

**ALPHA SYSTEMATICS OF SOME GENERA
OF EULOPHIDAE (HYMENOPTERA)
OF KERALA**

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CERTIFICATE

This is to certify that this thesis is an authentic record of the work carried out by **Mrs. K. FOUSI** from January 1999 to June 2003 under my guidance and supervision in partial fulfilment of the requirements for 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.

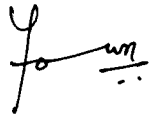

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DECLARATION

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.

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K. FOUSI



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Dedicated to
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INTRODUCTION

Systematics or taxonomy is the language of biology. It includes the science of classification and nomenclature. It finds applications in various fields of biology. To cite a few, biodiversity, agriculture, forestry, conservation, biological control, quarantine work, genetics, evolution and biotechnology.

Taxonomy has its greatest relevance in biological control. The correct identification of both the pest and its natural enemy is of utmost importance in employing biological control. Studies on biodiversity is impossible without the co-operation of taxonomic specialist of different groups. Quarantine laboratories functioning at the major air and sea ports employ taxonomists to check the accidental or intentional introduction of exotic fauna and flora that later become serious pests. Another area where taxonomy is essential is in the identification of harmful insects and other organisms which directly attack man and other animals. For *in situ* and *ex situ* conservation of endangered species, the combined effort of biotechnology and systematic experts is necessary. So studies on systematics is a primary necessity before undertaking any further study on the concerned group. Since it is not possible to take up all groups of animals for systematic studies, it is essential to choose groups of greatest importance (NARENDRAN, 2000). Eulophidae is one

such group. Eulophid taxonomy is very poorly studied in India especially South India.

Eulophids are mostly entomophagous. They are either primary or secondary parasitoids of other insects, including several major pests of agricultural crops. The vast majority of entomophagous eulophids attack Insecta Pterygota and egg-sacs of spiders. They are mostly larval parasites. Egg parasites and pupal parasites are also met with (BOUCEK, 1988).

Some phytophagous forms are also seen among eulophids. The genus *Anselmella* Girault is exclusively phytophagous. The genus *Ophelimus* Haliday causing gall leaves in eucalyptus are also phytophagous. Some species of *Quadrastichodella* Girault is found in eucalyptus flowers. Besides entomophagy and phytophagy, partial phytophagy is also suspected in many genera (BOUCEK, 1988).

The main host groups are Lepidoptera, Diptera, Coleoptera and Homoptera that are mainly leaf-miners, gall makers and insect larvae burrowing in plant tissues.

The family Eulophidae is one of the twenty families of the superfamily Chalcidoidea (Division: Parasitica; Suborder: Apocrita; Order: Hymenoptera). It is in fact the second largest chalcidoid family in the world with about 4260 nominal species and 550 nominal genera occurring in five subfamilies (NARENDRAN, 2001). Since it is not feasible to take up all the

subfamilies, the present investigation is restricted to seven genera coming under the subfamily Tetrastichinae.

Kerala, being the land of diverse geographic areas and natural vegetation is rich in the tetrastichine microfauna. Tetrastichines collected from different localities of Kerala are systematically analysed, identified and described with illustrations. Keys to genera and species, a detailed checklist and host-parasite index are also prepared.

As majority of this microfauna are entomophagous attacking the major pests of agricultural crops, the present study may prove to be of some help in supplying the fundamental information for undertaking biocontrol programmes against insect pests, involving these parasitoids.

Chapter I

REVIEW OF LITERATURE

Eulophid fauna is much neglected mainly because of its small weakly sclerotised body. Though many species have been described from Northern India, very little is known of the eulophid fauna of Peninsular India. As far as Eulophidae is concerned, many areas of South India especially Western ghats remain unexplored. Here, an attempt is made to review the earlier works with special emphasis to the subfamily Tetrastichinae of the world.

The earlier workers on the systematics of Eulophidae were WESTWOOD, WALKER, HALIDAY, FOERSTER, ASHMEAD, CRAWFORD, GIRAULT, WATERSTON AND ROHWER. Recently MANI, FERRIERE, BHATNAGAR, RANAWEERA, KURIAN, BOUCEK, LASALLE, GRAHAM, SUBBA RAO, HAYAT, HUSAIN, KHAN AND SHAFEE contributed to the systematics of Indian Eulophidae.

The study of Eulophidae had begun in 1758, when the father of taxonomy, LINNAEUS reported some eulophids under the genus *Ichneumon*. GEOFFROY in 1762 erected the genus *Eulophus*, but was rejected as unavailable name: Opinion 228, 1954, ICZN. Later OLIVIER (1791) re-erected the genus *Eulophus* based on the type species *Ichneumon ramicornis* Fabricius.

After a decade, SCHRANK (1802) erected the genus *Pnigalio* based on the type species *Ichneumon pectinicornis* Linnaeus. DALMAN in 1820 erected the genus *Entedon* based on the type species *Entedon cyanellus* Dalman. In the year 1828, WESTWOOD proposed the family name as 'subfamily Eulophina' in his paper 'On the Chalcididae'. In 1829, STEFFAN published a systematic catalogue of British insects in which he included eulophids also. FONSCOLOMBE (1832) described a new species *Pteromalus galerucae* which is actually a species of Eulophidae. WESTWOOD in the same year erected a new genus *Dicladocerus* based on the type species *Dicladocerus westwoodi* Westwood. Two more new genera i.e., *Cirrospilus* based on *Cirrospilus elegantissimus* Westwood and *Euplectrus* based on *Euplectrus maculiventris* Westwood were also erected by WESTWOOD in the same year.

In 1833, WALKER published 'Monographia Chalciditum' in which there is reference to the family Eulophidae. In the same year, HALIDAY erected a new genus *Omphale* based on the type species *Entedon (Omphale) salicis* Haliday. Three new genera i.e., *Closterocerus* based on the type species *Closterocerus trifasciatus* Westwood, *Hemiptarsenus* based on the type species *Hemiptarsenus fulvicollis* Westwood and *Stenomesus* based on the type species *Stenomesus pulchellus* Westwood were erected by WESTWOOD from Indian subcontinent in the same year. HALIDAY in

1836 contributed to the study of eulophids by publishing a paper on parasitic Hymenoptera.

In 1842, WALKER erected a new genus *Ceranisuus* based on the type species *Cirrospilus pacuvius* Walker. In the following year, he erected another new genus *Diglyphus* describing *Cirrospilus chabrias* Walker as the type species. HALIDAY (1843) erected a new genus *Euderus* based on the type species *Entedon amphis* Walker. In the following year, he published the paper 'Contributions towards the classification of the Chalcididae' which added to the knowledge of Eulophidae including the erection of a new genus *Tetrastichus* Haliday based on the type species *Cirrospilus attalus* Walker.

WESTWOOD (1847) erected a new genus *Melittobia* describing *Melittobia audouinii* Westwood as the type species. WALKER in 1848 published a list of specimens of Hymenopterous insects in the collection of British museum which gave much information about the family Eulophidae. In 1852, RATZEBURG described *Entedon hagenowii* obtained from the ootheca of *Blatta orientalis* Linnaeus. FOERSTER (1856) erected the genera *Baryscapus* based on the type species *Baryscapus centricolae* Ashmead by subsequent monotypy, *Sympiesis* based on the type species *Eulophus sereceicornis* Nees and *Chrysocharis* based on the type species *Chrysocharis femoralis* Foerster.

MOTSCHULSKY (1863) described eight new species from Srilanka i.e., *Tetrastichus patannas*, *Solenoderus cyaniventris*, *Tetrastichys ellia*, *Ceranismus nigricornis*, *Cirrospilus coccivorus*, *Ceranismus? subconicus*, *Ceranismus semitestaceus* and *Cirrospilus viridifrons*. In 1867, RONDANI described *Lopodytes asphondyliae*. In the same year, he erected a new genus *Sigmophora* by describing *Sigmophora scrophulariella* Rondani as the type species. Three years later, in 1870 he erected another new genus *Oomyzus* based on the type species *Pteromalus gallerucae* Fonscolombe.

HOWARD (1885) described the North American Chalcididae from the collections of the U.S. Department of Agriculture and along with Dr. C.V. Riley, he published biological notes with a list of described North-American species of the family Eulophidae. OLLIFF (1893) described a new species *Euplectrus howardi* from the Clarence River district, South Wales. ASHMEAD in 1894 erected a new genus *Ceratoneura* based on the type species *Ceratoneura petiolata* Ashmead along with two new species *Tetrastichus fasciatus* and *Euderus lividus*. GIARD in 1896 described *Lygellus epilachnae* from Pakistan.

In 1900, ASHMEAD published notes on some New Zealand and Australian parasitic Hymenoptera including some new genera and new species. CAMERON (1902) described new genera and species of Hymenoptera from India including Eulophidae. In the year 1905,

ASHMEAD published 'Additions to the recorded fauna of the Philippine Islands with description of new species' in which he described *Nesolynx flavipes* as the type species of his newly erected genus *Nesolynx*. In the same year, KIEFFER described a new species, *Hyperteles longicauda* from India. CRAWFORD in 1911 described *Euplectrus bussyi* from India. A year later, he described another two new species i.e., *Tetrastichus colemani* and *Tetrastichus ophuisae* from India.

KURDJUMOV in 1913 described a new species, *Tetrastichus coccinellae* from Srilanka. The same year CAMERON published a paper on the parasitic Hymenoptera reared at Dehra Dun from the lac and gall insects which included a new species, *Hadrothrix purpureus*. GAHAN in the same year described a new species, *Tetrastichus bruchophagi* from California. GIRAULT (1913) published a series of papers which boosted the knowledge of the family Eulophidae. This included the erection of eight new genera under the subfamily Tetrastichinae i.e., *Neotrichoporoides* based on the type species *Neotrichoporoides uniguttatus* Girault, *Ceratoneuronella* based on the type species *Ceratoneuronella nigriventris* Girault, *Ceratoneuropsis* based on the type species *Ceratoneuropsis poincarei* Girault, *Gyrolasomyia* based on the type species *Gyrolasomyia washingtoni* Girault, *Eulophoscotolinx* based on the type species *Eulophoscotolinx viridis* Girault, *Mestocharella* based on the type species *Mestocharella feralis* Girault, *Parachrysocharis* based on

the type species *Parachrysocharis javensis* Girault and *Quadrastichodella* based on the type species *Quadrastichodella bella* Girault.

WATERSTON in 1914 described a new species *Tetrastichodes asthenogmus* obtained from *Periplanata americana* (Linnaeus) from Srilanka. A year later, CRAWFORD described a new species *Tetrastichus pyrillae* from India. GIRAULT (1917) erected another new genus *Aceratoneuromyia* based on the type species *Aceratoneuromyia australis* Girault. In 1919 GAHAN published a report on a small collection of Indian parasitic Hymenoptera and an account on a new genus of chalcid wasp belonging to the family Eulophidae.

GIRAULT (1920) published 'New genera and species of chalcid flies from Australia' in which he had erected a new genus *Euceratoneura* based on the type species *Euceratoneura shelleyi* Girault. ROHWER in 1921 contributed much to the study of South Indian eulophids by describing several new species like *Tetrastichus okawus*, *Tetrastichus coimbatorensis*, *Tetrastichus ayyari*, *Tetrastichus nyemitawus* and *Ceratoneura indica*. In the following year (1922), WATERSTON described a new species *Tetrastichus spirabilis* bred at Dehra Dun. In the same year he also published 'On the chalcid parasites of Psyllids' including *Tetrastichus radiatus* and *Tetrastichus dryi*. Two years later in 1924, MERCET erected a new genus *Tamarixia* by describing *Tamarixia bicolor* Mercet as the type species.

WATERSTON (1925) published on some eulophid parasites of the oil palm. FERRIERE (1928) transferred *Hadrothrix purpureus* Cameron to *Tetrastichus* Haliday. In the same year, GIRAULT erected a new genus *Goethella* based on the type species *Goethella asulcata* Girault. In 1930, FERRIERE erected a new genus *Trichospilus* based on the type species *Trichospilus pupivora* Ferriere and described a new species *Tetrastichus ovulorum* in his 'Notes on Asiatic Chalcidoidea'. The following year, FERRIERE in his paper on chalcidoid egg-parasites from South Asia, described two new species *Tetrastichus gardneri* from Dehra Dun and *Tetrastichus schoenobii* from Malasia, Thailand and Srilanka. GIRAULT (1935) erected a new genus *Tetrastichomphale* based on *Tetrastichomphale multivena* Girault.

MANI (1935) described a new species, *Euplectrus himalayensis* from Darjeeling. Two years later, RAMAKRISHNAN AYYAR and MANI (1937) described *Euderus pempheriphila* from South India. LAL (1938) recorded the genus *Azotus* for the first time in India. In 1938, MANI published a catalogue of Indian Chalcidoidea in which he included the family Eulophidae. In the following year, MANI erected a new genus *Neparaprostocetus* based on the type species *Neparaprostocetus asphondyliae* Mani from Tanjore. FERRIERE (1939) described new species *Entedon pempheridis* from South India and *Euplectromorpha viridiceps* from Java, Indonesia and Dehra Dun.

In 1941, MANI described a new species *Aprostocetus krishnieri* from Tamilnadu.

CHERIYAN and MARGABANDU (1942) described a new species, *Trichospilus diatraea* from Coimbatore. In 1947, RANAWEERA published on three new species of *Tetrastichus* from Srilanka i.e., *Tetrastichus versicolor*, *Tetrastichus taprobanensis* and *Tetrastichus niger*. BHATNAGAR (1950) described *Euderus carpomyiae* parasitic in ber fruitfly from Agra. PECK (1951) published a catalogue for North American Tetrastichinae. The same year BHATNAGAR described *Tetrastichus lasiopterae* from Thiruvananthapuram. In the following year (1952), KURIAN described *Tetrastichus plecopterae* from Uttar Pradesh, *Aprostocetus punjabensis* from Punjab, *Aprostocetus coorgensis* from South Coorg (Karnataka) and *Aprostocetus nowsherensis* from Pakistan. NIKOLSKAYA in the same year published on the chalcid fauna of USSR which had a key to genera of Eulophidae of the country.

In 1953, KURIAN described two new species, *Tetrastichus sexmaculatus* and *Chrysonotomyia appannai* from Banglore. MANI and KURIAN (1953) described two new species of *Aprostocetus* Westwood i.e., *Aprostocetus israeli* and *Aprostocetus asphondyliae* from Orissa and Karnataka respectively. KURIAN (1954) described *Aprostocetus epilachnae* and *Syntomosphyrum israeli* from India. OPINION 228(1954) rejected

Eulophus Geoffroy as unavailable name. DELUCCHI in the same year published on the chalcidoids of the family Eulophidae.

SUBBA RAO (1957) reported some new eulophids from India. MAHDIHASAN (1957) published on some parasitic Hymenoptera associated with lac. In 1958, BURKS supplemented Peck's catalogue for North American Tetrastichinae. GRADWELL (1959) re-erected the genus *Aceratoneuromyia* Girault. BOUCEK (1959) made a thorough study of Central European Eulophidae. The very same year GRAHAM published a key to genera and species of Elachertinae, Eulophinae, Entedontinae and Euderinae of Britain. NARAYANAN (1960) described *Tetrastichus phyllocnistoides* and NARAYANAN, SUBBA RAO and RAMACHANDRA RAO in the same year added three more species to Indian Eulophidae – *Tetrastichus rhipiphorothripscidis*, *Closterocerus agromyzae* and *Goetheana thripsivora*. NIKOLSKAYA in the same year published on the Chalcidoid fauna of USSR which included Eulophidae.

GRAHAM (1961) gave an account on *Aprostocetus* Westwood with notes on synonymy of European species. In 1963, he added and corrected the British Eulophid list. PECK (1963) published a catalogue on Nearctic Chalcidoidea which had an extensive list of biological references. PECK, BOUCEK & HOFFER (1964) prepared keys to the Chalcidoidea of Czechoslovakia. BOUCEK (1965) studied European Eulophidae and

published synonymic notes on Chalcidoidea with correction of his own mistake and review of Chalcidoidea of Moldivian S.S.R. OPINION 720 (1965) of ICZN suppressed *Tetrastichus* Walker, 1842. In 1966, DOMENICHINI published an Index of Palearctic Tetrastichinae in which he had transferred *Lygellus epilachnae* Giard to *Tetrastichus* Haliday. BALTAZAR in the same year published a catalogue of Phillippine Hymenoptera.

DE SANTIS in 1967 published a catalogue on parasitic Hymenoptera of Argentina. In 1968, ASKEW published on Elasmidae and Eulophidae. The same year BOUCEK and ASKEW published an 'Index of Palearctic Eulophidae excluding Tetrastichinae'. BOUCEK (1970) contributed to the knowledge of Indian Chalcidoidea. YOSHIMOTO in the same year described a new species, *Tetrastichus inferens* from Taiwan, parasiting pupae of *Sesamia inferens* (Walker). In 1970, REIK included Elachertinae under Eulophinae. Formerly Elachertinae was treated as a separate subfamily of Eulophidae. GRAHAM (1971) made a revision of British *Entedon* Dalman and added four new species. MANI in 1971 gave an account on some chalcidoid parasites of the leaf mining Agromyzidae from India.

In 1972, BOUCEK described some new eulophids from Africa and Canary islands. In 1974, KAUL and SARASWAT published on collection of chalcids including eulophids from India. DE SANTIS in the same year,

reported a new Euderinae from Argentina. SARASWAT and MUKERJEE in 1975 recorded some known and described some new chalcid species from India. This included 13 new species of Eulophidae – *Tetrastichus shencottensis*, *Tetrastichus nilamburensis*, *Tetrastichus ootyensis*, *Tetrastichus polyseta*, *Tetrastichus malabarensis*, *Tetrastichus bicolor*, *Tetrastichus travancorensis*, *Tetrastichus tritrichia*, *Tetrastichus kodaikanalensis*, *Tetrastichus kumaonesis*, *Tetrastichus quadriseta*, *Tetrastichus uniarticulata* and *Tetrastichus postmarginaloides*. The same year SARASWAT published a new species *Tetrastichus krishnaiahi* from Andhra Pradesh.

GRAHAM (1975) came to Reik's conclusion regarding the identity of Elachertinae. BOUCEK (1977) erected a new genus *Tachinobia* based on the type species *Tachinobia repanda* Boucek along with three new species of Tetrastichinae. In the same year, he also reviewed the Yugoslavian Chalcidoidea and described two new species of Neotropical Eulophidae. KOSTJUKOV in 1978 published on subfamily Tetrastichinae including Keys to Insects of European part of the USSR. BOUCEK and GRAHAM (1978) published a check-list of Chalcidoidea of Britain. They also came to Reik's conclusion regarding the identity of Elachertinae. BURKS (1979) published a catalogue on Eulophidae of America north of Mexico. DE SANTIS in the same year published a catalogue on Chalcidoidea of Neotropical region

except Argentina and Brazil. In 1980, DE SANTIS published a catalogue of parasitic Hymenoptera of Brazil including eulophids.

KHAN & SHAFEE (1979) described two new species of *Syntomosphyrum* i.e., *Syntomosphyrum udaipurensis* and *Syntomosphyrum anomalococci* along with *Euplectrus gopimohani* Mani and *Scotolinx quadristriata* Subba Rao and Ramamani in their paper titled 'Taxonomic studies on some Indian Eulophid Parasites'. KAMIJO (1980) reported eulophids from Korea with description of two new species. He found 54 species, of which 40 species were new to Korea.

KHAN and SHAFEE (1981) described ten new species of Eulophidae in three papers i.e., *Tetrastichus indicus*, *Tetrastichus aligarhensis*, *Tetrastichus ajmerensis*, *Tetrastichus annulicornis*, *Tetrastichus psyllidis*, *Tetrastichus flavidus*, *Syntomosphyrum mashhoodi*, *Syntomosphyrum cerococci*, *Chrysonotomyia kerrichi* and *Chrysonotomyia latipennis*. KHAN and SHAFEE in the same year described a new species *Pediobius longicarpus* from Aligarh. In the same year KHAN reported a new species, *Tetrastichus atomelli* from Garhwal Hills (Uttar Pradesh) of India and another new species *Tetrastichus pantnagarensis* from cocoons of *Apantheles* sp. (Hymenoptera: Braconidae). In the same year GRAHAM reported two new species, *Tetrastichus asperulus* and *Tetrastichus viatorum* from Madeira, Portugal.

SHAFEE, FATMA and KISHORE (1982) described two new species, *Tetrastichus agarwali* and *Tetrastichus delhiensis* from Delhi. KAMIJO in 1983 published five new species of *Pediobius* Walker from Japan. In the year 1984, SHAFEE and RIZVI erected a new genus *Terebratella* based on the type species *Terebratella indica* Shafee from India. BOUCEK in the same year erected a new genus with exodont mandibles, *Exodontomphale* based on *Exodontomphale taborskyi*.

NARENDRAN (1984) published an account on chalcids and sawflies associated with plant galls in which systematics and ecology of eleven chalcidoid families including Eulophidae was given. HAYAT in 1985 gave a review and key to genera of the family Eulophidae. In the following year, HUSAIN and KHAN contributed a catalogue on the Chalcidoidea of India and adjacent countries. The same year KHAN, SAMRAJ and KHAN published a new species *Tetrastichus davidi* from India. BOUCEK in the same year published on the taxonomy of chalcidoid wasps associated with gallmidges (Diptera: Cecidomyiidae) on mango trees. In this paper, he described new eulophids *Aprostocetus sankarani*, *Chrysonotomyia obesula* and *Mangocharis longiscapus* gen. et. sp. n. . KAMIJO in the same year provided a key to species of *Pediobius* Walker of Japan.

LASALLE (1986) made a note on Tetrastichinae types in the Zoological Institute, Leningrad including designation of lectotypes to some

of the species. GRAHAM (1987) reclassified European Tetrastichinae and revised certain genera. In this work he erected nine new genera including *Anaprostocetus* based on the type species *Anaprostocetus dehraensis* from India and *Thripastichus* based on the type species *Tetrastichus gentilei* Del Guericco. HANSSON (1987) revised New World species of *Chrysocharis* Foerster. KAMIJO in the same year made notes on Japanese species of *Cirrospilus* with descriptions of two new species.

BOUCEK (1988) published his monumental work on Australasian Chalcidoidea (Hymenoptera). In this he subjected the genera of fourteen families to a biosystematic revision and reclassified the species. In fact, this work forms the sole basis for the genus level identification of the present investigation. In this, he identified *Tetrastichus coccinellae* Kurdjumov as synonymn of *Oomyzus scaposus* Thomson, *Aprostocetus israeli* Mani and *Tetrastichus inferens* Yoshimoto as synonymns of *Tetrastichus howardi* (Olliff), *Terebratella indica* Shafee as synonymn of *Aprostocetus percaudatus* (Silvestri), *Tetrastichus radiatus* Waterston and *Tetrastichus dryi* Waterston were transferred to *Tamarixia* Mercet and *Tetrastichus rhipiphorothripscidis* Narayanan was transferred to *Thripastichus* Graham. He also transferred *Tetrastichus ovulorum* to *Oomyzus* Rondani.

HANSSON (1990) made a taxonomic study on the Palearctic species of *Chrysonotomyia* Ashmead and *Neochrysocharis* Kurdjumov with descriptions

of two new species from Greece. LASALLE in the same year erected a new genus and species of Tetrastichinae, *Phymastichus* based on the type species *Phymastichus coffea*, parasitic on the coffee berry borer, *Hypothenemus hampei* (Ferrarl) [Coleoptera: Scolytidae]. He then reviewed Tetrastichinae associated with spider egg-sacs leading to the erection of a new genus *Aranobroter* based on the type species *Aranobroter rayorae* Graham from North America. LASALLE and GRAHAM in the same year found *Eutetrastichus* Kostjukov, *Thriposoma* Crawford and *Tetrastichopsis* Girault as junior synonyms of *Baryscapus* Foerster.

GRAHAM (1991) reclassified European Tetrastichinae revising the remaining genera. He identified two hundred and forty nominal species, one hundred and seventy seven valid and sixty four new species. He could also find twenty new synonymies. GRAHAM and LASALLE in the same year published on new synonymy in European Tetrastichinae including designation of some neotypes, lectotypes and new combinations. The same year SCHAUFF revised the Holarctic genera of Entedoninae. He recognized twenty seven valid genera, removed five genera to other subfamily of Eulophidae or families of Chalcidoidea and established seven new generic synonymies.

ASKEW (1991) reviewed the species of *Entedon* Dalman having a complete frontal fork. KAMIJO (1992) published two new species of

Cirrospilus Westwood, *Cirrospilus tischeriae* and *Cirrospilus kumatai* from Japan. ASKEW (1992) added the British list of *Entedon* Dalman with descriptions of three new species. KHAN in the same year recorded a new species *Stenomesus modicellus* from India. In the same year, KHAN and SUSHIL published on the parasitic wasps of *Tetrastichus* Haliday from Northern India with descriptions of five new species - *Tetrastichus mohani*, *Tetrastichus mangifera*, *Tetrastichus obliqua*, *Tetrastichus partellus* and *Tetrastichus chakrataensis* and redescriptions of three species. In this, he also gave a key to some twenty nine Indian species of *Tetrastichus* Haliday.

VIGGIANI and LASALLE in 1992 found *Elasmus steffani* Viggiani as a junior synonym of *Elasmus masii* Steffan and designed a lectotype for *Elasmus masii* Steffan. NARENDRAN and SHEELA (1993) published on a new genus *Neopediobopsis* from the leaf galls of *Ficus* in India. DOGANLAR in 1993 reported a new genus and a new species of Tetrastichinae from Ghana i.e., *Turktichus* based on the type species *Turktichus ghananensis*. KHAN in the same year erected a new genus *Mohaniella* from India describing *Mohaniella indica* as the type species.

DELVARE and LASALLE (1993) published a new genus of Tetrastichinae from the Neotropics – *Palmistichus* based on the type species *Palmistichus elaeisis* Delvare. It was found to be an important natural enemy of lepidopterous and coleopterous hosts on oil palm plantations. IKEDA and

KAMIJO (1993) described a new species of *Hispinocharis* i.e., *Hispinocharis nigrescens* from Japan.

LASALLE and BOLER (1994) added a new genus to subfamily Tetrastichinae. They erected a new genus *Hadranellus* describing *Hadranellus anomalus* LaSalle as the type species. LASALLE in the same year made a revision of the North American genera of Tetrastichinae. In this he recognized forty two valid genera, the largest being *Aprostocetus* with four subgenera. In this classic work, he also erected 13 new genera and made five new generic synonymies. The same year HANSSON synonymised *Chrysonotomyia* Ashmead as *Closterocerus* Westwood.

LASALLE and HUANG (1994) described two new economically important species of Eulophidae from China--*Aprostocetus prolixus* and *Hyssopus grossoris*. WIJESSEKARA and SCHAUFF in 1994 revised the tribe Euplectrini of Srilanka. LASALLE and SCHAUFF in the same year reviewed the eulophid parasitoids of white flies with systematic placement and a generic key. All the above eulophid parasitoids belong to the tribe Euderomphalini of the subfamily Entedoninae. LASALLE in late 1994 synonymised *Turktichus* Doganlar with *Aprostocetus* Westwood. KAMIJO (1994) made a revision of *Mestocharella* Girault with descriptions of six new species from east and south-east Asia. The same year KAMIJO described a new species *Pnigalio okutanli* from Japan. BAUR in the same year described

a new species, *Aprostocetus sensuna* from Central Europe. COOTE (1994) reviewed Nearctic genera of Euderinae.

GRAHAM (1995) reviewed European *Elasmus* Westwood and described its five new species with a key to species. LASALLE in the same year reported a new species *Phymastichus sxylebori* from Hawaii. IKEDA (1995) made a revision of the Japanese species of *Chrysocharis* Foerster. HEADRICK, LASALLE and REDAK in the same year erected a new genus of Australian Tetrastichinae, *Oncastichus* based on the type species *Oncastichus goughi* Headrick and LaSalle. In the same year SHENG, JINKUN, ZHAO and FENGXIA described a new species of *Aprostocetus* Westwood from China. IKEDA along with KAMIJO and HUBER in the same year published a new genus and species of Tetrastichinae from Japan – *Stipecarinata* based on *Stipecarinata striata* Ikeda.

BOUCEK and LASALLE (1996) transferred the genus *Awara* Boucek from the subfamily Eulophinae to the subfamily Tetrastichinae. HANSSON and LASALLE (1996) described two new eulophid parasitoids, *Cirrospilus ambiguus* and *Quadrastichus liriomyzae* from Taiwan. The former is also known from India. SUREKHA, UBAIDILLAH and LASALLE (1996) erected a new genus *Oxycantha* from Brunei based on the type species *Oxycantha darwini* Surekha and Ubaidillah. KAMIJO erected a new genus

and species of Eulophinae from spider egg-sac in the year 1996. KAMIJO and IKEDA in the same year revised *Citrostichus* Narayanan.

IKEDA (1997) erected a new genus of Tetrastichinae *Pasohstichus* describing *Pasohstichus konishii* as the type species. SINGH and KHAN (1998) described a new species of *Closterocerus* Westwood associated with Sisam leaf-miner. KHAN in the same year found four new species of *Pediobius* Walker from Northern India. SUSHIL and KHAN (1999) described a new species of *Obesulus* Boucek from Northern India. ZHU and LASALLE (1999) made a study on Chinese species of *Aulogymnus* Foerster. GAUTHIER, LASALLE, QUICKE and GODFRAY (1999) studied the phylogeny of Eulophidae with a reclassification of Eulophinae and recognition of Elasmidae as derived eulophids.

ZHU, LASALLE and HUANG (2000) revised the Chinese *Hemiptarsenus* Westwood and reviewed Chinese *Diglyphus* Walker. DELVARE and LASALLE (2000) erected a new Neotropical genus *Trisecodes* of subfamily Entedoninae, the first eulophid with three-segmented tarsi. NOYES (2001) provided a catalogue of World Chalcidoidea in which he had included eulophids. UBAIDILLAH and YEFREMOVA (2001) described a new species of *Diglyphus* Walker from Kazakisthan. UBAIDILLAH with LASALLE and QUICKE in the same year erected a new genus of Entedoninae from South east Asia *Ambocybe* based on

the type species *Ambocybe petiolata* Ubaidillah and LaSalle. In the year 2002, BOUCEK described a new species, *Elachertus anthophilae* from Great Britain. NARENDRAN and FOUSI in the same year erected a new genus *Neomestocharella* based on the type species *Neomestocharella keralensis* Narendran and Fousi. Recently NARENDRAN *et al.* (2003) raised a new genus of Tetrastichinae ie., *Lasalleola* Narendran from Karnataka.

Chapter II

MATERIALS AND METHODS

The materials for the study, the adult eulophids are abundant in green pastures, grasslands and cool, shady places. They were collected mainly with sweep nets and sucked in with aspirator. The specimens were then killed with ethyl acetate and preserved in 70% alcohol. For detailed identification, they were card mounted and studied.

A. COLLECTION

1. Materials required for collection

a. Sweep net (Fig. 2)

A sweep net has a long handle attached to a triangular frame carrying a net bag. Dr. Z. Boucek, in the late nineteen forties has designed a sweep net with a triangular head which increases the surface area of the net in contact with the ground. The frame is made of aluminium strip of size 445 mm x 18 mm x 3 mm on each side. Handle of the net is 1067 mm long to allow sweeping away from the body. It is made of two aluminium tubes – one of 13 mm internal diameter and the other of 15 mm internal diameter. This helps sliding of one into the other when not in use. The net bag is 584 mm long with a rounded bottom, made of durable material which allows air to pass through but not smaller specimens. The top of the bag which fits around

the frame is made of tough material like canvas. The bag is then attached to the aluminium head by strong wire tied alternately through the bag and holes drilled on the frame.

b. Aspirator/Pooter (Fig. 3)

It is a suction apparatus for collecting small insects. It consists of a glass or plastic vial fitted with a two-holed cork carrying two plastic tubes. One tube is for sucking in and the other is for drawing insect in the vial. The opposite end of the sucking tube is tied with a fine muslin cloth to prevent the entry of the insect into this tube.

c. Yellow pan or Moericke trap (Plate II)

The trap consists of a tray of 300 mm square and about 60-75 mm depth, painted bright yellow on the inside and some neutral colour like black on the outside. The trap is based on the principle that many insects are attracted to yellow colour.

d. Malaise trap (Plate II)

This was originally designed by Dr. R. Malaise and later modified by Townes in 1972. It is for collecting large number of flying and occasionally flightless insects. It makes use of geotactic and positively phototactic behaviour of insects. Basically, the trap resembles a tent made of fine-mesh terelene gauze with a specially adapted collecting bottle of 550 ml capacity at

the top. The trap is about 183 cm wide, 106.7 cm high at one end and 198 cm high at the other end.

e. Beating tray

A tray with frame measuring 70-100 cm square approximately is the beating tray. A white canvas stretched over a 1 m square frame or even an inverted umbrella can be used as a beating tray.

f. Pitfall trap

It consists of a jar sunk in the ground and partly filled with saturated picric acid solution. This trap is suitable for collection in wind blown areas and exposed mountain tops.

g. Rearing cages

Simple emergence cage or glass vial or container can be used for rearing of egg, pupae, galls, scales etc.

2. Collection techniques

Techniques of collection include a) sweeping b) beating c) setting traps and d) rearing.

Sweeping was found to be the most efficient method of collection of eulophids, as a good number of them could be collected within a short time. Sweep net especially the triangular type was used for sweeping. Small

insects were then sucked in into an aspirator and killed by placing a piece of cotton soaked in ethyl acetate at the mouth of the entry tube. The dead specimens were transferred to 70% alcohol with a fine brush.

Beating was done by holding the beating tray beneath a tree branch or bush and hitting the branch or bush with a stick. The dislodged insects fallen in the tray were collected by using aspirator or other suitable techniques.

The set yellow pan trap was emptied once in a day using fine-mesh net to filter the specimens. The yellow pan traps will not be of much use if kept in a place where lots of plants are with yellow flowers.

Malaise trap collects thousands of insects on a sunny day without attention. The insects when flying into the sides of trap by chance crawls upwards to the roof (negatively geotactic behaviour) where they enter the collecting bottle containing 70-90% alcohol situated in a direction of sunlight (positively phototactic behaviour). The insects thus collected in the bottle were emptied once in a week.

The specimens collected in the pitfall trap were taken, washed thoroughly in clean water and transferred to 70% alcohol.

Rearing of eggs, scales, pupae, galls, mines etc. were relatively easier when compared to rearing of larvae. In the case of host larvae, they have to be fed long for the emergence of parasites.

B. PRESERVATION

Unmounted material

The unmounted materials were stored in 70% alcohol in small bottles and kept in a refrigerator or in an air-conditioned room. The preservative was periodically changed and replenished to prevent deterioration. Any way, it is not wise to preserve for more than five years in alcohol.

C. RELAXING THE MATERIAL

In order to prevent breakage of rigid and brittle specimens, they are subjected to relaxation. For this, the specimens were placed in relaxing chamber containing a few drops of glacial acetic acid in a layer of cotton wool which is again covered over by a second layer of cotton wool without glacial acetic acid. Specimens to be relaxed were usually kept on a piece of tissue paper in a glass dish and placed over the cotton wool. The relaxing chamber, any suitable glass or plastic box, was tightly closed and kept for 5 to 10 hours.

D. MOUNTING & STORING

a. Card mounting

For mounting, specimens are to be soft to prevent damage of antennae, legs, and wings. So freshly killed or relaxed specimens were mounted on

cards. The procedure adopted by Boucek and Noyes (Noyes, 1982) was followed.

The specimen to be card mounted was first placed on the microscope stage with a drop of alcohol, next to a card rectangle. The antennae, legs and wings were then correctly positioned using a fine brush. A very small drop of water-soluble glue (about 1/2 to 2/3 the volume of mesosoma of the specimen) was then, put on the card. Then moisten the tip of the brush with a minute quantity of saliva and touch it against the mesopleuron of the specimen. The picked specimen was then placed on the glue in such a way that the mesopleuron of the specimen sticks on the glue. The specimen was then pressed gently with the brush for better adhesion. The wings on the card is then positioned properly and the tip is stuck on it with a brush containing little saliva.

Properly dried card-mounted specimens were held on entomological pins (Asta Insect Pins No:4, 38mm x 0.75mm made by Newey Goodman and Co., England), labelled and kept in insect boxes for detailed systematic study. Naphthalene balls were placed in the four corners of the boxes in order to keep off injurious insects. Thymol crystals were used as fungicide. Occasionally the boxes were subjected to warming using table lamps to check fungal growth.

b. Slide mounting

For detailed studies, slides were prepared of antennae and wings. Heavily sclerotised parts were subjected to clearing in 10% KOH solution for 1 or 2 days before mounting. When sufficiently cleared, they were washed with glacial acetic acid followed by distilled water and dehydrated through graded series of alcohols. The cleared parts of specimens were then mounted in DPX.

E. LABELLING AND REGISTERING

Field labels were written at the time of collection and permanent labels were given to card mounted specimens indicating the name of the country, state, name of the collector and date of collection. The identified specimens were given determination labels indicating the species, determiner, month and year of determination. Registering of specimens were made after the generic level identification. The entries in the register has serial number, collection number, scientific name, name of locality, date of collection, name of collector and remarks.

F. IDENTIFICATION

Identification of the specimen was done by running through the available key and confirmed by comparing with original descriptions and

illustrations. Those specimens which were not found fitting in the key and not agreeing with descriptions and illustrations were described as new taxa.

Sorting and mounting was done by using Stereozoom Binocular Olympus microscope. Card mounted specimens were identified, described and drawn using camera lucida attached WILD M3Z Stereozoom Binocular (Switzerland) microscope. The drawings so obtained were enlarged using KB enlarger, B2M model. The scale of magnification is shown near each figure.

SYSTEMATIC STATUS AND DIAGNOSIS OF THE FAMILY EULOPHIDAE

The name of the family was first proposed by Westwood (1828) as subfamily 'Eulophina'. This is based on the oldest generic name of Chalcidoidea *Eulophus* Mueller 1764. It is one of the largest families coming under the superfamily Chalcidoidea. In the world, there are about 4260 nominal species and 550 nominal genera coming under Eulophidae.

Nikolskaya (1952) split Eulophidae into four families – Elachertidae, Eulophidae, Entedonidae and Tetrastichidae. Boucek (1988) recognised four subfamilies in Eulophidae – Eulophinae, Euderinae, Tetrastichinae and Entedontinae. Recently, Gauthier, LaSalle, Quicke and Godfray (2000) identified Elasmidae as subfamily Elasmidae of Eulophidae.

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

Order	-	Hymenoptera
Suborder	-	Apocrita (Parasitica)
Superfamily	-	Chalcidoidea
Family	-	Eulophidae

Diagnostic characters: Body mostly less than 3mm long, with or without metallic reflections; antenna with two to four funicle segments; mesosoma with well developed prepectus; mesoscutum with notauli

complete, incomplete or absent; scutellum sometimes with a pair of submedian longitudinal grooves; each leg with four-segmented tarsi.

KEY TO THE SUBFAMILIES OF EULOPHIDAE

1. Metacoxa greatly enlarged, compressed and disc like; metatibia with conspicuous, short black bristles in undulatory rows or diamond pattern ELASMINAE
- Metacoxa normal sized, not compressed; metatibia without short black bristles in undulatory rows or diamond pattern 2
2. Mesoscutal notauli absent or incomplete in posterior half or hardly distinct 3
- Mesoscutal notauli complete, rarely with shallow interruption before middle 4
3. Scutellum with a pair of setae; smv with only two dorsal setae, rarely one, not smoothly joining parastigma; pmv usually shorter than st
..... ENTEDONINAE (part)
- Scutellum with at least 2 pairs of setae; smv with at least four dorsal setae, mostly continuous with parastigma; pmv often longer than st
..... EULOPHINAE (part)
4. Axillae strongly angulately advanced along hind portion of the straight, groove-like notauli or, if axillae only moderately advanced, then anterior pair of four setae on scutellum near to middle or behind

- middle of sclerite; scutellum mostly with almost parallel submedian grooves; smv not smoothly joining parastigma; pmv rudimentary
..... TETRASTICHINAE (part)
- Axillae not angulately advanced or if approaching that condition, then anterior setae of scutellum situated in anterior third; smv often continuous with parastigma; pmv distinct 5
 - 5. smv with two dorsal setae; scutellum with a pair of setae; frons usually with linear grooves of modified X-shape
..... ENTEDONINAE (part)
 - smv usually with more than two dorsal setae; if one or two, then scutellum with two pairs of setae; frons different 6
 - 6. smv smoothly joining parastigma; notauli if straight posteriorly, then axillae not or only moderately advanced or notauli curving to meet the advanced axillae; pmv usually longer than st; scutellum often with sublateral grooves joining axillar grooves anteriorly; seventh and eighth tergites not dorsally separated EULOPHINAE (part)
 - smv not smoothly joining parastigma; or if condition as in alternate then notauli posteriorly straight and deep but scutellum without sublateral grooves; seventh and eighth tergites dorsally separated 7
 - 7. Scutellum with two or four longitudinal grooves; sublateral grooves mostly delimited by an outside carina visible in dorsal view, even

when submedian grooves are absent; pmv usually rudimentary

..... TETRASTICHINAE (part)

- Scutellum without longitudinal grooves, axillae on sides separated by a depression, not visible dorsally, pmv distinct, often short

..... EUDERINAE

MORPHOLOGY AND MEASUREMENTS

(Figs. 4-9)

- Anellus (an) - Strongly shortened proximal flagellar segments seen between pedicel and first funicle segment.
- Antenna (at) - A paired, segmented sensory appendage of the head between the compound eyes.
- Antennal toruli (ai) - A paired socket on the front part of the head upon which scape is articulated.
- Axilla (ax) - Posterolateral portion of mesoscutum separated from mesoscutum and lateral to scutellum.
- Carina - A ridge or raised line.
- Cercal seta (cs) - Seta present on paired, posterior sensory appendage of the posterior gastral tergite.
- Club (cl) - The enlarged apical flagellomere of an antenna.
- Clypeus (cy) - The middle sclerite of the head immediately above the labrum.
- Costal cell (co) - The area above the submarginal vein.
- Coxa - The first segment of a leg, between the body and the trochanter.

Epipygium	- The tergite formed by the fusion of the seventh and eighth gastral tergites.
Femur	- The third segment of a leg, between the trochanter and tibia.
Flagellum (fl)	- The part of antenna after the pedicel.
Foramen magnum	- The hole through which the head is connected with mesosoma.
Forecoxa (fc)	- Coxa of the first pair of leg.
Fovea	- A deep depression.
Funicle (fn)	- The part of flagellum excluding the club and anelli.
Gaster (gs)	- The posterior division of the body, posterior to the leg-bearing segments.
Gena (gn)	- The anterior part of the back of the head between the compound eye and the occiput .
Hindcoxa (hc)	- Coxa of the third pair of leg.
Hypopygium (hp)	- The last visible sternum of the gaster.
Lateral ocellus (lc)	- One of a pair of round or oval facet on vertex.
Lower face (lf)	- The front part of the head below the antennae.

- Lower ocular line (ll) - An imaginary line joining the bases of eyes.
- Malar sulcus (ms) - A groove or line extending from base of eye to mouth-corner.
- Mandible (mn) - The paired, heavily sclerotized biting and chewing lateral appendage of the mouth parts.
- Marginal vein (mv) - The vein along anterior margin of forewing extending from distal end of costal cell to the branching point of stigmal vein.
- Median ocellus (mo) - The anterior median round or oval facet on vertex.
- Mesoscutum (mm) - The part of mesosoma between the pronotum and scutellum, often divided by notauli into a median lobe and two lateral lobes.
- Mesosoma (ma) - The middle part of the body between head and gaster.
- Midcoxa (mc) - Coxa of the second pair of leg.
- Notauli (no) - The usually oblique, paired longitudinal grooves on mesoscutum, dividing it into a median lobe and two lateral lobes.
- Occiput - The posterior part of the head behind the vertex dorsally.

- Ocell-ocular distance (OOL) - Distance from the eye to the lateral ocellus of that side.
- Ovipositor (ov) - A slender, paired and interlocking tubular structure in females, used for laying the eggs.
- Parascrobal area (pa) - Part of the frons between the scrobal margin and inner orbit.
- Paraspiracular carina (pc) - A lateral carina on propodeum which sends off a branch towards hind corner of propodeum.
- Parastigma (ps) - A stub to which the submarginal vein joins at the distal end.
- Pedicel (pd) - The second segment of the antenna, articulating apically with the flagellum.
- Petiole - A stalk joining gaster to the propodeum.
- Post-ocellar distance (POL) - Distance between the two lateral ocelli.
- Postmarginal vein (pmv) - The vein along the anterior margin of forewing from the branch point of the stigmal vein.
- Prepectus (pt) - The triangular sclerite lateral to pronotum.

- Pronotum (pr) - The anteriormost dorsolateral sclerite of the mesosoma.
- Propodeum (pp) - The posteriormost dorsal sclerite of the mesosoma.
- Scape (sc) - The first antennal segment which is joined to the front part of head.
- Scapula (sa) - The lateral lobe of mesoscutum separated from the median lobe by notauli.
- Scrobe - Depression on the upper face for reception of the scape.
- Scutellum (sm) - The middle sclerite of mesosoma between the mesoscutum and propodeum, usually with paired grooves in Tetrastichinae.
- Seta (se) - A slender, hair-like sensory extension of the cuticle, arising from pits on body wall.
- Stigmal vein (st) - The short vein arising from the distal end of the marginal vein and reaching the knobbed apex, stigma.
- Sublateral groove (sl) - A groove near the lateral side of a sclerite. It is seen on scutellum in this group.

- Submarginal vein (smv) - The vein arising from the anterior proximal end of forewing, below the costal cell and extending to the parastigma. Measure of costal cell is taken as the measure of smv.
- Submedian groove (sg) - A groove near the middle of a sclerite. It is present on scutellum in this group.
- Tarsus - The fifth segment of a leg, attached basally to the tibia and subdivided into tarsomeres.
- Tegula (tg) - A small, scale like sclerite covering the base of forewing.
- Tibia - The fourth segment of a leg between the femur and the tarsus.
- Vertex (vx) - The top of head between the eyes, from anterior margin of median ocellus to the occiput.

GENERAL ABBREVIATIONS

F ₁	-	first funicle segment
F ₂	-	second funicle segment
F ₃	-	third funicle segment
F ₄	-	fourth funicle segment
mv	-	marginal vein
OOL	-	ocell-ocular distance
POL	-	post-ocellar distance
pmv	-	postmarginal vein
smv	-	submarginal vein
st	-	stigmatal vein
DZCU	-	Department of Zoology of Calicut University.

Chapter III

Observations and Results

OBSERVATIONS AND RESULTS

The present study is restricted to the subfamily Tetrastichinae as it is not feasible to take up all the subfamilies of Eulophidae. Under this subfamily, 40 species belonging to 7 genera were identified and described with illustrations. Of this, 33 are new to science. Redescriptions were made of already described species. In addition to this, diagnosis of the 9 species not encountered in the study but reported from Kerala were also included.

A dichotomous key to Indian genera of Eulophidae and key to species of the 5 genera studied were prepared. Apart from this, a checklist of the species and genera and host-parasite index were also prepared.

DIAGNOSIS OF THE SUBFAMILY TETRASTICHINAE

The name 'Tetrastichinae' was proposed by Foerster(1856). Since then it was ranked between a tribe (Thomson, 1878) and a family (Nikolskaya, 1952).

Tetrastichines are minute to small, with weakly sclerotised body, especially head and gaster. So in dry specimens, these are very often collapsed making measurements unreliable and characters less visible. In slide mounted specimens, sculptural details become less transparent.

Diagnostic characters: Notauli is deep and straight. Scutellum is usually with a pair each of submedian and sublateral grooves. Submarginal vein is not smoothly continuous with parastigma. Female antenna is with three funicle segments. Male antenna is usually with four funicle segments, very often with a 'plaque' a thickened elongated ridge on ventral side of scape and often with characteristic rows or whorls of setae on flagellum.

Remarks: The present study recognised 19 genera of Tetrastichinae in India. This includes 2 new genera identified in this study.

KEY TO INDIAN GENERA OF *TETRASTICHINAE*

1. Brachypterous or apterous, wing stumps not reaching beyond first gastral tergite *Aprostocetus* Westwood (part)
- Fully winged, forewing at least as long as combined length of head and mesosoma 2
2. Lower face with conspicuous raised striations radiating from lower clypeal margin; antennal toruli well above centre of face
..... *Ceratoneura* Ashmead
- Lower face without conspicuous striations; antennal toruli often different 3
3. Malar sulcus absent 4
- Malar sulcus present 5

4. Midlobe of mesoscutum with more than 20 scattered setae
..... *Melittobia* Westwood
- Midlobe of mesoscutum with few scattered setae
..... *Tachinobia* Boucek
5. Pronotum with a transverse carina 6
- Pronotum without transverse carina 7
6. Funicle four-segmented; club biarticulate; petiole distinct; propodeum
areolate with anteriorly forking median carina
..... *Mestocharella* Girault
- Funicle three-segmented; club triarticulate; petiole absent; propodeum
non-areolate without anteriorly forking median carina
..... *Neomestocharella* Narendran & Fousi
7. Occiput unusually large, granulate; foramen magnum situated very
low, nearer to mouth *Citrostichus* Boucek
- Occiput not unusually large, non-granulate; foramen magnum at the
middle of back of head 8
8. Mesoscutal midlobe with raised longitudinal striae 9
- Mesoscutal midlobe without raised longitudinal striae 10
9. Scutellum with well developed submedian and sublateral grooves;
striae of mesoscutum extending from anterior to posterior mesoscutum
..... *Neoparachrysocharis* gen. nov.

- Scutellum without submedian and sublateral grooves; striae not extending from anterior to posterior mesoscutum
..... *Parachrysocharis* Girault
- 10. Propodeum with paraspiracular carinae 11
- Propodeum without paraspiracular carina (lateral carina may be present) 12
- 11. Hindcoxa with distinct carina running for entire length of the dorsal margin; paraspiracular carina curved posteriorly; area from median carina to paraspiracular carina distinctly reticulate; area from paraspiracular carina to spiracle smooth *Anaprostocetus* Graham
- Hindcoxa without dorsal carina; paraspiracular carina inverted Y-shaped, joining median carinal fork posteriorly; area from median carina to spiracle uniformly reticulate *Tetrastichus* Haliday
- 12. Gaster long with very long epipygium *Neogasterichus* gen. nov.
- Gaster with short epipygium 13
- 13. Scutellum without submedian grooves 14
- Scutellum with submedian grooves 15
- 14. Propodeum with strong median carina; female flagellum with very long semi erect setae *Aceratoneuromyia* Girault
- Propodeum without median carina; female flagellum without long setae *Thripastichus* Graham (part)

15. Midlobe of mesoscutum with dense setae on tubercles; antenna short with mostly transverse funicle segments *Nesolynx* Ashmead
- Midlobe of mesoscutum without setae on tubercles; antenna long 16
16. Propodeum long and horizontal with distinct raised wide-meshed reticulations; mv at least 6 times as long as st. *Neotrichoporoides* Girault
- Propodeum different, without raised reticulations, mv shorter than 6 times st 17
17. Marginal vein strongly widened; scutellum with indistinct submedian grooves *Oomyzus* Rondani (part)
- Marginal vein not unusually widened, scutellum mostly with submedian grooves 18
18. smv with one dorsal seta 19
- smv with more than one dorsal setae 20
19. Flagellum short and stout with at least F₃ transverse; submedian grooves of scutellum weak or absent; clypeal margin bidentate *Oomyzus* Rondani (part)
- Flagellum different; submedian grooves of scutellum well developed; clypeal margin truncate *Tamarixia* Mercet
20. Malar sulcus distinctly curved; mesoscutum with more than a single row of setae *Baryscapus* Foerster

- Malar sulcus straight 21
- 21. Gaster petiolate and distinctly narrowed at base, with a basal pale spot; propodeum without median carina *Thripastichus* Graham (part)
- Gaster petiolate or sessile and not narrowed at base; propodeum usually with median carina 22
- 22. Flagellum short with at least F₃ transverse; submedian grooves of scutellum often weak; smv with two dorsal setae
..... *Oomyzus* Rondani (part)
- Flagellum different; submedian grooves of scutellum strong; smv with two or more dorsal setae *Aprostocetus* Westwood (part)

Note: According to Graham, 1991 and LaSalle, 1994, *Crataepus* Foerster is Holartic with one species. Since no other author except Mani (1986) has mentioned, it is not incorporated in the above key.

Genus *ANAPROSTOCETUS* Graham

Anaprostocetus Graham, 1987: 84. Type species: *Anaprostocetus dehraensis*

Graham by original designation.

Diagnostic features: Body black with bright metallic blue or green reflections; vertex with large fovea near lateral ocelli (Fig. 14); ocelli surrounded by weak line of sclerotisation; pronotum densely setose; mesoscutum moderately long with deep and complete median longitudinal sulcus; a row of setae in deep pits near each notauli (Fig. 12); propodeum with well developed median carina forking both anteriorly and posteriorly (Fig. 13); paraspiracular carinae curved; area from median carina to paraspiracular carina with distinct reticulations (Fig. 17); area from paraspiracular carina to spiracle somewhat recessed and smooth; smv with four to six dorsal setae; hindcoxa with distinct carina running for entire length of dorsal margin (Figs. 10 and 15).

Distribution: INDIA (Kerala, Uttaranjal).

Host: Unknown.

Biology: Unknown.

Discussion: This genus comes near *Aprostocetus* Westwood but can be easily distinguished by the following characters: (i) propodeal median carina forked both anteriorly and posteriorly (In *Aprostocetus*, propodeal

median carina forked only posteriorly); (ii) area from propodeal median carina to paraspiracular carina with distinct reticulation and area from paraspiracular carina to spiracle somewhat smooth (In *Aprostocetus*, submedian area uniformly reticulate); (iii) hindcoxa with distinct carina running for entire length of dorsal margin (In *Aprostocetus*, no dorsal carina on hindcoxa).

Remarks: Only two species are known in this genus – one Holarctic and one from India. The present investigation reports two species, of which one is new to science. A key to species of Indian region is also given.

KEY TO INDIAN SPECIES OF *ANAPROSTOCETUS* Graham

1. smv with six dorsal setae; funicle segments gradually decreasing in length; gaster more than twice length of mesosoma; body over 3 mm (Uttaranjal) *A. dehraensis* Graham
- smv with four dorsal setae; funicle segments different, F₂ longest; gaster less than twice length of mesosoma; body less than 2 mm (Kerala) *A. narendrani* sp. nov.

Anaprostocetus dehraensis Graham

(Figs. 10 – 14)

Anaprostocetus dehraensis Graham, 1987. *Bull. Br.Mus. Nat. Hist. Ent.* 55 (1) : 84.

Female: Length 3.33 mm. Head black with green reflections; eyes and ocelli pale brown; antenna dark brown with pale brown scape and pedicel; mesosoma black with green reflections; legs yellow with dark brown basal coxa and claw; gaster black with green reflections; wings hyaline, veins pale brown; pubescence on body black.

Head: Collapsing, width in dorsal view subequal to mesosoma; occiput large, declivous; vertex punctate with line of weak sclerotisation forming an oval area around ocelli and connecting lateral ocellus to eye; POL 1.85x OOL; eyes pubescent; antennal toruli on lower ocular line; malar sulcus distinct and complete without a subocular fovea; antenna with 9 segments; antennal formula 1.1.1.3.3; scape 4.6x width; pedicel 0.47x scape; single large anellus; funicle segments gradually decreasing in length; F_1 twice pedicel; F_2 0.86x F_1 ; F_3 0.78x F_2 ; club triarticulate, spiculate, 0.88x combined length of last two funicle segments; flagellum densely setose. Relative length : width of antennal segments : scape = 23:5; pedicel = 11:6; F_1 = 22:6; F_2 = 19:6; F_3 = 15:6; club = 30:7.

Mesosoma: Pronotum large, densely setose in addition to a row of setae along posterior border; mesoscutum long, 0.71x width, 1.75x scutellum; median longitudinal sulcus deep and complete; a row of seven to nine setae near each notauli; deeply striato-reticulate; scutellum convex, 0.66x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum 0.21x scutellum, 0.13x width with well developed median carina forking both anteriorly and posteriorly; area from median carina to paraspircular carina densely reticulate; area from paraspircular carina to spiracle somewhat recessed and smooth; spiracle large, almost touching anterior margin; forewing 2.7x maximum width; smv with six dorsal setae; mv 1.36x smv, with seventeen dorsal setae; st 0.17x mv (mv = 5.6x st); pmv rudimentary; hindcoxa with distinct carina on dorsal margin. Relative lengths of forewing veins: smv = 25; mv = 34 ; pmv = 1; st = 6.

Gaster: Collapsible, sessile, narrow, elongate, 0.62x body; epipygium long; second tergite smallest; length of gaster = 2.13x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Palakkad Parambikulam Coll. Narendran and party 22. xii. 1985 (DZCU) FK- 78. Other materials: 1Female of same data as holotype (FK-114).

Distribution: INDIA (Kerala: Palakkad).

Host: Unknown.

Biology: Unknown.

Discussion: This species differs from *Anaprostocetus narendrani* sp. nov. in the following characters: (i) body over 3mm (In *A. narendrani*, body less than 2mm); (ii) smv with six dorsal setae (In *A. narendrani*, smv with four dorsal setae); (iii) F₂ distinctly shorter than F₁ (In *A. narendrani*, F₂ distinctly longer than F₁).

Remarks: This species shows slight variation from *Anaprostocetus dehraensis* Graham in size and ratio of POL : OOL. Size 3.33mm against 3.9mm of *A. dehraensis*. POL 1.85x OOL against 1.4x OOL in *A. dehraensis*.

Anaprostocetus narendrani sp. nov.

(Figs. 15 – 19)

Female: Length 1.94mm. Head black with green reflection; eyes and ocelli brown; antenna dark brown with paler scape and pedicel; mesosoma black with green reflections; legs brownish yellow with coxae concolorous with mesosoma; gaster dark brown with green reflections; wings hyaline, veins pale brown; pubescence on body dark brown.

Head: Non-collapsing, width in dorsal view slightly more than mesosoma; occiput declivous; vertex narrow with weak line of sclerotisation forming an oval area enclosing all three ocelli and connecting lateral ocellus

to eye; POL 1.66x OOL; eyes pubescent; antennal toruli on lower ocular line; malar sulcus distinct and complete without a subocular fovea; antenna with 11 segments; antennal formula 1.1.3.3.3; scape 4.4x width; pedicel 0.36x scape; three anelli; F_1 0.72x pedicel; F_2 1.2x F_1 ; F_3 0.75x F_2 ; club triarticulate, 0.89x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 22:5; pedicel 8:6; F_1 = 13:6; F_2 = 16:7; F_3 = 12:6.5.; club = 25:7.

Mesosoma: Pronotum large, densely setose, with a row of setae along posterior border; mesoscutum 0.58x width; median longitudinal sulcus deep and complete; a row of six setae near each notauli; densely striato-reticulate; scutellum convex with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum 0.25x width with well developed median carina forking both anteriorly and posteriorly and sublateral carinae; paraspiracular carinae curved; area from median carina to paraspiracular carina with distinct reticulation; area from paraspiracular carina to spiracle somewhat recessed and smooth; spiracle small, separated from anterior margin by about its diameter, an oval depression near spiracle; forewing 2.31x maximum width; smv with four dorsal setae; st 0.17x mv (mv = 5.8x st); pmv absent. Relative lengths of forewing veins: smv = 19⁺; mv = 41; pmv = 1; st = 7.

Gaster: Collapsible, sessile, acuminate beyond middle, 0.58x body;
length of gaster = 1.89x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Alappuzha
Kanhikuzhi Coll. Narendran and party. 22.ii.1989 (DZCU) FK -101.

Distribution: INDIA (Kerala: Alappuzha).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Anaprostocetus dehraensis* Graham mainly in the nature of propodeum but differs from it in the following characters: (i) body less than 2 mm (In *A. dehraensis*, body over 3.25 mm); (ii) anelli three in number (In *A. dehraensis*, anelli single); (iii) F_2 longer than F_1 and F_2 individually (In *A. dehraensis*, F_2 shorter than F_1); (iv) smv with four dorsal setae (In *A. dehraensis*, smv with six dorsal setae); (v) length of gaster 1.89x mesosoma (In *A. dehraensis*, gaster 2.13x mesosoma); (vi) mesoscutum with six setae near each notauli (In *A. dehraensis*, mesoscutum with seven to nine setae near each notauli).

Etymology: This species is named after my Supervising teacher.

Genus *APROSTOCETUS* Westwood

Aprostocetus Westwood, 1833 : 444. Type species: *Aprostocetus caudatus*
Westwood by monotypy.

Tetrastichus Walker, 1842 :116 (nec Haliday, 1844) Type species:
Cirrospilus lycidas Walker (Subsequent designation : Peck, 1951:443).
Placed on the Official Index of Rejected and Invalid Generic Names in
Zoology (ICZN, 1965).

Exurus Philippi, 1873:296. Type species: *Exurus colliguayae* Philippi by
monotypy (Synonymised by LaSalle, 1994).

Syntomosphyrum Foerster, 1878:60. Type species: *Syntomosphyrum fulvipes*
Foerster by monotypy.

Tetrastichodes Ashmead, 1887: 203. Type species: *Tetrastichus floridanus*
Ashmead by original designation (Synonymised by Graham, 1961 :
36).

Ootetrastichus Perkins, 1906 : 263. Type species: *Ootetrastichus beatus*
Perkins by monotypy (Synonymised by Graham, 1987).

Neomphaloides Girault, 1913 (145): 103-104. Type species: *Neomphaloides*
cinctiventris Girault (Synonymised by Boucek, 1988).

Selitrichodes Girault, 1913 (145): 104-105. Type species: *Selitrichodes fasciiventris* Girault (Synonymised by Boucek, 1988).

Zagrammosomoides Girault, 1913 (146): 177. Type species: *Zagrammosomoides fasciatus* Girault (Synonymised by Boucek, 1988).

Epomphaloides Girault, 1913 (156): 49. Type species: *Epomphaloides flavus* Girault (Synonymised by Boucek, 1988).

Aprostocerella Girault, 1913 (158): 71. Type species: *Aprostocerella kelloggi* Girault (Synonymised by Boucek, 1988).

Asyntomosphyrum Girault, 1913 (158): 71, also (167): 249-250. Type species: *Asyntomosphyrum pax* Girault (Synonymised by Boucek, 1988).

Ootetrastichella Girault, 1913 (167): 223. Type species: *Ootetrastichella longiventris* Girault (Synonymised by Boucek, 1988).

Selitrichodella Girault, 1913 (167): 225. Type species: *Selitrichodella mira* Girault (Synonymised by Boucek, 1988).

Neotetrastichodes Girault, 1913 (167): 228, 250 (*Neotetrastichoides*) also 1913 (172): 44. Type species: *Neotetrastichodes flavus* Girault (Synonymised by Boucek, 1988).

Epitetrastichus Girault, 1913 (167): 229 (& 205); and also 1913 (172): 45.

Type species: *Tetrastichus speciosissimum* Girault by original designation (Synonymised by Boucek, 1988).

Neomphaloidella Girault, 1913 (167): 234 and 1913 (175): 69. Type species:

Neomphaloidella fasciiventris Girault (Synonymised by Boucek, 1988).

Tetrastichella Girault, 1913 (167): 237 and 1913 (175): 108. Type species:

Tetrastichella fuscipennis Girault (Synonymised by Boucek, 1988).

Epentastichus Girault, 1913 (167): 241. Type species: *Epentastichus*

nugatorius Girault (Synonymised by Boucek, 1988).

Syntomosphyrella Girault, 1913 (167): 244. Type species: *Syntomosphyrella*

fuscipennis Girault (Synonymised by Boucek, 1988).

Selitrichodelia Girault, 1913 (167): 245. Type species: *Selitrichodelia aenea*

Girault (Synonymised by Boucek, 1988).

Trichaporoides Girault, 1913 (171): 104. Type species: *Trichaporoides*

fasciiventris Girault by original designation (Synonymised by Boucek, 1988). Type species transferred to *Ootetrastichus* by Girault, 1913 (167): 217 i.e., before actual publication of description of *Trichaporoides*.

Duotrastichus Dodd. in Girault, 1915 (230): 257. Type species:

Duotrastichus monticola Dodd. (Synonymised by Boucek, 1988).

Proceratoneura Girault, 1915 (230): 262. Type species: *Ootetrastichus*

lustris Girault by original designation (Synonymised by Boucek, 1988).

Paramphaloidomyia Girault, 1917 (309): 1. Type species:

Paramphaloidomyia homeri Girault (Synonymised by LaSalle, 1994)

Prothymus Girault, 1917 (309):1. Type species: *Prothymus novus* Girault

(Synonymised by LaSalle, 1994).

Blattotetrastichus Girault, 1917 (319): 257. Type species: *Entedon*

hagenowii Ratzeburg by original designation.

Omphalomopsis Girault, 1917 (336):88. Type species: *Omphalomopsis*

marilandia Girault (Synonymised by LaSalle, 1994).

Neomphaloidomyia Girault, 1917 (338): 118. Type species: *Hyperteles*

polynemae Ashmead by original designation.

Chrysotetrastichus Kostjukov, 1977: 189 (as subgenus of *Tetrastichus*). Type

species: *Tetrastichus oreophilus* Foerster by original designation.

Terebratella Shafee & Rizvi, 1984: 377-378. Type species: *Terebratella*

indica Shafee & Rizvi by original designation. Type species is found

to be a junior synonym of *Aprostocetus percaudatus* (Silvestri) (Synonymised by Boucek, 1988).

Geniocerus Ratzeburg, 1844 and *Trichoceras* Ratzeburg, 1844 also remain synonyms of *Aprostocetus* Westwood in restricted sense (Boucek, 1988).

Diagnostic features: *Aprostocetus* Westwood is a genus with highly variable features. However, majority of the species have smv with three or more dorsal setae; propodeal spiracle partially covered by a raised flap; propodeum without a posteriorly forking paraspiracular carina, submedian area usually smooth; mesoscutum mostly with a single row of seta near each notauli; gaster very often with a pair of long sinuate cercal setae.

Distribution: Cosmopolitan (INDIA: Uttar Pradesh, Kerala, Rajasthan, Tamilnadu, Karnataka, West Bengal, Andra Pradesh, Orissa, Punjab, Bihar, Madhya Pradesh; Srilanka; Pakistan).

Discussion: This genus can be easily distinguished from *Tetrastichus* Haliday by the following characters: (i) propodeum without inverted Y-shaped paraspiracular carina (In *Tetrastichus*, propodeum with inverted Y-shaped paraspiracular carinae); (ii) submedian areas of propodeum smooth and shiny (In *Tetrastichus*, submedian areas of propodeum densely reticulate); (iii) smv usually with three or more dorsal setae (In *Tetrastichus*, smv with one or two dorsal setae).

Host: Australian species are found to be associated with eucalyptus galls, eggs of crickets of genus *Oecanthus* in grass stems, Diptera, eriophid mites and other insects laying eggs into the plant tissues (Boucek, 1988).

Biology: Most species develop in plant tissues, especially associated with galls made by other insects mainly Cecidomyiidae. Mostly primary parasites attacking eggs or various larval instars of their hosts. In a few cases, they are suspected as gall-causers (Boucek, 1988).

Remarks: *Aprostocetus* is the largest Australasian genus in the whole Chalcidoidea with 228 species (Boucek, 1988). In India also this genus is the largest eulophid genus. Due to the highly variable nature of this genus, LaSalle has recognised four subgenera – *Aprostocetus*, *Ootetrastichus*, *Tetrastichoides*, and *Quercastichus* in North American genus of *Aprostocetus*. The present investigation reports 15 species, of which 14 are new to science. A key to 50 Indian species of the genus is provided.

KEY TO INDIAN SPECIES OF *APROSTOCETUS* Westwood

1.	Males	2
–	Females	6
2.	Anelli three	3
–	Anelli fewer than three	5

3. smv with four dorsal setae
..... *A. kumaonensis* (Saraswat) comb. nov.
- smv with three dorsal setae 4
4. Mesoscutum with four setae near each notauli
..... *A. quadriseta* (Saraswat) comb. nov.
- Mesoscutum with five setae near each notauli
..... *A. kodaikanalensis* (Saraswat) comb. nov.
5. Anelli two *A. nilamburensis* (Saraswat) comb. nov.
- Anelli one *A. uniarticulata* (Saraswat) comb. nov.
6. Propodeum without median carina 7
- Propodeum with median carina 8
7. smv with five dorsal setae *A. atomelli* (Khan) comb. nov.
- smv with less than five dorsal setae
..... *A. lotellae* (Khan) comb. nov.
8. Propodeum very short (Figs. 23, 28, 35, 63) with very short and broad
median carina 9
- Propodeum not very short 13
9. mv equal to or more than 1.5x smv 10
- mv less than 1.5x smv *A. okawus* (Rohwer) comb. nov.
10. smv with five dorsal setae 11
- smv with less than five dorsal setae 12
11. Anellus one *A. citrus* sp. nov.

–	Anelli two	<i>A. calicopteridis</i> sp. nov.	
12.	smv with four dorsal setae	<i>A. sttatus</i> sp. nov.	
–	smv with three dorsal setae	<i>A. disgrigus</i> sp. nov.	
13.	Ovipositor more than 0.5x body	<i>A. percaudatus</i> (Silvestri)	
–	Ovipositor less than 0.5x body		14
14.	Anelli four		15
–	Anelli fewer than four		23
15.	F ₁ distinctly longer than F ₂		16
–	F ₁ shorter than or equal to F ₂		22
16.	F ₂ distinctly longer than F ₃		17
–	F ₂ equal to F ₃		21
17.	Mesoscutum with two setae near each notauli		
	.....	<i>A. wyanadensis</i> sp. nov.	
–	Mesoscutum with more than two setae near each notauli		18
18.	Mesoscutum with three setae near each notauli		
	.....	<i>A. tritrichia</i> (Saraswat) comb. nov.	
–	Mesoscutum with more than three setae near each notauli		
	.....		19
19.	Mesoscutum with four setae near each notauli		
	.....	<i>A. thenhipalensis</i> sp. nov.	
–	Mesoscutum with more than four setae near each notauli		20

20.	Mesoscutum with six setae near each notauli	
	.....	<i>A. unicus</i> sp. nov.
–	Mesoscutum with seventeen setae near each notauli	
	.....	<i>A. dhireni</i> (Saraswat) comb. nov.
21.	smv distinctly shorter than mv	
	.....	<i>A. polyseta</i> (Saraswat) comb. nov.
–	smv longer than mv	<i>A. hagenowii</i> (Ratzeburg)
22.	Mesoscutum without median longitudinal sulcus	
	.....	<i>A. coimbatorensis</i> (Rohwer) comb. nov.
–	Mesoscutum with distinct median longitudinal sulcus	
	.....	<i>A. shencottensis</i> (Saraswat) comb. nov.
23.	Anelli three	24
–	Anelli fewer than three	35
24.	Funicle segments gradually decreasing in length	25
–	Funicle segments not gradually decreasing in length	32
25.	smv with eight dorsal setae	
	.....	<i>A. satpurensis</i> (Saraswat) comb. nov.
–	smv with less than eight dorsal setae	26
26.	smv with seven dorsal setae	27
–	smv with less than seven dorsal setae	28
27.	Mesoscutum with seven setae near each notauli	
	.....	<i>A. agarwali</i> (Khan) comb. nov.

- Mesoscutum with four setae near each notauli
..... *A. delhiensis* (Shafee) comb. nov.
- 28. Propodeum with indistinct median carina
..... *A. asthenogmus* (Waterston) comb. nov.
- Propodeum with distinct median carina 29
- 29. Mesoscutum with eleven to fifteen scattered setae near each notauli
..... *A. malabarensis* (Saraswat) comb. nov.
- Mesoscutum with less than eleven setae near each notauli
..... 30
- 30. Mesoscutum with five setae near each notauli 31
- Mesoscutum with three setae near each notauli
..... *A. travancorensis* (Saraswat) comb. nov.
- 31. smv with a single dorsal seta *A. javedi* sp. nov.
- smv with three dorsal setae *A. metallicus* sp. nov.
- 32. smv with four dorsal setae 33
- smv with less than four dorsal setae 34
- 33. Gaster yellow with five brown transverse bands
..... *A. flavidus* (Khan) comb. nov.
- Gaster without transverse bands (brown with basal one-third yellow)
..... *A. annulicornis* (Khan) comb. nov.
- 34. Mesoscutum yellow with brown semicircular patch anteriorly
..... *A. reshmus* sp. nov.

–	Mesoscutum without a semicircular patch anteriorly (entirely black with bright metallic green reflections)	
	.....	<i>A. thiruvannurensis</i> sp. nov.
35.	Anelli two	36
–	Anellus one	40
36.	smv reaching 0.5 of forewing	
	.....	<i>A. longicauda</i> (Kieffer) comb. nov.
–	smv less than 0.5 of forewing	37
37.	Flagellum gradually thickening; club more than twice width of F ₁	
	.....	<i>A. lasiopterae</i> (Bhatnagar)
–	Flagellum not gradually thickening; club not more than twice width of F ₁	38
38.	smv with five dorsal setae	39
–	smv with three dorsal setae	
	.....	<i>A. ajmerensis</i> (Khan) comb. nov.
39.	Mesoscutum with seven dorsal setae	<i>A. gasteris</i> sp. nov.
–	Mesoscutum with four dorsal setae	<i>A. neyyarensis</i> sp. nov.
40.	F ₂ and F ₃ equal to their width	41
–	F ₂ and F ₃ longer than their width	42
41.	Mesoscutum with three setae near each notauli	
	.....	<i>A. indicus</i> (Khan) comb. nov.

- Mesoscutum with more than seven setae near each notauli
..... *A. aligarhensis* (Khan) comb. nov.
- 42. F₁ shorter than F₂ *A. nowsherensis* Kurian
- F₁ equal to or longer than F₂ 43
- 43. Funicle segments subequal in length 44
- Funicle segments distinctly unequal in length 48
- 44. smv shorter than mv 45
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- 45. smv with single dorsal seta *A. sankarani* Boucek
- smv with three to four dorsal setae 46
- 46. Gaster 1.5x combined length of head and mesosoma
..... *A. granulatus* (Ashmead) comb. nov.
- Gaster shorter than combined length of head and mesosoma
..... *A. purpureus* (Cameron) comb. nov.
- 47. Propodeum short with median carina, eyes with silvery white
pubescence *A. kuriani* (Husain & Khan) comb. nov.
- Propodeum long with median carina; eyes bare
..... *A. tanjorensis* (Husain & Khan) comb. nov.
- 48. Funicle segments gradually decreasing in length; smv with less than
ten dorsal setae 49
- Funicle segments not gradually decreasing in length; smv with ten
dorsal setae *A. pantnagarensis* (Khan) comb. nov.

49. Mesoscutum with median longitudinal sulcus
 *A. manii* (Husain & Khan)
- Mesoscutum without median longitudinal sulcus
 *A. vithurensis* sp. nov.

***Aprostocetus asthenogmus* (Waterston) comb. nov.**

Tetrastichodes asthenogmus Waterston, 1914. *Bull. ent. Res.* 5 : 340.

Tetrastichus asthenogmus (Waterston) Boucek, 1979. *Bull. ent. Res.* 69 :
 93-96.

Diagnosis: Female: Length 1.50 mm. Body yellowish-brown; gaster brown; antenna brown with lemon yellow scape and pedicel; clypeus straight with two minute lobes in the middle; antennal toruli above lower ocular line; scape about 6x width; pedicel 0.33x scape; anelli three; funicle segments gradually decreasing in length; F_2 0.8 x F_1 ; F_3 0.75x F_2 ; club triarticulate; propodeum more than twice width, with indistinct median carina; forewing twice maximum width; smv with four dorsal setae; mv 1.66x smv; gaster with subequal tergites.

Host: *Periplanata americana* (Linnaeus), *P. australasiae* (Fabricius).

Type locality: Srilanka.

Distribution: South India, North America.

Remarks : Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus calicopteridis* sp. nov.**

(Figs. 20 – 25)

Female: Length 2.16 mm. Head dark brown ; eyes silvery white; ocelli pale brown; antenna brown with yellow scape and pedicel; mesosoma black; legs yellow with dark brown coxa, proximal 0.75 femur and claw; gaster brown; wings hyaline, veins very pale brown; pubescence on body black.

Head: Collapsing, width in dorsal view subequal to mesosoma; vertex narrow, emarginate anteriorly and posteriorly; occiput not visible; POL 2.66x OOL; eyes bare; malar sulcus distinct and complete without a subocular fovea; antennal toruli above lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 4.8x width; pedicel 0.41x scape; two anelli; F_1 subequal to pedicel; F_2 and F_3 subequal to F_1 ; club triarticulate indistinctly, 0.88x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 29:6; pedicel = 12:4; F_1 = 13:4; F_2 = 12.5:5; F_3 = 12.5: 6; club = 22:6.

Mesosoma: Pronotum very short with inverted V-shaped posterior border; mesoscutum 0.64x width, 1.57x scutellum; deeply striato-reticulate; median longitudinal sulcus present; a row of six setae near each notauli;

scutellum slightly arched (convex), 0.7x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.07x width, short with short and broad median carina (Fig. 23), no paraspircular carina; spiracle moderate, nearly touching anterior margin of propodeum; forewing 2.33x maximum width; smv with five dorsal setae; mv slightly less than twice smv; st 0.23x mv (mv = 4.2x st). Relative lengths of forewing veins: smv=20; mv=38; pmv=0; st = 9.

Gaster: Collapsible, sessile, 0.58x body; tip of gaster acuminate; seventh tergite longest, with a pair of sinuate cercal setae; ovipositor very slightly exerted; length of gaster = 1.8x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Narendran and party 30.x.1986 (DZCU) FK-120. Other materials: Female INDIA Kerala Malappuram Calicut University campus Coll. K. Fousi 2.i.2003 (FK-158).

Distribution: INDIA (Kerala: Malappuram).

Host: Galls of *Calicopterus floribunda* Lamarck.

Biology: Unknown.

Discussion: This species resembles *Aprostocetus okawus* (Rohwer) comb. nov. in having very short propodeum with very short and broad

medium carina but differs from it in the following characters: (i) mv 1.9x smv (In *A. okawus*, mv a little longer than smv); (ii) F₃ more than 2x width (In *A. okawus*, F₃ equal to its width); (iii) club as wide as funicle segments (In *A. okawus*, club 1.5x wider than funicle segments).

Etymology: The species name is after its host.

Aprostocetus citrus sp. nov.

(Figs. 26 – 31)

Female: Length 1.69 mm. Head lemon yellow; occiput brown; eyes and ocelli brownish red; antenna pale brown with yellow scape and pedicel; mesosoma lemon yellow; legs lemon yellow with brown terminal tarsi and claw; gaster ventrally yellow, dorsally brown with yellow transverse bands; wing hyaline, veins pale brown; pubescence on body dark brown.

Head: Collapsing, width in dorsal view 0.85x mesosoma; vertex narrow; lateral ocellus much nearer to eye; POL more than thrice OOL; eyes bare; antennal toruli on lower ocular line; malar sulcus distinct and complete without a subocular fovea; antenna short with 9 segments; antennal formula 1.1.1.3.3; scape 3.8x width; pedicel 0.42x scape; single anellus; F₁ slightly longer than pedicel; F₂ equal to F₁; F₃ slightly shorter than F₂; club triarticulate, subequal to combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 19:5; pedicel = 8:4; F₁ = 9:5; F₂ = 9:5; F₃ = 8:5; club = 16:6.

Mesosoma: Pronotum short, anteriorly brown, posteriorly yellow; posterior border inverted V-shaped with a row of strong setae; mesoscutum long, 0.57x width, 1.5x scutellum, linearly striate; median longitudinal sulcus distinct and complete; twelve setae in two rows (9+3) near each notauli; scutellum convex, 0.75x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; dorsellum not visible dorsally, flanked by scutellum; propodeum medially very short with broad median carina; paraspircular carina absent; spiracle large, almost touching anterior margin of propodeum; forewing 1.67x maximum width; smv with four dorsal setae; mv twice smv; st 0.16x mv (mv = 6 x st); pmv rudimentary. Relative lengths of forewing veins: smv = 15; mv = 30; pmv = 1; st = 5.

Gaster: Collapsible, sessile, conic-ovate; 0.59x body; basally with a semicircular notch; third tergite smallest, rest subequal; length of gaster = 1.97x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Thiruvananthapuram Neyyardam Coll. Narendran and party 24.ii.1989 (DZCU) FK -137.

Distribution: INDIA (Kerala: Thiruvananthapuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus okawus* (Rohwer) comb. nov. in having short propodeum with very short and broad median carina but differs from it in the following characters: (i) funicle segments of same width (In *A. okawus*, funicle segments gradually widening); (ii) body yellow with brown areas (In *A. okawus*, body dark metallic green with some parts yellow); (iii) mv more than 1.5x smv (In *A. okawus* mv a little longer than smv).

Etymology: The name of this species is an arbitrary combination of words.

Remarks: *Tetrastichus okawus* Rohwer has propodeum without sculpture and paraspiracular carina. So it is transferred to *Aprostocetus* Westwood.

***Aprostocetus disgrigus* sp. nov.**

(Figs. 32 - 37)

Female: Length 2.31mm. Head dark brown; eyes black; ocelli pale brown; antenna brown; mesosoma black; legs yellow with dark brown coxa, proximal 0.75 femur and terminal tarsi; gaster dark brown; wings hyaline, veins pale brown; pubescence on body brown.

Head: Collapsing, width in dorsal view slightly less than mesosoma; vertex with a weak line of sclerotisation connecting all three ocelli and eye; POL about twice OOL; eyes bare; antennal toruli above lower ocular line; malar sulcus distinct and complete without a subocular fovea; antenna with 9 segments; antennal formula 1.1.1.3.3; scape 5.25x width; pedicel 0.52x scape; single anellus; F_1 slightly longer than pedicel; F_2 1.08x F_1 ; $F_3 = F_1$; club triarticulate, 0.88x combined length of last two funicle segments; flagellum gradually thickening with long dense setae. Relative length: width of antennal segments: scape = 21:4; pedicel = 11:4; $F_1 = 12:5$; $F_2 = 13:5.5$; $F_3 = 12:7$; club = 22:10.

Mesosoma: Pronotum short with inverted V-shaped posterior border; mesoscutum 0.72x width, 1.44x scutellum; median longitudinal sulcus distinct and complete; twelve setae arranged in two rows near each notauli; scutellum 0.75x width with two pairs of setae, a pair parallel submedian grooves and a pair of sublateral grooves; median lobe large; propodeum 0.12x width, medially very short with short and broad median carina; paraspiracular carina absent; spiracle nearly touching anterior margin; forewing 2.43x maximum width; smv with three dorsal setae; mv broad subequal to twice smv; pmv absent; st narrow at base, 0.2x mv ($mv = 5x st$). Relative lengths of forewing veins: smv=12; mv = 25; pmv = 1; st = 5.

Gaster: Collapsible, sessile, width less than mesosoma, acuminate; 0.62x body, with a pair of long sinuate cercal setae; ovipositor exerted (length = 0.22mm); length of gaster = 2.36x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Palakkad Kalkandi Coll. Narendran and party 13.xii. 1987 (DZCU) FK-75. Other materials: 3 Females of same data as holotype (FK-80, FK-107, FK-108); Female INDIA Kerala Wyanad Manantody Coll. Narendran and party 22.ii. 1988 (FK-81); Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 26.iv.1989 (FK-106).

Distribution : INDIA (Kerala: Palakkad, Wayanad, Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus okawus* (Rohwer) comb. nov. and *Aprostocetus calicopteridis* sp.nov. in having short propodeum with very short and broad median carina but differs from both. This species differs from *A. okawus* in the following characters: (i) mv subequal to smv (In *A. okawas*, mv slightly longer than smv); (ii) F₃ elongate, 1.71x width (In *A. okawus*, F₃ transverse, subequal to width); (iii) body length 2.31mm (In *A. okawus*, body length 1.5mm). This species

differs from *A. calicopteridis* in the following characters: (i) smv with three dorsal setae (In *A. calicopteridis*, smv with five dorsal setae); (ii) mesoscutum with twelve setae in two rows of near each notauli (In *A. calicopteridis*, mesoscutum with a row of six setae near each notauli); (iii) fifth gastral tergite longest (In *A. calicopteridis*, seventh gastral tergite longest); (iv) club 1.42x wider than width of F_3 (In *A. calicopteridis*, club of same width as F_3).

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

***Aprostocetus gasteris* sp. nov.**

(Figs. 38 – 40)

Female: Length 1.33mm. Head brownish yellow; eyes red; ocelli white; antenna brown with yellow scape and pedicel; mesosoma brownish yellow; legs yellow with brown claw; gaster yellowish brown; wings hyaline, veins brown pubescence on body brown.

Head: Collapsing, vertex narrow, setose; POL slightly more than OOL; eyes bare; antennal toruli slightly above lower ocular line; malar sulcus distinct and complete without a subocular fovea; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 5.6x width; pedicel 0.39x scape; F_2 longest; F_3 shortest; F_1 1.27x pedicel; F_2 1.14x F_1 ; F_3 0.62x F_2 ; club triarticulate with terminal spicule, about 0.92x combined length of last two funicle segments;

flagellum densely setose. Relative length : width of antennal segments: scape = 28:5; pedicel = 11:6; $F_1 = 14:5.5$; $F_2 = 16:6$; $F_3 = 10:6$; club = 24:8.

Mesosoma: Pronotum short with inverted V-shaped posterior border; a row of strong setae along posterior border; mesoscutum 0.70x width, 1.65x scutellum; median longitudinal sulcus distinct and complete; seven setae in a row near each notauli; linearly striate; scutellum 0.76x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; striations as on mesoscutum; propodeum very short with inverted Y-shaped median carina; paraspircular carina absent; spiracle large, touching anterior margin of propodeum, very near to lateral margin; forewing 2.21x maximum width; smv with five dorsal setae; mv 1.66x smv, with twelve setae; st 0.16x mv (mv = 6.25x st); pmv absent. Relative lengths of forewing veins: smv = 15; mv = 25; pmv = 0; st = 4.

Gaster: Collapsible, sessile, acuminate, 0.59x body; ovipositor exerted (length = 0.18 mm); length of gaster = 2.1x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Malappuram Nilambur Coll. Narendran and party 11.viii.1987 (DZCU) (FK-113).

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus neyyarensis* sp. nov. but differs from it in the following characters: F₁ distinctly shorter than F₂ (In *A. neyyarensis*, F₁ distinctly longer than F₂); (ii) midlobe of mesoscutum with seven setae near each notauli (In *A. neyyarensis*, midlobe of mesoscutum with four setae near each notauli); (iii) mesoscutum with median longitudinal sulcus (In *A. neyyarensis*, mesoscutum without median longitudinal sulcus); (iv) propodeum without lateral carina (In *A. neyyarensis* propodeum with posteriorly forking lateral carinae).

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

Aprostocetus hagenowii (Ratzeburg)

Entedon hagenowii Ratzeburg, 1852. *Ichneum. forstins.* 3: 211.

Tetrastichus floridanus Ashmead, 1887. *Trans. Am. Ent. Soc.* 14: 183-203.

Tetrastichus hagenowii Ashmead, 1901. *Fauna Hawaii.* I. Cambridge. 329.

Geniocerus hagenowii Kurdjumov, 1913. *Rev. Russea Ent.* 13: 249.

Aprostocetus hagenowii (Ratzeburg) Graham, 1987. *Bull. Br. Mus. Nat. Hist. Ent.* 55(1): 1-392.

Diagnosis: Female: Length 1.60-1.90 mm. Body coppery-red; gaster dorsally dark violet at tip and base with a yellow-brown spot; eyes pubescent;

anelli four; funicle with long setae; F_1 longest; F_2 and F_3 subequal, $0.8x F_1$; propodeum carinate, forewing $2.38x$ maximum width; mv $0.85x$ smv ; gaster oblong, ovate, equal to $0.5x$ body.

Male: Male agrees with female in all the above characters except a long, triarticulate club subequal to combined length of preceding three funicle segments.

Host: *Periplanata* sp. and *Blatta* sp.

Type locality: Europe.

Distribution: Europe, Hawaii, Seychelles Islands, North America, South India.

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus javedi* sp. nov.**

(Figs. 41-45)

Female: Length 2.34 mm. Head black; clypeus yellow, eyes silvery white; ocelli pale cream; antenna dark brown with yellow scape and pedicel; mesosoma yellow with black areas; legs entirely yellow with brown basal hindcoxa and claw; gaster black with yellow base; wings hyaline, veins brown; pubescence on body dark brown.

Head: Collapsing, width in dorsal view slightly more than mesosoma; vertex concave anteriorly and posteriorly; POL 1.22x OOL; eyes bare; malar sulcus distinct and complete without a subocular fovea; antennal toruli above lower ocular line; antenna with 11 segments; antennal formula 1.1.3.3.3; scape 4.5x width; pedicel 0.46x scape; three anelli; F₁ 1.53x pedicel; F₂ 0.69x F₁; F₃ 0.69x F₂; club triarticulate, 0.79x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 32:7; pedicel = 15:6; F₁ = 23:7; F₂ = 16:8; F₃ = 13:8; club = 23:11.

Mesosoma: Pronotum yellow with black patch centrally and laterally, slightly concave posteriorly; a row of long setae along posterior border; mesoscutum 0.56x width, 1.44x scutellum; median longitudinal sulcus faint; five setae in a row near each notauli; linearly striate; scutellum 0.66x width, with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; median and submedian lobes black, lateral lobe yellow; propodeum short, partly covered by gaster; median carina well developed; paraspiracular carina absent; forewing 2.58x maximum width; smv with single dorsal seta; mv slightly longer than smv; st narrow at base; 0.25x mv (mv = 4x st); pmv absent. Relative lengths of forewing veins: smv=18; mv=24; pmv = 0; st = 6.

Gaster: Collapsible, sessile, acuminate beyond middle; 0.56x body; first tergite largest; ovipositor exerted (length = 0.34 mm); length of gaster = 0.59x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha. x.1987 (FK-115); Other materials: 6 Females of same locality as plesiotype but collected at different dates by Narendran and party and Surekha - 3 Females collected by Narendran and party in i.1986 (FK-102), x.1987 (FK-135) and on 20. viii. 1999 (FK-15), 3 Females collected by Surekha on 18.viii.1988 (FK-96), 22.viii.1988 (FK-136) and 17.x.1988 (FK-7).

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes use to *Aprostocetus satpurensis* (Saraswat) comb. nov. but differs from it in the following characters: (i) propodeal median carina not forked anteriorly (In *A. satpurensis*, propodeal median carina narrowly forked in front from middle before reaching anterior margin of propodeum); (ii) smv with single dorsal seta (*A. satpurensis* smv with six dorsal setae); (iii) mesoscutum with five setae in a

row near each notauli (In *A. satpurensis*, mesoscutum with six setae in a row near each notauli); (iv) eyes bare (In *A. satpurensis*, eyes sparsely pubescent); (v) F_2 2x width (In *A. satpurensis*, F_2 2.7x width).

Etymology: This species is named after author's son.

***Aprostocetus lasiopterae* (Bhatnagar)**

Tetrastichus lasiopterae Bhatnagar, 1951. *Ind. J. Agri. Sci.* 21(2): 176.

Aprostocetus lasiopterae (Bhatnagar) LaSalle, 1994. *J. Nat. Hist.* 28: 109-236.

Diagnosis: Female: Length 1.70 mm. Body light brownish-yellow with two dark-brown spots below front ocellus; POL subequal to OOL; antennal toruli below lower ocular line; antenna with 9 segments; two anelli; antennal formula 1.1.2.3.2; club biarticulate; scutellum with a pair of submedian grooves and a pair of sublateral grooves; propodeum smooth, without paraspiracular carina; smv subequal to mv; st 0.25x mv; gaster sessile, longer than mesosoma.

Host: *Lasioptera falcata* Felt.

Type locality: Thiruvananthapuram.

Distribution: INDIA (Kerala: Thiruvananthapuram).

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus malabarensis* (Saraswat) comb. nov.**

Tetrastichus malabarensis Saraswat, 1975. *Mem. School. Ent.* 4: 10.

Diagnosis: Female: Length 2.00-3.00 mm. Body non-metallic, brownish yellow with black markings on head, mesosoma and gaster; head with a pair of median black patches; POL 1.16x OOL; antennal toruli slightly above lower ocular line; antenna with 11 segments; antennal formula 1.1.3.3.3; funicle segments gradually decreasing in length; scape subequal to pedicel; F_1 1.33x pedicel; F_2 0.91 x F_1 ; F_3 0.90-0.96x F_2 ; club spiculate, triarticulate, 1.75x combined length of last two funicle segments; mesoscutum with eleven to fifteen setae near each notauli; median longitudinal sulcus complete; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum with broad, strongly developed median carina; paraspiracular carina absent; forewing 2.17x maximum width; smv with five dorsal setae; mv 1.21x smv; st 0.27x mv; gaster 0.5 or slightly more than 0.5x body.

Type locality: Moozhiar – Thekkady Road, Kargudi – Ooty Road, Cardamom – Nilgiri Hills.

Distribution: INDIA (Kerala).

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus metallicus* sp. nov.**

(Figs. 46 – 49)

Female: Length 2.07 mm. Head black with green reflection; eyes dark brown; ocelli pale brown; antenna dark brown with yellow ventral scape; mesosoma black with green reflection; legs pale lemon yellow with coxa concolorous with mesosoma; gaster black with green reflections; wings hyaline, veins brown; pubescence on body black.

Head: Collapsing, width in dorsal view subequal to mesosoma; vertex narrow with line of weak sclerotisation joining all three ocelli and lateral ocellus to eye; POL 2x OOL; eyes bare; antennal toruli above lower ocular line; malar sulcus distinct and complete with a subocular fovea as in *Neotrichoporoides* Girault; antenna with 11 segments; antennal formula 1.1.3.3.3; scape about 5x width; pedicel 0.33x scape; three anelli; funicle segments gradually decreasing in length; F_1 equal to scape, thrice pedicel; F_2 0.83x F_1 ; F_3 0.85x F_2 ; club triarticulate, 0.72x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal

segments: scape = 24:5; pedicel = 8:4; F_1 24:5; F_2 = 20:5; F_3 = 17:5; club = 27:5.

Mesosoma: Pronotum gradually sloping towards anterior end with a row of strong setae along posterior border; densely linearly striate; mesoscutum 0.63x width; median longitudinal sulcus on posterior half; five setae in a row near each notauli; scutellum convex, 0.84x width with a pair of submedian grooves, a pair of sublateral grooves and two pairs of setae; reticulations as on mesoscutum; propodeum 0.13x width with strong median carina; paraspircular carina absent; spiracle moderate, almost touching anterior margin and separated from lateral margin by about 3x its diameter; submedian areas reticulate and shining; forewing 2.57x maximum width; costal cell long moderate in width; smv with three dorsal setae; mv about 1.75x smv, with thirteen setae; st 0.16x mv (mv = 6.16x st); pmv rudimentary. Relative lengths of forewing veins : smv = 20⁺ ; mv = 37; pmv = 1. st = 6.

Gaster: Collapsible, sessile, 0.58x body with a pair of long cercal setae; first tergite largest; length of gaster = 1.81x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus. Coll. Surekha 11.iii. 1989 (DZCU) FK – 117. Other materials: 3 Females INDIA Kerala Alappuzha Kanhikuzhi Coll. Narendran and party, 27.ii.1989 (FK-99, FK-100, FK – 112).

Distribution: INDIA (Kerala: Malappuram, Alappuzha).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus malabarensis* (Saraswat) comb. nov. but differs from it in the following characters: (i) body metallic (In *A. malabarensis*, body non-metallic, brownish yellow with black markings); (ii) mesoscutum with five setae near each notauli (In *A. malabarensis*, mesoscutum with eleven to fifteen scattered setae or arranged in rows near each notauli); (iii) median longitudinal sulcus on mesoscutum obliterated anteriorly (In *A. malabarensis*, median, longitudinal sulcus on mesoscutum complete).

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

Remarks: *Tetrastichus malabarensis* Saraswat is without paraspiracular carina on propodeum and smv has three dorsal setae. So it has been transferred to *Aprostocetus* Westwood. As the wing is slightly glued on the card, the given measurement of smv is shorter than actual. It is indicated by a (+) sign.

***Aprostocetus neyyarensis* sp. nov.**

(Figs. 50 – 54)

Female: Length 2.06mm. Head lemon yellow with brown ocellar area and occiput; eyes dark brown; ocelli brown; antenna brown with paler scape and pedicel; mesosoma shining yellow with dark brown median pronotum, anterior median semicircular patch on mesoscutum, anterior corner of scapula, anterior axilla, scutellar midlobe and propodeum; legs entirely brownish yellow; gaster brownish yellow with brown gastral tip and dorsal patches; wings hyaline, veins brown; pubescence on body dark brown.

Head: Collapsing, width in dorsal view subequal to mesosoma; vertex with line of weak sclerotisation forming an oval area around ocelli and connecting lateral ocellus to eye; POL 1.25x OOL; eyes bare; malar sulcus distinct and complete without a subocular fovea; antennal toruli above lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 4.62x width; pedicel 0.35x scape; anelli two; F_1 slightly less than 2.5x pedicel; F_2 0.75x F_1 ; F_3 0.75x F_2 ; club wider than funicle segments, 0.66x combined length of last two funicle segments; flagellum with long setae. Relative length: width of antennal segments: scape = 37:8; pedicel = 13:6; F_1 = 32:6; F_2 = 24:6; F_3 = 18:5; club = 28:9.

Mesosoma: Pronotum concave posteriorly with a row of long setae along posterior border; mesoscutum 0.56x width, 1.4x scutellum, without median longitudinal sulcus; four setae in a row near each notauli; densely

striato-reticulate; midlobe with anterior brown semicircular area medially; scutellum 0.67x width with brown median lobe; reticulations as on mesoscutum; propodeum 0.14x width, with strong median carina; lateral carina narrowly forked posteriorly; submedian areas reticulate and shining; spiracle large, nearly touching anterior propodeal margin and touching lateral carina; forewing 2.62x maximum width; smv with five dorsal setae; mv 2.37x smv, with ten setae; pmv absent; st 0.15x mv (mv=6.33x st). Relative lengths of forewing veins : smv = 16; mv = 38; pmv = 0; st = 6.

Gaster: Collapsible, sessile, conical; more than 0.5x body; length of gaster = 1.31x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Thiruvananthapuram Neyyardam Coll. Narendran and party 24.ii.1989 (DZCU) FK - 151.

Distribution: INDIA (Kerala: Thiruvananthapuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus gasteris* sp. nov. but differs from it in the following characters: (i) mesoscutum with four setae near each notauli (In *A. gasteris*, mesoscutum with seven setae near each notauli); (ii) mesoscutum without median longitudinal sulcus (In *A. gasteris*,

mesoscutum with distinct median longitudinal sulcus); (iii) F_1 distinctly longer than F_2 (In *A. gasteris*, F_1 distinctly shorter than F_2); (iv) propodeum with posteriorly forked lateral carinae (In *A. gasteris*, propodeum without lateral carina).

Etymology: This species is named after its locality.

***Aprostocetus nilamburensis* (Saraswat) comb. nov.**

Tetrastichus nilamburensis Saraswat, 1975. *Mem. School Ent.* 4:12.

Diagnosis: Male: Length 1.76 mm. Body black with metallic-green and blue reflections; eyes sparsely pubescent; antennal toruli almost in the centre of frons; antenna with 11 segments; antennal formula 1.1.2.4.3; scape 3.5x width; pedicel 0.33x scape; F_1 shortest, 1.30x pedicel; F_2 longest, equal to F_3 ; F_4 0.94x F_3 ; club triarticulate, slightly shorter than combined length of last two funicle segments; flagellum with whorls of long setae; mesoscutum with anteriorly obliterated median longitudinal sulcus; four setae in a row near each notauli; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum with strong median carina; paraspircular carina absent; forewing 2.43x maximum width; smv with four dorsal setae; mv 1.11x smv; st 0.2x mv; gaster slightly less than 0.5x body.

Type locality: Nilambur.

Distribution: INDIA (Kerala: Malappuram).

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus percaudatus* (Silvestri)**

(Figs. 55 – 57)

Tetrastichus (Geniocerus) percaudatus Silvestri, 1910. 241. Syntypes Italy (Caserta). *Boll. Lab. Zool. Gen. Agrar. R. Scuola. Agric. Partici* 4: 228-244.

Aprostocetus percaudatus (Silvestri) new combination by Graham, 1987. *Bull. Br. Mus. Nat. Hist. Ent.* 55 (1): 1-392.

Terebratella indica Shafee & Rizvi, 1984. *Mitt. Schweiz Ent. Gaz.* 57: 377-378 (Boucek, 1988 synonymised)

Female: Length 1.82mm . Head dark brown with yellow face and gena; eyes and ocelli dark brown; antenna entirely dark brown; mesosoma dark brown with green reflection; legs entirely yellow with proximal 0.75 hindcoxa concolorous with mesosoma; gaster pale brown with slight green reflections; wings hyaline, veins brown; pubescence on body brown.

Head: Collapsing, width in dorsal view slightly less than mesosoma; POL about 2x OOL; lateral ocellus very close of eye; eyes bare; an oval area of weak sclerotisation enclosing all three ocelli and connecting lateral ocellus to eye; antennal toruli well above lower ocular line; malar sulcus distinct and

complete without a subocular fovea; antenna with 9 segments; antennal formula 1.1.1.3.3; scape about 5x width; pedicel 0.31x scape; single anellus; F_1 more than twice pedicel; F_2 equal to F_1 ; F_3 very slightly less than F_2 ($0.93 \times F_2$); club triarticulate, 0.8x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 19:4; pedicel = 7:4; $F_1 = 16:3$; $F_2 = 16:3$; $F_3 = 15:3$; club = 25:4.

Mesosoma: Pronotum with coarse raised reticulations, a row of setae along posterior border; mesoscutum 0.69x width, without median longitudinal sulcus; three setae in a row near each notauli; densely smoothly reticulate; scutellum 0.92x width with two pairs of setae, a pair of submedian and a pair of sublateral grooves; propodeum with strong inverted Y-shaped median carina extending along anterior propodeal border; submedian areas densely reticulate with green reflection; forewing 2.5x maximum width; smv with four dorsal setae; mv twice smv, with eleven setae; pmv absent; st 0.18x mv ($mv = 5.3 \times st$). Relative lengths of forewing veins : smv = 16; mv = 32; pmv = 0; st = 6.

Gaster: Collapsible, sessile; 0.55x body, with a basal semicircular notch; ovipositor exerted (length = 2.64mm); length of gaster = 1.8x mesosoma.

Male: Unknown.

Materials examined: Plesiotype: Female INDIA Kerala Kozhikode Kakkayam Coll. Mohana 8.ii.1996 (FK-47); Other materials: Female INDIA Kerala Palakkad Malampuzha Coll. Narendran and party 16.i.1986 (FK-48).

Distribution: INDIA (Kerala: Kozhikode, Palakkad).

Host: Unknown.

Biology: Larvae are egg-parasites of crickets of genus *Oecanthus* in grass stems (Boucek, 1988).

Discussion: This species is unique with a very long ovipositor which is not present in any of the other species of *Aprostocetus*.

Remarks: Holotype is collapsed, so profile given is of paratype. In paratype, ovipositor is only 1.29 mm long.

***Aprostocetus reshmus* sp. nov.**

(Figs. 58 – 60)

Female: Length 1.70 mm. Head yellow; eyes reddish brown on 0.75 near gena and silvery white on top; antenna brown with yellow ventral scape and pedicel; mesosoma yellow with brown areas on pronotum, mesoscutum and scutellum; legs pale brownish yellow; gaster yellow with brown bands; wings hyaline, veins brown; pubescence on body brown.

Head: Collapsing, width in dorsal view more than mesosoma; vertex narrow; POL very slightly more than OOL; eyes bare; malar sulcus distinct and complete without a subocular fovea; antennal toruli above lower ocular line; antenna with 11 segments; antennal formula 1.1.3.3.3; scape twice width; pedicel 0.75x scape; three large anelli; F_1 2.33x pedicel; F_2 very slightly longer than F_1 (1.07x F_1); F_3 0.8x F_2 ; club triarticulate, width twice that of funicle segments, 0.66x combined length of last two funicle segments; flagellum densely setose. Relative length : width of antennal segments: scape = 8:4; pedicel = 6:4; F_1 = 14:4; F_2 = 15:4; F_3 = 12:4; club = 18:8.

Mesosoma: Pronotum concave posteriorly with a row of setae along posterior border; mesoscutum 0.66x width with a brown semicircular area anteriorly; median longitudinal sulcus absent; three setae in a row near each notauli; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum medially short with a thick short inverted Y-shaped median carina; paraspircular carina absent; spiracle moderate, touching anterior margin of propodeum; forewing 2.22x maximum width; smv with two dorsal setae; mv 1.5x smv; pmv absent; st 0.3x mv (mv = 3.3x st). Relative lengths of forewing veins : smv = 20; mv = 30; pmv = 0; st = 9.

Gaster: Collapsible, sessile, acuminate, 0.64x body; first tergite with a basal semicircular notch; epipygium with a pair of long sinuate cercal setae; length of gaster = 2.17x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Thiruvananthapuram Palode Coll. Mohana 10. iii. 2000 (DZCU) FK-53.

Distribution: INDIA (Kerala: Thiruvananthapuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Aprostocetus malabarensis* (Saraswat) comb. nov. but differs from it in the following characters: (i) mesoscutum with three setae near each notauli (In *A. malabarensis*, mesoscutum with eleven to fifteen setae near each notauli); (ii) midlobe of mesoscutum without a median longitudinal sulcus (In *A. malabarensis* midlobe of mesoscutum with a median longitudinal sulcus); (iii) gaster 1.58x combined length of head and mesosoma (In *A. malabarensis*, gaster equal to or slightly more than combined length of head and mesosoma).

Colour pattern similar to *Aprostocetus unicus* sp. nov. but differs from it in the following characters: (i) anelli three (In *A. unicus*, four anelli seen); (ii) smv with two dorsal setae (In *A. unicus*, smv with four dorsal setae); (iii)

mesoscutum with three setae in a row near each notauli (In *A. unicus*, mesoscutum with four to six setae in a row near each notauli).

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

Remarks: This species of *Aprostocetus* has two dorsal setae on smv.

***Aprostocetus sankarani* Boucek**

Aprostocetus sankarani Boucek, 1986. *Bull. ent. Res.* 76: 401.

Diagnosis: Female: Length 0.9-1.33 mm. Body pale yellow with a brown dot on pronotum, two small dots on either side of forewing base and a conspicuous cross-band on fourth gastral tergite; ovipositor tip black; head width 1.1x mesosoma; POL 1.45x OOL; eyes sparsely pubescent; malar sulcus curving forward in middle; antenna with 8 segments; antennal formula 1.1.1.3.2; F_1 equal to F_2 ; F_3 slightly shorter than F_2 ; club biarticulate, 0.88x combined length of last two funicle segments; median longitudinal sulcus on mesoscutum absent; two setae in a row near each notauli; propodeum with narrow median carina; submedian areas raised reticulate with curved lateral carina; forewing 2.58x maximum width; smv with a single dorsal seta; mv 1.17x smv; gaster narrow, acuminate, about 1.5x mesosoma.

Male: Agrees with female except in the following characters: length 0.6-1.1 mm; brownish colour more extensive than in female; antenna longer

than in female with short plica on scape; antennal formula 1.1.1.4.3; flagellum with long whorl of setae gradually decreasing in length.

Host: *Protocontorina* sp. (Diptera: Cecidomyiidae) on mango trees.

Type locality: Karnataka.

Distribution: INDIA (Karnataka, Uttar Pradesh).

Remarks; Though this species is not reported from Kerala, it is included here as it is likely to be encountered later in Kerala.

***Aprostocetus stiatius* sp. nov.**

(Figs. 61-64)

Female: Length 2.53mm. Head lemon yellow; occiput dark brown; eyes brown; ocelli white; rim of ocelli brown; antenna brown with paler ventral scape and pedicel; mesosoma lemon yellow with brownish areas on anterior pronotum, midline of mesoscutum, anterior scapula and anterior axilla; propodeum brown with yellow circular patch on submedian area; legs entirely lemon yellow with brown terminal tarsi and claw; gaster ventrally yellow, dorsally lemon yellow with brown net works; wings hyaline, veins pale brown; pubescence on body brown.

Head: Collapsing, width in dorsal view 0.8x mesosoma; vertex narrow; lateral ocellus much nearer to eye; eyes bare; malar sulcus distinct and complete without a subocular fovea; antennal toruli on lower ocular line;

antenna with 9 segments; antennal formula 1.1.1.3.3; scape more than 4x width; pedicel 0.44x scape; single anellus; funicle segments subequal, gradually thickening; club triarticulate, spiculate, 0.88x combined length of last two funicle segments; flagellum densely setose. Relative length : width of antennal segments: scape = 25:6; pedicel = 11:6; $F_1 = 13:6$; $F_2 = 13:7$; $F_3 = 13:8$; club = 23:11.

Mesosoma: Pronotum anterior half brown, posteriorly yellow; posterior border inverted V-shaped with a row of strong setae; mesoscutum long, 0.75x width, 1.76x scutellum; linearly striate; median longitudinal sulcus distinct and complete; seventeen setae in three rows near each notauli; scutellum convex, 0.77x width, with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; dorsellum covered dorsally by scutellum; propodeum medially very short with broad median carina; paraspiracular carina absent; spiracle large, touching anterior margin of propodeum; forewing 2.47x maximum width; costal cell broad; smv with five dorsal setae; mv 1.64x smv, with thirteen setae; st 0.15x mv (mv=6.4x st); pmv rudimentary. Relative lengths of forewing veins: smv = 17; mv = 28; pmv = 1; st = 5.

Gaster : Collapsible, sessile, basally with a crescent shaped notch, acuminate beyond middle; 0.64x body with a pair of long sinuate cercal

setae; ovipositor exerted (length = 0.19mm); length of gaster = 2.36 x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Palakkad Kalkandi Coll. Narendran and party 13. xii 1987 (DZCU) FK-2. Other materials: 1 Female of same data as holotype (FK -3); Female INDIA Kerala Palakkad Agali Coll. Narendran and party 12.xii.1987 (FK-4); Female INDIA Kerala Wyanad Manantody Coll. Narendran and party 22.ii.1988 (FK-1); Female INDIA Kerala Kollam Memana Ochira Coll. Narendran and party 26.ii.1989 (FK-76); Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 15. iv. 1989 (FK -110).

Distribution : INDIA (Kerala : Palakkad, Wyanad, Malappuram, Kollam).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus okawus* (Rohwer) comb. nov. but differs from it in the following characters: (i) yellow body with brown areas (In *A. okawus*, body dark metallic green); (ii) mv 1.64x longer than smv (In *A. okawus*, mv a little longer than smv).

This species is very similar in colouration to *Aprostocetus citrus* sp. nov. but differs from it in the following characters: (i) gaster acuminate beyond middle (In *A. citrus*, gaster conic-ovate); (ii) gaster dorsally yellow with brown linear area along sides and middle (In *A. citrus*, gaster dorsally brown with yellow transverse bands); (iii) funicle segments gradually thickening (In *A. citrus*, funicle segments of uniform thickness); (iv) smv with five dorsal setae (In *A. citrus*, smv with four dorsal setae).

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

Remarks: Variation in the size of brown area on mesoscutum is noticed. Some paratypes also have brown linear areas on middle of scutellum. Another variation noted is in the number of setae on midlobe of mesoscutum. Still more than ten setae arranged in three rows are noted.

***Aprostocetus thenhipalensis* sp. nov.**

(Figs. 65 – 69)

Female: Length 1.73 mm. Head black with metallic green reflections; eyes and ocelli pale brown; antenna entirely dark brown with pale yellow ventral scape; mesosoma black with metallic green reflections; legs pale yellow with midcoxa, hindcoxa, base of forecoxa, terminal tarsi and claw concolorous with mesosoma; gaster black with metallic green reflections; wings hyaline, veins brown; pubescence on body black.

Head: Collapsing, width in dorsal view slightly less than mesosoma; vertex concave posteriorly with line of weak sclerotisation connecting all three ocelli and eye; POL 1.7x OOL; eyes bare; malar sulcus distinct and complete with a wide subocular fovea as in *Neotrichoporides* Girault; antennal toruli on lower ocular line; antenna with 12 segments; antennal formula 1.1.4.3.3; scape 4.8x width; pedicel 0.41x scape; four anelli; funicle segments gradually decreasing in length; F_1 1.33x pedicel; F_2 0.81x F_1 ; F_3 0.84x F_2 ; club triarticulate, 0.75x combined length of last two funicle segments; flagellum densely setose. Relative length : width of antennal segments: scape 29:6; pedicel = 12:5; F_1 = 16:5; F_2 =13:5; F_3 =11:4; club = 18:6.

Mesosoma: Pronotum concave posteriorly, with a transverse carina near posterior line of setae; mesoscutum 0.65x width, 1.33x scutellum; median longitudinal sulcus on posterior one-third; four setae arranged in a row near each notauli; scutellum 0.92x width with a pair of submedian grooves, a pair of sublateral grooves and two pairs of setae; propodeum 0.2x width with well developed median carina; paraspiracular carina absent; forewing 4.44x maximum width; smv slightly less than mv, with a single dorsal seta; pmv absent; st 0.21x mv (mv = 4.6x st). Relative lengths of forewing wing veins: smv = 21; mv = 23; pmv = 0; st = 5.

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Gaster: Collapsible, sessile, sixth tergite smallest, acuminate beyond middle; about 0.5x body; length of gaster = 1.56x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus. Coll. Surekha. 22. iv. 1989 (DZCU) FK -98.

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.



Discussion: This species comes close to *Aprostocetus shencottensis* (Saraswat) comb. nov. but differs from it in the following characters: (i) body metallic green (In *A. shencottensis*, body non-metallic brown); (ii) mesoscutum with four setae in a row near each notauli (In *A. shencottensis*, mesoscutum with seven setae in a row near each notauli); (iii) mesoscutal median longitudinal sulcus only on posterior third (In *A. shencottensis*, mesoscutal median longitudinal sulcus distinct and complete); (iv) F_1 distinctly longer than F_2 (In *A. shencottensis*, F_1 equal to F_2).

Etymology: The species name is after its locality.

Remarks: This species of *Aprostocetus* is with a single dorsal seta on smv.

***Aprostocetus thiruvannurensis* sp. nov.**

(Figs. 70 – 71)

Female: Length 1.64mm. Head black with metallic green reflections; eyes brown with silvery white rim; ocelli brown; antenna brown with pale yellow scape and pedicel; mesosoma black with bright metallic green reflections; legs pale yellow with brown coxa; gaster brown with slight green reflections; wings hyaline, veins pale brown; pubescence on body dark brown.

Head: Collapsing, width in dorsal view more than mesosoma; vertex narrow; POL about 1.5x OOL; eyes bare; antennal toruli on lower ocular line; malar sulcus distinct and complete with a subocular fovea; antenna with 11 segments; antennal formula 1.1.3.3.3; scape 4.25x width; pedicel 0.52x scape; three anelli; F_1 and F_2 subequal; F_1 1.94x pedicel; F_3 about 0.67x F_2 ; club triarticulate, same width as funicle segments; 0.94x combined length of last two funicle segments; flagellum with long setae. Relative length: width of antennal segments: scape = 17:4; pedicel = 9:3; F_1 = 17.5: 4; F_2 = 17.5:4; F_3 = 11.5:3; club = 26:4.

Mesosoma: Pronotum large, concave posteriorly with a row of setae along posterior border; mesoscutum 0.56x width, 1.21x scutellum; median longitudinal sulcus very faint; three setae in a row near each notauli; densely linearly striate; scutellum 0.93x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on

mesoscutum; propodeum with well developed median carina; paraspiracular carina absent; submedian areas shining; forewing about 2.8x maximum width; smv with two dorsal setae; mv 1.47x smv, with ten setae; pmv absent; st narrow at base, 0.21x mv (mv = 4.6x st). Relative lengths of forewing veins: smv = 19; mv = 28; pmv = 0; st = 6.

Gaster: Collapsible, sessile, acuminate; 0.54x body, with a pair of long sinuate cercal setae; length of gaster = 1.60x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Kozhikode Thiruvannur Coll. Mohana 23. xi. 1996 (DZCU) FK – 84. Other materials: 6 Females collected by Mohana from same locality at different dates - 5 Females collected on 23. xi. 1996 (FK – 79, FK – 85, FK – 89, FK – 88, FK – 91), 1 Female collected on 25.ii.1997 (FK – 86).

Distribution: INDIA (Kerala: Kozhikode).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Aprostocetus malabarensis* (Saraswat) comb.nov. but differs from it in the following characters: (i) body black with metallic green reflections (In *A. malabarensis*, body non-mettalic, brownish-yellow with black markings on head, mesosoma and gaster); (ii) F₂

subequal to F_1 , F_3 $0.67 \times F_2$ (In *A. malabarensis*, funicle segments gradually decreasing in length); (iii) mesoscutum with three setae in a row near each notauli (In *A. malabarensis*, eleven to fifteen setae near each notauli); (iv) smv with two dorsal setae (In *A. malabarensis*, smv with five dorsal setae).

Etymology: This species is named after its locality.

Remarks: This species in general appearance closely resembles *Tetrastichus keralensis* sp. nov.

***Aprostocetus travancorensis* (Saraswat) comb. nov.**

Tetrastichus travancorensis Saraswat, 1975. *Mem. School Ent.* 4 : 26.

Diagnosis: Female: Length 2.60-2.64 mm. Body black with metallic bluish-green reflections; POL subequal to OOL; eyes sparsely pubescent; antenna with 11 segments; three anelli; antennal formula 1.1.3.3.3; antennal toruli slightly above lower ocular line; scape about 6x width; pedicel 2x width; 0.4x scape; funicle segments very slightly decreasing in length; F_1 2.8x width, 1.4x pedicel; F_2 2.6-2.7x width, slightly shorter than F_1 ; F_3 twice width, 0.9x F_2 ; club 3x width, slightly shorter than combined length of last two funicle segments; mesoscutal midlobe with faint median longitudinal sulcus; four setae in a row near each notauli; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum without paraspircular carina; forewing 2.5x width; smv shorter

than mv, with four to five dorsal setae; mv with three to fourteen setae; st with one or two setae. Relative lengths of forewing veins : smv =73; mv = 100; pmv = 3; st = 18; gaster very slightly longer than 0.5x body.

Type locality: Travancore.

Distribution: INDIA (Kerala).

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus tritrichia* (Saraswat) comb. nov.**

Tetrastichus tritrichia Saraswat, 1975. *Mem. School Ent.* 4 : 29.

Diagnosis: Female: Length 2.22 mm. Body non-metallic, brownish yellow with brown markings on mesosoma and gaster; POL 1.14x OOL; eyes sparsely pubescent; antennal toruli in centre of frons; antenna with 12 segments; antennal formula 1.1.4.3.3; scape 4x width; pedicel 0.41x scape; funicle segments gradually decreasing in length; F₁ 2.7x pedicel; F₂ 0.66x F₁; F₃ 0.8x F₂; club spiculate, triarticulate, 1.33x combined length of last two funicle segments; mesoscutum with three setae near each notauli; median longitudinal sulcus faint; scutellum with two pairs of setae, a pair of submedian and a pair of sublateral grooves; propodeum with strong median

carina; paraspiracular carina absent; forewing 2.63x maximum width; smv with seven dorsal setae; mv = 1.42x smv; st 0.2x mv; gaster 0.58 x body.

Type locality: Moozhiar - Cardamom Hills.

Distribution: INDIA (Kerala).

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus uniarticulata* (Saraswat) comb. nov.**

Tetrastichus uniarticulata Saraswat, 1975. *Mem. School Ent.* 4 : 31.

Diagnosis: Male: Length 1.46-1.70 mm. Body dark brown with metallic-green reflections; eyes very sparsely pubescent; POL less than 1.5x OOL; antenna with 10 segments; antennal formula 1.1.1.4.3; scape more than 3x width; pedicel 0.44x scape; single anellus; F₁ shorter, 1.62x pedicel; F₂ longest, 1.08 x F₁; F₃ equal to F₂; F₄ 0.9x F₂; club triarticulate, 1.65-1.75x combined length of last two funicle segments; flagellum with long whorls of setae; mesoscutum with a complete median longitudinal sulcus; three pairs of setae near each notauli; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum with strong median carina; paraspiracular carina absent; forewing 2.7x maximum width; smv with three dorsal setae; mv 1.25x smv; gaster 0.5x body.

Type locality: Nilambur.

Distribution: INDIA (Kerala: Malappuram).

Remarks: Since no material of this species is encountered in this investigation, the above description is based on already published information.

***Aprostocetus unicus* sp. nov.**

(Figs. 72-76)

Female: Length 1.33 mm. Head yellow, brown around ocelli; eyes silvery white; ocelli brown; antenna entirely brown with yellow scape; mesosoma yellow with brown patch in anterior mesoscutal midlobe, pronotum, scapula, axilla, scutellar midlobe and propodeum; legs entirely yellow with darker midcoxa, hindcoxa and claw; gaster yellow, with brown fourth, fifth, sixth tergites and epipygium; wings hyaline, veins brown; pubescence on body brown.

Head: Collapsing, vertex narrow with line of weak sclerotisation forming an oval area around ocelli and connecting lateral ocellus to eye; POL 1.33x OOL; eyes pubescent; malar sulcus distinct and complete without a subocular fovea; antennal toruli well above lower ocular line; antenna with 11 segments; antennal formula 1.1.4.3.3; scape 5.5x width; pedicel 0.33x scape; four anelli; funicle segments gradually decreasing in length; F₁ twice pedicel;

F_2 0.86x F_1 ; F_3 0.73x F_2 ; club triarticulate, 0.63x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 33:6; pedicel=11:4; F_1 = 22:5; F_2 = 19:5; F_3 = 14:5; club = 21:7.

Mesosoma: Pronotum concave posteriorly with a row of long setae along posterior border; mesoscutum 0.71x width, 1.42x scutellum; striato-reticulate; median longitudinal sulcus absent; six setae in a row near each notauli; scutellum 0.86x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; sculpture as on mesoscutum; propodeum 0.17x width, with strong median carina; paraspircular carina absent; submedian areas densely reticulate; spiracle moderate, touching anterior propodeal margin; forewing 2.64x maximum width; smv with five dorsal setae; mv 1.63x smv, 5.1x st; st narrow at base, 0.19x mv; pmv absent. Relative lengths of forewing veins: smv = 19; mv =37; pmv = 0; st = 8.

Gaster: Collapsible, sessile, slightly more than 0.5x body, acuminate beyond middle; first tergite largest; ovipositor exerted (length = 0.08mm); length of gaster = 1.39x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Narendran and party 1.x.1986 (DZCU) FK-5. Other materials: Female INDIA Kerala Malappuram Calicut University

campus Coll. Surekha 18.x.1988 (FK-6); 2 Females INDIA Kerala Malappuram Edakkara Coll. Narendran and party 24.iv.1989 (FK-97, FK-50).

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus shencottensis* (Saraswat) comb. nov. in having: (i) anelli four; (ii) smv shorter than mv; (iii) smv with five dorsal setae. But differs from it in the following characters: (i) mesoscutum with six setae in a row near each notauli (In *A. shencottensis*, seven setae near each notauli); (ii) F_1 1.15x F_2 (In *A. shencottensis*, $F_1 = F_2$); (iii) club only 0.63x combined length of last two funicle segments (In *A. shencottensis*, club equal to combined length of last two funicle segments); (iv) mesoscutum without median longitudinal sulcus (In *A. shencottensis*, mesoscutal median longitudinal sulcus well developed).

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

Remarks: *Tetrastichus shencottensis* Saraswat is without paraspiracular carina and smv has more than two dorsal setae. So it is transferred to *Aprostocetus* Westwood.

Aprostocetus vithurensis sp. nov.

(Figs. 77 – 80)

Female: Length 1.45 mm. Head dark brown with green reflection; eyes and ocelli brown; antenna entirely dark brown with paler scape; mesosoma black with bright metallic green reflections; legs lemon yellow with proximal 0.75 coxa, terminal tarsi and claw dark brown; gaster dark brown with green reflection; wings hyaline, veins brown; pubescence on body pale brown.

Head: Collapsing, width in dorsal view more than mesosoma; vertex shrunken, concave posteriorly; POL 2.25x OOL; eyes bare; malar sulcus distinct and complete with a subocular fovea; antennal toruli above lower ocular line; antenna with 9 segments; antennal formula 1.1.1.3.3; scape 4x width; pedicel 0.5x scape; single anellus; funicle segments gradually decreasing in length; F_1 subequal to scape, twice pedicel; F_2 0.75x F_1 ; F_3 very slightly less than F_2 ; club indistinctly triarticulate, 0.79x combined length of last two funicle segments, wider than funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 20:5; pedicel = 10:5; F_1 = 20:5; F_2 = 15:5; F_3 = 14:6; club = 23:9.

Mesosoma: Pronotum large, 0.66x mesoscutum, concave posteriorly with a row of strong setae along posterior border; mesoscutum 0.58x width with three setae in a row near each notauli; median longitudinal sulcus absent;

scutellum subequal to mesoscutum in length, with a pair of submedian grooves, a pair of sublateral grooves and two pairs of setae; propodeum 0.68x width with well developed median carina and lateral carina beyond spiracle; paraspiracular carina absent; submedian areas reticulate; forewing 2.8x maximum width; smv with four dorsal setae, distinctly smaller than mv; st 0.13x mv (mv = 7.6x st); pmv rudimentary. Relative lengths of forewing veins: smv = 16⁺; mv = 38; pmv = 1; st = 5.

Gaster : Collapsible, sessile, 0.55x body; first tergite basally with a notch; length of gaster = 1.58x mesosoma.

Male: Unknown.

Material examined: Holotype : Female INDIA Thiruvananthapuram Vithura Coll. Mohana 9.iii.2000 (DZCU) FK-82.

Distribution: INDIA (Kerala: Thiruvananthapuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Aprostocetus manii* Husain & Khan but differs from it in the following characters: (i) length 1.45mm (In *A. manii*, length 2.5 to 2.7mm); (ii) pronotum large (In *A. manii*, pronotum narrow); (iii) mesoscutum without median longitudinal sulcus (In *A. manii*,

median longitudinal sulcus present); (vi) scutellum slightly convex (In *A. manii*, scutellum highly convex).

Etymology: The species is named after its locality.

Remarks: Base of smv not clearly seen. So measurement is shorter than actual.

***Aprostocetus wyanadensis* sp. nov.**

(Figs. 81- 82)

Female: Length 1.66mm. Head yellow, brown near ocelli; eyes red; ocelli yellow; antenna brown with yellow scape and pedicel; mesosoma yellow with slight brown patches; legs entirely yellow; gaster yellow with brown transverse bands; wings hyaline, veins brown; pubescence on body brown.

Head : Collapsing, width in dorsal view less than mesosoma; vertex narrow; POL about 2x OOL; eyes bare; malar sulcus distinct and complete without a subocular fovea; antennal toruli on lower ocular line; antenna with 12 segments; antennal formula 1.1.4.3.3; scape 6.1x width; pedicel 0.43x scape; funicle segments gradually decreasing in length; F₁ 1.5x pedicel; F₂ 0.91x F₁, F₃ 0.86x F₁; club triarticulate, equal to F₁, 0.58x combined length of last two funicle segments; flagellum densely setose. Relative length: width

of antennal segments: scape = 37:6; pedicel= 16:4; $F_1 = 24 :4$; $F_2 = 22:4$; $F_3 = 19:4$; club = 24:4.

Mesosoma: Pronotum concave posteriorly, with a row of setae along posterior border; mesoscutum without median longitudinal sulcus; two setae in a row near each notauli; scutellum with a pair of faint submedian grooves, a pair of sublateral grooves and two pairs of setae; propodeum yellow with well developed brown inverted median carina; spiracle moderate; forewing 2.93x maximum width; smv with three dorsal setae; mv 1.61x smv, with nine long setae; pmv absent; st 0.17x mv (mv = 5.8x st). Relative lengths of forewing veins: smv =16; mv =29; pmv = 0;st = 5.

Gaster: Collapsible, sessile, acuminate, with a pair of long sinuate cercal setae; very much longer than 0.5x body; length of gaster =1.91x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Wyanad Coll. K. Fousi 7.iv.2002 (DZCU) FK-93.

Distribution: INDIA (Kerala: Wyanad).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close *Aprostocetus reshmus* sp. nov. but differs from it in the following characters: (i) anelli three (In *A. reshmus*, anelli four); (ii) propodeum with well developed inverted Y-shaped median carina (In *A. reshmus*, propodeal median carina very short and broad); (iii) mesoscutum with very minute brown patch (In *A. reshmus*, mesoscutum with an anterior brown median patch); (iv) smv with three dorsal setae (In *A. reshmus*, smv with two dorsal setae); (v) mv 5.8x st (In *A. reshmus*, mv 3.3x st).

Etymology: The species name is after its locality.

Genus *Neogasterichus* gen. nov.

Type species: *Neogasterichus longigastris* sp. nov.

Diagnostic features : Head non-collapsing; vertex very broad but short, not elevated, without transverse carina, steeply falling into excavated occiput shortly behind lateral ocelli; malar sulcus distinct throughout (not replaced by straight ridge); occipital carina or ridge absent; lower face submedially depressed, resembling shallow foveae; clypeal area elevated dorsally with broadly divergent ridges towards outer toruli, lower margin with three sharp teeth; toruli full diameter apart, situated on lower ocular line; pronotum moderately short, dull with very dense raised reticulation; mesoscutum with distinct median longitudinal sulcus; thin setae near each

notauli; scutellum with submedian groove uniformly deep; propodeum densely reticulate with distinct well marked median and paraspiracular carinae; legs not unusually slender; hindcoxa deeply and coarsely reticulate on dorsal side; mv longer than smv; smv with one dorsal setae; gaster sessile, very long (Fig. 87), not laterally compressed; first tergite a little shorter than combined length of second and third tergites; cercal setae short; hypopygium ending before anterior one-fourth.

Distribution: INDIA: (Kerala).

Host: Unknown.

Biology: Unknown.

Discussion: This new genus comes extremely close to the genus *Gasterichus* Boucek but differs in the following characters: (i) malar sulcus deep and not replaced by straight ridge (In *Gasterichus*, malar sulcus replaced by a straight ridge, groove on top indistinct); (ii) lower clypeal margin with three teeth medially (In *Gasterichus*, lower clypeal margin straight, subemarginate); (iii) female antenna not unusually long (In *Gasterichus*, female antenna unusually long); (iv) legs not unusually slender (In *Gasterichus*, legs unusually slender); (v) petiole absent (In *Gasterichus*, petiole distinct, strongly expanding backwards).

Etymology : Named after *Gasterichus* Boucek.

Remarks: The present investigation reports two new species, including the type species.

KEY TO INDIAN SPECIES OF *NEOGASTERICHUS* gen. nov.

1. Occiput with a median longitudinal groove; gaster 2.5x length of mesosoma *N. longigastris* sp. nov.
- Occiput without a median longitudinal groove; gaster 1.58x length of mesosoma *N. dulciculus* sp. nov.

Neogasterichus dulciculus sp. nov.

(Figs. 83 – 86)

Female: Length 2.91 mm (Figs. 83-86). Body black with metallic blue reflections; antenna brown with pale brown scape and pedicel; eyes brownish red; ocelli dark brown; legs pale brownish yellow with hindcoxa concolorous with body; forecoxa and midcoxa dark brown; tegula dark brown; wings hyaline, veins brown; pubescence on body brown.

Head: Non-collapsing, width in dorsal view 1.11x mesosoma; vertex and occiput with scattered setigerous punctae; POL 1.7x OOL; frons and face distinctly reticulate; lower face with oblique ridges connecting toruli and lower clypeal margin; lower clypeal margin with three teeth; malar sulcus distinct; antennal toruli on lower ocular line; antennal formula 1.1.2.3.3; scape 4.25x width; pedicel 0.35x scape; two anelli; F₁ 1.8x pedicel;

F_2 1.13x F_3 1.08x F_2 ; club triarticulate, 0.8x combined length of last two funicle segments. Relative length: width of antennal segments : scape = 34 : 8; pedicel = 12 : 7; $F_1 = 21 : 9$; $F_2 = 24 : 9$; $F_3 = 26 : 9$; club = 35 : 13.

Mesosoma : Pronotum reticulate, with a row of setae along posterior border; mesoscutum slightly longer than scutellum; median longitudinal groove complete; densely raised reticulate; six setae in a row near each notauli; scutellum a little wider than long, with raised reticulation and two pairs of setae; propodeum with distinct median and paraspiracular carinae; submedian areas reticulate; forewing 2.33x maximum width; smv with a single dorsal seta; mv 1.1x smv; st 0.02x mv (mv = 4.7x st); pmv rudimentary. Relative lengths of forewing veins: smv = 39; mv = 43; pmv = 28; st = 9.

Gaster: Sessile, first tergite with a median shallow pit like area; hypopygium slightly exceeding third tergite; length of gaster = 1.56x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus 20.xii.2002 Coll. Narendran and party (DZCU) FK-144.

Distribution: INDIA (Kerala : Malappuram).

Host : Unknown.

Biology: Unknown.

Discussion : The species comes close to *Neogasterichus longigastris* sp.nov in general appearance but differs from it in the following characters :

(i) F_3 longer than F_2 (In *N. longigastris*, F_3 shorter than F_2); (ii) club $1.35 \times F_3$ (In *N. longigastris*, club $1.58 \times F_3$); (iii) gaster $1.56 \times$ length of mesosoma (In *N. longigastris*, gaster $2.5 \times$ length of mesosoma).

Etymology : Species name is taken from Latin meaning sweet.

***Neogasterichus longigastris* sp. nov.**

(Figs. 87-92)

Female: Length 2.81–3.26 mm. Body bright metallic green; antenna brown with pale yellow scape; eyes brick red; ocelli pale yellowish brown; legs yellow with basal 0.5 hindcoxa concolorous with body; tegula pale yellowish brown; wings hyaline, veins pale brown; pubescence on body white.

Head: Non-collapsing, width in dorsal view subequal to mesosoma; vertex and occiput with scattered setigerous punctae; POL about $2 \times$ OOL; occipital carina indistinct, longitudinal median groove on occipital region clearly distinct; frons and lower face distinctly reticulate; face with oblique ridge on either side connecting toruli and lower clypeal margin (Fig.92);

lower clypeal margin with three median teeth; malar sulcus distinct and complete; antennal toruli on lower ocular line; antennal formula 1.1.2.3.3; scape 5.7 x width; pedicel 0.42 x scape; two anelli; F_1 1.76 x pedicel; F_2 1.06 x F_1 ; F_3 0.90 x F_2 ; club triarticulate, 0.75x combined length of last two funicle segments. Relative length : width of antennal segments: scape = 40 : 7 ; pedicel = 17: 7; F_1 = 30 : 9; F_2 = 32 : 10; F_3 = 29:10; club = 46:12.

Mesosoma: Pronotum with raised dense reticulations, with a line of setae on posterior border; mesoscutum slightly longer than scutellum, with a complete median longitudinal groove and raised longitudinal reticulation; six thin setae in a row near each notauli; scutellum subequal to its width, with raised reticulation, a pair of submedian groups, a pair of sublateral grooves and two pairs of setae; propodeum with distinct median and paraspiracular carinae; submedian areas densely reticulate; forewing 2.15x maximum width; smv with a single dorsal seta; mv 1.17x smv; st 0.24x mv (mv = 4.1x st); pmv rudimentary. Relative lengths of forewing veins: smv = 28; mv= 33; pmv = 4; st = 8.

Gaster: Very long; first tergite with a median basal pit; hypopygium ending below third tergite; length of gaster = 2.5x mesosoma

Male : Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus 16.v.1988 Coll. Narendran (DZCU) FK- 148.

Other materials: 1 Female of same data as holotype except date of collection 12. xii. 1987 (FK – 134).

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion : This new species resembles *Neogasterichus dulciculus* sp.nov. in general appearance but differs from *N. dulciculus* in the following characters: (i) F_3 shorter than F_2 (In *N. dulciculus*, F_3 longer than F_2); (ii) club 1.58x F_3 (In *N. dulciculus*, club 1.35x F_3); (iii) gaster 2.5x as long as mesosoma (In *N. dulciculus*, gaster 1.56x as long as mesosoma); (iv) occiput with a median longitudinal groove (In *N. dulciculus*, occiput without a median longitudinal groove).

Etymology : This species is named after its long gaster.

Genus *Neomestocharella* Narendran & Fousi

Type species: *Neomestocharella keralensis* sp. nov. Gender feminine.

Diagnosis: Length (Female & Male): 1.1-1.3 mm. Head collapsible; malar sulcus complete; antennal formula of female 1.1.3.3.2; male 1.1.3.4.3; clava with distinct spicule at distal tip; scape swollen in male; pronotum with a distinct cross carina (visible only under accurate focussing and lighting);

mesoscutum with two pairs of setae; notauli complete; axilla produced forward; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; dorsellum bulging over propodeum anteriorly; propodeum mostly smooth with faint reticulations, with an inverted "Y" shaped median carina and without paraspiracular carina; forewing with long fringes; smv with two dorsal setae; pmv absent; smv distinctly interrupted at parastigma; hindwing long, distinctly narrow basally; gaster sessile, collapsing dorsally, longer than mesosoma; long cercal setae present.

Discussion : This new genus comes to *Mestocharella* Girault in the keys to genera by Hayat (1985), Boucek (1988) and others. However it differs from *Mestocharella* in having: (i) gaster sessile (In *Mestocharella*, gaster with distinct coarsely sculptured petiole); (ii) female antennal formula 1.1.3.3.2 (In *Mestocharella*, female antennal formula 1.1.1.4.2); (iii) axilla well advanced (not so in *Mestocharella*); and (iv) propodeum without distinct alveolae and with distinct inverted median "Y" shaped carina (In *Mestocharella*, propodeum with distinct alveolae and without inverted median "Y" shaped carina).

This new genus also resembles *Aprostocetus* Westwood in general appearance but differs from it in having: (i) pronotum with a cross carina (In *Aprostocetus*, pronotum without cross carina); (ii) smv with two dorsal setae

(In *Aprostocetus*, smv with more than two dorsal setae and in several other features).

Neomestocharella keralensis Narendran & Fousi

(Figs. 93-96)

Female: Length 1.1 mm. Head pale brownish yellow; eyes and ocelli black; POL and OOL area black with metallic green reflection; antenna pale brown; mandibles pale brown; mesosoma pale brownish yellow with metallic green patches on dorsum of pronotum, on anterior part of mesoscutum (Fig. 95), on part of scapula and on sides of axilla, on median part of scutellum and propodeum completely; legs pale whitish yellow with pretarsus darker; gaster pale brownish yellow with sides dark brown mingled with metallic green reflection; ovipositor sheath black; wings hyaline with veins pale yellowish brown; pilosity pale brown.

Head: Collapsing, broader than mesosoma in dorsal view, smooth with sparse pilosity; in anterior view head width a little more than its length (10:9); POL a little more than 2.5x OOL; mandible bidentate; malar sulcus distinct and complete without a subocular fovea; height of eye in profile about 2x length of malar surface; eye length in side view a little more than 1.6x its maximum width; eye bare; antennal toruli situated a little above lower ocular line; torulus nearer to eye than to each other; scape length a little more than 4x its width, as long as eye length in profile; antennal formula 1.1.3.3.2;

scape length a little more than 4x its width, as long as eye length in profile; scape slightly exceeding level of vertex; F_1 nearly 2x as long as pedicel and a little more than 1.6x length of F_2 ; F_3 subequal in length to F_2 ; clava with apical spicule present, claval length (including spicule) a little more than 2x length of F_3 .

Mesosoma: Pronotum with a distinct cross carina near its posterior margin (Fig. 95); faintly reticulate, mostly smooth, with weak and sparse setae on posterior border; mesoscutum with notauli complete, with two pairs of setae (Fig. 92), surface with faint reticulation; axilla advanced forward; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves, surface faintly reticulate; dorsellum slightly bulging over propodeum, faintly reticulate; propodeum with an inverted "Y" shaped median carina (Fig. 94), surface mostly smooth and shiny with faint reticulations; paraspircular carina absent; spiracle large, rounded with distance from anterior margin less than its diameter; forewing length about 3x its maximum width, with distinct and long fringe, speculum setose. smv with two dorsal setae. Relative lengths of forewing veins; smv = 36; mv = 52; st = 16; pmv = 0.

Gaster: Sessile, oval, collapsing from dorsal side, a little longer than 1.3x mesosoma, with a distinct cercal seta.

Male: Length 1.34 mm. Similar to female except in having antennal formula 1.1.3.4.3, scape swollen with its length 1.85x its width.

Materials examined: Holotype: Female INDIA Kerala Thrissur 9.v.1998 Coll. P. Beevi (DZCU). Other materials: 1 Female of same data as for Holotype : 1 Female Thrissur Avinisery v.1998 Coll. P. Beevi; 4 males Thrissur 9.iv.1999 Coll. M. Parvathy.

Distribution: INDIA: (Kerala).

Host: Unknown. Probably rice pests of Lepidoptera.

Biology: Unknown.

Habitat: Rice Ecosystem: Thrissur lying between 10 15 10 45 N and 77 77 45 E.

Etymology: The species is named after Kerala state.

Genus *NEOPARACHRYSOCHARIS* gen. nov.

Type species: *Neoparachrysocharis keralensis* sp. nov.

Diagnostic Features: Body about 2.5mm long; lateral ocellus connected to eye by a small groove; pronotum short, with two rows of setigerous punctae; mesoscutal midlobe with coarse longitudinal striae extending from anterior to posterior margin; median longitudinal sulcus distinct and complete; mesoscutum long, about 1.5x scutellum; scapula with

dense setigerous punctae; scutellum with a median longitudinal depression; submedian and sublateral grooves of scutellum well developed; propodeum medially short, with dense coarse reticulations submedially; smv with six dorsal setae; very short, 0.9x mv; gaster sessile, acuminate, more than 0.5x body.

Distribution: INDIA (Kerala).

Host: Unknown.

Biology: Unknown.

Discussion: This genus comes close to *Parachrysocharis* Girault in Boucek's key to Australasian Tetrastichinae (Boucek, 1988). Mesoscutal midlobe is with longitudinal striae, as found in *Parachrysocharis*. However it differs from it in the following characters: (i) longitudinal striae of mesoscutal midlobe extends from anterior margin to posterior margin (In *Parachrysocharis*, longitudinal striae of mesoscutal midlobe is conspicuous only on anterior half); (ii) mesoscutum with well developed median longitudinal sulcus) In *Parachrysocharis*, mesoscutum without median longitudinal sulcus); (iii) scutellum with a pair of well developed submedian grooves (In *Parachrysocharis*, scutellum without submedian grooves).

Etymology: Named after *Parachrysocharis* Girault.

Remarks : The present investigation reports a single species which is new to science.

***Neoparachrysocharis keralensis* sp. nov.**

(Figs. 97-102)

Female: Length 2.87 mm. Head dark brown; clypeus and gena yellow; eyes and ocelli coppery red; antenna testaceous with paler scape and pedicel; mesosoma dark brown with paler lower border of axilla; legs pale lemon yellow with brown coxa and femur; gaster dark brown; wings hyaline, veins brown; pubescence on body brownish white.

Head: Non-collapsing, width in dorsal view subequal to mesosoma; vertex with deep setigerous punctae; occiput emarginate; POL twice OOL; eyes pubescent; lateral ocellus connected to eye by a small groove; frons and lower face with deep setigerous punctae; malar sulcus distinct and complete with a subocular fovea; antennal toruli; well above lower ocular line; a ridge extends from clypeal border to toruli; antenna with 11 segments; antennal formula 1.1.3.3.3; scape 5.8x width; pedicel 3.22x scape; F_1 1.77x pedicel; F_2 0.87x F_1 ; F_3 equal to F_2 ; club triarticulate, with terminal spicule, 0.78x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 29:5; pedicel = 9:4; F_1 = 16:5; F_2 = 14:7; F_3 = 14:6; club = 22:8.

Mesosoma: Pronotum short with two rows of deep setigerous punctae; mesoscutum 0.73x width, 1.5x scutellum; midlobe with coarse longitudinal striae from anterior to posterior margin (Fig. 102); median longitudinal sulcus distinct and complete; twelve setae in two rows (8+4) near each notauli; scapula punctate with about sixteen setae; scutellum 0.8x width, with a median longitudinal depression, two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; densely coarsely reticulate; propodeum medially short, 0.2x width, with well developed inverted Y-shaped median carina; spiracle large, nearer to anterior margin and touching lateral margin; submedian areas with dense coarse reticulations; forewing 2.5x maximum width; costal cell long and large; smv with six dorsal setae; mv 1.44x smv; st 0.9x mv; pmv absent. Relative lengths of forewing veins: smv = 25; mv = 36; pmv = 0; st = 4.

Gaster: Collapsible, sessile, acuminate, 0.57x body; length of gaster = 1.7 x mesosoma.

Male : Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 3.iv.1989 (DZCU) FK- 116. Other materials: Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 4. iv. 1989 (FK-49).

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Etymology: The species name is after Kerala State.

Genus *NEOTRICHOPOROIDES* Girault

Neotrichoporoides Girault, 1913 (156): 50. Type species: *Neotrichoporoides uniguttatus* Girault.

Neotrichaporoides 1913 (167): 241, 250. Unnecessary amendment by Girault.

Trichaporoidella Girault, 1913 (167): 223 and 1913 (171): 105. Type species: *Trichaporoidella aenea* Girault (Boucek, 1988 Synonymised).

Tetrastichomorpha Girault, 1913 (167): 227 and (172): 38. Type species : *Tetrastichomorpha flava* Girault. Type species found to be junior synonym of *Neotrichoporoides uniguttatus* Girault by Girault, 1915 (Boucek, 1988 Synonymised).

Aprostoceroloides Girault, 1913 (167): 243. Type species: *Aprostoceroloides speciosus* Girault (Girault, 1915 synonymised *Aprostoceroloides* and placed under *Trichaporoidella*. Boucek, 1988 synonymised both as *Neotrichoporoides*).

Paraprostocetus Girault, 1915 (230): 257. Type species: *Paraprostocetus purpureithorax* Girault. (Later Girault synonymized as *Aprostoceroloides* and Boucek, 1988 synonymised as *Neotrichoporoides*).

Epiquadrastichus Girault, 1915 (230): 258. Type species : *Epiquadrastichus emersoni* Girault by monotypy (Boucek, 1988 synonymised).

Burksia Fullaway, 1955:409. Type species : *Burksia viridimaculata* Fullaway (Graham, 1986 synonymised).

Diagnostic features: Body over 1.5mm long; vertex with line of weak sclerotisation forming an oval area enclosing all three ocelli and connecting lateral ocellus to eye (Fig:107); malar sulcus widening into a triangular subocular fovea (Fig: 103); antenna long and slender with four anelli; funicle segments elongated, length in females more than twice width; F_1 greater than or equal to F_2 ; F_3 distinctly shorter than F_2 ; club always shorter than combined length of last two funicle segments; mesosoma long with relatively long pronotum and short mesoscutum; mesoscutum usually with a median depression; midlobe with one, two or three rows of setae near each notauli; scutellum with submedian grooves distinct and parallel; each lateral lobe with two to four setae; propodeum subhorizontal with median carina and distinct raised wide-meshed reticulations; smv of forewing with more than four dorsal

setae; mv longer than costal cell, at least 6x st (Fig. 109); pmv absent; gaster longer than or equal to mesosoma; first tergite always longest.

Distribution: INDIA (Kerala, Tamilnadu).

Host: Boucek, 1988 reported association with Diptera boring in the Graminae. *Atherigona* species are hosts of *Neotrichoporoides nyemitawus* (Rohwer).

Biology: Unknown.

Discussion: This genus comes near *Aprostocetus* Westwood but can be easily distinguished by the following characters : (i) mesosoma long with a relatively large pronotum and short mesoscutum (In *Aprostocetus*, mesosoma moderate with short to medium pronotum and moderately long mesoscutum); (ii) propodeum with median carina and raised wide-meshed reticulations (In *Aprostocetus*, propodeum with median carina but no raised wide-meshed reticulations); (iii) mv at least 6x st (In *Aprostocetus*, mv always less than 6x st); (iv) malar sulcus always widening into a triangular subocular fovea (In *Aprostocetus*, subocular fovea rarely seen); (v) antenna with F₂ longer than F₃ (In *Aprostocetus*, F₂ not always longer than F₃); (vi) mesoscutum usually without median longitudinal sulcus (In *Aprostocetus*, mesoscutum may be with median longitudinal sulcus).

Remarks: Only one species is reported from India . The present work reports seven species, of which six are new to science and all are new records for Kerala. A key to species of Indian region is also given.

KEY TO INDIAN SPECIES OF *NEOTRICHOPOROIDES* GIRAULT

1. Mesoscutal midlobe with median longitudinal sulcus
..... *N. silentvalleyensis* sp. nov.
- Mesoscutal midlobe without median longitudinal sulcus 2
2. Mesosoma and gaster lemon yellow with black or brown patches
..... *N. helvolus* sp. nov.
- Mesosoma and gaster not lemon yellow (black or dark brown with
green reflections) 3
3. Gaster with a basal yellow patch *N. choti* sp. nov.
- Gaster without a basal yellow patch 4
4. smv with five dorsal setae *N. nyemitawas* (Rohwer)
- smv with more than five dorsal setae 5
5. Gaster more than 1.5x mesosoma *N. moti* sp. nov.
- Gaster not more than 1.5x mesosoma 6
6. Mesoscutum subequal to scutellum *N. agaliensis* sp. nov

-- Mesoscutum distinctly shorter than scutellum
..... *N.malampuzhensis* sp.nov.

***Neotrichoporoides agaliensis* sp. nov.**

(Figs. 103-108)

Female: Length 3.22mm. Head black with bright metallic green reflections; yellow clypeal margin, rim of eye and a line extending to scrobes from clypeal margin; eyes and ocelli coppery red; antenna dark brown with yellow ventral scape; mesosoma black with bright metallic green reflections; legs entirely yellow with greenish base of midcoxa and hindcoxa; gaster black with green reflection; wings hyaline, veins brown; pubescence on body pale brown.

Head: Non-collapsing, width in dorsal view very slightly more than mesosoma ; vertex with line of weak sclerotisation enclosing all three ocelli in an oval area and connecting lateral ocellus with eye; POL 1.66x OOL; eyes sparsely pubescent; frons with setigerous punctae; malar sulcus complete, widening into a triangular subocular fovea; antennal toruli well above lower ocular line; twelve-segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape 5x width; pedicel 0.5x scape; F₁ 1.66x pedicel; F₂ 0.96x F₁; F₃ 0.79x F₂; club triarticulate, 0.55x combined length of last two funicle segments; flagellum densely setose. Relative length: width of

antennal segments: scape = 30:6; pedicel = 15:5; $F_1 = 25:6$; $F_2 = 24:5$; $F_3 = 19:5$; club = 24:6.

Mesosoma: Pronotum long, concave posteriorly with a row of twelve strong setae; densely coarsely reticulate; mesoscutum less than half its width, subequal to scutellum; striato-reticulate; median longitudinal sulcus absent; median depression in centre; eight setae in two rows near each notauli; scutellum subequal to width with four pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.4x width with well developed median carina and lateral carinae; submedian areas with raised wide-meshed reticulations; paraspircular carina absent; propodeal spiracle small, separated from anterior margin by 1.5x its diameter; forewing thrice maximum width; smv with seven dorsal setae; mv more than 1.5x smv; st 0.09x mv (mv = 10.5x st); pmv absent. Relative lengths of forewing veins: smv = 27; mv = 42; pmv = 0; st = 4.

Gaster: Non-collapsible, petiolate, convex, acuminate; first tergite largest, reaching 0.25 of gaster; a pair of long sinuate cercal setae; length of gaster = 1.22 x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Palakkad Agali Coll. Narendran and party 12.xii.1987 (DZCU) FK- 68. Other materials: 2 Females INDIA Kerala Palakkad Malampuzha

Coll. Narendran and party 11. xii.1987 (FK-128, FK-151); 6 Females of same data as holotype (FK-121, FK-122, FK-127, FK-129, FK-132, FK-133); Female INDIA Kerala Palakkad Kalkandi Coll. Narendran and party 13.xii.1987 (FK-152).

Distribution: INDIA (Kerala: Palakkad).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Neotrichoporoides nyemitawus* (Rohwer) but differs from it in the following characters: (i) smv with seven dorsal setae (In *N.nyemitawus*, smv with five dorsal setae); (ii) mesoscutum with eight setae in two rows near each notauli (In *N.nyemitawus*, mesoscutum with six setae in two rows near each notauli); (iii) scutellum with four pairs of setae (In *N.nyemitawus*, scutellum with three pairs of setae).

Etymology: This species is named after its locality.

***Neotrichoporoides choti* sp. nov.**

(Figs. 109-114)

Female: Length 2.4mm. Head yellow with brownish frons and vertex; eyes and ocelli dark brown; antenna brown with paler scape and pedicel; mesosoma brown with green reflections and with brownish yellow

regions in pronotal sides; legs entirely yellow with brown terminal tarsi and darker midcoxa and hindcoxa; gaster dark brown with a yellow area basally; wings hyaline, veins pale brown; pubescence on body pale brown.

Head: Collapsing, width in dorsal view slightly more than mesosoma; vertex concave posteriorly with line of weak sclerotisation enclosing all three ocelli in an oval groove and connecting lateral ocellus with eye; POL 1.28x OOL; eyes pubescent; malar sulcus distinct and complete widening into a triangular subocular fovea; antennal toruli above lower ocular line; mandible bidentate; twelve segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape 4.6x width; pedicel 0.43x scape; four anelli; F_1 twice pedicel; F_2 0.9x F_1 ; F_3 0.83x F_2 ; club triarticulate, 0.71x combined length of last two funicle segments. Relative length: width of antennal segments: scape = 23:5; pedicel = 10:5; F_1 = 20:5; F_2 = 18:5; F_3 = 15:5; club = 23:6.

Mesosoma: Pronotum concave posteriorly with a row of strong setae along posterior border; mesoscutum 0.47x width; eight setae in two rows near each notauli; median longitudinal depression present; scutellum longer than mesoscutum, with three pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum with a median carina; submedian areas with raised wide-meshed reticulations; paraspircular carina absent; spiracle small, nearer to anterior propodeal margin; forewing reaching much beyond tip of gaster; smv with seven dorsal setae; mv 1.53x smv; st 0.12x mv

(mv = 8x st); pmv absent. Relative lengths of forewing veins : smv = 26; mv = 40; pmv = 0; st = 5.

Gaster: Collapsible, subsessile, subequal to mesosoma in width, acuminate beyond middle; base of gaster with a yellow area extending to level of second tergite, a small notch at base of gaster; ovipositor exerted (length = 0.1mm); length of gaster = 1.48 x mesosoma.

Male: Unknown.

Materials examined: Holotype : Female INDIA Kerala Malappuram Calicut University campus Coll.Surekha 26.iv.1989 (DZCU) FK-145. Other materials: Female INDIA Kerala Malappuram Calicut University campus Coll. Narendran i.1982 (FK-67); Female INDIA Kerala Palakkad Parambikulam Coll. Narendran and party 22.xii.1985 (FK-46); Female INDIA Kerala Palakkad Malampuzha Coll. Narendran and party i.1986 (FK-141); Female INDIA Kerala Malappuram Nilambur Coll. Narendran and party 11.viii.1987 (FK-146); Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 26.ix.1988 (FK-149); Female INDIA Kerala Kozhikode Moodady Coll. Narendran and party 30.x.1988 (FK-130); 2 Females INDIA Kerala Thiruvananthapuram Neyyadam Coll. Narendran and party 24.ii.1989 (FK-139, FK-140); Female INDIA Kerala Kollam Neendakara Coll.Narendran and party 22.ii.1989 (FK-143); Female INDIA

Kerala Malappuram Calicut University campus Coll.Surekha 29.iv.1989 (FK-150).

Distribution: INDIA (Kerala: Malappuram, Kozhikode, Palakkad, Kollam, Thiruvananthapuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species shows resemblance with *Neotrichoporoides agaliensis* sp.nov. in having: (i) seven dorsal setae on smv; (ii) mesoscutum with eight setae in two rows near each notauli and differs from it in the following characters: (i) size = 2.4mm (In *N. agaliensis*, size 3.22mm); (ii) gaster dark brown with a yellow patch basally (In *N. agaliensis*, gaster uniformly black with bright metallic green);(iv) mesosoma brown with green reflection, brownish yellow rim of pronotum and axilla (In *N. agaliensis*, mesosoma uniformly black with green reflection).

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

Remarks: In some paratypes more brownish yellow regions in scapula, axilla and lateral pronotum; smv with six dorsal setae in some paratypes. Figure of forewing is that of paratype (FK-149).

***Neotrichoporoides helvolus* sp. nov.**

(Figs. 115-118)

Female: Length 1.86mm. Head lemon yellow with brown frons and face; ocelli and one eye brown, other eye silvery white; antenna brown with yellow ventral scape and anelli; mesosoma lemon yellow with a characteristic black strip along middle; axilla and scapula each with a black patch; legs lemon yellow with brown terminal two tarsi; gaster yellow with brown border extending to fourth tergite enclosing a yellow oval area; wings hyaline, veins brown; pubescence on body cream.

Head: Collapsing, width in dorsal view subequal to mesosoma; vertex with line of weak sclerotisation enclosing all three ocelli in an oval area and connecting lateral ocellus with eye; eyes bare; malar sulcus distinct and complete widening into a triangular subocular fovea; antennal toruli slightly above lower ocular line; mandible tridentate; twelve-segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape more than 4x width; pedicel more than 0.5x scape; F_1 2.5x pedicel, longer than F_2 ; F_2 much longer than F_3 ; club triarticulate, 0.64x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = $17^+ : 4$; pedicel = $8 : 3$; $F_1 = 17.5 : 4.5$; $F_2 = 17 : 5$; $F_3 = 14 : 5$; club = $20 : 6$.

Mesosoma: Pronotum posteriorly concave with a row of long setae along posterior border; mesoscutum 0.44x width; five setae in a row along

each notauli; median lobe with a median brown area similar to its shape; median longitudinal sulcus absent; median depression seen; scapula and axilla with a brown patch anteriorly; striato-reticulate; scutellum longer than mesoscutum, with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves, midlobe brown in colour; reticulations as on mesoscutum; propodeum with a median carina and raised wide-meshed reticulations; paraspiracular carina absent; spiracle small, almost touching anterior propodeal margin; forewing 3.07x maximum width; smv with six dorsal setae; mv more than 2.5x smv; st 0.13x mv (mv = 7.4 x st); pmv absent. Relative lengths of forewing veins: smv = 20; mv = 52; pmv = 0; st = 7.

Gaster: Collapsible, sessile, slightly broader than mesosoma; 0.5x body; yellow with brown border up to fourth tergite and cross-shaped brown area along fourth and fifth tergites; tip of gaster brown; length of gaster = 1.33x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Palakkad Malampuzha Coll. Narendran and party 11. xii. 1987 (DZCU) FK-8. Other materials: 2 Females of same locality and collector as holotype but for dates i.1986 and 11.xii.1987 (FK-9, FK- 12); 5 Females collected from Malappuram Calicut University campus by Surekha on 12.x.1988, 3.iv.1989,

3.iv.1989, 10.iv.1989 and 29.iv.1989 (FK-63, FK-62, FK-60, FK-10 and FK-11 respectively); Female INDIA Kerala Palakkad Kalkandi Coll. Narendran and party 13.xii.1987 (FK-52); Female INDIA Kerala Kozhikode Mavoor Coll. Narendran and party 14.x.1988 (FK-61); Female INDIA Kerala Thiruvananthapuram Neyyardam Coll. Narendran and party 24.ii.1989 (FK-138); Female INDIA Kerala Kannur Velannur Coll. Mohana 24.xii.1999 (FK-162).

Distribution: INDIA (Kerala: Palakkad, Malappuram, Kozhikode, Thiruvananthapuram, Kannur).

Biology: Unknown.

Discussion: This species differs from all other species of *Neotrichoporoides* in its characteristic lemon yellow colour with brown patches.

Etymology: The species name in Latin means yellow colour.

Remarks: Length of scape in actual is more than the given measurement.

***Neotrichoporoides malampuzhensis* sp. nov.**

(Figs. 119-124)

Female: Length 2.43mm. Head yellow with dark brown frons, vertex and occiput; eyes white; ocelli brown; antenna dark brown with proximal 0.75

scape yellow; mesosoma dark brown with green reflections and yellowish brown anterior pronotum; legs entirely brownish yellow with darker hindcoxa; gaster dark brown with very pale reflections; wings hyaline, veins yellow; pubescence on body pale brown.

Head: Non-collapsing, width in dorsal view slightly less than mesosoma; vertex with line of weak sclerotisation enclosing all three ocelli in an oval groove and connecting lateral ocellus to eye; POL 1.71x OOL; eyes pubescent; malar sulcus complete, widening into a triangular subocular fovea; antennal toruli well above lower ocular line; twelve -segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape 5.5x width; pedicel 0.42x scape; four anelli; F_1 1.53x pedicel; F_2 0.97x F_1 ; F_3 0.80x F_2 ; club triarticulate, 0.61x combined length of last two funicle segments; flagellum densely setose. Relative length : width of antennal segments: scape = 33:6; pedicel = 14:6; F_1 = 21.5:6; F_2 = 21:6; F_3 = 17:6; club = 26:7.

Mesosoma: Pronotum long, concave posteriorly with a row of sixteen setae; densely reticulate; mesoscutum 0.44x width, 0.89x scutellum; median depression present; nine setae in two rows (8+1) near each notauli; densely striato-reticulate; scutellum 0.95x width with four pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.25x width with well developed median and lateral carinae; paraspircular carina absent; submedian area with raised wide

meshed reticulations; spiracle small, separated from anterior margin by 0.75x diameter; forewing 3.34x maximum width; smv with seven dorsal setae; mv 1.55x smv; st 0.09x mv (mv = 10.3x st); pmv absent. Relative lengths of forewing veins: smv = 20; mv = 31; pmv = 0; st = 3.

Gaster: Collapsible, petiolate, conic-ovate, 0.52x body, first tergite largest, reaching 0.28 of gaster; a pair of long sinuate cercal setae present; length of gaster = 1.47x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Palakkad Malampuzha Coll.Narendran and party i.1986 (DZCU) FK-142. Other materials: 2 Females INDIA Kerala Palakkad Malampuzha Coll. Narendran and party 19.i.1988 (FK-159, FK-160).

Distribution: INDIA: Kerala (Palakkad).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Neotrichoporoides agaliensis* sp. nov. but differs from it in the following characters: (i) head yellow with dark brown frons, vertex and occiput (In *N. agaliensis*, head black with bright metallic green reflections, yellow clypeus, rim of eye and line extending from clypeus to scrobes; (ii) mesoscutum short, 0.89x scutellum (In *N. agaliensis*,

mesoscutum as long as scutellum); (iii) propoedum short, 0.25x width (In *N. agaliensis*, propodeum 0.4x width); (iv) gaster 1.47x mesosoma (In *N. agaliensis*, gaster 1.22x mesosoma); (v) body length 2.43mm (In *N. agaliensis*, body length 3.22mm).

Etymology: The species name is after its locality.

Neotrichoporoides moti sp. nov.

(Figs.124-131)

Female: Length 2.56mm. Head reddish brown with yellow clypeus and two vertical lines from clypeus to toruli; eyes and ocelli brown; antenna dark brown with yellow ventral scape; mesosoma black with green reflections; legs yellow with black midcoxa, hindcoxa and terminal tarsi; gaster dark reddish brown; wings hyaline, veins pale brown; pubescence on body pale brown.

Head: Non-collapsing, width in dorsal view more than mesosoma; vertex with line of weak sclerotisation enclosing all three ocelli in an oval groove and connecting lateral ocellus to eye; POL 2.22x OOL; eyes pubescent; malar sulcus complete widening into a subocular fovea; antennal toruli above lower ocular line; twelve-segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape 5.5x width; pedicel 0.45x scape; four anelli; F_1 1.6x pedicel; F_2 0.91 x F_1 ; F_3 0.86x F_2 ; club triarticulate, 0.60x combined length of last two funicle segments; flagellum densely setose.

Relative length: width of antennal segments: scape = 33:6; pedicel = 15:5; F_1 = 24:7; F_2 = 22:7; F_3 = 19:7; club = 25:8.

Mesosoma: Pronotum large, concave posteriorly with a row of setae along posterior border; mesoscutum 0.52x width, 0.86x scutellum; median longitudinal depression slightly seen; seven setae in two rows near each notauli; striato-reticulate; scutellum 0.95x width with three pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.53x width with well developed median and lateral carinae; paraspiracular carina absent; submedian areas with raised wide-meshed reticulations; spiracle small, separated from anterior margin by 0.5x diameter and from lateral margin by 1.5x diameter; forewing 2.9x maximum width; smv with seven dorsal setae; mv 1.66x smv; pmv absent; st 0.12x mv (mv = 8.33x st). Relative lengths of forewing veins: smv = 15; mv = 25; pmv = 0; st = 3.

Gaster: Collapsible, petiolate, convex, 0.57x body; first tergite 0.2 of gaster; length of gaster = 1.80 x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Alappuzha Kayamkulam CPCRI Coll. Narendran and party 20.ii.1989 (DZCU) FK-161.

Distribution: INDIA (Kerala: Alappuzha).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Neotrichoporoides agaliensis* sp. nov. but differs from it in the following characters: (i) gaster 1.8x mesosoma (In *N. agaliensis*, gaster 1.22x mesosoma); (ii) propodeum 0.53x width; (In *N. agaliensis*, propodeum 0.4x width); (iii) mv 8.33x st (In *N. agaliensis*, mv 10.5x st); (iv) POL 2.22x OOL (In *N. agaliensis*, POL 1.66x OOL); (v) body length 2.56mm. (In *N. agaliensis*, body length 3.22mm).

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

***Neotrichoporoides nyemitawus* (Rohwer)**

(Figs. 132-136)

Tetrastichus nyemitawus Rohwer, 1921. *Ann. Mag. Nat. Hist.* 7: 131.

Neotrichoporoides nyemitawus (Rohwer) Noyes, 2001. CD Rom *Taxapad*.

Female: Length 2.23mm. Head black with metallic green reflections; yellow face, lower gena and rim of eye; eyes and ocelli brown; antenna brown with yellow ventral scape; mesosoma black with metallic green reflections; legs yellow, with black midcoxa, hindcoxa and terminal two tarsi; gaster black, with green reflection; wings hyaline, veins brown; pubescence on body white.

Head: Non-collapsing, width in dorsal view slightly more than mesosoma; vertex concave posteriorly with a line of weak sclerotisation enclosing all three ocelli in an oval groove and connecting lateral ocellus to eye; POL slightly more than OOL; eyes bare; malar sulcus distinct and complete, widening into a triangular subocular fovea; antennal toruli well above lower ocular line; twelve-segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape about 5x width; pedicel less than 0.5x scape; four anelli; F_1 2.42x pedicel; F_2 0.70x F_1 ; F_3 0.91x F_2 ; club triarticulate, 0.69x combined length of last two funicle segments. Relative length: width of antennal segments: scape = 14:3; pedicel = 7:5; F_1 = 17:5; F_2 = 12:5; F_3 = 11.5:4; club = 16:5.

Mesosoma: Pronotum concave posteriorly, with a row of ten strong setae along posterior border; mesoscutum 0.54x width; six setae in two rows (5+1) near each notauli; median longitudinal depression prominent; striato-reticulate; scutellum 0.79x width, longer than mesoscutum, with three pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum with median carina; pairespiracular carina absent; submedian areas with wide-meshed reticulations; spiracles small; forewing 2.68x maximum width, exceeding tip of gaster; smv with five dorsal setae; costal cell narrow and long; three basal setae; speculum closed below; mv 2.7x smv, with sixteen setae; st 0.14x mv (mv = 7x st); pmv absent. Relative lengths of forewing veins: smv = 13; mv = 35; pmv = 0; st = 5.

Gaster: Collapsible, sessile, 0.47x body; acuminate beyond middle; base with a small semicircular notch; first tergite largest, reaching 0.3 of gaster; second tergite smallest, 0.08 of gaster; length of gaster = 1.1x mesosoma.

Materials examined: Plesiotype: Female INDIA Kerala Kozhikode Adivaram Coll. Fousi 11.iv.2000 (DZCU) FK-16. Other materials: Female INDIA Kerala Malappuram Edakkara Coll. Narendran and party 24.iv.1989 (FK-144).

Distribution: INDIA (Tamilnadu, Kerala: Kozhikode, Malappuram).

Host: *Anthomyid* sp., *Atherigona* sp. on shoot of *Sorghum vulgare*.

Biology: Unknown.

Discussion: This species comes close to *Neotrichoporoides agaliensis* sp. nov. but differs from it in the following characters: (i) smv with five dorsal setae (In *N. agaliensis*, smv with seven dorsal setae); (ii) mesoscutum with six setae in two rows near each notauli (In *N. agaliensis*, mesoscutum with eight setae in two rows near each notauli); (iii) mesoscutum more than half its width (In *N. agaliensis*, mesoscutum less than half its width); (iv) scutellum 0.79x width (In *N. agaliensis*, scutellum 0.55x width).

Remarks: Original description is inadequate. So a redescription is made. In the plesiotype, mv is 2.7x smv. In original description, mv about

two times smv. Size of plesiotype 2.23mm against 3mm in original description. These may be variations.

***Neotrichoporoides silentvalleyensis* sp. nov.**

(Figs. 137-144)

Female: Length 3.44mm. Head reddish brown with slight reflections, yellow clypeus and two vertical lines from clypeus to toruli; eyes and ocelli brown; antenna dark brown with yellow ventral scape; mesosoma black with green reflections; legs yellow with proximal 0.75 coxa dark brown; gaster reddish brown; wings hyaline, veins pale brown; pubescence on body brown.

Head: Non-collapsing, width in dorsal view more than mesosoma; vertex with line of weak sclerotisation enclosing all three ocelli in an oval groove and connecting lateral ocellus to eye; POL twice OOL; eyes bare; malar sulcus distinct and complete widening into a subocular fovea; antennal toruli above lower ocular line; twelve-segmented antenna with long funicle segments; antennal formula 1.1.4.3.3; scape 4.1x width; pedicel 0.36x scape; F_1 2.66x pedicel; F_2 0.79x F_1 ; F_3 0.94x F_2 ; club triarticulate, spiculate, 0.85x combined length of last two funicle segments. Relative length : width of antennal segments: scape = 25:6; pedicel = 9:4; F_1 = 24:5; F_2 = 19:5; F_3 = 18:5; club = 23:5.

Mesosoma: Pronotum large, concave posteriorly with a row of ten long setae along posterior border; mesoscutum 0.48x width, 0.86x scutellum;

median longitudinal sulcus distinct and complete; eight setae in two rows near each notauli; striato reticulate; scutellum 1.1x width with three pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.30x width, with well developed median carina and lateral carinae; paraspiracular carina absent; submedian areas with raised wide-meshed reticulations; spiracle small, separated from anterior margin by its diameter and from lateral margin by twice its diameter; forewing 3.12x maximum width; smv with five dorsal setae; mv 2.1x smv; pmv absent; st 0.075x mv (mv = 13.3x st). Relative lengths of forewing veins: smv =19; mv = 40; pmv = 0; st = 3.

Gaster: Collapsible, petiolate, conic-ovate; 0.52x body; first tergite reaching 0.25 of gaster; length of gaster = 1.44x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Palakkad Silent Valley Coll. Narendran and party 15.v.1985. (DZCU) FK-131.

Distribution: INDIA (Kerala: Palakkad).

Host: Unknown.

Biology: Unknown.

Discussion: This species differs from all other species of *Neotrichoporoides* in having a well developed median longitudinal sulcus on

mesoscutum. All other species of *Neotrichoporoides* have only a median longitudinal depression on mesoscutum.

Etymology: This species is named after its locality.

Genus *TETRASTICHUS* Haliday

Tetrastichus Haliday, 1844: 297-298. Type species: *Cirrospilus attalus* Walker by monotypy. Not *Tetrastichus* Walker, 1842:116, a name suppressed by Opinion 720, ICZN.

Ennetoma Dahlbom, 1857: 292. Type species: *Eulophus hylotomarum* Bouché, by designation of Graham (1990: 198) [Graham, 1990 synonymised].

Solenoderus Motschulsky, 1863: 71. Type species: *Solenoderus cyaniventris* Motschulsky by monotypy [Boucek, 1965 synonymised].

Lygellus Giard, 1896: 839. Type species: *Lygellus epilachnae* Giard by monotypy [Domenichini, 1966a synonymised].

Ceratoneuromyia Girault, 1913 [167]: 252. Type species: *Ceratoneuromyia arnoldi* Girault (Boucek, 1988 synonymised).

Pseudomphaloides Girault, 1915 [230]: 258. Type species: *Pseudomphaloides aenellus* Girault [Boucek, 1988 synonymised].

Redinia Girault, 1936 [447]: 4. Type species: *Redinia hispidivertex* Girault by monotypy [Boucek, 1988 synonymised].

Diagnostic features: Propodeum subhorizontal with an inverted Y-shaped median carina joining inverted Y-shaped paraspiracular carinae; submedian areas of propodeum densely reticulate; smv with one or two dorsal setae; mesoscutum usually with a median longitudinal sulcus.

Distribution: All major regions including New Guinea, Australia and New Zealand (INDIA: Kerala, Uttar Pradesh, Tamilnadu, Karnataka, Delhi, Orissa, Andra Pradesh; Srilanka, Pakistan, Bangladesh, Taiwan).

Host: Chrysomelid beetles, pupae of various Lepidoptera, larvae of certain sawflies.

Discussion: This genus comes close to *Aprostocetus* Westwood but can be easily distinguished by the following characters: (i) propodeum with well developed inverted Y-shaped median carina joining inverted Y-shaped paraspiracular carinae (In *Aprostocetus*, propodeum without inverted Y-shaped paraspiracular carina); (ii) smv with one or two dorsal setae (In *Aprostocetus*, smv usually with three or more dorsal setae); (iii) submedian areas of propodeum densely reticulate (In *Aprostocetus*, submedian areas usually smooth without prominent reticulations).

Remarks: 36 species are reported from Indian subcontinent. The present investigation reports 12 species from Kerala, including 2 new reports from Kerala and 9 new to Science. A key to Indian species of this genus is also provided.

KEY TO INDIAN SPECIES OF *TETRASTICHUS* Haliday

1. Males 2
- Females 3
2. Anellus one; funicle segments gradually becoming shorter and thicker
..... *T. plecopterae* Kurian
- Anelli three; funicle segments not gradually becoming shorter and
thicker ($F_1 < F_2 = F_3 = F_4$) *T. ootyensis* Saraswat
3. Anelli four 4
- Anelli fewer than four 5
4. Mesoscutum with a complete median longitudinal sulcus; F_1 equal to
 F_2 ; gaster ovate *T. fasciatus* Ashmead
- Mesoscutum with an incomplete median longitudinal sulcus, seen only
posteriorly; F_1 distinctly longer than F_2 ; gaster gradually narrowing to
an acute apex *T. isaaci* Rohwer
5. Anelli three 6
- Anelli fewer than three 7

6.	smv with two dorsal setae; mesoscutum without median longitudinal sulcus and with three setae near each notauli	<i>T. chakrataensis</i> Khan	
–	smv with more than two dorsal setae; mesoscutum with median longitudinal sulcus and more than three setae near each notauli	<i>T. saraswati</i> Husain and Khan	
7.	Anelli two		8
–	Anellus one		20
8.	Mesoscutum without median longitudinal sulcus	<i>T. misellus</i> Delucchi	
–	Mesoscutum with median longitudinal sulcus		9
9.	Funicle segments subequal in length		10
–	Funicle segments unequal in length		14
10.	Mesoscutal median longitudinal sulcus obliterated anteriorly		11
–	Mesoscutal median longitudinal sulcus distinct and complete		13
11.	smv with a single dorsal seta		12
–	smv with more than one dorsal setae	<i>T. niger</i> Ranaweera	
12.	Ocelli surrounded by a groove; mv longer than smv	<i>T. schoenobii</i> Ferriere	
–	Ocelli not surrounded by a groove; mv shorter than smv	<i>T. keralensis</i> sp. nov.	

13. Gaster distinctly shorter than mesosoma; club distinctly longer than (1.25x) combined length of last two funicle segments *T. latus* sp. nov.
- Gaster equal to combined length of head and mesosoma; club distinctly shorter than (about 0.75x) combined length of last two funicle segments *T. taprobanensis* Ranaweena
14. Gaster rounded, shorter than mesosoma *T. gardneri* Ferriere
- Gaster not rounded, distinctly longer than mesosoma 15
15. Club equal to combined length of F₂ and F₃ 16
- Club longer than combined length of F₂ and F₃ 18
16. smv with a single dorsal seta; mesoscutum with strong median longitudinal sulcus 17
- smv with more than one dorsal seta; mesoscutum with a faint median longitudinal sulcus *T. versicolor* Ranaweera
17. Mesoscutum with five setae near each notauli *T. corvinus* sp. nov.
- Mesoscutum with eleven setae near each notauli *T. carus* sp. nov.
18. mv more than 1.5x smv 19
- mv less than 1.5x smv (only slightly longer than smv) *T. spirabilis* Waterston

19. Mesoscutum with one seta near each notauli; smv with three dorsal setae *T. obliqua* Khan
 – Mesoscutum with four setae near each notauli; smv with a single dorsal seta *T. sanae* sp. nov.
20. Mesopleura with a large testaceous spot beneath forewing; club equal to combined length of F₁, F₂ and F₃ *T. colemani* Crawford
 – Mesopleura without a testaceous spot beneath forewing; club not equal to combined length of F₁, F₂ and F₃ 21
21. Malar sulcus distinct 22
 – Malar sulcus absent *T. davidi* Khan
22. Mesoscutum without median longitudinal sulcus 23
 – Mesoscutum with distinct median longitudinal sulcus 25
23. Gaster distinctly longer than mesosoma *T. mangifera* Khan
 – Gaster distinctly shorter than mesosoma 24
24. Club very nearly equal to combined length of F₁, F₂ and F₃; submedian and sublateral grooves of scutellum distinct *T. partellus* Khan
 – Club much shorter than combined length of F₁, F₂ and F₃; submedian and sublateral grooves of scutellum faint *T. sexmaculatus* Kurian
25. smv with a single dorsal seta 26
 – smv with more than one dorsal seta 31
26. POL twice OOL 27
 – POL less than twice OOL 30

27. Club shorter than (0.85x) combined length of last two funicle segments
..... *T. orissaensis* Husain and Khan
- Club distinctly longer than combined length of last two funicle
segments 28
28. smv distinctly shorter than mv 29
- smv distinctly longer than mv *T. rividus* sp. nov.
29. Funicle segments gradually decreasing in length; mesoscutum with an
anteriorly indistinct median longitudinal sulcus and four setae near
each notauli *T. kozhikodensis* sp. nov.
- Funicle segments not gradually decreasing in length (F₂ longest);
mesoscutum with distinct median longitudinal sulcus and five setae
near each notauli *T. malappurensis* sp. nov.
30. Funicle segments of equal thickness; club distinctly longer than (1.17x)
combined length of last two funicle segments *T. festivus* sp. nov.
- Funicle segments gradually thickening; club subequal to combined
length of last two funicle segments *T. epilachnae* (Giard)
31. smv with four dorsal setae *T. mohani* Khan
- smv with two dorsal setae 32
32. POL 3.5x OOL *T. punjabensis* Kurian
- POL less than 3.5x OOL 33
33. POL thrice OOL; smv equal to mv *T. krishnaiahi* Saraswat
- POL less than thrice OOL; smv longer than mv 34

34. POL 2.25x OOL; club shorter than combined length of last two funicle segments *T. coorgensis* Kurian
- POL twice OOL; club equal to combined length of last two funicle segments 35
35. Body black, non-metallic; propodeum reticulately rugose
 *T. howardi* (Olliff)
- Body metallic green or blue; propodeum finely rugose
 *T. krishnieri* Mani

Unplaced species for want of adequate details:

1. *Tetrastichus cyaniventris* (Motschulsky)
2. *Tetrastichys ellia* Motschulsky
3. *Tetrastichus ophiusae* Crawford
4. *Tetrastichus patannas* Motschulsky

***Tetrastichus carus* sp. nov.**

(Figs. 145-150)

Female: Length 2.62 mm. Head black with slight green reflection; eyes and ocelli brown; antenna brown with pale yellow ventral scape; mesosoma black with green reflection; legs yellow with coxa, hindfemur and terminal tarsi concolorous with mesosoma; gaster brown with green reflection; wings hyaline, veins brown; pubescence on body brown.

Head: Non-collapsing, width in dorsal view slightly less than mesosoma; vertex punctate; POL about 1.5x OOL; eyes pubescent; malar sulcus distinct and complete without a subocular fovea; parascrobal area with setigerous punctures along sides of inner orbit; antennal toruli above lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 5x width; pedicel 0.37x scape; two anelli; F_1 slightly more than 1.5x pedicel; F_2 subequal to F_1 ; F_3 0.75x F_2 , wider than both F_1 and F_2 ; club triarticulate, slightly shorter than combined length of last two funicle segments; antenna except scape densely setose. Relative length: width of antennal segments : scape = 35:7; pedicel = 13:8; F_1 = 21:8; F_2 = 20:8; F_3 = 15:9; club = 35:8.

Mesosoma: Pronotum concave posteriorly, with twelve strong setae along posterior border; mesoscutum very slightly more than half its width, 1.3x scutellum; median longitudinal sulcus distinct and complete; eleven setae more or less in three rows near each notauli; striato-reticulate; scutellum 0.83x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum 0.27x width with well developed median and paraspiracular carinae; submedium areas densely reticulate; spiracle large, separated from anterior propodeal margin by about its diameter; forewing 2.3x maximum width; smv with a single dorsal seta; mv distinctly longer than smv; st 0.25x mv, with narrow base; pmv absent. Relative lengths of forewing veins: smv = 28; mv = 37; pmv = 0; st = 8.

Gaster: Collapsible, sessile, 0.57x body; tip of gaster acuminate; ovipositor slightly exerted; length of gaster = 1.78x mesosoma.

Male : Unknown.

Material examined: Holotype: Female, INDIA Kerala Malappuram Calicut University campus Coll. Surekha 12. iv. 1989 (DZCU) FK-105.

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Tetrastichus spirabilis* Waterston but differs from it in the following characters: (i) size 2.6mm (In *T. spirabilis*, size 2 mm); (ii) eyes pubescent (In *T. spirabilis*, eyes glabrous); (iii) antennal toruli above lower ocular line (In *T. spirabilis*, antennal toruli on lower ocular line); (iv) relative length of F_2 and F_3 is 4:3 (In *T. spirabilis*, $F_2 : F_3 = 7:6$); (v) forewing length 2.3x width (In *T. spirabilis*, forewing 2.5x width).

Etymology: This species is named carus, the Latin word meaning dearer.

Tetrastichus corvinus sp. nov.

(Figs. 151-156)

Female: 1.67mm. Head black; eyes brown; ocelli pale brown; antenna brown with pale brown ventral scape; mesosoma black with slight green reflection; legs cream with coxa and femur concolorous with mesosoma; gaster dark brown with green reflection; wings hyaline, veins brown; pubescence on body pale brown.

Head: Non-collapsing, width in dorsal view subequal to mesosoma; vertex broad, with large setigerous punctae, more concave anteriorly; POL thrice OOL; eyes very sparsely pubescent; malar sulcus distinct and complete without a subocular fovea; antennal toruli on lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 6.5x width; pedicel 0.26x scape; two anelli; F₁ 2.3x pedicel; F₂ 0.78x F₁; F₃ 1.09x F₂; club triarticulate, subequal to combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 23:3.5; pedicel = 6:5; F₁ = 14:6.5; F₂ 11:6.5; F₃ = 12:8; club = 24:10.

Mesosoma: Pronotum slightly concave posteriorly, with a row of setae along posterior border; mesoscutum 0.44x width, longer than scutellum; median longitudinal sulcus distinct and complete; five setae in two rows (3+2) near each notauli; densely striato-reticulate; scutellum 0.73x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves;

reticulations as on mesoscutum; propodeum 0.14x width with well developed median and paraspiracular carinae; spiracle small, almost touching anterior margin and separated from lateral margin by about twice its diameter; forewing more than twice maximum width; smv with a single dorsal seta; mv 1.4x longer than smv, with twelve setae; st 0.32x mv (mv = 3.1x st); pmv absent. Relative lengths of forewing veins: smv = 20; mv = 28; pmv = 0; st = 9.

Gaster: Collapsible, sessile, acuminate, with a pair of long cercal setae; 0.54x body; a semicircular notch at base; length of gaster = 1.62x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Palakkad Malampuzha Coll. Narendran and party 16.i.1986 (DZCU) FK- 66.

Distribution: INDIA (Kerala: Palakkad).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Tetrastichus spirabilis* Waterston but differs from it in the following characters: (i) F_2 0.78x F_1 (In *T. spirabilis*, F_2 equal to F_1); (ii) F_3 1.09x F_2 (In *T. spirabilis*, F_3 0.85x F_2).

Etymology: The species name in Latin meaning black colour.

Tetrastichus festivus sp. nov.

(Figs. 157-160)

Female: 1.69 mm. Head brown with green reflection; eyes and ocelli pale brown; antenna brown with yellowish scape and pedicel; mesosoma dark brown with green reflection; legs cream with brown coxa; gaster brown with green reflection; wings hyaline, veins pale brown; pubescence on body pale brown.

Head: Non-collapsing, width in dorsal view 1.12x mesosoma; eyes bare; POL 1.72x OOL; malar sulcus distinct and complete without a subocular fovea; antennal toruli above lower ocular line; antenna with 9 segments; antennal formula 1.1.1.3.3; scape 5.25x width; pedicel 0.47x scape; single anellus; F_1 1.1x pedicel; F_2 0.86x F_1 ; F_3 1.15x F_2 ; club triarticulate, 1.17x combined length of last two funicle segments; flagellum densely setose. Relative length : width of antennal segments : scape = 21:4; pedicel = 10:4; F_1 = 11.5:5; F_2 = 9.5:5; F_3 = 11:5; club = 24:6.

Mesosoma: Pronotum slightly concave posteriorly, with a row of setae along posterior border; mesoscutum 0.5x width with distinct and complete median longitudinal sulcus; four setae in a row near each notauli; densely striato-reticulate; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum;

propodeum 0.29x width with well developed median and paraspiracular carinae; submedian areas densely reticulate; spiracle small, separated from anterior margin and lateral margin by twice its diameter; forewing 2.43x maximum width; smv with a single dorsal seta; mv 1.5x smv; st narrow at base, 0.22x mv; pmv rudimentary. Relative lengths of forewing veins : smv = 29; mv = 45; pmv = 3; st = 10.

Gaster: Collapsible, 0.56x body; first two tergites somewhat larger than rest; ovipositor exerted; length of gaster = 1.85x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 6.x.1988 (DZCU) FK-126.

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Tetrastichus partellus* Khan but differs from it in the following characters: (i) smv distinctly shorter than mv (In *T. partellus*, smv distinctly longer than mv); (ii) gaster longer than mesosoma (In *T. partellus*, gaster shorter than mesosoma); (iii) F₁ and F₂ about twice width (In *T. partellus*, F₁ and F₂ transverse); (iv) smv with two dorsal setae (In *T. partellus*, smv with single dorsal seta).

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

***Tetrastichus howardi* (Olliff)**

(Figs. 161-166)

Euplectrus (!) *Howardi* Olliff, 1893: *Agr. Gaz. N.S.W.* 4(5): 381-382. NSW
(AMS).

Euplectrus Howardi Olliff. Girault, 1918 corrected the generic name.

Tetrastichus ayyari Rohwer, 1921. *Ann. Mag. Nat. Hist.* 7:129. India:
Coimbatore (USNM) [Boucek, 1988 synonymised).

Aprostocetus israeli Mani & Kurian, 1953. *Indian J. Ent.* 15:20. India.
Cuttack (ZSI) [Boucek, 1988 synonymised).

Tetrastichus inferens Yoshimoto, 1970. *Canad. Ent.* 102 : 1607. Taiwan:
Tainan (CNC, Ottawa) (Boucek, 1988 synonymised).

Female: Length 1.79mm. Head black; eyes and ocelli brown; antenna brown with yellow scape and honeybrown pedicel; flagellum dark brown; mesosoma black; legs brownish yellow with black forecoxa and midcoxa; forefemur testaceous; gaster dark brown with pale reflection; wings hyaline, veins honey brown; pubescence on body black.

Head: Non-collapsing, slightly wider than mesosoma in dorsal view; vertex emarginate, punctate; POL a little more than twice OOL; eyes

pubescent; frons with two rows of setigerous punctures along inner margin of eye; malar sulcus distinct and complete without a subocular fovea; antennal toruli a little below lower ocular line; antenna with 9 segments; antennal formula 1.1.1.3.3; scape 4.71x width; single large anellus; pedicel 0.24x scape; funicle segments gradually becoming shorter; F_1 subequal to pedicel; F_2 and F_3 transverse; F_2 0.66x F_1 ; F_3 0.75x F_2 ; club sharply acuminate, triarticulate, slightly longer than combined length of last two funicle segments; claval spicule present; flagellum densely setose. Relative length: width of antennal segments: scape = 33:7; pedicel = 8:7; F_1 = 18:7; F_2 = 12:11; F_3 = 9:10; club = 29:9.

Mesosoma: Pronotum concave posteriorly, densely reticulate with strong setae on posterior border; mesoscutum half its width; densely striato-reticulate; median longitudinal sulcus distinct, slightly obliterated anteriorly; a row of four setae near each notauli; scutellum subequal to width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; mesoscutum and scutellum subequal in length; propodeum 0.33x width with well developed median and paraspiracular carinae; submedian areas shining, with coarse reticulations; spiracle large, separated from anterior margin by its diameter; forewing slightly more than twice maximum width; smv with two dorsal setae; mv slightly less than twice smv; st narrow at base, about 0.25x mv (mv = 5x st);

pmv absent. Relative lengths of forewing veins: smv = 25; mv = 45; pmv = 0; st = 9.

Gaster: Collapsible, sessile, subequal to mesosoma, 0.4x body; tergites smooth, shining; length of gaster = 0.94x mesosoma.

Male: Unknown.

Materials examined: Plesiotype: Female INDIA Kerala Kasargod Coll. Sujatha 15. xi.1998 (DZCU) FK-17. Other materials: 26 Females of same data as plesiotype (FK-19 to FK-45).

Distribution: Throughout Oriental region and eastern Australia.

Hosts: *Anadevidia peponis* (Fabricius); *Argyria* sp.; *Attacus ricini* Boisduval; *Bethylectes curculionis* (Thomson); *Chilo auricilia* Ddgn; *Chilo infuscatellus* (Snellen); *Chilo partellus* (Swinhoe); *Chilo sacchariphagus indicus* (Kapur); *Chilo sacchariphagus* (Walker); *Chilo simplex* feeding on *Sorghum vulgare*; *Chilo suppressalis* (Walker); *Chilo venosatus*; *Chilo zonellus*; *Cnaphalocrocis medinalis* (Guenee); *Crocidolomia binotalis* Zeller; *Diatraea sticticrasis* Hampson; *Dysodia viridatrix* (Walker); *Galleria melonella* (Linnaeus); *Heliothis armigera* (Hubner); *Hyblaea puer*(Cramer); *Mythimna albistigma* Moore; *Opisina arenosella* (Walker); *Pectinophora gossypiella* (Saunders); *Plutella xylostella*(Linnaeus); *Polytela gloriosae* Fabricius; *Precis orithya* Linnaeus; *Schoenobius bipunctifer*; *Scirpophaga*

incertulus (Walker); *Sesamia inferens* (Walker); *Spodoptera litura* (Fabricius); *Spodoptera mauritia* Boisduval; *Sylepta derogata* (Fabricius).

Biology: Unknown.

Discussion: This species resembles *Tetrastichus coorgensis* (Kurian) comb. nov. in having F_1 longer than F_2 and F_3 individually but differs from it in the following characters: (i) club distinctly longer than combined length of F_2 and F_3 (In *T.coorgensis*, club slightly shorter than combined length of F_2 and F_3); (ii) scape about twice pedicel (In *T. coorgensis*, scape thrice pedicel); (iii) mv 1.8x smv (In *T. coorgensis*, mv less than smv).

Remarks: This species is known to occur in a wide variety of hosts.

***Tetrastichus keralensis* sp. nov.**

(Figs. 167-172)

Female: Length 2.16mm. Head dark brown with bright metallic green reflection; eyes brown with silvery white regions; ocelli dark reddish brown; antenna honeybrown with lemon yellow scape; mesosoma black with bright metallic green reflection; legs creamy white with basal hindcoxa and terminal tarsi concolorous with mesosoma; gaster black with bright metallic green reflection; wings hyaline, veins brown; pubescence on body light brown.

Head: Collapsing, width in dorsal view slightly less than mesosoma; vertex narrow, emarginate both anteriorly and posteriorly; sparsely setose;

POL slightly more than 2.5x OOL; eyes bare; frons with line of setae along sides of inner orbit and another line from toruli to median ocellus; malar sulcus distinct and complete without a subocular fovea; antennal toruli on lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 5.4x width; pedicel 0.25x scape; two anelli; funicle segments subequal in length; F_1 twice pedicel; F_2 equal to F_1 ; F_3 0.95x F_2 ; club triarticulate, 0.87x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 27:5; pedicel = 7:7; F_1 = 20:6; F_2 = 20:7; F_3 = 19:8; club 34:9.

Mesosoma: Pronotum slightly concave posteriorly, with a row of short setae along posterior border; mesoscutum slightly less than 0.5x width, very slightly longer than scutellum; median longitudinal sulcus complete, faint anteriorly; three setae in a row near each notauli; densely striato-reticulate; scutellum 0.8x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.55x width with well developed median and paraspircular carinae; submedian areas shining, densely reticulate; forewing slightly less than 2.5x maximum width; costal cell large; smv with a single dorsal seta; mv less than smv; st about 0.25x mv (mv = 4x st); pmv absent. Relative lengths of forewing veins: smv = 35; mv = 31; pmv = 0; st = 8.

Gaster: Collapsible, sessile, sharply acuminate; more than 0.5x body;
length of gaster = 1.7 x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Kannur Coll. Mohana 23.ii.1999 (DZCU) FK-95. Other materials: 15 Females of same data as holotype (FK-55 to FK-59; FK-64; FK-65; FK-83; FK-87; FK- 89; FK- 94; FK-103; FK-104; FK-109); Female INDIA Kerala Alappuzha Kayamkulam Coll. Narendran and party 21.ii.1989 (FK-125).

Distribution: INDIA (Kerala: Kannur, Alappuzha).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Tetrastichus schoenobii* Ferriere but differs from it in the following characters: (i) mv distinctly shorter than smv (In *T. schoenobii*, mv longer than smv); (ii) ocelli not in grooves (In *T. schoenobii*, ocelli in grooves); (iii) pedicel 0.25x scape (In *T. schoenobii*, pedicel a little shorter than 0.5x scape).

Etymology: The species name is after Kerala State.

***Tetrastichus kozhikodensis* sp. nov.**

(Figs. 173-176)

Female: Length 1.59mm. Head black with slight green reflection; eyes silvery white with a coppery red arch over inner margin; ocelli pale yellow; antenna entirely dark brown with pale yellow scape; mesosoma black with slight green reflection; legs yellow with dark brown coxa, proximal femur, terminal tarsi and claw; gaster black with slight green reflection; wings hyaline, veins brown; pubescence on body dark brown.

Head: Non-collapsing, width in dorsal view subequal to mesosoma; vertex large with strong erect setae, anteriorly with a notch in the middle; POL about twice OOL; eyes pubescent; malar sulcus distinct and complete without a subocular fovea; antennal toruli above lower ocular line; antenna with 9 segments; antennal formula. 1.1.1.3.3; scape 6x width; pedicel 2.66x scape; single anellus; funicle segments gradually decreasing in length; F_1 1.5x pedicel; F_2 0.88x F_1 ; F_3 0.95x F_2 ; club slightly longer than combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 24:4; pedicel = 9:4; F_1 = 13.5:5; F_2 = 12:5; F_3 = 11.5:5; club = 27:5.

Mesosoma: Pronotum large, concave posteriorly with a row of setae along posterior border; mesoscutum 0.45x width; median longitudinal sulcus indistinct anteriorly; four setae in a row near each notauli; scutellum long with

a two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum with well developed median and paraspiracular carinae; submedian areas densely reticulate; spiracle large, separated from anterior margin by half its diameter; forewing 2.31x maximum width; smv with single dorsal seta; mv with nine setae, 1.38x smv; st 0.27x mv (mv = 3.6 x st); pmv absent. Relative lengths of forewing veins: smv = 26; mv =36; pmv =0; st =10.

Gaster: Collapsible, sessile, subequal to 0.5x body; epipygium with a pair of long sinuate cercal setae; length of gaster = 1.48x mesosoma.

Male: Unknown.

Material examined: Holotype : Female INDIA Kerala Kozhikode Anakampoyil Coll. Narendran 17.x.1995 (DZCU) FK -87.

Distribution: INDIA (Kerala: Kozhikode).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Tetrastichus colemani* Crawford but differs from it in the following characters: (i) club 0.75x combined length of F₁, F₂ and F₃ (In *T. colemani*, club equal to combined length of F₁, F₂ and F₃); (ii) mesopleura without a large testaceous spot beneath wing (In *T. colemani*, mesopleura with a large testaceous spot

beneath wing); (iii) funicle segments gradually decreasing in length (In *T. colemani* funicle segments subequal in length).

Etymology: This species is named after the district Kozhikode.

***Tetrastichus latus* sp. nov.**

(Figs. 177-180)

Female: Length 1.5mm. Head black with slight green reflection; eyes silvery white; ocelli pale yellow; antenna dark brown with pale brown scape and pedicel; mesosoma black with slight green reflection; legs pale yellow with coxa, anterior 0.75 femur and terminal tarsi dark brown; gaster dark brown with green reflection; wings hyaline, veins brown; pubescence on body pale brown.

Head: Collapsing, width in dorsal view more than mesosoma; vertex narrow, concave both anteriorly and posteriorly; POL slightly less than twice OOL; eyes moderately pubescent; parascrobal area with setigerous punctae along sides of eye; malar sulcus distinct and complete without a subocular fovea; antennal toruli slightly above lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape 3.12x width; pedicel 0.32x scape; two anelli; funicle segments subequal in length; F_1 1.5x pedicel; club triarticulate, 1.29x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 25:8; pedicel = 8:6; F_1 = 12:6; F_2 = 12:6; F_3 = 12:8; club = 31:10.

Mesosoma: Pronotum concave posteriorly, with setae along posterior border; mesoscutum very slightly more than half its width, subequal to scutellum; median longitudinal sulcus distinct and complete; three setae in a row near each notauli; densely striato-reticulate; scutellum 1.11x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.3x width with well developed median and paraspircular carinae; submedian areas densely reticulate; spiracle medium sized, separated from anterior margin and lateral margin by about its diameter; forewing slightly more than twice maximum width; smv with a single dorsal seta; mv 1.27x smv; st 0.21x mv (mv = 4.6x st) pmv absent. Relative lengths of forewing veins: smv = 22; mv = 28.9; pmv = 0; st = 6.

Gaster: Collapsible, petiolate, 0.45x body; shorter than mesosoma; length of gaster = 0.94 x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Malappuram Thalappara Coll. Narendran and party 31.viii. 1987 (DZCU) FK-201.

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Tetrastichus schoenobii* Ferriere but differs from it in the following characters: (i) ocelli not joined to eye-margin (In *T.schoenobii*, ocelli joined to eye-margin by a thin furrow); (ii) club 1.29x combined length of last two funicle segments (In *T.schoenobii*, club subequal to combined length of last two funicle segments); (iii) gaster shorter than mesosoma (In *T.schoenobii*, gaster a little longer than combined length of head and mesosoma); (iv) mesoscutal median longitudinal sulcus well developed (In *T.schoenobii*, mesoscutal median longitudinal sulcus weak and nearly obliterated anteriorly).

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

***Tetrastichus malappurensis* sp. nov.**

(Figs. 181-186)

Female: Length 1.63mm. Head brown with green reflection; eyes brown; ocelli silvery white; antenna entirely brown with pale brown scape and pedicel; mesosoma brown with green reflection; legs creamy white with brown coxa and terminal tarsi; gaster brown with green reflection; wings hyaline, veins brown; pubescence on body brown.

Head: Non-collapsing, width in dorsal view subequal to mesosoma; vertex moderate-sized, strongly concave posteriorly; POL twice OOL; eyes bare; an elliptical groove around the ocelli; parascrobal area with setigerous punctae along sides of inner orbit; malar sulcus distinct and complete without

a subocular fovea; antennal toruli slightly above lower ocular line; antenna with 9 segments; antennal formula: 1.1.1.3.3; scape more than 4x width; pedicel 0.23x scape; single anellus; F_1 twice pedicel; F_2 1.1x F_1 ; F_3 0.90x F_2 ; club triarticulate, 1.19x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 21:5; pedicel = 5:5; F_1 =10:5; F_2 = 11:5; F_3 = 10:5.5; club = 25:7.

Mesosoma: Pronotum concave posteriorly, with a row of strong setae along posterior border; mesoscutum 0.4x width, subequal to scutellum; median longitudinal sulcus distinct and complete; five setae in a row near each notauli; densely striato-reticulate; scutellum 0.8x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.36x width with well developed median and paraspircular carinae; submedian areas densely reticulate; spiracle small, separated from anterior margin by its diameter and from lateral margin by 1.5x its diameter; forewing 2.18x maximum width; smv with a single dorsal seta; mv 2.11x smv; st narrow at base, about 0.2x mv (mv = 6x st); pmv rudimentary. Relative lengths of forewing veins: smv = 17; mv = 36; pmv =2; st = 6.

Gaster: Collapsible, sessile, 0.55x body; tergites subequal; ovipositor exerted (length = 0.1mm); length of gaster = 1.5x mesosoma.

Male: Unknown.

Material examined: Holotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Surekha 22.x. 1988 (DZCU) FK- 54.

Distribution: INDIA (Kerala : Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes close to *Tetrastichus orissaensis* Husain & Khan but differs from it in the following characters: (i) club 1.2x combined length of last two funicle segments (In *T.orissaensis*, club 0.85x combined length of last two funicle segments); (ii) smv 0.5x mv (In *T. orissaensis*, smv only very slightly less than mv); (iii) eyes bare (In *T. orissaensis*, eyes pubescent); (iv) gaster 1.5x mesosoma (In *T. orissaensis*, gaster 1.25x mesosoma).

Etymology: This species is named after Malappuram district.

***Tetrastichus orissaensis* Husain& Khan**

(Figs. 187-192)

Aprostocetus epilachnae Kurian, 1954. *Agra.Univ. J. Res. (Sci.)* 3:129.

(Preoccupied by Giard, 1896).

Tetrastichus orissaensis Husain & Khan, 1986. *Orient. Ins.* 20:211.

Female: Length 1.61mm. Head black with green reflection; eyes silvery white; ocelli yellowish brown; antenna honey brown with lemon yellow scape; mesosoma black with green reflection; legs yellow with dark brown coxa and proximal 0.75 femur; gaster black with green reflection; wings hyaline; veins brown; pubescence on body pale brown.

Head: Non-collapsing, width in dorsal view slightly less than mesosoma; vertex punctate, posteriorly emarginate; occiput emarginate; POL 2.5x OOL; eyes sparsely pubescent; frons with two lines of setigerous punctae; antennal toruli slightly above lower ocular line; malar sulcus distinct and complete with a small subocular fovea; antenna with 9 segments; antennal formula 1.1.1.3.3; scape 7x width, more than 4x pedicel; pedicel 0.22x scape; single large anellus; F₁ 1.75x pedicel; F₂ 1.14x F₁; F₃ subequal to F₁; club triarticulate, spiculate, subequal to combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 35:5; pedicel = 8:6; F₁ = 14:8; F₂ 16:7; F₃ 14:8; club = 30:11.

Mesosoma: Pronotum slightly concave posteriorly, with a row a setae along posterior border; mesoscutum slightly more than 0.5x width, 1:13x scutellum; coarsely striato-reticulate, median longitudinal sulcus distinct and complete; scutellum subequal to width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum 0.5x width

with well developed median carina, paraspircular carinae and another obscure carinae; submedian areas coarsely reticulate; spiracle touching lateral margin and separated from anterior margin by about its diameter; forewing 2.05x maximum width; costal cell large; smv with single dorsal seta; mv slightly longer than smv; st 0.25x mv (mv = 4xst); pmv absent. Relative lengths of forewing veins: smv=41; mv = 44; pmv = 0; st = 11.

Gaster: Short, collapsible, petiolate, conical, 0.45x body; first tergite largest, reaching 0.4 of gaster; length of gaster = 1.2x mesosoma.

Male: Unknown.

Materials examined: Plesiotype: Female INDIA Kerala Malappuram Calicut University campus Coll. Narendran and party 9.x.1986 (FK -13). Other materials: 6 Females collected from *Epipyrops* moths by Dr. Livingston (FK -69, FK - 70, FK-71, FK -72, FK -73, FK - 77).

Distribution: INDIA (Kerala: Malappuram; Razol).

Host: *Epilachna* sp., *Epipyrops* sp.

Discussion: This species comes close to *Tetrastichus krishnaihi* Saraswat mainly in the length of funicle segments and short gaster but differs from it in the following characters: (i) mesoscutum with five setae in a row near each notauli (In *T. krishnaihi*, mesoscutum with four setae near each notauli); (ii) first gastral tergite longest (In *T.krishnaihi*, gastral tergites

subequal in length); (iii) mv slightly longer than smv (In *T. krishnaihi*, mv equal to smv).

Remarks: The above description agrees with *Tetrastichus orissaensis* Husain & Khan for all characters except club shorter than combined length of last two funicle segments ($0.85 \times F_2 + F_3$). In this description, club subequal to combined length of last two funicle segments.

***Tetrastichus rividus* sp. nov.**

(Figs. 193-196)

Female: 1.44 mm. Head black with green reflection; eyes light brown with white reflections; ocelli white; antenna brown with yellow scape and pale brown pedicel; mesosoma black with green reflection; legs yellow with dark brown coxa and proximal 0.75 femur; gaster black with green reflection; wings hyaline, veins brown; pubescence on body pale brown.

Head: Collapsing, eyes moderately pubescent; parascrobal area with setigerous punctae along sides of inner orbit; malar sulcus distinct and complete with slight subocular fovea in high magnification; antennal toruli on lower ocular line; antenna with 9 segments; antennal formula: 1.1.1.3.3; scape 4.28x width; pedicel 0.3x scape; single anellus; F_1 1.55x pedicel; F_2 subequal to F_1 ; F_3 0.85x F_2 ; F_2 and F_3 wider than F_1 ; club triarticulate, 1.26x combined length of last two funicle segments; antenna densely setose except scape.

Relative length: width of antennal segments: scape = 30:7; pedicel = 9:7; $F_1 = 14:7$; $F_2 = 14:9$; $F_3 = 12:9$; club = 33:10.

Mesosoma: Pronotum slightly concave posteriorly, with strong setae along posterior border; mesoscutum 0.55x width, 1.33x scutellum; median longitudinal sulcus anteriorly indistinct; three setae in a row near each notauli; scutellum 0.76x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.43x width with well developed median carina, four short transverse carinae arising from middle of median carina and paraspiracular carinae; submedian areas reticulate; spiracle large, almost touching anterior and lateral margins; forewing 2.24x maximum width; smv with a single dorsal seta; mv distinctly shorter than smv (0.83x smv); st narrow at base, 0.34x mv (mv = 2.8x st); pmv absent. Relative lengths of forewing veins: mv = 31; mv = 26; pmv = 0; st = 9.

Gaster: Collapsible, subsessile, subglobose, 0.45x body; ovipositor slightly exerted; length of gaster = 1.05x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female INDIA Kerala Malappuram Nilambur Coll. Narendran and party. 11.viii. 1987 (DZCU) FK-118. Other materials: Female INDIA Kerala Malappuram Calicut University campus Coll. Narendran and party 28. xi. 1986 (FK- 119).

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Tetrastichus colemani* Crawford but differs from it in the following characters: (i) club 0.91x combined length of F₁, F₂ and F₃ (In *T. colemani*, club equal to combined length of F₁, F₂ and F₃); (ii) gaster 1.25x combined length of head and mesosoma (In *T. colemani*, gaster equal to combined length of head and mesosoma).

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

***Tetrastichus sanae* sp. nov.**

(Figs. 197-202)

Female: Length 1.74mm. Head black with slight green reflection, yellow clypeal margin; eyes and ocelli silvery white; antenna brown with lemon yellow scape and pedicel; mesosoma black with slight green reflection; legs brownish yellow; gaster dark brown with green reflection, first tergite brownish yellow; wings hyaline, veins dark brown; pubescence on body brown.

Head: Non-collapsing, width in dorsal view subequal to mesosoma; vertex broad; POL twice OOL; eyes pubescent; malar sulcus distinct and complete; antennal toruli on lower ocular line; antenna with 10 segments;

antennal formula: 1.1.2.3.3; scape 5.8x width; pedicel 0.37x scape; two anelli; F_1 1.36x pedicel; F_2 1.26x F_1 ; F_3 0.84x F_2 ; club triarticulate, 0.85x combined length of last two funicle segments; flagellum with long setae. Relative length: width of antennal segments: scape = 29:5; pedicel = 11:6; F_1 = 15:5; F_2 = 19:7; F_3 = 16:7; club = 30:7.

Mesosoma: Pronotum concave posteriorly, brownish yellow with a row of setae; mesoscutum 0.5x width; median longitudinal sulcus anteriorly obliterated; four setae in a row near each notauli; densely striato-reticulate; scutellum with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; propodeum 0.28x width with well developed median and paraspircular carinae; submedian areas densely reticulate; spiracle moderate, separated from anterior and lateral margins by its diameter; forewing 2.2x maximum width; smv with single dorsal seta; mv 1.60x smv; st 0.24x mv (mv = 4.1x st); pmv absent. Relative lengths of forewing veins: smv = 23; mv = 37; pmv = 1; st = 9.

Gaster: Collapsible, sessile, acuminate, 0.51x body; length of gaster = 1.53x mesosoma.

Male: Unknown.

Materials examined: Holotype: Female **INDIA** Kerala Malappuram Calicut University campus Coll. Surekha 22. x. 1988 (DZCU) FK – 153.

Distribution: INDIA (Kerala: Malappuram).

Host: Unknown.

Biology: Unknown.

Discussion: This species comes near *Tetrastichus schoenobii* Ferriere but differs from it in the following characters: (i) F_2 longest (In *T. schoenobii*, F_2 subequal to F_1 and F_3 individually); (ii) club 0.85xcombined length of last two funicle segments (In *T. schoenobii*, club subequal to combined length of last two funicle segments).

Etymology: The species name is after author's daughter.

***Tetrastichus spirabilis* Waterston**

(Figs. 202-208)

Tetrastichus spirabilis Waterston, 1922. *Indian Forest Rec.* 9:39. India: Dehra Dun (BMNH).

Female: Length 1.85 mm. Head black; eyes and ocelli dark brown; antenna entirely dark brown; mesosoma black with very slight green reflection; legs brownish yellow with black coxa, anterior 0.75 femur and terminal tarsi; gaster black with green reflection; wings hyaline, veins dark brown; pubescence on body black.

Head: Non-collapsing, width in dorsal view a little more than mesosoma; vertex with line of weak sclerotisation forming an oval area around three ocelli; POL 2.4x OOL; eyes pubescent; parascrobal area with setigerous punctures along sides of inner orbit; malar sulcus distinct and complete without a subocular fovea; antennal toruli slightly above lower ocular line; antenna with 10 segments; antennal formula 1.1.2.3.3; scape about 4x width; pedicel 0.38x scape; two anelli; F_1 1.6x pedicel; F_2 subequal to F_1 ; F_3 slightly shorter than F_2 ; club 0.84x combined length of last two funicle segments; flagellum densely setose. Relative length: width of antennal segments: scape = 21:5; pedicel = 8:5; F_1 = 13:5; F_2 = 13:5; F_3 = 12:6; club = 21:9.

Mesosoma: Pronotum large, concave posteriorly, with a row of strong setae along posterior border; mesoscutum 0.72x width, with distinct and complete median longitudinal sulcus; seven setae in two rows (5+2) near each notauli; densely coarsely striato-reticulate; scutellum convex, 0.79x width with two pairs of setae, a pair of submedian grooves and a pair of sublateral grooves; reticulations as on mesoscutum; propodeum 0.22x width with well developed median and paraspiracular carinae; submedian areas densely coarsely reticulate; spiracle large, separated from anterior margin by 0.5x diameter and lateral margin by 1.25x diameter; forewing 2.55x maximum width; costal cell large; smv with single dorsal seta; mv distinctly longer than

smv, with twelve setae; st 0.27x mv (mv = 3.5x st); pmv absent. Relative lengths of forewing veins: smv = 16; mv = 21; pmv = 0; st = 6.

Gaster: Collapsible, sessile, conical; slightly longer than 0.5xbody; fourth tergite largest; length of gaster = 1.88x mesosoma.

Male: Similar to female except in the following features: length 1.50mm; head slightly wider than in female; face above clypeus slightly swollen; scape swollen, a little less than 3x width. Relative lengths of funicle segments: F₁ = 32: F₂ = 38: F₃ = 42: F₄ = 40; club segments ratio: 30:26:27. Forewing a little longer than 2x width; sixth gastral tergite with twelve to thirteen setae.

Materials examined: Plesiotype: Female INDIA Kerala Kozhikode Pokkunnu Coll. Fousi 1. iv. 2003 (DZCU) FK-92. Other materials: Female INDIA Kerala Kozhikode Pokkunnu Coll. Fousi 13.iv.2003 (FK-14).

Distribution: INDIA (Kerala: Kozhikode, Wyanad; Uttaranjal).

Host: *Hypsipyla robusta* (Moore).

Biology: Unknown.

Discussion: This species comes near *Tetrastichus carus* sp. nov. but differs from it in the following characters: (i) mesoscutum with seven setae in two rows near each notauli (In *T.carus*, mesoscutum with eleven setae in three rows near each notauli); (ii) mv with twelve setae (In *T.carus*, mv with

nineteen setae); (iii) female length 1.85 mm (In *T.carus*, female length 2.62mm).

Remarks: The original description of *T. spirabilis* is very poor for easy recognition. So a redescription of female is made here. Male description is from Waterson. In the redescription of female, propodeum is coarsely sculptured and antennal toruli slightly above lower ocular line. But in original description propodeum is without sculpture and antennal toruli is on lower ocular line. But for all other characters it agrees with original description.

Checklist

**CHECKLIST OF SOME GENERA (TREATED IN THIS WORK) AND
SPECIES OF TETRASTICHINAE OF
INDIAN SUBCONTINENT**

Genus 1 : *ANAPROSTOCETUS* Graham, 1987

1. *A. dehraensis* Graham, 1987 - India (Uttaranjal, Kerala)
2. *A. narendrani* sp. nov. - India (Kerala)

Genus 2 : *APROSTOCETUS* Westwood, 1833

- = *Tetrastichus* Walker, 1842
- = *Trichoceras* Ratzeburg, 1844
- = *Geniocerus* Ratzeburg, 1844
- = *Exurus* Philippi, 1873
- = *Syntomosphyrum* Foerster, 1878
- = *Tetrastichodes* Ashmead, 1887
- = *Ootetrastichus* Perkins, 1906
- = *Neomphaloides* Girault, 1913
- = *Selitrichodes* Girault, 1913
- = *Zagrammosomoides* Girault, 1913
- = *Epomphaloides* Girault, 1913
- = *Aprostocerella* Girault, 1913
- = *Asyntomosphyrum* Girault, 1913
- = *Ootetrastichella* Girault, 1913
- = *Selitrichodella* Girault, 1913
- = *Neotetrastichodes* Girault, 1913
- = *Epitetrastichus* Girault, 1913
- = *Neomphaloidella* Girault, 1913

- = *Tetrastichella* Girault, 1913
- = *Epentastichus* Girault, 1913
- = *Syntomosphyrella* Girault, 1913
- = *Selitrichodelia* Girault, 1913
- = *Trichaporoides* Girault, 1913
- = *Duotrastichus* Dodd, in Girault, 1915
- = *Proceratoneura* Girault, 1915
- = *Paramphaloidomyia* Girault, 1917
- = *Prothymus* Girault, 1917
- = *Blattotetrastichus* Girault, 1917
- = *Omphalomopsis* Girault, 1917
- = *Neomphaloidomyia* Girault, 1917
- = *Chrysotetrastichus* Kostjukov, 1977
- = *Terebratella* Shafee & Rizvi, 1984

1. *A. agarwali* (Shafee, 1984) comb. nov. (Tetrastichus) - India (Uttar Pradesh, Delhi)
2. *A. ajmerensis* (Khan & Shafee, 1981) comb. nov. (Tetrastichus) - India (Rajasthan)
3. *A. aligarhensis* (Khan & Shafee, 1981) comb. nov. (Tetrastichus) - India (Uttar Pradesh)
4. *A. annulicornis* (Khan & Shafee, 1981) comb. nov. (Tetrastichus) - India (Rajasthan)
5. *A. asthenogmus* (Waterston, 1914) comb. nov. (Tetrastichodes) - Srilanka, India (South India)
6. *A. atomelli* (Khan, 1983) comb. nov. (Tetrastichus) - India (Uttar Pradesh)
7. *A. calicopteridis* sp. nov. - India (Kerala)
8. *A. citrus* sp. nov. - India (Kerala)

9. *A. coimbatorensis* (Rohwer, 1921) comb. nov. (*Tetrastichus*) - India (Tamilnadu)
10. *A. delhiensis* (Shafee, 1984) comb. nov. (*Tetrastichus*) - India (Delhi)
11. *A. dhireni* (Saraswat, 1978) comb. nov. (*Tetrastichus*) - India (West Bengal)
12. *A. disgrigus* sp. nov. - India (Kerala)
13. *A. flavidus* (Khan, 1981) comb. nov. (*Tetrastichus*) - India (Andra Pradesh)
14. *A. gasteris* sp. nov. - India (Kerala)
15. *A. granulatus* Ashmead, 1888 - India, Australia, Europe, Trinidad
- = *microcosmus* (Girault, 1917) (*Tetrastichus*)
- = *asperulus* (Graham, 1981) (*Tetrastichus*)
16. *A. hagenowii* (Ratzeburg, 1852) (*Entedon*) - India (South India)
- = *floridanus* Ashmead, 1887 (*Tetrastichus*)
- = *longifellowi* Girault, 1913 (*Epitetrastichus*)
- = *viridis* Girault, 1913 (*Epomphaloides*)
- = *robutus* Dodd in Girault, 1915 (*Neotetrastichus*)
17. *A. indicus* (Khan & Shafee, 1981) comb. nov. (*Tetrastichus*) - India (Tamilnadu)
18. *A. javedi* sp. nov. - India (Kerala)

19. *A. kodaikanalensis* (Saraswat, 1975) comb. nov. (*Tetrastichus*) - India (Tamilnadu)
20. *A. kumaonensis* (Saraswat, 1975) comb. nov. (*Tetrastichus*) - India (Uttar Pradesh)
21. *A. kuriani* (Husain, 1986) comb. nov. (*Tetrastichus*) - India (Orissa)
= *israeli* Kurian, 1954
(*Syntomosphyrum*)
22. *A. lasiopterae* (Bhatnagar, 1952) (*Tetrastichus*) - India (Kerala)
23. *A. longicauda* (Kieffer, 1905) comb. nov. (*Hyperteles*) - India (Tamilnadu)
24. *A. lotellae* (Delucchi, 1954) comb. nov. (*Tetrastichus*) - India (Uttar Pradesh)
25. *A. malabarensis* (Saraswat, 1975) comb. nov. (*Tetrastichus*) - India (Kerala)
26. *A. manii* (Husain, 1986) comb. nov. (*Tetrastichus*) - India (Karnataka)
= *asphondyliae* Mani & Kurian, 1953
27. *A. metallicus* sp. nov. - India (Kerala)
28. *A. neyyarensis* sp. nov. - India (Kerala)
29. *A. nilamburensis* (Saraswat, 1975) comb. nov. (*Tetrastichus*) - India (Kerala)
30. *A. nowsherensis* (Kurian, 1952) comb. nov. (*Tetrastichus*) - Pakistan
31. *A. okawus* (Rohwer, 1921) comb. nov. (*Tetrastichus*) - India (Tamilnadu)
32. *A. pantnagarensis* (Khan, 1982) comb. nov. (*Tetrastichus*) - India (Uttar Pradesh)

33. *A. percaudatus* (Silvestri, 1920) - India (Bihar, Kerala)
Tetrastichus (*Geniocerus*)
= *indica* (Shafee & Rizvi, 1984)
(*Terebratella*)
34. *A. polyseta* (Saraswat, 1975) - India (Tamilnadu)
comb. nov. (*Tetrastichus*)
35. *A. purpureus* (Cameron, 1913) - India (Bihar)
comb. nov. (*Hadrothrix*)
= *immsii* (Mahdihasan, 1923)
(*Tetrastichus*)
36. *A. quadriseta* (Saraswat, 1975) - India (Tamilnadu)
comb. nov. (*Tetrastichus*)
37. *A. reshmus* sp. nov. - India (Kerala)
38. *A. sankarani* Boucek, 1986 - India (Karnataka,
Uttar Pradesh)
39. *A. satpurensis* (Saraswat, 1978) - India (Madhya -Pradesh)
comb. nov. (*Tetrastichus*)
40. *A. shencottensis* (Saraswat, 1975) - India (Tamilnadu)
comb. nov. (*Tetrastichus*)
41. *A. stiatus* sp. nov. - India (Kerala)
42. *A. tanjorensis* (Husain, 1986) - India (Kerala)
comb. nov. (*Tetrastichus*)
= *asphondyliae* Mani, 1939
(*Neparaprostocetus*)
43. *A. thenhipalensis* sp. nov. - India (Kerala)
44. *A. thiruvannurensis* sp. nov. - India (Kerala)
45. *A. travancorensis* (Saraswat, 1975) - India (Kerala)
comb. nov. (*Tetrastichus*)
46. *A. tritrichia* (Saraswat, 1975) - India (Kerala)
comb. nov. (*Tetrastichus*)
47. *A. uniarticulata* (Saraswat, 1975) - India (Kerala)
comb. nov. (*Tetrastichus*)
48. *A. unicus* sp. nov. - India (Kerala)

49. *A. vithurensis* sp. nov. - India (Kerala)
50. *A. wyanadensis* sp. nov. - India (Kerala)
- Genus 3 : **NEOGASTERICHUS** gen. nov.
1. *N. dulciculus* sp. nov. - India (Kerala)
2. *N. longigastris* sp. nov. - India (Kerala)
- Genus 4 : **NEOMESTOCHARELLA** Narendran & Fousi, 2002
1. *N. keralensis* Narendran & Fousi, 2002 - India (Kerala)
- Genus 5 : **NEOPARACHRYSOCHARIS** gen. nov.
1. *N. keralensis* sp. nov. - India (Kerala)
- Genus 6 : **NEOTRICHOPOROIDES** Girault, 1913
- = *Neotrichaporoides* Girault, 1913
- = *Trichaporoidella* Girault, 1913
- = *Tetrastichomorpha* Girault, 1913
- = *Aprostoceroioides* Girault, 1913
- = *Paraprostocetus* Girault, 1915
- = *Epiquadrastichus* Girault, 1915
- = *Burksia* Fullaway, 1955
1. *N. agaliensis* sp. nov. - India (Kerala)
2. *N. choti* sp. nov. - India (Kerala)
3. *N. helvolus* sp. nov. - India (Kerala)
4. *N. malmpuzhensis* sp. nov. - India (Kerala)
5. *N. moti* sp. nov. - India (Kerala)
6. *N. nyemitawus* (Rohwer, 1921) - India
(*Tetrastichus*) (Madhya Pradesh, Maharashtra, Kerala, Rajasthan, Tamilnadu)

7. *N. silentvalleyensis* sp. nov. - India (Kerala)

Genus 7: **TETRASTICHUS** Haliday, 1844

= *Ennetoma* Dahlbom, 1857

= *Solenoderus* Motschulsky, 1863

= *Lygellus* Giard, 1896

= *Ceratoneuromyia* Girault, 1913

= *Psuedomphaloides* Girault, 1915

= *Redinia* Girault, 1936.

1. *T. carus* sp. nov. - India (Kerala)
2. *T. chakrataensis* Khan, 1992 - India (Uttar Pradesh)
3. *T. colemani* Crawford, 1912 - India (Karnataka)
4. *T. coorgensis* (Kurian, 1952)
comb. nov. (*Aprostocetus*) - India (Karnataka)
5. *T. corvinus* sp. nov. - India (Kerala)
6. *T. davidi* Khan 1986 - India (Tamilnadu)
7. *T. epilachnae* (Giard, 1896) (*Lygellus*) - Pakistan
8. *T. fasciatus* Ashmead, 1894 - India (Chumurajhagar
Chintaman) West Indies
9. *T. festivus* sp. nov. - India (Kerala)
10. *T. gardneri* Ferriere, 1931 - India (Uttaranjal)
11. *T. howardi* (Olliff, 1893) (*Euplectrus*)
= *ayyari* Rohwer, 1921 - India (Kerala, Tamilnadu,
Cuttack, Dharwar)
= *israeli* Mani & Kurian, 1953 - Pakistan & Mauritius to
(*Aprostocetus*) Taiwan & Eastern Australia
= *inferens* Yoshimoto, 1970
12. *T. isaaci* Rohwer, 1921 - India (Tamilnadu)
13. *T. keralensis* sp. nov. - India (Kerala)
14. *T. kozhikodensis* sp. nov. - India (Kerala)

15. *T. krishnaiahi* Saraswat, 1974 - India (Andra Pradesh)
16. *T. krishneri* (Mani, 1941)
(*Aprostocetus*) - India (Tamilnadu)
17. *T. latus* sp. nov. - India (Kerala)
18. *T. malappurensis* sp. nov. - India (Kerala)
19. *T. mangifera* Khan, 1992 - India (Uttar Pradesh)
20. *T. misellus** Delucchi, 1954 - India (Uttar Pradesh)
Germany
21. *T. mohani* Khan, 1992 - India (Uttar Pradesh)
22. *T. niger* Ranaweera, 1947 - Srilanka
23. *T. obliqua* Khan, 1992 - India (Uttar Pradesh)
24. *T. ootyensis* Saraswat, 1975 - India (Tamilnadu)
25. *T. orissaensis* Husain, 1986
= *epilachnae* Kurian, 1954
(*Aprostocetus*) - India (Cuttack,
Kerala)
26. *T. partellus* Khan, 1992 - India (Uttar Pradesh)
27. *T. plecopterae* Kurian, 1952 - India (Uttaranjal)
28. *T. punjabensis* (Kurian, 1952) comb.
nov. (*Aprostocetus*) - India (Punjab)
29. *T. rividus* sp. nov. - India (Kerala)
30. *T. saraswati* Husain & Khan, 1986
= *bicolor* Saraswat, 1975 - India (Tamilnadu)
31. *T. sanae* sp. nov. - India (Kerala)
32. *T. schoenobii* Ferriere, 1931 - India (Andhra
Pradesh, Karnataka,
West Bengal) Srilanka
Bangladesh, Malaysia
Thailand
33. *T. sexmaculatus* Kurian, 1953 - India (Karnataka)
34. *T. spirabilis* Waterston, 1922 - India (Uttaranjal, Kerala)

35. *T. taprobanensis* Ranaweera, 1947 - Srilanka
36. *T. versicolor* Ranaweera, 1947 - Srilanka

*Graham, 1991 provisionally transferred to *Quadrastichus* Girault, 1913.

Unplaced species due to poor original description and failure in examining the types:

1. *cyaniventris* Motschulsky, 1863 (*Solenoderus*)
2. *ellia* Motschulsky, 1863 *Tetrastichys*
3. *ophiusae* Crawford, 1912 *Tetrastichus*
4. *patannas* Motschulsky, 1863 *Tetrastichus*

Summary

SUMMARY

In this thesis entitled 'Alpha systematics of some genera of Eulophidae (Hymenoptera) of Kerala', an attempt is made to explore the diversity of Tetrastichinae subfamily of Eulophidae and to revise the taxa. Redescriptions of little known taxa are also attempted to. In fact, it is amazing to see the diversity of some of the genera like *Aprostocetus* Westwood and *Tetrastichus* Haliday.

The present investigation is concentrated on 7 genera of Eulophidae of Kerala – *Anaprostocetus* Graham, *Aprostocetus* Westwood, *Neogasterichus* gen. nov., *Neomestocharella* Narendran & Fousi, *Neoparachrysocharis* gen. nov., *Neotrichoporoides* Girault and *Tetrastichus* Haliday.

This study provides description of 40 species and diagnosis of 19 species already reported from Kerala. The following table gives the total number of species reported from Kerala.

Sl. No.	Name of genera	No. of species	No. of new species	No. of new combinations	No. of new records for Kerala	No. of known taxa from Kerala
1.	<i>Anaprostocetus</i> Graham	2	1	0	2	0
2.	<i>Aprostocetus</i> Westwood	24	14	6	15	9
3.	<i>Neogasterichus</i> gen. nov	2	2	0	2	0
4.	<i>Neomestocharella</i> Narendran & Fousi	1	0	0	0	1
5.	<i>Neoprachrysocharis</i> gen. nov.	1	1	0	1	0
6.	<i>Neotrichoporoides</i> Girault	7	6	0	7	0
7.	<i>Tetrastichus</i> Haliday	12	9	0	11	1
Total		49	33	6	38	11

The summary of the species of seven genera of the subfamily Tetrastichinae is as follows:

Genus 1: ***ANAPROSTOCETUS*** Graham

1. *A. dehraensis* Graham
2. *A. narendani* sp. nov.

Genus 2: ***APROSTOCETUS*** Westwood

1. *A. asthenogmus* (Waterston) comb. nov.
2. *A. calicopteridis* sp. nov.
3. *A. citrus* sp. nov.
4. *A. disgrigus* sp. nov.
5. *A. gasteris* sp. nov.

6. *A. hagenowii* (Ratzeburg)
 7. *A. javedi* sp. nov.
 8. *A. lasiopterae* (Bhatnagar)
 9. *A. malabarensis* (Saraswat) comb. nov.
 10. *A. metallicus* sp. nov.
 11. *A. neyyarensis* sp. nov.
 12. *A. nilamburensis* (Saraswat) comb. nov.
 13. *A. percaudatus* (Silvestri)
 14. *A. reshmus* sp. nov.
 15. *A. sankarani* Boucek
 16. *A. stiatatus* sp. nov.
 17. *A. thenhipalensis* sp. nov.
 18. *A. thiruvannurensis* sp. nov.
 19. *A. travancorensis* (Saraswat) comb. nov.
 20. *A. tritrichia* (Saraswat) comb. nov.
 21. *A. uniarticulata* (Saraswat) comb. nov.
 22. *A. unicus* sp. nov.
 23. *A. vithurensis* sp. nov.
 24. *A. wyanadensis* sp. nov.
- Genus 3: **NEOGASTERICUS** gen. nov.
1. *N. dulciculus* sp. nov.
 2. *N. longigastris* sp. nov.
- Genus 4: **NEOMESTOCHARELLA** Narendran & Fousi
1. *N. keralensis* Narendran & Fousi
- Genus 5: **NEOPARACHRYSOCHARIS** gen. nov.
1. *N. keralensis* sp. nov.

Genus 6: **NEOTRICHOPOROIDES** Girault

1. *N. agaliensis* sp. nov.
2. *N. choti* sp. nov.
3. *N. helvolus* sp. nov.
4. *N. malampuzhensis* sp. nov.
5. *N. moti* sp. nov.
6. *N. nyemitawus* (Rohwer)
7. *N. silentvalleyensis* sp. nov.

Genus 7: **TETRASTICHUS** Haliday

1. *T. carus* sp. nov.
2. *T. corvinus* sp. nov.
3. *T. festivus* sp. nov.
4. *T. howardi* (Olliff)
5. *T. keralensis* sp. nov.
6. *T. kozhikodensis* sp. nov.
7. *T. latus* sp. nov.
8. *T. malappurensis* sp. nov.
9. *T. orissaensis* Husain & Khan
10. *T. rividus* sp. nov.
11. *T. sanae* sp. nov.
12. *T. spirabilis* Waterston

In this study, collections made from different localities are properly identified and described with illustrations. Redescriptions are made of poorly described taxa obtained. Apart from this key to subfamilies, genera and

species of the taxa studied are prepared. Finally, a checklist and host-parasite index of the seven genera of the subfamily Tetrastichinae are also provided. The specimens studied including types are arranged in insect boxes and kept in the Department of Zoology, University of Calicut.

Host-Parasite Index

HOST-PARASITE INDEX OF THE GENERA STUDIED

HOST	PARASITE
1. <i>Anadevidia peponis</i> (Fabricius) – Lep.: Noctuidae	<i>Tetrastichus howardi</i> (Olliff)
2. <i>Anastatus colemani</i> Crawford – Hym.: Eupelmidae	<i>Tetrastichus gardneri</i> Ferriere
3. <i>Anthomyiid</i> sp.– Dipt.: Muscidae	<i>Neotrichoporoides nyemitawus</i> (Rohwer)
4. <i>Apanteles taragamae</i> Gahan – Hym.: Braconidae	<i>Tetrastichus versicolor</i> Ranaweera
5. <i>Apanteles</i> sp.– Hym.: Braconidae	<i>Aprostocetus pantnagarensis</i> (Khan) comb. nov.
6. <i>Argyria</i> sp.	<i>Tetrastichus howardi</i> (Olliff)
7. <i>Asphondylia pongamiae</i> Felt – Dipt.: Cecidomyiidae	<i>Aprostocetus manii</i> Husain & Khan
8. <i>Asphondylia riveae</i> Mani – Dipt.: Cecidomyiidae	<i>Aprostocetus tanjorensis</i> (Husain & Khan) comb. nov.
9. <i>Aspidomorpha miliaris</i> (Fabricius) – Col.: Chrysomelidae	<i>Tetrastichus colemani</i> Crawford
10. <i>Atherigona naqvii</i> Steyskal – Dipt.: Muscidae	<i>Neotrichoporoides nyemitawus</i> (Rohwer)
11. <i>Atherigona soccata</i> Rondani – Dipt.: Muscidae	<i>Aprostocetus agarwali</i> Shafee, <i>A. delhiensis</i> Shafee, <i>Neotrichoporoides nyemitawus</i> (Rohwer)
12. <i>Atherigona</i> sp. – Dipt.: Muscidae	<i>Neotrichoporoides nyemitawus</i> (Rohwer)
13. <i>Attacus ricini</i> Boisduval – Lep.: Saturnidae	<i>Tetrastichus howardi</i> (Olliff)

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| 14. | <i>Bethyplectes curculionis</i> (Thomson) –
Hym.: Bethylidae | <i>Tetrastichus howardi</i> (Olliff) |
| 15. | Cecidomyiid of <i>Artemisia</i> galls | <i>Aprostocetus longicauda</i>
(Kieffer) comb. nov.,
<i>A. coimbatorensis</i> (Rohwer)
comb. nov., <i>A. okawus</i>
(Rohwer) comb. nov. |
| 16. | <i>Chilo auricilia</i> Ddgn.–
Lep.: Pyralidae | <i>Tetrastichus howardi</i> (Olliff) |
| 17. | <i>Chilo infuscatellus</i> (Snellen) | <i>Tetrastichus howardi</i> (Olliff) |
| 18. | <i>Chilo partellus</i> (Swinhoe) | <i>Tetrastichus howardi</i> (Olliff) |
| 19. | <i>Chilo sacchariphagus indicus</i> (Kapur) | <i>Tetrastichus howardi</i> (Olliff),
<i>Tetrastichus partellus</i> Khan |
| 20. | <i>Chilo sacchariphagus</i> (Walker) | <i>Tetrastichus howardi</i> (Olliff) |
| 21. | <i>Chilo simplex</i> | <i>Tetrastichus howardi</i> (Olliff) |
| 22. | <i>Chilo suppressalis</i> (Walker) | <i>Tetrastichus howardi</i> (Olliff) |
| 23. | <i>Chilo venosatus</i> | <i>Tetrastichus howardi</i> (Olliff) |
| 24. | <i>Chilo zonellus</i> | <i>Tetrastichus howardi</i> (Olliff) |
| 25. | <i>Cnaphalocrocis medinalis</i> (Guenee) –
Lep.: Pyralidae | <i>Tetrastichus howardi</i> (Olliff) |
| 26. | <i>Coccidohystrix insolita</i> (Green)
Hom.: Psuedococcidae | <i>Aprostocetus ajmerensis</i>
(Khan) comb. nov.
<i>A. annulicornis</i> (Khan) comb.
nov. |
| 27. | <i>Coccophagus tischirchii</i> Mahdihasan
– Hym.: Aphelinidae | <i>Aprostocetus purpureus</i>
(Cameron) comb. nov. |
| 28. | <i>Contarinia caudata</i> Felt –
Dipt.: Cecidomiidae | <i>Tetrastichus fasciatus</i>
Ashmead |
| 29. | <i>Crocidolomia binotalis</i> Zeller –
Lep.: Pyralidae | <i>Tetrastichus howardi</i> (Olliff) |

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| 30. | <i>Darna nararia</i> Moore –
Lep.: Limacocidae | <i>Tetrastichus taprobanensis</i>
Ranaweera |
| 31. | <i>Diacrisia obliqua</i> (Walker) –
Lep.: Arctidae | <i>Aprostocetus pantnagarensis</i>
(Khan) comb. nov. |
| 32. | <i>Diatraea sticticraspis</i> Hampson –
Lep.: Pyralidae | <i>Tetrastichus howardi</i> (Olliff) |
| 33. | <i>Dysodia viridatrix</i> (Walker) –
Lep.: Thyrididae | <i>Tetrastichus howardi</i> (Olliff) |
| 34. | <i>Earias vitella</i> (Fabricius) –
Lep.: Noctuidae | <i>Tetrastichus davidi</i> Khan |
| 35. | <i>Elasmus homonae</i> Ferriere –
Hym.: Elasmidae | <i>Tetrastichus versicolor</i>
Ranaweera |
| 36. | <i>Epilachna</i> sp.–
Col.: Coccinellidae | <i>Tetrastichus orissaensis</i>
Husain & Khan |
| 37. | <i>Epipyrops eurybrachydis</i> –
Hem.: Epipyropidae | <i>Tetrastichus orissaensis</i>
Husain & Khan |
| 38. | <i>Euproctis lunata</i> Walker –
Lep.: Lumantriidae | <i>Tetrastichus krishnieri</i> (Mani)
comb. nov. |
| 39. | <i>Galleria melonella</i> (Linnaeus) –
Lep.: Pyralidae | <i>Tetrastichus howardi</i> (Olliff) |
| 40. | <i>Goniozus montanus</i> Kieffer –
Hym.: Bethylidae | <i>Tetrastichus versicolor</i>
Ranaweera |
| 41. | <i>Heliothis armigera</i> (Hubner) –
Lep.: Noctuidae | <i>Tetrastichus howardi</i> (Olliff) |
| 42. | <i>Homona coffearia</i> (Nietner) –
Lep.: Tortricidae | <i>Tetrastichus versicolor</i>
Ranaweera |
| 43. | <i>Hyblaea puera</i> (Cramer) –
Lep.: Hyblaeidae | <i>Tetrastichus howardi</i> (Olliff) |
| 44. | <i>Hypolixus truncatulus</i> (Fabricius) –
Col.: Curculionidae | <i>Tetrastichus krishnieri</i> (Mani)
comb. nov. |
| 45. | <i>Hypsipyla robusta</i> (Moore) –
Lep.: Pyralidae | <i>Tetrastichus spirabilis</i>
Waterston. |

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| 46. <i>Kerria lacca</i> (Kerr)–
Hom.: Kerridae | <i>Aprostocetus purpureus</i>
(Cameron) comb. nov. |
| 47. <i>Lasioptera falcata</i> Felt –
Dipt.: Cecidomyiidae | <i>Aprostocetus lasiopterae</i>
(Bhatnagar) |
| 48. <i>Lixus truncatulus</i> | <i>Tetrastichus krishnieri</i> (Mani)
comb. nov. |
| 49. <i>Macrina arenaria</i> | <i>Tetrastichus isaaci</i> Rohwer |
| 50. <i>Macrocentrus homonae</i> Nixon –
Hym.: Braconidae | <i>Tetrastichus versicolor</i>
Ranaweera |
| 51. <i>Menochilus sexmaculatus</i>
(Fabricius)– Col.: Coccinellidae | <i>Tetrastichus sexmaculatus</i>
Kurian |
| 52. <i>Mythimna albistigma</i> Moore –
Lep.: Noctuidae | <i>Tetrastichus howardi</i> (Olliff) |
| 53. <i>Notolophus posticus</i> Walker –
Lep.: Lymantriidae | <i>Tetrastichus versicolor</i>
Ranaweera |
| 54. <i>Ophiusa melicerta</i> | <i>Tetrastichus ophiusae</i>
Crawford |
| 55. <i>Opisina arenosella</i> Walker –
Lep.: Oecophoridae | <i>Tetrastichus coorgensis</i>
(Kurian),
<i>T. howardi</i> (Olliff) |
| 56. <i>Pectinophora gossypiella</i> (Saunders)–
Lep.: Gelechiidae | <i>Tetrastichus howardi</i> (Olliff) |
| 57. <i>Pennisetum typhoides</i> | <i>Aprostocetus okawus</i>
(Rohwer) comb. nov. |
| 58. Pentatomidae | <i>Tetrastichus gardneri</i> Ferriere |
| 59. <i>Periplanata americana</i> (Linnaeus) –
Dict.: Blattaria | <i>Aprostocetus asthenogmus</i>
(Waterston) comb. nov.,
<i>A. hagenowii</i> (Ratzeburg) |
| 60. <i>Periplanata australasiae</i> (Fabricius) | <i>Aprostocetus asthenogmus</i>
(Waterston) comb. nov.,
<i>A. hagenowii</i> (Ratzeburg) |
| 61. <i>Phytodiaetus capuae</i> Morley | <i>Tetrastichus versicolor</i>
Ranaweera |

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| 62. <i>Plecoptera reflexa</i> Guenee –
Lep.: Noctuidae | <i>Tetrastichus plecopterae</i>
Kurian |
| 63. <i>Plutella xylostella</i> (Linnaeus) –
Lep.: Yponomeutidae | <i>Tetrastichus howardi</i> (Olliff) |
| 64. <i>Polytela gloriosae</i> Fabricius –
Lep.: Noctuidae | <i>Tetrastichus howardi</i> (Olliff) |
| 65. <i>Precis orithya</i> Linnaeus –
Lep.: Nymphalidae | <i>Tetrastichus howardi</i> (Olliff) |
| 66. <i>Procontorina</i> spp. –
Dipt.: Cecidomiidae | <i>Aprostocetus sankarani</i>
Boucek |
| 67. <i>Pulvinaria</i> spp. –
Hom.: Coccidae | <i>Aprostocetus aligarhensis</i>
(Khan) |
| 68. Pyralidae – Lep. | <i>Tetrastichus coorgensis</i>
(Kurian) |
| 69. <i>Schoenobius bipunctifer</i> | <i>Aprostocetus kuriani</i> (Husain
& Khan) comb. nov.,
<i>Tetrastichus howardi</i> (Olliff),
<i>Tetrastichus schoenobii</i>
Ferriere |
| 70. <i>Scirpophaga incertulas</i> (Walker) –
Lep.: Pyralidae | <i>Aprostocetus kuriani</i> (Husain
& Khan) comb. nov.,
<i>Tetrastichus howardi</i> (Olliff) |
| 71. <i>Sesamia inferens</i> (Walker) –
Lep.: Noctuidae | <i>Tetrastichus howardi</i> (Olliff) |
| 72. <i>Simmondsius pakistanensis</i> Ahmed &
Ghani – Col.: Coccinellidae | <i>Tetrastichus epilachnae</i>
(Giard) |
| 73. <i>Simplicia robustalis</i> Guenee –
Lep.: Noctuidae | <i>Tetrastichus niger</i> Ranaweera |
| 74. <i>Spilosoma obliqua</i> –
Lep.: Arctidae | <i>Tetrastichus obliqua</i> Khan |
| 75. <i>Spodoptera litura</i> (Fabricius) –
Lep.: Noctuidae | <i>Tetrastichus howardi</i> (Olliff) |

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| 76. <i>Spodoptera mauritia</i> Boisduval | <i>Tetrastichus howardi</i> (Olliff),
<i>T. schoenobii</i> Ferriere |
| 77. <i>Sylepta derogata</i> (Fabricius) –
Lep.: Pyralidae | <i>Tetrastichus howardi</i> (Olliff) |
| 78. <i>Tachardiophagus tachardiae</i>
(Ashmead) – Hym.: Encyrtidae | <i>Aprostocetus purpureus</i>
(Cameron) comb. nov. |
| 79. <i>Tropicomyia atomella</i> (Malloch) –
Dipt.: Agromyzidae. | <i>Aprostocetus atomelli</i> (Khan)
comb. nov. |

INDETERMINED SPECIES

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| 80. Agromyzid leafmine | <i>Tetrastichus mohani</i> Khan |
| 81. Coccids | <i>Aprostocetus flavidus</i> (Khan)
comb. nov.,
<i>Tetrastichus mangifera</i> Khan |
| 82. Diptera, including leafminers | <i>Aprostocetus coimbatorensis</i>
(Rohwer) comb. nov.,
<i>Neotrichoporoides nyemitawus</i>
(Rohwer) |
| 83. Lepidopterous leafmine | <i>Tetrastichus chakrataensis</i>
Khan |
| 84. Mealybugs –
Hom.: Psuedococcidae | <i>Aprostocetus indicus</i> (Khan)
comb. nov. |
| 85. Psyllids including <i>Psylla</i> spp. – Hom. | <i>Tetrastichus coorgensis</i>
(Kurian) |

FROM PLANT GALLS

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| 86. <i>Caliopteris floribunda</i> (Lamarck) | <i>Aprostocetus caliopteridis</i>
sp. nov. |
| 87. Indetermined Plants | <i>Tetrastichus isaaci</i> Rohwer |

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Plates and Figures

COLLECTION LOCALITIES

SILENT VALLEY – THE HOME OF INTERESTING
PARASITIC HYMENOPTERA



SILENT VALLEY - EVER GREEN FOREST



SILENT VALLEY - GRASS LAND



YELLOW PAN TRAP



MALAISE TRAP

KRD	-	Kasargode
KNR	-	Kannur
KKD	-	Kozhikode
WYD	-	Wayanad
MPM	-	Malappuram
PGT	-	Palakkad
TSR	-	Thrissur
EKM	-	Ernakulam
IDK	-	Idukki
KTM	-	Kottayam
ALP	-	Alappuzha
PNT	-	Pathanamthitta
KLM	-	Kollam
TVM	-	Thiruvananthapuram

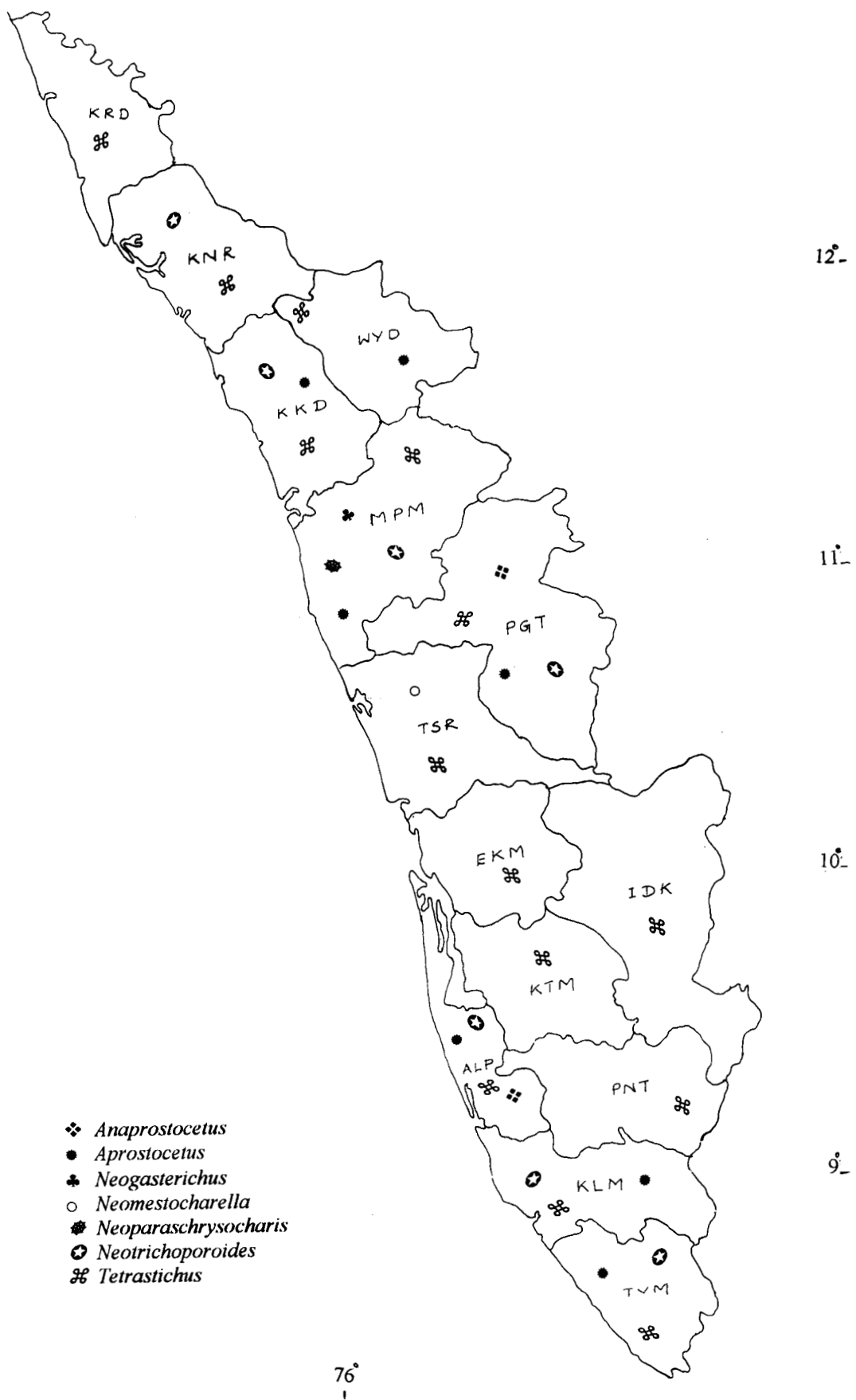


Fig. 1. Generic distribution of Tetrastichinae in Kerala

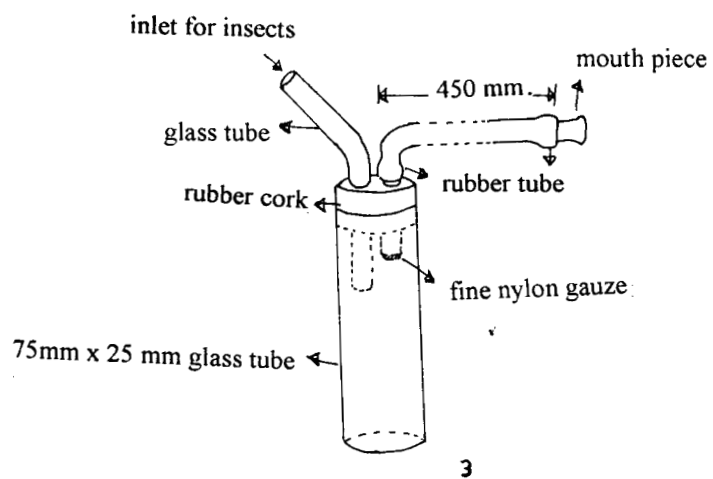
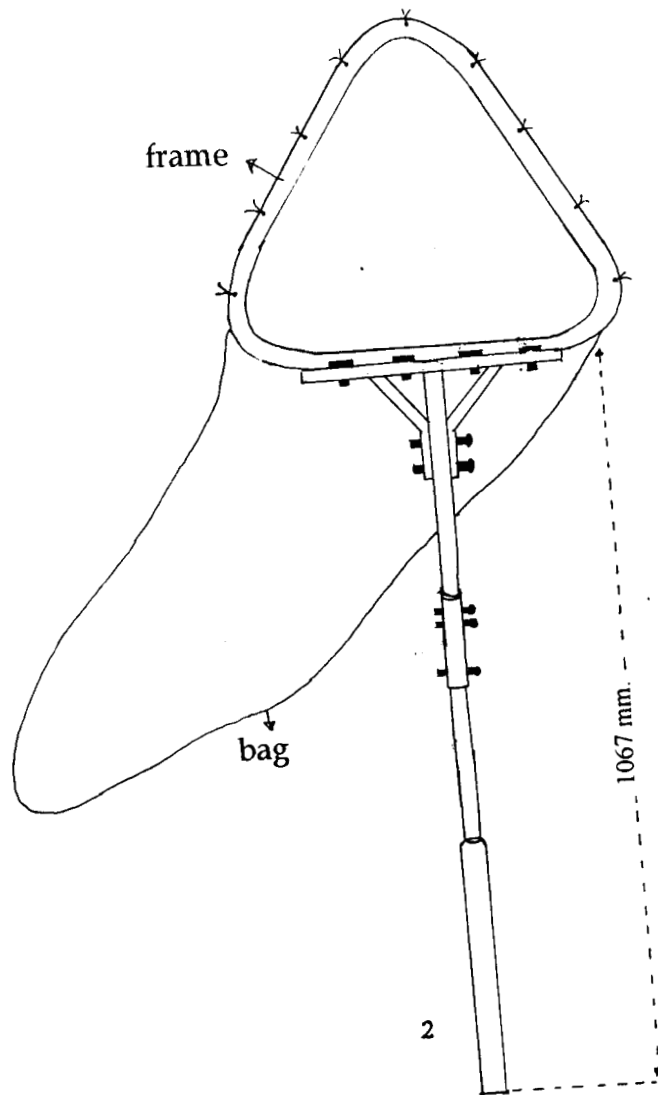
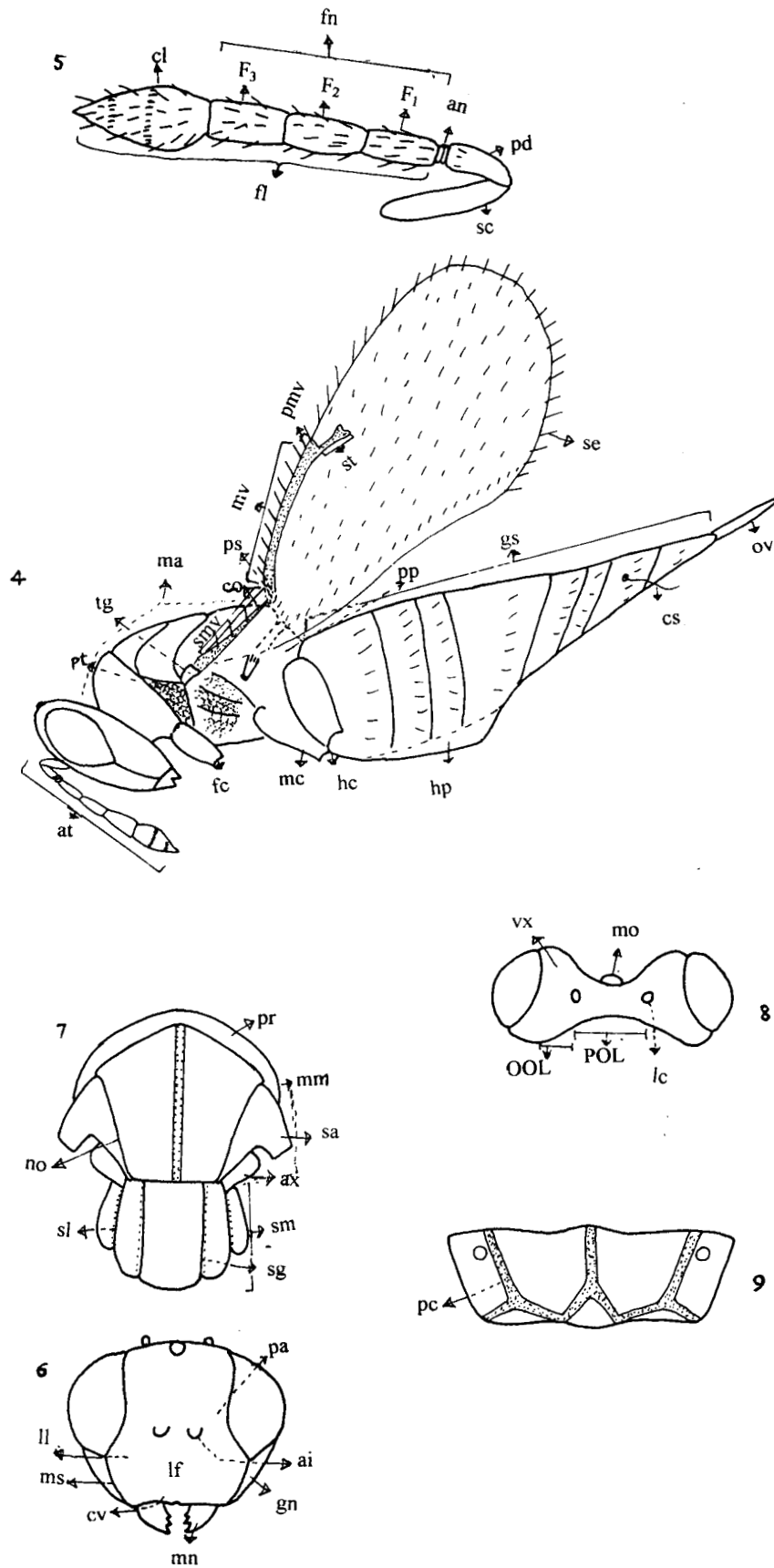


Fig. 2. Sweep net

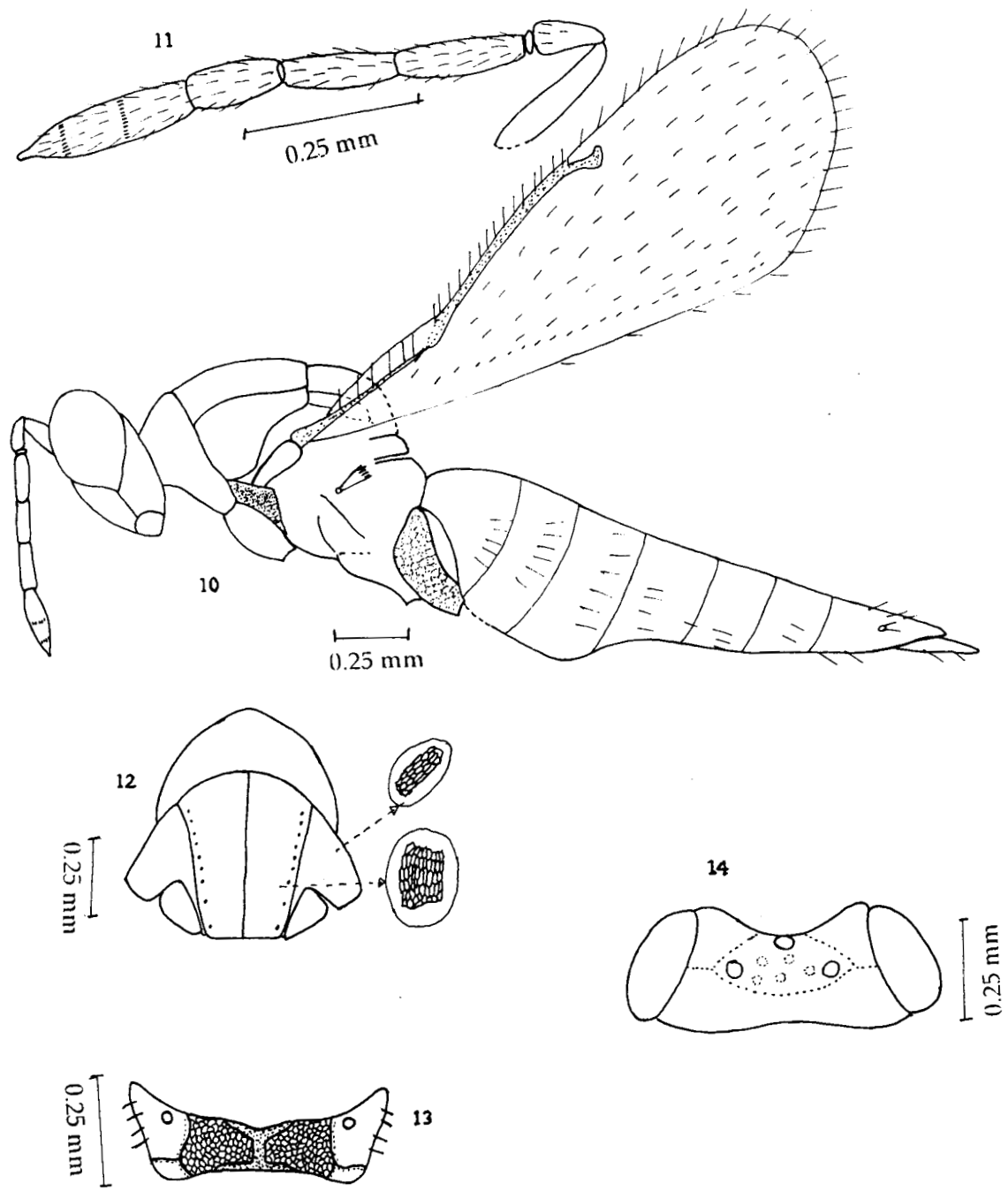
Fig. 3. Aspirator

ai - antennal toruli	hp - hypopygium	pd - pedicel
an - anellus	lc - lateral ocellus	pmv - post marginal vein
at - antenna	lf - lower face	POL - post-ocellar distance
ax - axilla	ll - lower ocular line	pp - propodeum
cl - club	ma - mesosoma	pr - pronotum
co - costal cell	mc - midcoxa	ps - parastigma
cs - cercal seta	mm - mesoscutum	pt - prepectus
cy - clypeus	mn - mandible	sa - scapula
F ₁ - first funicle segment	mo - median ocellus	sc - scape
F ₂ - second funicle segment	ms - malar sulcus	se - seta
F ₃ - third funicle segment	mv - marginal vein	sg - submedian groove
fc - forecoxa	no - notauli	sl - sub-lateral groove
fl - flagellum	OOL - ocell-ocular distance	sm - scutellum
fn - funicle	ov - ovipositor	smv - submarginal vein
gn - gena	pa - parascrobal area	st - stigmal vein
gs - gaster	pc - paraspiracular carina	tg - tegula
hc - hindcoxa		vx - vertex



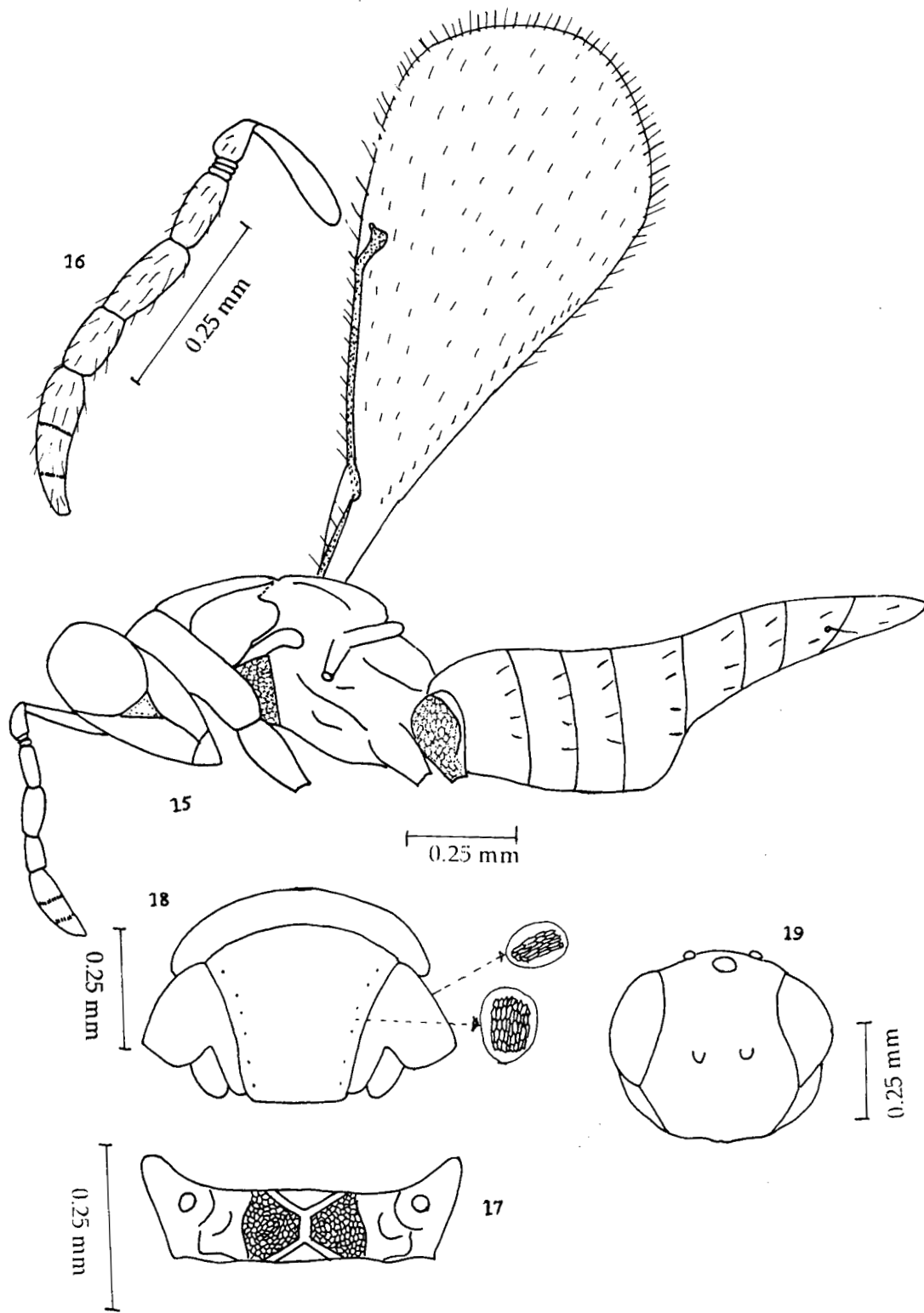
Figs. 4-9 General Morphology

- 4. Body - lateral view
- 5. Antenna
- 6. Head - anterior view
- 7. Pronotum, mesoscutum and scutellum
- 8. Head dorsal view
- 9. Propodeum



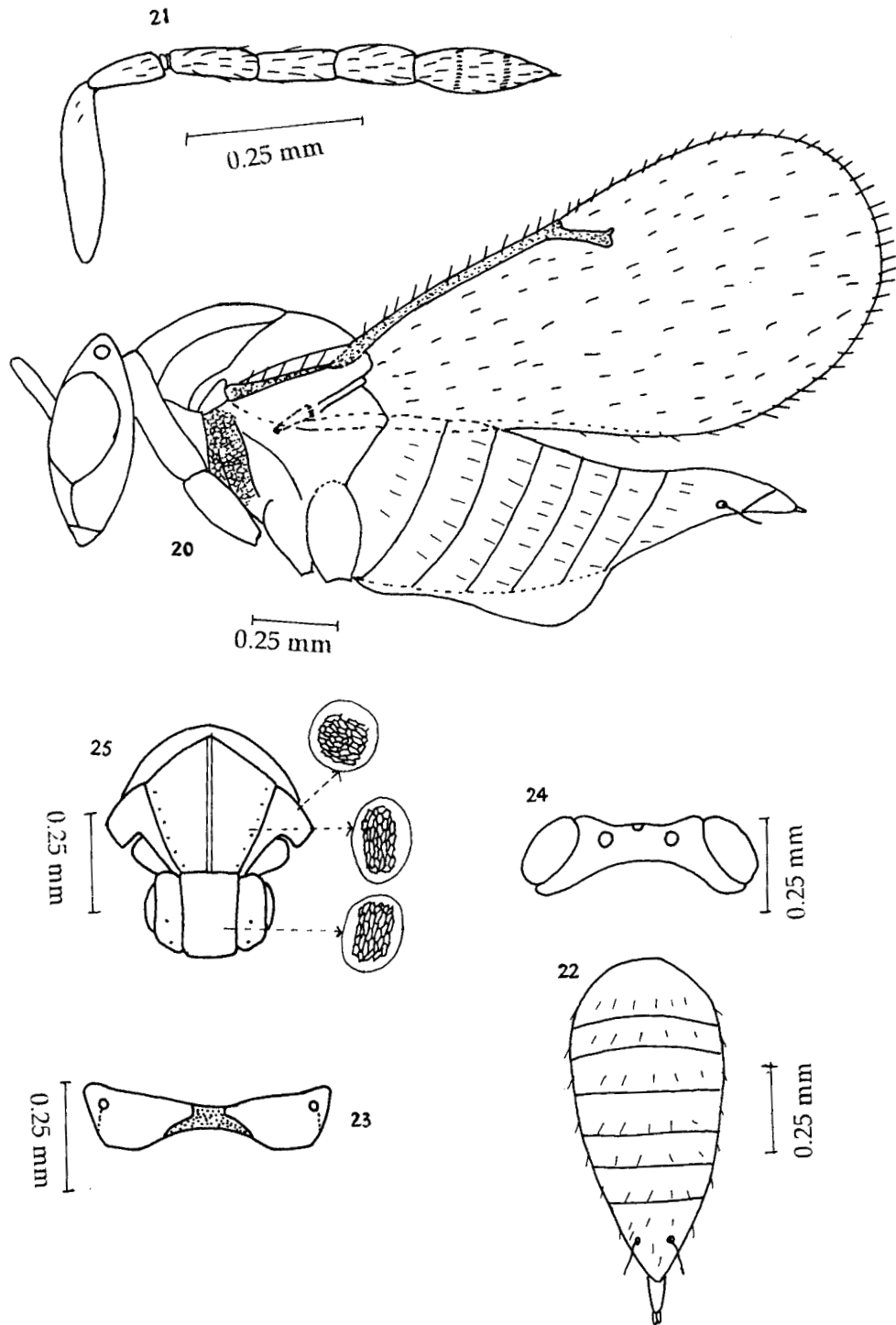
Figs. 10-14 *Anaprostocetus dehraensis* Graham Female

- 10. Body - lateral view
- 11. Antenna
- 12. Pronotum and mesoscutum
- 13. Propodeum
- 14. Head dorsal view



Figs. 15-19 *Anaprostocetus narendrani* sp. nov. Female

- 15. Body - lateral view
- 16. Antenna
- 17. Propodeum
- 18. Pronotum and mesoscutum
- 19. Head - anterior view



Figs. 20-25 *Aprostocetus calicopteridis* sp. nov. Female

20. Body - lateral view

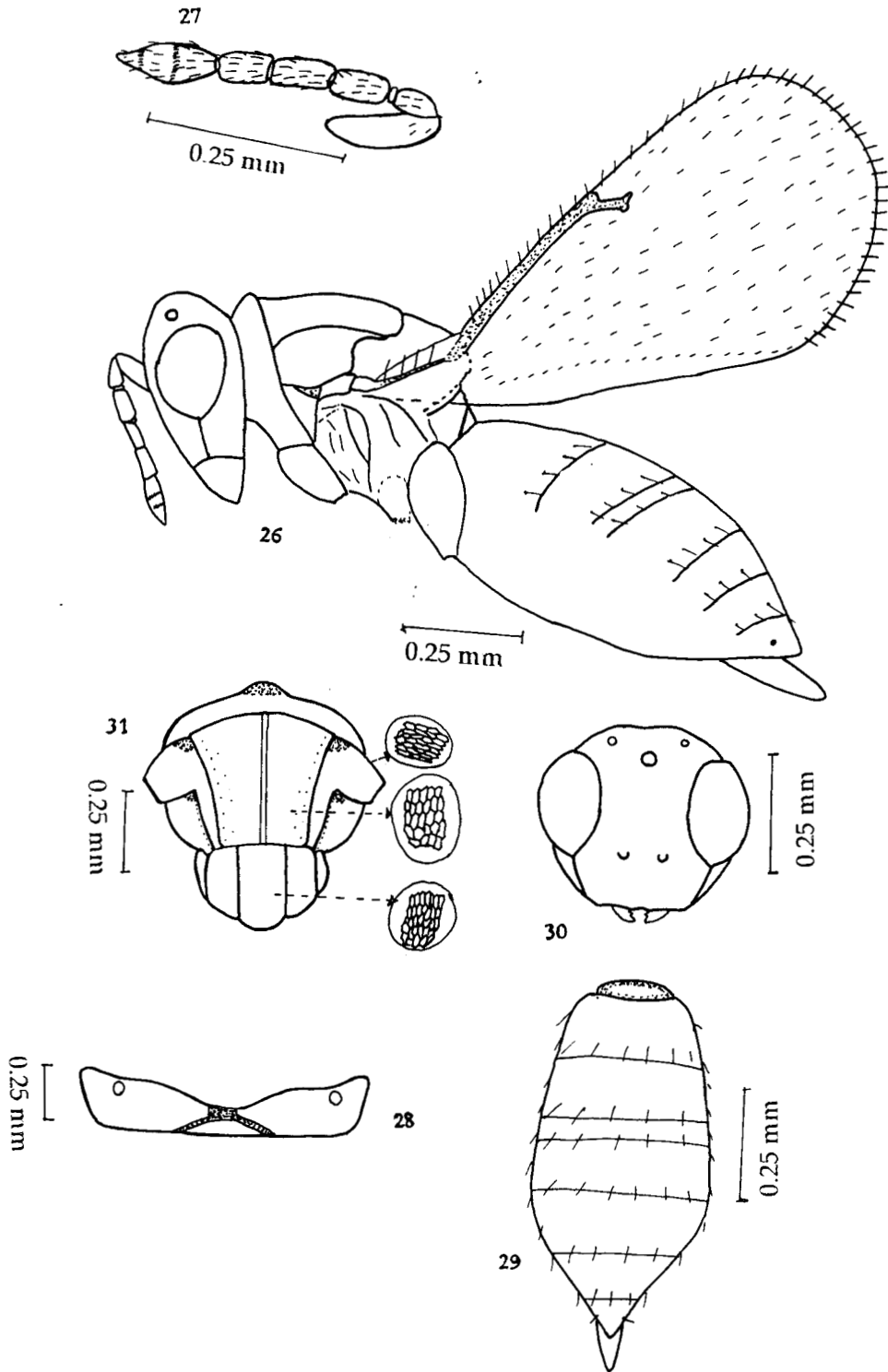
21. Antenna

22. gaster

23. Propodeum

24. Head-dorsal view

25. Pronotum, mesoscutum and scutellum



Figs. 26-31 *Aprostocetus citrus* sp. nov. Female

26. Body - lateral view

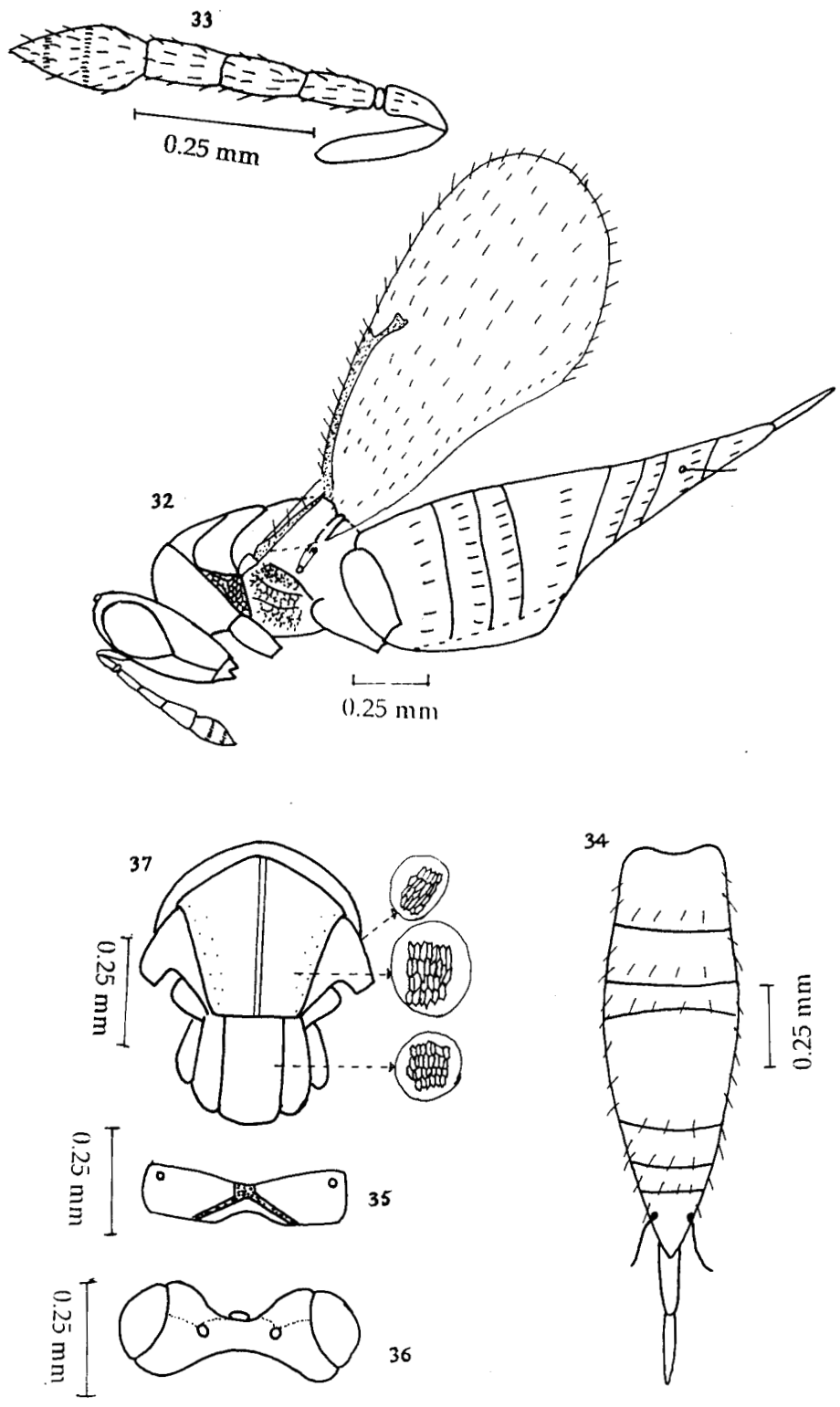
27. Antenna

28. Propodeum

29. Gaster

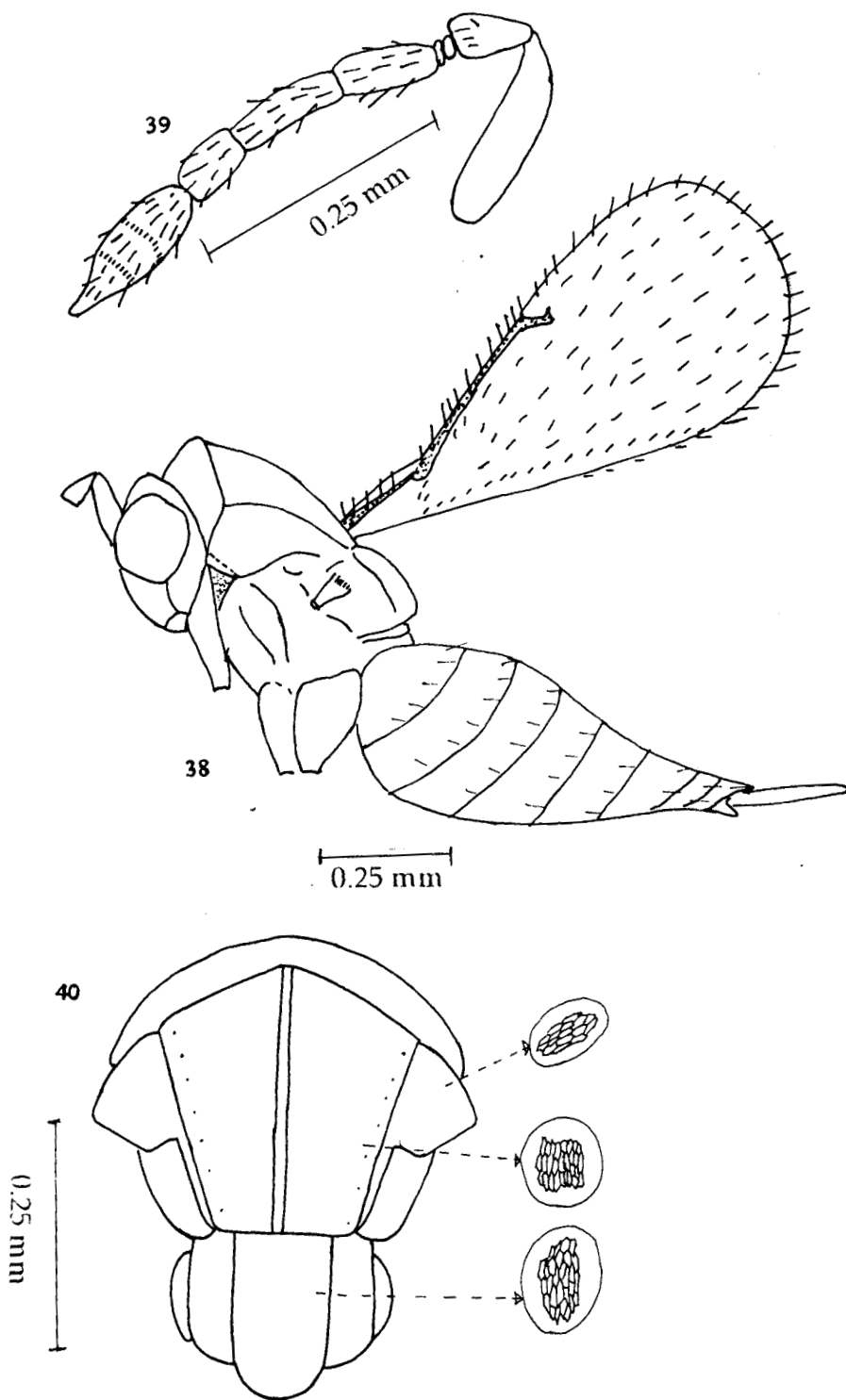
30. Head - anterior view

31. Pronotum, mesoscutum and scutellum



Figs. 32-37 *Aprostocetus disgrigus* sp.nov. Female

- 32. Body - lateral view
- 33. Antenna
- 34. gaster
- 35. Propodeum
- 36. Head dorsal view
- 37. Pronotum, mesoscutum and scutellum

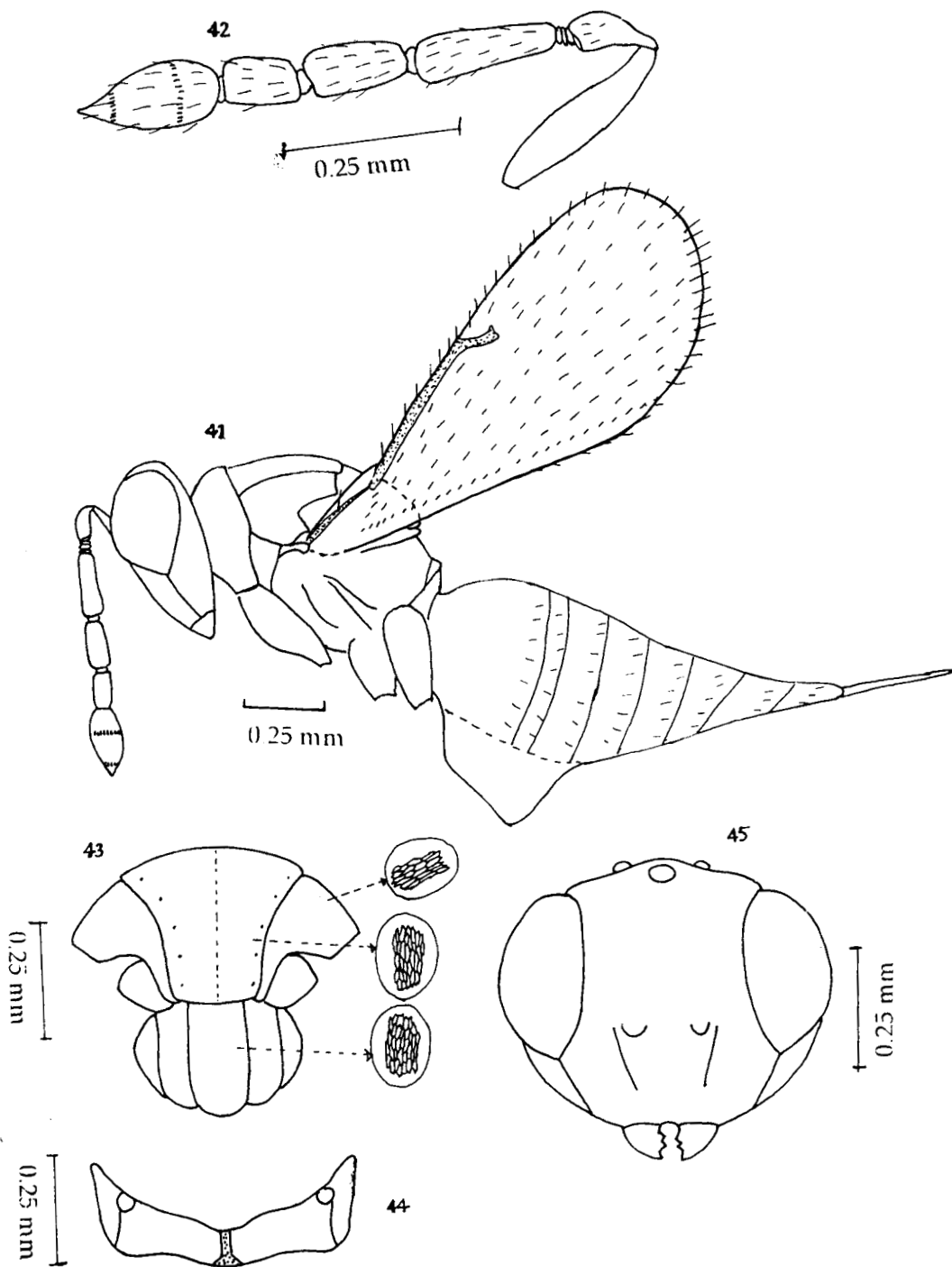


Figs. 38-40 *Aprostocetus gasteris* sp. nov. Female

38. Body - lateral view

39. Antenna

40. Pronotum, mesoscutum and scutellum



Figs. 41-45 *Aprostocetus javedi* sp. nov. Female

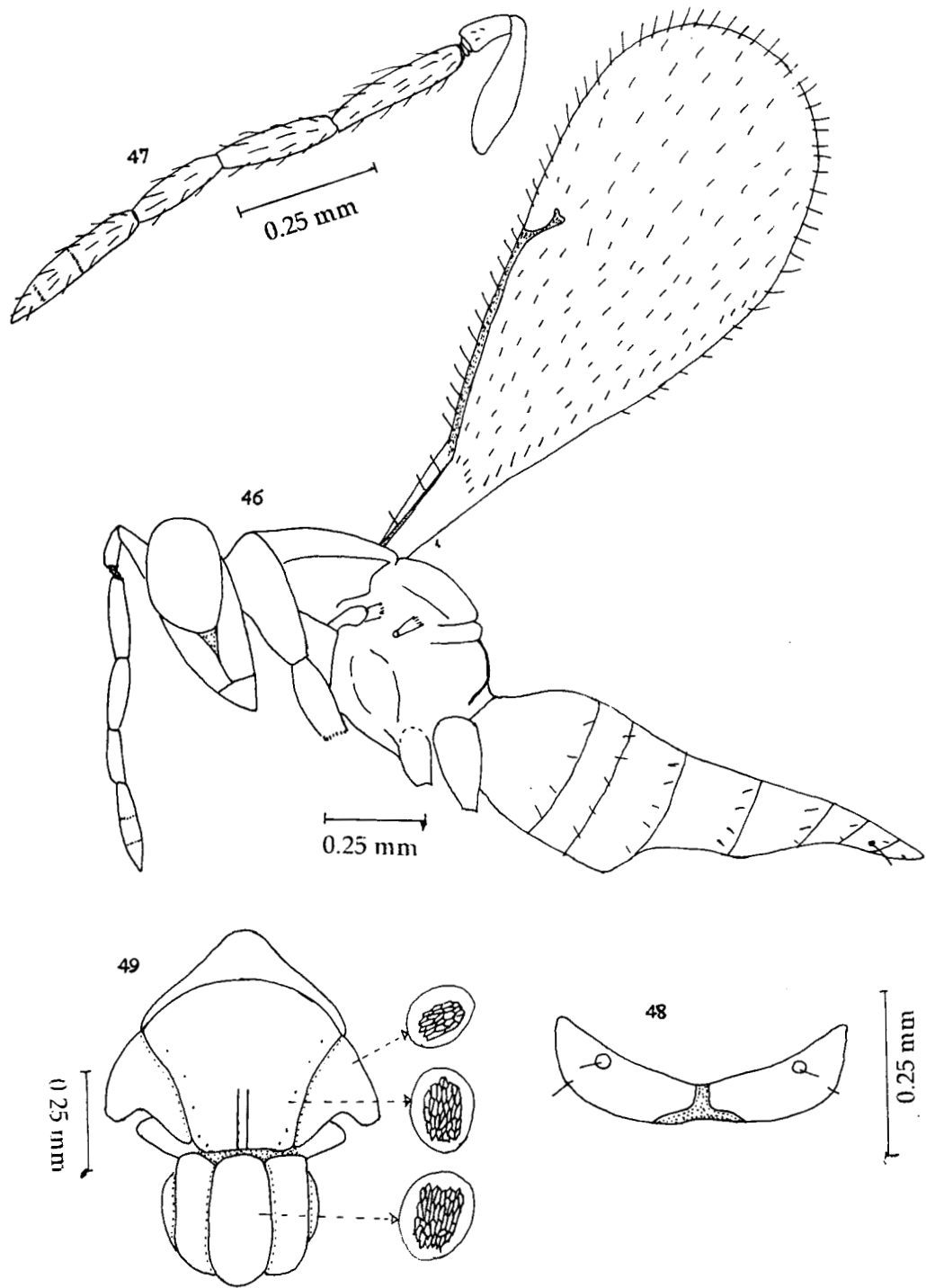
41. Body - lateral view

42. Antenna

43. Mesoscutum and scutellum

44. Propodeum

45. Head - anterior view



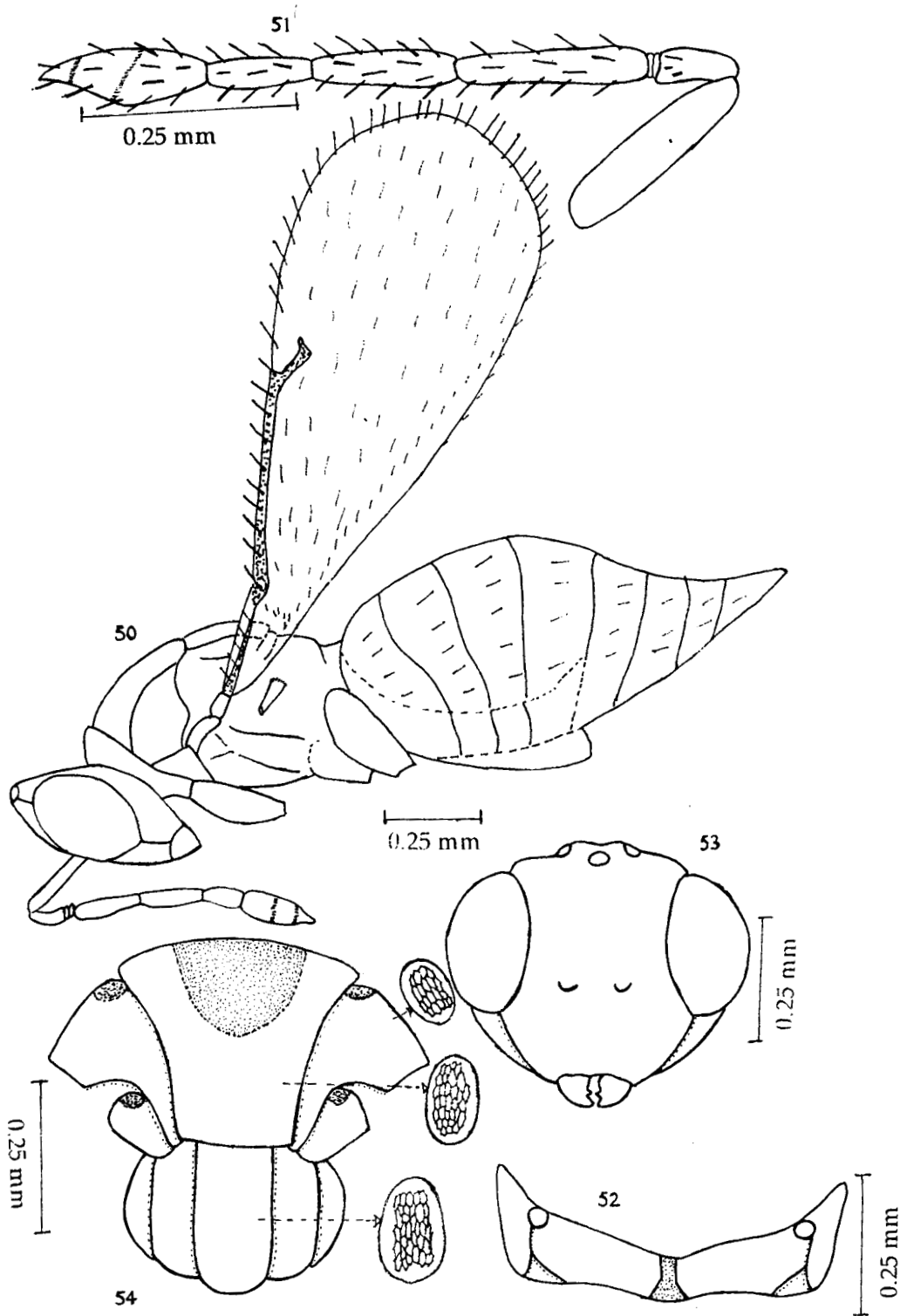
Figs. 46-49 *Aprostocetus metallicus* sp. nov. Female

46. Body - lateral view

47. Antenna

48. Propodeum

49. Pronotum, mesoscutum and scutellum



Figs. 50-54 *Aprostocetus neyyarensis* sp. nov. Female

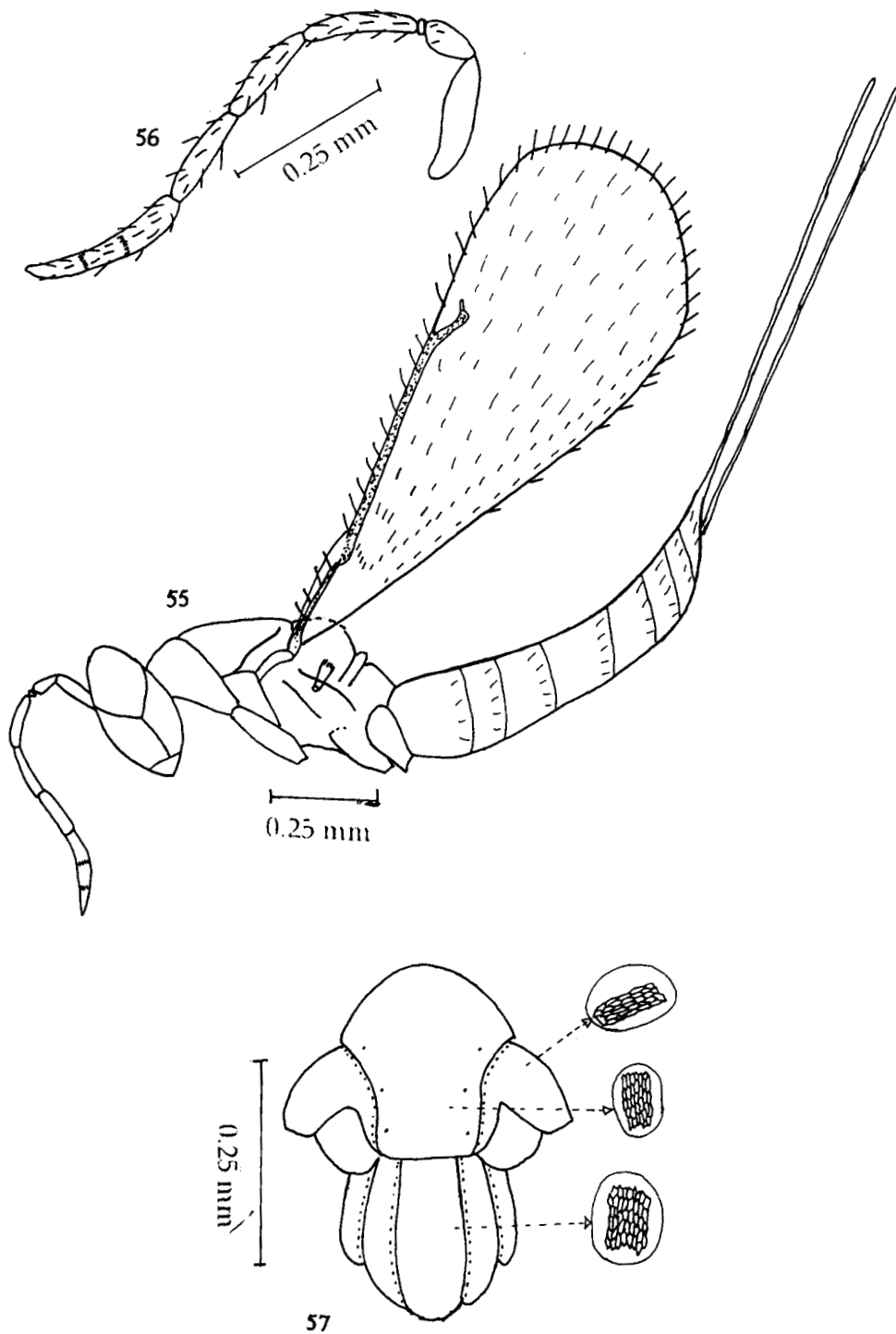
50. Body - lateral view

51. Antenna

52. Propodeum

53. Head - anterior view

54. Mesoscutum and scutellum

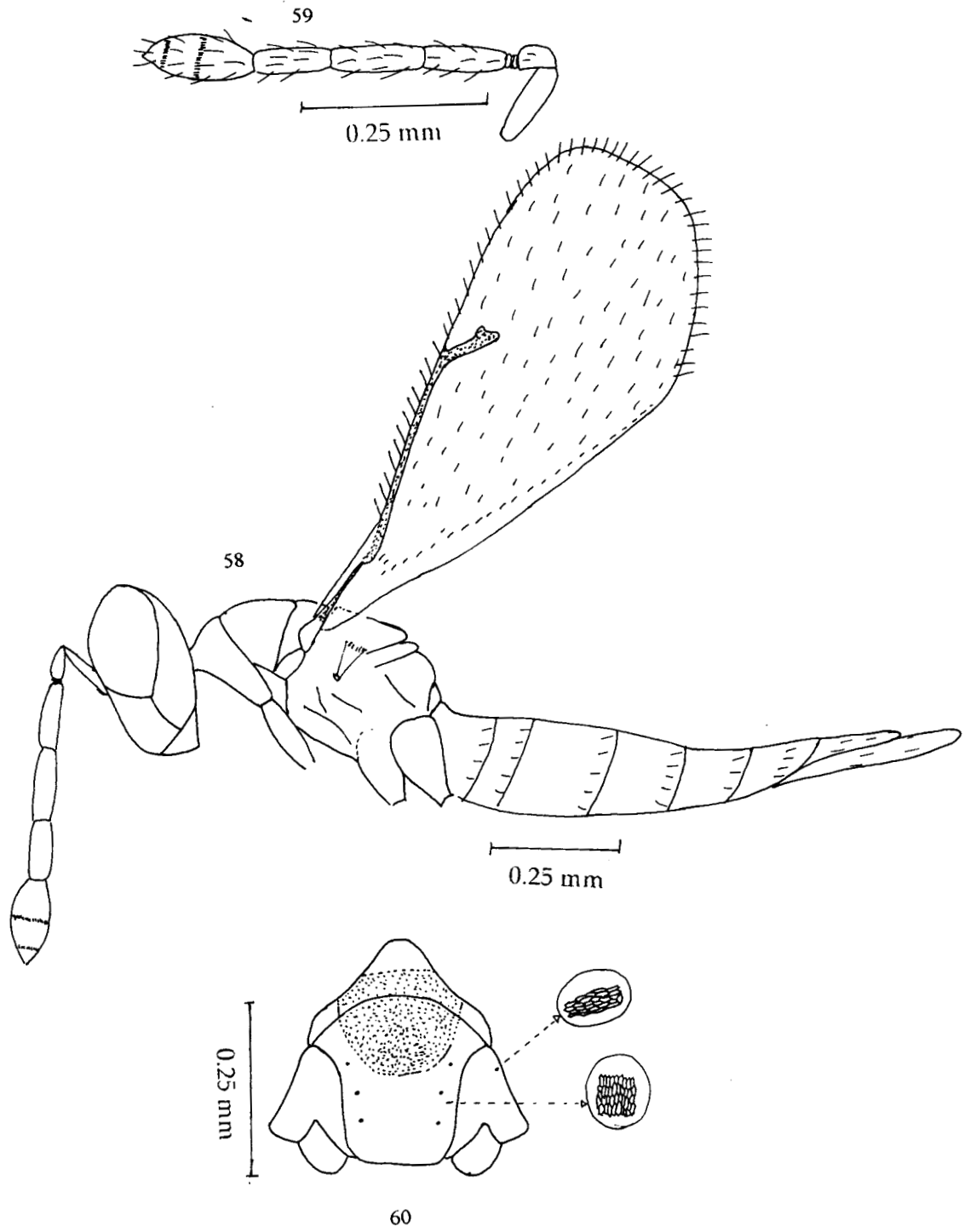


Figs. 55-57 *Aprostocetus percaudatus* (Silvestri) Female

55. Body - lateral view

56. Antenna

57. Mesoscutum and scutellum

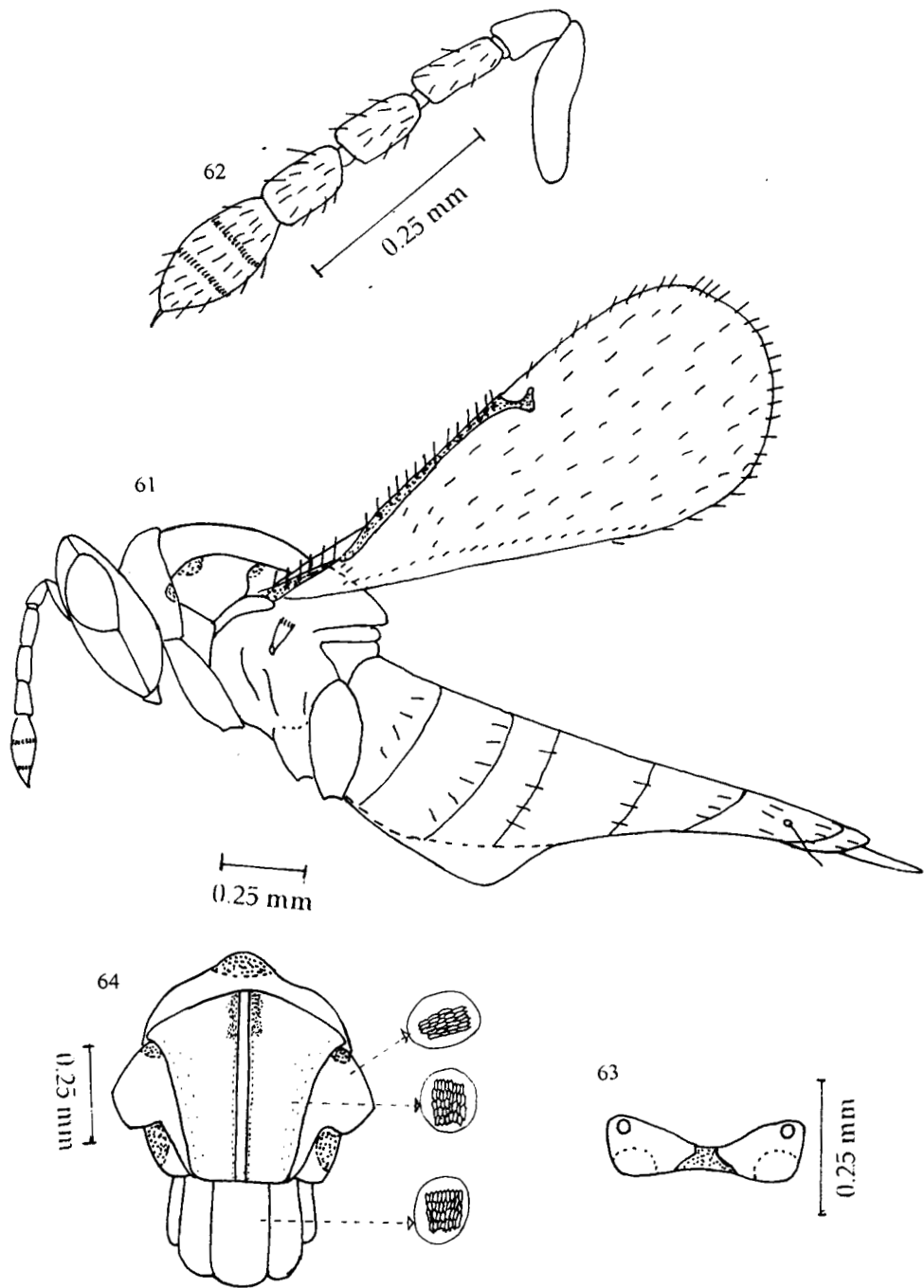


Figs. 58-60 *Aprostocetus reshmus* sp. nov. Female

58. Body - lateral view

59. Antenna

60. Pronotum and mesoscutum



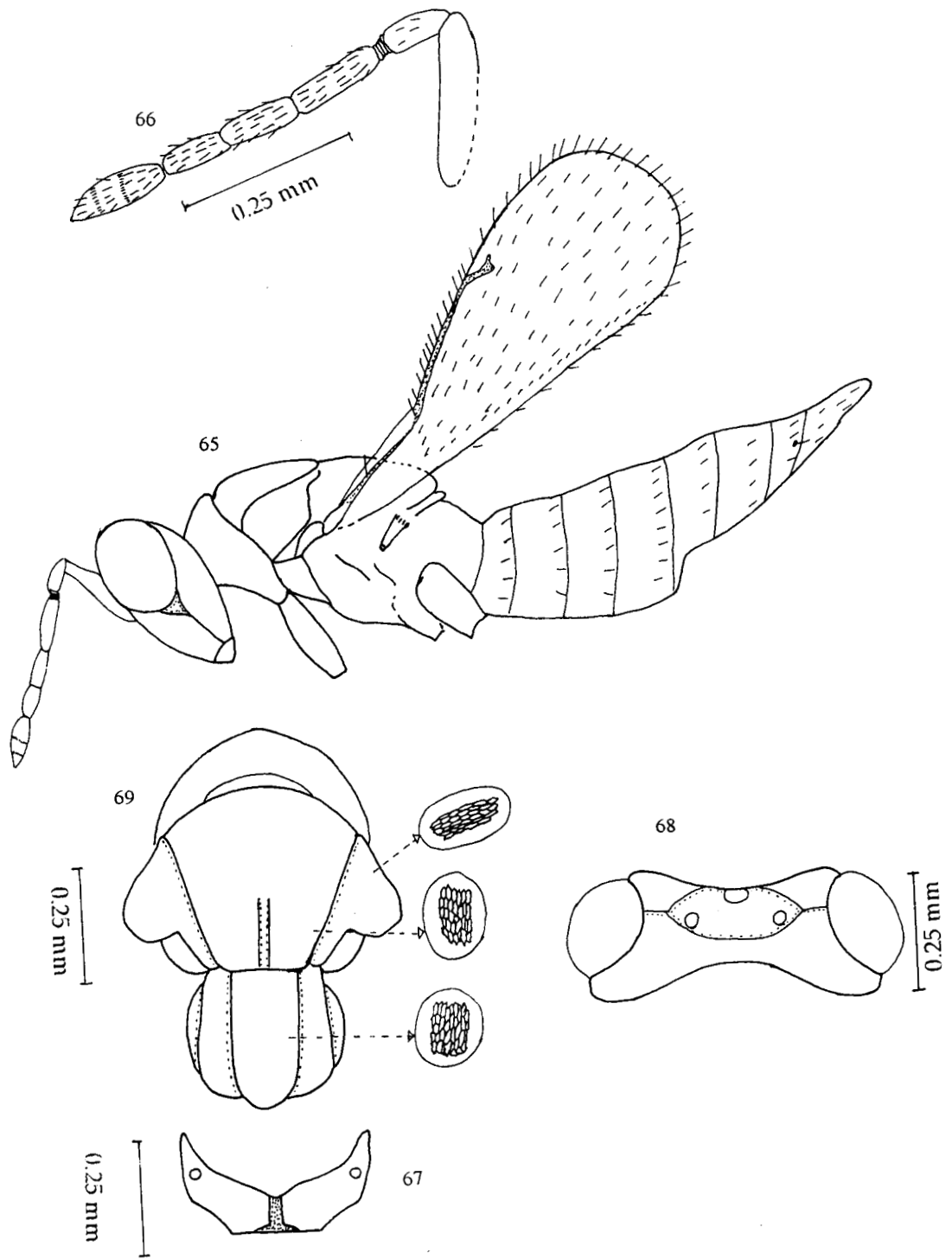
Figs. 61-64 *Aprostocetus stiatius* sp. nov. Female

61. Body - lateral view

62. Antenna

63. Propodeum

64. Pronotum, mesoscutum and scutellum



Figs. 65-69 *Aprostocetus thenhipalensis* sp. nov. Female

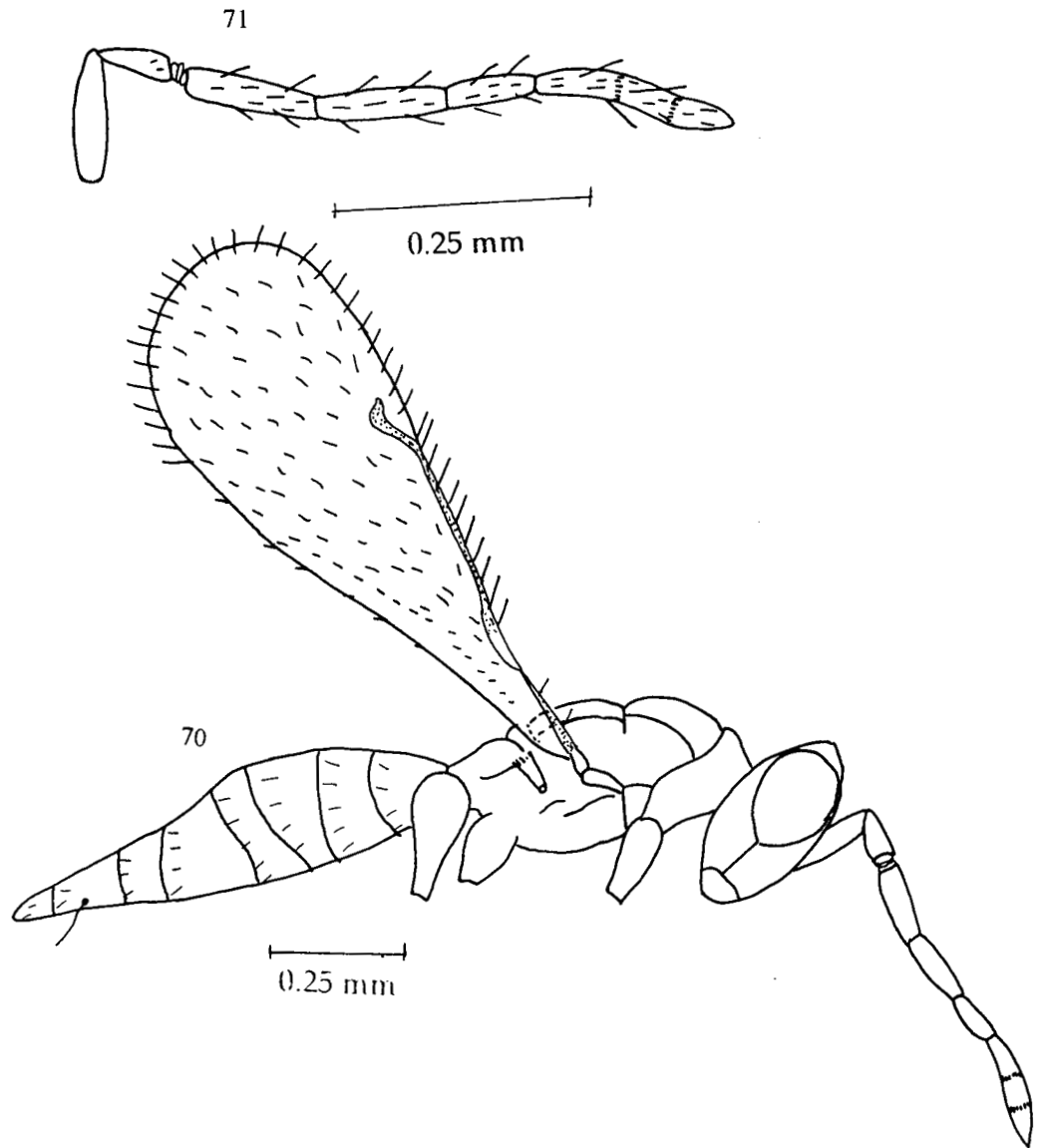
65. Body - lateral view

66. Antenna

67. Propodeum

68. Head dorsal view

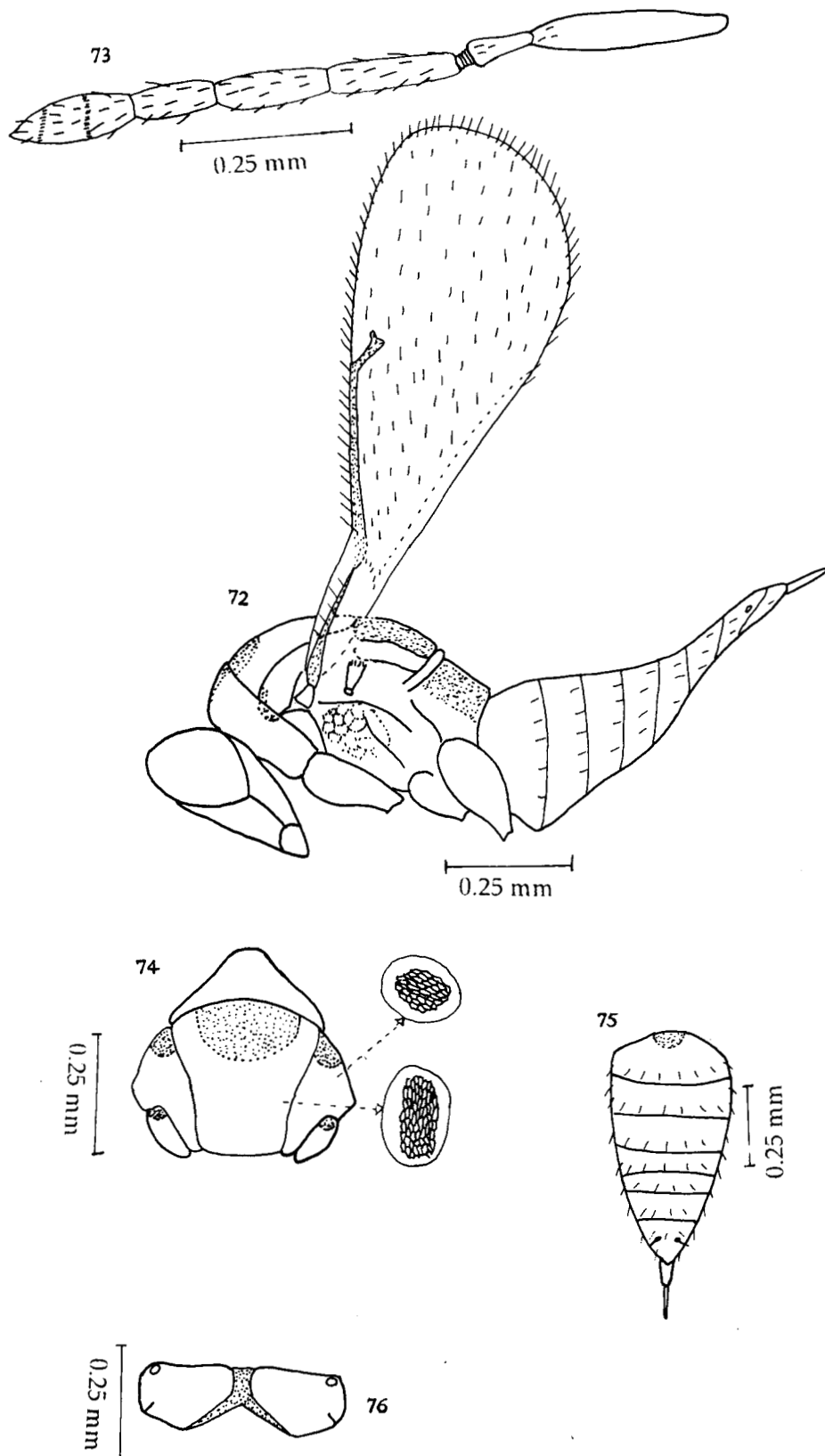
69. Pronotum, mesoscutum and scutellum



Figs.70-71 *Aprostocetus thiruvannurensis* sp. nov. Female

70. Body - lateral view

71. Antenna

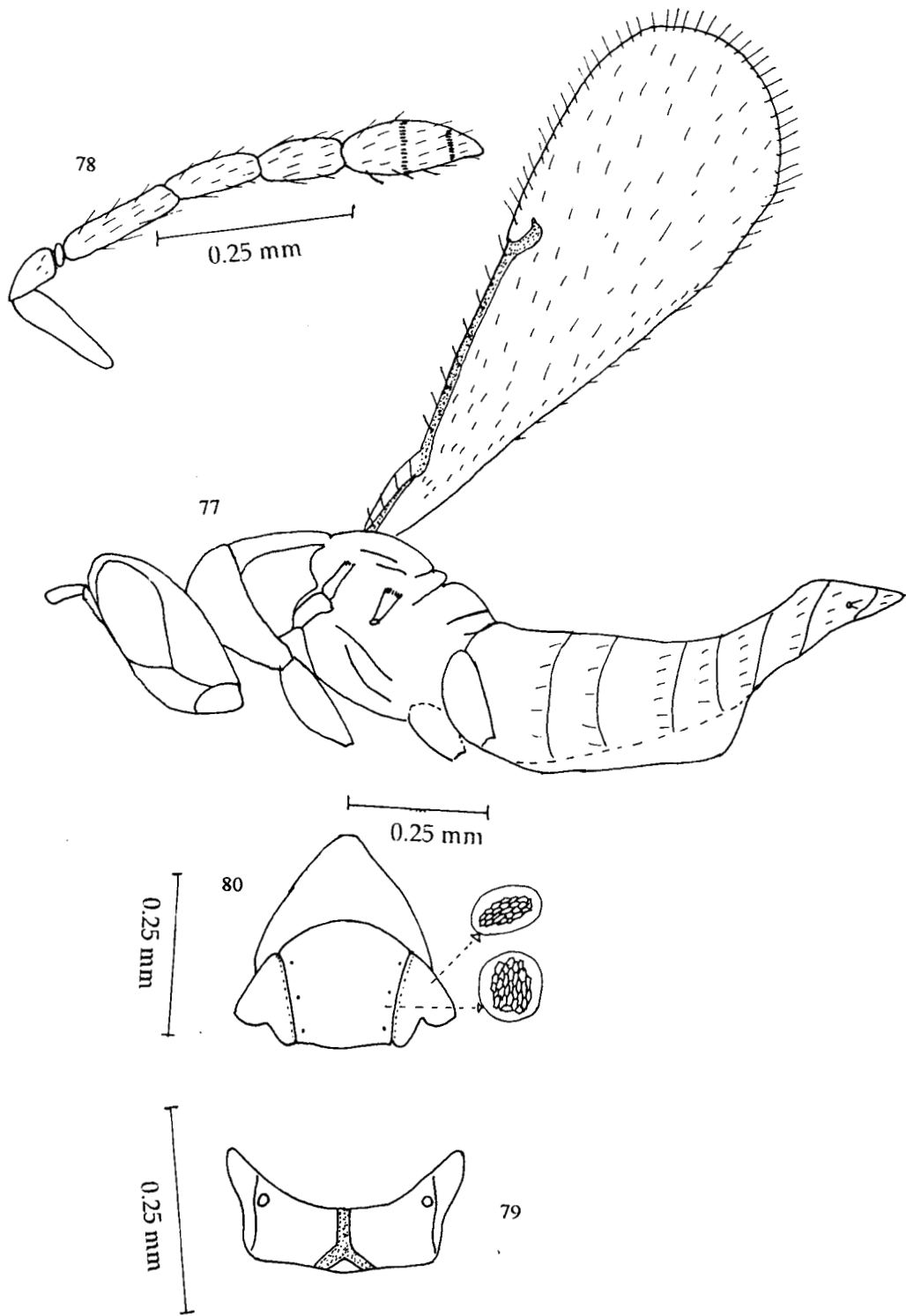


Figs. 72-76 *Aprostocetus unicus* sp. nov. Female

72. Body - lateral view 75. gaster

73. Antenna 76. Propodeum

74. Pronotum and mesoscutum



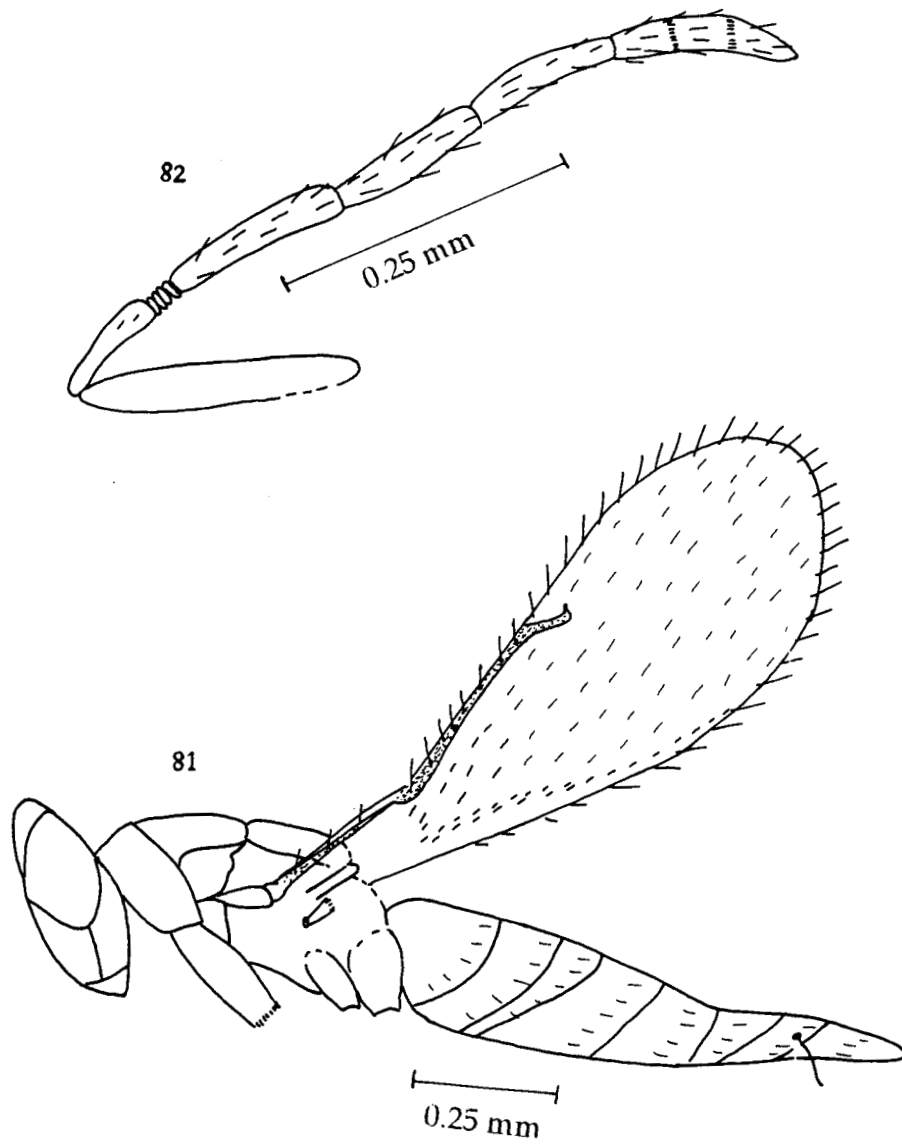
Figs. 77-80 *Aprostocetus vithurensis* sp. nov. Female

77. Body - lateral view

78. Antenna

79. Propodeum

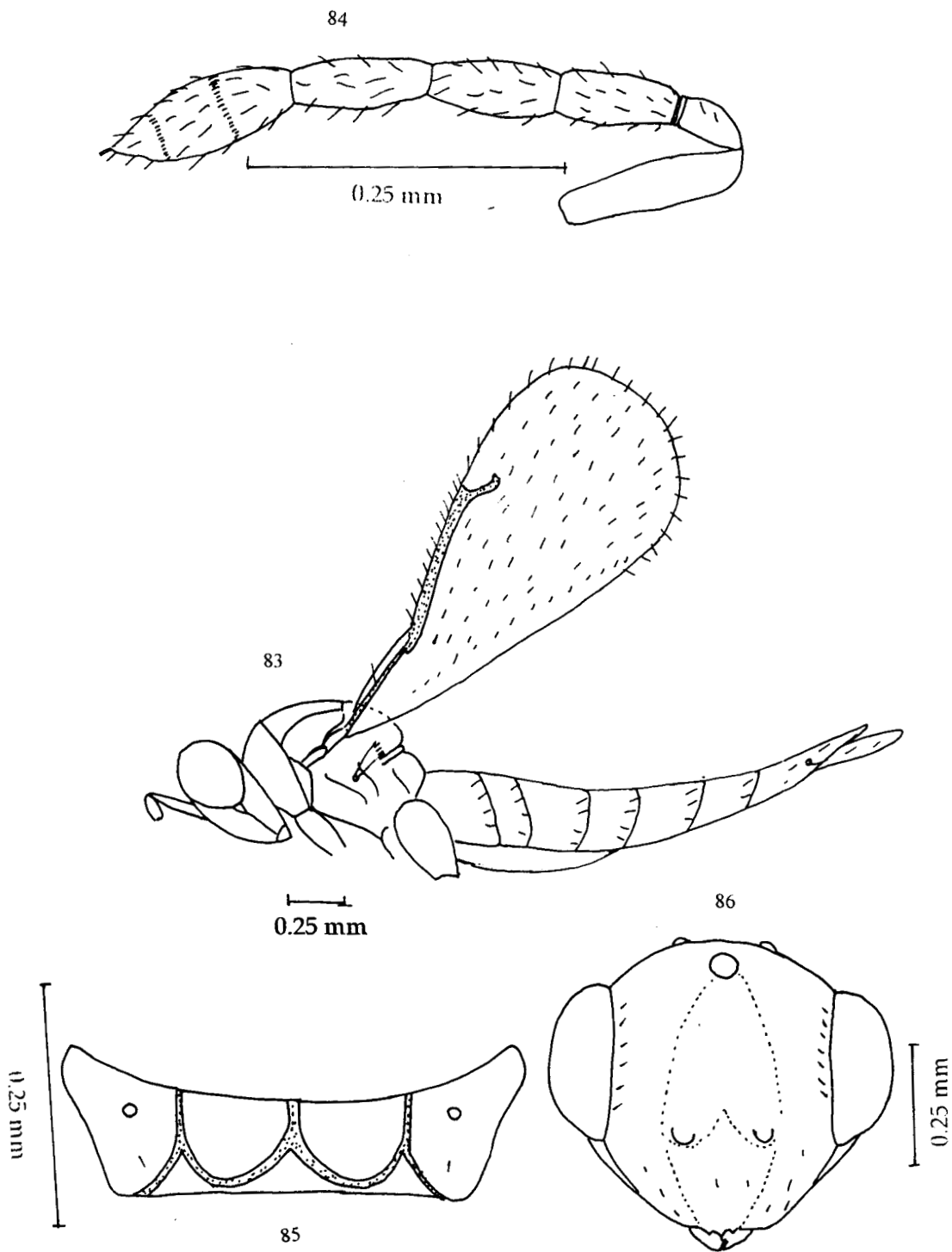
80. Pronotum and mesoscutum



Figs. 81-82 *Aprostocetus wyanadensis* sp. nov. Female

81. Body - lateral view

82. Antenna



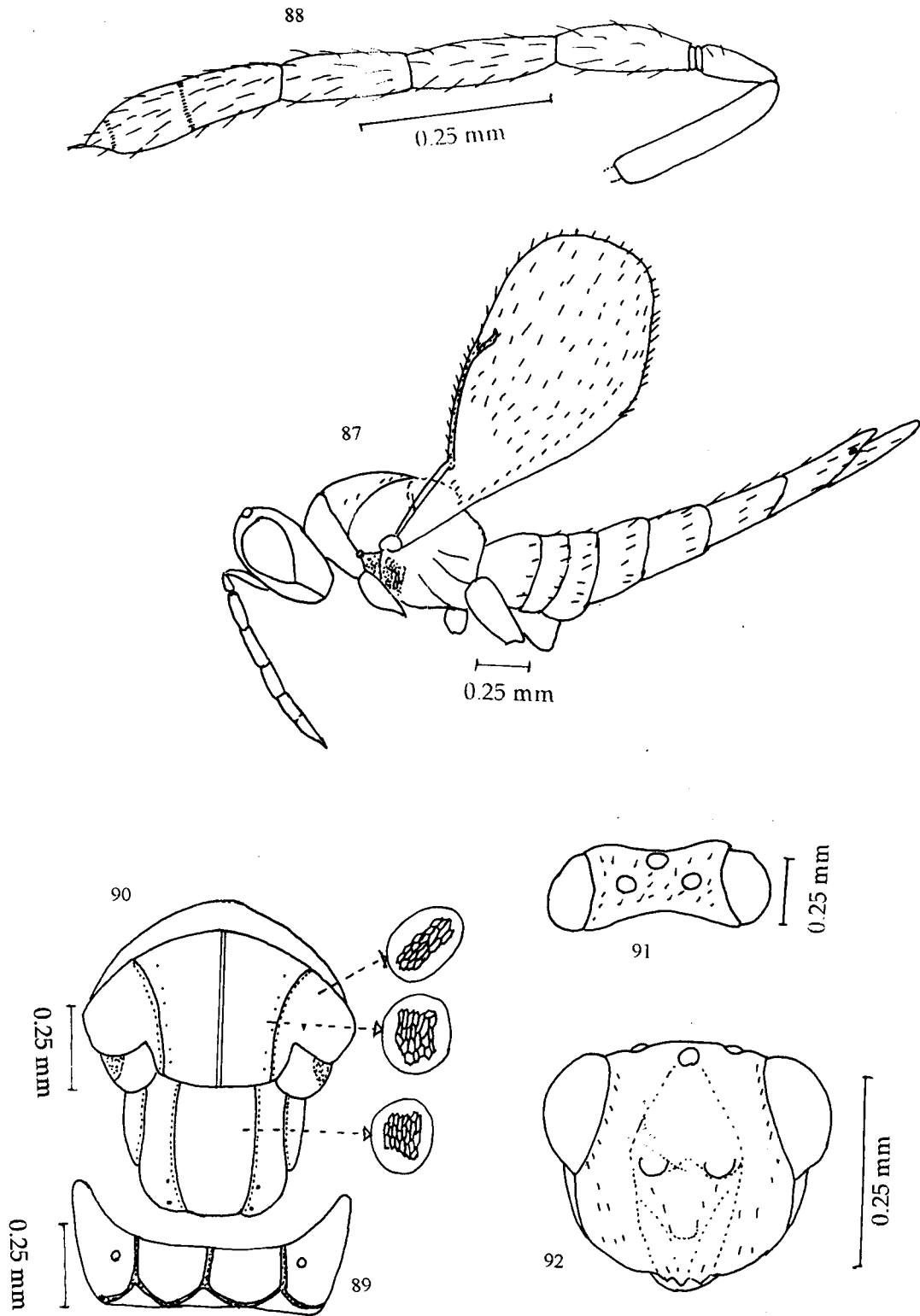
Figs. 83-86 *Neogasterichus dulciculus* sp. nov. Female

83. Body - lateral view

84. Antenna

85. Propodeum

86. Head - anterior view



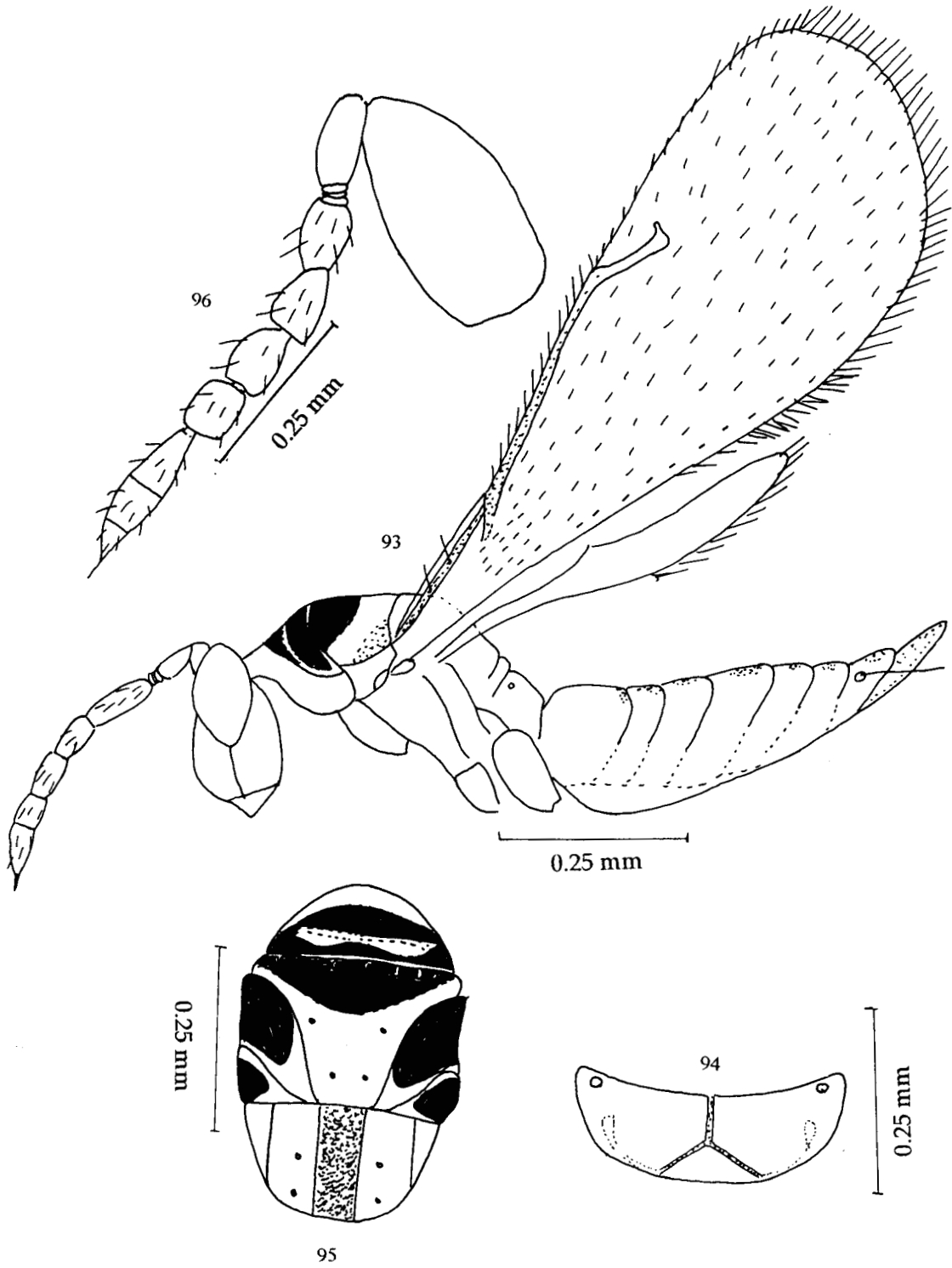
Figs. 87-92 *Neogasterichus longigastris* sp. nov. Female

87. Body - lateral view 91. Head-dorsal view

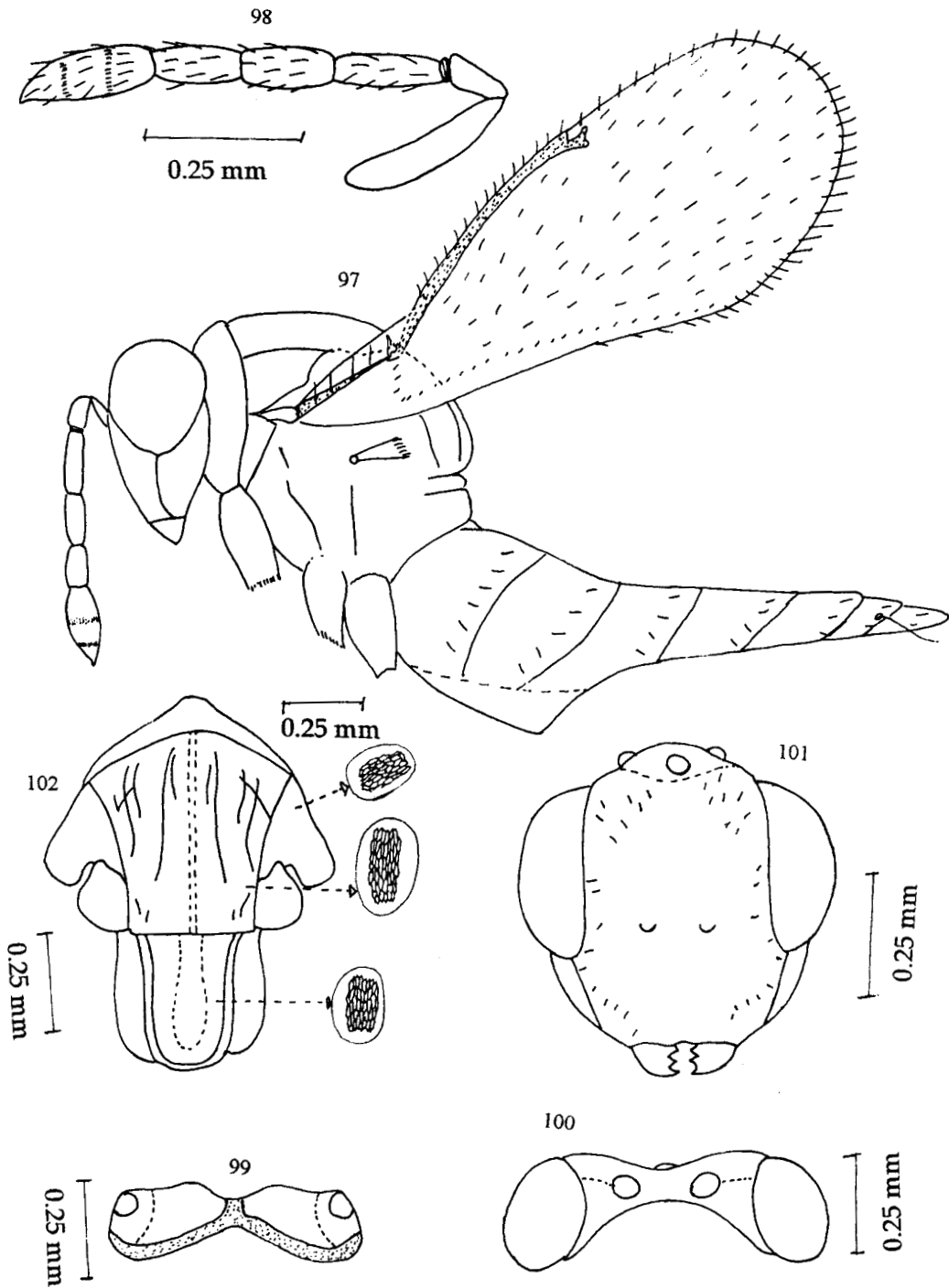
88. Antenna 92. Head - anterior view

89. Propodeum

90. Mesoscutum and scutellum



Figs. 93-96. *Neomestocharella keralensis* Narendran & Fousi
 93-95. Female
 93. Body - lateral view
 94. Propodeum
 95. Pronotum, mesoscutum and scutellum
 96. Male: Antenna



Figs. 97-102 *Neoparachrysocharis keralensis* sp. nov. Female

97. Body - lateral view

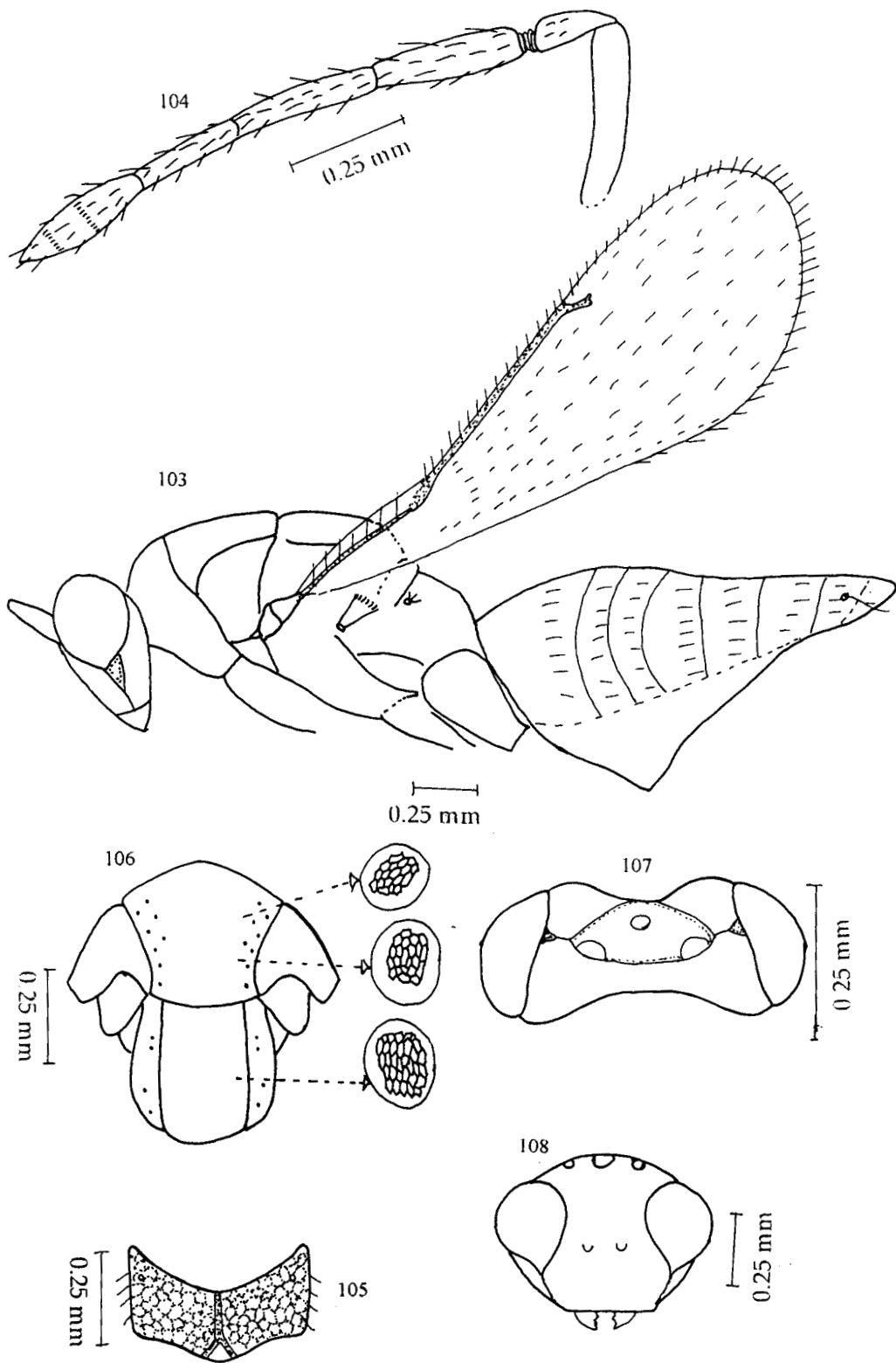
98. Antenna

99. Propodeum

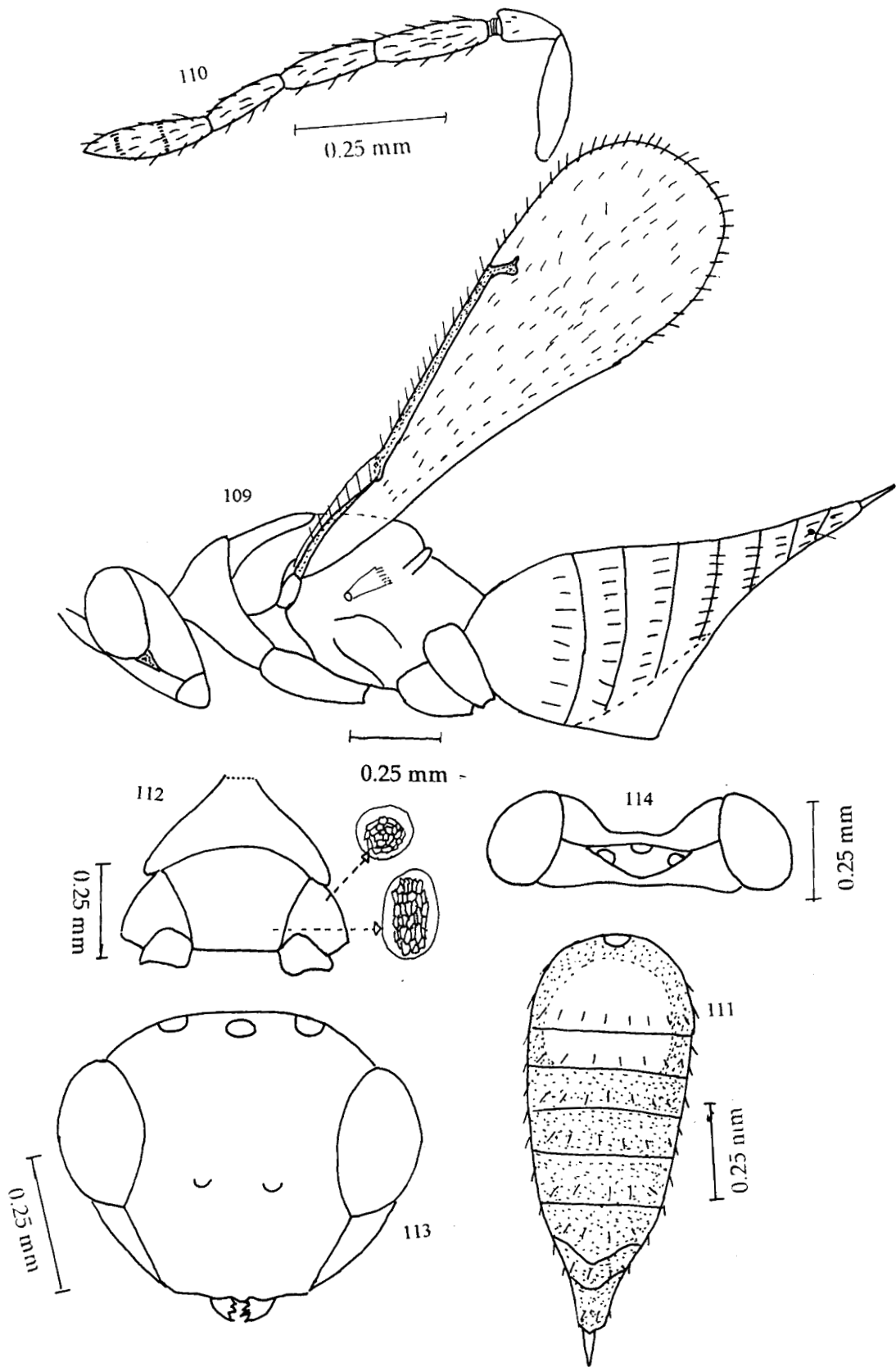
100. Head dorsal view

101. Head - anterior view

102. Pronotum, mesoscutum and scutellum



Figs. 103-108 *Neotrichoporoides agaliensis* sp. nov. Female
 103. Body - lateral view 107. Head dorsal view
 104. Antenna 108. Head - anterior view
 105. Propodeum
 106. Mesoscutum and scutellum



Figs. 109-114 *Neotrichoporoides choti* sp. nov. Female

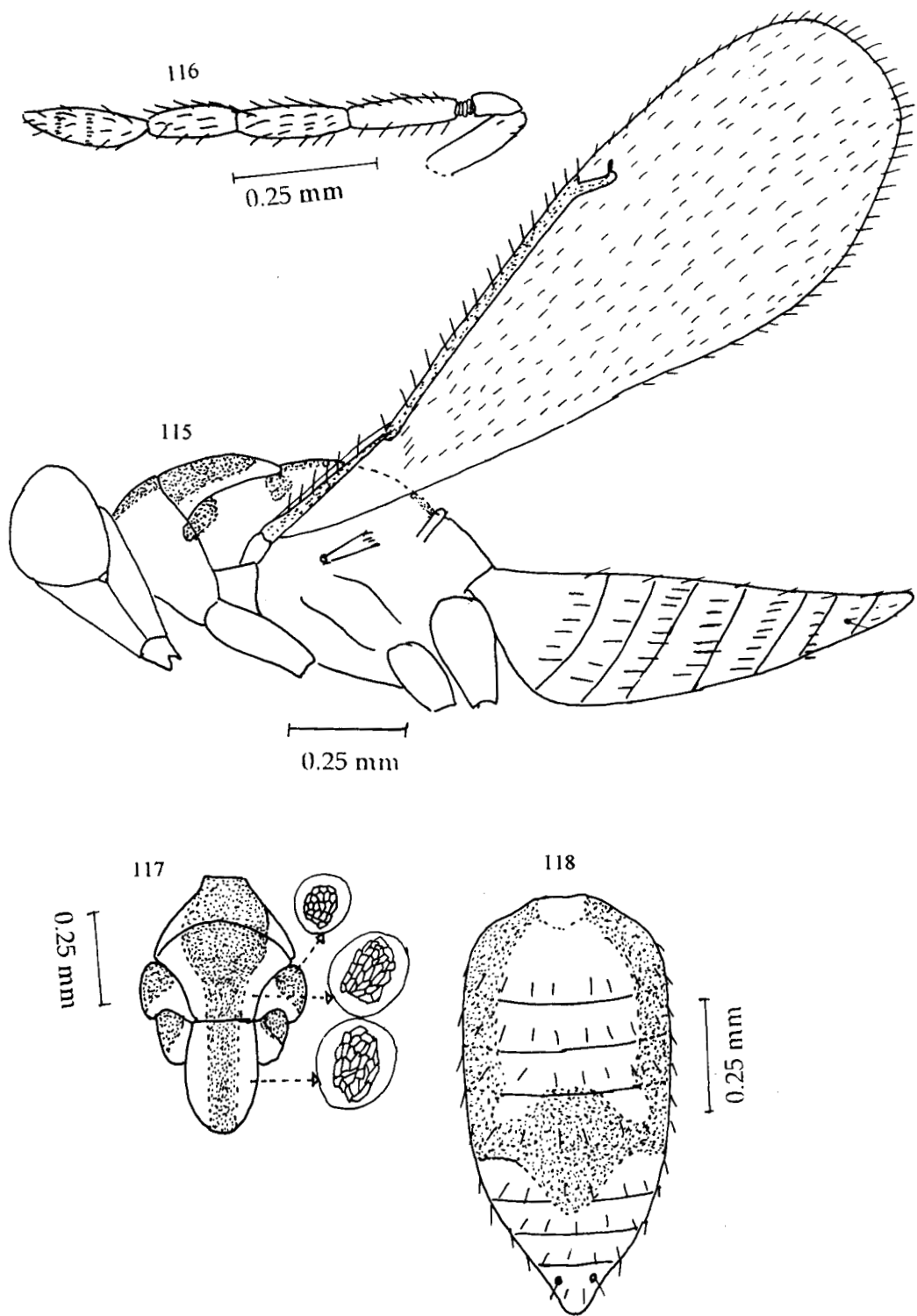
109. Body - lateral view 113. Head - anterior view

110. Antenna

114. Head dorsal view

111. gaster

112. Pronotum and mesoscutum

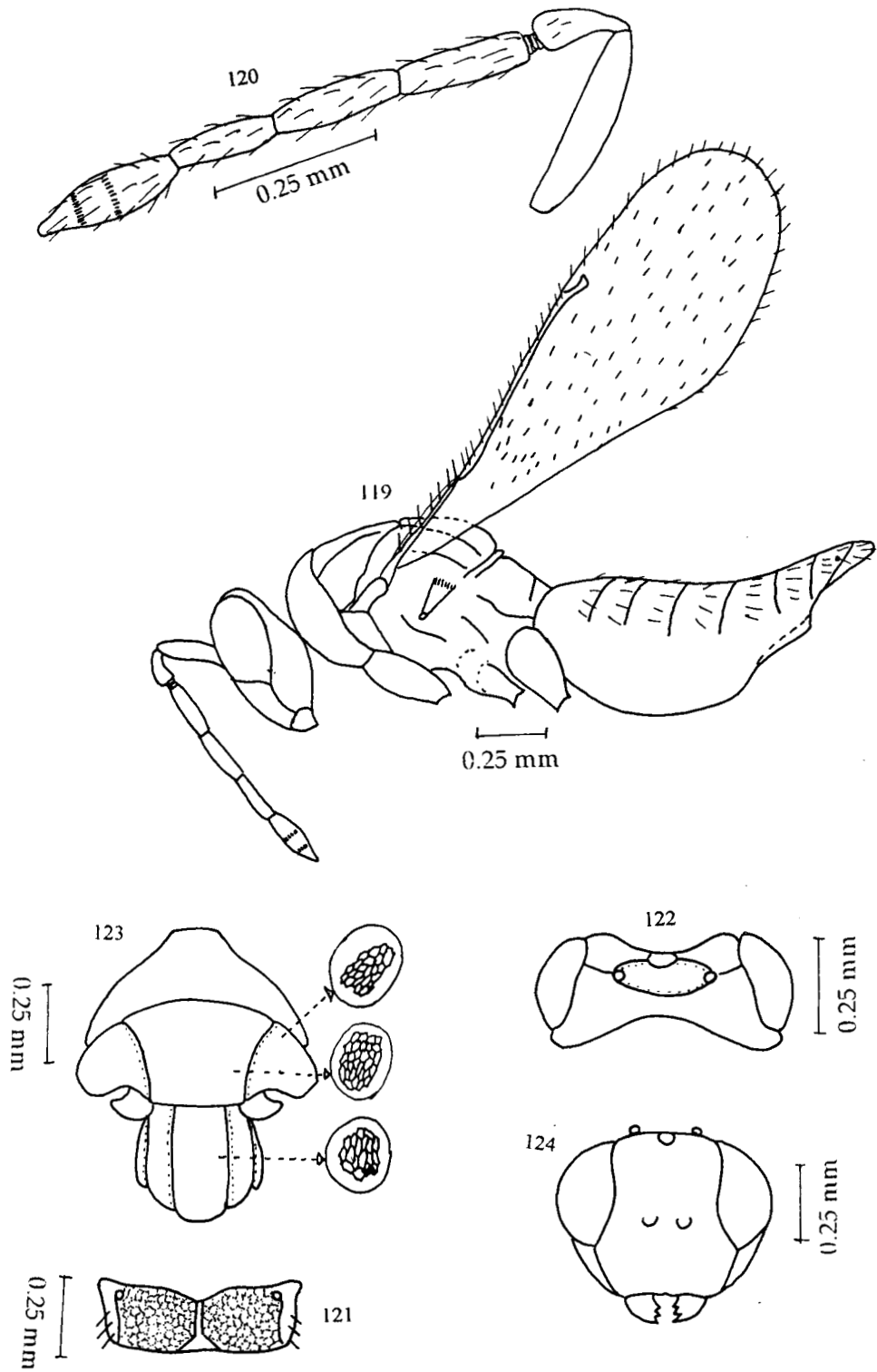


Figs. 115-118 *Neotrichoporoides helvolus* sp. nov. Female

115. Body - lateral view 118. gaster

116. Antenna

117. Pronotum, mesoscutum and scutellum



Figs. 119-124 *Neotrichoporoides malampuzhensis* sp. nov. Female

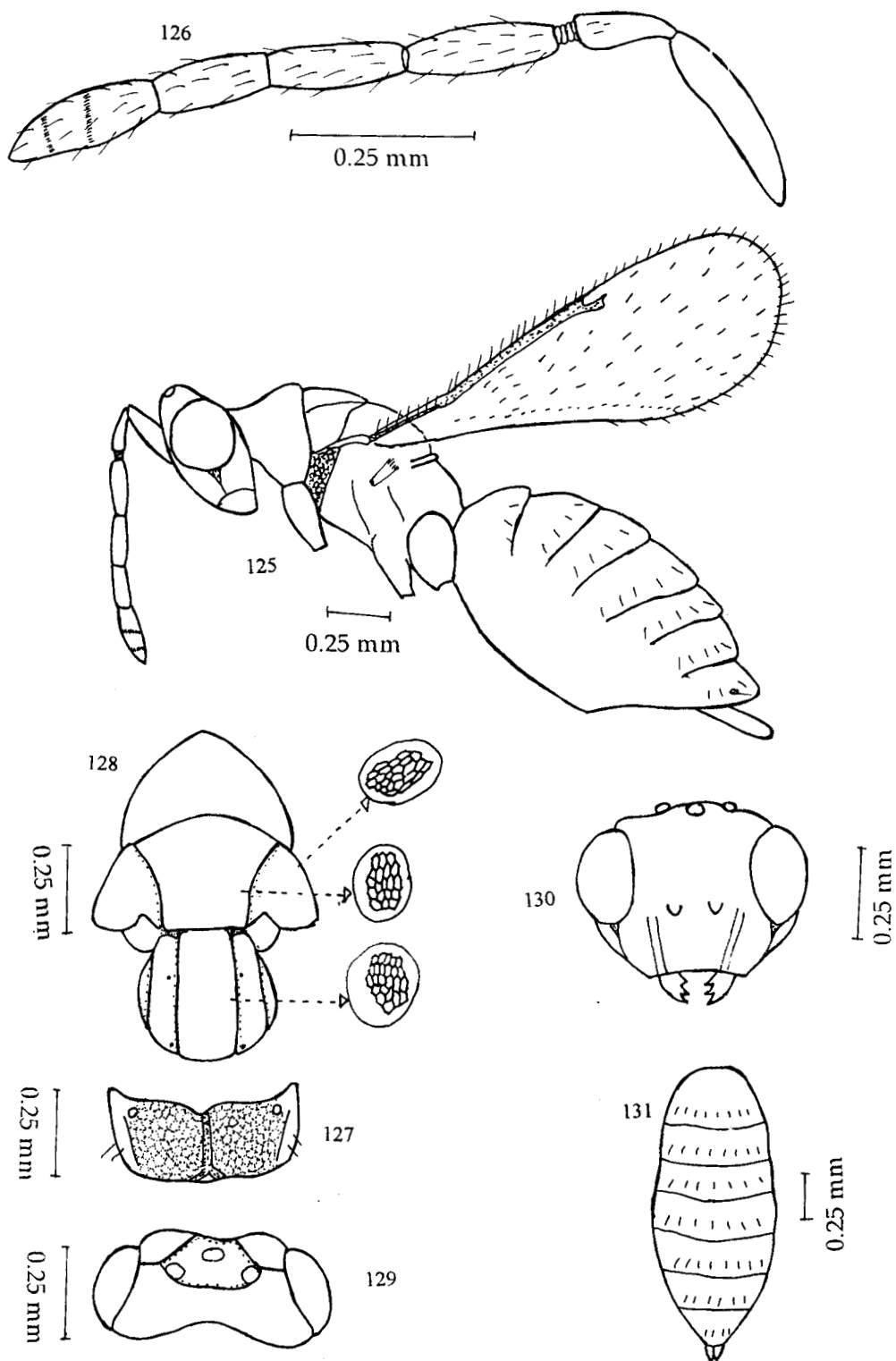
119. Body - lateral view 124. Head - anterior view

120. Antenna

121. Propodeum

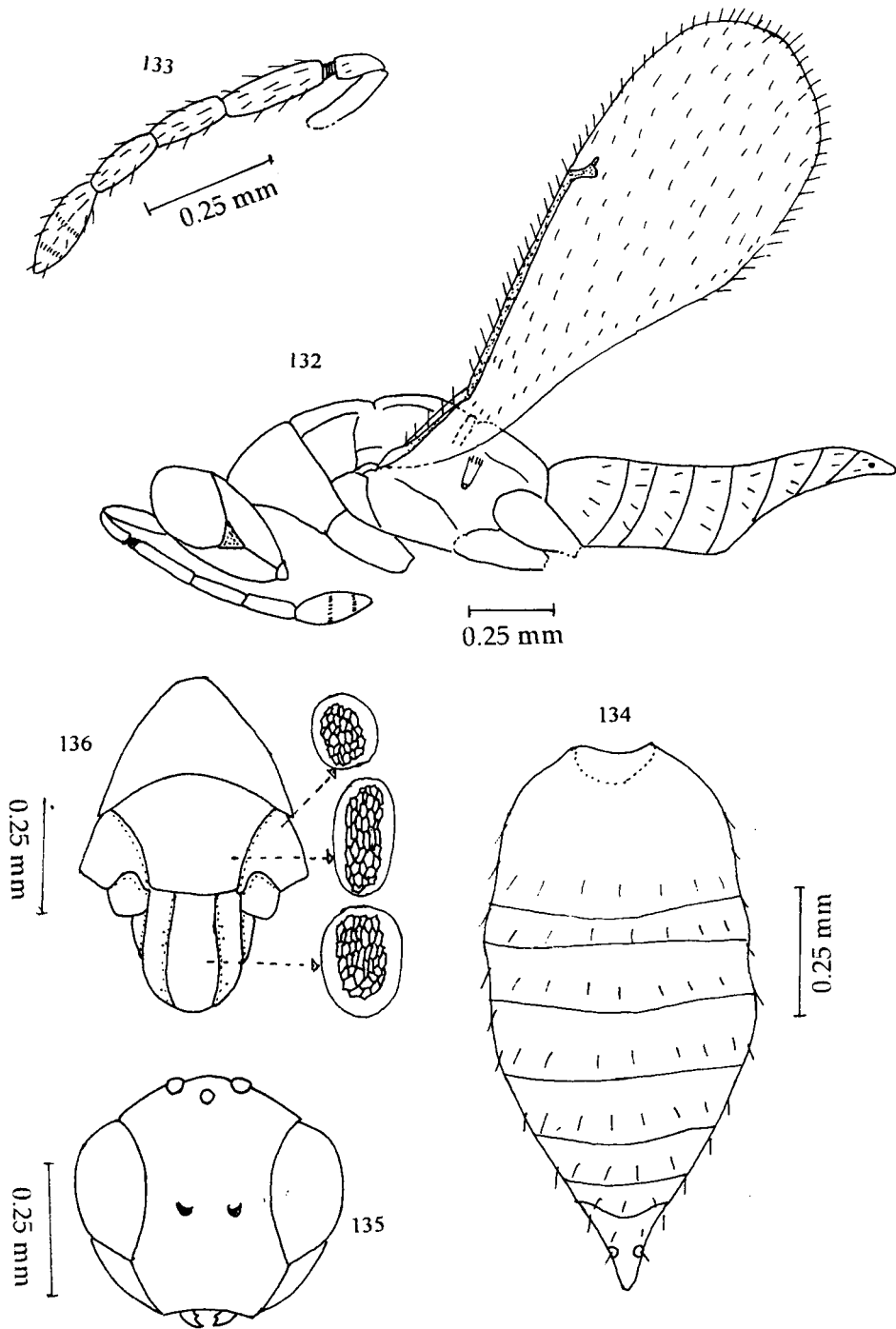
122. Head dorsal view

123. Pronotum, mesoscutum and scutellum



Figs. 125-131 *Neotrichoporoides moti* sp. nov. Female

- | | |
|---|---------------------------|
| 125. Body - lateral view | 129. Head dorsal view |
| 126. Antenna | 130. Head - anterior view |
| 127. Propodeum | 131. gaster |
| 128. Pronotum, mesoscutum and scutellum | |



Figs. 132-136 *Neotrichoporoides nyemitawus* (Rohwer) Female

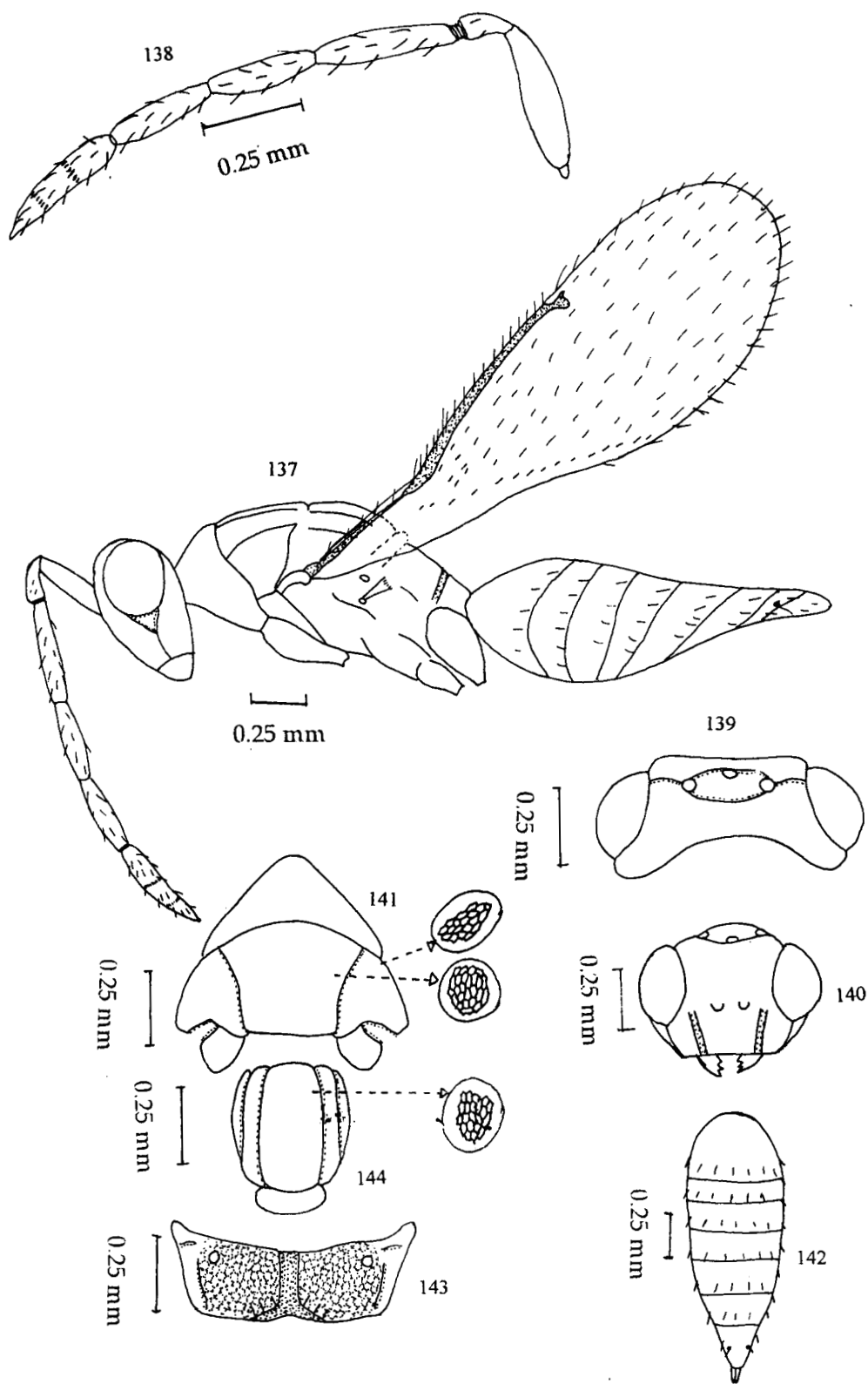
132. Body - lateral view

133. Antenna

134. gaster

135. Head - anterior view

136. Pronotum, mesoscutum and scutellum



Figs. 137-144 *Neotrichoporoides silentvalleyensis* sp. nov. Female

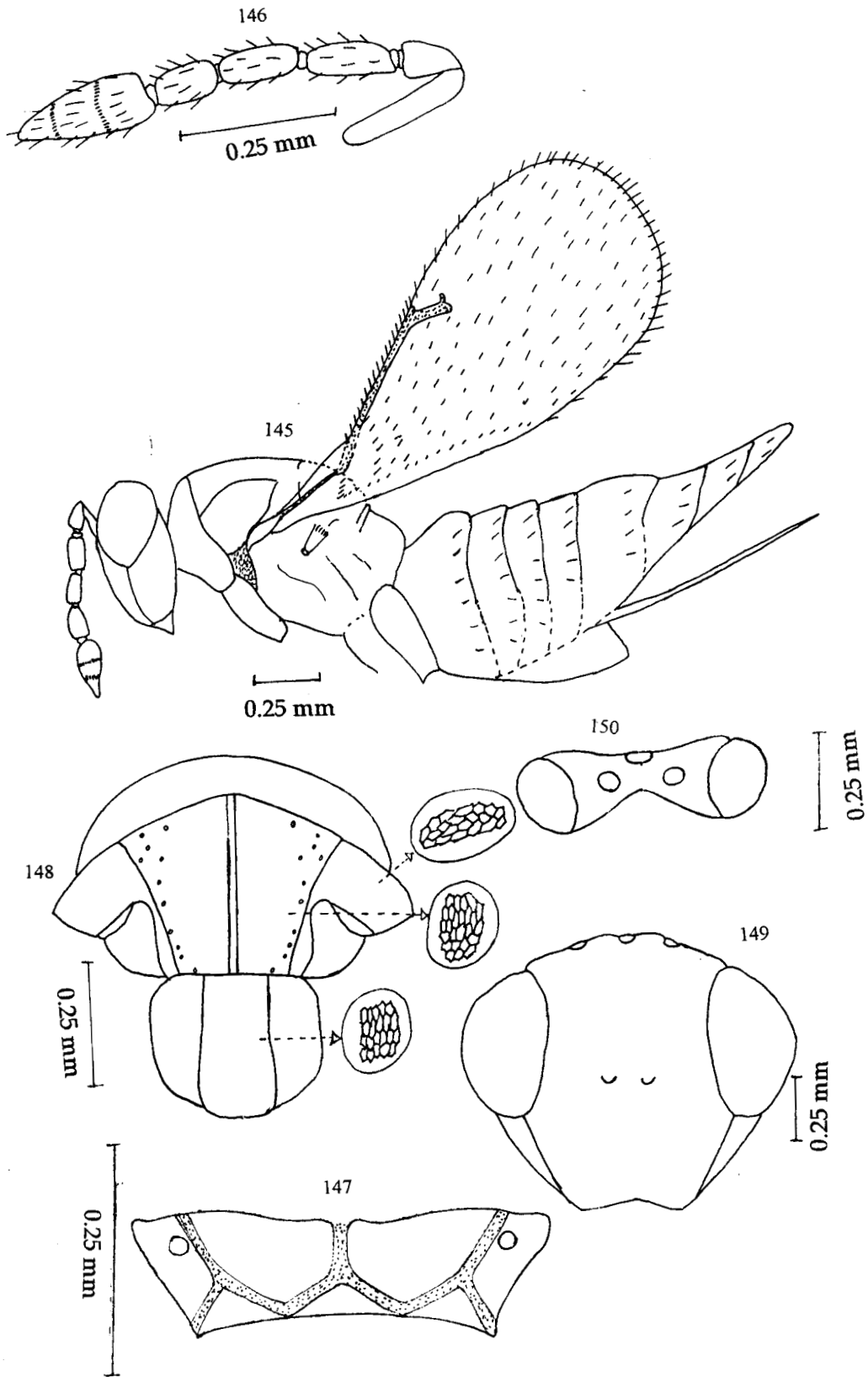
137. Body - lateral view 142. gaster

138. Antenna 143. Propodeum

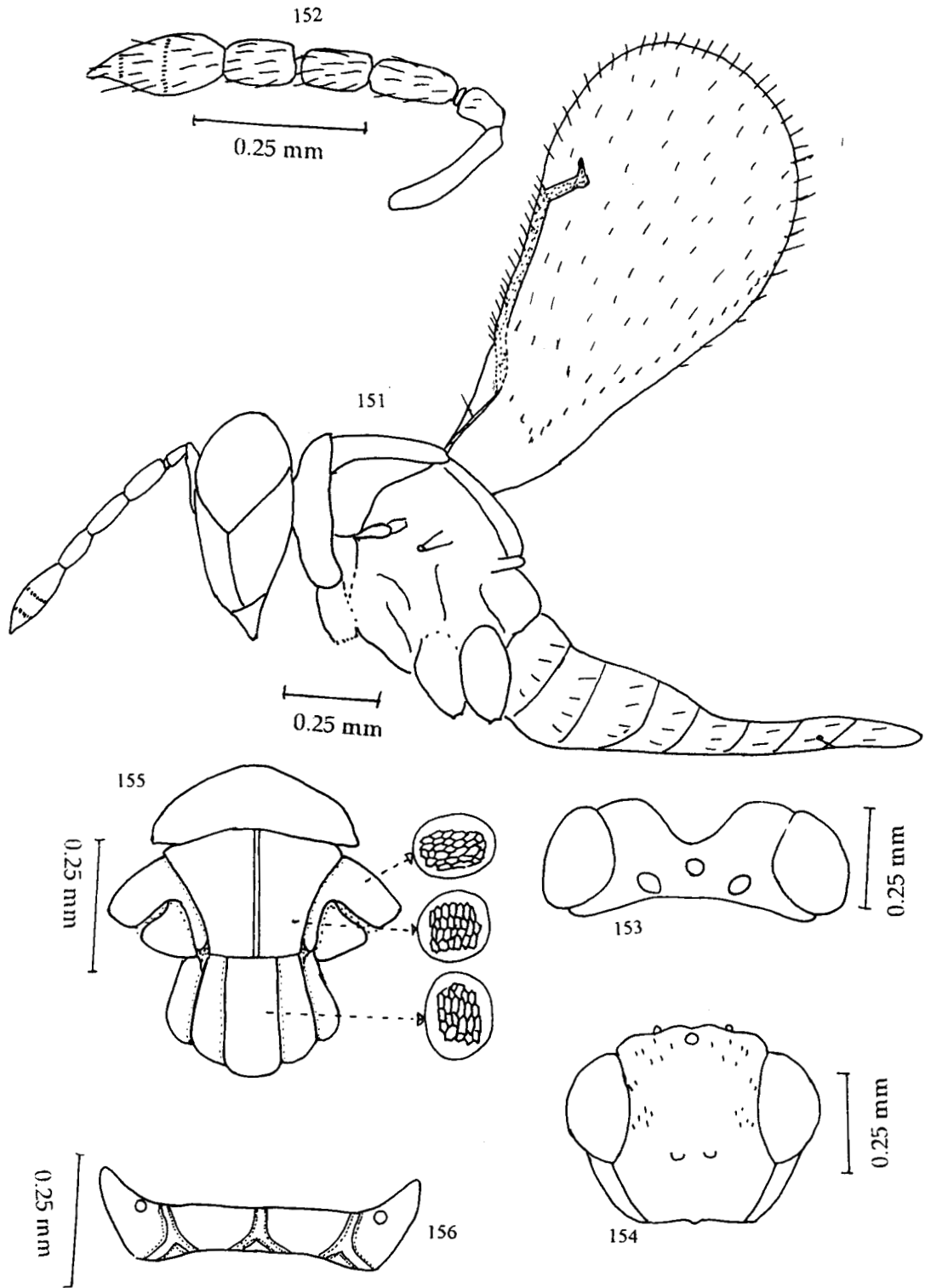
139. Head dorsal view 144. Scutellum

140. Head - anterior view

141. Pronotum and mesoscutum



Figs. 145-150 *Tetrastichus carus* sp. nov. Female
 145. Body - lateral view 149. Head - anterior view
 146. Antenna 150. Head dorsal view
 147. Propodeum
 148. Pronotum, mesoscutum and scutellum



Figs. 151-156 *Tetrastichus corvinus* sp. nov. Female

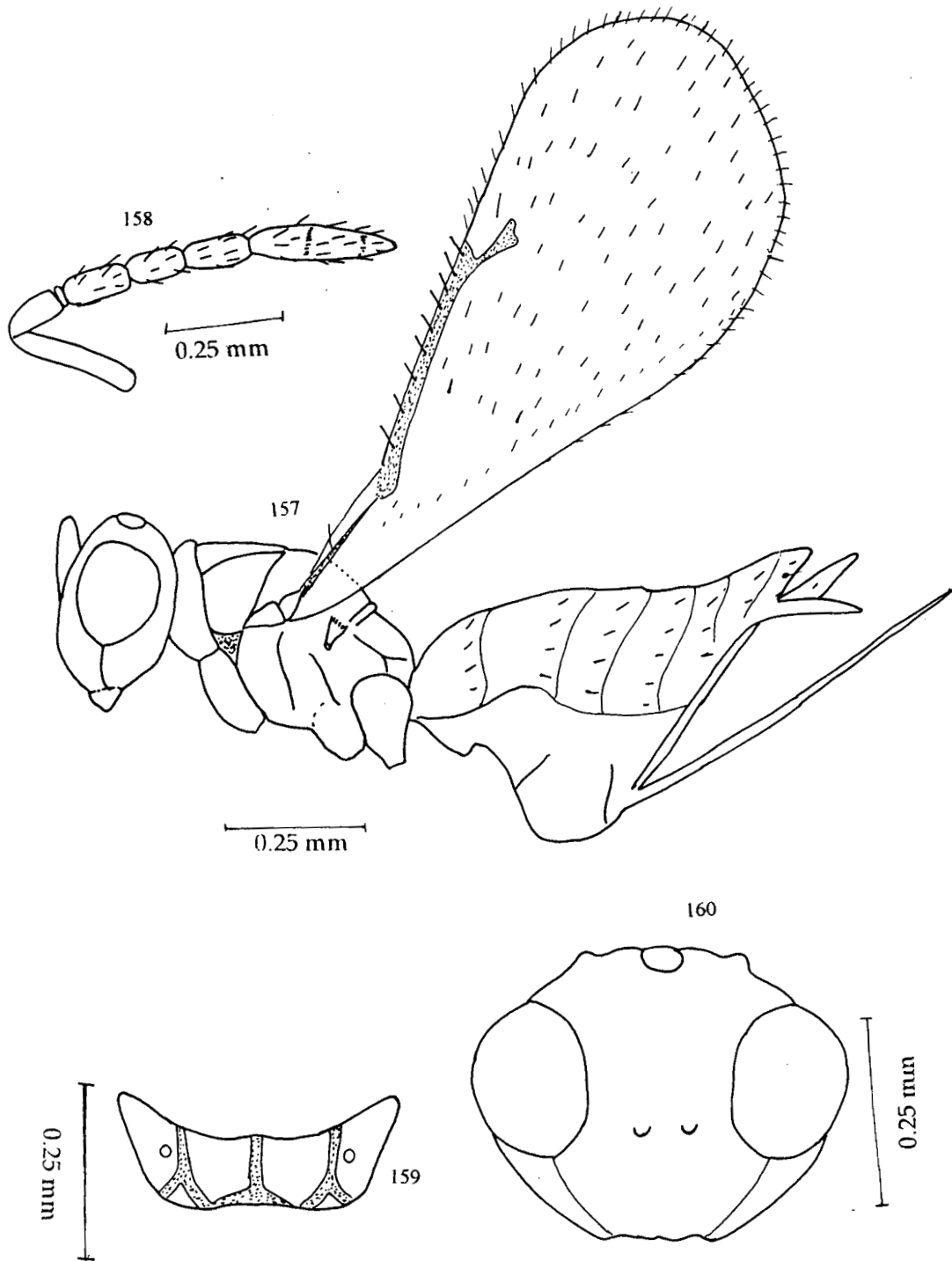
151. Body - lateral view 156. Propodeum

152. Antenna

153. Head dorsal view

154. Head - anterior view

155. Pronotum, mesoscutum and scutellum



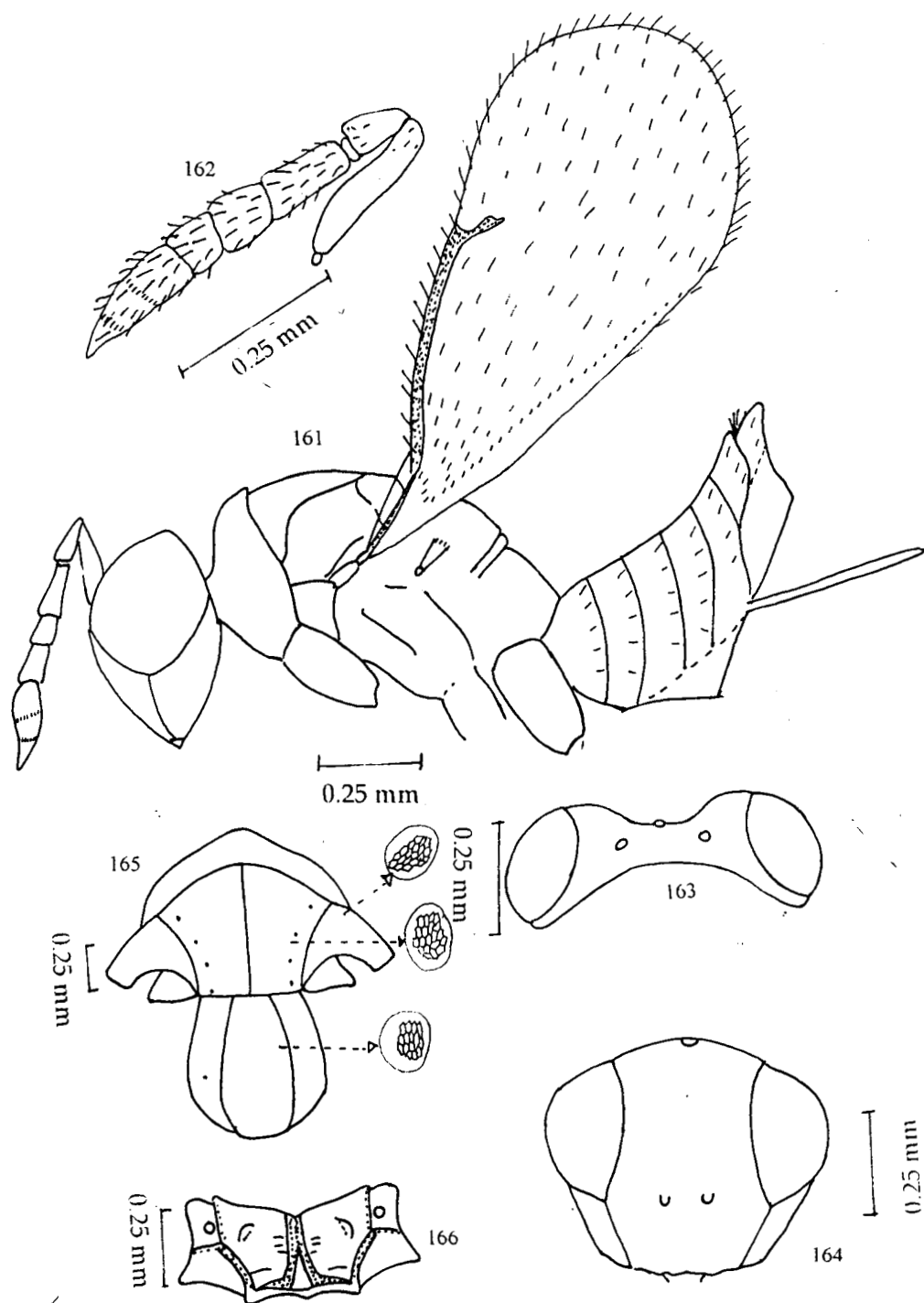
Figs. 157-160 *Tetrastichus festivus* sp. nov. Female

157. Body - lateral view

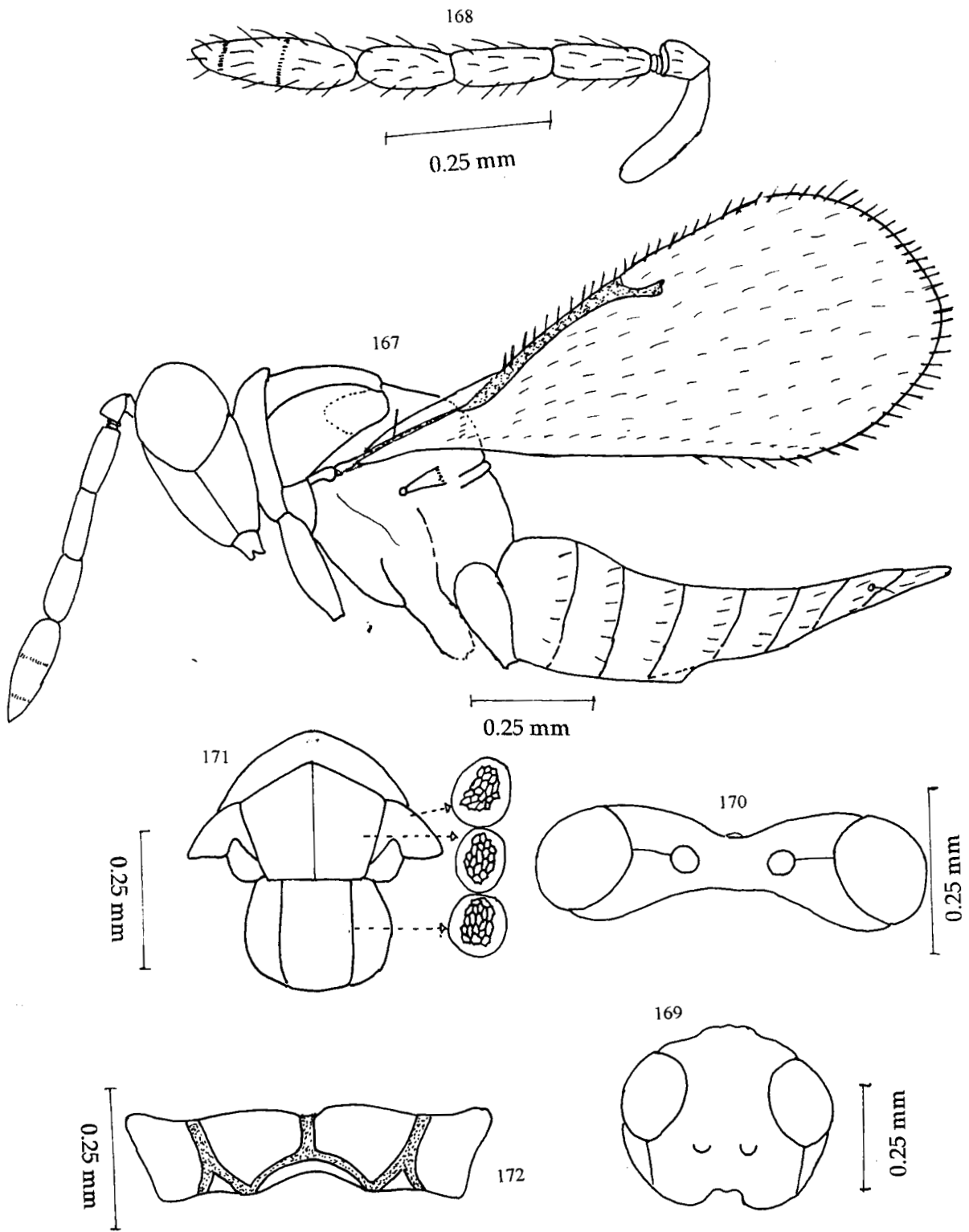
158. Antenna

159. Propodeum

160. Head - anterior view



Figs. 161-166 *Tetrastichus howardi* (Olliff) Female
 161. Body - lateral view 166. Propodeum
 162. Antenna
 163. Head dorsal view
 164. Head - anterior view
 165. Pronotum, mesoscutum and scutellum



Figs. 167-172 *Tetrastichus keralensis* sp. nov. Female

167. Body - lateral view

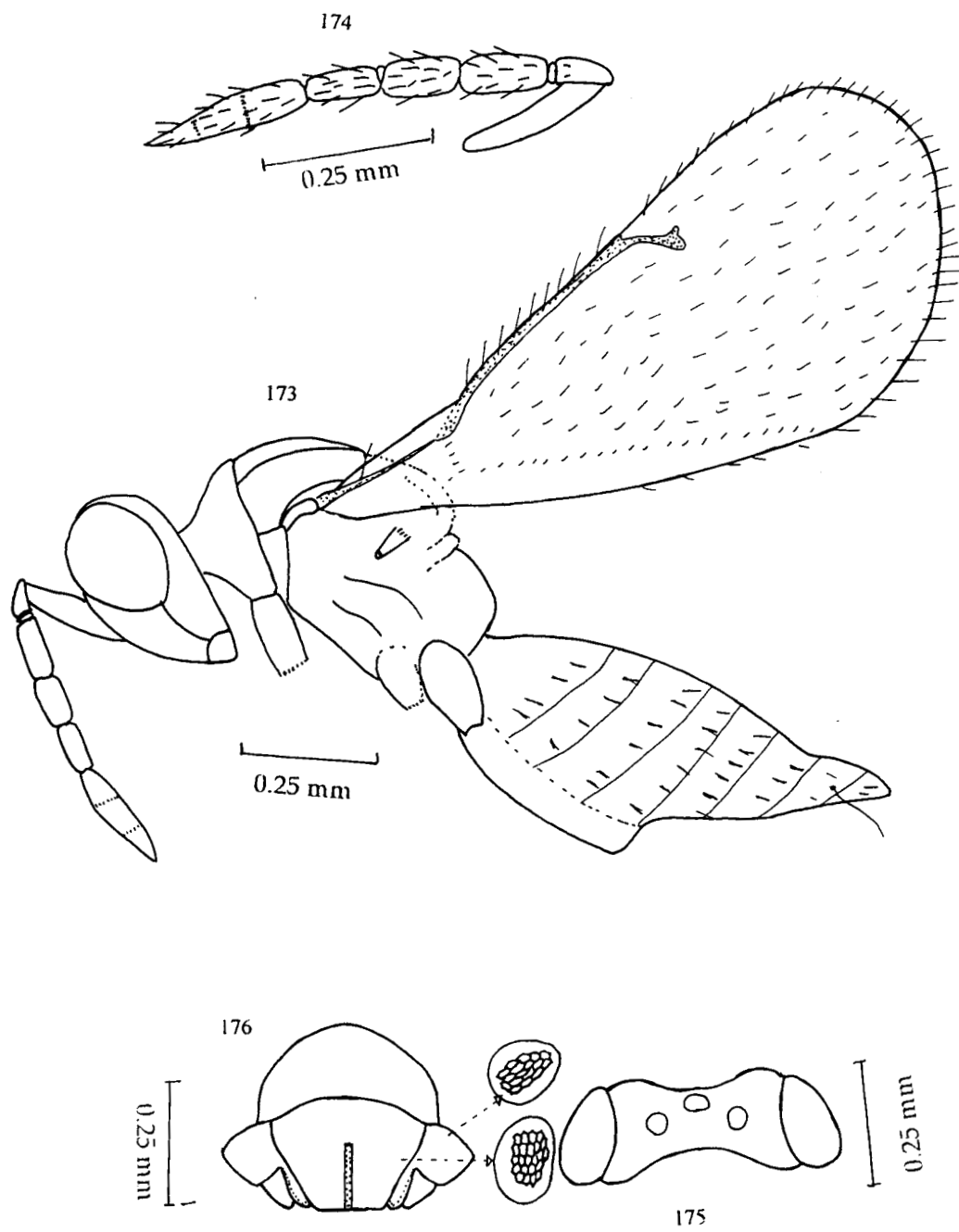
172. Propodeum

168. Antenna

169. Head - anterior view

170. Head dorsal view

171. Pronotum, mesoscutum and scutellum



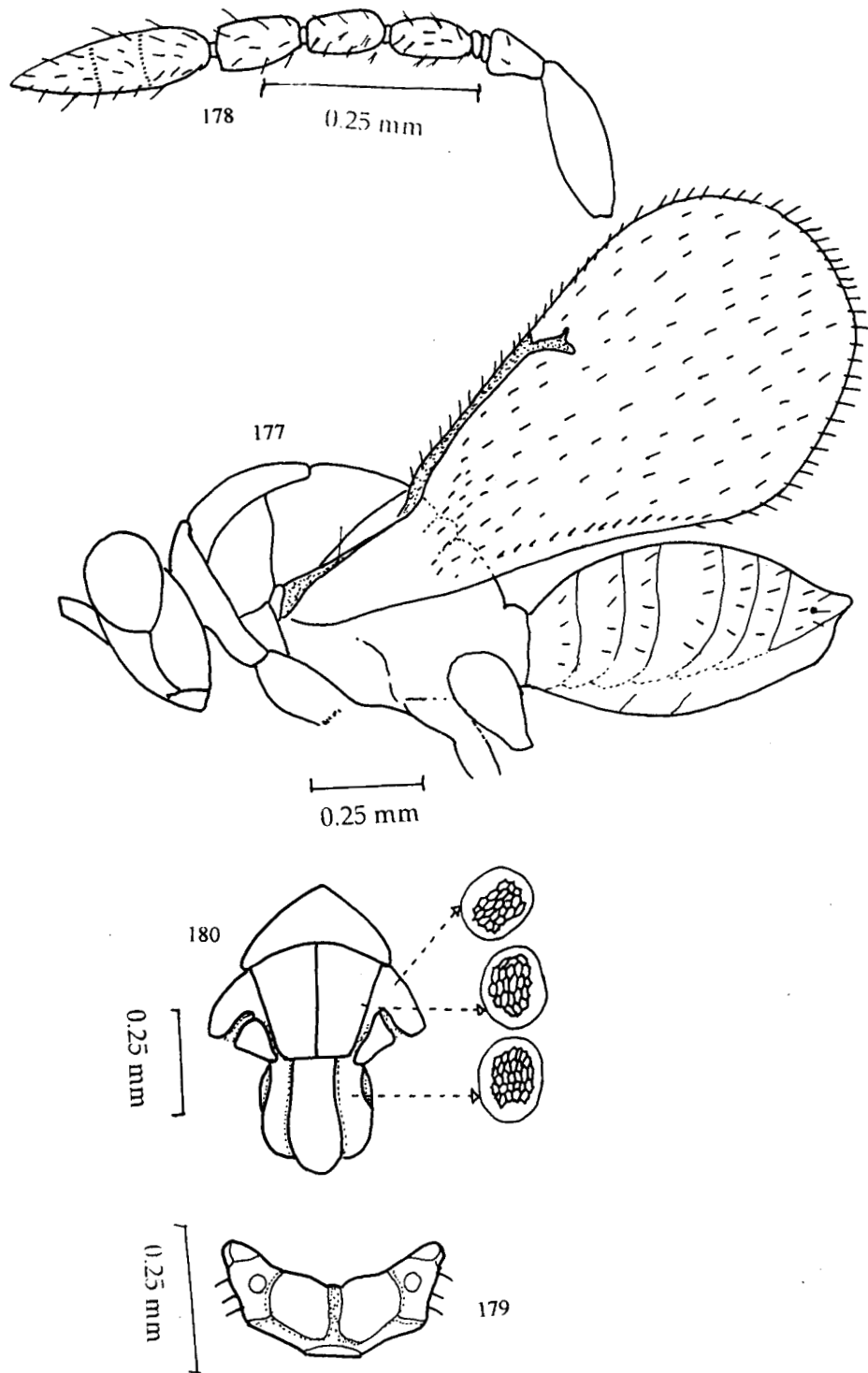
Figs. 173-176 *Tetrastichus kozhikodensis* sp.nov. Female

173. Body - lateral view

174. Antenna

175. Head dorsal view

176. Pronotum and mesoscutum



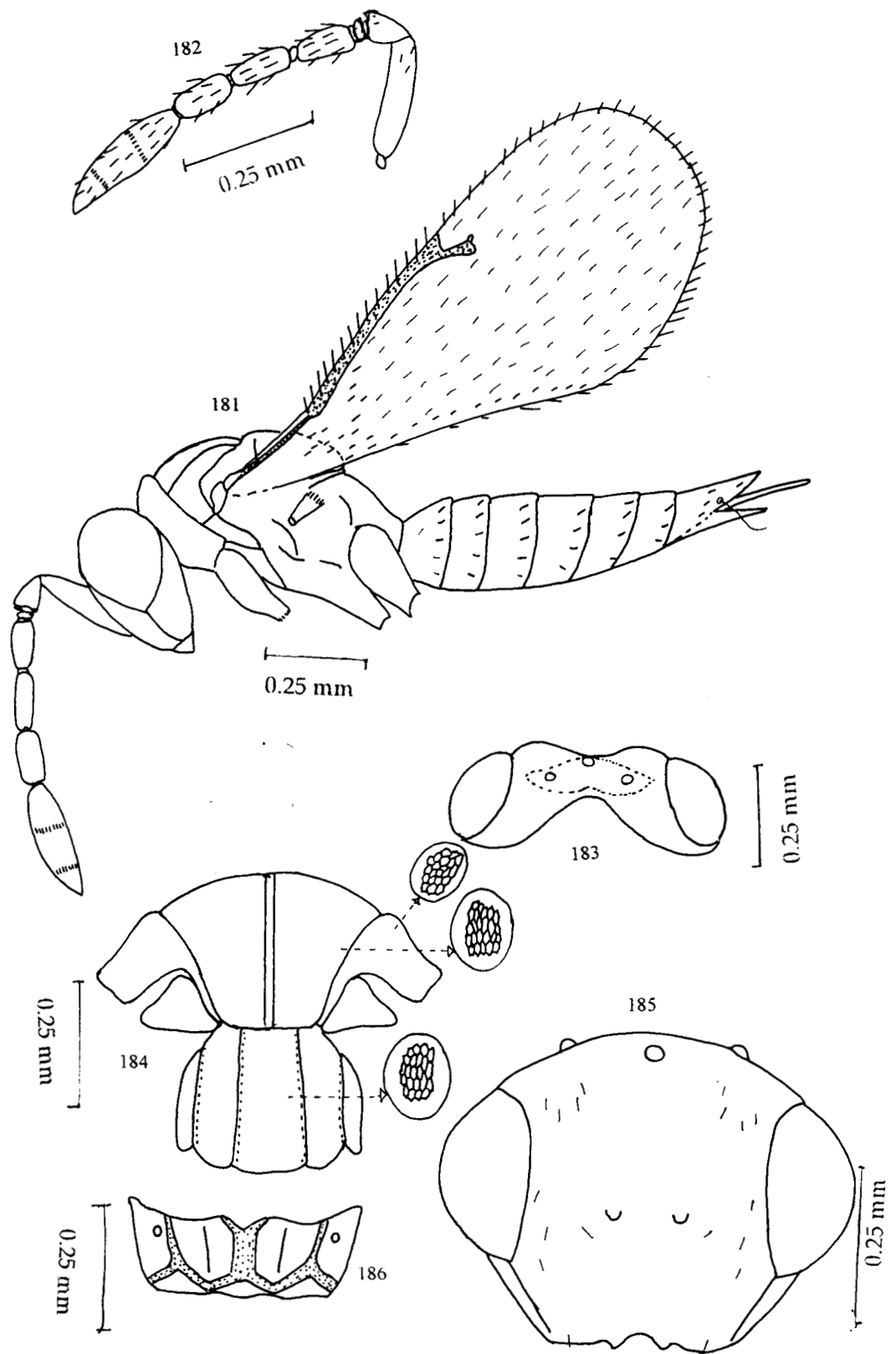
Figs. 177-180 *Tetrastichus latus* sp. nov. Female

177. Body - lateral view

178. Antenna

179. Propodeum

180. Pronotum, mesoscutum and scutellum



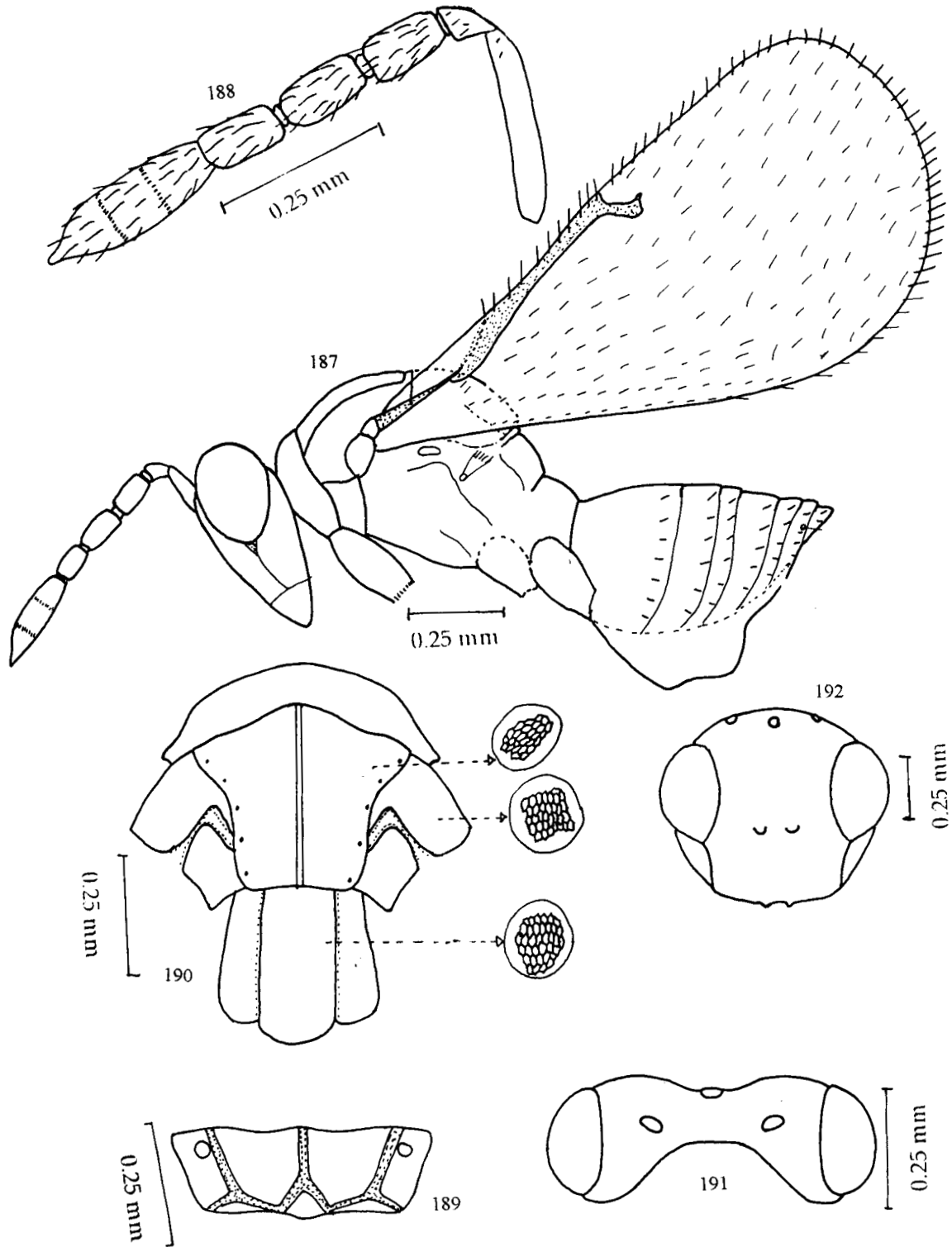
Figs. 181-186 *Tetrastichus malappurensis* sp.nov. Female

181. Body - lateral view 185. Head - anterior view

182. Antenna 186. Propodeum

183. Head dorsal view

184. Mesoscutum and scutellum



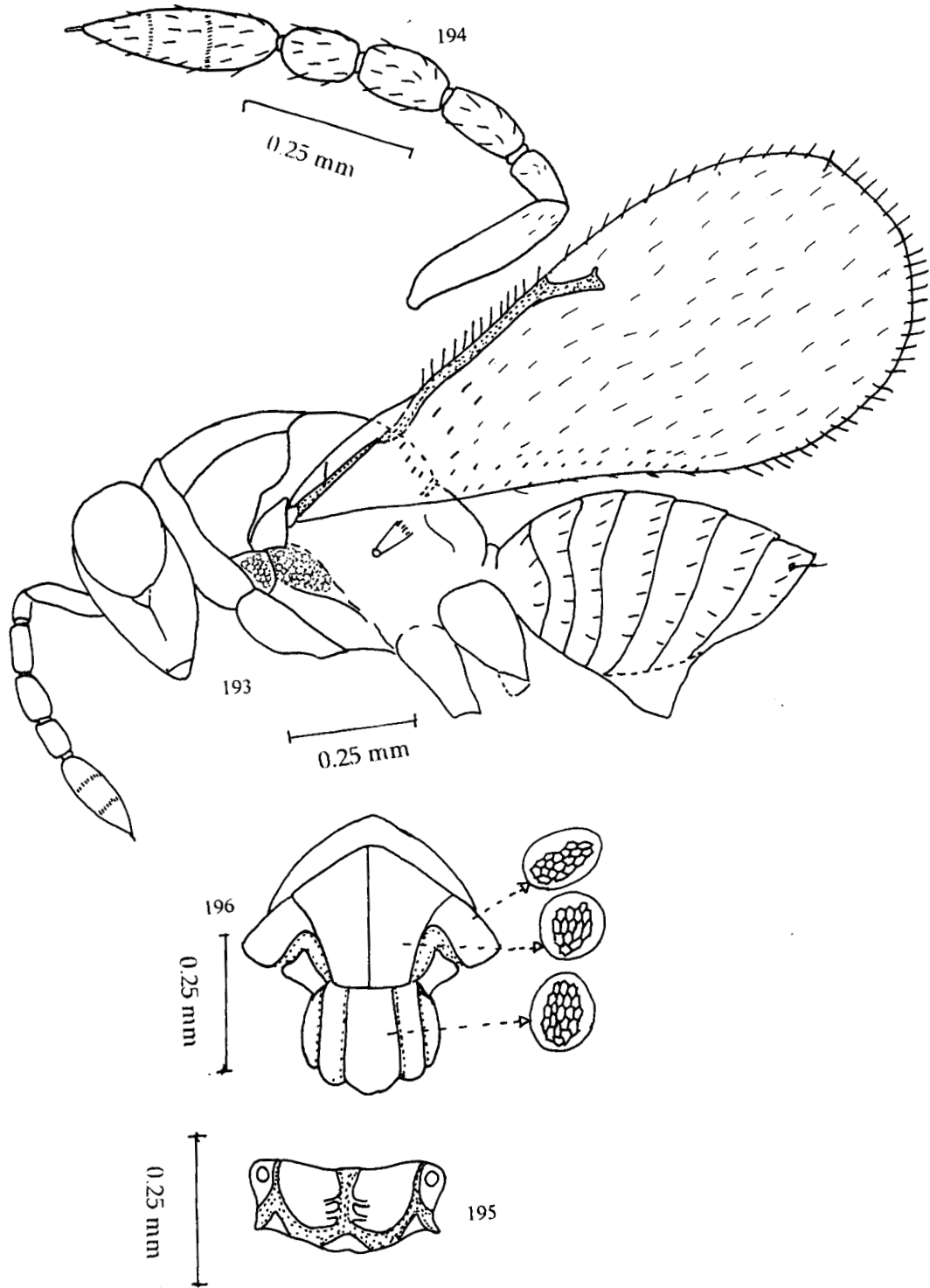
Figs. 187-192 *Tetrastichus orissaensis* Husain Khan Female

187. Body - lateral view 191. Head dorsal view

188. Antenna 192. Head - anterior view

189. Propodeum

190. Pronotum, mesoscutum and scutellum



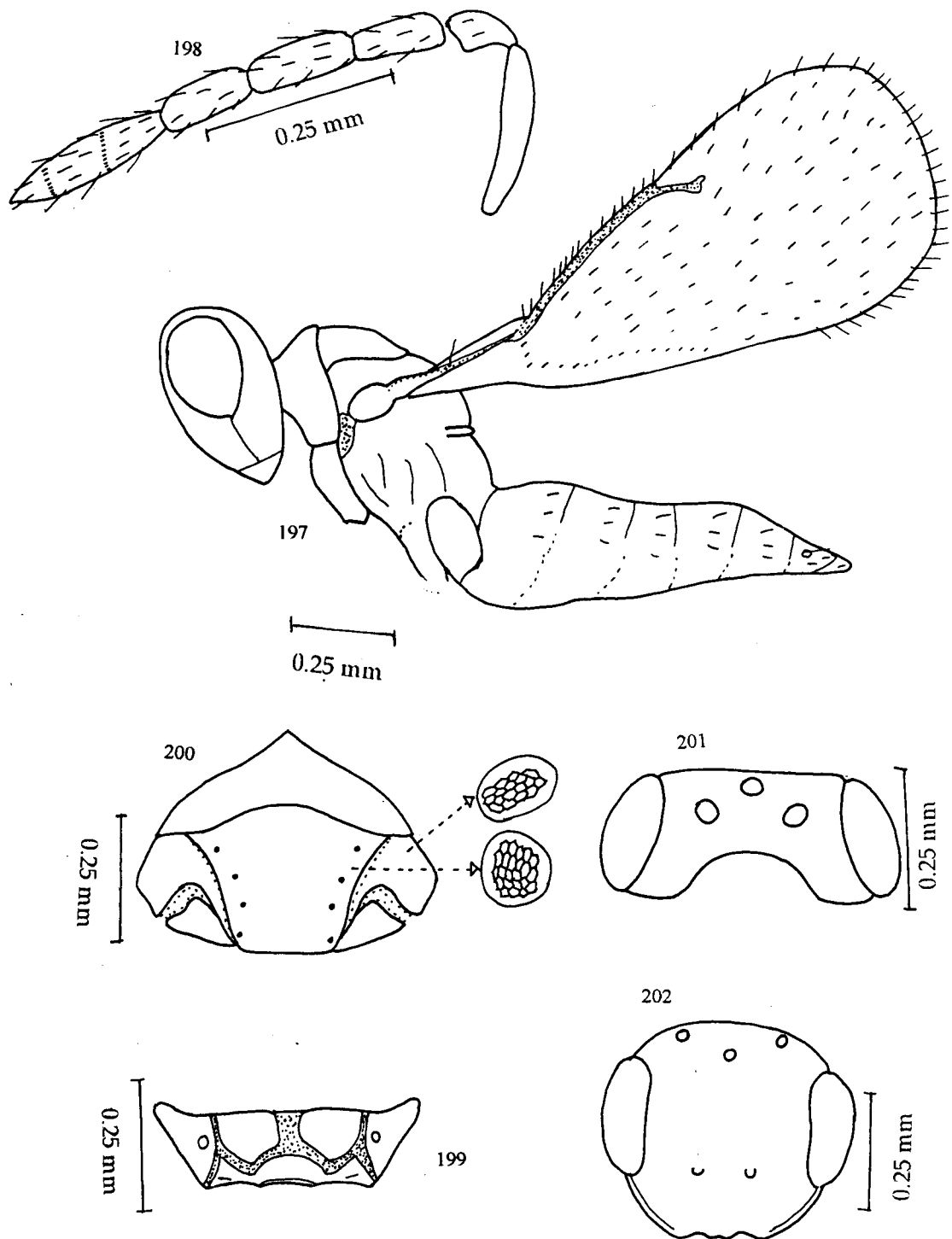
Figs. 193-196 *Tetrastichus rividus* sp. nov. Female

193. Body - lateral view

194. Antenna

195. Propodeum

196. Pronotum and mesoscutum



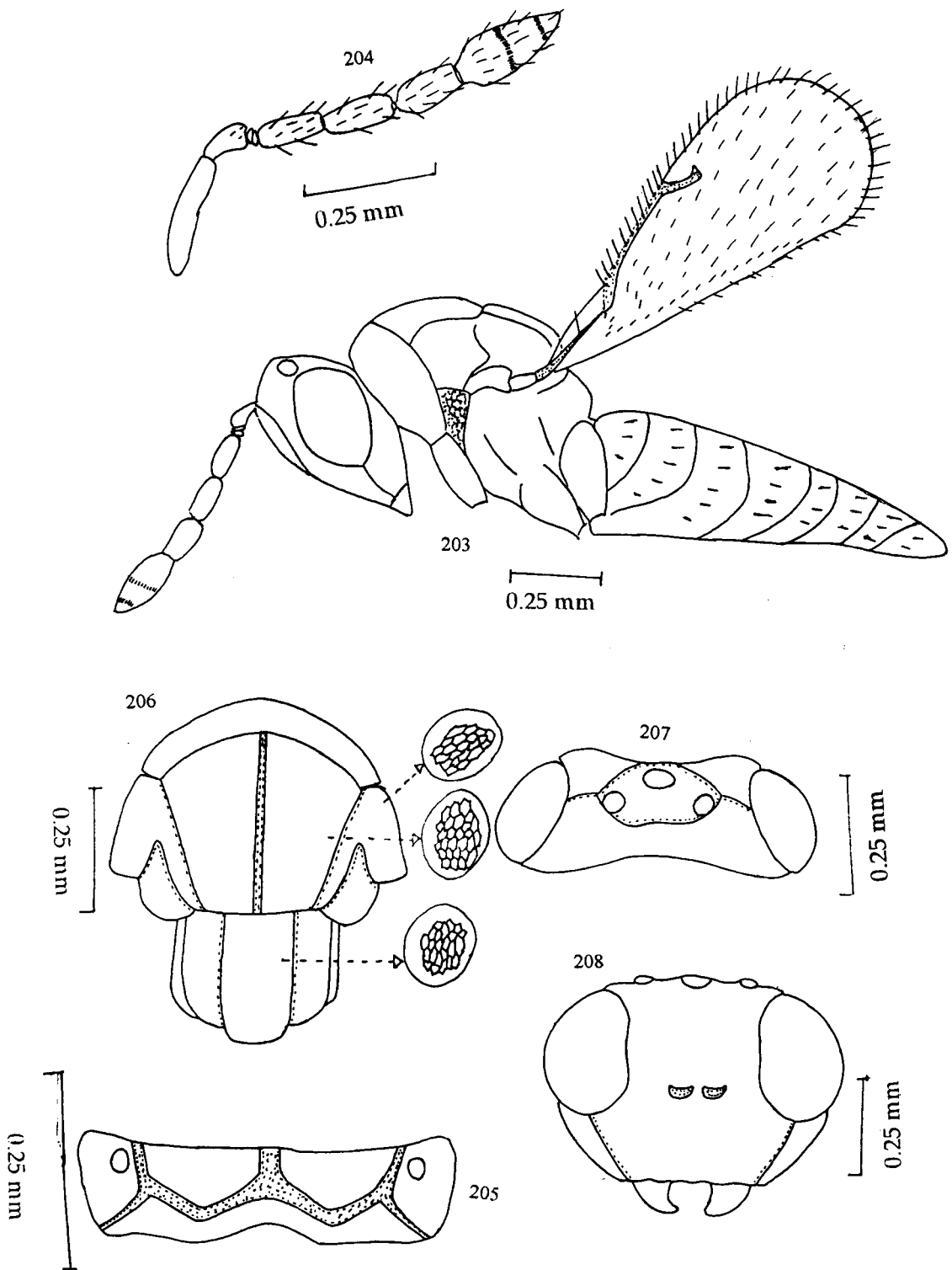
Figs. 197 -202 *Tetrastichus sanae* sp. nov. Female

197. Body - lateral view 201. Head dorsal view

198. Antenna 202. Head - anterior view

199. Propodeum

200. Pronotum and mesoscutum



Figs. 203-208 *Tetrastichus spirabilis* Waterston Female

203. Body - lateral view 207. Head dorsal view

204. Antenna 208. Head - anterior view

205. Propodeum

206. Pronotum, mesoscutum and scutellum

A NEW GENUS AND A NEW SPECIES OF EULOPHIDAE (HYMENOPTERA : CHALCIDOIDEA) FROM THE RICE ECOSYSTEMS OF CENTRAL KERALA, INDIA

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ABSTRACT

The new genus *Neomestocharella* can be distinguished by the combination of the following features : Pronotum with cross carina; propodeum without areolae; axilla well advanced etc. *Neomestocharella keralensis* sp. nov. is the type species of the new genus.

Key words: Eulophidae, New genus, New species, Rice ecosystem, Kerala, India.

INTRODUCTION

While studying the parasitic Hymenoptera associated with the rice ecosystem in Kerala (Pathummal Beevi *et al* 2000) we came across an interesting genus of Eulophidae from Central Kerala. On our closer study it has been found out to be an undescribed genus and an undescribed species. The Eulophidae is one of the largest families of Chalcidoidea with more than 550 nominal genera in the world. So far about 150 genera are known from Indo-Australian region. This new genus does not fit to descriptions of any known genus. It also does not fit to the keys to genera of Eulophidae by Boucek (1988), Hayat (1985), LaSalle (1994), Graham (1991), Nikolskaya (1963) and Tyapitsyn & Kostyukov (1987).

MATERIALS AND METHODS

The specimens were collected from the rice ecosystems using hand sweep-nets. Laboratory studies were made using M3Z Wild Stereozoom (Switzerland) and Leitz Wetzlar (Germany) microscopes. Abbreviations used: OOL -Ocellocular line; POL - Postocellar line; MV-Marginal vein, PMV - Postmarginal vein; SMV - Submarginal vein; F1 to F4 - Funicular segments first to fourth. ZSIC - Zoological Survey of India, Calicut (Western Ghat Regional Research Station).

RESULTS AND DISCUSSION

Genus *Neomestocharella* gen. nov.

Type species : *Neomestocharella keralensis* sp. nov. Gender feminine.

Diagnosis: Length (Female & Male) 1.1 - 1.3 mm. Head collapsible; malar sulcus complete; antennal formula of female 11332; male 11343; clava with distinct spicule at distal tip; scape swollen in male. Pronotum with a distinct cross carina (visible only under accurate focussing and lighting); mesoscutum with 2 pairs of setae; notauli complete; axilla produced forward; scutellum with 2 Paris of setae, with a pair of submedian grooves and another pair of sublateral grooves. Dorsellum bulging over propodeum anteriorly; propodeum mostly smooth with faint reticulations, with an inverted "Y" shaped median carina and without paraspiracular carinae; callus not pubescent. Forewing with long fringes; SMV with 2 dorsal setae; PMV absent; SMV distinctly interrupted at parastigma. Hind wing long, distinctly narrow basally (Fig.1). Gaster sessile, collapsing dorsally, longer than mesosoma. Long cercal setae present.

DISCUSSION

This new genus comes to *Mestocharella* Girault in the keys to genera by Hayat (1985), Boucek (1988) and others. However it differs from *Mestocharella* in having:

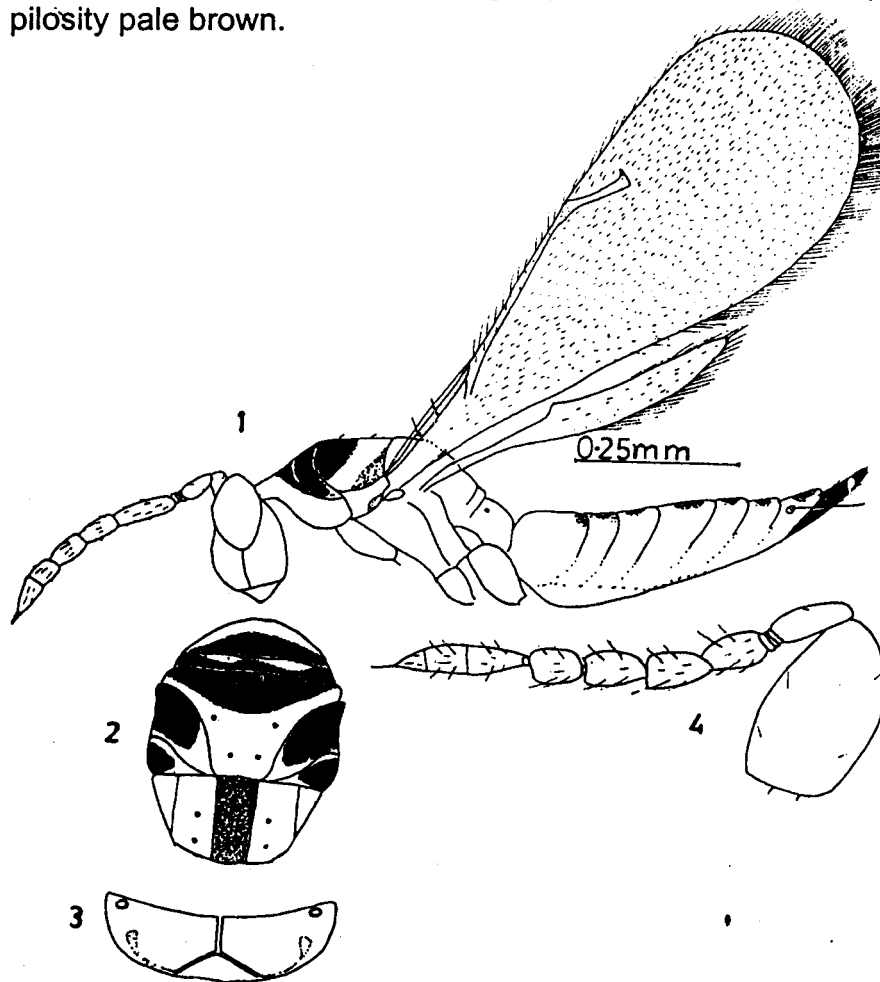
1. Gaster sessile (in *Mestocharella* gaster with distinct coarsely sculptured petiole);
2. female antennal formula 11332 (in *Mestocharella* female antennal formula 11142);
3. axilla well advanced (not so in *Mestocharella*); and
4. propodeum without distinct alveolae and with distinct inverted median "Y" shaped carina (in *Mestocharella* propodeum with distinct alveolae and without inverted median "Y" shaped carina)

This new genus also resembles *Aprostocetus* Westwood in general appearance but differs from it in having:

- 1 pronotum with a cross carina (in *Aprostocetus* without cross carina)
- 2 SMV with two dorsal setae (in *Aprostocetus* SMV with more than 2 dorsal setae and in several other features.

***Neomestocharella keralensis* sp. nov.**

Female: Length 1.1 mm. Head pale brownish yellow; eyes and ocelli black; POL and OOL area black with metallic green reflection; antenna pale brown; mandibles pale brown. Mesosoma pale brownish yellow with metallic green patches on dorsum of pronotum, on anterior part of mesoscutum (Fig.2), on part of scapula and on sides of axilla, on median part of scutellum and propodeum completely. Legs pale whitish yellow with pretarsus darker. Gaster pale brownish yellow with sides dark brown mingled with metallic green reflection. Ovipositor sheath black. Wings hyaline with veins pale yellowish brown; pilosity pale brown.



Figs.1-3 *Neomestocharella keralensis* sp.nov. Female: 1. Body profile; 2. Pronotum, Mesoscutum & Scutellum dorsal view; 3. Propodeum; 4. Male antenna.

Head: Collapsing, broader than mesosoma in dorsal view, smooth with sparse pilosity; in anterior view head width a little more than its length (10:9); POL a little more than 2.5 x OOL; each mandible bidentate; malar groove distinct and complete without a basal fovea; height of eye in profile about 2x length of malar surface; eye length in side view a little more than 1.6x its maximum width; eye bare; antennal toruli situated a little above lower ocular line; each torulus nearer to eye than to each other; scape length a little more than 4x its width, as long as eye length in profile. Antennal formula: 11332. Scape length a little more than 4x its width, as long as eye length in profile; scape slightly exceeding level of vertex; F1 nearly 2x as long as pedicel and a little more than 1.6x length of F2; F3 subequal in length to F2; clava with apical spicule present, clavel length (including spicule) a little more than 2x length of F3.

Mesosoma: Pronotum with a distinct cross carina near its posterior margin (Figs.1 & 2); faintly reticulate, mostly smooth, with weak and sparse setae on posterior border; mesoscutum with notauli complete, with two pairs of setae (Fig.2), surface with faint reticulation; axilla advanced forward. Scutellum with 2 pairs of setae, with a pair of submedian grooves and another pair of sublateral grooves, surface faintly reticulate. Dorsellum slightly bulging over propodeum, faintly reticulate. Propodeum with an inverted "Y" shaped median carina (Fig.3), surface mostly smooth and shiny with faint reticulations; paraspicular carina absent; callus not pubescent; spiracle large, rounded with distance from anterior margin less than its diameter. Forewing length about 3x its maximum width, with distinct and long fringe (Fig.1), speculum setose. SMV with 2 dorsal setae. Relative length of veins; SMV 36; MV 52; STV 16. PMV absent.

Gaster: Sessile, oval, collapsing from dorsal side, a little longer than 1.3x mesosoma, with a distinct cercal seta.

Male: Length 1.34 mm. Similar to female except in having antennal formula 11343, scape swollen (Fig.4) with its length 1.85x its width.

Host: Unknown: Probably rice pests of Lepidoptera.

Habitat: Rice Ecosystem: Thrissur lying between 10 15 10 45 N and 77 77 45 E.

Etymology: The species is named after Kerala state.

Materials examined

Holotype: Female, INDIA, Kerala, Thrissur, 9.v.1998. Coll. P. Beevi (ZSIC).

Paratypes: 1 Female of same data as for Holotype (ZSIC); 1 Female, Thrissur District: Aviniseri, v. 1998, Coll. p. Beevi; 4 Males, Thrissur, 9. iv. 1999. Coll. M. Parvathy (ZSIC).

ACKNOWLEDGEMENTS

We are grateful to the authorities of the University of Calicut for providing facilities to carry out this research.

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A NEW SPECIES OF EULOPHIDAE (HYMENOPTERA: CHALCIDOIDEA) PARASITOID ON THE SLUG CATERPILLAR PEST, *CONTHEYLA ROTUNDA* HAMPSON (LEPIDOPTERA: COCHLIIDAE) OF COCONUT IN KERALA

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ABSTRACT : *Aroplectrus contheylae* Narendran sp. nov. is described from India from the host *contheyla rotunda* Hampson a pest of coconut in Kerala. A key to Oriental species of *Aroplectrus* is also provided.

INTRODUCTION

The slug Caterpillar, *Contheyla rotunda* Hampson is a sporadic pest of coconut in the west coast of India. The caterpillar damages the coconut palm, by feeding on the leaves. When the larval population is high, it feeds the petioles, spathes and even rind of nuts, resulting in the premature drooping and shedding of the leaves, buttons and tender nuts. As a result, the yield may be reduced upto 75% (NAIR, 1978). The eulophid, *Aroplectrus contheylae* Narendran sp. nov. parasitises the caterpillar of *Contheyla rotunda*. So far only one chalcidoid viz. *Antrocephalus hackonensis* (Ashmead) is reported from *Contheyla rotunda* Hampson (NARENDRAN, 1988). The genus *Aroplectrus* Lin is so far known to be represented by only three species (LIN, 1963; WIJSEKHARA and SCHAUF 1994). They are *A. dimerus* Lin, *A. haplomerus* Lin and *A. flavescence* (Crawford). In this paper a fourth species is described and a key to this Oriental species is provided for easy identification of the species.

MATERIAL AND METHODS

The specimens were mounted on rectangular cards and pinned with Asta insect pins of size 38 mm X 0.53 mm of No.3. The observations were made using M3Z wild stereozoom (Switzerland) and Leitz-wetzlar (Germany) Microscopes. The figures were drawn using the drawing tube of Wild M3Z stereozoom.

Abbreviations used are POL = Postocellar distance; OOL=Ocellocular distance; F1-F4=Funicular segments 1-4; SMV=Submarginal vein; MV=Marginal vein; PMV=Post marginal vein; STV=Stigmal vein; T1=Tergite 1; ZSIC = Zoological Survey of India, Western Ghat Regional Station, Calicut.

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RESULTS AND DISCUSSION

Description: *Aroplectrus contheylae* Narendran sp. nov. (Figs. 1-5)

Female : Length 3.84 mm, black with following parts as follows: head pale yellow with median part of frons brownish black; postocciput black; scape pale yellow; pedicel pale brown; flagellum brownish black; pronotum with posterior margin and two faint patches reddish brown; mesoscutum with a median reddish brown patch near posterior margin, with two reddish brown patches on each scapula; tegula pale yellowish brown; scutellum with side margin and posterior marginal area pale brown; propodeal lamina pale brown. Legs having all coxae black with apices paler; all femora brownish black with apical one-third part paler; all trochanters pale brownish yellow; all tibiae pale brownish yellow with median part of hind tibiae slightly darker; tibial spurs and tarsi pale yellow; pretarsi black. Metasoma black; wings hyaline, veins and pilosity brown; stouter setae on body brown; other pubescence pale yellowish white.

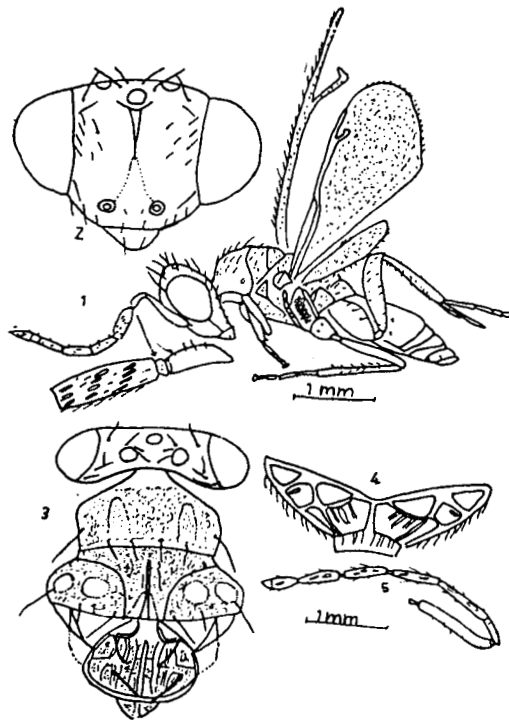
Head (Figs. 2,3) 1.10 x width of mesosoma; width in anterior view 1.25 x its length; width in dorsal view about 4x its median length; vertex and frons smooth with faint reticulations, the former with a few black setae and latter with sparse cilia; malar space smooth, 0.36x length of eye in profile; malar sulcus complete; occiput and postgena faintly reticulate; the former with sparse cilia. Eye length about 1.5x its width in profile. POL about 1.7x OOL; epistomal sulcus distinct, straight, margin of clypeus as in Fig.2. Antenna (Fig.1) densely ciliate on funicle and club; scape a little shorter than eye, 6x as long as its width; pedicel a little shorter than 2.8x its width; anellus two segmented; first anellus thin, hardly visible, bare; second anellus ciliate; F1 3x as long as its width, longer than any of the funicular segments and club, with 3 rows of sensillae, F2 slightly longer than F3; F4 longer than F3; clava length subequal to length of F2, distinctly 3-segmented.

Mesosoma : Pronotum width about 1.5x as long as its length, coarsely and irregularly striate-punctate, densely pubescent with 4 strong setae at posterior margin; reddish brown area adjacent to posterior margin of pronotum densely microsculptured; lateral area of pronotum with a very long seta near centre. Mesoscutum distinctly reticulate on anterior part, posterior part irregularly striate and granulate; mesoscutum with a median weak carina (Fig.3), with 4 long strong setae and 2 shorter strong setae on posterior marginal area, anterior area with 2 strong setae, remaining part of dorsum densely pubescent. Scutellum a little wider than its length (47:43), granulate with strong longitudinal irregular carinae, basal part with 2 strong areolae; scutellum without pubescence except for 4 strong setae. Metanotum with a strong median carina and a pair of weak sublateral carinae. Anterior median lamina (Fig.3) strongly projecting, weakly sculptured, median carina distinct. Propodeum (Fig.4) gradually descending caudad, weakly and sparsely granulate, mostly smooth, submedian areola weakly convex. Forewing (Fig.1) thoughly microtrichiate; relative lengths of veins: -SMV=40; MV=25.2; PMV=15.75; STV=7. Hind coxa smooth; femur in profile 4.75 x as long as its maximum width; longest spur of hind tibia slightly exceeding combined length of hind metatarsus and second hind tarsus.

Metasoma: Sessile, stronger and narrower than mesosoma; oblong-ovate in dorsal view; apical tergites with a few hairs on each side; ovipositor sheath not exceeding beyond metasomal apex (hardly reaching apex).

Male: 2.39 mm. Similar to female except in having head width with smaller profile depth in female; antenna (Fig.5) more slender, anellus only 1 segmented; club broader than F1; metasomal apex truncate.

Host: Caterpillar of *Contheyla rotunda* Hampson



Figs. 1-4. *Aroplectrus contheylae* Narendran sp. nov. Female:
 1. Body profile; 2. head anterior view; 3. Head and part of mesosoma dorsal view;
 4. Propodeum; 5. Male antenna

Material examined: Holotype Female: INDIA, Kerala, Kayamkulam, 10.ix.1999. Coll. Chandrika Mohan (ZSIC). Paratype: 1 Male of same collection data as that of holotype (ZSIC)

Etymology: Named after its host *Contheyla*.

Remarks : This new species resembles *A. dimerus* Lin having similar type of antenna, head much narrower than mesosoma, submedian propodeal areola divided completely into two sectors by a continuous oblique carina and in several other features. However this new species can be separated from *A. dimerus* and from other species by the key given below.

KEY TO ORIENTAL SPECIES OF *AROPLECTRUS*

(Based on females)

1. Scutellum at base with 2 large foveae; longest spur of hind tibia reaching apex of second hind tarsal segment2
 - Scutellum at base without such fovea as above; longest spur of hind tibia not at all reaching apex of second hind tarsal segment3
2. Hind tarsi almost 1.5x as long as second hind tarsal segment; general body colour with yellow predominant; most of propodeum, pleurae and middle of scutellum reddish honey colour; legs yellow with hind coxa slightly tinged with red; F1 over 2x as long as pedicel: Philippines *A. FLAVESCENS* (Crawford)
 - Hind tarsi a little more than 2x as long as second hind tarsal segment; general body colour with black predominant; propodeum, pleurae and middle of scutellum black; leg colour not as above, coxae and femora black with their apices paler; F1 a little shorter than 2x as long as pedicel. India*A. CONTHEYLAE* Narendran sp. nov.
3. Head much narrower than mesosoma; submedian propodeal areola divided completely into 2 sectors by a continuous oblique carina; anellus well defined in both sexes (2 in female, 1 in male). Taiwan*A. DIMERUS* Lin
 - Head much broader than mesosoma; submedian propodeal areola partially divided by interrupted carina; anellus only partly definable in female, 1 segmented in male. TAIWAN *A. HAPLOMERUS* Lin

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