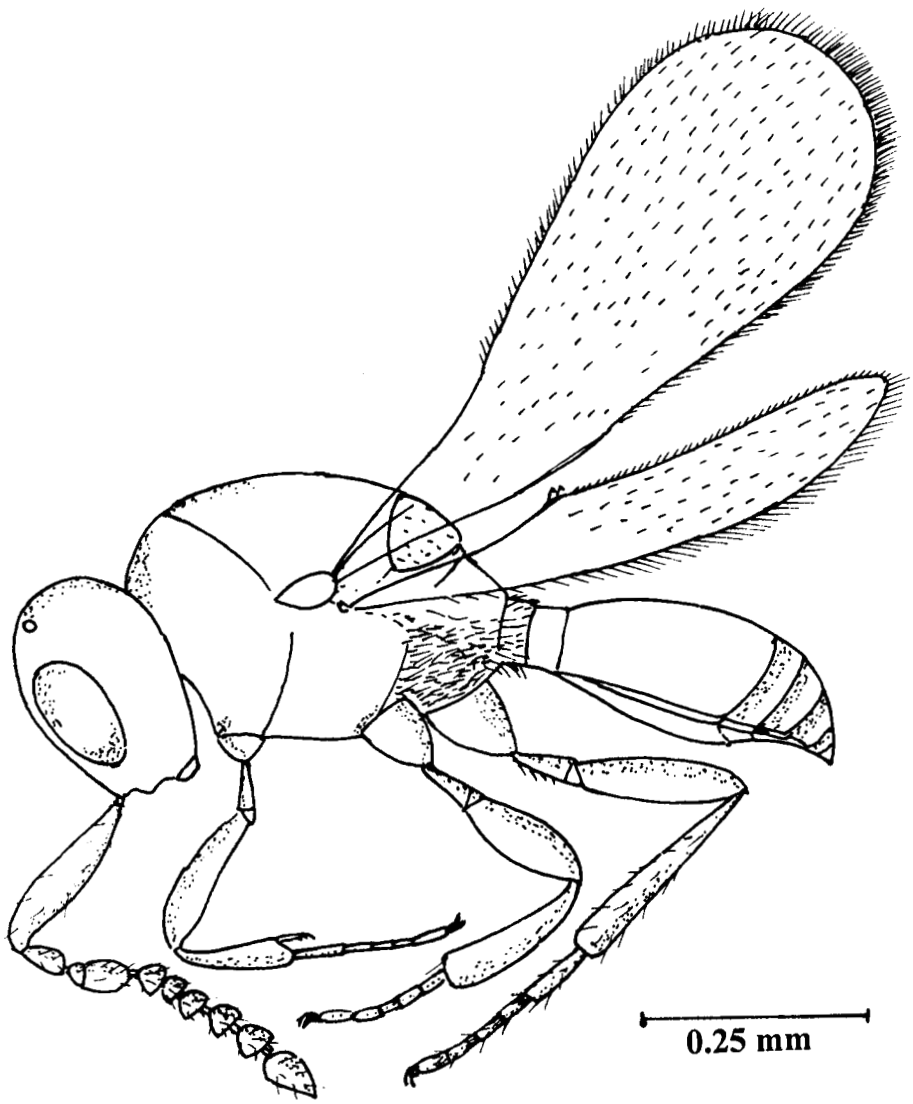


103. *Platygaster galbus* sp.nov. Female (Lateral view)

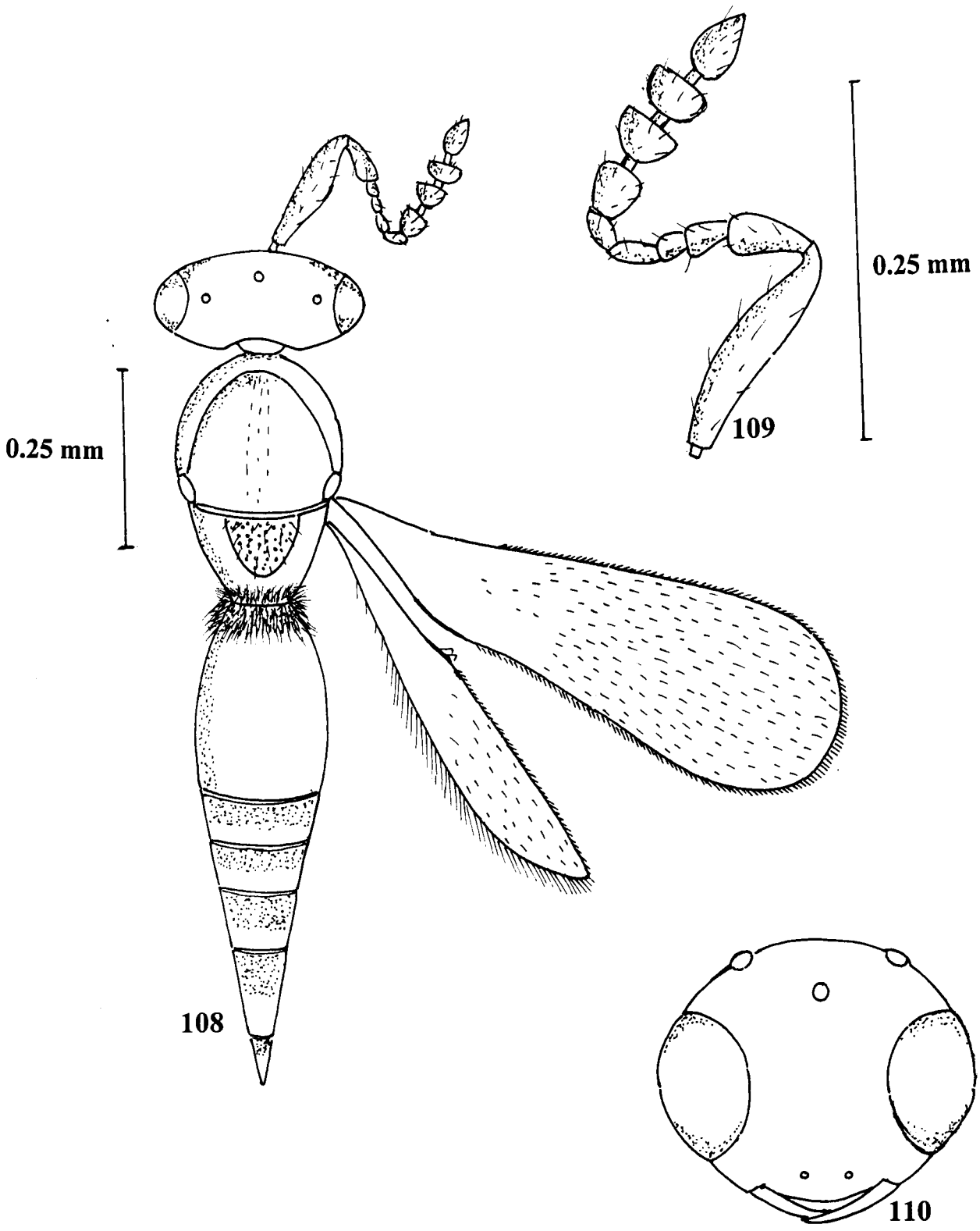


Figs. 104-107. *Platygaster inderdaadi* (Mukerjee) Female

104. Body (Dorsal view) 105. Antenna
106. Head (Anterior view)

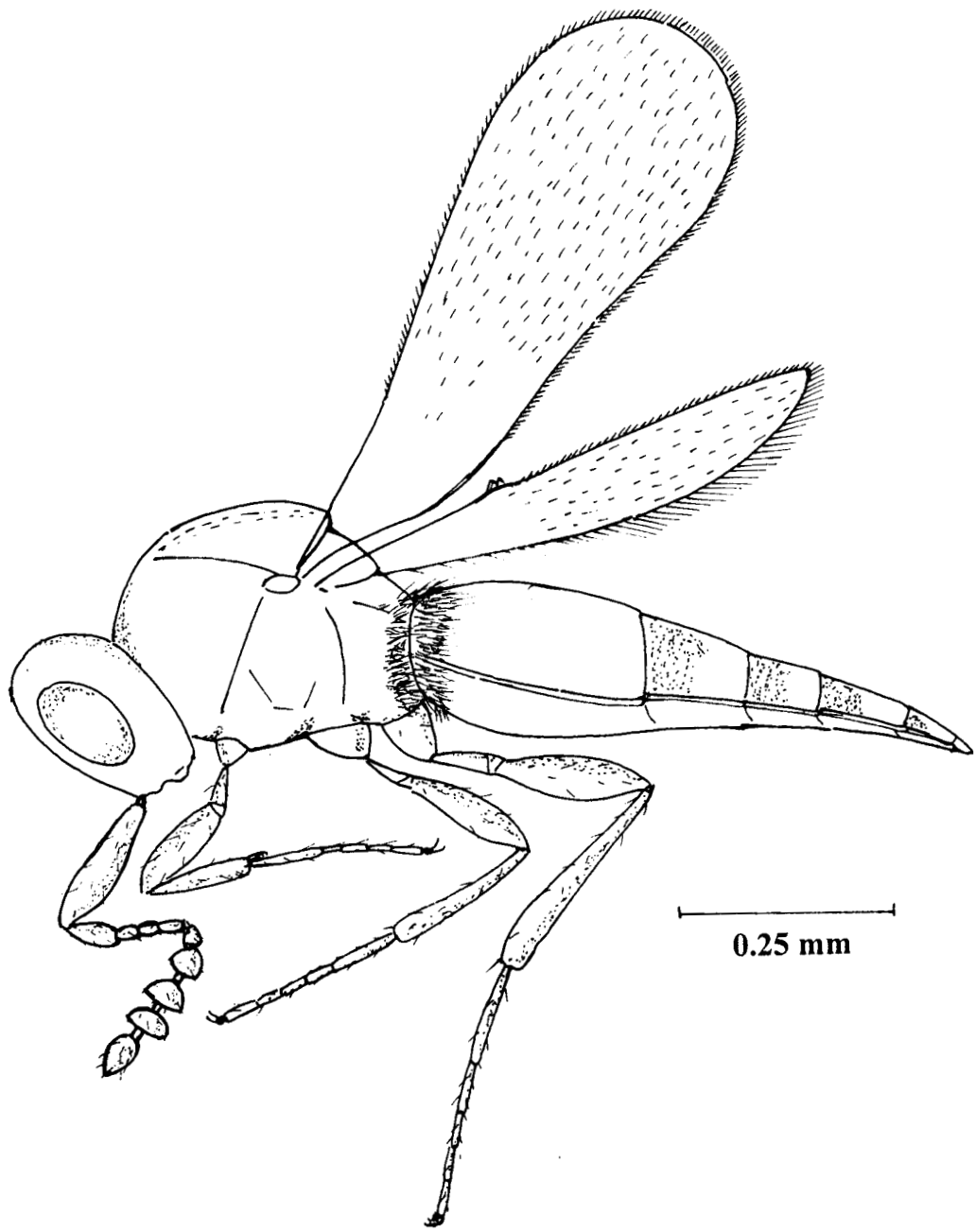


107. *Platygaster inderdaadi* (Mukerjee) Female (Lateral view)

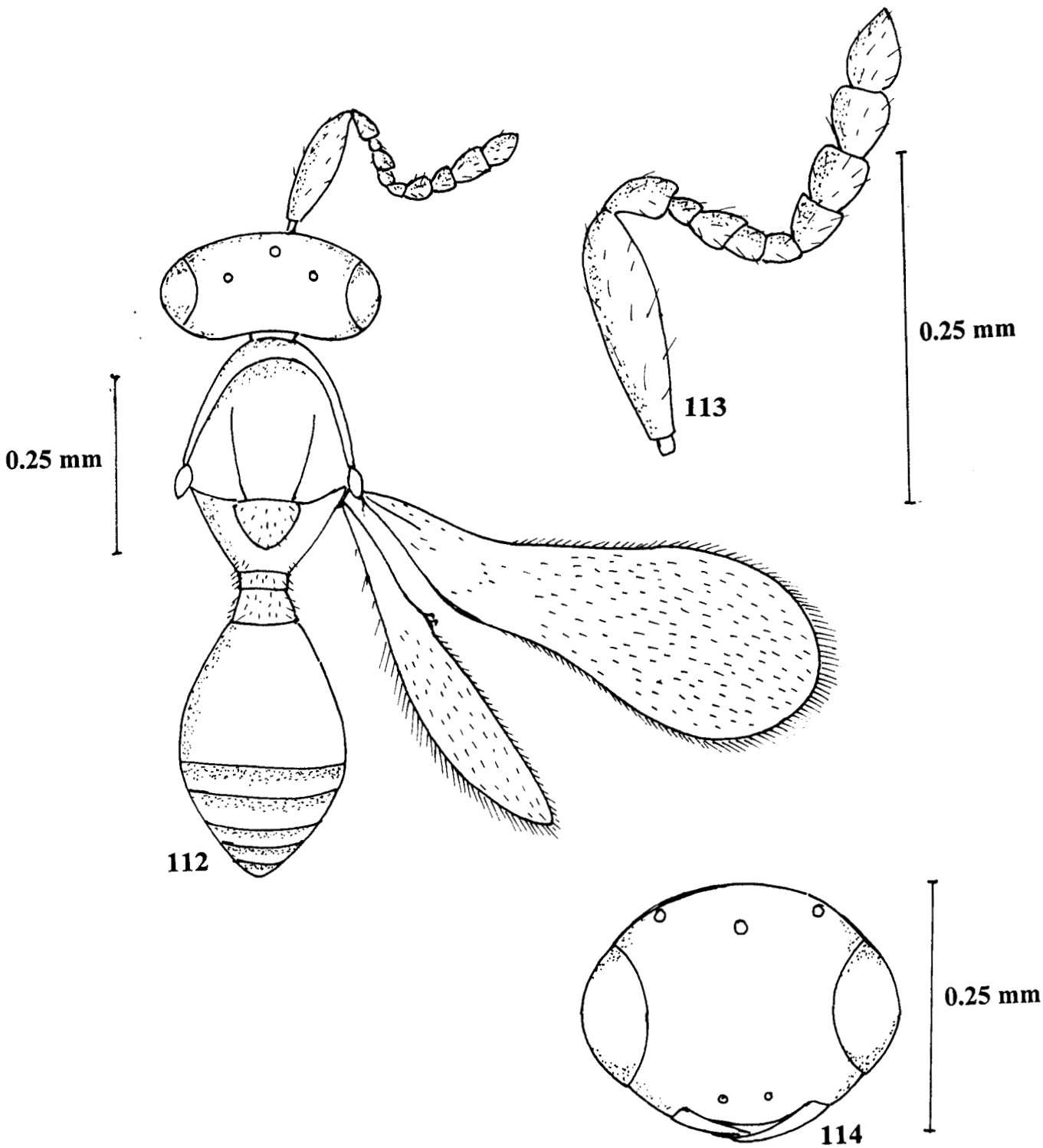


Figs. 108-111. *Platygaster intermedius* sp.nov. Female

108. Body (Dorsal view) 109. Antenna
110. Head (Anterior view)

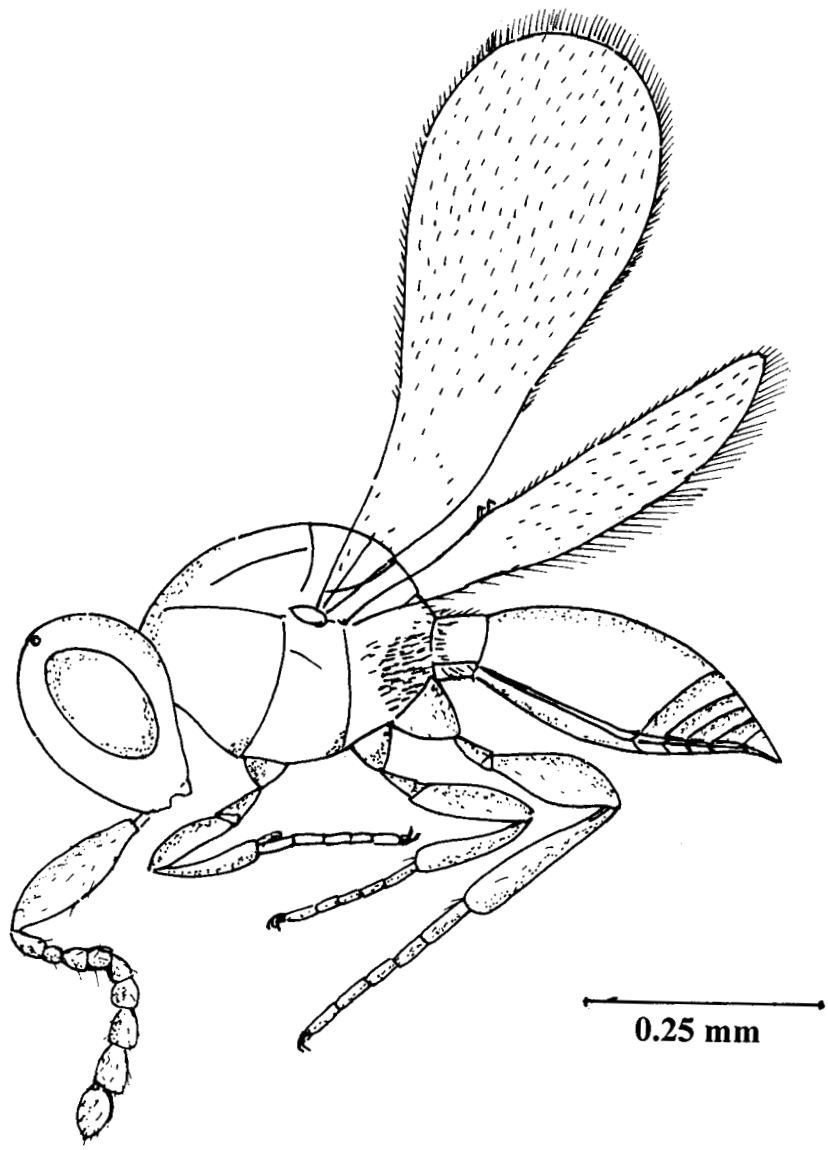


111. *Platygaster intermedius* sp.nov. Female (Lateral view)

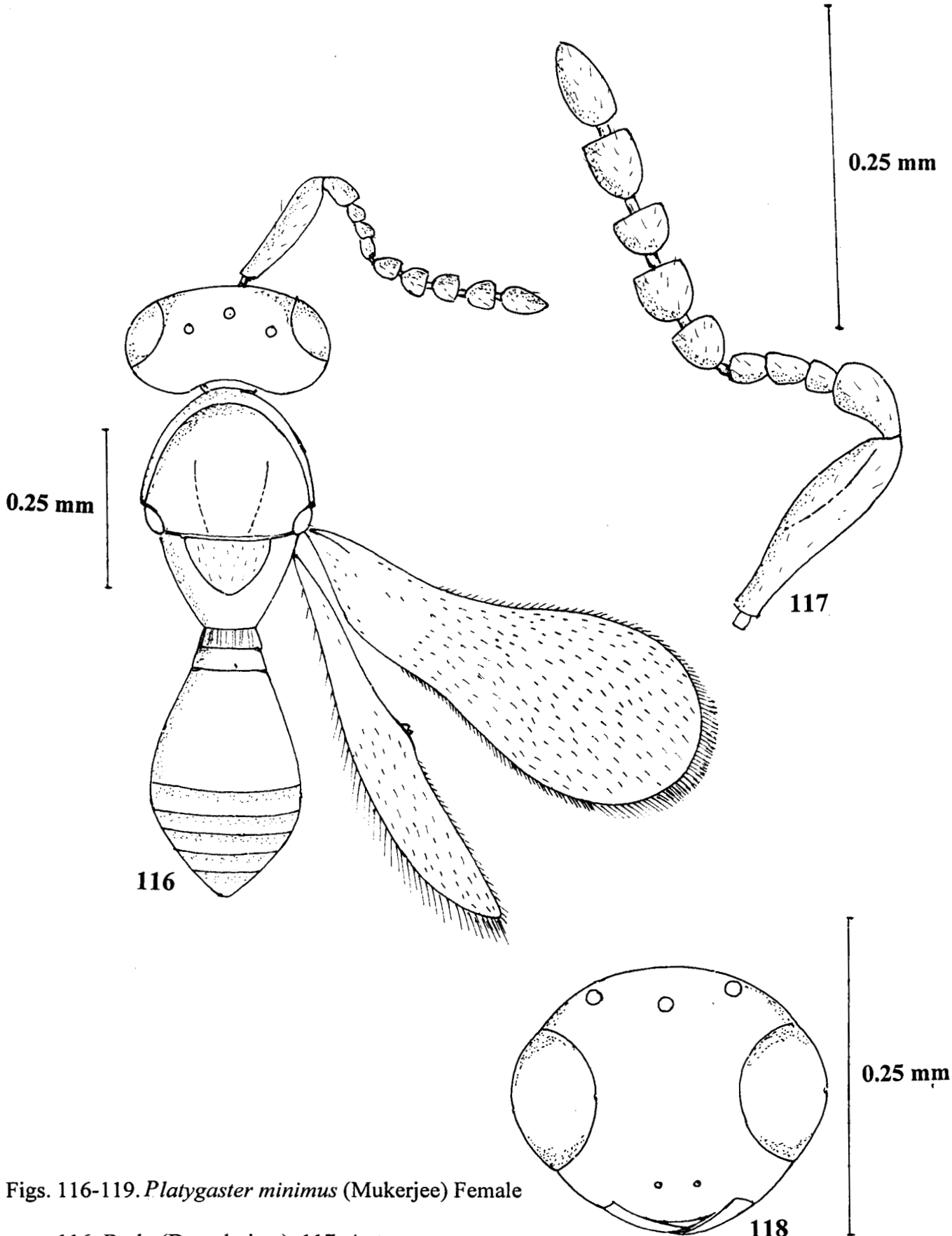


Figs. 112-115. *Platygaster keralicus* sp.nov. Female

112. Body (Dorsal view) 113. Antenna
114. Head (Anterior view)

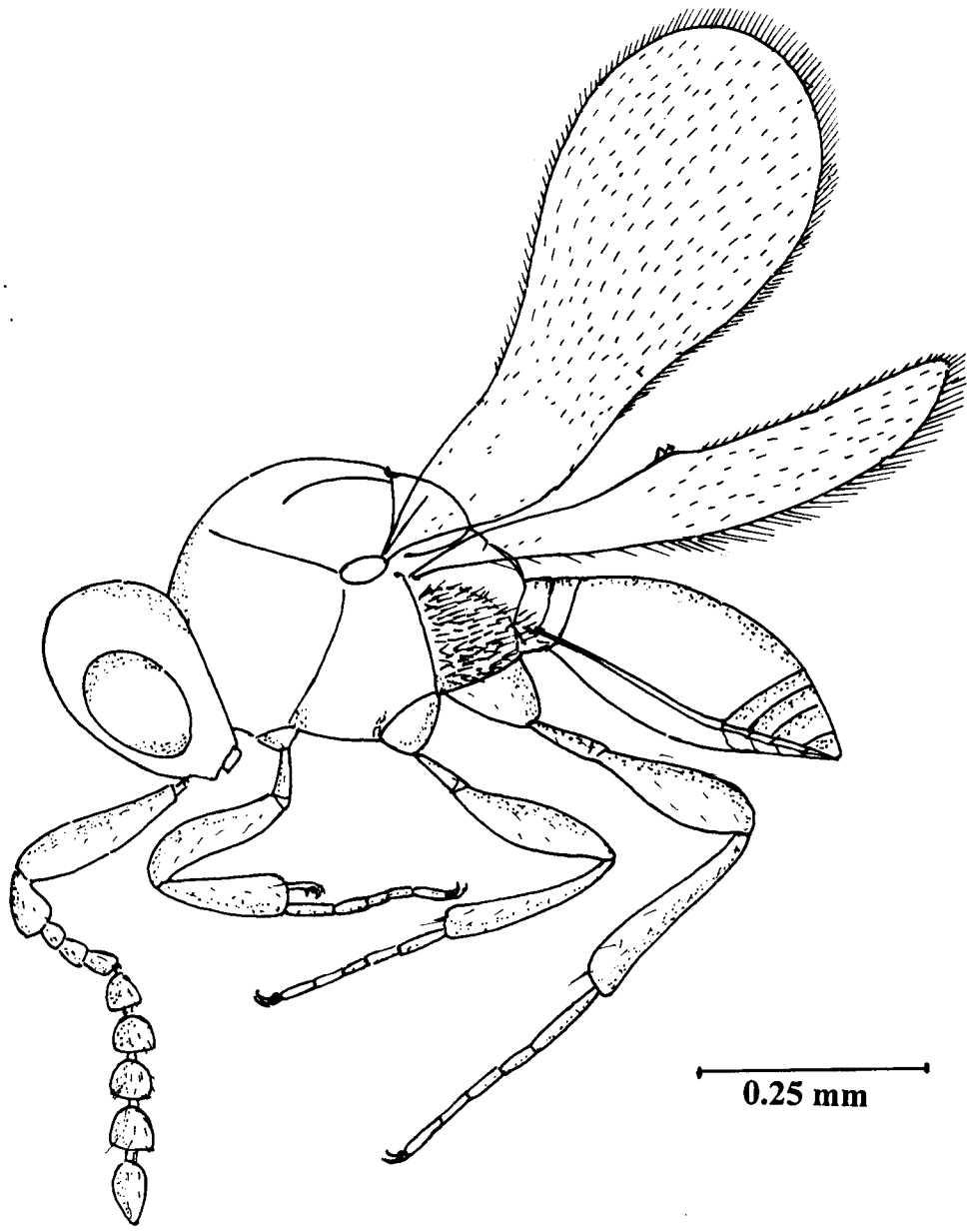


115. *Platygaster keralicus* sp.nov. Female (Lateral view)

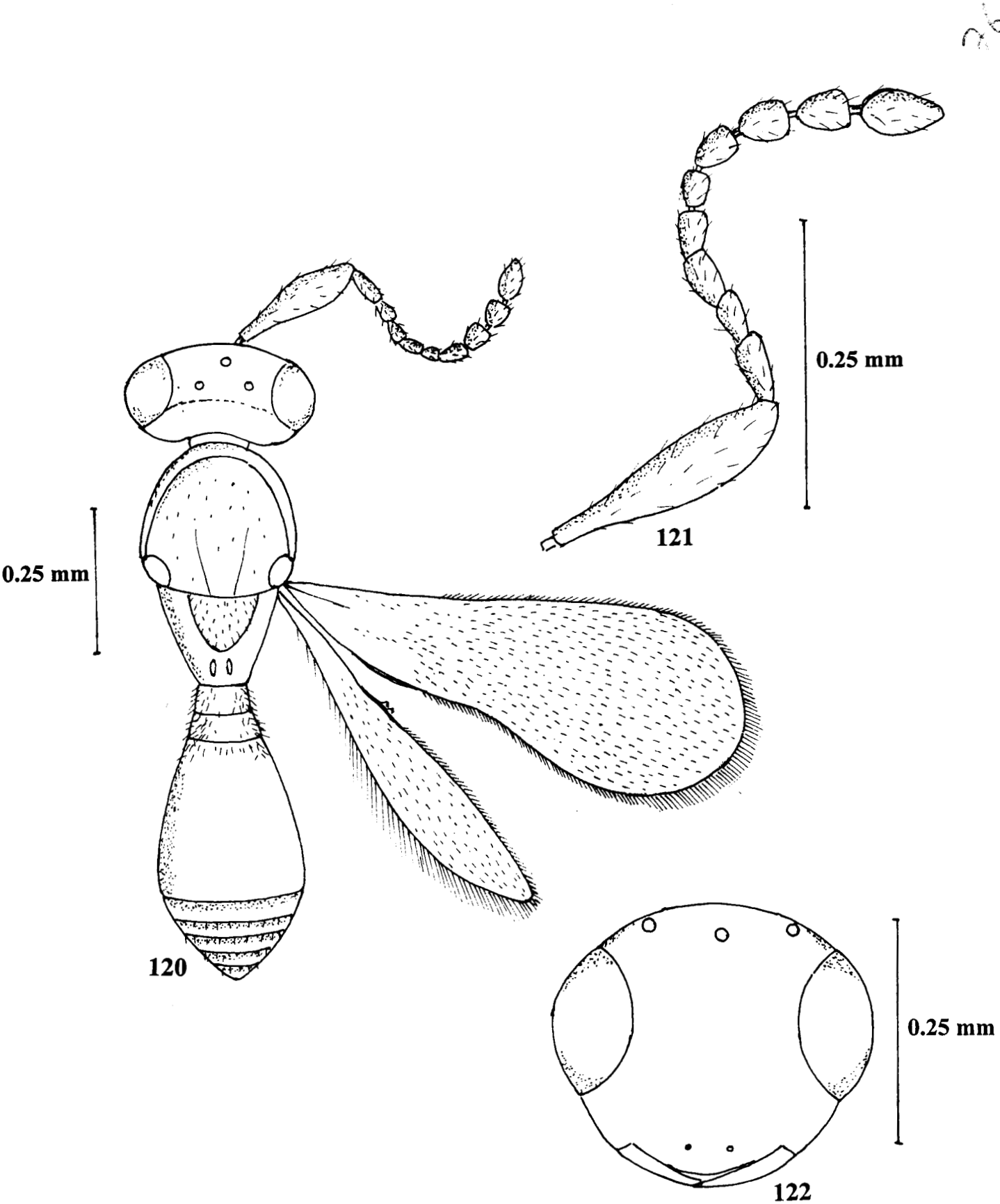


Figs. 116-119. *Platygaster minimus* (Mukerjee) Female

116. Body (Dorsal view) 117. Antenna
118. Head (Anterior view)

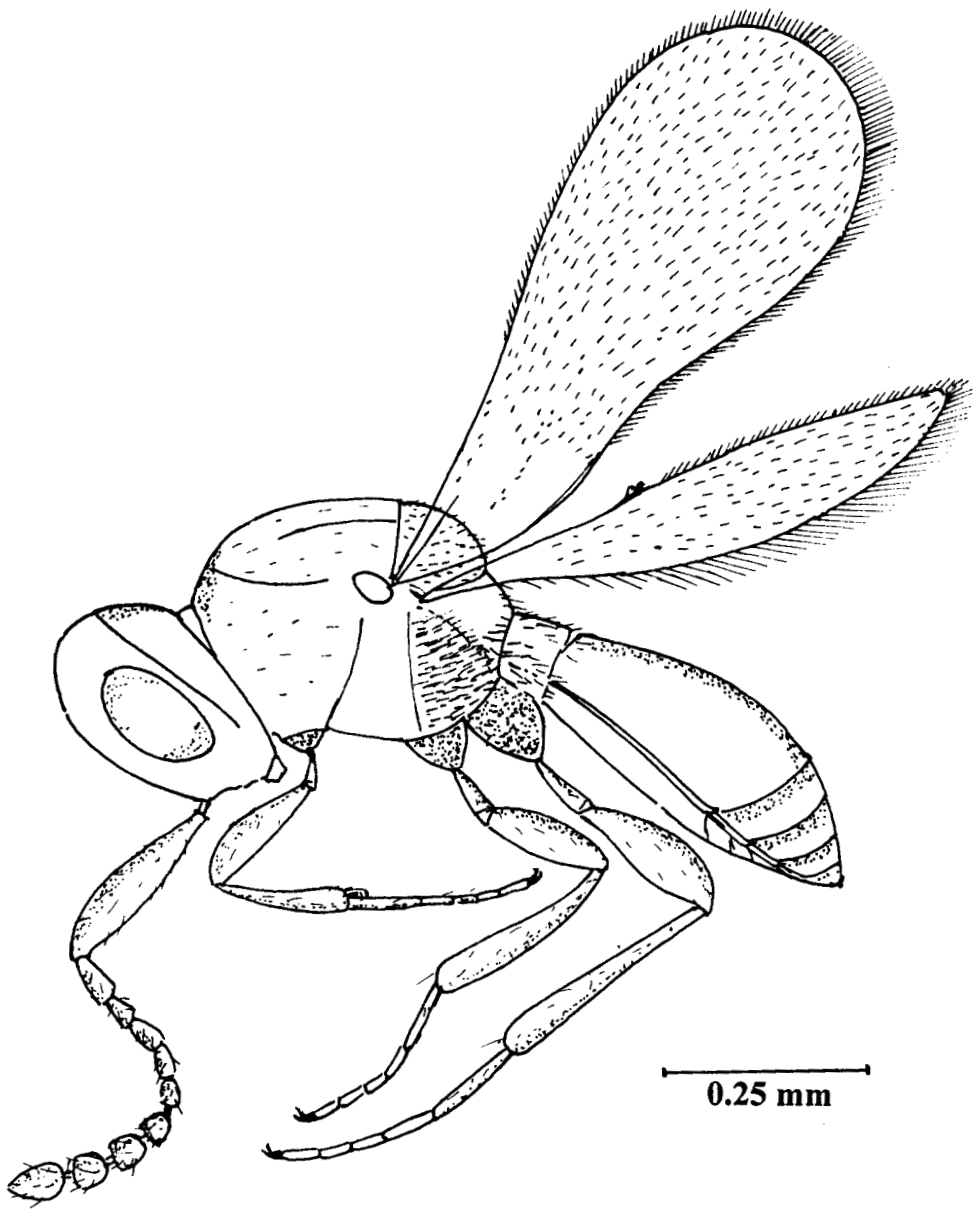


119. *Platygaster minimus* (Mukerjee) Female (Lateral view)

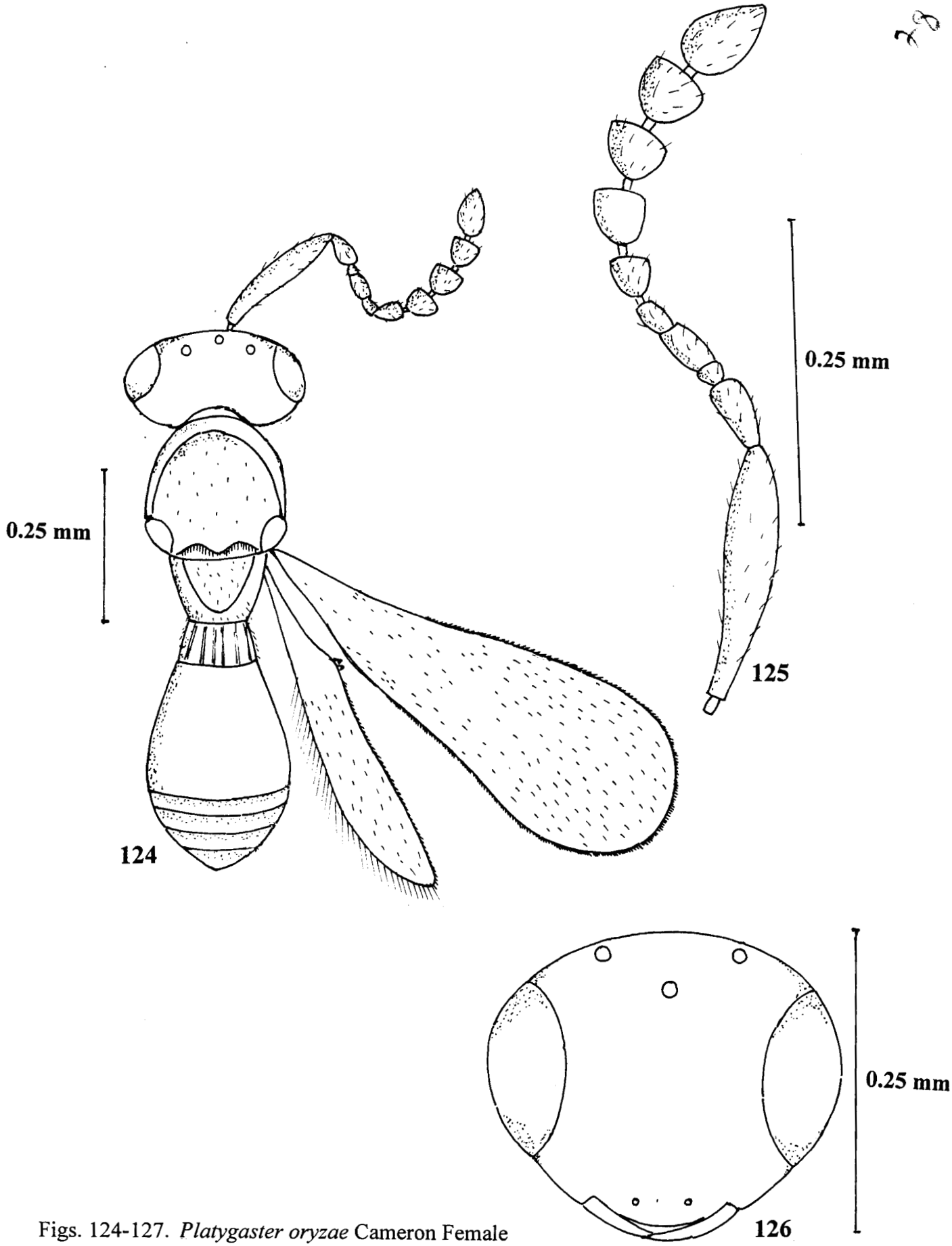


Figs. 120-123. *Platygaster nigrocoxatus* sp.nov. Female

120. Body (Dorsal view) 121. Antenna
122. Head (Anterior view)

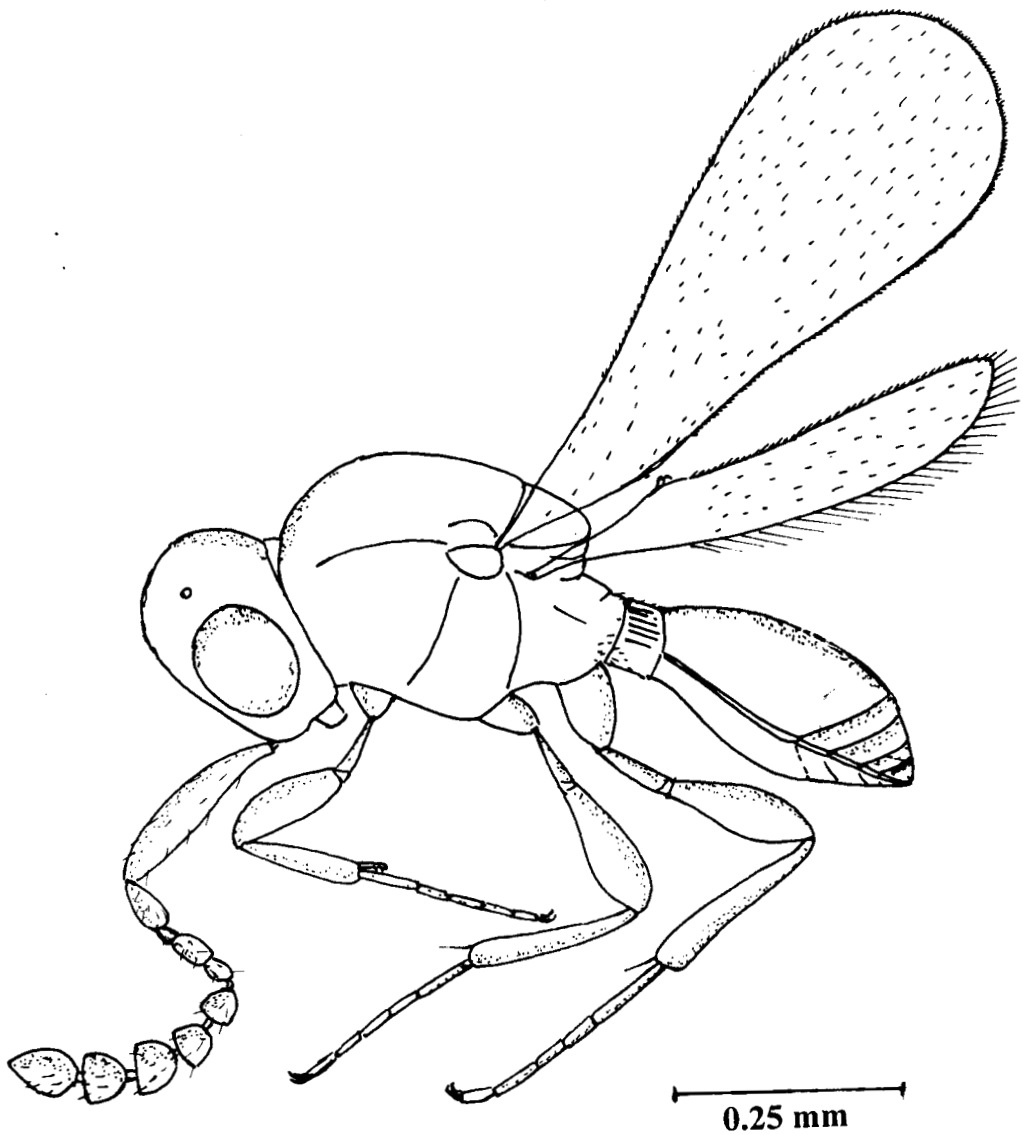


123. *Platygaster nigrocoxatus* sp.nov. Female (Lateral view)

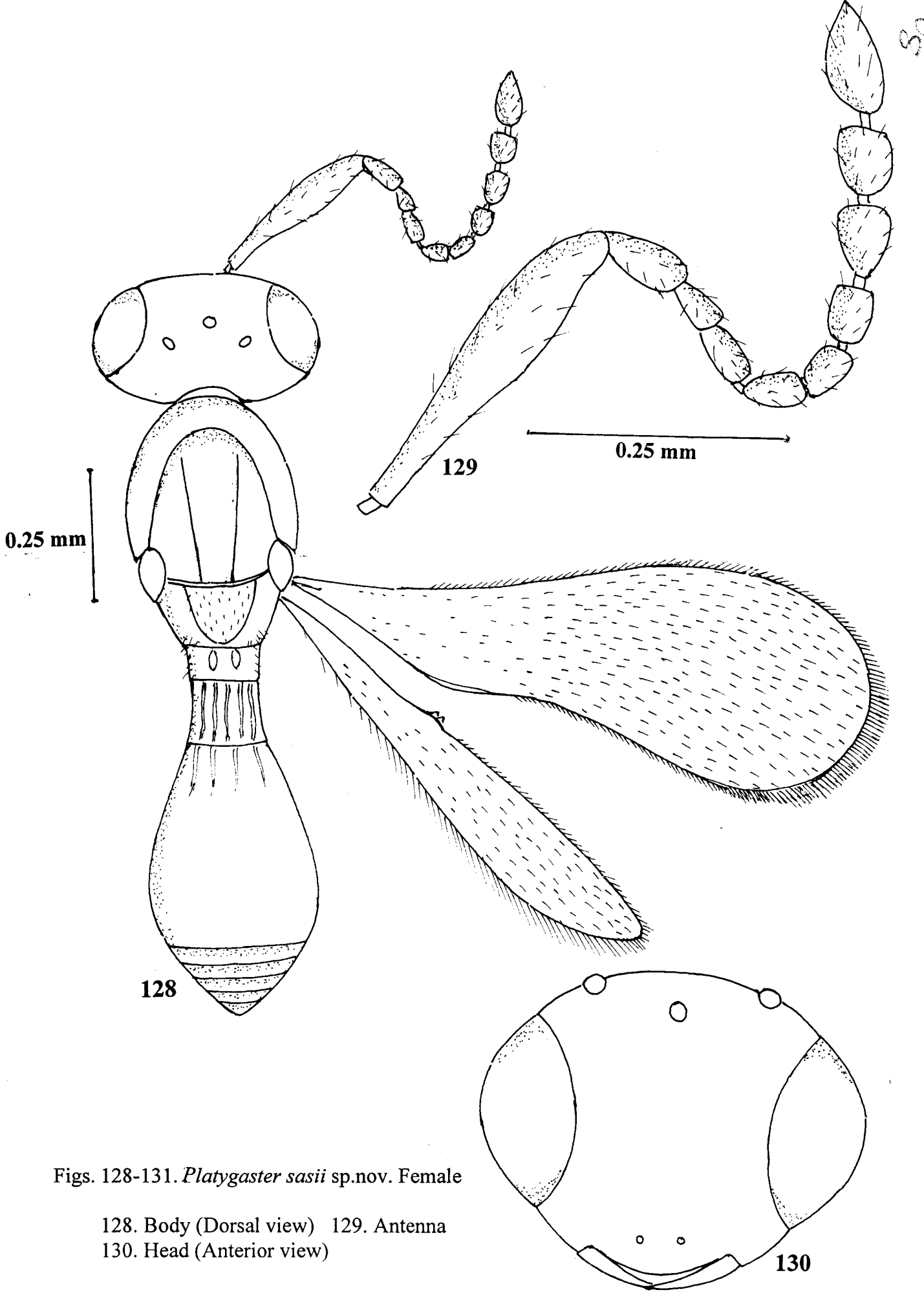


Figs. 124-127. *Platygaster oryzae* Cameron Female

124. Body (Dorsal view) 125. Antenna
126. Head (Anterior view)

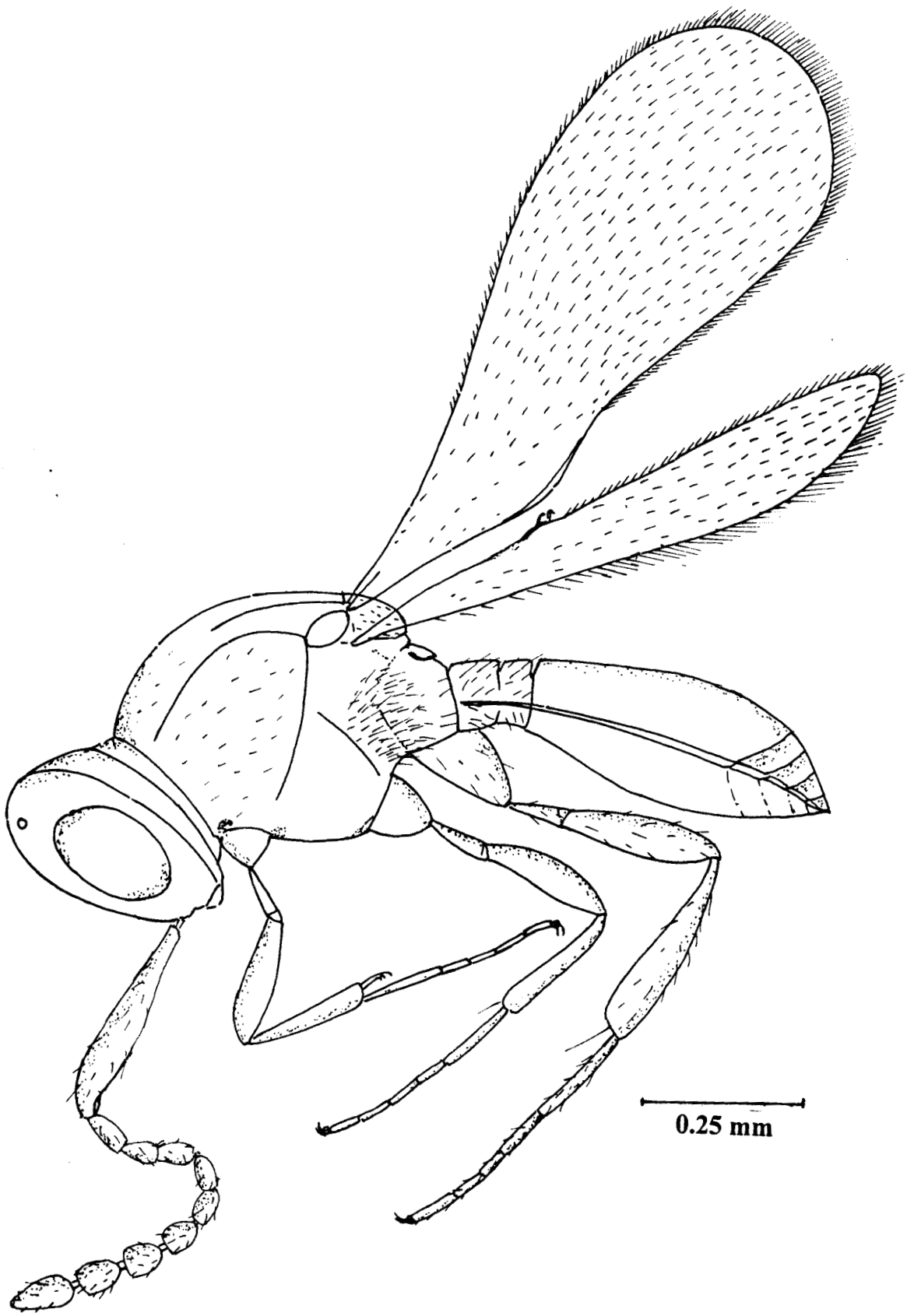


127. *Platygaster oryzae* Cameron Female (Lateral view)

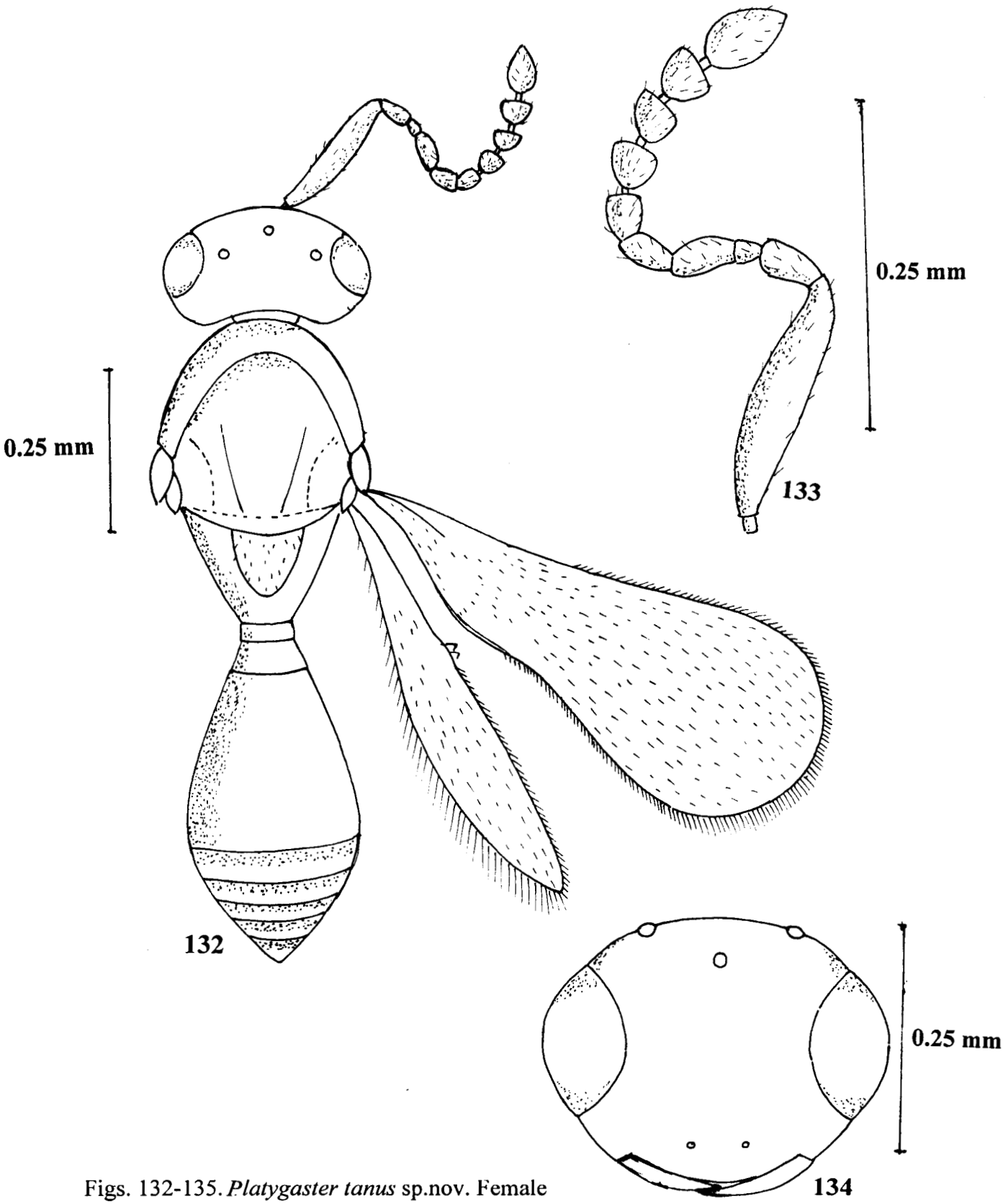


Figs. 128-131. *Platygaster sasii* sp.nov. Female

128. Body (Dorsal view) 129. Antenna
130. Head (Anterior view)

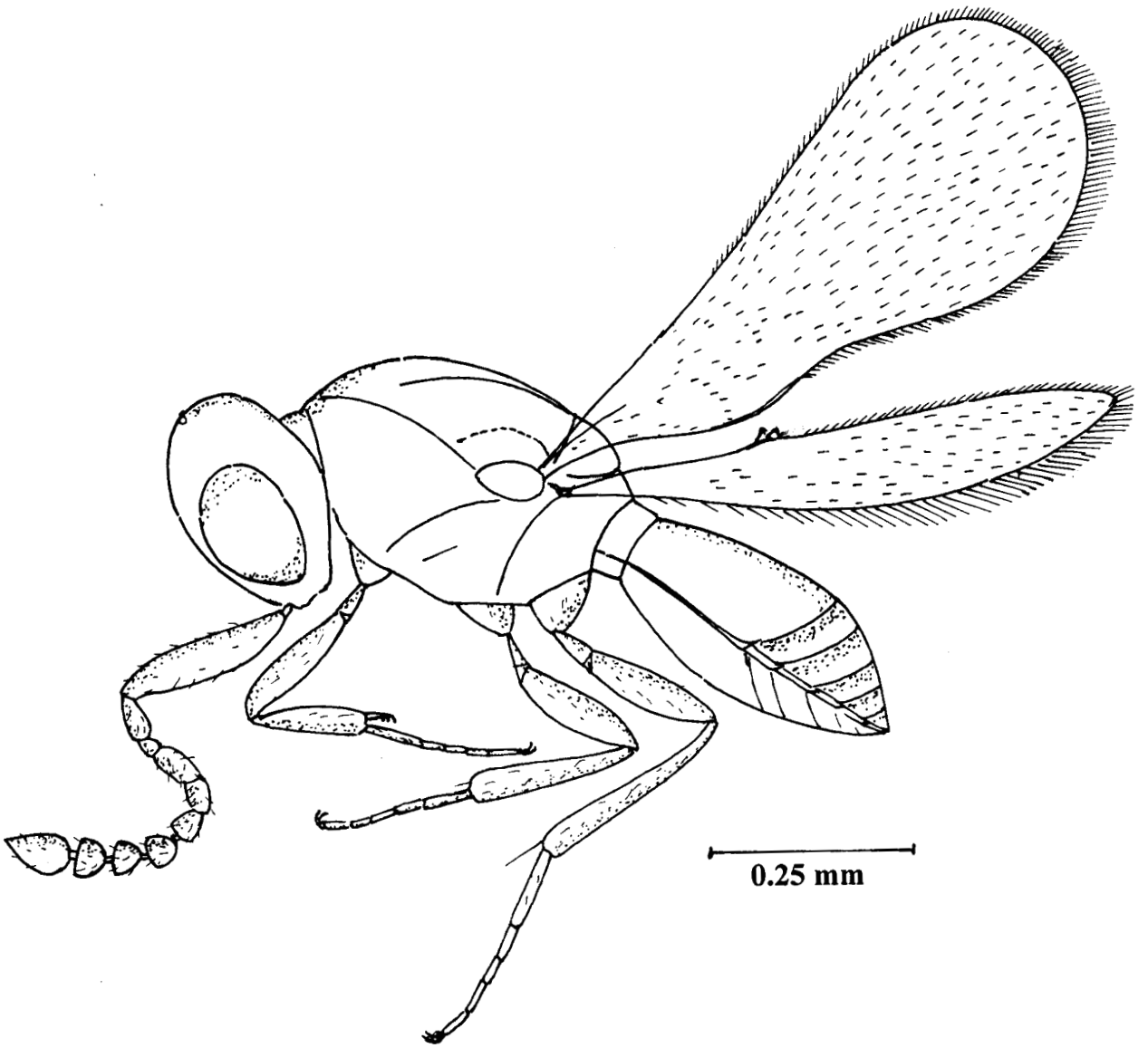


131. *Platygaster sasii* sp.nov. Female (Lateral view)

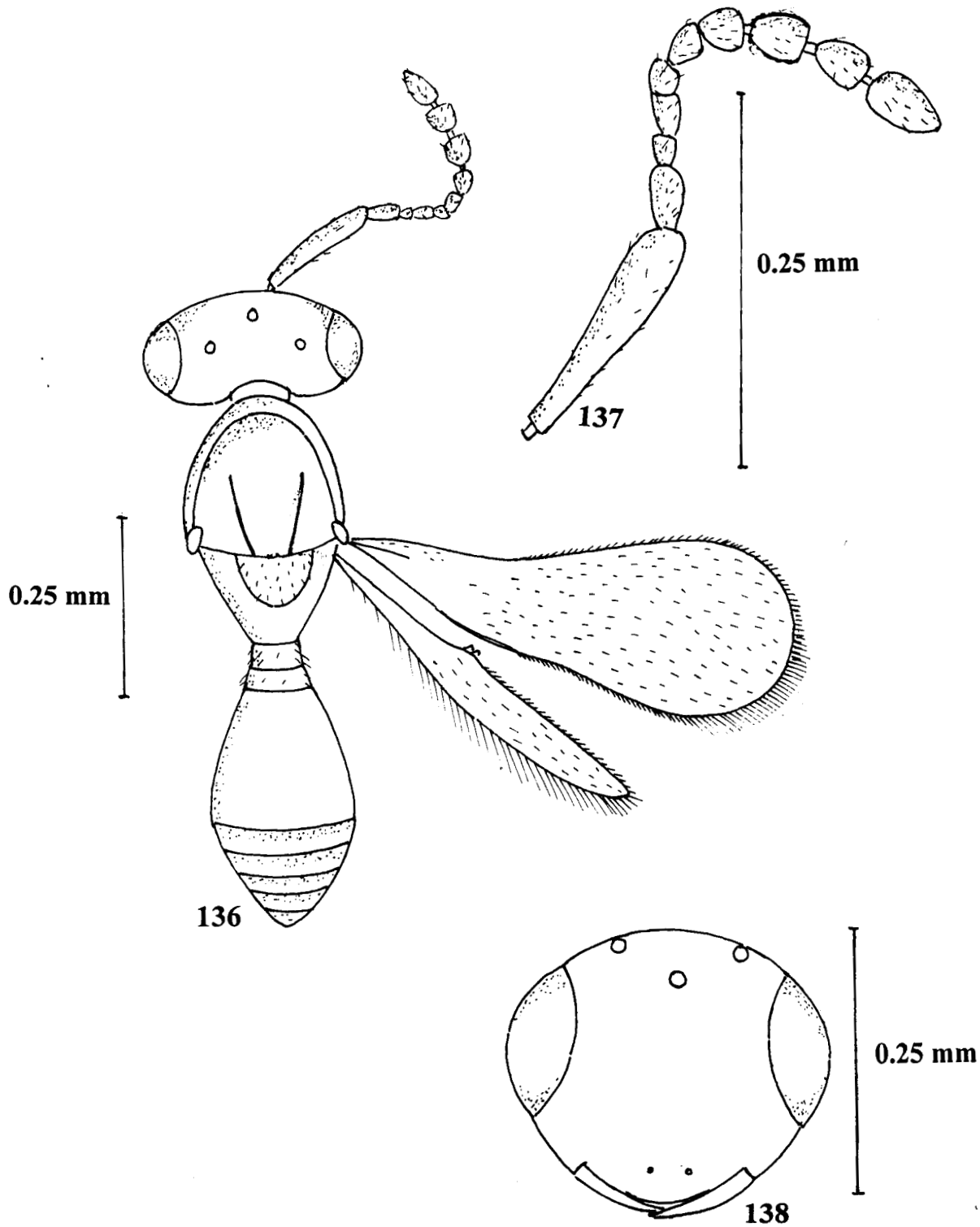


Figs. 132-135. *Platygaster tanus* sp.nov. Female

132. Body (Dorsal view) 133. Antenna
134. Head (Anterior view)

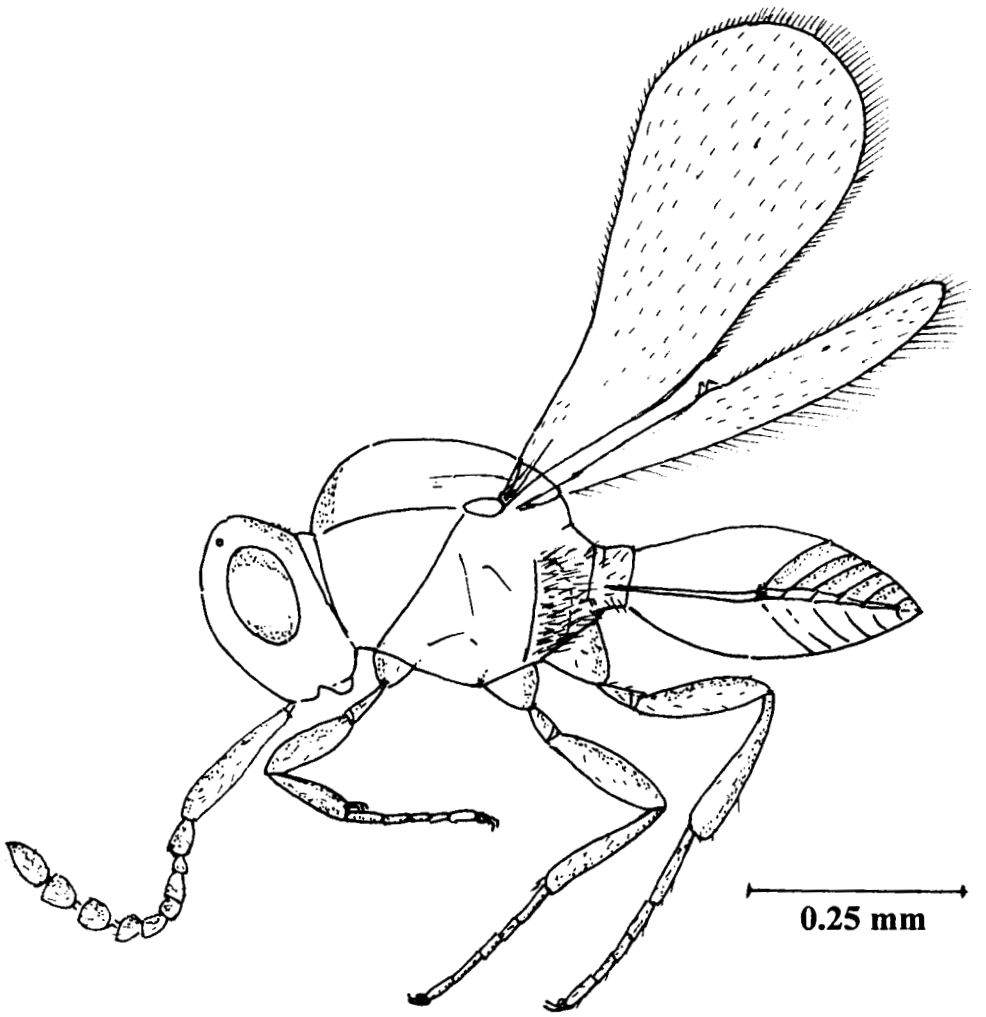


135. *Platygaster tanus* sp.nov. Female (Lateral view)

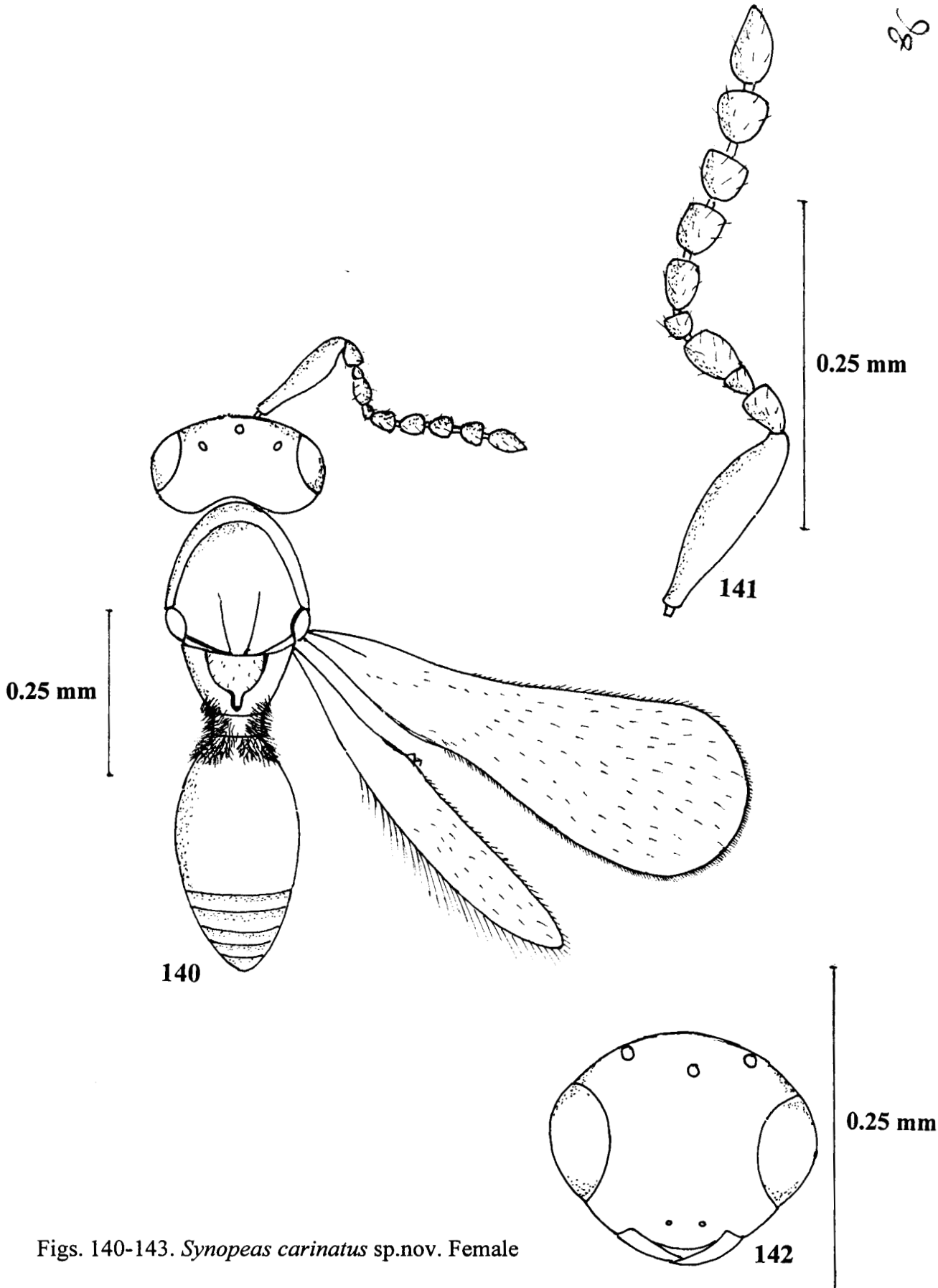


Figs. 136-139. *Platygaster zandanus* sp.nov. Female

136. Body (Dorsal view) 137. Antenna
138. Head (Anterior view)

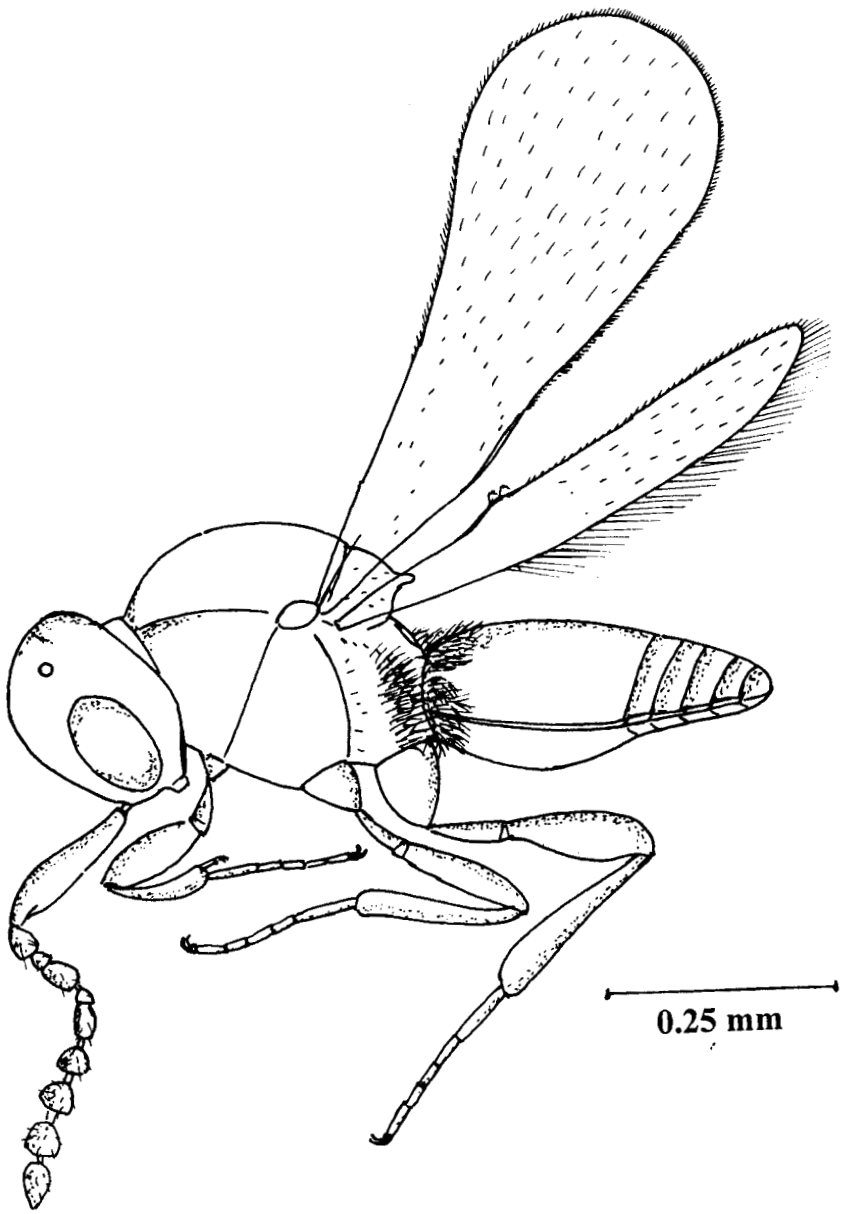


139. *Platygaster zandanus* sp.nov. Female (Lateral view)

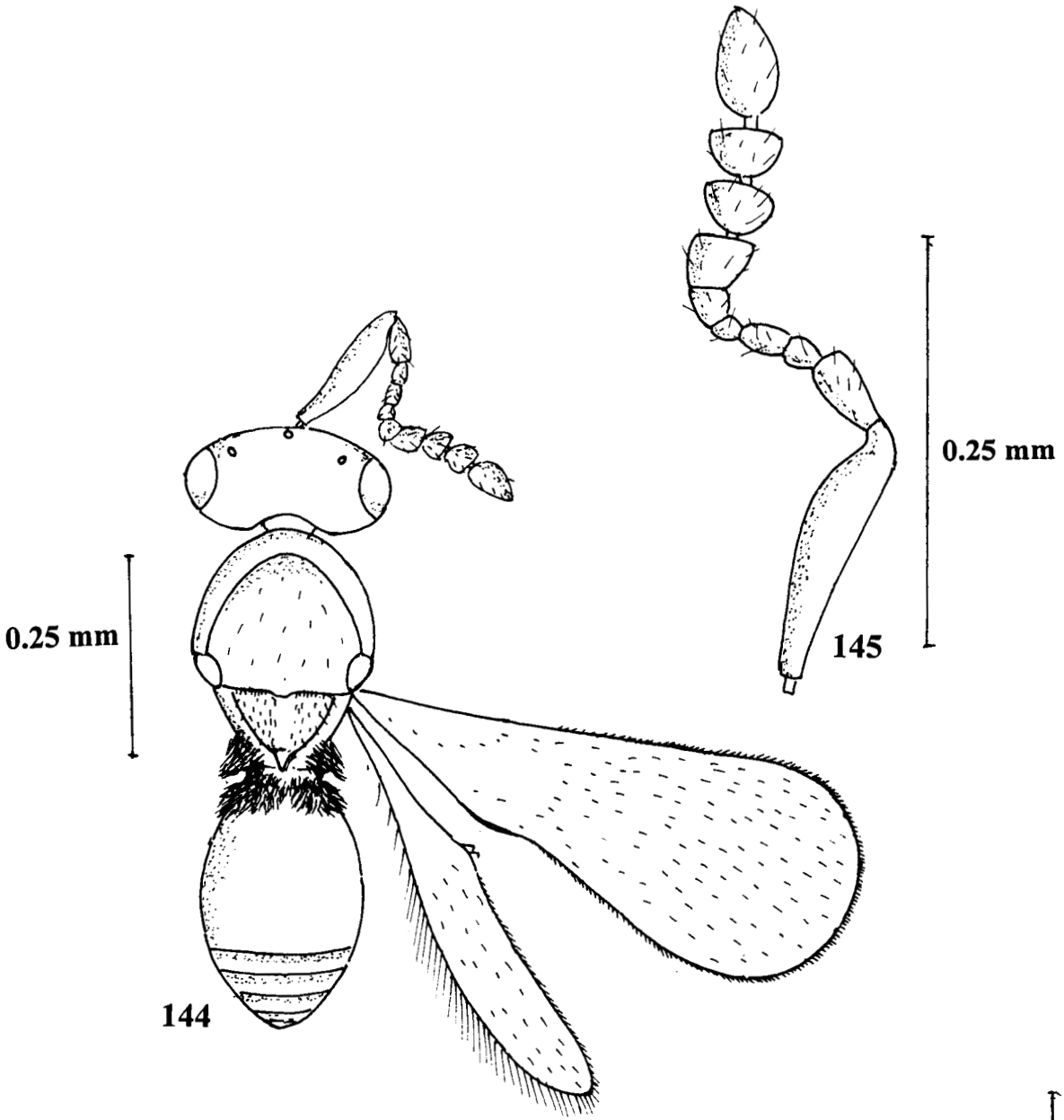


Figs. 140-143. *Synopeas carinatus* sp.nov. Female

140. Body (Dorsal view) 141. Antenna
142. Head (Anterior view)

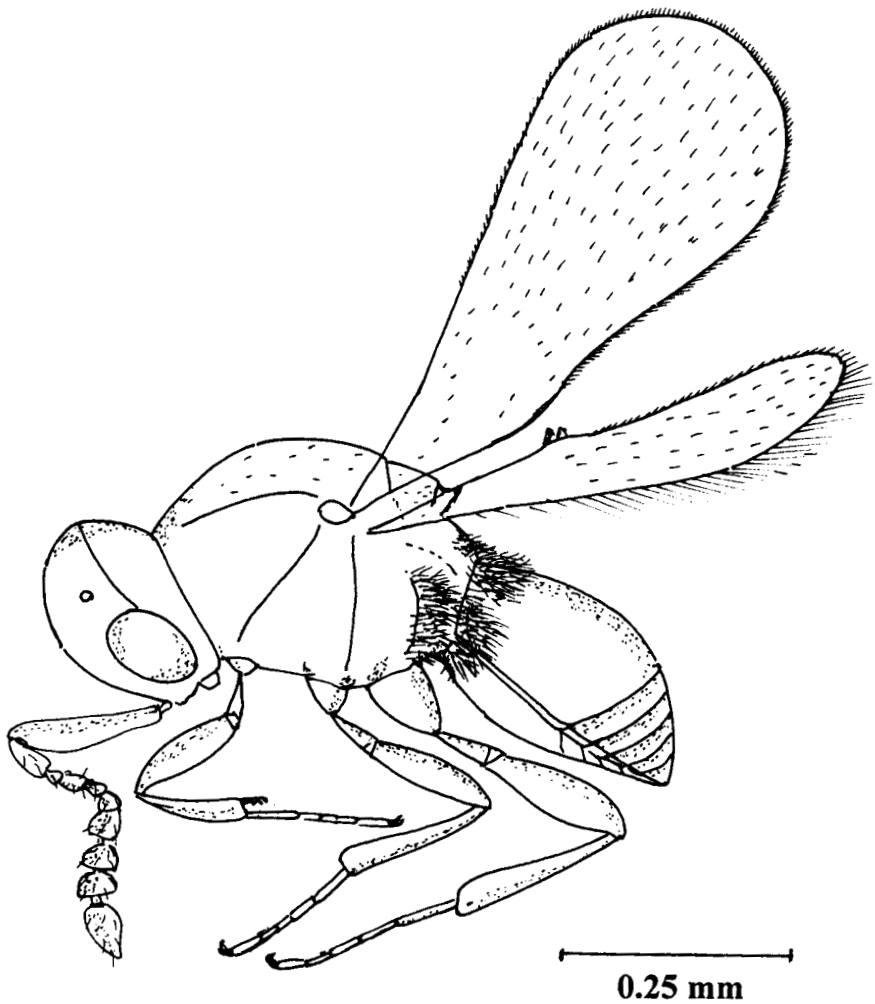


143. *Synopeas carinatus* sp.nov. Female (Lateral view)

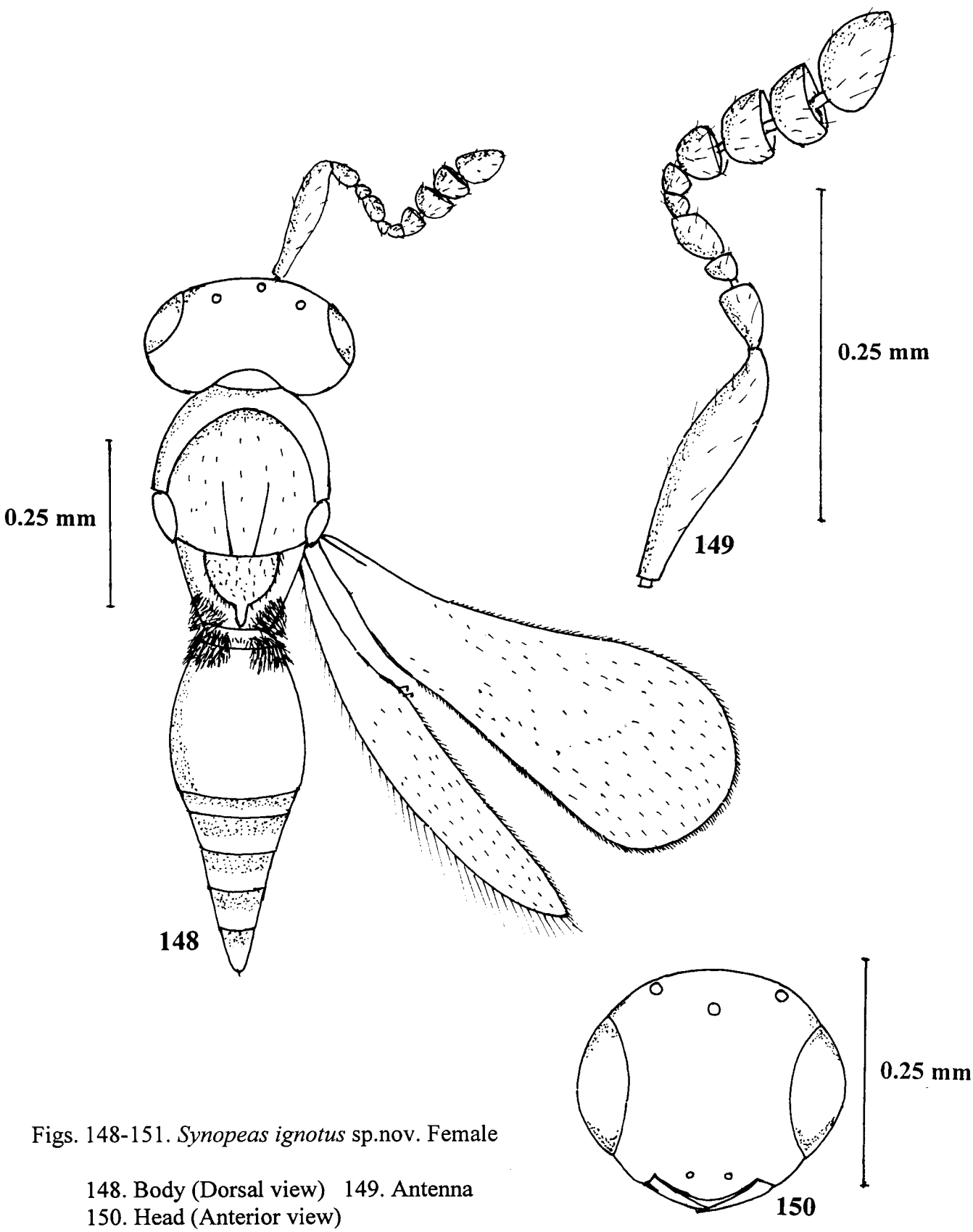


Figs. 144-147. *Synopeas curiosus* sp.nov. Female

144. Body (Dorsal view) 145. Antenna
146. Head (Anterior view)

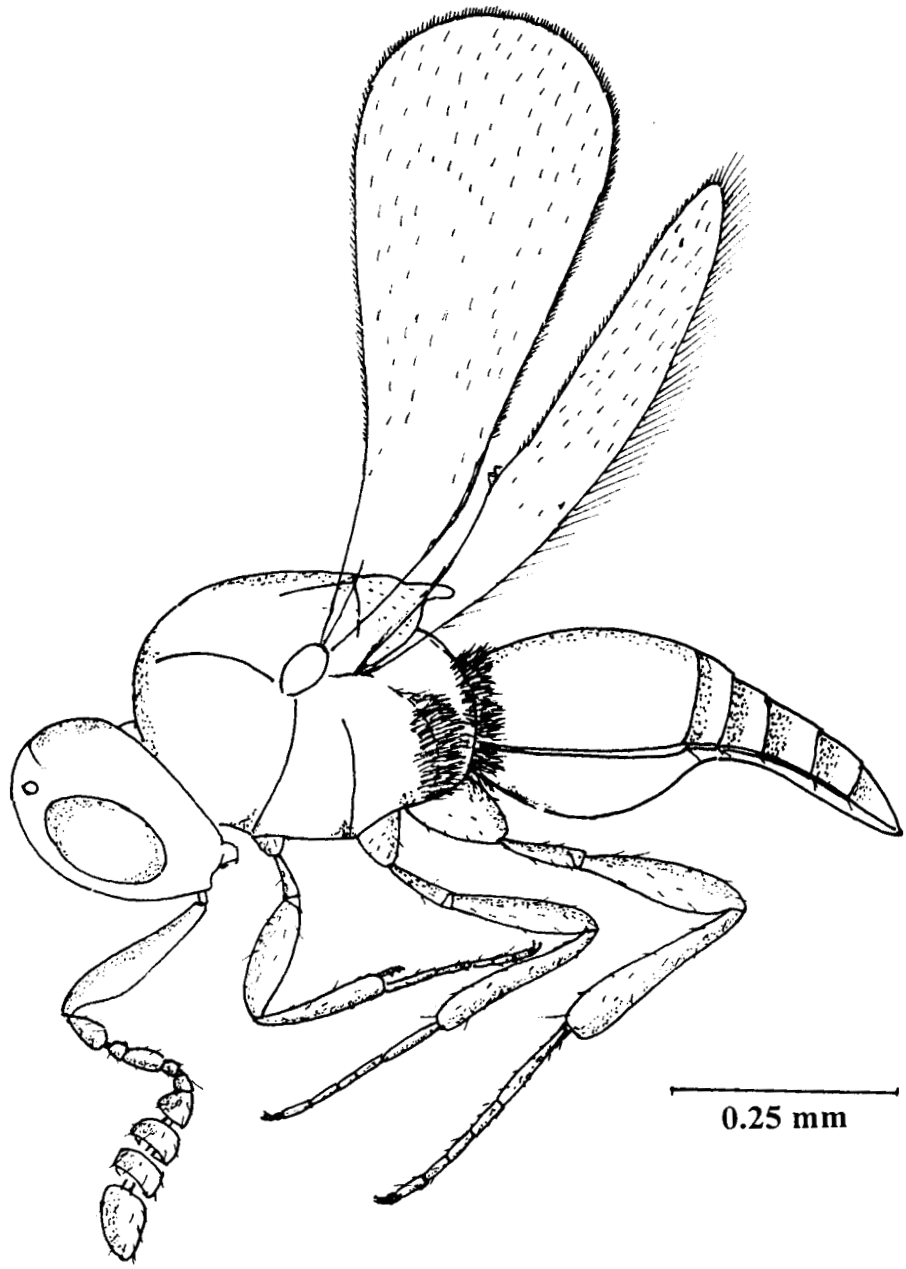


147. *Synopeas curiosus* sp.nov. Female (Lateral view)

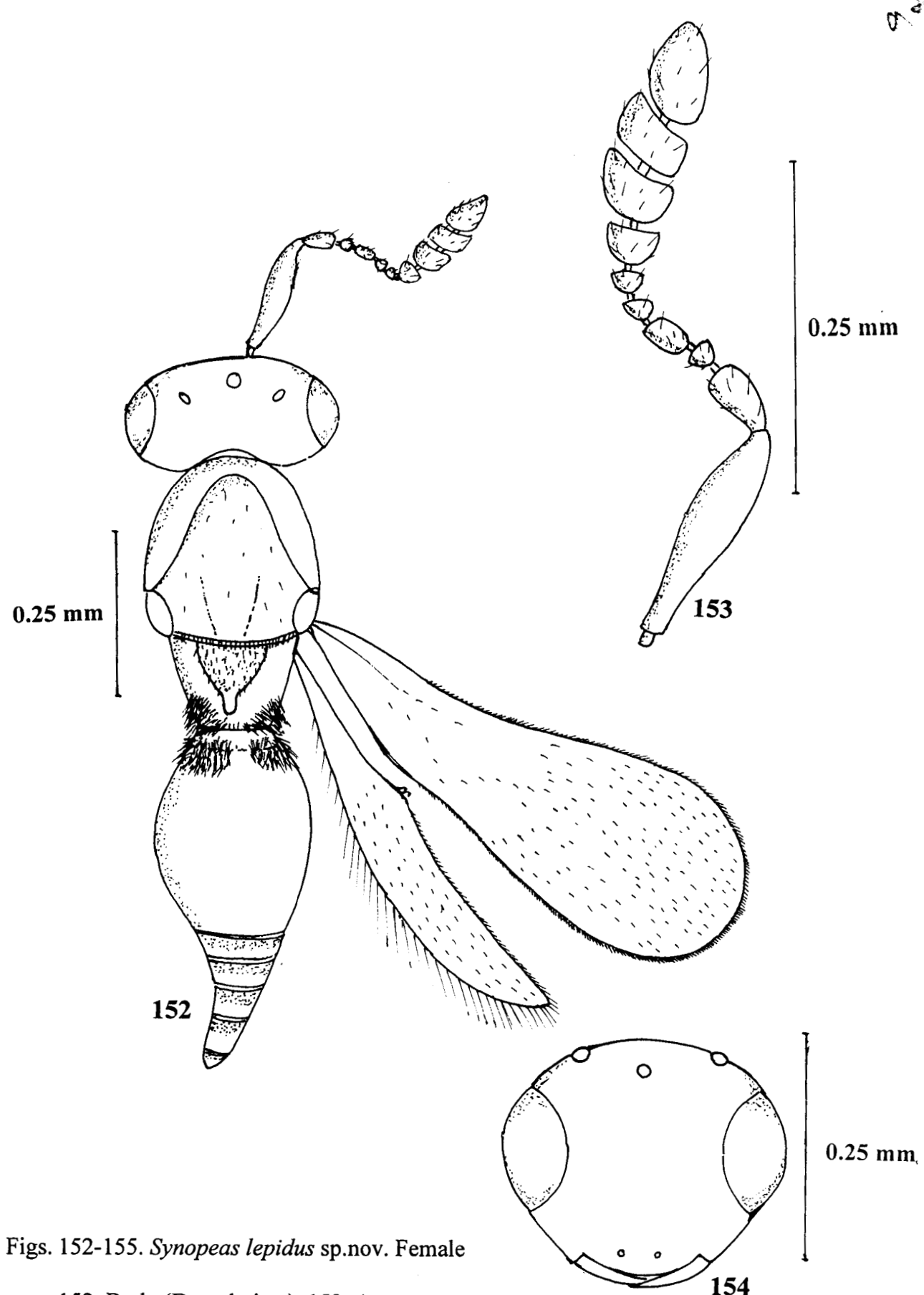


Figs. 148-151. *Synopeas ignotus* sp.nov. Female

148. Body (Dorsal view) 149. Antenna
150. Head (Anterior view)

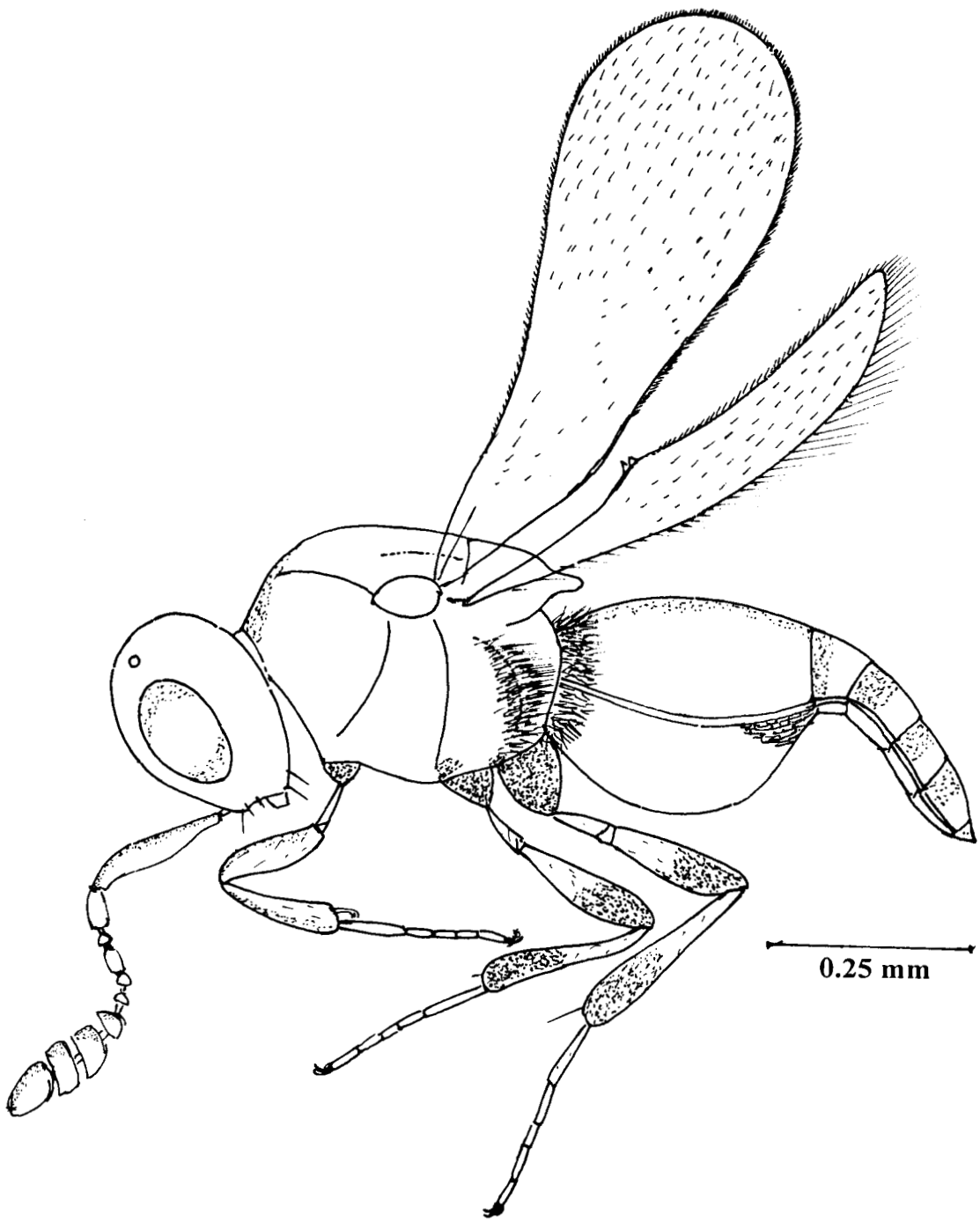


151. *Synopeas ignotus* sp.nov. Female (Lateral view)

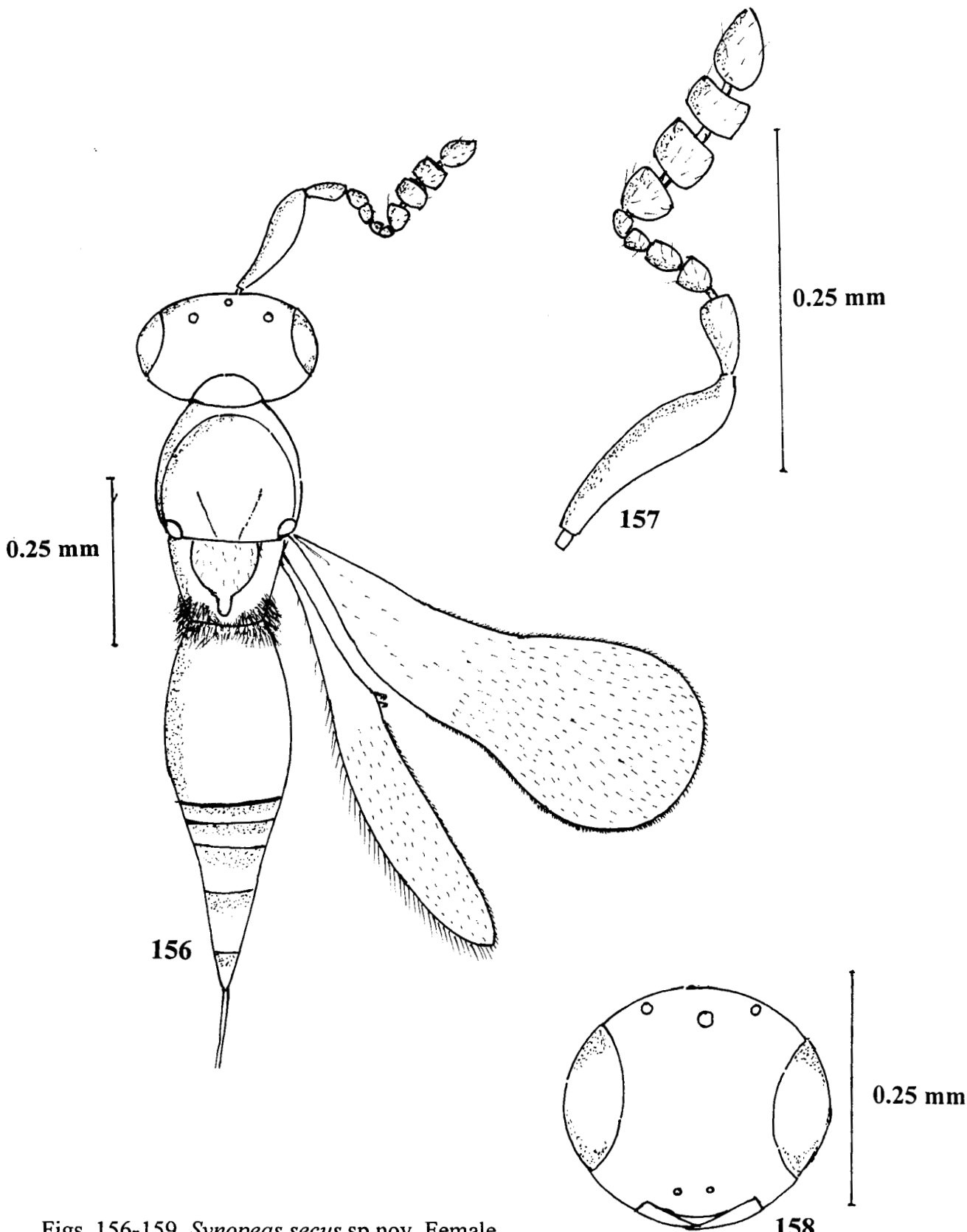


Figs. 152-155. *Synopeas lepidus* sp.nov. Female

152. Body (Dorsal view) 153. Antenna
154. Head (Anterior view)

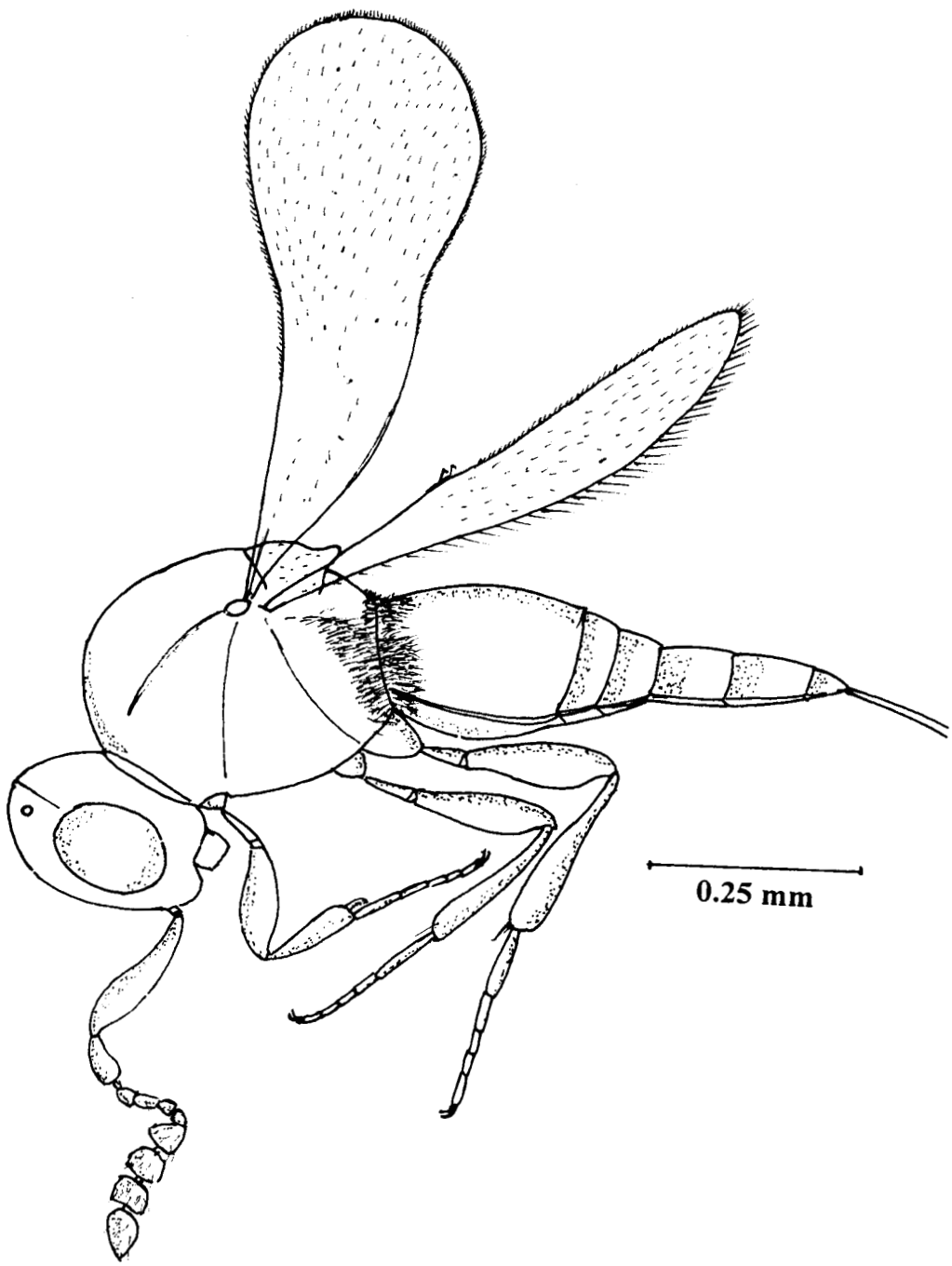


155. *Synopeas lepidus* sp.nov. Female(Lateral view)

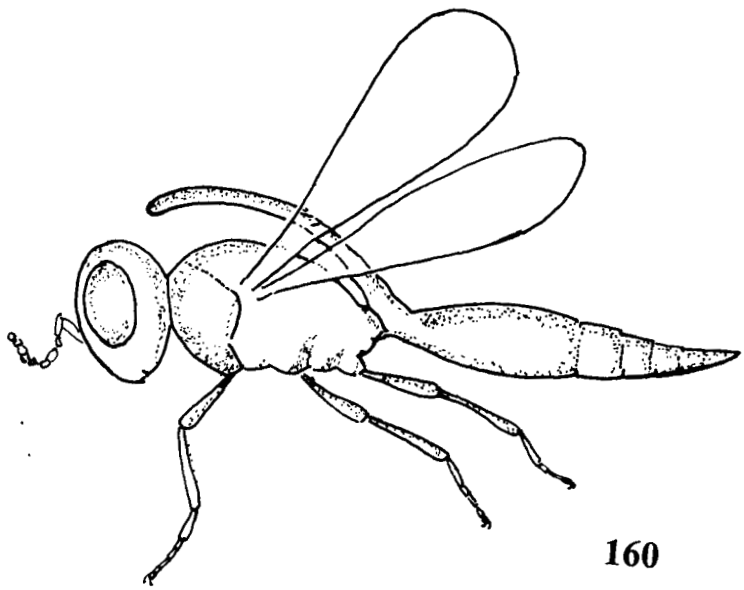


Figs. 156-159. *Synopeas secus* sp.nov. Female

156. Body (Dorsal view) 157. Antenna
158. Head (Anterior view)



159. *Synopeas secus* sp.nov Female (Lateral view)



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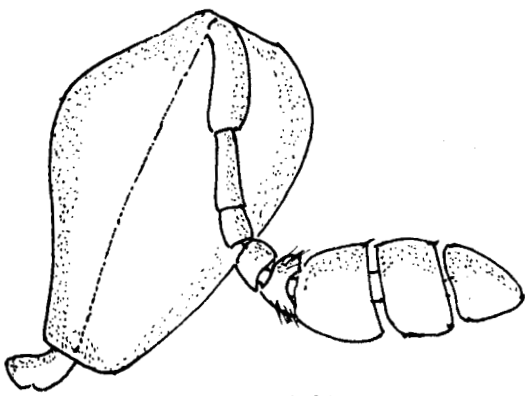

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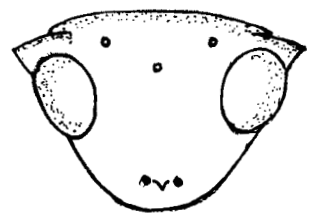

162

Fig. 160. Hump on petiole in *Inostema* Haliday

Fig. 161. Scape with expanded lamella in *Plutomerus* Masner and Huggert

Fig. 162. Head character in *Synopeas temporale* Austin

INVESTIGATION ON THE ALPHA SYSTEMATICS OF PLATYGASTROIDEA (HYMENOPTERA) OF KERALA STATE

THESIS SUBMITTED TO THE UNIVERSITY OF CALICUT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ZOOLOGY

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A NEW SPECIES AND A KEY TO SPECIES OF *ANTEROMORPHA* DODD (HYMENOPTERA : SCELIONIDAE) OF INDIA

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ABSTRACT

Anteromorpha malabarica Narendran sp. nov. comes near *A.deccanensis* Sharma in general appearance but differs from it in having lateral ocelli contiguous with eye border and T1 with hump or module in middle base. A key to species of *Anteromorpha* is provided.

Key words: Scelionidae, *Anteromorpha*, New species, Key.

INTRODUCTION

The genus *Anteromorpha* was erected by Dodd (1913) with the type species *Anteromorpha australica* Dodd. Since then Nixon (1933) erected the genus *Govinda* which was synonymized with *Antermorpha* by Kozlov (1971). Priesner (1951) erected the genus *Aegyptoscelio* which was synonymized with *Govinda* Nixon by Sundholm (1970). Risbec (1956) erected the genus *Afroscelio* which was synonymized with *Aegyptoscelio* Priesner by Masner (1958). Johnson (1992) listed various synonyms of *Anteromorpha* Dodd. There are 18 species of *Anteromorpha* in the world and among these 3 are known from India (Mani & Sharma 1982) and from Oriental region (Johnson 1992). In this paper a new species from Kerala is described. A key to Indian species is also provided. This paper is in continuation of our earlier studies on scelionidae (Narendran & Ramesh Babu 1996; Rajmohana & Narendran 1997, Narendran 1998; Narendran & Ramesh Babu 1997 ;1999).

Abreviations used: OOL=Ocellocular distance; POL = Post Ocellar Distance; F=Funicular Segment; T-tergite; SMV=Submarginal vein; MV=Marginal vein;

PMV=Post-marginal vein; STV=Stigmal vein; DZCU=Department of zoology, University of Calicut.

MATERIALS AND METHODS

The specimens were collected using specially made sweeping net and studied in the laboratory using M3Z wild stereozoom microscope (Switzerland) and Leitz-Wetzlar (German made) microscopes. The drawings were made using the drawing tube of M3Z wild sterozoom. The specimens were card-mounted and held on pins No.3 (Size 38 mm x 0.53) made by Newey Goodman Ltd. England.

RESULTS AND DISCUSSION

Anteromorpha malabarica Narendran sp. nov. (Figs.1-3)

Holotype Female: Length 1.85 mm. Head black; mesosoma notum, scuttellum blackish brown, rest of mesosoma and gaster liver brown; scape legs excepting coxae yellowish brown; pedicel, mandibles and coxae brown; rest of antenna brownish black; mandibular teeth reddish brown; eye pale blackish yellow; ocelli pale reflecting yellow; wings hyaline with fine dense, yellowish brown pubescence; body clothed with sparse, fine, moderately long silvery white hairs.

Head: With vertex and frons reticulate and granulate, densely pubescent; occiput striate reticulate; frons in front of front ocellus granulate; scrobal area smooth in middle; lower frons longitudinally striate; frons, vertex, gena and eyes fully pubescent; antennal sockets close to clypeal border; clypeus short; mandibles long and bidentate with few long hairs; lateral ocelli distinctly separated from eye border; relative measurement of OOL=2;POL=13;occiput strongly margined posteriorly; gena carinate posteriorly; malar groove distinct and carinate; gena with radiating striations originating from base of mandibular area towards cheek; head width in front view subequal to its length; eye length to head length 85:10.5; head width in dorsal view as wide as mesosoma; median length; width 28:38 head viewed laterally length to height 10:14. Antenna 12 sgmented; relative length of antenna to body=85:158. Relative measurements of length:width of antennal segments: Scape =25:6.5, pedicel =9.4; F1=7.5:4.3, F1=7.5:4.3, F2=5.3:4; F3=4:4; F4=4:3, F5=4:6,F6=5:7, F7=5.2:7.5, F8=5:9; F9=5:8; F10=6:6.

Mesosoma: Mesonotum with shallow close setigerous punctate; interstices not smooth, narrow, granulate; notauli absent; scutellum semicircular, unarmed

and punctate as on mesonotum; metanotum produced medially into a subtriangular plate with subhexagonal reticulations; mesonotum to scutellum 29:10, mesonotum and scutellum densely pilose; propodeum with two submedian and sublateral foveae, laterally striate-reticulate. Propleura rugose and granulate; prepectus distinct, transversely striated; mesopleura reticulately punctate on anterodorsal side; mesopleural depression deep, smooth and shiny with a row of close rectangular punctate near posterior border, two or three irregular transverse striations below tegulae; metalpeura reticulate on anterior half and basally, posteriorly smooth and shiny in middle; mesosoma length to width in dorsal view 49:34; in lateral view length:height 13:18. Wings hyaline with minute dense pubescence, marginal fringe present; forewing length to width 94:28. Relative length of forewing veins. SMV = 49; PMV=10; STV = 8; relative length of forewing to hindwing 94:89; hind femur 0.9 hind tibia; hind metatasus 0.8 x following tarsal segments combined.

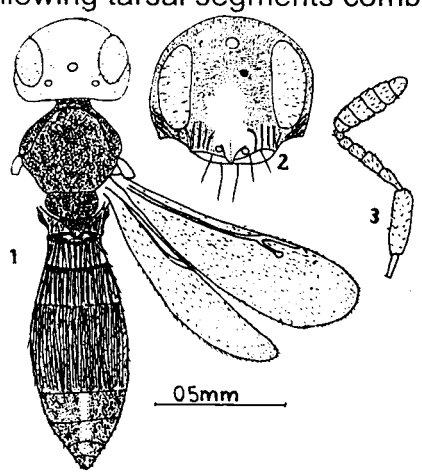

Fig.1-3 *Anteromorpha malabarica* Narendran sp. nov. Female 1. Part of body in dorsal view; 2. Head in front view; 3. Antenna

Gaster: Length of gaster to rest of body 80:77; length of gaster 2.5 x its width. Tergites as in Fig.1; T1 and T2 distinctly carinated longitudinally and with deep pits in between carinae basally; T3 longest, distinctly striolate; T4,T5,T6 and T7 smooth medially, matty laterally.

Male: Unknown

Host: Unknown

Holotype: Female, India, Kerala, Calicut University Campus, T.C. Narendran & Party 12.viii-1988 (DZCU). Paratypes: 2 Females of same data of holotype.

Key to species of *Anteromorpha* of Indian subcontinent

1. Metanotum produced medially into a transverse lamella; hind ocelli contiguous with eyes; PMV and STV equal; eye pubesent ....*glabra* Sharma.
   = Metanotum produced medially into subtriangular plate; other charac ters may or may not be in the same combination 2
2. Mandibles tridentate; T3 irregularly striolate .....*tuberculata* Sharma.
   = Mandibles bidentate; T3 different from above alternate 3
3. Lateral ocelli distinctly separated from eye border. T1 without hump (Fig.1)..... *malabarica* Narendran sp. nov.
   = Lateral ocelli contiguous with eye border; T1 with hump or nodule in middle base .....*deccanensis* Sharma

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REFERENCES

Dodd A P 1913 Australian Hymenoptera Proctotrupoidea. No.1 **Trans.R.Soc. S.Aust.37**:130-181.

Johnson N 1992 Catalog of World Proctotrupoidea, excluding Paltygastridae. **Mem. Amer. Ent. Inst. 51**: 1-825.

Kozlov M A 1971 Proctotrupoids (Hymenoptera, Proctotrupoidea) of USSR. **Tr. Vses. Entomol. Obschch. 54**:3-67.

Mani M S and Sharma S K 1982 Proctotrupoidea (Hymenoptera) from India. A review. **Oriental Ins.16**: 135-258.

Masner L 1958 New Scelioniden aus Grrotten von Franzosich Aquatorial Afrika (Hym. Scelionidae). **mitt. Schweiz. Entomol. Ges. 31**: 45-51.

Narendran T C and Ramesh Babu M G 1996. On the systematics of *Heptascelio* kieffer (Hymenoptera: Scelionidae). **Uttar Pradesh J. of Zool. 16**:89-93.

Narendran T C 1998 A rew species and a key to species of *Calotelia* Westwood (Hymenoptera: Proctotrupoidea). **Ann. Mag. Nat. Hist. 12**: 288-326, 465-479, 549-563.

Priesner H 1951. New genera and species of Scelionidae (Hymenoptera: Proctotrupoidea) from Egypt. **Bull. Inst. Fouad. 1Des 1(2)**: 119-149.

Rajmohana K and Narendran T C 1997 A remarkable new subgenus *Neotrimorus* of *Trimorus* Foerster (Hymenoptera: Scelionidae) from India. **J. Adv. Zool. 18(1)**: 32-37.

Risbec J 1956 Hymenoptera du Cameroun (3 contribution). **Bull. Inst. Fr. Afr. Noire. 18**: 806-833.

Sundholm A 1970 Hymenoptera: Proctotrupoiden - Gattung aus New-Guinea (Hymenoptera: Scelionidae). **Ann. Hist. Nat. Mus. Nat. Hung. (n.s.)7**: 151-152.