SYSTEMATIC STUDIES ON THE EUCHARITIDAE (HYMENOPTERA: CHALCIDOIDEA) OF KERALA AT THE ALPHA LEVEL

Thesis
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DOCTOR OF PHILOSOPHY IN ZOOLOGY

GIRISH KUMAR P.

DEPARTMENT OF ZOOLOGY
UNIVERSITY OF CALICUT
KERALA – 673 635
INDIA

JUNE 2006

DEPARTMENT OF ZOOLOGY
UNIVERSITY OF CALICUT

Dr. T.C. Narendran, FASc.
Professor & Head (Retd.)

Phone: Off: 0494-2401144 * 419
Res: 0494-2400302
CALICUT UNIVERSITY P.O.
673 635, KERALA

Date: 2-VI-2006

CERTIFICATE

This is to certify that this thesis is an authentic record of the work carried out by **Mr. Girish Kumar P.**, from October 2002 to May 2006 under my guidance and supervision in partial fulfilment of the requirements of the Degree of Doctor of Philosophy in Zoology, under the Faculty of Science of the University of Calicut. No part of the thesis has been presented before for any other degree.

It is further certified that the candidate has passed the Ph.D. qualifying examination of the University of Calicut held in June 2004.

Tcnarendran

Prof. T.C. NARENDRAN

DECLARATION

I hereby declare that this 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 the thesis has previously formed the basis for the award of any Degree or Diploma as stipulated in the statutes of the University of Calicut.

Date: 02.06.2006

GIRISH KUMAR P.

Dedicated to My Parents

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Girish Kumar P.

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INTRODUCTION

INTRODUCTION

The family Eucharitidae is the largest and most diverse group of hymenopteran parasitoids of eusocial insects. It comprises the most striking forms in the superfamily Chalcidoidea. Most of the members of this family are brilliantly coloured and strikingly attractive. Some of them show bizarre form of thoracic scutellum. They are moderately sized individuals measuring approximately about 4-5 mm in length.

The eucharitids are probably most closely related to the Perilampidae, the only other family of the Chalcidoidea in which the prepectus is fused with the lateral part of the pronotum. The eucharitidae is most readily distinguished from other families by the reduced pronotum and the elongated sickle-shaped mandibles.

The members are distributed in almost every zoogeographical region of the world. They are not reported from New Zealand and a few of smaller oceanic islands and are relatively poorly represented throughout the Palaearctic region. The eucharitids are most abundant and speciose in the tropics. No genera are shared between the Nearctic and Palaeartic regions. A few New World genera (*Orasema* Cameron, *Kapala* Cameron and *Pseudochalcura* Ashmead) are also found in Old World tropics (Boucek, 1988; Heraty, 2002).

Eucharitids have remarkable host relationships. They are parasitic on ants. The eggs are laid on plants and the primary larva (planidium type) attaches itself to the worker ants and so are carried into the ant nest where it is transferred to the ant larva. It waits till the host larva reaches prepupal or pupal stage before it starts to feed and completes its development.

Chapter I

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The study of Eucharitidae *s.s.* may be said to have begun well before 200 years ago when FABRICIUS (1787) described the species *Eucharis adscendens* under the name *Cynips adscendens.* It was LATRIELLE (1804) who erected the genus *Eucharis*, with the type species *Cynips adscendens* Fabricius.

In 1805 FABRICIUS reported *Eucharis furcata* from Brazil and *E. festiva* and *E. flabellatus* from America meridionali Dom. SPINOLA (1811) erected a new genus, *Stilbula* with *Ichneumon cyniformis* Rossius as type species. LATRIELLE (1825) erected a new genus, viz., *Thoracantha* with *Thoracantha striata* Perty as type species. PERTY (1833) studied the genus *Thoracantha* WESTWOOD (1835) erected an interesting new genus, *Schizaspidia* with *S. furcifera* as type species from India and described another new species namely *Thoracantha flabellata* from Brazil. GUERIN-MENEVILLE (1838) described a new species, *Thoracantha romandii* from Colombia. WATERHOUSE (1839) described a new species. *Thoracantha coleopteroides* from Brazil. WALKER (1839) contributed much to taxonomy by describing several new species from Australia.

BLANCHARD (1840) erected a new genus, viz., *Psilogaster* and described *P. cupreus* from Egypt and *Thoracantha latriellei.* Later BRULLE (1846) erected a new genus *Galearia* with *G. violacea* (= *Thoracantha latriellei)* as type species and another new genus *Chirocerus* and described *Psilogaster pallipes* from New Guinea. The family name based on *Eucharis* Latrielle was first proposed by Walker (1846) as Eucharidae. He described *Thoracantha nasua* and *Eucharis aeginatus* from Philippines, *E. pyttalus* and *E. larymna* from S. Australia and *Thoracantha anchurus* from Brazil.

SPINOLA (1853) described a new species *Eucharis dicerodera* from Brazil. FOERSTER (1856) excluded Perilampidae from the Eucharitidae. FOERSTER (1859) described three new species, viz., *Eucharis kollari* and *E. punctata* from Austria and *Thoracantha bella* from Europe.

WALKER (1860) gave descriptions of two new species of *Eucharis* Latrielle, viz., *E. deprivata* and *E. convergens* from Ceylon (= Sri Lanka). DESMAREST (1860) provided an unjustified emendation of *Chirocerus* Brulle. WALKER (1862) contributed to the knowledge of Eucharitidae by describing many new species of *Eucharis* Latrielle, *Thoracantha* Latrielle and *Schizaspidia* Westwood. They are *Eucharis smaragdina* and *E. impelxa* from Tasmania, *E. piceicornis*, *E. delicatula* and *E. rufiventris* from Australia, *E. contigens* from Borneo, *Thoracantha cynipsea, T. apta, T. reflexa, T. surgen, T. inexagens, T. atrata, T. alta, T. pallescens, T. flavicornis, T. striatissima, Schizaspidia pretendens* and *S. plagiata* from Brazil and *S. cyanea* from Indonesia. WESTWOOD (1868) erected a new genus *Eucharissa* with *E. speciosa* as type species and described another species *E. natalica* from South Africa.

WALKER (1871) in his "Notes on Chalcidiae" included Eucharidae also and provided several new combinations. Later WESTWOOD (1874) described three new species of *Schizaspidia* Westwood, viz., *S. rudis* from S. Australia, *S. caffra* from South Africa and *S. maculata* from S. America, two new species of *Eucharissa*, viz., *E. cuprifrons* and *E. stigmatica* from South Africa, a new species of *Stilbula* Spinola, viz., *S. peduncularis* from Australia and three new species of *Thoracantha* Latreille, viz., *T. coronata* from Mexico and *T. batesella* and *T. aculeata* from Brazil. PROVANCHER (1881) described a new species of *Eucharis* Latrielle, viz., *E. gibbosa* from N. America.

CAMERON (1884) contributed to the knowledge of Eucharitidae by erecting four new genera, viz., *Orasema, Lophyrocera, Lirata* and *Kapala* with *Orasema stramineipes, Lophyrocera stramineipes, Lirata luteogaster* and *Eucharis furcata* as type species respectively. He also described a new species of *Lophyrocera* Cameron, viz., *L. nigromaculata* from Nicaragua in this paper. KIRBY (1884) described a new species of *Schizaspidia* Westwood, viz., *S. murrayi* from Tonga Island. Later ASHMEAD (1885) described a new species of *Thoracantha* Latrielle, viz., *T. floridana* from Florida.

KIRBY (1886) divided the family Eucharitidae into two subfamilies when he erected a new subfamily, viz., Eucharissinae. In the same paper he erected seven new genera, viz., *Tricoryna, Tetramelia, Metagea, Uromelia, Chalcura, Rhipipallus* and *Saccharissa* with *Eucharis iello* Walker from Tasmania, *Schizaspidia plagiata* Walker from Brazil, *Eucharis zalates* Walker from Sydney, *Thoracantha striata* Perty from Brazil, *Eucharis deprivata* Walker from Ceylon, *Eucharis volusus* Walker from Australia and *Eucharis contigens* Walker from N. Borneo as type species respectively. Besides the above, KIRBY (1886) made some changes (new combinations) such as *Eucharis festiva* Fabricius to *Orasema festiva* (Fabricius) and *E. rapo* Walker to *O. rapo* (Walker). ASHMEAD (1888) described a new species of *Lophyrocera* Cameron, viz., *L. floridana* from U.S.A., *Orasema minuta* and *O. violacea* from U.S.A. KIRBY (1889) described a new species namely *Tetramelia meridionalis* from Brazil.

FOREL (1890) described a new species of *Eucharis* Latrielle, viz., *E. myrmeciae* from S. Australia. ASHMEAD (1890) described a new species of *Stilbula* Spinola, viz., *S. montana* from Colorado, U.S.A. CAMERON (1891) described a new species of *Psilogaster,* viz., *P. myrmiciae* from S. Australia and *Chalcura bedeli* from Algeria. ASHMEAD (1892) described *Chalcura*

californica, Lophyrocera apicalis and *Orasema occidentalis* from California, *Metagea schwarzii* from Washington, *Kapala floridana* from N. America and *K. terminalis* from Cuba.

SHIPP (1894) erected five new genera, viz., *Laetocantha* with *Thoracantha nasua* Walker from Philippines as type species, *Acrostela* with *Thoracantha apta* Walker as type species, *Dilocantha* with *Thoracantha flavicornis* Walker as type species, *Isomerala* with *I. coronata* as type species and *Lasionychus* with *L. flabellatus* Westwood as type species. KIRBY (1894) described a new species of *Rhipipallus* Kirby, viz., *R. (?) turneri* from Australia. HOWARD (1894) described a new species of *Chalcura* Kirby, viz., *C. americana* from N. America.

ASHMEAD (1895) described a new species of *Orasema* Cameron, viz., *O. viridis* from Mexico. Again HOWARD (1896) described a new species of *Stilbula* Spinola, viz., *S. grenadensis* from Grenada and two new species of *Orasema* Cameron, viz., *O. smithi* and *O. cameroni* from West Indies. DALLA TORRE (1898) modified Eucharidinae to Eucharidiae and described a new species of *Psilogaster,* viz., *P. pallidipes* from Tasmania. ASHMEAD (1899) provided the first key to the genera of Eucharitidae and dealt with 23 of the 43 genera recognized. ASHMEAD in the same year erected four new genera, viz., *Pseudometagea* with *Metagea schwarzii* Ashmead as type species, *Dicoelothorax* with *D. flavicornis* Walker as type species, *Isomeralia* and *Lasiokapala* with *L. serrata* Ashmead as type species. COCKERELL (1899) described a new species of *Orasema* Cameron, viz., *O. mexicana.*

ASHMEAD (1900) described two new species of *Metagea* Kirby from Australia, viz., *M. kirbyi* and *M. rufiventris.* ALFKEN (1900) described a new species of *Stilbula* Spinola, viz., *S. knuthii* from Java. CAMERON (1904) described four new species, viz., *Lirata iridicolor, L. fulvicornis, L.*

nigriventris and *L. sulcifacies* from Nicaragua. ASHMEAD (1904 a) provided key to 25 genera of the family Eucharitidae and erected a new genus, viz., *Pseudochalcura* with *Eucharis gibbosa* Provancher as type species from N. America. He also described 5 new species of *Pseudochalcura* Ashmead from N. America, 3 new species, viz., *Dicoelothorax platycerus, Kapala splendens* and *Stilbula nigriceps* from Brazil. ASHMEAD (1904b) described a new species, viz., *Schizaspidia tenuicornis.* KIEFFER (1904) erected a new genus *Hydrorhoa* based on *H. striaticeps* Kieffer and described a new species of *Pseudochalcura* Ashmead, viz., *P. chilensis* and provided description of *Kapala furcata* (Fabricius). Later BINGHAM (1906) described two new species, viz. *Rhipipallus affinis* and *Schizaspidia doddi* from Queensland.

BRUES (1907) described a new species of *Schizaspidia* Westwood, viz., *S. septentrionalis* from U.S.A. CAMERON (1907) erected a new genera namely *Stilbulaspis* based on the type species *S. atropurpurea* Cameron and described another species *S. fortistraita* from South Africa. WHEELER (1907) published a paper with descriptions of three new species of *Orasema* Cameron from America, viz., *O. coloradensis, O. wheeleri* and *O. viridis.* CAMERON (1908) described a new species of *Stilbula* Spinola, viz., *S. insularis* from Chagos Island.

SCHMIEDEKNECT (1909) provided key to 26 genera of the family Eucharitidae and redescribed the genera *Stilbulaspis.* CAMERON (1909 a) described a new species of *Schizaspidia* Westwood, viz., *S. caeruleiceps* and two new species of *Eucharis* Latrielle from Borneo, viz., *E. pallidipes* and *E. purpureoventris.* CAMERON (1909 b) described a new species of *Eucharis* Latrielle. viz., *E. leviceps* from Borneo and a new species of *Schizaspidia* Westwood namely *S. trimaculata.* He also (1909 c) erected three new genera, viz., *Ancylotropus, Eltolada* and *Semora* with *A. cariniscutis* from Malaysia,

E. trimaculata from Borneo and *Semora xanthopus* from Argentina as type species respectively. In the same work he described a new species of *Eltolada* Cameron, viz., *E. leucopoda* from Borneo. Later GIRAULT (1911) described a new species of *Stilbula* Spinola, viz., *S. semifumipennis* from Paraguay.

ENDERLEIN (1912) erected a new genus, viz., *Psygmatocera* with *P. ceylonica* as type species. FULLAWAY (1913) described a new species of *Chalcura* Kirby, viz., *C. upeensis* from Mariana Island. In the same year GIRAULT (1913 a) erected a new genus, viz., *Epimetagea* with *E. purpurea* Girault as type species from Queensland. GIRAULT (1913 b) published the description of a new genus, *Chalcurelloides* with *C. hyalinus* Girault as type species from Australia. GIRAULT (1913 c) erected two new genera, viz., *Eucharomorpha* with *E. worcesteri* as type species and *Liratella* with *L. nigra* as type species and also described new species such as *Eucharomorpha dubia* and *Liratella nigrella* from Argentina. He (1913 d) also published descriptions of three new genera, viz., *Chalcuroidella*, *Astilbula* and *Neokapala* with *Chalcuroidella orientalis* from Queensland, *Astilbula aenea* from Australia and *Neokapala furcatella* from Australia as type species respectively.

GIRAULT (1913 e) contributed much to the knowledge of family Eucharitidae by describing 5 new genera, viz., *Neokapala* with *N. furcatella* as type species from Queensland, *Chalcurella* with *C. nigricyanea* as type species from Tasmania, *Astilbula* with *A. magnifica* as type species from Australia, *Chalcuroides* with *C. versicolor* from Queensland as type species and *Psilogasteroides* with *Eucharis fausta* Walker as type species. In this paper, he also described the following new species from Australia: *Eucharomorpha viridis, E. fuscipes, Orasema pheidolophaga, Psilogaster pulcher, Astilbula purpura, Stilbula australiana* and *Stilbula bidentata* and

provided a new combination of *Eucharis theocles* Walker into *Psilogaster theocles* (Walker).

REICHENSPERGER (1913) described a new species of *Psilogaster*, viz., *P. fraudulentus* from Ethiopia. CAMERON (1913) published a paper in which he described a new species *Dicoelothorax parviceps* from Guyana, a new genus *Holcokapala* based on *H. striaticeps* (= *Thorocantha inexagens* Walker) and a new species *Kalapa cuprea.* CRAWFORD (1914) described a new species of *Chalcura* Kirby, viz., *C. arizonensis* from Arizona. MANN (1914) described a new species of *Orasema* Cameron, viz., *O. tolteca* from America.

GIRAULT (1915) provided descriptions of several new species from Australia, viz., *Eucharomorpha tridentata, Tricornya ectatommae, T. subsalebrosa, Metagea tuberculaticornis, Epimetagea bicoloriventris, E. polita, E. purpureicorpus, Schizaspidia quinqueguttata and Thoracantha emersoni.* In 1915, GIRAULT gave brief notes on several species, viz., *Chalcuroides versicolor, Metagea kirbyi, Psilogaster pulcher, Epimetagea purpurea, Chalcuroidella orientalis, C. hyalinus, Stilbula australiana, Parapsilogaster valgius* and *Chalcurella nigricyanea.* GIRAULT (1916) published the description of *Pseudometagea hillmeadia* from Gllendale, Maryland. BRETHES (1916) described a new species, viz., *Tetramelia chilensis* from Chile. WATERSTON (1916) erected a new genus namely *Timioderus* with *T. refringens* as type species.

MASI (1917) described a new species of *Stilbula* Spinola, viz., *S. lissoma* from Seychelles Islands. BRUES (1919) described *Psilogaster fasciiventris* from Australia. GIRAULT (1920) described a new species of *Isomerala* Shipp, viz., *I. azteca.* GIRAULT (1922) described *Orasema palgravei* from Queensland. RUSCHKA (1924) published a paper on the South European species, in which he described five new species of *Eucharis*,

viz., *E. reticulata* from Hungary, *E. spocularis* from Asia minor, *E. intermedia* from Tunis, *E. schmiedeknechti* from Algeria and Tunisia and *E. acuminata* from Russian federation. WHEELER & WHEELER (1924) described *Schizaspidia polyrhachicida* from Luzon.

GIRAULT (1926) described *Kapala astriaticeps* and *Psilogaster partiglabra* from Queensland. MASI (1926) gave descriptions of two new species of *Schizaspidia* Westwood, viz., *S. scutellaris* and *S. vicina* from Taiwan. BRETHES (1927) described a new species, *Eucharomorpha brasiliensis*. CLAUSEN (1928) described another new species of *Schizaspidia* Westwood, viz., *S. manipurensis* from India.

GIRAULT (1928 a) used the name Eucharitidae to the family and erected a new genus, *Thoracanthoides* with *T. albispina* as type species from Queensland and described a new species namely *Metagea punctulativentris* from Australia. GIRAULT (1928 b) provided the descriptions of *Kapala foveatella, K. fasciatipennis, Chalcura glabra, Parapsilogaster montanus* and *P. striatus* from Philippines. GIRAULT (1929) provided descriptions of *Metagea punctulativentris, Epimetagea flavifemora, E. aeneobrunnea, E. sanguiniventris, Chalcurelloidea bispinosa, Stilbula albipennis, S. quadridigitata, S. albipetiole* and *S. octodigitata* from Australia.

GIRAULT (1932) described two new species, viz., *Orasema gemma* and *Thoracantha guttivpennis* and erected a new genus *Kapatella* with *K. transstriata* as type species from Queensland. ISHII (1932) described a new genera, viz., *Losbanus* with *Psilogaster uichancoi* Ishii as type species and a new species of *Kapala* Cameron, viz., *Kapala violacea,* both from Philippines. GEMIGNANI (1933) erected a new genus *Parasemora* and described several new species such as *Orasema argentina, O. doellojuradoi, Kapala argentina, Parasemora freychei, Thoracantha bruchi* and *Uromelia spegazzinii* from Argentina. BRUES (1934) described three new species,

viz., *Eucharomorpha wheeleri, Tricoryna chalcoponerae* and *Schizaspidia calomyrmecis* from Australia.

GIRAULT (1934 a) erected three new genera, viz., *Akapala, Prometagea* and *Rhipipalloidea* with *Akapala austriaticeps, Prometagea minor* and *Rhipipalloidea mira* Girault from Australia as type species respectively and described a number of new species from Australia, viz., *Eucharomorpha goethei, Epimetagea reticulativentris, E. brunneipolita, E. bunyae, Stilbula pallidiclava, S. arenae* and *Orasema emma.* GIRAULT (1934 b) described a new genus, viz., *Prometagea* with *P. minor* Girault as type species from Tasmania and provided descriptions of two new species, viz., *Prometagea offenbachi* and *Epimetagea brunneipetiole* from Australia. MASI (1934) described a new species of *Stilbula* Spinola namely *S. vitripennis* from Cyprus.

MANI (1935) described a new species of *Schizaspidia* Westwood from India, viz., *S. indica.* ISHII (1935) described another new species of *Schizaspidia* Westwood, viz., *S. nekkensis* from Japan. GIRAULT (1936) erected a new genus, viz., *Arhipipallus* with *A. turneri* as type species from Queensland and described the following new species from Australia: *Eucharomorpha varidentata, Orasema emma, Epimetagea ilyichi, E. maximovichi* and *E. myrmicae.*

GIRAULT (1937) described a new species of *Stilbula* Spinola from Australia, viz., *S. toga.* WHEELER & WHEELER (1937) described two new species of *Orasema* Cameron, viz., *O. sixaolae* and *O. costaricensis* from Costa Rica. GEMIGNANI (1937) published a paper with descriptions of two new species of *Orasema* Cameron, viz., *O. deltae* and *O. vianai* and one new species of *Lirata* Cameron, viz., *L. daguerrei* from Argentina. He erected a new genus namely *Parakapala* based on the type species *P. decarloi.* ISHII (1938) described two new species of *Schizaspidia* Westwood, viz., *S.*

taiwanensis and *S. yakushimensis* from Taiwan and *Eucharis esakii* from Japan.

GIRAULT (1940) erected three new genera, viz., *Parachalcura*, *Thoracanthella* and *Propsilogaster* with *Parachalcura ramosa*, *Thoracanthella emersoni* and *Propsilogaster biclavata* as type species respectively from Australia. He also described a number of new species from Australia, viz., *Eucharomorpha partiglabra*, *E. didentata*, *Epimetagea boudiennyi*, *E. koseiuskoi*, *E. ulyanovi*, *E. bunnyae*, *E. hemiglaber*, *E. monilicornis*, *E. phidiasae*, *Tricoryna myrmicis* and *Rhipipalloidea gruberi*.

GAHAN (1940) provided a key to the American species of *Orasema* Cameron and described a few other species, viz., *Psilogaster laeviceps* from Ceylon, *P. antennatus* from East Malaysia, *Stilbula floridana*, *S. septentrionalis* from America, *Eucharis scutellaris* from Japan and *Schizaspidia antennata* from Kualalumpur. FULLAWAY (1940) described two new species, viz., *Chalcura samoana* and *Stilbulaspis samoana* from Samoa. GUSSAKOVSKIY (1940) erected a new genera *Chalcurella* based on the type species, *Chalcura bedeli* and described several new species of *Eucharis* Latrielle, viz., *E. alashanica* from China, *E. alticola*, *E. hissariensis* and *E. ruficornis* from Tadjikstan, *E. atrocyanea* and *E. carnifora* from Uzebekistan, *E. cyanella*, *E. diaphana* and *E. fulviventris* from Turkmenistan, *E. dimidiata*, *E. parvula* and *E. turanica* from Kazhakhstan, *E. hyalina* and *E. przhevalskii* from Mongolia, *E. nana*, *E. rugulosa* and *E. shestakovi* from Russia and two species of *Stilbula* Spinola namely *S. oxiana* from Uzbekistan and *S. ussuriensis* from Russia. ISHII (1941) described two new species of *Schizaspidia* Westwood, viz., *S. ponapensis* and *S. palauensis* from Caroline Island.

ISHII & NAGASAWA (1941) described a new species of *Psilogaster* Blanchard, viz., *P. nishidai* from W. Caroline Island. YASUMATSU (1942)

described a new species of *Schizaspidia* Westwood, viz., *S. chamorro* from Caroline Island. MANI (1942) erected a new genus, viz., *Kapalodes* from India with *K. travancorensis* as type species and provided key to the identification of *K. travancorensis* and *K. andamanensis*. STRAND (1942) gave the replacement name *Semorata* for *Semora* Cameron.

GHESQUIERE (1946) contributed a lot to the knowledge of the family Eucharitidae and gave replacement names for two genera, viz., *Parapsilogastrus* and *Semorella* for *Parapsilogaster* Girault and *Semora* Cameron respectively. GEMIGNANI (1947) described several new species such as *Kapala chacoensis, Orasema susanae, O. violacea, Lirata bonariensis, Parakapala vianai, Tetramelia daguerrei* from Argentina and erected a new genus *Pseudokapala* based on *P. proseni* Gemignani as type species. WATANABE (1950) reviewed the Japanese species of Eucharitidae.

RISBEC (1951 a) described three new species; *Saccharissa longispina, Stilbulaspis striata* and *S. lougae* from Senegal. RISBEC (1951b) described another new species, *Saccharissa viridis* from Senegal. MUESEBECK *et al.* (1951) established the family (*s.s*) Eucharitidae (The name most often was used by some authors as Eucharidae or Eucharididae). He provided descriptions of *Pseudochalcura arizonensis* (Crawford) and *P. californica* (Ashmead). PECK (1951) provided a synoptic catalogue of family Eucharitidae of America North of Mexico. BOUCEK (1951) described a new species of *Eucharis* Latrielle, viz., *E. anatolica* from Ankara-Baraj.

NIKOLSKAYA (1952) treated the South European species and described four new species of *Eucharis* Latrielle, viz., *E. gussakovskii, E. pusilla, E. scylla* and *E. turca* and two new species of *Stilbula* Spinola viz. *S. montana* and *S. tazhika* from Palaearctic region. RISBEC (1952) described several new species such as *Orasema ranomafanae, O. seyrigi, O. communis,*

Schizaspidia multistriata, S. bekiliensis bekilirensis, S. bekiliensis minor, S. ivondroi, S. seyrigi and *Psygmatocera fianarantsoae* from Madagascar. RISBEC (1953) described a new species, viz., *Saccharissa striolate* from Ivory Coast. RISBEC (1954) described a new species, *Kapala ivorensis* from Ivory Coast. HOFFER & NOWICKY (1954) described a new species, viz., *Eucharis hyalinipennis* from Czechoslovakia.

BOUCEK (1955) described a new species of *Eucharis* Latrielle, viz., *E. marani* from Bulgaria. BOUCEK (1956) erected 2 new subgenera of the genera *Eucharis* Latrielle, viz., *Pachyeucharis* and *Eucharisca* with 5 new species, viz., *Eucharis (Pachyeucharis) microcephala, E. (P.) albipennis, E. (P.) affinis,* E. (P.) *nigriventris* and *E. (Eucharisca) bytinski-salzi* from Israel. FERNANDO (1957) provided descriptions of three new species of *Eucharis* Latrielle from Ceylon, viz., *E. casca, E. cassius* and *E. melantheus.*

RISBEC (1958) described new species such as *Orasema viridicyanea* and *Schizaspidia stevensoni* from Zimbabwe. WATANABE (1958) studied the Micronesian species. He transferred *Parapsilogaster* Gahan to *Losbanus* Ishii and provided a redescription of the genus. In the same year WATANABE synonymized *Schizaspidia palauensis* with *S. ponapensis* and described a few new species, viz., *Losbanus gressitti, Schizaspidia brevifurcata, Stilbula carolinensis* and *Parachalcura maculata* from Caroline Island. FERRIERE (1960) described a new species of *Stilbula* Spinola, viz., *C. viridiceps* from Senegal.

BURKS (1961) revised the genus *Pseudometagea* Ashmead and described *P. bakeri* from Colarado. YASUMATSU (1961) studied the genera *Eucharis* Latrielle from Shansi, North China. BALTAZAR (1961) synonymized *Rhipipallus* Kirby to *Chalcura* Kirby, *Laetocantha* Shipp and *Spygmatocera* Enderlein to *Schizaspidia* Westwood and placed

Pseudometagea hillmedia in synonymy with *P. schwarzii.* DAS (1963) carried out preliminary studies on the biology of *Orasema assectator* Kerrich parasitic on *Pheidole* and causing damage to leaves of tea. BURKS (1963) provided a new combination of the *Eucharis gibbosa* Provancher to *Pseudochalcura gibbosa* (Provancher). KERRICH (1963) described two new species of *Orasema* Cameron, viz., *O. assectator* and *O. initiator* from India.

PECK *et al.* (1964) provided a key to the genera and species of Eucharitidae of Czechoslovakia. BALTAZAR (1966a) provided some generic synonymy and new combination in some Indo-Australian Eucharitids. BALTAZAR (1966b) published a catalogue of Philippine hymenoptera. DE SANTIS (1967) provided a replacement name to *Orasema violacea* Gemignani to *O. gemignanii.*

DE SANTIS (1968) described a new species of *Orasema* Cameron, viz., *O. crassa.* ANDRIESCU (1968) described two new species of *Eucharis* from Palaearctic region, viz., *E. (Eucharis) borceai* from Romania, *E. (E.) idobrogica* from Romania. MANI *et al.* (1974) described a number of new species, viz., *Schizaspidia atkinsoni* from Burma, *S. mysorensis*, *S. tanjorensis*, *Kapaloides coromandelica* and *K. sabariensis* from India.

One of the most important contribution to the knowledge of Eucharitidae was the publication of HEDQVIST (1978), in which he described a new genus, viz., *Gollumiella* with *G. longipetiolata* as type species from Palawan and recorded 15 species, including 8 new species, viz., *Gollumiella longipetiolata*, *Losbanus peterseni*, *Stilbula palawanensis* and *Schizaspidia palawanensis* from Palawan, *S. batuensis* and *S. tawiensis* from Tawi, *S. peterseni* from Mindanao and *Rhipipallus peterseni* from New Britian. He also proposed new generic synonyms, viz., *Kapaloides* Mani, *Neokapala* Girault, *Kapatella* Girault and *Thoracanthella* Girault under

Schizaspidia Westwood; *Propsilogaster* Girault and *Parapsilogaster* Ghesquiere under *Epimetagea* Girault; *Arhipipallus, Chalcurella, Chalcurelloides, Chalcuroidella, Chalcuroides, Parachalcura* and *Rhipipalloidea,* all of Girault under *Rhipipallus* Kirby and *Eltolada* Cameron under *Stilbula* Spinola. A few new specific synonyms, viz., *Thoracantha emersoni* and *Thoracanthella emersoni* as *Schizaspidia murrayi; Kapala* foveatella and *K. violacea* as *Schizaspidia nasua; Schizaspidia palauensis* as *S. ponapensis; Epimetagea aenea, Kapatella transstriate* and *Neokapala furcatella* as *Schizaspidia aenea; Parapsilogaster striatus* as *Epimetagea montana; Arhipipallus turneri* as *Rhipipallus turneri* and *Stilbula volosus* as *Rhipipallus volusus* and a series of specific combinations are also presented. The same publication also includes a revised check-list of Indo-Australian species of the genera *Lobsanus* Ishii, *Gollumiella* Hedqvist, *Schizaspidia* Westwood, *Chalcura* Kirby, *Epimetagea* Girault, *Rhipipallus* Kirby and *Stilbula* Spinola and keys are provided for the Indo-Australian species of *Losbanus* Ishii, *Schizaspidia* Westwood and *Chalcura* Kirby. TRJAPITZIN (1978) provided a key to genera of Eucharitidae of the European part of the USSR.

DE SANTIS (1979) described a new species of *Stilbula* Spinola, viz., *S. americana* from St. Vincent. BURKS (1979) divided the family into two subfamilies, the Oraseminae which is represented in the New World by the single widespread genus, *Orasema* Cameron and the Eucharitinae which is represented in the Nearctic by five genera: *Pseudometagea* Ashmead, *Kapala* Cameron, *Obeza* Heraty, *Lophyrocera* Cameron and *Pseudochalcura* Ashmead.

PRINSLOO (1980) in his 'An illustrated guide to the families of African Chalcidoidea' provided a key to the families of African Chalcidodea including Eucharitidae. He also included a brief account on the relationships,

diagnoses and biologies of African eucharitids. BOUCEK & WATSHAM (1982) gave description of a new eucharitid wasp, viz., *Mateucharis glabra* from Southern Africa.

HUSAIN & AGARWAL (1983) described a new interesting genus from India, viz., *Indosema* with *I. indica* as the type species. DOGANLAR (1984) studied eucharitid fauna of Turkey. HERATY & DARLING (1984) studied the variations in the morphology of planidial larvae of Eucharitidae and Perilampidae in 146 individuals from nineteen geographical locations in N. America. NARENDRAN (1985 a) described three new species of *Schizaspidia* Westwood, viz., *S. brevifuniculata, S. sitarami* and *S. malabarica* from India with a key and a check-list of species of *Schizaspidia* Westwood of Indian subcontinent.

HERATY (1985) contributed a lot to the knowledge of the family Eucharitidae, with the revision of the subfamily Eucharitinae and provided keys for the five genera and 16 known species of the Nearctic region. The taxonomic history of the family is briefly reviewed and the defining characters of the subfamilies Oraseminae and Eucharitinae are given. Descriptions of five new species of *Pseudometagea* Ashmead, *P. barberi* from Ontario, *P. hirsuta* from California, *P. nefrens* from lower Boreal, *P. occipitalis* from Central America and *P. rugosa* from Mexico are also included. The work also included redescriptions of species and keys to the Nearctic species of *Kapala* Cameron and *Lophyrocera* Cameron, a key to Nearctic species of *Pseudochalcura* Ashmead, a new genus, viz., *Obeza*, proposed for the New World species which were previously included in the Old World genus *Stilbula* Spinola and included a series of new combinations, brief discussion on the phylogenetic relationships among genera and species.

NARENDRAN (1985 b) provided a key to the families of Chalcidoidea and genera including the family Eucharitidae. NARENDRAN (1986) presented a catalogue of the genera and species of the family from India and the adjacent countries. A total of 8 genera were listed with a few generic and specific synonyms. HERATY (1986) revised the genus *Pseudochalcura* Ashmead to include 13 species, with generic diagnoses and key. Eight Neotropical and one Nearctic species of *Pseudochalcura* Ashmead are described as new. They are *P. atra* and *P. septuosa* from Mexico, *P. condylus* from lesser Antilles, *P. excruciata* from Brazil, *P. frustrata*, *P. liburna*, *P. pauca* and *P. prolata* from Argentina, *P. sculpturata* from Brazil, Florida and U.S.A. The work included the redescription of *P. chilensis* Kieffer, a list of synonyms of *P. gibbosa* (Provancher) with *P. arizonensis* (Crawford) and *P. california* (Ashmead) as junior synonyms, biological informations on both plant and ant hosts and a phylogenetic hypothesis for the genus. SUBBARAO (1987) made additions and corrections to the catalogue of Chalcidoidea of India and adjacent countries.

An elaborate work on the family Eucharitidae of Australasian region was done by BOUCEK (1988) in his 'Australasian Chalcidoidea'. He provided key to 18 genera of Australian Eucharitidae and erected two new subfamilies, viz., Echthrodapinae and Akapalinae and also erected 6 new genera, viz., *Orasemorpha* with *Eucharomorpha viridis* Girault as type species from Tasmania, *Anorasema* with *Eucharis pallidipes* Cameron from East Malaysia as type species, *Austeucharis* with *Psilogaster pallipes* Brull'e as type species from Tasmania, *Substilbula* with *Stilbula bidentata* Girault as type species from Queensland, *Striostilbula* with *S. quadridigitata* Girault as type species from S. Australia and *Stilbuloidea* with *Schizaspidia doddi* Bingham as type species from Queensland. He also described a few new species, viz., *Propsilogaster alcicornis, Echthrodape papuana, Losbanus*

minutus and *Saccharissa latifurca* from Australia and included a few generic synonyms, viz., *Eucharomorpha* Girault as *Orasema* Cameron; *Gollumiella* Hedqvist as *Losbanus* Ishii; *Prometagea* Girault as *Tricoryna* Kirby; *Metagea* Kirby as *Tricoryna* Kirby; *Epimetagea, Chalcurelloides, Chalcurella, Chalcuroidella, Chalcuroides, Arhipipallus* and *Parachalcura* all of Girault as *Chalcura* Kirby. The work also includes several new specific synonyms, a series of new specific combinations, viz., *Stilbula delicatula* (Walker) into *Orasema delicatula* (Walker) and *Schizaspidia manipurensis* Clausen into *Ancylotropus manipurensis* (Clausen). DARLING (1988) discussed the morphology of labrum in Eucharitidae with comparative studies with other families also.

HERATY (1989) carried out a study on the morphology of the mesosoma of *Kapala* Cameron with emphasis on its phylogenetic implications. MANI (1989) revised the family Eucharitidae of India and provided a key to genera. FAROOQI *et al.* (1989) described male of *Indosema indica* Husain and Agarwal from India.

HERATY (1992) revised the genera *Gollumiella* Hedqvist and *Anorasema* Boucek, in which *Gollumiella* Hedqvist was resurrected from synonymy with *Losbanus* Ishii, and *Losbanus* was synonymised with *Orasema* Cameron and a key was provided to distinguish 6 species in the Indo-pacific region including three new species, viz., *G. guineensis* from New Guinea, *G. infuscata* from Borneo and *G. neopetiolata* from Borneo, New Guinea and Philippines. The revision also includes new character states for *Anorasema* Boucek and descriptions of a new species, viz., *A. manii* from India, discussions on phylogenetic relationships among *Gollumiella, Anorasema* and other Eucharitidae and a new combination of *Gollumiella uichancoi* (Ishii) into *Orasema uichancoi* (Ishii). SNEHALATHA &

NARENDRAN (1992) described a new species of *Orasema* Cameron, viz., *O. indica* with a key to Indian species.

HERATY & WOOLLEY (1993) discussed the recurring problem in *Kapala* in species determination and provided descriptive notes for new combinations of *K. iridicolor* (Cameron) and *K. sulcifacies* (Cameron). *Lirata fulvicornis* Cameron and *Lirata nigriventris* Cameron were proposed as new synonymies under *Kapala sulcifacies.* The South American species of the *Orasema xanthopus*- group were revised by HERATY, WOJCIK & JOUVENAZ (1993), which included five species, viz., *O. pireta, O. salebrosa, O. simplex, O. worcesteri* (Girault) (*O. doellojuradoi* Gemignani as new synonym) and *O. xanthopus* (Cameron) (*Eucharomorpha paraguayensis* Girault and *O.crassa* De Santis as new synonyms), descriptions of immature stages for three of the species, data of ant hosts and the life history of *O. xanthopus*.

HERATY (1994 a) revised two new closely related genera of Eucharitinae, viz., *Psilocharis* Heraty and *Neolosbanus* Heraty and made an extensive study on the classification and evolution of the Oraseminae in the Old World. In this study he divided the subfamily Eucharitinae into 2 new tribes based on the presence of an independent prepectus (Psilocharitini) or a fused prepectus (Eucharitini), provided keys to genera and species, descriptions, biogeographic informations and descriptions of immature stages and behaviour for the 4 genera of Oraseminae and the 2 genera placed in the Psilocharitini. In this work he treated 56 species of which 33 are new to science, proposed several new combinations, proposed many new synonymies and the phylogenetic relationships of Eucharitidae using 62 morphological characters analysed. NARENDRAN (1994) described an interesting new genus *Cherianella* with *C. narayani* as type species from India. DE SANTIS & FIDALGO (1994) described a new species, viz., *Galearia bruchi.*

HERATY (1995) studied the eucharitid fauna of Costa Rica. NARENDRAN & SHEELA (1995) redefined the rare genus *Ancylotropus* Cameron with a diagnosis of the genus, redescribed the little known species *A. cariniscutis* Cameron and *A. manipurensis* (Clausen) and provided a key to separate the two species was also provided. NARENDRAN & SHEELA (1996) described three new species of *Stilbula* Spinola, viz., *S. peethavarna*, *S. lata* and *S. ashokai* from Oriental Region and also provided a key for the identification of Indo-Pacific species.

HERATY (1997) provided an annotated key to the genera of Eucharitidae of North America. HERATY (1998) described 4 new species of Neotropical genera, *Dilocantha albicoma* from Mexico, *D. bennetti* from Trinidad, *D. lachaudii* from Mexico and *D. serrata* from Costa Rica and provided a key to the species.

NARENDRAN (1999) described a new species of *Parapsilogastrus* Ghesquire, viz., *P. heratyi* from Thailand. MAEYAMA *et al.* (1999) described a new species of *Rhipipalloidea* Girault, viz., *R. madangensis* from Papua New Guinea. HERATY (2000) described a new species of *Orasema* Cameron, viz., *O. monomoria* from Madagascar.

HERATY (2002) made a significant contribution to the study of this family with the revision of Eucharitidae at the generic level on a world wide basis. He discussed the taxonomic and phylogenetic relationships of 53 genera in 2 subfamilies, provided identification keys for all genera, species of *Ancylotropus* Cameron, *Babockiella* Heraty, *Cherianella* Narendran, *Eucharissa* Westwood, *Hydrorhoa* Kieffer, *Lirata* Cameron, *Mateucharis* Boucek & Watsham, *Parapsilogastrus* Ghesquiere, *Saccharissa* Kirby, *Substilbula* Boucek and *Zulucharis* Heraty. In the same work he described 13 new genera: *Apometagea*, *Athairocharis*, *Babockiella*, *Carletonia*, *Colocharis*, *Cyneucharis*, *Laurella*, *Leurocharis*, *Mictocharis*, *Neostilbula*,

Pogonocharis, Risbecia and *Zulucharis.* This publication also includes descriptions of 37 new species, several synonyms and a total of 34 new combinations. In the same work he analyzed the phylogenetic relationships of Eucharitidae with a matrix of 100 morphological characters used Akapalinae and Perilampidae as the outgroups, analyzed various combination of character states using parsimony, discussed the differing results, recognized four distinct clades, viz., the Eucharis clade (9 genera), Stilbula clade (10 genera), Kapala clade (12 genera) and the Chalcura clade (11 genera) and also discussed the associated ant host relationships.

HERATY (2004) described three new species of *Gollumiella* Hedqvist, viz., *G. buffingtoni* from China and Japan, *G. ochreata* from Malaysia and *G. darlingi* from Indonesia and also discussed the biology and phylogenetic position of *Gollumiella* Hedqvist. HERATY *et al.* (2004) proposed Gollumiellinae as a new subfamily for the Indo-Pacific genera, *Gollumiella* Hedqvist and *Anorasema* Boucek and explained the phylogeny and behaviour of the Gollumiellinae.

The Indian genera of family Eucharitidae was reviewed by GIRISH KUMAR (2004), with the generic diagnoses, their distribution and the list of species reported from the Indian subcontinent. An illustrated key to the eucharitid genera of Indian subcontinent was also provided. NARENDRAN & GIRISH KUMAR (2004) described two new species of *Stilbula* Spinola from Yemen, viz., *S. tonyi* and *S. yemenica.* HERATY (2005) revised the genus *Isomerala* Shipp and described a new species, viz., *I. bouceki* from Venezuela and Trinidad. NARENDRAN & GIRISH KUMAR (2006, in press) described a new species of *Orasema* Cameron, viz., *O. delhiensis* from India and provided a key to species of *Orasema* Cameron of India.

Chapter II

MATERIALS AND METHODS

1. Collection Work

There are various methods for collecting Eucharitids for its systematic studies which are described in detail below:

a. Study area (Fig. 1)

Specimens for the present work were collected from different parts of Kerala and the adjacent places. Kerala is the southern most state of India which occupies a unique position in the map of the country. It lies between north latitudes 8°18' and 12° 48' and east longitudes 74°25' and 77°22'. In betweer the western ghats on the east and the Arabian sea on the west, the width of state varies from 35 to 120 km.

According to the geographical features Kerala can be divided in to three regions (1) High lands above 76m, (2) Mid lands 7.6 to 76m and (3) Low land below 7.6m.

The Highlands slope down from the western ghats which rise to an average height of 900m, with a number of peaks well over 1800m in height. This is the area of forests and of major plantations like tea, coffee, rubber, cardamom and other spices. This is a hot spot area as far as the biodiversity of fauna and flora are concerned.

The midlands lying between the mountains and the lowlands is made up of undulating hills and valleys. This is an area of intensive cultivation. Cashew, coconut, arecanut, tapioca, banana, rice, ginger, pepper, sugarcane and vegetables of different varieties are grown in this area.

The lowlands or the coastal area is formed by the deposition of sediments brought down by the rivers of western ghats and sand deposited by the waves. It is made up of the river deltas, backwaters and the shore of Arabian sea is essentially a land of coconut and rice.

Kerala with its rich and diverse flora provides an excellent habitat for insect fauna throughout the year. The present investigation has shown that we have a rich fauna of Eucharitidae in this state.

b. Climate

The climate in Kerala can be divided in to three periods viz., the summer, the monsoon and the winter months. The summer begins approximately in the second half of February and lasts till the end of May. The monsoon period starts in June and ends in September-October. This is followed by winter which lasts till the beginning of February. The winter in Kerala is not severe as in the North of India. The temperature raises from 18 to 26°C during the winter months. The temperature varied within the range 31-35°C during the summer months when this investigation was carried out.

2. Methods of collection

a. Sweep net and Sweeping

Eucharitids were generally most easily collected in clear windless weather during the forenoon periods of the day. Sweeping was found to be the most rewarding way of collecting Eucharitids since a relatively good diversity of species could be collected within a short time.

The type of net most suitable for sweeping is a modified framework of the one originally designed by Noyes (1982). The frame of the net (Plate II A) is triangular in shape and is made up of aluminum with sides measures 48

x 46 x 48cm. The triangular frame increases the surface area of the net in contact with the ground when sweeping grassland.

The net (Plate II A) handle was made up of ¾" aluminum tube about 4 feet long. The frame could be fitted to one end of the handle. The long handle allows the net to be used as far away from the body as possible, making sweeping underneath low, over hanging bushes easier and extends the area of each individual sweep.

The net bag measures 60cm in length and is made up of thin cotton cloth which allows the easy passage of air. The tope of the bag which fits around the frame is made of canvas. The canvas is folded over the frame and sewn in position.

When sweeping, it is important to choose area where the host ant nest is situated. The eucharitids are usually slow moving parasitoids resting on the neighbouring plants. Sweeping was done as described by Noyes (1982). Eucharitids collected in the net was immediately sucked in to an aspirator (Plate II B).

The collected insects were killed by placing a piece of tissue containing a few drops of ethyl acetate in the entry tube of the aspirator. After ensuring them as dead they are transferred to 70% alcohol for further examination.

b. Rearing

Suspected ant pupae were collected and placed them in a suitable receptacle to await the emergence of parasites.

c. Malaise trap

A suitable design of Malaise trap (Plate II C) has been well described by Townes (1972). This tent like device catches insects by chance as they fly

in to the sides of the trap, crawl upwards on the cloth to the roof where they enter the killing bottle containing 70% alcohol. The trap used in this study is usually about 6' wide, 3'6" high at one end and 6'6" at the other end.

d. Yellow Pan or Moericke trap

This method is based on the principle that insects are attracted to yellow colours. The trap consists of a shallow tray about 60-75 mm deep and about 30 cm^2 which is painted bright yellow on the inside and some neutral colour, such as black on the outside (Plate II D). The tray was filled with water, to which a few drops of detergent was added to break the surface tension. It was then laid on the ground on a suitable habitat such as grassland. The tray was emptied once a day with a small net. Before transferring the specimens in to alcohol, they were washed with fresh water to prevent deposits forming on the specimens due to contamination from the detergent.

e. Pit Fall Trap

Female eucharitids are usually inactive and slow moving. They are usually collected from ground level. So pit fall trap is also used for eucharitids collection, however, not found to be very rewarding. The pit fall trap consists of a jar sunk in the ground and partly filled with 50% alcohol or ethylene glycol/water mix or salt solution. The specimens collected must be thoroughly washed in clean water before transferring to 70% alcohol.

3. Storing and Preserving

a. Unmounted materials

The unmounted specimens were stored in 70% alcohol in small vials and kept in a refrigerator. The preservative was periodically changed and replenished to prevent drying.

b. Mounted Materials

Card mounted materials are preserved in insect boxes specially made for the purpose. Naphthalene balls were placed on the inside corners of the boxes in order to protect the specimens from other injurious insects. Thymol crystals and 2,4-dichlorobenzene were used as fungicide. Besides, the collection boxes were periodically subjected to warming by using table lamps to avoid fungal growth.

4. Relaxing material

For relaxing, specimens were kept in an atmosphere of acetic acid for 6-8 hours. This method was found very suitable for specimens which had been killed using ethyl acetate. Relaxing helped to prevent the breakage of specimens when they were being card mounted. To achieve the best results use a clear plastic sandwich box, with a tightly fitting lid and covered the bottom with a thick layer of cotton wool. A few drops of glacial acetic acid was added to this followed by a second layer of cotton wool. Specimens to be relaxed were placed on top of a piece of tissue in a glass dish and the whole dish was kept in the box which was then closed.

5. Mounting, Labelling and Registering

The method followed in the present work is that adopted by Boucek and Noyes (Noyes, 1982 & Narendran, 2001). The specimen was mounted on a card either rectangle or triangle, tilted slightly on its side (at about 45° to the plane of card) in such a way that the whole body including the face and mandible were clearly visible.

The materials used for card mounting were: 1) a fine zero point brush, 2) a pair of fine needles or pins, 3) water soluble glue, 4) a pair of fine

forceps, 5) mounting cards (usually measuring 14 x 5 mm), 6) Entomology pins 7) Blotting paper and 8) Table lamp.

The specimens to be mounted, either freshly killed specimens in alcohol, were first of all dried. For this, the specimen was placed with a drop of alcohol on an absorbent piece of card. The wings, legs and antennae were then correctly positioned. When the specimen had just dried, it was placed on the microscope stage next to a card either rectangle, or triangle. Using a pin a small drop of glue (approximately 1/2- 2/3 the volume of the thorax of the specimen to be mounted) was put on the card at the point where the imaginary lines bisecting the angles at the top corners of the card. Then a fine brush was taken and it was moistened by a minute quantity of alcohol. Using the brush the specimen was picked up by touching against the mesopleuron. It was then positioned with the venter of the thorax on the glue, the body lying lengthwise along the card and the head pointing towards the far end. Then the body was tilted to that it lay on its side at about 45° to the card. The specimen was pressed down firmly but gently with the brush to acquire good adhesion. The wings were kept stretched out and flat on the card. For mounting, Olympus microscope (Japan made) was used.

The specimens thus mounted on the cards were held on entomological pins (Asta insect pins No.3: 38mm x 0.5mm made by Newey-Goodman Ltd., England); labelled and kept in insect boxes, for detailed systematic studies. The label contained the following information: the name of the country, state, district, exact locality, collector, date and host data (if host known). Registering of specimens was done after the specimens have been identified. The registering of entries is as follows: (1) Serial number, (2) Collection number, (3) Scientific name, (4) Name of person who determined the species, (5) Name of the locality, (6) Date of collection, (7) Name of the host, (8) Name of the collector and (9) Remarks.

5. Observations and Illustrations

Observations were mostly done on card mounted specimens under Olympus (Japan made) and M3Z WILD stereozoom (Switzerland made) microscopes. The figures were drawn using the drawing tube of WILD M3Z Stereozoom microscope. The figures thus obtained were enlarged using KB enlarger of the model B2M.

MORPHOLOGY AND MEASUREMENTS

(Figs. 12-22)

Morphological terms followed in this study are those of Narendran (1985a, 1994, 1999), Boucek (1988) and Heraty (1994a, 2002). Terms frequently used in the keys and descriptions are defined below and are shown in the accompanying figures.

Alveolate - Having a regular network of broad depressions with slightly rounded, narrow septa.

Anellus (anl) - Strongly shortened proximal flagellar segments seen between pedicel and first funicle segment.

Anteclypeus (acl) - The apical margin of the clypeus has a distinct glabrous flange or ventral projection called the anteclypeus.

Antenna - A paired, segmental sensory appendage of the head between the compound eyes.

Antennal toruli (tor) - A paired socket on the front part of the head upon which scape is articulated.

Areolate	- Having an irregular network of broad depressions with slightly rounded narrow septa.
Axilla (ax)	- Posterolateral portion of mesoscutum separated from mesoscutum and lateral to scutellum.
Axillula (axl)	- The lateral subdivision of the scutellum delimited by a longitudinal line.
Callar nib	- A small pointed 'nib' is found on the dorsal medial aspect of the callus of some taxa.
Callus (cal)	- It is usually a swollen area between the postspiracular sulcus and the metepimeron and may have a distinct patch of elongate hairs.
Carina	- A ridge or raised line.
Cercal seta	- Seta present on posterior sensory appendage of the posterior gastral tergite.
Clava (clv)	- The enlarged apical flagellomere of an antenna.
Clypeus (cly)	- The middle sclerite of the head immediately above the labrum.
Coriaceous	- Leather-like with minute septa.
Costal cell (cc)	- The area above the submarginal vein.
Coxa	- The first segment of a leg, between the body and the trochanter.
Crenulate	- Scalloped and evenly rounded with sharp dividing septa.
Emarginate	- Notched; with an obtuse, rounded, or quadrate section cut out of a margin.

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 (flg) - The part of antenna after the pedicel.

Foramen magnum - The hole through which the head is connected with mesosoma.

Fore coxa (cx_1) - Coxa of the first pair of leg.

Fovea - A deep depression.

Frenum (fre) - The transverse line on the scutellum that delineates a posterior portion of the scutellum, the frenal area.

Frontal carina - A longitudinal ridge or pair of ridges on the frons between the toruli.

Frontogenal sulcus - The region dorsal to the clypeus is often swollen and may be bordered lateraly by a sulcus called the frontogenal sulcus.

Frons - The area of the head between the ventral margin of the toruli and the anterior margin of the median ocellus.

Funicle (fun) - The part of flagellum excluding the club and anelli.

Gaster - The posterior division of the body, posterior to the leg-bearing segments.

Gena (gen) - The anterior part of the back of the head between the compound eye and the occiput.

Glabrate - Smooth or nearly so, shiny and almost devoid of all sculpture, allows for isolated and minute sculpture and scattered fine setae.

Glabrous - Completely smooth and polished and devoid of any hairs or setae.

Granulate - Minutely verrucose and appearing like sandpaper even under high magnification.

Groove - A linear impression on a sclerite.

Hamulus - One of a series of small bristle-like hooks on the anterior margin of the hind wing.

Head - The principal anterior division of the body; it bears the mouthparts and antenna.

Hind coxa (cx_3) - Coxa of the third pair of leg.

Hypopygium - The last visible sternum of the gaster.

Labrum (lbr) - The anterior, medial appendage of the mouthparts attached to the underside of, and often concealed by the clypeus.

Lateral ocellar line (LOL) - Minimum distance between median ocellus and lateral ocellus.

Lateral ocellus (po) - One of a pair of round or oval facet on vertex.

Lower face - The front part of the head below the antennae.

Lower ocular line - An imaginary line joining the bases of eyes.

Malar sulcus (msp) - A groove or line extending from base of eye to mouth corner.

Mandible (man) - The paired, heavily sclerotized biting and chewing lateral appendage of the mouth parts.

Marginal vein (mv) - The vein along anterior margin of fore wing extending from distal end of coastal cell to the branching point of stigmal vein.

Median ocellus (ao) - The anterior median round or oval facet on vertex.

Mesepimeron (lep_2 and uep_2) - The posterior subdivision of the mesopleuron.

Mesepisternum (es_2) - The anterior subdivision of the mesopleuron.

Mesopleuron - The lateral and ventral part of mesothorax.

Mesoscutum - The part of mesosoma between the pronotum and scutellum, often divided by notauli into a median lobe and two lateral lobes.

Mesosoma - The middle part of the body between head and gaster.

Metapleuron - The lateral and ventral part of the metathorax.

Metepimeron - The posterior subdivision of the metapleuron.

Metepisternum - The anterior subdivision of the metapleuron.

Microtrichia - Setae that are barely visible using light microscopy at high magnification.

Mid coxa (cx_2) - Coxa of the second pair of leg.

Multiporous plate sensillum (MPS) – Appressed, plate like or rounded roof like or groove like sensory structure on funicular segments and clava.

Notauli (not) - The usually oblique, paired longitudinal grooves on mesoscutum, dividing it into a median lobe and two lateral lobes.

Occipital carina (occ) - A ridge on the posterior surface of the head that separates the occiput from the vertex and gena.

Occiput - The posterior part of the head behind the vertex dorsally.

Ocellocular distance (OOL) - Distance from the eye to the lateral ocellus of that side.

Ovipositor (ovi) - A slender, paired and interlocking tubular structure in females, used for laying the eggs.

Parascrobal area - Part of the frons between the scrobal margin and inner orbit.

Pedicel - The second segment of the antenna, articulating apically with the flagellum.

Petiole - A stalk joining gaster to the propodeum.

Postocellar distance (POL) - Distance between the two lateral ocelli.

Postmarginal vein (pmv) - The vein along the anterior margin of fore wing from the branch point of the stigmal vein.

Prepectus (pre) - The triangular sclerite lateral to pronotum.

Pretarsus - The apical segment of a leg, bearing the claws and associated structures.

Pronotal sulcus - Pronotum with a broadly impressed median longitudinal sulcus called the pronotal sulcus.

Pronotum (no_1) - The anteriormost dorsolateral sclerite of the mesosoma.

Propleuron (pl_1) - The lateral part of the prothorax. It is displaced somewhat by the pronotum so as to occupy an oblique position ventrolateral and anterior to the pronotum.

Propodeum (ppd) - The posteriormost dorsal sclerite of the mesosoma.

Reticulate - Having a fine, regular network of raised septa.

Rugose - Having rough, raised sculpture with smooth septa and no regular patterns evident, dividing septa may be prominent (strongly rugose) or hardly raised above surface(weakly rugose)

Rugulose - Finer sculpture of rugose.

Scape - The first antennal segment which is joined to the front part of head.

Scapula (llm) - The lateral lobe of mesoscutum seprated from the median lobe by notauli.

Scrobal depression (scd) - Depression on the upper face of reception of the scape.

Scutellum (sct) - The middle sclerite of mesosoma between the mesoscutum and propodeum.

Seta - A slender, hair-like sensory extension of the cuticle, arising from pits on body wall.

Speculam (spc) - The bare area just posterior to the parastigmal vein and base of the marginal vein.

Spiracle (sp) - A small, round or oval lateral opening on a body segment through which air enters the tracheae.

Sternaulus - The horizontal lateroventral carina or groove near the lower margin of the mesopleuron, extending from the lower end of the epicnemial carina toward the mesocoxa.

Stigmal vein (stv) - The short vein arising from the distal end of the marginal vein and reaching the knobbed apex, stigma.

Sulcus of the first gastral sternite (gsu) – The first gastral sternite is constricted at the base in some taxa by a transverse sulcus which is often crenulate and deeply impressed.

Submarginal vein (smv) - The vein arising from the anterior proximal end of fore wing, below the costal cell and extending to the marginal vein.

Tarsus - The fifth segment of a leg, attached basally to the tibia and subdivided into trasomeres.

Tegula (tgl) - A small, scale like sclerite covering the base of fore wing.

Tibia - The fourth segment of a leg between the femur and the tarsus.

Tibial spur - A spine-like, multicellular extension of the cuticle connected to an appendage by a socket; usually found apically on the tibiae.

Transepimeral sulcus - The upper and lower mesepimeron separated by a sulcus called transepimeral sulcus.

Transcutal articulation (TSA) – A line of weakness across the mesonotum between the fore wing bases, which secondarily separates the posterolateral angles of the mesoscutum beside the scutellum.

Trochanter - The second segment of a leg, between the coxa and femur.

Valvula - The distal part of ovipositor.

Verrucose - Covered with fine, irregularly shaped spots which could be lobes or wart like protuberances on small circular depressions.

Absolute measurements, in millimeters (mm), are used for the body length in descriptions. All measurements were taken in a position in which the measured distance was fully exposed, i.e., in view perpendicular to the measured part. Head height was measured from the top of the median ocellus to the apex of the clypeus. LOL was measured as the minimum distance between lateral ocellus and median ocellus. OOL was measured as the minimum distance between lateral ocellus and dorsal margin of eye. POL

was measured as the minimum distance between two lateral (posterior) ocellus. Length of malar space is the minimum distance between the ventral margin of the eye and the lateral margin of the oral fossa. Fore wing length was measured from the apex of the humeral plate to the wing apex (fringe excluded). Width of the fore wing was measured as the maximum width perpendicular to the fore wing margin at the stigmal vein. The length of gaster does not include the petiole or a protruding ovipositor, unless so specified. The gastral tergites are normally measured medially, but only with their exposed part.

ABBREVIATIONS

1. General abbreviations

$F_1 - F_7$	Funicular segments 1 – 7
$Gs_1 - Gs_8$	Gastral sternites 1 – 8
$Gt_1 - Gt_8$	Gastral tergites 1 – 8
LOL	Lateral ocellar line
MPS	Multiporous plate sensilla
MV	Marginal vein
OOL	Ocellocular line
PMV	Postmarginal vein
POL	Postocellar line
SMV	Submarginal vein
SSS	Scutoscutellar sulcus
STV	Stigmal vein
TSA	Transcutal articulation

2. Abbreviations of depositories

BMNH	The Natural History Museum, London, England.
BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, USA.
CNCI	Canadian National Collection, Agriculture Canada, Ottawa, Ontario, Canada.
DZUC	Department of Zoology, University of Calicut, Kerala, India.
NZSI	Zoological Survey of India, National Zoological Collection, Calcutta, India.
QMBA	Queensland Museum, Brisbane, Queensland, Australia.
USNM	United States National Museum of Natural History, Washington DC, USA.
ZMUC	Zoologisk Museum, Copenhagen, Denmark.
ZSIC	Zoological Survey of India, Regional Station, Chennai.

SYSTEMATIC STATUS OF THE FAMILY EUCHARITIDAE

The family name was proposed first by Walker (1846) as Eucharidae. Dalla Torre (1898) corrected it to Eucharidinae. Girault (1928b) used Eucharitinae and now it is known as Eucharitidae (Heraty, 1985). About 53 nominal genera and 420 nominal species are currently described in the world (Heraty, 2002, 2004, 2005; Noyes, 2004; Narendran and Girish Kumar, 2004, 2006 (in press)).

Dalla Torre (1898) proposed a separate subfamily Eucharissinae for the genera *Eucharissa* Westwood and *Saccharissa* Kirby. Burks (1979) erected a subfamily Oraseminae. According to Boucek (1988) the family Eucharitidae

comprises five subfamilies, viz., Echthrodapinae, Akapalinae, Oraseminae, Eucharitinae and Philomidinae. Echthrodapinae and Philomidinae are parasites of ground or twig-nesting bees (Michener, 1969; Darling, 1992). Later Grissell (1995) transferred Echthrodapinae into Torymidae. Based on recent morphological and molecular evidence Akapalinae may be the sister group of Eucharitidae *s.s.* (Oraseminae + Eucharitinae), and Philomidinae may be more closely associated with some Chrysolampinae (Perilampidae) (Heraty, 2002).

Heraty *et al.* (2004) erected a new subfamily from Eucharitinae namely Gollumiellinae for the Indo-Pacific genera *Gollumiella* Hedqvist and *Anorasema* Boucek. So at present Eucharitidae has 3 subfamilies, viz., Oraseminae, Gollumiellinae and Eucharitinae. Females of these subfamilies deposit their eggs in or on plant tissue, initially parasitize the ant larva and complete their development on the ant pupa. The Oraseminae is composed of four genera, three of which are found in the Old World tropics. The Gollumiellinae is composed of two Indo-Pacific genera. The Eucharitinae is composed of two tribes: the Psilocharitini, which includes two genera in the Old World and the Eucharitini, which includes diverse group of remaining 45 genera.

List of 53 nominal genera and their distribution

Sl. No.	Genera	Distribution
	Subfamily Oraseminae	
1	*Indosema* Husain & Agarwal	Oriental: India
2	*Orasema* Cameron	Neotropical; Nearctic; Palaeotropical (except New Zealand and the Oceanic islands east of New Caledonia); Southern Japan; Tropical and subtropical areas

3	*Orasemorpha* Boucek	Australia including Tasmania
4	*Timioderus* Waterston	Ethiopian
	Subfamily: Gollumiellinae	
5	*Anorasema* Boucek	Oriental
6	*Gollumiella* Hedqvist	Indo-Pacific
	Subfamily : Eucharitinae	
	Tribe 1 : Psilocharitini	
7	*Neolosbanus* Heraty	Indo-Pacific. Single questionable records are known from Algeria (Palaearctic) and Uruguay (Neotropical)
8	*Psilocharis* Heraty	SouthernMalagasy, Ethiopian and Indo-Pacific regions including the Polynesian and Australian subregions. A single questionable record is known from Argentina
	Tribe 2: Eucharitini	
9	*Ancylotropus* Cameron	Palaeotropical
10	*Apometagea* Heraty	Australia
11	*Athairocharis* Heraty	Southern Ethiopian
12	*Austeucharis* Boucek	Australia including Tasmania
13	*Babockiella* Heraty	Ethiopian
14	*Carletonia* Heraty	Neotropical
15	*Chalcura* Kirby	Australia and Oriental
16	*Cherianella* Narendran	India and Africa
17	*Colocharis* Heraty	Neotropical
18	*Cyneucharis* Heraty	Neotropical
19	*Dicoelothorax* Ashmead	Neotropical
20	*Dilocantha* Shipp	Neotropical
21	*Eucharis* Latreille	Palaearctic, including eastern Mediterranean
22	*Eucharissa* Westwood	Southern Ethiopian

23	*Galearia* Brulle	Neotropical
24	*Hydrorhoa* Kieffer	Ethiopian
25	*Isomerala* Shipp	Neotropical
26	*Kapala* Cameron	Neotropical; Nearctic; Ethiopian and Malagasy
27	*Lasiokapala* Ashmead	Neotropical
28	*Laurella* Heraty	Neotropical
29	*Leurocharis* Heraty	Australia
30	*Lirata* Cameron	Neotropical
31	*Liratella* Girault	Neotropical
32	*Lophyrocera* Cameron	Neotropical and Nearctic
33	*Mateucharis* Boucek & Watsham	Southern Ethiopian
34	*Mictocharis* Heraty	Madagascar
35	*Neostilbula* Heraty	Malagasy
36	*Obeza* Heraty	Neotropical and Nearctic
37	*Parakapala* Gemignani	Neotropical
38	*Parapsilogastrus* Ghesquiere	Indo-Pacific
39	*Pogonocharis* Heraty	Sulawesi and New Guinea
40	*Pseudochalcura* Ashmead	Nearctic andNeotropical
41	*Pseudometagea* Ashmead	Nearctic
42	*Rhipipalloidea* Girault	Australasian
43	*Risbecia* Heraty	Southern Ethiopian
44	*Saccharissa* Kirby	Indo-Pacific
45	*Schizaspidia* Westwood	Indo-Pacific, including the Papuan subregion of Australia and the Polynesian subregion
46	*Stilbula* Spinola	Palaearctic; Ethiopian; Malagasy and Indo-Pacific

47	*Stilbuloida* Boucek	Australia
48	*Striostilbula* Boucek	Australia including Tasmania
49	*Substilbula* Boucek	Nortern Australia
50	*Thoracantha* Latreille	Neotropical
51	*Thoracanthoides* Girault	Australia
52	*Tricoryna* Kirby	Australia including Tasmania
53	*Zulucharis* Heraty	Southern Ethiopian

DIAGNOSIS OF THE FAMILY EUCHARITIDAE

Pronotum hidden in dorsal view by the convex mesoscutum; prepectus fused with the pronotum in Eucharitinae and Gollumiellinae whereas in Oraseminae it is not so; in several species, apex of scutellum often produced posteriorly into a fork or horn or stump; mandibles sickle shaped; malar sulcus absent; labrum with single row of 4-16 marginal digits; antennae each with 10 to 24 segments; in some species the flagellar segments serrate or ramose; fore wing with usually well developed marginal vein but in some cases veins not discernible; notauli usually present; tarsi 5 segmented; gaster often with a long petiole in many species; Gt_1 usually more than half as long as gaster; ovipositor concealed or exserted, if exserted then either acicular or expanded.

SEXUAL DIMORPHISM

Sexes are readily distinguishable based on the relative length of the petiole, the shape of the gaster, sometimes the shape and number of antennal segments and the presence or absence of an ovipositor or genitalia that usually are visible externally. More subtle differences can also be observed. Males are usually less robust than females, the mesosoma is slightly smaller in proportion to body size, sculpture may be more prominent, colouration is darker and metallic reflections, if present, tend to be more extensive.

Chapter III

OBSERVATION AND RESULTS

KEY TO GENERA OF EUCHARITIDAE OF INDIAN SUBCONTINENT

1. Pronotum and prepectus separated as different sclerites (Fig. 23); anellus usually present (Fig. 25); face smooth or sculptured; apex of scutellum always rounded (Fig. 26) 2

– Prepectus evidently fused with pronotum, although fusion sometimes indicated as groove or carina (Figs. 70, 74, 80, 144 & 192); anellus usually absent, but if present then face smooth; apex of scutellum rounded, emarginate or with some form of projection 5

2. First gastral sternite with transverse furrow delimiting small crescentic anterior region (Figs. 23 & 28); dorsal occipital margin usually rounded, rarely with carina; face usually with raised coriaceous, rugose or reticulate sculpture, rarely smooth; ovipositor always expanded (Fig.33); ventral valve usually with lateral teeth, rarely with diagonal ridges ..... **Oraseminae** 3

– First gastral sternite evenly rounded without a transverse furrow; dorsal occipital margin with distinct carina; face smooth or smooth with scattered pits, never with strong sculptures as above; ovipositor acicular or expanded; ventral valve with diagonal ridges .... **Psilocharitini (Eucharitinae)** 4

3. Transscutal articulation obliterated; palpi absent; anellus absent; mandibles absent ..... ***INDOSEMA*** Husain & Agarwal

– Transscutal articulation complete; palpi present; anellus usually present (Figs. 25 & 30); mandibles present ..... ***ORASEMA*** Cameron

4. Clypeal margin rounded, anteclypeus absent (Fig. 35); palpi each with 3 segments; femoral groove foveate (Fig. 34); petiole gradually narrowed basally; hypopygium bare or with few small sublateral setae,

setae minute; ovipositor acicular or expanded .....
..... *NEOLOSBANUS* Heraty

– Clypeal margin straight with well-defined narrow anteclypeus (Fig.66); palpi each with 2 segments; femoral groove broadly impressed and smooth or reticulate (Fig. 65); petiole abruptly narrowed basally; hypopygium with long transverse brush of hairs or with only a few long hairs on each side of mucro; ovipositor always acicular .....
..... *PSILOCHARIS* Heraty

5. Gt_1 small, less than 0.6x as long as Gt_2 laterally, even when gaster shriveled; face completely smooth; anellus present or absent; hypopygium usually with linear brush of long hairs, rarely with few hairs; scutellar apex rounded; small individuals, less than 2.6 mm
..... **Golumiellinae** ... 6

– Gt_1 large, always longer than Gt_2 laterally, often covering most of following segment when gaster shriveled; face smooth or sculptured; anellus absent; hypopygium without linear brush of long hairs; scutellum rounded or with a process; generally large individuals .....
..... **Eucharitini (Eucharitinae)** 7

6. Scape exceeding vertex by more than scape width, ventral half of scape swollen; funicular segments 3-4x as long as broad; anellus present or absent; dosral margin of occiput with distinct carina; postmarginal vein long and extending almost to apex of wing; Gs_1 constricted medially; hypopygium with brush of 16-18 long hairs; ovipositor broad along entire length ..... *ANORASEMA* Boucek

– Scape not exceeding vertex, cylindrical or swollen medially; funicular segments not more than 2x as long as broad; anellus separate or partially to completely fused with F_1; dorsal margin of occiput rounded and smooth; postmarginal vein not reaching half distance between stigmal vein and apex of wing; Gs_1 smooth without a constriction;

hypopygium with 2-8 long hairs; ovipositor acicular or 3-keeled .... ***GOLLUMIELLA*** Hedqvist

7. Scutellar apex distinctly produced (either forked or not) at its apical part (Figs. 72, 79, 83 & 147) 8

– Scutellar apex not distinctly produced, more or less rounded (Fig. 195) 12

8. Scutellar apex produced into single horn (Figs. 72 & 79) 9

– Scutellum with a distinct forked process at apex (Figs. 83 & 147) 10

9. Scutellum with narrow horn with its apex blunt (Fig. 72); antenna 12 segmented (Fig. 70); notauli present (Fig. 72); mesosoma strongly sculptured ..... ***ANCYLOTROPUS*** Cameron

– Scutellum with extraordinarily long horn, with pointed apex usually extending beyond gaster (Fig. 74); antenna 13 segmented (Figs. 77 & 78); notauli absent (Fig. 79); mesosoma granulate .... ***CHERIANELLA*** Narendran

10. Flagellar segments cylindrical in both sexes (Figs. 81 & 105); STV reduced (Fig. 80); petiole much longer and slender .... ***STILBULA*** Spinola

– Antenna serrate in females (Figs. 145, 155, 170) and ramose in males (Figs. 152, 161, 178, 184, 189); STV moderately long, perpendicular to marginal vein (Fig. 144); petiole longer than hind coxa 11

11. Antenna with 12 or more flagellomeres; scutellar process with short fork or apically emarginate; scutellum longitudinaly carinate; prepectus broad and triangular dorsally; apex narrowly separated from tegula .... ***SACCHARISSA*** Kirby

– Antenna of both sexes with 10 flagellomeres, with last 2 segments of female often fused (Figs. 145 & 152); scutellum produced as long fork (Fig. 147), if diverging spines short, then scutellum with alveolate or

rugose-alveolate sculpture; dorsal length of prepectus short, apex broadly separated from tegula ..... ***SCHIZASPIDIA*** Westwood

12. Apex of scutellum entire or rounded (Fig. 195); mesosoma densely striato-reticulate except scapula usually smooth (Fig. 195); notauli distinct ..... ***CHALCURA*** Kirby

– Apex of scutellum usually incised or with two minute spike-like plates; mesosoma smooth and glossy, occasionally sparsely punctate; notauli indistinct ..... ***EUCHARIS*** Latrielle

1. GENUS *ORASEMA* CAMERON

Orasema Cameron, 1884. *Biologia Centrali – americana. Insecta Hymenoptera* 1: 1-104. Type species: *Orasema stramineipes* Cameron, by monotypy.

Semora Cameron, 1909a. *Transactions of the Entomological Society of America* 35: 432-433. Type species: *Semora xanthopus* Cameron, by original designation. Homonym discovered by Strand, 1942: 393; preoccupied by Peckham, 1892. Synonymy by Kerrich, 1963: 366.

Eucharomorpha Girault, 1913c. *Archiv fur Naturgeschichte* 79 AH 6: 62-63. Type species: *Orasema worcesteri* Girault. Subsequently designated by Gahan and Fagan, 1923: 58. Synonymy by Boucek, 1988: 519.

Losbanus Ishii, 1932. *Bulletin of the Imperial agricultural Experiment Station, Nishigahara* 3: 210. Type species: *Losbanus uichancoi* Ishii, by monotypy. Incorrectly placed as senior synonym of *Gollumiella* Hedqvist by Boucek, 1998: 521. Synonymy by Heraty, 1992: 586.

Parasemora Gemignani, 1933. *Anales del Museo Nacional de Historia Natural, Buenos Aires* 37: 192-193. Type species: *Parasemora freychei* Gemignani, by monotypy. Synonymy by Heraty, 1994a: 54.

Semorata Strand, 1942. *Folia Zoologica und Hydrobiologica* 11: 393. Replacement name for *Semora* Cameron.

Semorella Ghesquiere, 1946. *Revue de Zoologie et de Botanique Africaines* 39: 368. Unnecessary replacement name for *Semora*.

Diagnosis: Clypeal margin slightly rounded, with a distinct narrow anteclypeus; anteclypeus rarely absent; mandibles falcate (either 3/3 or 3/2 dentate); maxilla and labium large; palpal formula 3/3 or 3/2; labrum usually with 4 digits, rarely with several digits; scape always elongate; flagellomeres in both sexes simple; funicle usually with 7 or 8 flagellomeres, rarely 6 or 9;

transarticulation present; propodeal foramen broadly emarginate; petiole cylindrical, usually longer than broad, rarely as short as 0.8x as long as broad; extreme base of petiole truncate, usually with a distinct marginal carina overlapping nucha; gastral terga smooth and polished with few or no setae; first gastral sternite with a median furrow; ovipositor expanded apically, ridged and curved forward in profile, with 3-10 small teeth laterally on ventral valve; body black or metallic blue or green in colour.

Distribution: Neotropical, Nearctic, Palaeotropical region except New Zealand and the Oceanic Islands east of New Caledonia. In Palaearctic region it is reported only from Southern Japan. Most common in tropical or subtropical areas.

Biology and Hosts: Various species of *Orasema* have been reared from *Monomorium, Pheidole, Solenopsis, Tetramorium, Wasmannia* (Myrmicinae) and *Formica* (Formicinae) (Johnson *et al.*, 1986; Heraty, 1994a, 1994b & 2000). *Pheidole* and *Monomorium* are the only hosts known from the Old World tropics. The biology of several species have been studied in detail (Wheeler, 1907; Wheeler & Wheeler, 1937; Van Pelt, 1950; Das, 1963; Kerrich, 1963; Johnson *et al.*, 1986; Vander Meer *et al.*, 1989; Heraty *et al.*, 1993; Heraty, 1994a & 2000).

Immature stages: Immature stages have been described for several species (Wheeler, 1907; Wheeler & Wheeler, 1937; Kerrich, 1963; Johnson *et al.*, 1986; Heraty *et al.*, 1993; Heraty, 2000). Eggs are smooth with an apical stalk, typical of most Eucharitidae. First-instar larvae of *Orasema* have the first and second terga separated dorsally, lack a ventral seta on tergite III and have a leaf like plate associated with tergite IX (Heraty & Darling, 1984; Johnson *et al.*, 1986; Heraty, 1994b). The third instar and pupa possess distinct nodules covering the body (Hearty, 1994a). Except for minor

differences between species, the immature stages are almost identical across very different species group (Heraty, 2002).

Discussion: *Orasema* is the most speciose of the orasemine genera. *Orsema* Cameron closely resembles to *Orasemorpha* Boucek in having: (1) TSA Complete, (2) Mandible falcate (3) Maxilla and labium usually large and (4) Palpi 1-3 segmented. However, this genus can be distinguished from *Orasemorpha* in having: (1) Base of petiole truncated (In *Orasemorpha* base of petiole gradually narrowed) and (2) Both sexes with petiole usually more than twice as long as broad (In *Orasemorpha* petiole of female transverse).

Remarks: Fifty five species are known from all over the world of which 5 species were reported from Oriental Region and 3 species from Indian subcontinent. No valid species was reported from Kerala so far (Heraty, 2002; Girish Kumar, 2004; Narendran and Girish Kumar, 2006 (in press)). The present work recognizes 2 species which are new to science. A key to species of Indian subcontinent is also provided. This is the **first report** of the genus from Kerala.

KEY TO SPECIES OF *ORASEMA* CAMERON OF INDIAN SUBCONTINENT

1. Antenna with two anelli (Fig. 25); fore wing 2.25x as long as broad, wing disc sparsely setose (Fig. 23); head 1.23x as broad as high; LOL 0.78x OOL; pedicel globose, as long as broad; MPS absent; clava distinctly longer (1.25x) than preceding 2 segments (Fig. 25); scutellum, axilla and frenal area rugose; hind coxa reticulate; hind femur with minute sparse setae; costal cell with sparse line of setae. Male ..... *O. maseora* sp. nov.

– Antenna with one anellus; fore wing 2.35x or above as long as broad, wing disc with moderaetly dense setae; other characters partly or completely different. Female 2

2. LOL as long as or less than OOL; temple broad and reticulate 3

– LOL distinctly longer than OOL; temple narrow and coriaceous 4

3. Gaster oblong, Gt_1 covering beyond 2/3 of gaster (Fig. 28); clava distinctly longer (1.5x) than preceding two segments (Fig. 30); ocelli reflecting blackish brown; clypeus with minute sparse setae .... *O. nirupama* sp. nov.

– Gaster more or less ovate, Gt_1 small, almost reaching half of gaster; clava slightly longer (1.18x) than preceding two segments; ocelli reflecting pale yellowish white; clypeus bare .... *O. delhiensis* Narendran and Girish Kumar

4. Hind coxa completely reticulate; occiput broadly rounded; pedicel subconical; anellus large; clava slightly longer than preceding 2 segments; frenal area finely rugulose to reticulate; petiole 0.6-0.8x as long as propodeum ..... *O. assectator* Kerrich

– Hind coxa weakly coriaceous basally to glabrous apically; occiput broadly emarginate; pedicel globular; anellus small; clava distinctly longer than preceding two segments; frenal area coriaceous; petiole 0.9-1.2x as long as propodeum ..... *O. initiator* Kerrich

1. Orasema maseora sp. nov.

(Plates III A & V A; Figs. 23-27)

Holotype: Male: Length 2.03 mm. Head, mesosoma and petiole metallic brownish black; antenna yellowish brown; clypeus blackish brown; ocelli reflecting brown; eye brownish black; mandible brown; coxae blackish brown, femora brown, tibia yellowish brown, tarsi pale brownish yellow;

claws brown; wings hyaline; SMV dark brown, rest of veins pale brown; gaster blackish brown.

Head: Subtriangular (Fig. 24) with moderately large eyes; 1.23x as broad as high, 1.68x as broad as mesosoma; lateral ocellus separated from occipital margin by less than its own diameter; LOL 0.78x OOL (Fig. 26); face relatively flat; scrobal depression deep; face and vertex finely reticulate; temple broad and reticulate; dorsal occipital margin sharp and extends lateral to eye margin; eye separated by 1.77x their height; malar space 0.70x height of eye; clypeus and supraclypeal area glabrate and slightly swollen, upper portion of clypeus with transverse striations; tentorial pits deep; lateral margin of clypeus deeply impressed; frontogenal sulcus converging to inner margin of torulus; mouth plate 4 digitate. Antenna (Fig. 25) 12 segmented; scape cylindrical, reaching 0.91x distance to median ocellus; pedicel globose, as long as broad; anelli two; flagellum 1.17x height of head; funicular segments and clava densely setose, MPS absent; F1 0.47x as long as scape, 1.90x as long as broad; clava distinctly longer (1.25x) than preceding 2 segments.

Mesosoma: Dorsum (Fig. 26) completely and finely reticulate; scutellum and axilla rugose, mesoscutum with midlobe strongly elevated along anterior lateral margin; notauli broad and deeply impressed; SSS foveate; scutellum distinctly longer (1.76x) than broad, almost meeting TSA; frenal line forming narrow band dorsally; frenal area finely rugose; axillula ruguloso-reticulate; postspiracular furrow broad and foveate; callus swollen, glabrate with small callar nib; metapleuron glabrate with rugose towards hind coxa; upper mesepimeron glabrous with anterior portion foveate, lower mesepimeron and mesepisternum finely reticulate, glabrous ventrally, mesepisternum glabrous at middle of lateral margin towards prepectus; transepimeral sulcus shallow, foveate; femoral groove obscure; prepectus triangular, reticulate; pronotum finely reticulate, even dorsally. All coxae

reticulate; hind femur glabrate with minute sparse setae. Fore wing (Fig. 23) 1.50x as long as mesosoma, 2.25x as long as broad (Fig. 23); basal area and speculum bare; costal cell with sparse line of setae; disc with moderately sparse seta; STV narrow, 2.15x as long as broad, slightly angled distally; PMV indistinct, 0.92x as long as STV; hamuli 3 in number.

Metasoma (Fig. 23): with petiole 2.20x as long as hind coxa, 1.94x as long as propodeum; petiole cylindrical, 6.60x as long as broad, strongly ruguloso-reticulate, Gt_1 almost reaching half of gaster, 0.92x as long as hind femur, glabrous; Gs_1 with smooth constriction; aedeagus broadly rounded.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 3).

Etymology: The species epithet is an anagram of the generic name 'Orasema'.

Material examined: Holotype: Male, INDIA: Kerala; Palakkad Dt.; Kalkandy (near Silent Valley) (11°23'N 75°49'E), Narendran T.C. & Party, 13.xii.1987, Reg. No. GK9 (DZUC).

Discussion: This new species is close to *O. assectator* Kerrich in having: (1) Hind coxa completely reticulate; (2) Face completely reticulate; (3) Lower mesepimeron reticulate; (4) Basal area and speculum of fore wing bare and (5) Prepectus reticulate. However, it differs from *O. assectator* in having: (1) 2 Anelli (In *O. assectator* anellus 1); (2) Head 1.68x as broad as mesosoma (In *O. assectator* head 1.10 -1.30x as broad as mesosoma); (3) LOL 0.78x OOL (In *O. assectator* LOL 1.40-1.90x OOL); (4) Clava distinctly longer (1.25x) than preceding 2 segments (In *O. assectator* clava slightly longer than preceding two segments) and (5) Fore wing 2.25x as long as broad (In *O. assectator* fore wing 2.50-2.60x as long as broad).

2. Orasema nirupama sp. nov.

(Plates III B, V B & VI E; Figs. 28-33)

Holotype: Female: Length 2.97 mm. Head black with metallic green reflections; mesosoma and petiole black with metalic bluish reflections; scape and pedicel yellowish brown, remaining parts brown; eyes reddish brown; ocelli reflecting blackish brown; clypeus blackish brown; mandible yellowish brown; tegula brown; coxae blackish brown, femora brown except apices yellowish brown; tibiae and tarsi brownish yellow; claws dark brown; wings hyaline, SMV dark brown, rest of vein pale brown; blackish brown; ovipositor brown.

Head: Slightly subtriangular (Fig. 29) with moderately large eyes; 1.23x as broad as high, 1.58x as broad as mesosoma; lateral ocellus almost touching occipital margin; LOL 0.80x OOL (Fig. 31); face relatively flat; scrobal depression shallow; face and vertex finely reticulate; temple broad and reticulate; dorsal occipital margin sharp and extends lateral to eye margin; eye separated by 1.60x their height, bare; malar space 0.81x height of eye, glabrate; clypeus with a shallow median groove and minute sparse setae; supraclypeal area with distinct pits and with faint transverse striations towards clypeus; clypeus and supraclypeal area slightly swollen; tentorial pits deep, lateral margin of clypeus deeply impressed; frontogenal sulcus converging to inner margin of torulus; labral digits indistinct (may be worn out). Antenna (Fig. 30) 11 segmented; scape cylindrical, reaching 0.81x distance to median ocellus; pedicel subconical; anellus present; flagellum as long as height of head; funicular segments and clava moderately setose; MPS numerous; F1 0.39x as long as scape, 1.5x as long as broad, following segments subequal in length and width; clava distinctly longer (1.50x) than preceding 2 segments.

Mesosoma: Dorsum (Fig. 31) completely and finely reticulate including scutellum and axilla, except posteriorly rugose scutellum;

mesoscutum with midlobe almost subtriangular with anterior margin angled anteriorly; notauli broad and deeply impressed; SSS foveate; scutellum longer (1.23x) than broad, widely separated at base from TSA; frenal line forming narrow band dorsally; frenal area finely rugulose to reticulate; axillula ruguso-reticulate; propodeal disc reticulate with broad median band of strong sculpture anteriorly (Fig. 32); postspiracular furrow broad and foveate; callus bare, swollen, glabrate with faint reticulations posteriorly and with small callar nib; metapleuron glabrate with rugose towards hind coxa; upper mesepimeron glabrate; lower mespimeron and mesepisternum finely reticulate, glabrous ventrally, transepimeral sulcus shallow, foveate; femoral groove obscure; prepectus triangular, finely reticulate; pronotum finely reticulate. Coxae reticulate, glabrate apically; hind femora faintly coreaceous except apices smooth with minute sparse setae. Fore wing (Fig. 28) 1.50x as long as mesothorax, 2.59x as long as broad; basal area and speculum bare; costal cell with sparse median band of setae; disc moderately dense setose; STV narrow, 2.16x as long as broad, slightly angled distally; PMV indistinct, 1.23x as long as STV; hamuli 3 in number.

Metasoma (Fig. 28): Petiole 1.03x as long as hind coxa, 0.82x as long as propodeum, cylindrical, 2.75x as long as broad, finely reticulate. Gaster oblong; Gt_1 covering beyond 2/3 of gaster, 1.26x as long as hind femur, glabrous; Gs_1 with sharp lateral constriction; ovipositor (Fig. 33) expanded, strongly curved anteriorly; second valvula shorter than first valvula in length, with several strong teeths (9 teeths) dorsally, first valvula with 7 distinct lateral teeths.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 3).

Etymology: The species name is from Sanskrit, which means 'unique', due to its unique feature in the shape of gaster.

Material examined: Holotype: Female, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11°7'N 75°5'E), Narendran T.C. & Party, December 1986, Reg. No.GK 10 (DZUC).

Discussion: This species resembles to *O. assectator* Kerrich in having: (1) Hind coxa completely reticulate; (2) Face completely reticulate; (3) Lower mesepimeron reticulate; (4) Basal area and speculum of fore wing bare and (5) Prepectus reticulate. However, this species differs from *O. assectator* in having: (1) LOL 0.80x OOL (In *O. assectator* LOL 1.40-1.90x OOL); (2) Head 1.23x as broad as high (In *O. assectator* head 1.30-1.40x as broad as high); (3) Clava distinctly longer (1.50x) than preceding two segments (In *O. assectator* clava slightly longer than preceding two segments) and (4) Propodeal disc reticulate with broad median band of strong sculpture anteriorly (In *O. assectator* propodeal disc slightly evenly reticulate).

This new species also comes close to *O. delhiensis* Narendran and Girish Kumar in having: (1) LOL as long as or less than OOL; (2) Temple broad and reticulate; (3) Antenna with one anellus; (4) Hind coxa completely reticulate; (5) Face completely reticulate; (6) Lower mesepimeron reticulate; (7) Basal area and speculum bare and (8) Prepectus reticulate. However, this new species differs from *O. delhiensis* in having: (1) Gaster oblong, Gt_1 covering beyond 2/3 of gaster (In *O. delhiensis* gaster ovate, Gt_1 small, almost reaching half of gaster); (2) Clava distinctly longer (1.50x) than preceding two segments (In *O. delhiensis* clava slightly longer (1.18x) than preceding two segments); (3) Ocelli reflecting blackish brown (In *O. delhiensis* ocelli reflecting pale yellowish white) and (4) Clypeus with minute sparse setae (In *O. delhiensis* clypeus bare).

2. GENUS *NEOLOSBANUS* HERATY

Neolosbanus Heraty, 1994a. *Life Sciences Contributions*, ROM 157:93-96. Type species: *Orasema palgravei* Girault, by original designation.

Diagnosis: Head smooth or punctate; palpi each with 3 segments; clypeus usually strongly rounded without an anteclypeus projecting over mouth parts, without marginal raw of setae; in gemma-group clypeus broadly rounded, fine raw of marginal setae (as in *Psilocharis* Heraty); dorsal occipital margin carinate; femoral groove foveate; prepectus not fused to pronotum, foveate; petiole gradually narrowed basally; first gastral sternite smooth, not medially constricted; hypopygium with few small setae on each side of mucro; ovipositor acicular or expanded, straight, not distinctly curved, ventral valve with oblique ridges, not teeth.

Distribution: Indo-Pacific Region. Single questionable records are known from Algeria (Palaearctic) (Boucek, 1988) and Uruguay (Neotropical) (Heraty, 1994a).

Biology and Hosts: *Neolosbanus palgravei* and *N. gemma* were reared from pupae of *Hypoponera* sp. (Ponerinae) (Heraty, 1994a). Larval stages and oviposition habits have been described for *N. (=Parapsilogaster) laeviceps* (Clausen, 1940a,b) and *N. palgravei* (Heraty, 1994a). Eggs are deposited singly into punctures made by the ovipositor in to the underside of young leaves of broadleaf plants (Clausen, 1940b; Heraty, 1994a). *N. palgravei* uses a wide variety of host plants (Euphorbiaceae, Monimaceae, Rutaceae, Schizaceae), *N. laeviceps* has been collected from *Artocarpus* (Moraceae) and *N. townesi* has been associated with *Castanopsis* (Fagaceae) and bamboo (Poaceae). The oviposition punctures become brown and hardened around the opening, and numerous punctures can result in the entire undersurface of leaves becoming scarified. Planidia are external parasites of

the ant larva, with further development taking place on the pupa within the hoist cocoon (Heraty, 1994a).

Immature stages: The egg is smooth with an apical stalk, typical of most Eucharitidae. Planidia of *N. palgravei* are similar to other eucharitid parasitoids of Ponerinae in having a hatchet-shaped sclerite in the cranium, tergites I and II fused dorsally, ventral seta on tergite III present and a distinct tergopleural line of desclerotization on tergites II-IX. Later instar larvae and pupae lacks any distinctive pustules (Heraty, 1994a, 2000 and 2002).

Discussion: *Neolosbanus* includes a group of species that were originally misplaced in *Losbanus* Ishii by Watanabe (1958). *Neolosbanus* Heraty closely resembles to *Psilocharis* Heraty in having: (1) Gs_1 usually evenly rounded and not constricted and (2) Dorsal occipital margin with distinct carina. However, this genus can be distinguished from *Psilocharis* in having: (1) Base of petiole gradually narrowed laterally and dorsally (In *Psilocharis* base of petiole abruptly narrowed laterally), (2) Clypeal margin strongly lobate or slightly rounded (In *Psilochoris* clypeal margin straight with well defined and narrow anteclypeus) and (3) Femoral groove narrow and foveate (In *Psilocharis* femoral groove broad and evenly impressed).

Remarks: Sixteen species are known from all over the world of which 10 species were reported from Oriental region. Four species were reported from Indian subcontinent of which 1 valid species was from Kerala (Heraty, 2002; Girish Kumar, 2004). The present work recognizes 5 species of which 3 are new to science. A key to species of Indian subcontinent is also provided. In this study most of the specimens were collected from high ranges like Idukki and Wayanad districts. Some specimens were collected from forest ecosystem and some specimens from agroecosystems.

KEY TO SPECIES OF *NEOLOSBANUS* HERATY OF INDIAN SUBCONTINENT

1. STV strongly angled relative to anterior wing margin; PMV more than 3x as long as STV; ovipositor needle like; gonostylus long and narrow, sometimes exceeding circus; antenna of male 13 segmented; head without any indication of groove; vertex and ocellar triangle evenly rounded; frenum vertically striate ..... *N. purpureoventris* (Walker)

– STV almost perpendicular relative to anterior wing margin; PMV short, atmost slightly longer than STV; ovipositor expanded and strongly ridged; gonostylus broad and tapering to apex, not exceeding circus; antenna of male 11 or 12 segmented; other characters partly or completely different 2

2. Anellus absent (Fig. 43); scape expanded apically (Fig. 43), strongly so in male; frenal groove absent or weakly impressed dorsally; dorsum of mesosoma lightly sculptured; Gs_7 of male broader than petiole and truncate apically; prepectus foveate medially; funicle of female 7-segmented (Fig. 43) ..... *N. laeviceps* (Gahan)

– Anellus present (Figs. 37, 47, 53, 56, 61 & 63); scape narrow and cylindrical; frenal groove foveate; dorsum of mesosoma strongly rugoso-areolate to areolate; Gs_7 of male narrower than petiole, rounded apically; other characters partly or completely different 3

3. Callus with dense patch of hairs (more than 15 hairs); hind tibia white or yellowish brown in both sexes; STV angled proximally; antennal flagellum long in both sexes; mesosomal dorsum with sparse setae; flagellum of female more than 1.50x height of head; flagellum of male more than 2.20x height of head ..... *N. nepalensis* Heraty

– Callus bare or with few hairs; hind tibia white to dark brown in female, always dark brown in male; other characters partly or completely different 4

4. Scape not reaching median ocellus; LOL 0.60x or below 0.60x OOL 5

– Scape reaching median ocellus; LOL 0.70x or above 0.70x OOL 6

5. Median ocellus separated from occipital margin by distinctly less (0.6x) than its own diameter (Fig. 52); Clava shorter than preceding two funicular segments combined (10:12) (Fig. 53); clypeus as in figure 51; basal flagellomeres yellowish brown to apical flagellomeres dark brown ..... *N. secus* sp. nov.

– Median ocellus separated from occipital margin by equal or subequal to its own diameter (Fig. 60); clava equal or slightly longer than preceding two funicular segments combined (Fig. 61) clypeus as in figure 59; other characters partly or completely different .... *N. trichuricus* sp. nov.

6. Ovipositor slightly directed downwards and first valvula distinctly longer than second valvula (Fig. 45); clypeus extended as strong lobe, more pronounced ventrally over labrum (Fig. 46); flagellum 1.28x (less than 1.4x) height of head (Fig. 45); clava subequal to preceding two funicular segments combined (Fig. 47) ..... *N. palgravei* (Girault)

– Ovipositor straight and first valvula equal or subequal to second valvula (Fig. 39); clypeus broadly lobate, but not so pronounced as above ventrally over labrum (Fig. 35); flagellum 1.57x height of head (Fig. 34); clava distinctly shorter than preceding two funicular segments combined (Fig. 37) ..... *N. diversus* sp. nov.

1. *Neolosbanus diversus* sp.nov.

(Figs. 34-39)

Holotype: Female: Length 2.98 mm. Head and gaster metallic blackish brown; mesosoma and petiole metallic brownish black; scape and pedicel pale yellowish brown; remaining parts of antenna pale brown, dark brown towards apex; mandibles brownish yellow; eyes reddish brown; ocelli reflecting yellowish brown; coxae, trochanter, and femora dark brown except at extreme base and apex of femur paler; tibiae and tarsi brownish yellow; claws brown; wings hyaline, venation pale brown.

Head: Subtriangular (Fig. 35); occiput broadly emarginate; median ocellus separated from occipital margin by equal or subequal to its own diameter; LOL 0.75x OOL; face rounded; scrobal depression narrow, weakly impressed; occipital carina extending to eye margin; eyes separated by 1.40x their height; eye height 0.92x malar space; clypeus broadly lobate; epistomal sulcus indistinct. Antenna (Fig. 37) 11 segmented; scape reaching median ocellus; pedicel short; anellus present; flagellum 1.57x height of head; funicle 7 segmented; F_1 3x as long as broad; 1.17x F_2; clava 3 segmented, not discernible, distinctly shorter than preceding two funicular segments combined (14:18).

Mesosoma: Dorsum rugoso-areolate; lateral lobe of mesoscutum transversely carinate; axilla irregularly carinate; scutellum broader than long, apex rounded in dorsal view; frenal groove foveate dorsally; frenal area smooth; axillula weakly carinate, dorsal margin clear; propodeum (Fig. 38) with median carina; callus with sparse short setae (less than 10); femoral groove broad and shallowly foveate; pronotal sulcus foveate; coxa and femora glabrate; tibiae and tarsi with dense setae. Fore wing (Fig. 34) 2.30x as long as broad; basal area and speculum bare; STV perpendicular to wing margin; hamuli 3 in number.

Metasoma (Fig. 34)**:** Petiole 2.14x as long as hind coxa; 1.66x as long as propodeum, longitudinally carinate; Gt_1 bare; ovipositor expanded, straight, first valvula equal or subequal to second valvula (Fig. 39).

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 4).

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

Material examined: Holotype: Female, INDIA: Kerala; Kasaragode (12°30'N 74°59'E), Balamany E.J., 10. vi.2001, Reg. No.GK 399 (DZUC).

Discussion: This species closely resembles to *N. palgravei* (Girault) in having: (1) Scape reaching median ocellus; (2) LOL 0.75x or above OOL; (3) General body colour; (4) Callus with few short hairs (below 15); (5) Anellus present; (6) Scape narrow and cylindrical and (7) Frenal groove foveate. However, it differs from *N. palgravei* in having: (1) Ovipositor straight and first valvula equal or subequal to second valvula (In *N. palgravei* ovipositor slightly directed downwards and first valvula distinctly longer than second valvula); (2) Clypeus broadly lobate, but not so pronounced ventrally over labrum (In *N. palgravei* clypeus extended as strong lobe, more pronounced ventrally over labrum); (3) Flagellum 1.57x height of head (In *N. palgraveii* flagellum 1.28x (less than 1.40x) height of head) and (4) Clava distinctly shorter than preceding two funicular segments combined (In *N. palgravei* clava subequal to preceding two funicular segments combined).

2. *Neolosbanus laeviceps* (Gahan)

(Figs. 40-44)

Psilogaster laeviceps Gahan, 1940. *Proceedings of the United States National Museum* 88: 429-430. Type data: Sri Lanka [Ceylon]: Peradeniya. Holotype Female, by original designation (USNM). Description of female. Unjustified synonymy with *Orasema purpureoventris* by Boucek, 1988: 520.

Parapsilogaster laeviceps, New combination by Ghesquiere, 1946. *Revue de Zoologie et de Botanique Africaines* 39: 368.

Losbanus laeviceps, New combination by Watanabe, 1958. *Insects of Micronesia* 19: 230 (catalogue and key).

Neolosbanus laeviceps, New combination by Heraty, 1994a. *Life Sciences Contributions, ROM* 157: 105-106.

Plesiotype: Female: Length 2.33 mm. Head, mesosoma and petiole metallic black; scape and pedicel pale yellowish brown; remaining parts of antenna yellowish brown to dark brown towards apices; mandibles brownish yellow with tips dark brown; eye greyish brown with silvery white reflection; ocelli reflecting brownish yellow; coxae blackish brown; fore and mid trochanters pale brown; hind tochanters yellowish brown; femora dark brown except at extreme apex; tibiae yellowish brown; tarsi pale brownish yellow; claws dark brown; wings hyaline, venation pale brown; gaster blackish brown; ovipositor brown.

Head: Subtriangular (Fig. 41); occiput broadly emarginate; median ocellus separated from occipital margin by less than its own diameter; LOL 0.25x OOL; face broadly rounded; scrobal depression narrow, strongly impressed, including median ocellus; occipital carina extending to lateral margin of eye; eyes separated by 1.58 x their height; height of eye subequal to malar space; clypeus broadly rounded, slightly extending over base of labrum; epistomal sulcus present. Antenna (Fig. 43) 10 segmented; apical end of scape near to pedicel broad and flat; scape not reaching median ocellus; apicel end of pedicel near to flagellum broad, broader than F2; anellus absent; flagellum 1.55x height of head; funicle 7 segmented; F_1 3.75x as long as broad, 1.42x F_2; claval segments not discernible, distinctly shorter than preceding two funicular segments combined (8:10).

Mesosoma: Dorsum lightly sculptured (Fig. 42); lateral lobe of mesoscutum and axilla smooth and very lightly sculptured; SSS carinate; scutellum longer than broad, apex narrowly rounded in dorsal view; frenal

groove weakly impressed dorsally; frenal area glabrous; axillula weakly carinate, dorsal margin obscure; propodeum (Fig. 44) almost completely glabrous; callus with short hairs; femoral groove broad and shallowly foveate; coxae glabrate; tibiae and tarsi with dense setae. Fore wing (Fig. 40) 2.49x as long as broad, basal area and speculum bare; STV perpendicular to wing margin; PMV very short, distinctly shorter than STV; hamuli 3 in number.

Metasoma (Fig. 40)**:** Petiole 1.81x as long as hind coxa, 1.93x as long as propodeum, petiole longitudinally carinate, Gt_1 bare; ovipositor straight.

Male: Length 2.2mm. Colour as in female; tentorial pit deep; antenna 11 segmented, broader than that of female; scape strongly expanded apically; propodeum almost completely glabrous; genitalia large and broad, paramere short and bearing 3 stout setae; aedeagus broad, subtruncate. Other characters same as that of female.

Host: Unknown.

Biology: Clausen (1940b, 1941) discussed biology and the morphology of the first-instar larva of *N. laeviceps*. First-instar larva share derived character states with other Eucharitinae (Heraty, 1994a). Adults are known to deposit single egg in to leaves of *Artocarpus* (Moraceae) (Clausen, 1940b).

Distribution: Oriental (Indo-Chinese): India (Kerala (Fig. 4), Tamil Nadu), Laos, Sri Lanka, Taiwan, Vietnam. **Palaearctic:** Japan (Heraty, 2002).

Material examined: Plesiotype: Female, INDIA: Kerala; Idukki Dt.; Vandiperiyar (9°35'N 77°5'E), P. Girish Kumar, 8.i.2004, Reg. No. Gk 499 (DZUC). **Other material examined:** 21 Females, same data as plesiotype. Reg. Nos. GK 494, 495, 496, 497, 498, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 519, 520, 521, 522, 523, 524; 2 Females, INDIA: Kerala; Idukki Dt.; Painavu (9°51'N 76°58'E), M.B.R & Party, 17-18.i.1992, Reg. Nos. GK 275 and 276; 2 Females, INDIA: Kerala; Idukki Dt.; Painavu (9°51'N 76°58'E), Sureshan P.M, 18.i.1992, Reg. Nos. GK 271 and 274.

Discussion: This species closely resembles to *N. townesi* Heraty in having: (1) Anellus absent; (2) Scape expanded apically, strongly so in male;

(3) Frenal groove absent or weakly impressed dorsally; (4) Dorsum of mesosoma lightly sculptured and (5) Gs_7 of male broader than petiole and truncate apically. However, this species differs from *N. townesi* in having: (1) Prepectus foveate medially (In *N. townesi* prepectus swollen medially); (2) Mesosoma lightly sculptured (In *N. townesi* mesosoma almost completely glabrous dorsally and laterally) and (3) Funcile of female 7 segmented (In *N. townesi* funicle of female 8 segmented).

3. *Neolosbanus palgravei* (Girault)

(Figs. 45-49)

Orasema palgravei Girault, 1922. *Insecutor Inscitiae Menstruus* 10: 105-106. Type data: Australia: Queensland, Cairns. Lectotype Female, designated by Heraty, 1994a: 109 (QMBA). Description of both sexes.

Psilogaster nishidai Ishii and Nagasawa, 1941. *Tenthredo* 3: 292-294. Type data: Caroline Islands. Description of female, illustrated. Unjustified synonymy with *Orasema purpureoventris* by Boucek, 1988: 520. Synonymy with *N. palgravei* by Heraty, 1994a: 109.

Losbanus nishidai, New combination by Watanabe, 1958. *Insects of Micronesia* 19: 27-28.

Losbanus petersoni Hedqvist, 1978. *Steenstrupia* 4: 229. Type data: Philippines: Palawan, Tagembung. Holotype Female, by original designation (ZMUC). Description of female, illustrated. Unjustified synonymy with *Orasema purpureoventris* by Boucek, 1988: 520. Synonymy with *N. palgravei* by Heraty, 1994a: 109.

Orasema indica Snehalatha and Narendran, 1992. *Journal of the Bombay Natural History Society* 89: 355. Type data: India: Kerala: Trichur. Hologype Female, by original designation (USNM). Description of both sexes illustrated. Synonymy by Heraty, 1994a: 109.

Neolosbanus palgravei, New combination by Heraty, 1994a. *Life Sciences Contributions. ROM* 157: 109-113. Subsequent description of both sexes, illustrated.

Plesiotype: Female: Length 2.40 mm. Head, mesosoma and petiole metallic black; coxae and femora brown except extreme apex of femora; scape and pedicel yellow; flagellar segments yellowish brown to dark brown; legs beyond femur pale yellow; claws brown; clypeus brown; mandibles brownish yellow with dark brown tips; eyes brownish white; ocelli reflecting

pale yellow; wings hyaline, venation light brown; gaster brown; ovipositor pale brown.

Head: Subtriangular (Fig. 46); occiput broadly emarginate; median ocellus separated from occipital margin by equal in its own diameter; LOL 0.80x OOL; face broadly rounded; scrobal depression narrow, weakly impressed; occipital carina extending to margin of eye; eyes separated by 1.36x their height; height of eye almost equal to malar space; clypeus extended as strong lobe ventrally over labrum; epistomal sulcus obscure. Antenna (Fig. 47) 11 segmented; scape narrow, sparsely setose, reaching median ocellus; pedicel short, slightly narrower in width to scape; anellus present; flagellum 1.28x height of head; funicle 7 segmented; F_1 3.75x as long as broad, 1.36x F_2; following segments subequal in length; clava 3 segmented; segments not discernible; clava subequal to preceding two funicular segments combined (14:15).

Mesosoma: Dorsum rugose-areolate (Fig. 48); lateral lobe of mesoscutum transversely carinate; axilla irregularly carinate; scutellar apex rounded in dorsal view; frenal groove distinctly foveate dorsally; axillula glabrate; propodeum (Fig. 49) with a median carina; callus with sparse short setae (11 in number); femoral groove broad, shallowly foveate; coxae glabrate; basal region of mid coxa with few longitudinal striations; femora, tibiae and tarsi setose; fore wing (Fig. 45) 2.61x as long as broad; basal area and speculum bare; stigmal vein elongate, more than twice as long as broad, perpendicular to wing margin; hamuli 3 in number.

Mesosoma (Fig. 45)**:** Petiole 2.13x as long as hind coxa, 1.58x as long as propodeum, longitudinately carinate; Gt_1 bare; ovipositor expanded, slightly directed downwards, first valvula distinctly longer than second.

Male: Length 2.1-2.6 mm. Colour as in female, hind tibia always dark brown with apex white or yellowish brown; antenna 12 segmented; anellus present; flagellum 1.90-2.10x height of head; funicle 8 segmented; F_2 1.20x F_3, following flagellomeres cylindrical and subequal in length; clava with 2 fused segments; fore wing 2.20-2.40x as long as broad; petiole carinate, long and narrow, 2.80-4.10x as long as hind coxa, 2.10-3.40x as long as propodeum; Gs_7 narrow and rounded; genitalia moderately sized, paramere narrow, elongate; aedeagus subacute.

Host: *Hypoponera* sp. (Ponerinae).

Biology: Discussed by Heraty (1994a) in detail.

Variation: Epistomal sulcus present or absent, presence of a median groove or channel on the propodeum, white or dark hind tibia in female, and relative size of petiole and hind coxa.

Distribution: Indo-Pacific: Australia, India (Karnataka (Fig. 4) and Kerala), Indonesia, Nepal; Palau, Papua New Guinea, Philippines, Solomon Islands, Singapore, Taiwan, Thailand, Vietnam. **Palaearctic:** Algeria (Heraty, 2002).

Material examined: Plesiotype: Female, INDIA: Karnataka; Sringeri (13°25'N 75°15'E), Sinu P.A., 15.v.2003, Reg. No.GK 412 (DZUC). **Other material examined:** 4 females, same data of holotype except collection date, 21.v.2003, 22.v.2003 and 15.v.2003, Reg. Nos. GK 409, 410, 411 and 579.

Discussion: This species closely resembles to *N. nepalensis* Heraty sp. nov. in having: (1) Body sparsely setose; (2) Petiole completely bare; (3) Length of head in dorsal view long at median ocellus, exceeding diameter of median ocellus by more than 1.50; (4) Srobal depression shallow and indistinct; (5) Aellus present; (6) Scape narrow and cylindrical and (7) Frenal groove foveate. However, this species differs from *N. nepalensis* in having: (1) Flagellum of female less than 1.40x height of head (In *N. nepalensis* flagellum of female more than 1.50x height of head); (2) Flagellum of male less than 2.10x height of head (In *N. nepalensis* flagellum of male more than

2.20x height of head); (3) Callus bare or with less than 10 hairs (In *N. nepalensis* callus with more than 15 hairs) and (4) Hind tibia white to dark brown in female, always dark brown in male (In *N. nepalensis* hind tibia white or yellowish brown in both sexes).

Remarks: This is the **first report** of this species from Karnataka state.

4. *Neolosbanus secus* sp. nov.

(Plates III C, V C & VI F; Figs. 50-57)

Holotype: Female: Length 2.68 mm. Body metallic brownish black; mid and hind coxae concolourous to body; fore coxa dark brown; trochanters and femora dark brown except at extreme apex of femora; legs beyond femora pale yellow; claws brown; scape and pedicel yellowish brown, remaining parts of antenna yellowish brown to dark brown towards apices mandibles brownish yellow with dark brown tips; eye red with silvery white reflections; ocelli reflecting yellow; wings hyaline, venation pale brown.

Head: Substriangular (Fig. 51); occiput broadly emarginated; median ocellus separated from occipital margin by less than (0.60x) its own diameter; LOL 0.44x OOL; face broadly rounded; scrobal depression narrow, strongly impressed; occipital carina extending to lateral margin of eye; eyes separated by 1.65x their height; height of eye subequal to malar space; clypeus broadly rounded, slightly extending over base of labrum; epistomal sulcus present. Antenna (Fig. 53) 11 segmented; scape narrow basally, sparsely setose not reaching median ocellus; pedicel short, slightly narrower in width to scape; anellus present; flagellum 1.59x height of head; funicle 7 segmented; F_1 5x as long as broad, 1.33x F_2, following segments narrower in length; claval segments not discernible, distinctly shorter than preceding two funicular segments combined (10:12).

Mesosoma: Dorsum rugoso-areolate (Fig. 52); lateral lobe of mesoscutum transversely carinate; axilla irregularly carinate; scutellar apex rounded in dorsal view; axillula with a central smooth area; frenal groove foveate dorsally; propodeal disc (Fig. 54) glabrous laterally; callus with hairs (almost 8); femoral groove broad and shallowly foveate; coxae glabrate; femora with sparse setae; tibia and tarsi with dense fine setae; fore wing (Fig.50) 2.48x as long as broad; basal area and speculum bare; STV perpendicular to wing margin; PMV distinctly shorter than STV; hamuli 3 in number.

Metasoma (Fig. 50)**:** Petiole 2.54x as long as hind coxa, 1.93x as long as propodeum, longitudinally carinate; Gt_1 bare; ovipositor weakly curved forward (Fig. 55).

Male: Colouration darker; metallic reflections tend to be more extensive; antenna (Fig. 56) 12 segmented; 1.19x longer than that of female; scape 1.3x shorter than that of female; funicle 8 segmented; petiole 1.38 x longer than that of female; gaster (Fig. 57) less robust than that of female.

Host: Unknown.

Biology: Unknown.

Variation: Fore wing length 2.33-2.48x as long as its maximum width; petiole 2.36-2.83x as long as hind coxa, 1.71-1.93x as long as propodeum; scape 1.60-1.78x as long as $F_1$and flagellum 1.41-1.59x height of head.

Distribution: India (Kerala) (Fig. 4).

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

Material examined: Holotype: Female, INDIA: Kerala; Idukki Dt.; Cheruthoni (9°51'N 76°58'E), Girish Kumar P., 10.i.2004, GK 510 (DZUC). **Paratypes:** 7 Females and 1 Male, same data as holotype, GK 511, 512, 513, 514, 515, 516, 517 and 518. 1 Female, INDIA: Kerala; Wayanad Dt.; Kalpetta (11°36'N 76°6°E), Narendran T.C and Party, 22.ii.1988, GK 408. 4 Females, INDIA: Kerala; Kozhikode Dt.; Nanminda (11°26'N 75°50'E),

Girish Kumar P., 16.xi.2003, GK 458, 459, 460 and 461. 3 Females, same data as above except collection date, 16-xi-2003, GK 470,471 and 472. 1 Female, same date as above except collection data, 4.i-2004, GK 493 (DZUC).

Discussion: This new species resembles to *N. palgravei* (Girault) in having: (1) Callus with few hairs; (2) Anellus present; (3) Scape narrow and cylindrical; (4) Frenal groove foveate; (4) Dorsum of mesosoma strongly rugose-areolate to areolate. However, this new species differs from *N. palgravei* in having: (1) Scape reaching median ocellus (In *N. palgravei* scape reaching median ocellus) and (2) LOL 0.44-0.57x OOL (In *N. palgravei* LOL 0.80x or above OOL).

This new species is also close to *N. trichuricus* sp. nov. in having: (1) Scape not reaching median ocellus; (2) LOL 0.60x or below LOL; (3) Callus bare or with few hairs; (4) Hind tibia white to dark brown in female, always dark brown in male and (5) Anellus present. However, this new species differs from *N. trichuricus* sp. nov. in having: (1) Median ocellus separated from occipital margin by distinctly less than (0.60x) its own diameter (In *N. trichuricus* sp. nov. median ocellus separated from occipital margin by equal to or slightly longer than its own diameter); (2) Fore wing 2.48x as long as its maximum width (In *N. trichuricus* sp. nov. fore wing 2.63x as long as its maximum width); (3) Clava distinctly shorter than preceding two funicular segments combined (10:12) (In *N. trichuricus* sp. nov. clava equal or slightly longer than preceding two funicular segments combined) and (4) Basal flagellomeres yellowish brown to apical flagellomeres dark brown (In *N. trichuricus* sp. nov. all flagellar segments yellowish brown).

5. *Neolosbanus trichuricus* sp. nov.

(Figs. 58-64)

Holotype: Female: Length 2.55mm. Head blackish red; mesosoma and petiole black with red tinge; fore coxa pale brown; femora brown except

at extreme apex pale; legs beyond femora pale yellow; claws brown; scape and pedicel pale yellowish brown; flagellar segments yellowish brown; mandibles brownish yellow with dark brown tips; eye brown with silvery white reflections; ocelli reflecting yellow; wings hyaline, venation pale brown; gaster dark brown.

Head: Subtriangular (Fig. 59); occiput broadly emarginate; median ocellus separated from occipital margin by equal or subequal to its own diameter; LOL 0.50x OOL; face broadly rounded; scrobal depression narrow, weakly impressed; occipital carina extending to lateral margin of eye; eyes separated by 1.34x their height; height of eye subequal to malar space; clypeus broadly rounded, slightly extending over base of labrum; epistomal sulcus indistinct. Antenna (Fig. 61) 11 segmented; scape narrow; sparsely setose, not reaching median ocellus; pedicel short, slightly narrower in width to scape; anellus present; flagellum 1.39x height of head; funicle 7 segmented; F_1 3.63x as long as broad, 1.39x F_2; following segments subequal in length; clava with 3 segments, segments, not discernible, equal or slightly longer than preceding two funicular segments combined (18:17).

Mesosoma: Dorsum rugoso-areolate (Fig. 60); lateral lobe of mesoscutum transversely carinate; axilla irregularly carinate; scutellar apex rounded in dorsal view; frenal groove foveate dorsally; axillula glabrate, propodeal disc (Fig. 62) glabrous laterally, narrow median carina beyond middle from the base of propodeum; callus bare (may be worn out); femoral groove broad and shallowly foveate; coxae glabrate; femora with sparse setae; tibiae and tarsi with dense fine setae; fore wing (Fig. 58) 2.63x as long as broad; basal area and speculum bare; STV perpendicular to wing margin; hamuli 3 in number.

Metasoma (Fig. 58): Petiole 2.45x as long as hind coxa, 1.74 x as long as propodeum; petiole longitudinally carinate; Gt_1 bare; ovipositor not exserted.

Male: Colouration darker, metallic reflection tend to be more extensive; antenna (Fig. 63) (broken) distinctly longer than that of female; scape 1.21x shorter than that of female; petiole 1.34x longer than that of female; gaster (Fig. 64) less robust than that of female.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 4).

Etymology: The species is named after its collection locality.

Material examined: Holotype: Female, INDIA: Kerala; Thrissur (10°31'N 76°13'E), Narendran T.C, 19.iv.1986, GK 2 (DZUC). **Paratypes:** 3 Females and 1 Male, same data as holotype, GK 3,4,5 & 7 (DZUC). 2 Females, INDIA: Kerala; Kozhikode Dt.; Chathamangalam; REC (11°19'N 75°52'E), Narendran T.C. and Party, 28.xi.1985, GK 6 and 8.1 Female, INDIA: Kerala; Kozhikode Dt.; Kakkayam (11°15'N 75°50'E), Mini T.V., 9.ii.1996, GK 277. 1 Female, INDIA: Kerala; Idukki; Meenmutty (9°51'N 76°58'E); Dr. M.B.R and Party, 17.i.1992, GK 273.

Discussion: This new species close to *N. palgravei* (Girault) in having: (1) Callus bare or with few hairs; (2) Anellus present; (3) Scape narrow and cylindrical; (4) Frenal groove foveate and (4) Dorsum of mesosoma strongly rugose-areolate to areolate. However, this new species differs from *N. palgravei* in having: (1) Scape not reaching median ocellus (In *N. palgravei* scape reaching median ocellus) (2) LOL 0.50x OOL (In *N.palgravei* LOL 0.80x or above OOL) and (3) All flagellar segments yellowish brown (In *N. palgravei* basal flagellomeres yellowish brown to apical flagellomeres dark brown).

This new species also close to *N. secus* sp. nov. in having: 1) Scape not reaching median ocellus; (2) LOL 0.60x or below OOL; (3) Callus bare or with few hairs; (4) Hind tibia white to dark brown in female, always dark brown in male and (5) Anellus present. However, this new species differs from *N. secus* sp. nov. in having: (1) Median ocellus separated from occipital margin by equal or slightly longer than its own diameter (In *N. secus* sp. nov. median ocellus separated from occipital margin by distinctly less than (0.60x) its own diameter; (2) Fore wing 2.63x as long as its maximum width (In *N. secus* sp. nov. fore wing 2.48x as long as its maximum width); (3) Clava equal or slightly longer than preceding two funicular segments combined (In *N. secus* clava distinctly shorter than preceding two funicular segments combined) and (4) All flagellar segments yellowish brown (In *N. secus* sp. nov. basal flagellomeres yellowish brown to apical flagellomeres dark brown).

3. GENUS *PSILOCHARIS* HERATY

Psilocharis Heraty, 1994a. *Life Sciences Contributions*, ROM 157: 81-83. Type species: *Eucharis theocles* Walker, by original designation.

Diagnosis: Head smooth, palpi each with 2 segments; clypeal margin transverse (Fig. 66) with a narrow anteclypeus and a row of fine elongate setae; malar space with complete longitudinal depression (Fig. 65); occipital carina present; femoral groove broadly impressed, smooth or reticulate; STV slightly broader than MV; petiole abruptly narrowed basally; hypopygium usually with a marginal row of elongate hairs rarely with only 2 long setae (*P. aenigma*); ovipositor acicular; ovipositor sheath narrow, cylindrical; body usually dark green or black with bluish reflections.

Distribution: Southern Malagasy, Ethiopian and Indo-Pacific Region (north to southern Japan), including the Polynesian (east to Figi) and

Australian subregions. A single questionable record is known from Argentina (Heraty, 1994a).

Biology and Hosts: Unknown.

Immature stages: Unknown.

Discussion: *Psilocharis* is considered as most closely related to *Neolosbanus* Heraty in having: (1) Gs_1 usually evenly rounded and not constricted and (2) dorsal occipital margin with distinct carina. However, this genus can be distinguished from *Neolosbanus* in having: (1) Base of petiole abruptly narrowed laterally (In *Neolosbanus* gradually narrowed laterally and dorsally); (2) Clypeal margin straight with well-defined and narrow anteclypeus (In *Neolosbanus* clypeal margin strongly lobate or slightly rounded) and (3) Femoral groove broad and evenly impressed (In *Neolosbanus* femoral groove narrow and foveate).

Remarks: Nine species are known from all over the world of which 2 species were reported from Oriental Region. One species was reported from Indian subcontinent (Heraty, 2002; Girish Kumar, 2004). The present work recognizes 1 species which is the **first report** of this genus from Kerala. In this study specimens were collected from both undisturbed forest ecosystem and disturbed urban areas.

1. *Psilocharis hypena* Heraty

(Plates III D & V D; Figs. 34-39)

Psilocharis hypena Heraty, 1994a. *Life Sciences Contributions*, ROM 157: 91-93. Type data: Malaysia: Sarawak, Tenompok. Holotype Female (BPBM) by original designation. Description of both sexes illustrated.

Plesiotype: Female. Length 1.8 mm. Head and mesosoma metallic brownish black; petiole and gaster blackish brown; scape brownish yellow, remaining parts of antenna yellowish brown; mandibles brownish yellow; eyes reddish brown; coxae and femora dark brown except at extreme base and

apices of femora paler; remaining parts of legs yellowish brown; claws brown; wings hyaline, venation brown.

Head: Subtrianglar (Fig. 66); occiput broadly emarginate; LOL 0.72x OOL; face rounded, polished with sparse decumbent setae; scrobal depression reaching 0.61x distance to median ocellus, parallel channels strongly impressed, apex of each channel with distinct semicircular depression; median groove absent; occipital carina weak, extending beyond lateral ocellus; temple broad, weakly strigate dorsally; eyes with minute sparse setae, separated by 1.20x their height; malar space 0.55x height of eye; clypeus sparsely setose, apical margin of elongate setae, lateral margin strongly impressed; epistomal sulcus distinct. Antenna (Fig. 67) 10 segmented; scape not reaching medina ocellus, cylindrical but flattened on ventral surface below pedicel, pedicel 2x as long as broad; anellus absent; flagellum 0.83x height of head; funicle 7 segmented; F_1 1.08x F_2, following segments slightly increasing in width to apex; clava conate, longer (1.23x) than preceding 2 segments.

Mesosoma: Dorsum ruguloso-areoalte (Fig. 68); lateral lobe and axilla carinate; scutellum 1.18x as long as broad, rounded at apex; frenal groove narrow, foveate; frenal area smooth; axillula rugose, axillular sulcus narrow, not deeply impressed; callus with 6 short hairs; upper and lower mesepimeron smooth; transepimeral sulcus broadly foveoate; femoral groove broadly impressed, glabrous; sternaular area broad and deeply foveate anteriorly, abruptly narrowed posteriorly; coxae glabrate; hind femur weakly granulate with dense short setae; hind tibia narrow basally, broad at apex; with moderately dense semi-erect setae. Fore wing (Fig. 65) 2.25x as long as broad; basal area almost bare, speculum closed behind by setae; STV twice as long as broad; PMV as long as STV.

Metasoma (Fig. 65): Petiole 1.46x as long as hind coxa, 1.10x as long as propodeum, subtriangular in cross section, ribbed dorsally and sublaterally,

without dorsal flange at base. Gaster typical for genus; hypopygium with 6 elongate hairs along apical margin.

Male: Length 1.79-2.40 mm. Colour and sculpture as in female. Ocelli large, LOL 1.0-1.70x OOL; eyes separated by 1.10-1.30x their height; face generally more setose than in female. Antenna 11 segmented; scape reaching top of median ocellus, cylindrical, with small pores ventrally; flagellum 0.90-1.10x height of head; F_1 1.80x as long as broad; petiole 1.90-2.50x length of hind coxa, 1.80-2.80x length of propodeum; petiole cylidrical, strongly carinate.

Host:Unknown.

Biology: Unknown.

Variation: Variations in the length of the antennal flagellum, density of setae on the callus, presence or absence of setae on the eye, relative size of the eyes to their separation, and relative length of the petiole.

Distribution: **Oriental:** India (Kerala (Fig. 5), Himachal Pradesh, Tamil Nadu), China Indonesia, Malaysia, Philippines, Taiwan. **Palaearctic:** Japan.

Material examined: Plesiotype: Female, INDIA: Kerala; Thiruvananthapuram Dt., Vithura (8°40'N 77°7'E), Narendran T.C. & Party, 8.iii.2000, GK 585 (DZUC). **Other material examined**: 4 Females, same data of plesiotype, GK 584, 586, 587 & 588. 1 Female, INDIA: Kerala; Kottayam Dt.; Athirampuzha (9°41'N 76°31'E); Amalagiri, Sureshan P.M., 28.xi.1988, GK 583. 1 Female, INDIA: Kerala; Palakkad Dt.; Malampuzha (10°53'N 76°46'E), Sureshan P.M., 13.i.1986, GK 582. 3 Females, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11°7'N 75°5'E), Narendran T.C. & Party, 13.iii.1985, GK 272, Sureshan P.M., 5.iv.1988, GK 581, Sureshan P.M., May 1989, GK 580. 1 Female, INDIA: Kerala; Malappuram Dt.; Manjeri (11°7'N 76°7'E), Sheeba. M., 6.iii.2005, GK 673.

Discussion: This species resembles to the African species *Psilocharis afra* Heraty in having: (1) Lateral lobe and axilla completely rugose or carinate; (2) Frenum vertically carinate (smooth in some *hypena*) and 3) Temple finely strigate dorsally. However, this species differs from *P. afra* in

having: (1) Lower face broad (In *P. afra* lower face below eye strongly narrowed); (2) Posterior margin of gena rounded and distinct in frontal view (In *P. afra* posterior margin of gena not or slightly visible in frontal view) and (3) Head width at lower margin of eye 2.50-2.90x vertical distance between eye margin and apex of clypeus (In *P. afra* head width at lower margin of eye, including posterior genal margin, 1.80-2.40x vertical distance between eye margin and apex of clypeus).

Remarks: This species is the **first report** from Kerala.

4. GENUS *ANCYLOTROPUS* CAMERON

Ancylotropus Cameron, 1909c. *Entomologist* 42: 229-234. Type species: *Ancylotropus cariniscutis* Cameron, by monotypy.

Diagnosis: Antenna 11 or 12 segmented in females and 12 segmented in males; funicular segments cylindrical or rarely flared; in males antenna usually much longer than, or at least as long as head and mesosoma combined; spiracle situated at anterior face of pronotal-prepectal complex under a shelf-like expansion of lateral lobe of mesoscutum; apex of scutellum rounded or prolonged in to a truncate or emarginate projection; frenal line usually absent, rarely present as complete or incomplete lines; propodeal spiracle usually circular or at most with a very small ventral emargination; usually with a distinct, vertical, anterior prepectal carina that terminates dorsally just below or posterior to mesothoracic spiracle, rarely carina indistinct from surrounding sculpture or anterior margin abrupt without any carina; posterior margin of prepectus usually apically truncate or expanded as a rounded lobe and in either case not reaching tegula; gaster either triquetrous or bivalved.

Distribution: Palaeotropical Region through the Malagasy subregion to western Malaysia.

Biology and Hosts: Based on their phylogenetic position, species of *Ancylotropus* are probably parasites of Ponerinae in the tribe Ectatommini (Heraty, 2002). Clausen (1928) placed numerous planidia on mature larvae (within cocoon) of *Camponotus*, and although larvae attached to the host and initiated feeding, none developed beyond the first instar. *Ancytrotropus manipurensis* (Clausen) deposits clusters of about 1000 eggs under the outer bud scales of *Flemingia* (Fabaceae) (Clausen, 1928). The eggs hatch within 2-3 weeks. Larvae are very active and readily attach to any object in their vicinity (Clausen, 1928). *Ancylotropus montanus* scatter eggs on the underside of leaves of *Sandoricum* (Meliaceae) and *Premna* (Verbenaceae) (Ishii, 1932). The eggs are so numerous that they resemble a white powder. Larvae hatch within one week (Ishii, 1932). An undescribed species from South Africa was associated with ovipositions in to the skin of mature berries of *Psychotria capensis* (Rubiaceae) in which clusters of 60-80 stalked eggs were deposited (Heraty, 2002).

Immature Stages: Egg and planidium of *A.manipurensis* described by Clausen (1928) and *A. motanus* by Ishii (1932). Planidia collected from adults of the type of *A.manipurensis* were similar to those of most other Eucharitini with a distinct tergopleural line, hatchet shaped sclerite, TI and TII fused dorsally, T III with a ventral seta, T IV- T VIII with long extensions of the ventral margin and scalloped posteroventral margins, dorsal margin of TXII with 2 acuminate processes (bidentate), and caudal cerci stout. The planidium of *A. montanus* and the undescribed species from South Africa are identical for all the above characters, including TXII bidentate (Heraty, 2002).

Discussion: The species of *Ancylotropus* were studied by Narendran and Sheela (1995) and Boucek (1988). The structure of the gaster identifies two very distinct lineages within *Ancylotropus* that have either a bivalve gaster or a triquetrous (three sided) gaster.

Ancylotropus Cameron closely resembles to *Substilbula* Boucek and *Rhipipalloidea* Girualt in having: (1) Propodeum and mesosoma coarsely sculptured and (2) Callus slightly swollen or forming on elongate projection. However, this genus differs from *Substilbula* and *Rhipipalloidea* in having: (1) Fore wing pilose and with marginal fringe (In *Substilbula* and *Rhipipalloidea*, fore wing bare, at most with microtrichiae, rarely with sparse hairs, and no marginal fringe); (2) Ovipositor broad along entire length (In Substilbula and *Rhipipalloidea* ovipositor thin and needle like) and (3) Apex of hypopygium with patch of dense hairs (In *Substilbula* and *Rhipipalloidea* apex of hypopygium bare or with few minute setae).

Remarks: Five species are known from all over the world of which 3 species were reported from Oriental Region and 1 species from Indian subcontinent. No valid species was reported from Kerala so far (Narendran and Sheela, 1995; Heraty, 2002 and Girish Kumar, 2004). The present work recognizes 1 species which is new to science. A key to species of Indian subcontinent is also provided. The specimens were collected from Muthanga reserve forests of Western Ghats region. This is the **first report** from Kerala.

KEY TO SPECIES OF *ANCYLOTROPUS* CAMERON OF INDIAN SUBCONTINENT

1. Gt_1 triquetrous; scutellum with posterior horn almost rounded (Fig.72); scuttellar horn almost at the same plane of scutellum and not tilted upwards; frons with few strong transverse striation (Fig. 71); fore wing hyaline without any infuscation around STV; head 1.27x as broad as high (excluding mandibles) (Fig. 71); eyes separated by 1.64x their height (Fig. 71) ..... *A. keralensis* sp. nov.

– Gt_1 bivalved; scutellum with posterior horn deeply incised at apex; scutellar horn tilted upwards about 30° on horizontal axis of scutellum; frons smooth with weak longitudinal striations on upper part joining

vertex; fore wing with an infuscation around STV; head 1.43x as broad as high (excluding mandibles); eyes separated by 2.50x their height ..... *A. manipurensis* (Clausen)

1. *Ancylotropus keralensis* sp. nov.

(Plate III E & V E; Figs. 70-73)

Holotype: Female: Length 3.83mm. Head, mesosoma and petiole Black with metallic green refrigence; antenna pale yellowish brown except scape and pedicel yellow; mandible pale brownish yellow with tip of teeth brown; eyes black with silvery white reflections; ocelli reflecting brown; legs pale brownish yellow except coxae brownish black; claws brown; wings hyaline without any infumation around stigma, veins brown; gaster blackish brown.

Head: Transverse subtriangular (Fig. 71), 1.27x as broad as high excluding mandibles; in dorsal view 5.50x as broad as its median length including median ocellus (Fig. 72); OOL as long as POL; vertex smooth with few striations; frons with few strong transverse striations; gena and sides of lower frons with minute scattered pits; labrum 8 digitate; clypeal and supraclypeal area smooth; tentorial pit deap; vertex and frons with sparse hairs; eyes bare separated by 1.64x their height. Antenna (Fig. 70) 12 segmented; scape cylindrical, not reaching front ocellus; relative proportions of length and width of antennal segments: scape: 3.1; pedicel: 1.1; F1: 2.4; F2: 4.1; F3: 3.7; F4: 4.1; F5: 3.3; F6: 5.1; F7: 4.6; F8: 3.4; F9: 3.12; clava: 3.

Mesosoma: Mesoscutum and scutellum including posteriorly projecting horn with close rugoso-alveolate sculpture and moderately pubescent, interstices carinate; SSS transversely carinate; scutellum with a single horn directed straight posteriorly, almost rounded at apex (Fig. 72); callus and propodeal disc with felt like pilosity; mesepimeron with sparse

pilosity; median length from SSS to apical tip of scutellar horn in dorsal view 1.31x basal width (excluding axillae) of scutellum; scutellar horn almost at the same plane of scutellum and not tilted upwards; propodeum rugulose; mesopleuron almost fully sculptured except at the anterodorsal angle; coxae sparsely pubescent; femora moderately pubescent; pubescence on tibiae and tarsi denser than those on femora. Fore wing (Fig. 70) 2.75x as long as broad, 1.76x length of mesosoma (including length of scutellar horn); fore wing densely pubescent except basal cell sparsely pubescent; SMV 1.47xMV; MV 1.58x PMV; PMV 3.42x STV; hamuli 3 in number.

Metasoma (Fig. 70)**:** Petiole shorter (0.72x) than hind femur, 0.61x length of gaster, with longitudinal striations; Gt_1 triquetrous, smooth and shiny.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Variation: Scutellar process almost rounded to slightly incised and hamuli 3-5 in number.

Distribution: India (Kerala) (Fig. 6).

Etymology: The species is named after the state from where the type specimens are collected.

Material examined: Holotype: Female, INDIA: Kerala; Wayanad Dt.; Muthanga (11°44'N 76°29'E); Narendran T.C and Party, 7.v.2000, GK 145 (DZUC). **Paratypes**: 1 Female, same data of holotype, GK 144. 1 Female, same data of holotype except collection date, 6.v.2000, GK 146 (DZUC).

Discussion: This new species resembles to *A. manipurensis* (Clausen) in having: (1) Antenna 12 segmented; (2) Scape not reaching median ocellus; (3) Mesosoma with shallow, close, rugoso-alveolate sculpture on mesoscutum and scutellum and sparsely pubescent and (4) Gastral petiole distinctly shorter

than hind femur. However this new species differs from *A. manipurensis* in having: (1) Gt_1 triquetrous (In *A. manipurensis* Gt_1 bivalved); (2) Scutellum with posterior horn almost rounded or atleast slightly incised (In *A. manipurensis* scutellum with posterior horn deeply incised at apex) (3) Scutellar horn almost at the same plane of scutellum and not tilted upwards (In *A. manipurensis* scutellar horn tilted upwards about 30° on horizontal axis of scutellum); (4) Frons with few strong transverse striations (In *A. manipurensis* frons smooth with weak longitudinal striations on upper part joining vertex); (5) Fore wing hyaline without any infuscation around STV (In *A. manipurensis* fore wing with an infuscation around STV); (6) Head 1.27x as broad as high (excluding mandibles) (In *A. manipurensis* head 1.43x as broad as high (excluding mandibles)) and (7) Eyes separated by 1.64x their height (In *A. manipurensis* eyes separated by 2.50x their height).

5. GENUS *CHERIANELLA* NARENDRAN

Cherianella Narendran, 1994. *Geobios New Reports* 13: 94-96. Type species: *Cherianella narayani* Narendran, by original designation. Proposed as masculine gender

Diagnosis: Head width distinctly less than maximum width of thorax in dorsal view (Fig. 79); head extremely smaller compared to thorax, transverse; median areas below antennal base raised; frons granulate (Fig.75); each mandible sickle shaped; hind ocelli situated on posterior border of vertex; antenna 13 segmented with scape very short, subequal to pedicel (Figs. 77 & 78); mesosoma with pronotum not visible from dorsal view; mesoscutum greatly swollen with dorsum finely granulate and with characteristic and adpressed setae (Fig. 74); notaulices absent; scutellum with a long posterior single horn without emargination at apex (Fig. 79); fore wing venation indiscernible (Fig. 74).

Distribution: India, Sri Lanka and Africa.

Biology and Hosts: Unknown.

Immature stages: Unknown.

Discussion: *Cherianella* Narendran comes close to *Thoracanthoides* Girault in having: (1) Frinal line absent and (2) Apex of scutellum with a single process that is longer than the scutellar disc. However, this genus differs from *Thoracanthoides* in having: (1) Scutellar spine cylindrical or clubbed apically (In *Thoracanthoides* scutellar spine subtriangular); (2) Sides of mesosoma rounded and finely sculptured (In *Thoracanthoides* sides of mesosoma vertical and smooth); (3) Dorsum of mesosoma often with spatulate or clubbed setae (In *Thoracanthoides* dorsum of mesosoma and propodeum with covering of fine hairs); (4) Occiput bare (In *Thoracanthoides* occiput densely pilose); (5) Antenna of male serrate or obconical (In *Thoracanthoides* antenna of male pectinate) and (6) Genae fused posterior to mandibles (In *Thoracanthoides* genae broadly separated posteriorly).

Remarks: Six valid species are known from all over the world of which 1 species was reported from Oriental Region (Indian subcontinent). No species was reported from Kerala so far (Narendran, 1994; Heraty, 2002; Girish Kumar, 2004). The present work recognizes male of *Cherianella narayani* Narendran. This is the **First report** of the genus from Kerala.

1. *Cherianella narayani* Narendran

(Plates III F & Plate V F; Figs. 74 - 79)

Cherianella narayani Narendran, 1994. *Geobios News Reports* 13: 94-96. Type data: India: Tami Nadu, Pambukurichi. Holotype Female (examined) (ZSIC) by original designation.

Cherianella narayani Narendran; Heraty, 2002. *Memoirs of the American Entomological Institute* 68: 116-117. Description of male, illustrated.

Plesiotype: Male: Length 3.25mm. Head and mesosoma black with faint bluish reflections; antenna blackish brown except last two segments

pale; coxae blackish brown; trochanters pale brown; fore femur pale brown with apices darker; mid and hind femur dark brown except at apices paler; tibiae brownish yellow; tarsi pale yellow; claws blackish brown; gaster black; wings hyaline; pubescence on head and body white.

Head: Width in dorsal view less than width of mesoscutum, 2.06x as broad as high (excluding mandibles) (Fig. 75); face rugulose with scattered thin spatulate setae; vertex granulate with striations; scrobal cavity absent; no carina posterior to median ocellus; vertex rounded posterior to ocelli; eyes separated by 2.13x their height; height of eye 1.09x malar space; clypeus rugulose, swollen and projecting from lower face; supraclypeal area swollen and rugulose; labrum forming a simple lobe; mouth plate 2 digitate; mandible long and thin with a single teeth; maxillary complex reduced to minute button-like lobe. Antenna (Figs. 77 & 78) 13 segmented; flagellum 2.56x height of head; F_1 2.21x as long as broad, 1.26 x as long as F_2; F_2 1.68x as long as broad; remaining segments thickly serrate; apical margins of F_2 - F_{11} with prominent peg-like sensillae; all flagellar segments clearly separated; funicular segments finely granulate.

Mesosoma: Mesoscutum evenly rounded, microreticulate with fine striae laterally; mesoscutum and axilla with scattered thin spatulate hairs; axilla and base of scutellum distinctly striate, micropunctate medially, abruptly rounded laterad to base of scutellar spine; scutellor process 6.60 x as long as broad (Fig. 79), 2.86x as long as scutellar disc, evenly tapered to blunt apex, dorsally microreticulate, laterally with fine oblique striae; hairs on scutellum and spine pronounced and evenly scattered; propodeum rugoso-punctate; propleuron and mesopleuron with longitudinal striae, anterior part of metapleuron with longitudinal striae; hind coxa and legs microreticulate with thin spatulate hairs; claws thin and aciculate. Fore wing (Fig. 74)

subtriangular and broadly rounded apically, 2.73x as long as broad; wings hyaline with veins indiscernible, bare; hamulus 1 in number.

Metasoma (Fig. 74)**:** Petioles 2.63x as long as broad, 1.11x as long as hind coxa, cylindrical, smooth with scattered long hairs ventrally, shorter than mesosoma; Gt_1, smooth and shiny, invaginated medially and laterally; gaster with scattered long hairs.

Female: Similar to male except in having larger body size.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala (Fig. 7), Tamil Nadu), Sri Lanka.

Material examined: Plesiotype: Male, INDIA: Kerala; Kannur Dt., Azhikode Chal (11°51N 75°21'E), Divakaran, T., 16.ii.2003, GK 362. **Holotype.** Female, INDIA: Tamil Nadu; Pambukurichi, K.V.L. Narayana & Party, 24.ii.1991.

Discussion: This species is the only member lacking dense setae at the base of the scutellar spine and apex of scutellum and the spine extends well beyond the apex of the gaster. Otherwise *C. narayani* Narendran is very similar to the majority of African Species.

Remarks: This most highly modified species of eucharitid is originally described by Narendran (1994) based on female collected from Tamil Nadu. Subsequent description of male provided by Heraty (2002) based on Sri Lankan specimen. The specimen of species reported here is collected from grasses near coconut plantations. This species is a **new record** for Kerala.

6. GENUS *STILBULA* SPINOLA

Stilbula Spinola, 1811. *Annales du Museum d'histoire naturelle, Paris* 17: 150. Type species: *Ichneumon cyniformis* Rossi, by monotypy.

Eltolada Cameron, 1909c. *Entomologist* 42: 230. Type species: *Eltolada trimaculata* Cameron. Subsequently designated by Gahan & Fagan, 1923: 50. Synonymy by Hedqvist, 1978: 245.

Diagnosis: Body metallic blue, green or yellow with dark maculations; in lighter forms head black or black with a metallic luster; antennal flagellum simple, 12 segmented, rarely 11 in females; scape less than 1.5x as long as broad; basal flagellomere in males long, often slightly flattened; hypostomal lobes broadly separated posterior to mandibles; maxillary complex relatively large, without palpi; frenal projection arises from a single basal stalk and diverges in to a pair of short cylindrical spines, although the apex rarely projecting and truncate or narrowly emarginate; propodeum slightly swollen laterad to postspiracular furrow; fore wing slightly lanceolate, bare; costal cell narrow; stigma broad, triangular; hind wing broad, venation complete; petiole usually long, cylindrical and smooth; first gastral tergite has a single split medially.

Distribution: Widespread in the Old World.

Biology and Hosts: *S. cyniformis* reared from *Camponotus* (Clausen, 1923 and 1940a); *S. arenae* and *S. polyrachicida* reared from *Polyrachis* (Wheeler & Wheeler, 1924; Boucek, 1988). *Stilbula cyniformis tenuicornis* deposits large clusters of 940-1230 eggs into over wintering leaf buds of *Betula* (Betulaceae), *Castanea* (Fagaceae), *Cladrastis* (Fabaceae), *Morus* (Moraceae) and *Quercus* (Fagaceae) (Clausen, 1923 and 1940b). *Stibula cyniformis cyniformis* deposits eggs in "bundles of several thousands" into fruit pods of *Picris* (Asteraceae), these eggs are placed on to the inner surface of the bracts or on the outer surface of seeds which are later dispersed by wind (Parker, 1937). The eggs of *S. c. tenuicornis* pass the winter in the egg

stage (Clausen, 1923), but the eggs develop immediately in *S. c. cyniformis* (Parker, 1937).

Immature stages: All stages of *S. cyniformis* (Clausen, 1923) and *S. c. tenuicornis* have been described (Parker, 1937; Clausen, 1940a).

Discussion: *Stilbula* Spinola was reviewed by Hedqvist (1978), Boucek (1988) and Narendran and Sheela (1996). This genus resembles *Australian genera Stilbuloida* Boucek in having: (1) Propodeum not expanded medial to propodeal spiracle, disc evenly rounded, not bilobed; (2) Venation of hind wing complete and (3) spines arising from common extension of frenum. However, this genus differs from *Stilbuloida* Boucek in having: (1) Flagellomeres long and cylindrical, sometimes evenly flared apically (In *Stilbuloida* flagellomeres serrate or pectinate); (2) Scutellar spines diverging and prominent, process rarely short and truncate, emarginate or rounded (In *Stilbuloida* scutellar spines diverging and thin or lobate) and (3) SMV without subapical swelling (In *stilbuloida* SMV with prominent subapical swelling).

Remarks: Thirty six species are known from all over the world of which 15 species were from Oriental Region. Eight species were recorded from Indian subcontinent, of which 2 valid species were from Kerala (Narendran and Sheela, 1996; Heraty, 2002). The present work recognizes 11 species of which 8 species are new to science from Kerala and adjascent places. A key to the species of Indian subcontinent is also provided. In this study most of the specimens were collected from agroecosystems. Some specimens were collected from disturbed shruby habitat. Few specimens were collected from the mangroove ecosystem of Cheruvannur, Kozhikode.

KEY TO SPECIES OF *STILBULA* SPINOLA FROM INDIAN SUBCONTINENT

1. Female 2
-- Male 8
2. Frons completely striated more or less in a circular manner (Figs. 82, 94 & 99) 3
-- Frons with longitudinal striations mostly on upper half (Figs. 137) 7
3. Petiole without a distinct ring or band; general body colour dark metallic bluish green; head nearly black with blue reflections; antennae brownish black; wings with a conspicuous infuscation adjoining stigma; coxae concolourous with mesosoma, rest of legs of brown; petiole brownish black to dark brown; gaster black; scutellar process with a 'Y' shaped carina; petiole 0.55x as long as gaster, smooth, abruptly wider in apical 0.50 part ..... *S. atkinsoni* (Mani & Dubey)
-- Petiole with a brownish or blackish ring or band at or near middle, rest of portions pale yellow or white or pale brown; other characters partly or completely different 4
4. Scutellar horn bluntly and shortly bifurcate; antennal scape less than 2x length of pedicel; body black with metallic copper reflections; head black; antenna dark brown; fore wing with a brown infuscation adjoining stigma; mouth plate 11 digitate .... *S. mysorensis* (Mani & Dubey)
-- Scutellar teeth diverging; other characters partly or completely different 5
5. Length of scutellar stalk distinctly shorter than its width (Fig. 100); mouth plate 8 digitate (Fig. 99); head dark brown with metallic green reflections; mesosoma brown with metallic green reflections; hamuli 3 in number; ovipositor exserted and acicular ..... *S. athira* sp. nov.

-- Length of scutellar stalk equal or subequal to its width (Figs. 83, 95); mouth plate with more than 8 digits (Fig. 82); other characters partly or completely different 6

6. Head dark brown and mesosoma brown without metallic green refringence, mouth plate 10 digitate (Fig. 82); ocelli reflecting yellowish brown; upper half of gaster dark brown, lower half pale brown; POL 2.70 x OOL ..... *S. aruna* sp. nov.

-- Head and mesosoma black with mettallic green refringence; mouth plate 14 digitate; ocelli reflecting brown; gaster yellowish brown with T1, black; POL 2.50 x OOL ..... *S. ashokai* Narendran

7. Scutellar process with a single narrow frenal spine; flagellum testaceous; mesoscutal side lobes smooth and swollen; body dark brown with bluish reflections; labrum with 6 digits; body length 2.5 mm ..... *S. minispina* Heraty

-- Scutellar process with a slender elongate stalk (Fig. 138); flagellum dark brown to black; mesoscutal side lobes mostly smooth and evenly rounded; body black with dark green metallic reflections; labrum with 9 digits; body length 5 mm ..... *S. tanjorensis* (Mani & Dubey)

8. Scutellum with an upturned, smooth, cleft frenal process; funicular segments slightly swollen apically; head black with green reflections; mesosoma mostly black with bluish green reflections, lower half of mesoscutum, upper corner of prepectus, acropleuron and propodeum yellow; wings hyaline except a small infuscate spot around STV; labrum with 9 digits ..... *S. nilgiri* Heraty

-- Scutellum not as above; other characters partly or completely different 9

9. Gastral petiole of uniform colour; Body generally with dark metallic green reflections; head black; coxae concolourous with mesosoma, rest of legs brown; antenna brownish yellow; gaster dark metallic green,

terminal segment somewhat brown along margins; head coarsely and umbilicately punctate; antenna with dense pubescence; pedicel short and transverse; fore wing with stigma sessile; PMV very long; scutellar process bidentate, about as long as gastral petiole ..... *S. indica* (Mani)

-- Gastral petiole with dark ring or band medially or submedially; other characters partly or completely different 10

10. Posterior process of scutellum with a slender elongated stalk diverging into elongated spines (Fig. 143); frons with weak logitudinal striations seen mostly on upper half (Fig. 141); body black with dark green or shiny bluish green with metallic reflections; stigma distinct (Fig. 139); mesopleuron with a large smooth area (Fig. 139); mouth plate 8 or 9 digitate ..... *S. tanjorensis* (Mani & Dubey)

-- Posterior process of scutellum stouter (Figs. 88, 107, 111, 116, 121, 124, 129 & 134); other characters partly or completely different 11

11. Mesopleuron (Figs. 117, 118 & 125) distinctly and closely punctate without a patch of smooth area 12

-- Mesopleuron (Figs. 89, 92, 104, 108, 127 & 131) with a distinct smooth area on anterior half 14

12. Head and mesosoma brownish black without metallic green reflections; petiole subequal to gaster (Fig. 113); fore wing without brown infumation adjoining stigma (Fig. 113); labrum with 8 digits; frenal process 0.76x as long as broad ..... *S. isula* sp. nov.

-- Colour of head and mesosoma different; petiole distinctly shorter than gaster (Figs. 118 & 122); other characters partly or completely different 13

13. Fore wing with brown infumation adjoining stigma (Fig. 122); median ocellus separated from occipital margin by its own diameter (Fig. 124); mouth plate 8 digitate (Fig. 123); head and mesosoma blackish brown

with metallic green reflections; eye reddish brown; body length 5.59 mm .... *S. lepida* sp. nov.

-- Fore wing without brown infumation adjoining stigma (Fig. 118); median ocellus separated from occipital margin by less than its own diameter; mouth plate 12 digitate; head and mesosoma bluish green with metallic refringence; eye brownish yellow; body length 3.3 mm ..... *S. lata* Narendran

14. POL 2x or above 2x (2.25 - 2.85x) OOL 15

-- POL below 2x (1.60 - 1.68x) OOL 18

15. Fore wing with brown infumation adjoining stigma (Figs. 88 & 92) 16

-- Fore wing without brown infumation adjoining stigma (Figs. 104 & 131) 17

16. Head brownish black, mesosoma blackish brown; mouth plate 8 digitate (Fig. 87); POL 2.25x OOL (Fig. 83); body length 4.58 mm; ocelli reflecting brownish yellow; eyes separated by 2.08 x their height (Fig. 87); F1 1.23x as long as F2; stigmal vein clear and finger like (Fig. 86) ..... *S. aruna* sp. nov.

-- Head and mesosoma black with metallic green refringence; mouth plate 10-14 digitate; POL 2.50x OOL; body length 3.43 mm; eyes separated by less than 2x their height; other characters partly or completely different ..... *S. ashokai* Narendran

17. POL 2.80 x OOL (Fig. 107); head and mesosoma black with metallic green reflections; ocelli reflecting yellowish brown; base of coxa brown with metallic green reflections; body length 6.28 mm; stalk of scutellar process as long as broad (Fig. 107); mouth plate 8 digitate (Fig. 106); hamuli 7 in number ..... *S. bangalorica* sp. nov.

-- POL 2.42x OOL (Fig. 134); head and mesosoma dark brown with metallic black reflections; median ocellus reflecting brownish yellow;

lateral ocellus reflecting red; base of coxa dark borwn without metallic green reflections; body length 4.77 mm; stalk of scutellar process 0.86x as long as broad (Fig. 134); mouth plate 9 digitate (Fig. 133); hamuli 3 in number ..... *S. namida* sp. nov.

18. Stalk of scutellar process (excluding teeth) 0.86 x as long as broad (Fig. 111); STV perpendicular to wing margin and finger like (Fig. 108); petiole 1.42x as long as hind femur (Fig. 108); F1 1.27x as long as F2; body length 4.47 mm; hamuli 3 in number ..... *S. bullista* sp. nov.

-- Stalk of scutellar process (excluding teeth) 1.21x as long as broad (Fig.129); STV angled to wing margin and stout (Fig. 127); petiole 1.62x as long as hind femur (Fig. 127); F1 1.44x as long as F2; body length 5.96 mm; hamuli 4 in number ..... *S. muthangensis* sp. nov.

1. Stilbula aruna sp. nov.

(Figs. 80 - 91)

Holotype : Female: Length 4.35 mm. Head dark brown; mesosoma brown; antenna yellowish brown with scape, pedicel, base of first funicular segment, last two funicular segments and club paler; mandibles yellow, apical margins with brown reflections; ocelli reflecting yellowish brown; eye brown; legs pale brownish yellow except coxae brown, claws and tegulae brown; fore wing with brown infumation adjoining stigma, vein brown; hind wing vein pale brown; petiole brownish yellow with brown band medially; upper half of gaster dark brown, lower half pale brown.

Head: 1.54x as broad as high (excluding mandibles) (Fig. 82); POL 2.71 x OOL; median ocellus separated from occipital margin by less (0.6x) than its own diameter; frons carinate, carinae weaker towards eye, converging below toruli; lower face transversely carinate; vertex with few striations, eye separated by 1.85x their height, bare; gena obliquely striate; malar space 0.64 x height of eye; epistomal sulcus absent; tentorial pit and clypeogenal sulci

distinct and deep; clypeus with faint transverse striations; supraclypeal area not well defined, striated on upper half, smooth on lower half; labrum with 10 digits; apical tooth of mandible long and thin. Antenna (Fig. 81) 12 segmented; scape 1.25x as long as broad; funicle 9 segmented; F1 4.10x as long as broad, 1.57x as long as F2; scape and pedicel bare; flagellar segments pilose; MPS numerous; antenna subequal (0.99x) to head and mesosoma combined.

Mesosoma: Mesoscutum and scutellum closely punctate, interstices carinate, surface bare; notauli distinct and foveolate; mesoscutum without median fovea; SSS deeply impressed and strongly carinate; scutellum (excluding axilla) 1.03x wider than the median distance between SSS and carinate frenal groove at base of scutellar process (Fig. 83), with a median furrow; frenal process stout and pitted; each tooth of posterior scutellar process shorter than its stalk; stalk as long as broad; propodeum completely punctate, interstices carinate, without a median carina; callus bare; mesepimeron (Fig. 84) with a smooth area; upper mesepimeron completely punctate, interstices carinate; femoral groove broad and transversely carinate, swollen anterior to mid coxa. Fore coxa slightly striated basally; mid coxa striated ventrally on sides with a slight ventral sulcus; hind coxa glabrous; all femora with minute sparse setae; all tibiae and tarsi with setae. Fore wing (Fig. 80) 2.63x as long as broad; STV 0.45 x as long as broad; PMV 2 x as long STV; STV finger-like; wing disc with microtrichia except at basal area bare; hind wing with microtrichia and marginal fringes; hamuli 3 in number.

Metasoma (Fig. 80): Petiole 0.59x as long as gaster, 3.11x as long as hind coxa, slightly longer (1.08x) than hind femur, smooth and swollen medially; gaster subequal to head and mesosoma combined (6.8: 6.7), subglobose and smooth; ovipositor not exserted.

Male: Length 4.58 mm; petiole pale brownish yellow with brown band submedially; antenna pale brownish yellow; mandibles pale brownish yellow; ocelli reflecting brownish yellow; POL 2.25x OOL (Fig. 88); median ocellus separated from occipital margin by less (0.77x) than its own diameter; vertex striate laterad to ocelli, striate medially; eyes separated by 2.08x their height; malar space 0.80x height of eye (Fig. 87); clypeus smooth on upper half; labrum with 8 digits; scape as long as width. F1 5.25x as long as broad, 1.23x as long as F2; flagellum slightly swollen apically; MPS absent; antennal length longer than the combined length of head, mesosoma and petiole (11.70: 10.30). Scutellum 1.93x wider than the median distance between SSS and carinate freenal groove at base of scutellar process (including axilla) (Fig.88). Fore wing (Fig. 86) 2.87x as long as broad; STV 7x as long as broad PMV 1.71x as long as STV; margins of STV clear. Petiole (Fig. 86) 0.72x as long as gaster, 4.44x as long as hind coxa, 1.21x as long as hind femur, smooth and swollen submedially. Other characters as in female.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) Fig. 8).

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

Material examined: **Holotype**: Female, INDIA: Kerala; Alappuzha Dt.; Kayamkulam (9°10' N 76°30'E), T.C. Narendran, 21.ii.1989, GK 26 (DZUC). **Paratypes**: 1 Female, Same data of holotype, GK 17, 1 Female and 2 Males, INDIA: Kerala; Ernakulam (10° 1' N 76° 18'E), T.C. Narendran, 1989, GK 155, 170 & 187, 2 Males, INDIA: Kerala; Ernakulam (10°1'N 76°18'E), T.C. Narendran, 9.ii.1989, GK 171 & 174, 2 Males, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11°7'N 75°5'E), T.C. Narendran, 5.i.1993, GK 172 (Male description and illustration provided), GK 193 (DZUC).

Discussion: *S. aruna* sp. nov. closely resembles to *S. ashokai* Narendran in having: (1) Fore wing with a brown infumation adjoining stigma; (2) Scutellar fork stout and pitted; (3) Antennae yellowish brown with

paler apices and (4) Mesopleura with a smooth area. However, this new species differs from *S. ashokai* in the following features: (1) Head dark brown and mesosoma brown without metallic green reflections (In *S. ashokai* head and mesosoma black with metallic green reflections) and (2) Mouth plate 8-10 digitate (In *S. ashokai* mouth plate 14 digitate).

2. *Stilbula ashokai* Narendran

(Figs. 92-96)

Stilbula ashokai Narendran, 1996. *Entomon* 21(1): 69-70. Type data: India: Kerala; Malampuzha. Holotype: Female (DZUC) by original designation. Descripton of both sexes, illustrated.

Diagnosis: Head and mesosoma black with metallic refringence; antenna yellowish brown with scape, pedicel, last two funicular segments and club paler; ocelli brown; eyes brown with darkish spots; coxae brown, remaining parts of legs straw yellow; fore wing with brown infumation adjoining STV (Fig. 92); petiole yellow with pale brown band in middle; gaster yellowish brown with T1 black; head width (Fig. 94) in anterior view 1.50x (in female) and 1.60x (in male) its median length excluding mandibles; POL 2.50 x OOL; median ocellus separated from occipital margin by less than its own diameter; frons with more or less oblique and semicircular striations (Fig. 94) extending from ocellar area to supraclypeal and clypeal margins; clypeus and supraclypeal areas smooth; vertex longitudinally striated; scrobe striated on sides, upper part rugoso-punctate; mouth plate 14 digitate; gena obliquely striate; malar space in profile 0.60x eye height; epistomal sulcus indistinct; tentorial pits and clypeogenal sulci distinct, deep; eye separated by less than 2x height of eye in front view; antenna 12 segmented (Fig. 93), more elongated in male (Fig. 96); mesoscutum and scutellum deeply and closely punctate, interstices carinate; notauli distinct, foveolate; mesoscutum without a median fovea; SSS ecarinate; scutellum wider than the median distance between SSS and carinate frenal groove at

base of scutellar process (Fig. 95); width of scutellar stalk subequal to its length (excluding teeth); scutellum with a median longitudinal pitted fovea; mesopleuron (Fig. 92) with a smooth area on anterior half; propodeum completely punctate, interstices carinate, without a median carina; callus bare; fore and mid coxae striate ventro-laterally hind coxa smooth and shiny. Fore wing (Fig. 92) 2.83x as long as its maximum width, without marginal fringe; petiole smooth, distinctly shorter than gaster, longer than hind femur, slightly swollen at middle; gaster shorter than mesosoma, subglobose, smooth.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

Material examined: **Holotype:** Female, INDIA**:** Kerala; Malampuzha (10°53'N 76°46'E), Narendran, T.C., 10.i.1986(DZUC). **Paratypes**: 2 Females and 4 Males, INDIA: Kerala; Palakkad Dt.; Malampuzha (10°53'N 76°46'E), Narendran T.C., 10.i.1986 (DZUC). 1 Female, INDIA: Kerala; Thiruvananthapuram Dt.; Sreekaryam (8°30'N 76°57'E), Narendran T.C., 25.ii.1989 (DZUC). **Other material examined**: 1 Female, INDIA: Kerala; Kozhikode Dt.; Thiruvannur (11°16'N 75°47'E), Raj Mohana K., 23.ii.1996, GK 147. 1 Females, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11°7'N 75°5' E), Lakshmi, 4.iv.1999, GK 151. 1 Female, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11°7'N 75°5'E), Sreeja Johnson, 30.iv.2001, GK 154. 1 Female, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11°7'N 75°5'E), Bindu K., 30.vi.2001, GK 153.

Discussion: This species comes near *S. mysorensis* (Mani & Dubey) in general appearance but *S. mysorensis* differs from this species in having: (1) Scutellar teeth not diverging and (2) Flagellar segments not shorter as in *S. ashokai* Narendran.

3. Stilbula athira sp. nov.

(Plates IV A, V G & VI G; Figs. 97-103)

Holotype: **Female:** Length 4.42 mm. Head dark brown with metallic green reflections; mesosoma brown with metallic green reflections; antenna yellowish brown with scape, pedicel, base of first funicular segment, last two funicular segments and club paler; mandibles yellow, apical margins with brown reflectins; ocelli reflecting brown; eye brown; legs pale brownish yellow except coxae brown, claws brown; tegulae yellowish brown, fore wing with brown infumation adjoining stigma; SMV and STV dark brown, MV and PMV pale brown, hind wing vein pale brown; petiole yellow with brown band medially; upper half of gaster dark brown, lower half yellowish brown.

Head: 1.57x as broad as high (excluding mandibles) (Fig. 99); POL 2.89 x OOL; median ocellus separated from occipital margin by less (0.75x) than its own diameter; frons carinate, carinae weaker towards eye, converging below toruli; lower face transversely carinate; vertex with few striations; eyes separated by 1.80x their height, bare; gena obliquely striate; malar space 0.77x height of eye; epistomal sulcus absent; tentorial pit and clypeogenal sulci distinct and deep; clypeus smooth with few faint transverse striations on apical margin; supraclypeal area not well defined, smooth; labrum with 8 digits; apical tooth of mandible long and thin. Antenna (Fig. 98) 12 segmented; scape 1.50x as long as broad; funicle 9 segmented; F1 2.70x as long as broad, 1.58x as long as F2; scape and pedicel bare; flagellar segments pilose, pilosty well pronounced; MPS numerous, large and exposed; antenna subequal (0.99x) to head and mesosoma combined.

Mesosoma: Mesoscutum and scutellum closely punctate, interstices carinate, surface bare; notauli distinct, foveolate; mesoscutum without median fovea; SSS deeply impressed, strongly carinate; scutellum (excluding axilla) 0.93x wider than median distance between SSS and carinate frenal groove at

base of scutellar process (Fig. 100) with a median furrow; frenal process stout and pitted; propodeum completely punctate, interstices carinate, without a median carina; callus bare; mesepimeron (Fig. 101) with a smooth area; upper mesepimeron completely punctate, interstices carinate; femoral groove broad and transversely carinate, swollen anterior to mid coxa. Fore coxa slightly striated basally; mid coxa striated ventro-laterally; hind coxa and all femora glabrous; all tibiae and tarsi with setae. Fore wing (Fig. 97) 2.88 x as long as broad; STV 2x as long as broad; PMV as long as STV; margins of STV and PMV not clear; wing disc with microtrichia except at basal area bare; hind wing with microtrichia and marginal fringes; hamuli 3 in number.

Metasoma (Fig. 97): Petiole 0.47x as long as gaster, 3.25x as long as hind coxa, slightly longer (1.08x), than hind femur smooth and swollen submedially; gaster slightly longer (1.04x) than head and mesosoma combined (6.8 : 6.5), subglobose and smooth; ovipositor exserted and acicular.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

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

Material Examined: **Holotype**: Female. INDIA: Kerala; Kottayam Dt.; Athirampuzha (9°41'N 76°31'E), Narendran T.C. & Party, 28.xi.2000, GK 405 (DZUC). **Paratype**: 1 Female. Same data as holotype, GK 406 (DZUC).

Discussion: This new species closely resembles to *S. ashokai* Narendran in having: (1) Body with metallic green refringence, antenna yellowish brown with scape, pedicel, base of first funicular segment, last two funicular segments and club paler, ocelli reflecting brown, coxae brown and fore wing with brown infumation adjoining stigma; (2) Median ocellus

separated from occipital margin by less than its own diameter; (3) eyes separated by less than 2x height of eye in front view; (4) F1 0.8x as long as F2 + F3; (5) scutellar process stout and pitted; (6) mesopleuron with a smooth area in anterior half and (7) gaster slightly longer than head and mesosoma combined. However, this new species distinctly differs from *S. ashokai* in the following features: (1) Mouth plate 8 digitate (In *S. ashokai* mouth plate 14 digitate); (2) Length of scutellar stalk distinctly shorter (0.64x) than its width (In *S. ashokai* length of scutellar stalk equal or subequal to its width); (3) Hamuli 3 in number (in *S. ashokai* hamuli 4 in number) and (4) Ovipositor exserted and acicular (In *S. ashokai* ovipositor concealed).

This new species closely resembles to *S. aruna* sp. nov. also in having: (1) Antenna yellowish brown except at apices, eyes brown, coxae brown and fore wing with an infumation adjoining stigma; (2) Median ocellus separated from occipital margin by less than its own diameter; (3) Eyes separated by less than 2x height of eye in front view; (4) Mesopleuron with a smooth area on anterior half; (5) Length of antenna subequal to head and mesosoma (excluding scutellar process) (6) Hamuli 3 in number and (7) Gaster slightly longer than the combined length of head and mesosoma (excluding scutellar process). However, this new species distinctly differs from *S. aruna* sp. nov. in having: (1) Body without metallic green reflections (In *S. aruna* sp. nov. body with metallic green reflections); (2) Mouth plate 8 digitate (In *S. aruna* sp. nov. mouth plate 10 digitate); (3) Length of scutellar stalk distinctly shorter (0.64x) than its width. (In *S. aruna* sp. nov. length of scutellar stalk as long as its width) and (4) Ovipositor exserted and acicular (In *S. aruna* sp. nov. ovipositor not exserted).

4. Stilbula bangalorica sp. nov.

(Plates IV B, V H & VI H; Figs. 104-107)

Holotype: Male: Length 6.28 mm. Head and mesosoma black with metallic green reflections; antenna yellowish brown; mandibles yellow with brownish tinge; ocelli reflecting yellowish brown; eyes brown; coxae dark brown with metallic green reflections except apices near to trochanters brownish yellow, remaining parts of legs yellow; tegulae brown; wings hyaline except for small infuscate spot around STV, venation brown; petiole yellow with pale brown band submedially; upper half of gaster dark brown, lower half pale brown.

Head: 1.53x as broad as high (excluding mandibles) (Fig. 106); POL 2.85 x OOL; median ocellus separated from occipital margin by less (0.42x) than its own diameter; frons finely carinate, carinae converging below toruli; lower face transversely carinate; vertex smooth laterad to ocelli, rugose medially; eyes separated by 1.79x their height, bare; malar space 0.82x height of eye; clypeus smooth basally, transversely striate apically, even with lower face, supraclypeal area not defined basally; labrum with 8 digits; apical tooth of mandible long and thin. Antenna (Fig. 105) 12 segmented; scape as long as broad; flagellum 5.20x as long as head; funicle 9 segmented; F1 3.90x as long as broad; 1.34 x as long as F2; flagellomeres slightly swollen apically; scape and pedicel bare; flagellar segments pilose; MPS absent; antenna distinctly longer than combined length of head, mesosoma and petiole (15: 11.9).

Mesosoma: Mesoscutum and scutellum deeply and closely punctate, interstices carinate, surface bare; notauli distinct and foreolate SSS deeply impressed and strongly carinate; scutellum broadly rounded with median furrow, 1.61x as broad as distance between SSS and frenal carina (including axilla) (Fig. 107); frenal line smooth, complete dorsally; frenal process stout,

pitted; each tooth of posterior scutellar process shorter than its stalk; stalk as long as wide; propodeum completely punctate, interstices carinate, without a mediun carina, bare; callus swollen, strongly rugoso-areolate, bare; mesepisternum with a smooth area (Fig. 104); upper mesepimeron rugoso-areolate; femoral groove broad, transversely carinate, swollen anterior to mid coxa; Fore and mid coxa striate basally, mid coxa with a ventral sulcus, hind coxa verrucose; fomora glabrous. Fore wing (Fig. 104) 3.35x as long as broad; STV 2x as long as broad; PMV 1.6x as long as STV; wing disc with microtrichia; hind wing with microtrichia and marginal fringes; hamuli 7 in number.

Metasoma: Petiole 0.85 x as long as gaster, 5.66x as long as hind coxa, 1.70x as long as hind femur, smooth and swollen submedially; Gt_1 glabrous.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Karnataka) (Fig. 8).

Etymology: The species is named after the collection locality.

Material examined: **Holotype**: Male, INDIA: Karnataka; Bangalore (12°58'N 77°35'E), Virakthamath C.A., 6.x.1989, GK 159 (DZUC). **Paratypes**: 9 Males, Same data as holotype, GK 158, 160, 161, 162, 163, 164, 165, 179 & 180 (DZUC).

Discussion: This new species resembles to *S. lata* Narendran in having (1) Head and mesosoma with metallic green refringence; (2) Gaster blackish brown; (3) Median ocellus separated from occipital margin by less than its own diameter; (4) Scutellar process stout and pitted and (5) Petiole distinctly shorter than gaster. However, this new species distinctly differs from *S. lata* in having: (1) Mesopleuron with a distinct smooth area (In *S. lata*

mesopleuron completely sculptured); (2) Hamuli 7 in number (In *S. lata* hamuli 3 in number); (3) Mouth plate 8 digitate (In *S. lata* mouthplate 12 digitate); (4) Body 6.28 mm (In *S. lata* body 3.3 mm); (5) POL 2.85x OOL (In *S. lata* POL 2.50x OOL); (6) Fore wing 3.35 x as long as broad (In *S. lata* fore wing 2.90x as long as broad) and (7) Length of scutellar process (excluding teeth) as long as its width (In *S. lata* length of scutellar process 1.30x as long as its width).

This new species similar to *S. tanjorensis* (Mani & Dubey) in having: (1) Mesopleuron with a smooth area; (2) Margins of STV distinct and (3) Head and mesosoma black with metallic green reflections. However, this new species distinctly different from *S. tanjorensis* in having: (1) Scutellar process stout (In *S. tanjorensis* scutellar process slender and elongated (2) Hamuli 7 in number (In *S. tanjorensis* hamuli 3 in number) and (3) Body length 6.28 mm (In *S. tanjorensis* body length 4 mm).

5. *Stilbula bullista* sp. nov.

(Figs. 108-112)

Holotype: Male: Length 4.47 mm. Head and mesosoma dark brown with metallic black reflections; antenna brownish yellow; mandibles yellowish brown; ocelli reflecting yellowish brown; eyes brown with silvery white reflections, coxae brown, remaining parts of legs pale brownish yellow; claws brown; tegula brown; wings hyaline except for small infuscate spot around STV, venation pale brown; petiole brownish yellow with brown band submedially; upper half of gaster dark brown, lower half pale brownish yellow.

Head: 1.49x as broad as high (excluding mandibles) (Fig. 110); POL 1.66x OOL; median ocellus separated from occipital margin by less (0.62x) than its own diameter. Frons finely carinate, carinae converging below toruli;

face with protuberences, lower face transversely carinate; vertex striate laterad to ocelli, rugose medially; eye separated by 1.85x their height, bare; malar space 0.68x height of eye; clypeus smooth without protuberences; lower margin of clypeus with transverse striations; supraclypeal area not defined; apical tooth of mandible long and thin. Antenna (Fig. 109) 12 segmented; scape as long as broad; funicle 9 segmented; F1 4.20x as long as broad, 1.27x as long as F2; flagellomeres slightly swollen apically; scape and pedicel bare, flagellar segments densely pilose; MPS absent; antennal length shorter than the combined length of head, mesosoma and petiole (10.6: 12).

Mesosoma: Mesoscutum and scutellum deeply and closely punctate, interstices carinate, bare; notauli distinct and foveolate; SSS deeply impressed and strongly carinate; scutellum (Fig. 111) broadly rounded with a slight median furrow, 1.56x as broad as the distance between SSS and frenal carina (including axilla); frenal line smooth and complete dorsally; frenal process stout; pitted; each tooth of posterior scutellar process shorter than its stalk; stalk 0.86x as long as wide; propodeum (Fig. 112) completely punctate, interstices carinate, without a median fovea, bare; callus bare; mesepisternum with a smooth area (Fig. 108); upper mesepimeron completely punctate, interstices carinate; femoral groove broad, transversely carinate, swollen anterior to mid coxa. Fore and mid coxa almost smooth with few faint striations at base, bare; mid coxa without ventral sulcus; hind coxa almost glabrous with very minute pits and hairs; all femora almost glabrous. Fore wing (Fig. 108) 3.01 x as long as broad; STV perpendicular to wing margin, 2x as long as broad, finger like, surrounded by brown infumation; PMV 4.50x stigmal vein; wing disc with microtrichia except at basal area bare; hind wing with microtrichia and marginal fringes; hamuli 3 in number.

Metasoma (Fig. 108): Petiole 0.86x as long as gaster , 5.47x as long as hind coxa, 1.42x as long as hind femur, smooth, slightly swollen submedially; Gt_1 glabrous.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

Etymology: The species epithet is an anagram of the generic name *'Stilbula'*.

Material examined: **Holotype**: Male, INDIA: Kerala; Malappuram Dt.; Pullancode Reserve Forest; Chenappadi (11°12'N 76°20'E), Sureshan P.M. & Party, 1.v.1993, GK 182 (DZUC).

Discussion: This new species closely resembles to *S. lata* in having: (1) Posterior process of scutellum stouter; (2) Petiole with dark ring or band submedially, shorter than gaster; (3) Median ocellus separated from occipital margin by less than its own diameter and (4) Hamuli 3 in number. However, this new species differ from *S. lata* Narendran in having: (1) Mesopleuron with out a smooth area anteriorly (In *S. lata* mesopleuron completely punctate without a smooth area); (2) Scutellar process (excluding teeth) shorter (0.86x) than its width (In *S. lata* scutellar process (excluding teeth) longer (1.30x) than its width); (3) STV fingerlike and its margins clear (In *S. lata* margins of STV not clear); (4) POL 1.60x OOL (In *S. lata* POL 2.50x OOL) and (5) Head and mesosoma dark brown with metallic green refringence (In *S. lata* head and mesosoma bluish green with metallic refringence).

This new species is also close to *S. muthangensis* sp. nov. in having: (1) Scutellar process stout; (2) Head and mesosoma dark brown with metallic black reflections; (3) Antenna brownish yellow; (4) Fore wing with infumation adjoining stigma; (5) Median ocellus separated from occipital

margin by less than its own diameter and (6) Mesopleuron with a smooth area. However, this new species differs from *S. muthangensis* sp. nov. in having: (1) Stalk of scutellar process (excluding teeth) 0.86x as long as broad (In *S. muthangensis* stalk of scutellar process (excluding teeth) 1.21x as long as broad; (2) STV perpendicular to wing margin and finger like (In *S. muthangensis* sp. nov. STV angled to wing margin and stout); (3) Petiole 1.42x as long as hind femur (In *S. muthangensis* sp. nov. petiole 1.62x as long as hind femur); (4) F1 1.27x as long as F2 (In *S. muthangensis* sp. nov. F1 1.44 x as long as F2); (5) Body length 4.47 mm (In *S. muthangensis* sp. nov. body length 5.96 mm) and (6) Hamuli 3 in number (In *S. muthangensis* sp. nov. hamuli 4 in number).

6. *Stilbula isula* sp. nov.

(Figs. 113-117)

Holotype: **Male**: Length 3.57 mm. Head and mesosoma brownish black; antenna pale brownish yellow; mandibles pale brownish yellow; ocelli reflecting yellow; eyes blackish brown; coxae dark brown with apices near to trochanter yellowish brown, remaining parts of legs pale brownish yellow; claws brown; tegula yellowish brown; wings hyaline, venation dark brown; petiole whitish yellow with dark brown band submedially; upper half of gaster dark brown, lower half yellowish brown.

Head: 1.58x as broad as high (excluding mandibles) (Fig. 115); POL 2.25x OOL (Fig. 116); median ocellus separated from occipital margin by its own diameter; frons finely carinate, carinae converging well below toruli; lower face transversely carinate; vertex striate laterad to ocelli, rugose medially; eyes separated by 1.92x their height, bare; malar space 0.76x height of eye; clypeus smooth on upper half, faint transverse striations on lower half; supraclypeal area not well defined, transversely striated on upper half, smooth on lower half, labrum with 8 digits; apical tooth of mandible long and thin.

Antenna (Fig. 114) 12 segmented; scape as long as broad; funicle 9 segmented; F1 5.50x as long as broad, 1.22x as long as F2; flagellomeres slightly swollen apically; scape and pedicel bare; flagellar segments pilose; MPS absent; antennal length longer than combined length of head, mesosoma and petiole (13.8: 12.7).

Mesosoma: Mesoscutum and scutellum deeply and closely punctate, interstices carinate, surface bare; notauli distinct and foveolate; SSS deeply impressed and strongly carinate; scutellum broadly rounded, 1.46x as broad as distance between SSS and frenal carina with a median furrow; frenal line smooth, complete dorsally; frenal process stout, pitted; each tooth of posterior scutellar process shorter than its stalk; stalk 1.30x as wide as its length. Propodeum completely punctate, interstices carinate, without a median carina, bare; callus bare; mesepisternum almost fully sculptured (Fig. 117); upper mesepimeron completely punctate, interstices carinate; femoral groove broad and transversely carinate, swollen anterior to mid coxa. Fore and mid coxae striate basally; mid coxa without ventral sulcus, hind coxa without striations; femora glabrous; tibiae and tarsi with setae. Fore wing (Fig. 113) 2.90x as long as broad; margins of STV and PMV not clear; wing disc with microtrichia except at basal area bare; hind wing with microtrichia and marginal fringes; hamuli 3 in number.

Metasoma (Fig. 113): Petiole subequal to gaster, 6.05x as long as hind coxa, 1.59x as long as hind femur smooth and swollen submedially; Gt_1 glabrous.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

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

Material examined: **Holotype**: Male, INDIA: Kerala; Kozhikode Dt.; Nanminda (11°26'N 75°50'E), Girish Kumar P., 14.ii.2004, GK 525 (DZUC).

Discussion: This new species is close to *S. lata* Narendran in having: (1) Posterior process of scutellum stouter; (2) Margins of stigma not clear (3) Mesopleuron rugosopunctate; (4) Antenna pale brownish yellow; (4) Fore wing without an infumation adjoining STV; (5) Scutellar teeth shorter than its stalk; (6) Fore wing 2.90x as long as broad and (7) Hamuli 3 in number. However, this new species differs from *S. lata* in having: (1) Head and mesosoma brownish black (In *S. lata* head and mesosoma bluish green with metallic refringence); (2) Eye blackish brown (In *S. lata* eye brownish yellow); (3) POL 2.25x OOL (In *S. lata* POL 2.50x OOL); (4) Median ocellus separated from occipital margin by its own diameter (In *S. lata* median ocellus separated from occipital margin by less than its own diameter); (5) Mouth plate 8 digitate (In *S. lata* mouth plate 12 digitate); (6) Petiole subequal to gaster (In *S. lata* petiole distinctly shorter than gaster) and (7) Stalk of scutellar process shorter (0.76x) than its width (In *S. lata* stalk of scutellar process longer (1.30x) than its width.

This new species also resembles to *S. lepida* sp. nov. in having: (1) Posterior process of scutellum stouter; (2) Median ocellus separated from occipital margin by its own diameter; (3) Mouth plate 8 digitate; (4) Mesopleuron rugosopunctate without a distinct smooth area and margin of STV not clear. However, this new species differs from *S. lepida* sp. nov. in having: (1) Head and mesosoma brownish black without metallic green reflections (In *S. lepida* sp. nov. head and mesosom blackish brown with metallic green reflections); (2) Eyes blackish brown (In *S. lepida* sp. nov. eye reddish brown); (3) Fore wing without an infumation adjoining STV (In *S. lepida* sp. nov. fore wing with an infumation adjoining stigma); (4) POL

2.25x OOL (In *S. lepida* sp. nov. POL 1.90x OOL); (5) Petiole subequal to gaster (In *S. lepida* sp. nov. petiole distinctly shorter than gaster; (6) Stalk of scutellar process wider than long (0.76x) (In *S. lepida* sp. nov. stalk of scutellar process as long as wide) and (7) Hamuli 3 in number (In *S. lepida* sp. nov. hamuli 4 in number).

7. *Stilbula lata* Narendran

(Figs. 118-121)

Stilbula lata Narendran, 1996. *Entomon* 21(1): 69-70. Type data: India: Kerala; Kayamkulam. Holotype Female (examined) (DZUC), by original designation. Description of male illustrated.

Diagnosis: Male: Length 3.3 mm. Head and mesosoma bluish green with metallic refringence; interstices of mesosoma with slight purple reflections; ocelli and antenna pale brownish yellow; eye brownish yellow; coxae brown with apices paler; wings hyaline; head width (Fig. 120) in anterior view 1.60x its median length (excluding mandibles); POL 2.50x OOL; median ocellus separated from occipital margin by less than its own diameter; frons with distinct oblique and semicircular striations (Fig. 120); clypeal area slightly striate, shiny; supraclypeal area smooth, shiny; epistomal sulcus faintly distinct; clypeogenal sulci and tentorial pits deep and distinct; vertex and scrobe longitudinally and transversely striate, upper part of scrobe rugosopunctate; mouth plate 12 digitate; eyes separated in front view by 1.80x height of eye; antenna (Fig. 119) 12 segmented; mesoscutum and scutellum deeply and closely punctate; scutellum with a median longitudinal forea; scutellum wider than distance between SSS and frenal carina; each tooth of posterior scutellar process shorter than its stalk, 1.30x as long as its width (Fig. 121); propodeum completely punctate; without median carina; callus bare; mesopleuron distinctly and closely punctate without a patch of smooth area; fore wing (Fig. 118) 2.90x as long as its maximum width; petiole smooth, distinctly shorter than remaining part of gaster, longer than hind

femur, middle part slightly thickened; gaster (Fig. 118) 1.90x its height in side view; tergites smooth and polished; gaster shorter than mesosoma.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

Material examined: **Holotype**: Male, INDIA: Kerala; Thrissur (10°31'N 76°13'E), Narendran T.C. 4.xii.1988 (DZUC). **Paratype**: 1 1Male, INDIA: Kerala; Alappuzha Dt.; Kayamkulam (9°10'N 76°30'E), Narendran T.C., 19.ii.1989 (DZUC). **Other materials examined:** 7 Males, INDIA: Kerala; Ernakulam (10°1'N 76°18'E), Narendran T.C., 9.ii.1989, GK 167, 173, 175, 183, 186, & 192.

Discussion: This species comes near *Stilbula mysorensis* (Mani & Dubey) in general appearance but *S. mysorensis* differs from this new species in having fore wing with slight infumation adjoining stigma, scutellar process blunt and slightly bifurcated and eyes separated in front view 1.6x height of eye.

8. Stilbula lepida sp. nov.

(Figs. 122-126)

Holotype: Male: Length 5.59 mm. Head and mesosoma blackish brown with metallic green reflections; antenna brownish yellow; mandibles pale brownish yellow; ocelli reflecting brownish yellow; eye reddish brown; coxae brown with apices near to trochanter paler, remaining parts of legs pale brownish yellow; claws brown; tegula yellowish brown; wings hyaline except brown infumation adjoining stigma, venation dark brown; petiole brownish yellow with brown band submedially; upper half of gaster brownish black, lower half yellowish brown.

Head: 1.65x as broad as high (excluding mandibles) (Fig. 123); POL 1.90x OOL; median ocellus separated from occipital margin by its own diameter; frons finely carinate, carinae converging well below toruli, lower face transversely carinate; vertex striate laterad to ocelli; rugose medially; eyes separated by 2.20x their height, bare; malar space 0.95x height of eye; clypeus smooth on upper half, faint transverse striations on lower half; supraclypeal area not well defined, transversely striated except at apex near to clypeus smooth; labrum with 8 digits; apical tooth of mandible long and thin. Antenna (Fig. 122) 12 segmented; scape 1.42x as long as broad; funicle 9 segmented; F1 7x as long as broad, 1.2x as long as F2; flagellomeres slightly swollen apically; scape and pedicel bare; flagellar segments pilose; MPS absent; antenna longer than the combined length of head, mesosoma and petiole (11.6: 10.2).

Mesosoma: Mesoscutum and scutellum deeply and closely punctate, interstices carinate, surface bare (Fig. 124); notauli distinct and foveolate; SSS deeply impressed and strongly carinate; scutellum broadly rounded with a median furrow, 1.77x as broad as distance between SSS and frenal carina (including axilla); frenal process stout, pitted, each tooth of posterior scutellar process shorter than it stalk; stalk as wide as its length (Fig. 126); propodeum completely punctate, interstices carinate, without a median carina, bare; callus bare; mesepisternum (Fig. 125) almost fully sculptured; upper mesepimeron completely punctate, interstices carinates; femoral groove broad, transversely carinate, swollen anterior to mid coxa. Fore and mid coxae striate basally; mid coxa without ventral sulcus, hind coxa and all femora glabrous; tibiae and tarsi with setae. Fore wing (Fig. 122) 2.78x as long as broad; margins of STV and PMV not clear; wing disc with microtrichia except at basal area bare; hind wing with microtrichia and marginal fringes; hamuli 4 in number.

Metasoma (Fig. 122): Petiole 0.82x as long as gaster, 3.72x as long as hind coxa, 1.36x as long as hind femur, smooth and swollen submedially; Gt_1 glabrous.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

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

Material examined: **Holotype**: Male, INDIA: Kerala; Malappuram Dt., Calicut University Campus (11° 7' N 75° 5' E), Indu V., 30.iv.2001, GK 157 (DZUC). **Paratype**: 1 Male, same locality of holotype, Saritha, 1.vii.2001, GK 156 (DZUC).

Discussion: This new species resembles to *S. lata* Narendran in having: (1) Scutellar process stout and pitted; (2) Head and mesosoma with metallic green refringence; (3) Frons finely carinate, carinae converging well below toruli; (4) Mesopleura rugosopunctate without smooth area; (5) Petiole distinctly shorter than gaster and (6) Margins of stigmal vein not clear as. However, this new species differs from *S. lata* Narendran in having: (1) Fore wing with an infumation adjoining stigma (In *S. lata* fore wing without infumation adjoining stigma); (2) POL 1.90x OOL (In *S. lata* POL 2.50x OOL); (3) Median ocellus separated from occipital margin by its own diameter (In *S. lata* median ocellus separated from occipital margin by less than its own diameter); (4) Mouth plate 8 digitate (In *S. lata* mouth plate 12 digitate); (5) Eyes separated by 2.20x their height (In *S. lata* eyes separated by 1.80x their height); (6) Scutellar stalk as long as its width (In *S. lata* scutellar stalk 1.30x its width) and (7) Hamuli 4 in number (In *S. lata* hamuli 3 in number).

9. *Stilbula muthangensis* sp. nov.

(Figs. 127-130)

Holotype: Male : Length 5.96 mm. Head and mesosoma dark brown with metallic black reflections; antenna brownish yellow; mandible yellowish brown; ocelli reflecting yellowish brown; eyes dark brown; coxae brown, remaining parts of legs pale brownish yellow; claws pale brown; tegula brown; wings hyaline except for small infuscate spot around STV, venation brown; petiole brownish yellow with brown band submedially; upper half of gaster black, lower half brown.

Head: 1.59x as broad as high (excluding mandibles) (Fig. 128); POL 1.68x OOL; median ocellus separated from oceipital margin by less (0.41x) than its own diameter; frons finely carinate, carinae converging just below toruli; face with protuberences, lower face transversely carinate; vertex striate laterad to ocelli, rugose medially; eyes separated by 2.09x their height, bare; malar space 0.81x height of eye; clypeus smooth with protuberences, few faint transverse striations above clypeus; supraclypeal area not defined; labrum with 12 digits; apical tooth of mandible long and thin. Antenna (Fig. 127) 12 segmented; scape slightly longer than broad; funicle 9 segmented; F1 5.50 x as long as broad, 1.44x as long as F2; flagellomeres slightly swollen apically; scape and pedicel bare, flagellar segments pilose; MPS absent; antennal length shorter than the combined length of head, mesosoma and petiole (11: 12.8).

Mesosoma: Mesoscutum and scutellum deeply and closely punctate, intestices carinate, surface bare; notauli indistinct and foreolate; SSS deeply impressed and strongly carinate; scutellum broadly rounded with median furrow, 1.77x as broad as the distance between SSS and frenal carina (including axilla) (Fig. 129); frenal line smooth and complete dorsally; frenal process pitted; each tooth of posterior scutellar process shorter than its stalk;

stalk 1.21x as long as broad; propodeum (Fig. 130) completely punctate, interstices carinate without median carina, bare; callus bare; mesepisternum with a smooth area (Fig. 127); upper mesepimeron completely punctate, interstices carinate; femoral groove broad, transversely carinate, swollen anterior to mid coxa; fore coxa smooth with very small protuberences; mid coxa smooth with few faint striations, without ventral sulcus; hind coxa and all femora glabrous. Fore wing (Fig. 127) 2.90x as long as broad; STV angled to wing margin, stout, 1.60x as long as broad; PMV 2 x as long as STV; wing disc with microtrichia; hind wing with microtrichia and marginal fringes; hamuli 4 in number.

Metasoma (Fig. 127): Petiole 0.85x as long as gaster, 5.20x as long as hind coxa, 1.62x as long as hind femur, smooth and slightly swollen submedially; Gt_1 glabrous.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

Etymology: The species is named after the collection locality.

Material examined: **Holotype**: Male, INDIA: Kerala; Wayanad Dt.; Muthanga Wild life Sanctuary (11°44' N 76°29' E), Narendran T.C. & Party, 7.v.2000, GK 189 (DZUC).

Discussion: This new species resembles to *S. ashokai* Narendran in having: (1) Scutellar process stout; (2) Mesopleuron with a distinctly smooth area; (3) Petiole distinctly shorter than gaster; (4) Fore wing with infumation adjoining stigma and (5) Median ocellus separated from occipital margin by less than its own diameter. However, this new species differs from *S. ashokai* in having: (1) POL 1.68x OOL (In *S. ashokai* POL 2.5x OOL); (2) Head and mesosoma dark brown with metallic black reflections (In *S. ashokai* head and

mesosoma black with metallic green refringence); (3) Body length 5.96 mm (In *S. ashokai* body length 3.43 mm) and (4) Eyes separated by 2.09x their height (In *S. ashokai* eyes separated by less than 2x their height).

This new species is also similar to *S. bullista* sp. nov. in having: (1) Scutellar process stout; (2) Head and mesosoma dark brown with metallic black reflections; (3) Antenna brownish yellow; (4) Fore wing with infumation adjoining stigma; (5) Median ocellus separated from occipital margin by less than its own diameter and (6) Mesopleuron with a smooth area. However, this new species differs from *S. bullista* sp. nov. in having: (1) Stalk of scuteliar process (excluding teeth) 1.21x as long as broad (In *S. bullista* sp. nov. scutellar process (excluding teeth) 0.86x as long as broad); (2) STV angled to wing margin and stout (In *S. bullista* sp. nov. STV perpendicular to wing margin and finger like; (3) Gastral petiole 1.62x as long as hind femur (In *S. bullista* sp. nov. gastral petiole 1.42x as long as hind femur); (4) F_1 1.44x as long as F2 (In *S. bullista* sp. nov. F1 1.27x as long as F2); (5) Body length 5.96 mm (In *S. bullista* sp. nov. body length 4.47 mm) and (6) Hamuli 4 in number (In *S. bullista* sp. nov. hamuli 3 in number).

10. *Stilbula namida* sp. nov.

(Figs. 131-134)

Holotype: Male: Length 4.77 mm. Head and mesosoma dark brown with metallic black reflections; antenna pale brownish yellow; mandibles pale brownish yellow; median ocellus reflecting brownish yellow, lateral ocelli reflecting red; eyes reddish brown; coxae dark brown with apices near to trochanter yellowish brown, remaining parts of legs pale brownish yellow, claws brown; tegula yellowish brown; wings hyaline, venation pale brown; petiole yellow with pale brown band submedially; upper half of gaster brown, lower half yellowish brown.

Head: 1.69 x as broad as high (excluding mandibles) (Fig. 133); POL 2.42 x OOL; median ocellus separated from occipital margin by less (0.5x) than its own diameter; frons finely carinate, carinae converging below toruli; lower face transversely carinate; vertex striate laterad to ocelli, slightly rugose medially; eyes separated by 1.90x their height, bare; malar space 0.87x height of eye; clypeus smooth on upper half, faint transverse striations on lower half; supraclypeal area not well defined, transversely striated on upper half, smooth on lower half; labrum with 9 digits; apical tooth of mandible long and thin; Antenna (Fig. 132) 12 segmented; scape as long as broad; funicle 9 segmented; F1 4.36x as long as broad, 1.26x as long as F2; flagellomeres slightly swollen apically; scape and pedicel bare; flagellar segments pilose; MPS absent; antennal length longer than combined length of head, mesosoma and petiole (12.4: 11.7).

Mesosoma: Mesosocutum and scutellum deeply and closely punctate, interstices carinate, surface bare; notauli distinct and foveolate; SSS deeply impressed, strongly carinate; scutellum broadly rounded with median furrow, 1.44x as broad as distance between SSS and frenal carina (including axilla) (Fig. 134); frenal line smooth and complete dorsally; frenal process stout, pitted; each tooth of posterior scutellar process shorter than its stalk; stalk 0.86 x as long as wide; propodeum completely punctate, interstices carinate, without a median carina, bare; callus bare; mesepisternum with a smooth area (Fig. 131); upper mesepimeron punctate, interstices carinate; femoral groove broad and transversely carinate, swollen anterior to mid coxa. Fore and mid coxae striate basally; mid coxa without ventral sulcus, hind coxa and all femora glabrous. Fore wing (Fig. 131) 3.55 x as long as broad; STV 1.40x as long as broad; PMV 1.14x as long as STV; wing disc with microtrichia except at basal area bare; hind wing with microtrichia and marginal fringes; hamuli 3 in number.

Metasoma (Fig. 131): Petiole 0.83x as long as gaster, 3.87x as long as hind coxa, 1.40x as long as hind femur, smooth and swollen submedially; Gt_1 glabrous.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 8).

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

Material examined: **Holotype**: Male, INDIA: Kerala; Kozhikode Dt.; Nanminda (11°26' N 75° 50'E), Girish Kumar P., 8.iv.2001, GK 190 (DZUC).

Discussion: This new species resembles to *S. ashokai* Narendran in having (1) POL 2x or above 2x OOL; (2) Mesopleuron with a distinct smooth area on anterior half; (3) Posterior process of scutellum stouter; (4) Median ocellus separated from occipital margin by less than its own diameter and (5) Petiole distinctly shorter than remaining part of gaster. However, this new species differs from *S. ashokai* in having: (1) Fore wing without a brown infumation adjoining stigma (In *S. ashokai* fore wing with a brown information adjoining stigma); (2) Head and mesosoma dark brown with metallic black reflections (In *S. ashokai* head and mesosoma black with metallic green reflections); (3) Mouth plate 9 digitate (In *S. ashokai* mouth plate 12 digitate); (4) Fore wing 3.55x as long as its maximum width (In *S. ashokai* fore wing 2.83x as long as its maximum width) and (5) Hamuli 3 in number (In *S. ashokai* hamuli 4 in number).

This new species is also close to *S. bangalorica* sp. nov. in having: (1) Fore wing without brown infumation adjoining stigma; (2) POL 2x or above 2x OOL; (3) Mesopleuron with a distinct smooth area on anterior half and (4) Posterior process of scutellum stouter. However, this new species differs

from *S. bangalorica* sp. nov. in having: (1) POL 2.42x OOL (In *S. bangalorica* sp. nov. POL 2.80x OOL); (2) Head and mesosoma dark brown with metallic black reflectins (In *S. bangalorica* sp. nov. head and mesosoma black with metallic green reflections); (3) Median ocellus reflecting brownish yellow, lateral ocellus reflecting red (In *S. bangalorica* sp. nov. median and lateral ocelli reflecting yellowish brown); (4) Base of coxa dark brown without metallic green reflections (In *S. bangalorica* sp. nov. base of coxa brown with metallic green reflections); (5) Body length 4.77 mm (In *S. bangalorica* sp. nov. body length 6.28 mm); (6) Stalk of scutellar process 0.86x as long as broad (In *S. bangalorica* sp. nov. stalk of scutellar process as long as broad); (7) Mouth plate 9 digitate (In *S. bangalorica* sp. nov. mouthplate 8 digitate) and (8) Hamuli 3 in number (In *S. bangalorica* sp. nov. hamuli 7 in number).

11. *Stilbula tanjorensis* (Mani & Dubey)

(Figs. 135-143)

Stilbula tanjorensis Mani & Dubey, 1974. *Memoirs of the School of Entomology* No.3: 39-41. Type data: India: Tamil Nadu; Tanjore. Holotype Female (USNM), by original designation. Description of both sexes illustrated.
Stilbula tanjorensis (Mani & Dubey), comb. nov. by Hedqvist 1978: 247.

Plesiotype: Female: Length 4.70 mm. Head and mesosoma blackish brown with metallic green reflections; antenna dark brown; mandibles brownish yellow; ocelli reflecting reddish brown; eyes reddish brown; coxae brown; remaining parts of legs pale brownish yellow; claws and tegulae brown; wings hyaline with brown infumation adjoining STV, venation brown; petiole pale brownish yellow with brown band medially; gaster dark brown with upper half of first tergite black.

Head: 1.40x as broad as high (excluding mandibles) (Fig. 137); POL 2.50 x OOL; median ocellus separated from occipital margin by less (0.87 x)

than its own diameter; frons finely carinate, carinae reaches up to the level of toruli; face with minute protuberences; lower face transversely carinate; vertex striato ruguse; eyes separated by 1.64x their height, bare; malar space 0.64x height of eye; clypeus smooth with minute protuberences, supraclypeal area not defined, lower half smooth; labrum with 7 digits; apical tooth of mandible long and thin. Antenna (Fig. 136) 12 segmented; scape longer than broad; funicle 9 segmented; F1 3x as long as broad, 1.2x as long as F2; flagellomeres not swollen apically; scape and pedicel bare; flagellar segments pilose; MPS absent; antenna distinctly shorter than combined length of head, mesosoma and petiole (6.3 : 9.6).

Mesosoma: Mesocutum and scutellum closely punctate, interstices carinate, surface bare; notauli distinct and foveolate; SSS deeply impressed, strongly carinate; scutellum broadly rounded with a slight median furrow; frenal line smooth and complete dorsally; frenal process (Fig. 138) slender and pitted; propodeum completely punctate, interstices carinate, without a median carina; callus bare; mesepisternum with a smooth area (Fig. 135); upper mesepimeron completely punctate, interstices carinate; femoral groove broad, transversely carinate, swollen anterior to mid coxa. Fore coxa weakly striated anteriorly; mid coxa weakly rugose dorsally and ventrally, smooth laterally, with ventral sulcus; hind coxa and all femora glabrous; tibiae smooth and bare except at apices near to tarsi with weak setae; tarsi setose. Fore wing (Fig. 135) 2.84x as long as broad; STV 2.25x as long as broad; PMV 2x as long as STV; wing disc with microtrichia except at basal third bare; hind wing with microtrichia and marginal fringes; hamuli 3 in number.

Metasoma (Fig. 135): Petiole 0.49x as long as gaster, 3.2x as long as hind coxa, as long as hind femur, smooth, slightly swollen medially; Gt_1 glabrous.

Male: Length 4.31 mm; petiole with a band submedilly; antenna dark brownish yellow; POL 2.16 x OOL (Fig. 142); median ocellus separated from occipital margin by less (0.57x) than its own diameter; carinae reaches below level of toruli; vertex striate laterad to ocelli, rugose in between ocellus, broadly rounded; eyes separated by 1.88 x their height; malar space 0.73 x height of eye (Fig. 141); F1 4.16x as long as broad (Fig. 140); 1.47x as long as F2; flagellomeres slightly swollen apically; antenna longer than the combined length of head, mesosoma and petiole (13.80: 10.45). STV 2.1x as long as broad; PMV 1.33x as long as STV; petiole 0.82x as long as gaster, 5.11 x as long as hind coxa, 1.58 x as long as hind femur, smooth, swollen submedially. Other characters as in female.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala, Tamil Nadu) (Fig. 8).

Material examined: **Plesiotype**: Female, INDIA: Tamil Nadu; Coimbatore (11°0' N 76°58' E), Narendran T.C. & Party, September 1987, GK 14 (DZUC). **Other material examined**: 3 Males, same data of plesiotype, GK 13, 15 & 16. 4 Males, INDIA: Kerala; Malappuram Dt.; Manjeri (11°7' N 76° 7' E), Sheeba M., 25.xi.2003, GK 462,463 & 464 (description and illustration provided) and 24.10.2004,GK 619. 1 Male, INDIA: Kerala; Trissur (10°31'N 76°13'E), Priya Menon, 28.vi.1999, GK 191. 1 Male, INDIA: Kerala, Malappuram Dt.; Calicut University Campus (11° 7' N 75° 5' E), Sudheer K., 16.vii.2001, GK 168 (DZUC).

Discussion: This species resembles *S. minispina* Heraty in having frons with longitudinal striations mostly on upper half and in several other characters but differs from it in having: (1) Scutellar process with a slender elongated stalk (In *S. minispina* scutellar process with a single narrow frenal spine); (2) Flagellum dark brown to black (In *S. minispina* flagellum tetaceous); (3) Mesoscutal side lobes mostly smooth and evenly rounded (In *S. minispina* mesoscutal side lobes smooth and swollen); (4) Body black with dark green metallic reflections (In *S. minispina* body dark brown with bluish

reflections); (5) Labrum with 9 digits (In *S. minispina* labrum with 6 digits) and (6) Body length 5mm (In *S. minispina* body length 2.5 mm).

Remarks: This is the **first report** of this species from Kerala.

7. GENUS *SCHIZASPIDIA* WESTWOOD

Schizaspidia Westwood, 1835. *Proceedings of Zoological Society of London* 3: 69. Type species: *Schizaspidia furcifer* Westwood, by monotypy.

Laetocantha Shipp, 1894. *Entomologist* 27: 188 Type species: *Thoracantha nasua* Walker, by original designation. Synonymy by Baltazar, 1961: 394.

Psygmatocera Enderlein, 1912. *Entomologische Mitteilungen* 1: 146. Type species: *Psygmatocera ceylonica* Enderlein, by original designation. Synonymy by Baltazar, 1961:394.

Astilbula Girault, 1913d. *Archiv fur Naturgeschichte* 79 AH6: 101. Type species: *Astilbula aenea* Girault, by monotypy. Synonymy by Boucek, 1988: 534.

Neokapala Girault, 1913d. *Archiv fur Naturgeschichte* 79 AH6: 92. Type species: *Neokapala furcatella* Girault (= *Astilbula aenea* Girault), by original designation. Synonymy by Hedqvist, 1978: 231.

Kapatella Girault, 1932a. *Memoirs of the American Entomological Institute* 28: 4[289]. Type species: *Kapatella transstriata* Girault (= *Astilbula aenea* Girault),by monotypy. Synonymy by Hedqvist, 1978: 231.

Thoracanthella Girault, 1940. *Revista de la Sociedad Entomologica Argentina* 10: 323. Type species: *thoracanthella emersoni* Girault, by original designation. Synonymy by Hedqvist, 1978: 231.

Kapaloides Mani, 1944. *Indian Journal of Entomology* 4: 155. Type species: *Kapaloides travancorensis* Mani, by original designation. Synonymy by Hedqvist, 1978: 227.

Diagnosis: Mesosoma usually dark metallic green or blue, rarely entirely black; antennal flagellum of female serrate, usually with 9 or rarely 10 flagellomeres, with last 2 segments partially fused (Fig. 145); 10 segmented flagellum of male pectinate, F2 simple, serrate or with a short branch that always much shorter than branch of F3 (Fig. 152); posterolateral corners of mesoscutum produced as a prominent flange that extends over tegula; scutellum produced apically in to a horizontal flat fork; tines usually long, rarely short, produced from a single basal process, laterally projection margined by a distinct carina (Fig. 147); frenal groove absent; axillular

groove present or absent; fore wing hyaline or with dark infuscate patch around STV.

Distribution: Indo - Pacific Region, including the Papuan subregion of Australia and the Polynesian subregion. *Schizaspidia* is widely distributed and ranges from India in the west, South China and Taiwan in the north, northern Australia (Queensland) in the South, and the Tonga and Solomon Islands in the east.

Biology and Hosts: *Schizaspidia* was reared from *Odontomachus* in Sri Lanka (Clausen, 1941) and Western Malaysia. Oviposition habits of *Schizaspidia* vary with the different forms of the ovipositor. *S. antennata* and *S. nasua* use an expanded ovipositor to hollow a chamber in leaf tissue and deposit 1-4 eggs in serpentine rows or scattered punctures (Clausen, 1940b; Ishii, 1932). *S. convergens* uses a needle like ovipositor to deposit clusters of a few hundred eggs under the leaf or bud scales of jackfruit (*Artocarpus*, Moraceae). Host plants for *S. antennata* and *S. nasua* are leaves of *Eugenia* (Myrtaceae), *Medinilla* (Melastomaceae), *Gliricidia* (Fabaceae) and *Leucaena* (Fabaceae) (Clausen, 1940b; Ishii, 1932).

Immature stages: Egg and planidium of *S. antennata* (Clausen, 1940 a & b); first and thir instar larva and pupa of *S. convergens* (Clausen, 1940a) and the egg and planidium of *S. nasua* (Ishii, 1932).

Discussion: The taxonomic history of *Schizaspidia* Westwood was reviewed by Boucek (1988). Keys to species were provided by Hedqvist (1978) for the Indo-Pacific region and by Narendran (1985a) for Indian subcontinent. Unfortunately, the accurate identification of species is difficult (Boucek, 1988). There is considerable variation within species and between sexes, especially in the sculpture of the mesosoma and shape of the scutellar tines.

This genus resembles *Pogonocharis* Heraty in having: (1) Antenna of both sexes with 10 flagellomeres, with the last 2 segments of female often fused; (2) Scutellum produced as long fork, if diverging spines short, than scutellum with alveolate or rugoso-alveolate sculpture and (3) Dorsal length of prepectus short, apex broadly separated from tegula. However, this genus differs from *Pogonocharis* in having: (1) Antennal flagellomeres of female serrate, male pectinate (In *Pogonocharis* antennal flagellomeres of female simple, male weakly serrate with a dense brush of ventral setae; (2) Frons smooth or striate, most of lower face smooth and bare (In *Pogonocharis* frons and lower face vertically striate and lower face including clypeus pilose) and (3) Ovipositor acicular or swollen, curved and strongly ridged (In *Pogonocharis* ovipositor acicular).

Remarks: Twenty eight species are known from all over the world of which 19 species were from Oriental Region. Nine species were recorded from Indian subcontinent, of which 5 valid species were reported from Kerala (Narendran, 1985a; Heraty, 2002; Girish Kumar, 2004). The present work recognizes 6 species of which 1 species is new to science. A key to the species of Indian subcontinent is also provided. In this study most of the specimens were collected from agroecosystems. Some specimens were collected from tropical rain forests such as Kottiyoor reserve forest, Nadukani reserve forest, Palode reserve forest etc., while some specimens were collected from deciduous forest such as Manimooly forest of Nilambur.

KEY TO SPECIES OF *SCHIZASPIDIA* WESTWOOD OF INDIAN SUBCONTINENT

(Modified from Narendran, 1985a)

1. Antennae with very long branches (Figs. 152, 161, 178, 184 & 189) ..... 2 (Males)

-- Antennae without long branches (Fig. 145, 155 & 170) .... 10 (Females)

2. First flagellar segment without a tooth or branch 3

-- First flagellar segment with a tooth or branch 5

3. Mesopleuron with distinct punctures and pits and without a distinct smooth area; scutellar arms short ..... *S. convergens* (Walker)

-- Mesopleuron smooth at extreme anterodorsal angle followed by obscure transverse striations; scutellar arms long and prominent 4

4. Clava subequal to preceeding 3 segments combined (Fig. 178); petiole smooth (Fig. 182); gaster black without green reflection; labrum with 9 digits (Fig. 175); aedeagus exserted .... *S. sabariensis* (Mani & Dubey)

-- Clava 1.25x as long as preceding 3 segments combined (Fig. 152) petiole rugose dorsally and smooth ventrally (Fig. 150); gaster blackish brown with metallic green reflections; labrum with 8 digits (Fig. 15); aedeagus not exserted ..... *S. anupama* sp. nov.

5. Flagellar segments with cylindrical branches; head and body dark metallic green in colour ..... *S. travancorensis* (Mani)

-- Flagellar segments with flattened branches 6

6. Mesopleuron anteriorly with a more or less smooth area (Fig. 186) 7

-- Mesopleuron rugosopunctate without a smooth area 8

7. Scutellum with very large and broad forks (Fig. 185) .... *S. sitarami* Narendran

-- Scutellum with smaller and narrower forks ..... *S. andamanensis* (Mani)

8. Scutellum with short and broad apical branches (as in Fig. 24 of Hedquist, 1978) ..... *S. frucifera* Westwood

-- Scutellum not as above 9

9. Gaster subglobose (Fig. 26G of Mani *et al.*, 1974); petiole smooth without any striae; fore wing with a diffuse faint infumation .... *S. coromandelica* (Mani & Dubey)

-- Gaster elongate (Fig. 166); petiole not smooth but distinctly rugosopunctate; fore wing without infumation .... *S. malabarica* Narendran

10. Scutellar arms very short (as in Fig. 12 of Hedqvist, 1978) with longitudinal striations; fore wing with a transverse band from STV, extending towards posterior wing margin ..... *S. furcifera* Westwood

-- Scutellum not as above 11

11. Scutellum with large pits, umbilicately punctate (Fig. 173); upper part of frons with strong striations; fore wing with a distinct conspicuous infumation around STV ..... *S. sabariensis* (Mani & Dubey)

-- Scutellum not as above 12

12. Scutellum with more or less longitudinal carinae with regular transverse wrinkles (as in Fig. 14 of Hedqvist, 1978); gaster green; Head and body metallic yellowish green ..... *S. convergens* (Walker)

-- Scutellum not as above 13

13. Scutellum with more or less weak irregular longitudinal carinae without irregular transverse wrinkles on lateral sides, with few scattered weak punctures medially (Fig. 147).; fore wing with a distinct conspicuous infumation around STV (Fig. 144); upper half of gaster blackish brown with metallic green reflections, lower half brown ..... *S. anupama* sp. nov.

-- Scutellum with more or less irregular longitudinal carinae with irregular wrinkles (Fig. 157); fore wing almost hyaline without any distinct infumation; gaster ferrugenous brown .... *S. brevifuniculata* Narendran

1. *Schizaspidia anupama* sp. nov.

(Plates IV C, IV D, VI A & VI B; Figs. 144-154)

Holotype: Female: Length 4.04 mm. Head, mesosoma and petiole blackish brown with metallic green reflections; antenna dark brown except scape yellowish brown; mandible yellowish brown; ocelli reflecting brownish yellow; eyes dark brown; coxae concolourous with mesosoma, all femora yellowish brown, all tibiae and tarsi brownish yellow, claws blackish brown; tegula pale yellow; fore wing with blackish brown infumation, faintly extending towards lower margin; veins brown with apex of SMV near to MV and STV blackish brown; body hairs silvery; wing disc with dark brown piloses; upper half of gaster blackish brown with metallic green reflections, lower half brown.

Head: Width subequal to mesosomal width when measured from dorsal side; head 1.21x as broad as high (excluding mandibles) (Fig. 146); POL 1.55 x OOL; diameter of median ocellus 2x distance between median ocellus and occipital margin; frons smooth and polished on lower half with upper weak striations; lower face smooth; vertex with few striations; a strong carina encircle median ocellus dorsally (Fig. 147); occipital carina reaches just beyond posterior ocellus; occiput with striations, eyes separated by 1.68x their height, bare; gena with faint striations; malar space subequal to height of eye (0.92x); antennal scrobe smooth, polished on lower half, strong transverse striations on upper half; epistomal sulcus indistinct; tentorial pit deep; clypeogenal sulci distinct, deep; clypeus smooth with few scattered hairs; supraclypeal area indistinct, smooth without hairs; labrum with 8 digits; apical tooth of mandible long and thin. Antenna (Fig. 145) 11 segmented; scape 4.20x as long as broad, 2.33 x as long as F1; flagellum 1.1 x as long as head (excluding mandibles); funicle 8 segmented; F1 1.63 x as long as broad, simple, 0.75 x as long as clava; clava 0.77x as long as preceeding two

segments; scape and pedicel sparsely setose, flagellar segments pilose, MPS small and recessed into depressions; antenna 0.84 x head and mesosoma combined (excluding scutellar process).

Mesosoma: Dorsum moderately setose; mesoscutum 1.92 x as broad as long, transversely striated except lateral sides, closely punctate and interstices carinate; notauli distinct, complete; mesoscutum without median fovea; scutellum with irregular longitudinal striations (Fig. 147); SSS deeply impressed and strongly carinate, meeting TSA through broad forea; axillular groove present; axillular area densely setose; scutellum subequal (0.91 x) to scutellar process; scutellar process as in Fig.; metanotum closely punctate, interstices carinate, bare; propodeum (Fig. 149) 3.5x as long as metanotum; propodeal spiracle broadly separated from dorsal margin, propodeal disc broadly rounded, faintly sculptured, with a group of long hairs on two sides, middle area bare; post spiracular furrow not well pronounced; callus not swollen, with dense long hairs; metapleuron with hairs; femoral groove shallow; mesepimeron (Fig. 148) with a smooth area and sparse hairs on the lateral margin towards metapleuron; transepimeral sulcus absent; acropleuron deeply grooved for reception of upper corner of prepectus; margin of prepectus towards mesopleuron with hairs; fore coxa with weak striations, mid coxa with few strong striations, hind coxa smooth; 2 tibial spurs, one is longer than other; Fore wing (Fig. 144) 2.80 x as long as broad; STV perpendicular to wing margin; basal area bare; hind wing vein not continuous with a gap at its posterior end (Fig. 144); hamuli 6 in number.

Metasoma (Fig. 144): Petiole 0.26x as long as gaster, 1.20x as long as hind coxa, dorsal half almost smooth without distinct sculptures, ventral half smooth with longitudinal striations; gastral tergites smooth and shiny with few sparse setae; gaster completely covered by 3 visible tergites; hypopygeum

with 3 pairs of long hairs; cerci present with a bunch of setae; ovipositor not exserted.

Male: Length 3.89 mm; ocelli reflecting brownish black; tibiae yellowish brown; claws blackish brown, tegula yellowish brown. POL 1.85 x OOL; diameter of median ocellus 3x distance between median ocellus and occipital margin; frons with strong striations on dorsal half (Fig. 151); vertex in between posterior ocellus and eye coriaceous; malar space 0.76x height of eye; antenna (Fig. 152) 12 segmented; scape 2.53 x as long as broad, 1.90x as long as F1; flagellum 1.31x as long as head (excluding mandibles); funicle 9 segmented; F1 1.25x as long as broad; F3 teeth 1.16x as long as F2 teeth; clava 1.25x as long as preceding 3 segments combined; antenna 0.70x head and mesosoma combined (excluding scutellar process); scutellum closely punctate, interstices carinate (Fig. 153); scutellum 1.08x as long as scutellar process through median line; propodeum 4x as long as metanotum; propodeal disc closely punctate; upper mesepimeron closely punctate without smooth area; mesepisternum with a smooth area anterodorsally (Fig. 154); fore coxa with a carina basally, mid coxa smooth; hind tibial spurs subequal in length; fore wing (Fig. 150) 2.49x as long as broad; petiole (Fig. 150) 0.51x as long as gaster, 1.90x as long as hind coxa, 0.63x as long as hind femur, dorsal half rugose, ventral half smooth with weak longitudinal striations; gaster almost completely covered by one visible tergite; hypopygium with a tuft of hairs, not exserted. Other characters as in female.

Host : Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 9).

Etymology: The species name is from Sanskrit, which means 'unique' due to its unique scutellar shape and sculpture.

Variation: Size varies from 3.33 mm - 4.04 mm; labrum with 8-9 digits; hamuli 5-7 in number.

Material examined: **Holotype**: Female, INDIA: Kerala; Kozhikode Dt.; Kakkur (11°23'N 75°49'E), Girish Kumar P., 27.viii.2004, GK 604 (DZUC) **Paratypes**: 12 Males, same data of holotype, GK 591 to GK 602. 21 Males, INDIA: Kerala; Thiruvananthapuram Dt.; Palode Tropical Botanical Garden and Research Institute; (8° 42' N 77° 2'E); Girish Kumar P., 8.xii.2004, GK 643 to GK 652 & 10.xii.2004, GK 653 to GK 663. 14 Males, INDIA: Kerala; Kannur Dt.; Chovva (11° 52' N 75° 23' E), Seena N., 2.v.2004, GK 573, 28.xi.2004, GK 623, 624, 5.xii.2004, GK 627, 629, 12.xii.2004, GK 664 to GK 669. 7 Males, INDIA: Kerala; Malappuram Dt.; Nilambur (11° 16' N 76° 13' E), Aboobaker, 23.i.1996, GK 307, 308, 309, 310, 311, 312 & 321. 1 Male, INDIA: Kerala, Kollam Dt.; Thenmala (8° 57' N 77°5' E), Girish Kumar P., 8.xii.2004, GK 636. 1 Male, INDIA: Kerala; Kozhikode Dt.; Cheroopa (11° 14' N 75° 47' E), Abdul Latheef, 10.xi.2004, GK 751. 1 Male, INDIA: Kerala; Malappuram Dt.; Manjeri (11°7' N 76° 7'E), Sheeba M., 27.xi.2005, GK 721. 1 Male, INDIA: Kerala, Kottayam Dt., Kumarakom (9°36' N 76° 26' E), Sheeba M., 7.xii.2005, GK 740. 8 Males, INDIA: Kerala; Kannur Dt.; Kottiyoor reserve forest (10° 7' N 78° 49' E), Girish Kumar P. and Divakaran T., 17.ii.2003, GK 371 to GK 378. 2 Males, INDIA: Kerala; Kozhikode Dt.; Kanayamkode, (11° 27' N 75° 44' E); near Koyilandi, Girish Kumar P., 9.i.2005, GK 671 & 672. 6 Males, INDIA: Kerala; Ernakulam Dt.; Aluva (76° 21' E 10°7' N), K.A. Karmali, 1.viii.2000, GK 379 to 384. 6 Males, INDIA: Karnataka; Uppinangadi (12° 56' N 75° 15'E), Narendran T.C, GK 38, 44, 54, 59, 64, 72. 4 Males, INDIA: Kerala; Malappuram Dt.; Nilambur (11° 16'N 76° 13' E), Manimooly forest, P. Girish Kumar, G.K. 364, 367, 368 & 369. 1 Male, INDIA: Kerala; Nilambur forest (11°16'N 76°13' E), Ganapathikallu, Girish Kumar P., 30.i.2003, GK 363. 10 Males, INDIA: Kerala, Malappuram Dt., Nilambur (11°16' N 76°32'E), T.C. Narendran, February, 1994, GK 322 to 331. 1 Male, INDIA: Kerala; Kozhikode Dt.; Balussery; (11°27' N 75° 50' E); Karumala; T. Jobiraj, 5.vi.2000, GK 341. 2 Males, INDIA: Kerala; Kozhikode Dt., Thamarassery; Anakampoyil (11°8' N 76° 3' E), Narendran T.C. & Party, 17.x.1995, GK 402 & 403. 1 Male, INDIA: Kerala; Palakkad Dt.; Parambikulam (10°24' N 76° 49' E), P.M. Sureshan, 5.ii.1995, GK 338. 2 Males, INDIA: Kerala; Malappuram Dt.; Nedumkayam (11°18' N 76° 16' E), Narendran T.C. & Party, 23.i.1990, GK 58 & 77. 1 Male, INDIA: Kerala; Kannur Dt.; Payyannur (12° 6' N 75°12' E), Narendran T.C. & Party, 26.ii.1988. 1 Male, INDIA: Kerala, Kozhikode Dt.; Kurukkathodu, P.M. Sureshan, 6.iv.1995, GK 337. 3 Males, INDIA: Kerala; Pathanamthitta Dt.; Perunad; Ranni (9° 23' N 76° 49' E), Narendran T.C., 24.xi.1988, GK 332 to 334. 3 Males, INDIA: Kerala; Idukki Dt.; Adimali (10° 2' N 76° 59' E), T.C. Narendran, 3.xii.1988, GK 39, 53 & 67. 4 Males, INDIA: Kerala; Kasaragod Dt.; Manjeswaram (12° 42' N 74°53'

E), Narendran T.C., 27.ii.1988, GK 43, 44, 61 & 71. 2 Males, INDIA: Kerala; Kozhikode Dt.; Peruvannamuzhi (11° 36' N 75° 56' E), Narendran T.C. & Party, 25.1.1988, GK 52 & 82. 2 Females and 12 Males, INDIA: Kerala; Kozhikode Dt.; Pookad (75° 44' E 11°23' N), K. Sudheer, 20.vi.2004, GK 575, & 576, 19.xi.2004, GK 607-617, 5.xii.2004, GK 626. 1 Female and 1 Male, INDIA: Kerala; Kannur Dt.; Aralam Wild Life Sanctuary (75° 40' E 11° 58' N), K. Raj Mohana, 16.xii.1995, GK 335 & 336. 1 Female and 27 Males, INDIA: Kerala; Kozhikode Dt.; Nanminda (11° 26' N 75° 5' E), P. Girish Kumar, 12.x.2003, GK 415 & 416, 24.x.2003, GK 417, 26.x.2003, GK 423-426, 2.xi.2003, GK 433 & 434, 9.xi.2003, GK 444 - 448, 7.xii.2003, GK 465-466, 25.xii.2003, GK 478-480, 4.i.2004, GK 484-488, 10.iv.2005, GK 674-675, 11.xii.2005, GK 734. 1 Female and 10 Males, INDIA: Kerala; Malappuram Dt.; Nedumkayam (11° 18' N 76° 16' E), P. Aboobacker, 12.i.1995, GK 296-306. 5 Females and 13 Males, INDIA: Kerala; Pathanamthitta Dt.; Ranni (9°23' N 76° 49' E), Valiyakavu, Narendran T.C. & Party, 25.ii.1993, GK 278-295. 1 Female and 1 Male, INDIA: Kerala; Palakkad Dt.; Parambiculam Wild Life Sanctuary (10° 24' N 76°49' E), Orukombenparambu, K. Raj Mohana, 3.xi.1995, GK 400 & 401. 4 Females and 20 Males, INDIA: Karnataka; Hosmota; Narendran T.C. & Party, 17.xii.1988, GK 35, 36, 37, 40, 41, 42, 45, 46, 47, 48, 49, 50, 51, 55, 56, 57, 63, 68, 69, 70, 73, 74, 76, 78. 1 Female and 1 Male, INDIA: Kerala; Kannur Dt.; Nedumpoyil, T.C. Narendran, 11.ii.1988, GK 60 & 75 (DZUC).

Discussion: *S. anupama* sp. nov. closely resembles *S. sabariensis* (Mani & Dubey) in having: (1) Fore wing with brown infumation around STV (2) Scutellar fork prominent; (3) Mesopleura smooth at extreme anterobasal angle and (4) Tergites smooth and shiny. However, this new species differs from *S. sabariensis* (Mani & Dubey) in the following features: (1) Gaster blackish brown with metallic green reflections (In *S. sabariensis* gaster black without metallic green reflections); (2) Clava 1.25x as long as preceding three segments combined; (In *S. sabariensis* clava subequal to preceding three segments combined); (3) In female, scutellum with more or less weak irregular longitudinal carinae without irregular transverse wrinkles on lateral sides, with few scattered weak punctures medially (In *S. sabariensis* scutellum with large pits, umbilicately punctate); (4) Petiole rugose dorsally, smooth ventrally. (In *S. sabariensis* petiole smooth) and (5) Aedeagus not exserted (In *S. sabariensis* aedeagus exserted).

This new species is also very close to *S. brevifuniculata* Narendran in having: (1) Mesopleuron smooth at extreme anterobasal angle and (2) Gastral tergites smooth and shiny without distinct sculptures. However, this new species differs from *S. brevifuniculata* Narendran in having: (1) In female, scutellum with more or less weak irregular longitudinal carinae without irregular transverse wrinkles on lateral sides, with few scattered weak punctures medially (In *S. brevifuniculata* scutellum with more or less irregular longitudinal carinae with irregular wrinkles); (2) Fore wing with a distinct conspicuous infumation around STV (In *S. brevifuniculata* fore wing almost hyaline without any distinct infumation) and (3) Upper half of gaster blackish brown with metallic green reflections, lower half brown (In *s. brevifuniculata* gaster ferrugenous brown).

2. *Schizaspidia brevifuniculata* Narendran

(Figs. 155-160)

Schizaspidia brevifuniculata Narendran, 1985a. *Journal of the Bombay Natural History Society* 82(3): 606-607. Type data: India: Kerala, South Malabar, Chettiyarmad, Holotype Female (examined) (DZUC). Description of female, illustrated.

Diagnosis: **Female**: Head and Body blackish metallic green; antennae dark brown with scape and pedicel yellowish brown; coxae concolorous with mesosoma, femora and middle portions of tibiae brown; apices of femora, bases and apices of tibiae and tarsi pale yellow; wings hyaline without any distinct infumation; head width subequal to thoracic width; frons smooth, polished with very weak striations on dorsal half (Fig. 156) POL: 9, OOL 5; tentorial pits deep; antenna as in figure 155; scutellum sculptured as in figure 157; sculpture of mesopleuron as in figure 158; petiole a trifle longer than hind coxa, sides weakly carinte; gastral tergites smooth, shiny without distinct sculptures.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala, Karnataka) (Fig. 9).

Material examined: **Holotype**: Female, INDIA: Kerala, S. Malabar, Chettiarmad (near Calicut University Campus) (11° 8' N 75° 5' E), T.C. Narendran, 15.i.1984 (DZUC). **Other material examined**: 1 Female; INDIA: Kerala; Calicut University Campus (11° 71 N 75° 5' E), Narendran T.C. & Party, ii.1989, GK 572. 1 Female, INDIA: Kerala; Kozhikode Dt.; Chelavoor (11° 18' N 75° 52' E), T. Jobiraj, 15.xi.1999, GK 340. 1 Female, INDIA: Kerala; Kasargod Dt., Chowki, near CPCRI Campus (12°31' N 74° 59' E), P. Girish Kumar, 23.i.2003, GK 370. 1 Female, INDIA: Karnataka; Sringeri (13°25'N 75°15'E), P.A. Sinu, 1.x.2003, GK 749, from Arecanut plantation.

Discussion: *Schizaspida brevifuniculata* Narendran resembles to *S. fasciatipennis* (Girault) but differs from it in not having a transverse band on the fore wing, in having different colour of the body (not blue green as in *S. fasciatipennis)* and in having differences in the shape and size of the antennal segments.

Remarks: This species is reported for **the first** time from Karnataka.

3. *Schizaspidia malabarica* Narendran

(Figs.161-166)

Schizaspidia malabarica Narendran, 1985a. *Journal of the Bombay Natural History Society* 82(3): 607-608. Type data: India: Kerala, South Malabar, Ramanattukara, near Calicut. Holotype Male (examined), by original designation (DZUC). Description of male, illustrated.

Diagnosis: Male: Head and body generally blackish green; antenna pale brown; eyes blackish yellow; coxae blackish brown, remaining parts of legs brownish yellow; petiole blackish green; gaster yellowish brown; wings hyaline without infumation, veins pale brown; head width equal to width of mesosoma; frons smooth, polished on lower half, upper half rugulose very sparsely setose; tentorial pits deep; sculpture on scutellum as in figure 163; mesopleuron as in figure 164; petiole a trifle longer than twice length of hind

coxa, dorsal side with distinct reticulate punctures, ventral side shallowly grooved longitudinally; gastral tergites smooth, shiny.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala) (Fig. 9).

Material examined: **Holotype**: Male, INDIA: Kerala; S. Malabar, Ramanattukara, near Calicut, (11°9' N 75° 54' E) T.C. Narendran, 1.v.1983. **Paratype**: 1 Male, INDIA: Kerala; S. Malabar, Calicut University (11° 7' N 75° 5' E), T.C. Narendran *et al.*, 1.iv.1985. GK 569. **Other material examined**: 1 Male, INDIA: Kerala; S. Malabar, Calicut University (11° 7' N 75° 5' E), Narendran T.C. & Party, 3.vii.1989. GK 339.

Discussion: *S. malabarica* Narendran resembles to the Philippine species, *S. batuensis* Hedqvist but differs from it in having entirely different type of scutellum, different type of antenna, different colouration of head and body and in several other features.

4. *Schizaspidia sabariensis* (Mani & Dubey)

(Figs. 167-174)

Kapaloides sabariensis Mani & Dubey, 1974. *Memoirs of the school of Entomology* 3: 42-45. Type data: India: Kerala; Cardamom Hills. Holotype Male, by original designation (USNM). Description of male, illustrated.

Schizaspidia sabariensis; new combination by Hedqvist, 1978. *Steenstrupia* 4: 238, 240.

Diagnosis: **Female**: Body black with metallic bluish green; head dark metallic green; antennae reddish brown except scape yellowish brown; wings hyaline with aconspicuous infumation around STV (Fig. 172); fore and mid coxae dark brown; hind coxa concolourous with mesosoma, femora dark brown; tibiae and tarsi brown; petiole and Gt_1 metallic bluish black; head subequal to mesosoma; clypeal fovea deep; labrum with 9 digits; funicular segments 2, 3, 4, 5 and 6 distinctly pectinate above; scutellum as in figure 173; scutellar arms prominent; mesopleura smooth at extreme anterodorsal

angle; petiole smooth and slender; gastral tergites smooth, shiny; ovipositor subequal to width of abdomen (Fig. 174).

Male: Body black with metallic green reflections; head black; antenna dark brown except scape brownish yellow; wings hyaline with a diffuse conspicuous infumation around STV; coxa concolourous with mesosoma, rest of legs brown; petiole and abdomen black except the brown aedeagus and tip of abdomen; head subequal to thorax; clypeal fovea deep; labrum with 9 digits; scrobe shallow, transversely striate (Fig. 175); funicle 2-9 segmented with long branches (Fig. 178); club subequal to preceding 3 segments combined; scutellum as in figure 181; mesopleura smooth at extreme anterodorsal angle; fore wing as in figure 180; petiole smooth, slender; gastral tergites smooth, shining.

Host: Unknown.

Distribution: India (Kerala) (Fig. 9).

Discussion: This species similar to *S. travancorensis* (Mani), but differs in large body size, predominent black colour antenna with 8 branches, F_1 without any branch, branches more flattened, scutellum with shallow median carina, scutellar arm 0.36 x as long as scutellum and petiole smooth, without any longitudinal striae.

Remarks: This species is not represented in the present collection and the above diagnosis is based on the original description by Mani *et al.* (1974).

5. *Schizaspidia sitarami* Narendran

(Figs. 183-188)

Schizaspidia sitarami Narendran, 1985a. *Journal of the Bombay Natural History Society* 82(3): 607-608. type data: India: Kerala; Calicut University Campus. Holotype Male (examined), by original designation (DZUC). Description of male, illustrated.

Diagnosis: **Male:** Head and mesosoma greenish black; antenna blackish brown; coxae and petiole concolourous with mesosoma, rest of legs and gaster brownish yellow; wings hyaline without infuscation; head width subequal to width of mesosoma; frons smooth, polished with somewhat strong striations on upper part; POL 10; OOL 8; tentorial pits deep; antennae as in figure 184; sculpture of scutellum as in figure 185; mesopleura as in figure 186; petiole a little over two times the length of hind coxa, dorsal and lateral sides distinctly punctate, sides ecarinate, ventral surface with irregular weak carinae; gastral tergites smooth, shiny.

Host: Unknown.

Distribution: India (Kerala) (Fig. 9).

Material examined: **Holotype**: Female, INDIA: Kerala; Calicut University Campus (11° 7' N 75° 5' E), Narendran *et al.*, 1.iv.1985. **Other material examined**: 1 Male, INDIA: Kerala, v.1989, GK 345 (exact locality and name of collector not known).

Discussion: This species resembles to *S. batuensis* Hedqvist but differs from it in having much broader scutellar forks, in having different scutellar sculptures and in having a number of other miner characters.

6. *Schizaspidia travancorensis* (Mani)

(Figs. 189-191)

Kapaloides travancorensis Mani, 1942. *Indian Journal of Entomology* 4: 153-162. Type data: Travancore. Holotype Male, by original designation (NZSI). Description of male, illustrated.

Schizaspidia travancorensis, New combination by Narendran 1985a. *Journal of the Bombay Natural History Society* 82(3): 609.

Diagnosis: Male: Body generally dark metallic green; head and coxae metallic green; antennae dark brown, as in figure 189 head uniformly pubescent, 0.71x as long as broad, wider than mesosoma, longitudinally striate in front between eye and scrobe (Fig. 190); striations near inner borders of the eye much longer and reaching lower down than those near

scrobe; face below antenna and sides of cheek below eye smooth, not striate; scrobe trasversely striate; occiput transversely striate; sculpture in the middle lobe of mesonotum reticulate and in the lateral lobes transversely reticulate-striate; scutellum relatively small, sculptured similiar to mesoscutum (Fig. 191); median furrow not very deep; scutellar process narrow, not extremely widely separated; carina moderately large; petiole moderately long and longitudinally striate.

Female: Unknown.

Host: Unknown.

Distribution: India (Kerala) (Fig. 9).

Discussion: This species resembles *S. andamanensis* (Mani). But differs in having: (1) Body mostly dark metallic green (In *S. andamanensis* body metallic greenish black); (2) Antennal branches not exceedingly flattened (In *S. andamanensis* antennal branches rather greatly flattened); (3) Scutellum with median furrow not very deep. (In *S. andamanensis* scutellum with median furrow rather deep); (4) Scutellar process relatively one-fifth shorter without an abnormally broad carinae (In *S. andamanensis* scutellar process relatively longer with broad carinae) and (5) Striae on face descending down to lower level of eye well on the attachment of antennae (In *S. andamanensis* striae on face well above the level of attachment of antennae and never descending below).

Remarks: This species is not represented in the present collection and the above diagnosis is based on the original description by Mani, 1942.

8. GENUS *CHALCURA* KIRBY

Chalcura Kirby, 1886. *Journal of the Linnean Society* 20: 28-37. type species: *Eucharis deprivata* Walker, by original designation.

Rhipipallus Kirby, 1886. *Journal of the Linnean Society* 20: 28-37. Type species: *Eucharis volosus* Walker, by original designation. Synonymy by Baltazar, 1961: 394.

Epimetagea Girault, 1913a. *Canadian entomologist* 45: 220-238. Type species: *Epimetagea purpurea* Girault (= *Rhipipallus affinis* Bingham), by original designation. Synonymy by Boucek, 1988: 527.

Chalcurelloides Girault, 1913b. *Archiv. für Naturgeschichte* 79 AH6: 46-47. Type species: *Chalcurelloides hyalinus* Girault, by original designation. Description repeated by Girault, 1915: 237. Synonymy by Boucek, 1988: 527.

Chalcuroidella Girault, 1913d. *Archiv für Naturgeschichte* 79 AH 6: 90-101. Type species: *Chalcuroidella orientalis* Girault, by original designation. Synonymy by Boucek, 1988: 527.

Astilbula Girault, 1913e. *Transactions of the Royal Society of South Australia* 37; 67-115. Type species: *Astilbula magnifica* Girault, by original designation. Synonymy by Boucek, 1988: 527.

Chalcurella Girault, 1913e. *Transactions of the Royal Society of South Australia* 37: 67-115. Type species: *Chalcurella nigricyanea* Girault, by original designation. Synonymy by Boucek, 1988: 527.

Chalcuroides Girault, 1913e. *Transactions of the Royal Society of South Australia* 37: 67-115. Type species: *Chalcuroides versicolor* Girault, by original designation. Synonymy by Boucek, 1988: 527.

Arhipipallus Girault, 1936. *Memoirs of the American Entomological Institute* 28: 323-325. Type species: *Rhipipallus turneri* Kirby, by monotypy. Synonymy by Boucek, 1988: 527.

Parachalcura Girault, 1940. *Revista de la Sociedad Entomologica Argentina* 10: 321-326. Type species: *Parachalcura ramosa* Girault, by monotypy. Synonymy by Boucek, 1988: 527.

Diagnosis: Funicular segments in females serrate (sometimes very weakly) or moniliform, in males pectinate (sometimes with double branches); flagellum 8 or 9 segmented in females; 10-segmented in males; face usually strongly striate, sometimes weakly striate or completely smooth; clypeal margin usually strongly produced as a smooth rounded lobe, rarely broadly rounded or subtruncate; corner of mesoscutum sharply upturned, smooth just above spiracle; dorsal sculpture of mesosoma ranges from almost completely smooth, rarely to entirely coarse rugose-alveolate, but usually only lateral

lobes of mesoscutum smooth, polished; a long, foveate, finger-like extension of prepectus that extends to tegula. Hypopygium with 2-3 hairs on each side of the mid line.

Distribution: Common in the eastern Australasian Region, ranging from the Philippines to Australia and east as far as Samoa. Specimens are also collected from mainland Asia including India and Sri Lanka. By far the greatest diversity is in Australia (23 spp.).

Biology and Hosts: *Chalcura affinis* has been reared from *Odontomachus* sp. (Girault, 1915; Boucek, 1988) and a species near *C.* polita from *Rhytidoponera chalybaea* Emery. Heraty collected females of a species near *C.* maculata from flowering *Lantana* (Verbenaceae) in Fiji. Females of *C. affinis* deposited small groups of several eggs into undeveloped flower buds of a small shrub like species of *Acacia* (Fabaceae), and active planidia were found in closed or partially open buds (Heraty, 2002). I have collected several specimens from the leaves of *Mangifera indica* L. (Anacardiaceae), *Musa paradisiaca* L. (Musaceae), *Cocos nucifera* L. (Arecaceae), *Areca catechu* L. (Arecaceae), *Gliricidia sepium* (Jaeq.) Kunth ex Walp (Papilionaceae), *Oryza sativa* L. (Poaceae), and *Tabernaemontana divaricata* (L.) R. Br. (Apocyanaceae).

Immature Stages: First instar larva of *C. aeginetus* and *C. affinis* have the same morphology and these are basically the same as *C. deprivata* (Clausen, 1940a). Important features include the presence of pleurostomal spines, hatchet-shaped labial plate, three pairs of setae on T III, enlarged setae on TV and T VI, ventral setae on T VII, two long thin apical processes on the ventropical margin of T VIII, and caudal cerci only slightly longer than T XII. The planidia are similar to *Schizaspidia* and *Ancylotropus*, but in these genera the apical margin of T XII is excised medially, not broadly rounded. The

planidia of *Austeucharis*, *Parapsilogastrus* and *Chalcura* are indistinguishable (Heraty, 2002).

Discussion: *Chalcura* Kirby is currently one of the largest genera of Eucharitidae with 29 described species. This genus closely resembles *Parapsilogastrus* Girault in having: (1) Scape slender; (2) Anterolateral corners of mesoscutum over spiracle produced as an upturned and smooth flange and (3) Ovipositor acicular. However, this genus differs from *Parapsilogastrus* in having: (1) Propodeal spiracle with ventral emargination (In *Parapsilogastrus* propodeal spiracle circular); (2) Hypopygium with 2-3 minute setae on each side of mucro (In *Parapsilogastrus* hypopygium with a fuft of bristlelike hairs on each side of mucro); (3) Male antenna pectinate (In *Parapsilogastrus* male antenna without branches) and (4) Female with funicular segments moniliform or serrate, if moniliform, then F1 serrate. (In *Parapsilogastrus* female antenna slightly moniliform, but with basal flagellomere simple).

Remarks: Twenty nine species are known from all over the world of which two species were from Oriental region and one species was from Indian subcontinent. One species was reported from Kerala (Narendran, 1986; Heraty, 2002; Girish Kumar, 2004). The present work recognizes 7 species of which 6 species are new to science. A key to the species of Indian subcontinent is also provided. In this study most of the species were collected from agroecosystems.

KEY TO SPECIES OF *CHALCURA* KIRBY OF INDIAN SUBCONTINENT

1. Antennae (Figs. 193, 202 & 220) without branches ..... 2 (Females)
-- Antennae (Figs. 197, 209, 213, 224 & 228) with branches .... 4 (Males)

2. F1 1.30x as long as scape (Fig. 193); POL 1.17x OOL (Fig. 195); diameter of median ocellus 2x distance between median ocellus and occipital margin (Fig. 195); ovipositor exserted (Fig. 192) .... *C. bouceki* sp. nov.

-- F1 1.2x or below 1.2x as long as scape (Figs. 202 & 220); POL 1.2x or above 1.2x OOL (Figs. 204 & 221); diameter of median ocellus below 2x distance between median ocellus and occipital margin (Figs. 204 & 221); ovipositor not exserted (Figs. 201 & 218) 3

3. Labrum with 10 digits; ocelli reflecting pale whitish yellow; eyes separated by 2.23x their height (Fig. 203); fore wing 2.87x as long as broad (Fig. 201); hamuli 4 in number; gaster covered by more than 2 visible tergites (Fig. 201) ..... *C. deprivata* (Walker)

-- Labrum with 6 digits; ocelli reflecting yellowish brown; eyes separated by 2.03x their height (Fig. 219); fore wing 2.59 x as long as broad (Fig. 218); hamuli 3 in number; gaster covered by 2 visible tergites (Fig. 218) ..... *C. nanmindica* sp. nov.

4. Length of first funicular segment equal or more than 2x its teeth (Fig. 234); F1 serrate (Fig. 224); POL 1.09 x OOL (Fig. 226); labrum with 8 digits; hamuli 3 in number; aedeagus not exserted; tergum almost completely covered by one visible tergite (Fig. 223) .... *C. neodeprivata* sp. nov.

-- Length of first funicular segment less than 2x its teeth (Figs. 197, 209, 213 & 228); F1 pectinate; other characters partly or completely different 5

5. Petiole subequal (more than 0.90 x) to hind femur (Fig. 228); a distinctly wide groove between pronotum and propleuron present (Fig. 231); hamuli 4 in number; labrum with 7 digits; upper mesepimeron, mesepisternum and posterior part of propleuron with a smooth area

(Fig. 232); gaster completely covered by more than one visible tergite (Fig. 228) ..... *C. sudheeri* sp. nov.

-- Petiole distinctly shorter (less than 0.90 x) than hind femur (Figs. 197, 208 & 213); no such distinct wide groove between pronotum and propleuron; hamuli 3 in number; other character partly or completely different 6

6. Upper mesepimeron and propleuron almost fully sculptured (Fig. 216); mesepisternum with a slight smooth area anteriorly (Fig. 217); diameter of median ocellus 1.75 x the distance between median ocellus and the occipital margin (Fig. 215) ..... *C. galata* sp. nov.

-- Upper mesepimeron and propleuron with distinctly smooth area; mesepisternum with distinctly smooth area (Fig. 200, 212); diameter of median ocellus 2 x or above distance between median ocellus and occipital margin (Fig. 199 & 211) 7

7. Aedeagus exserted (Fig. 197); F1 1.05 x as long as its teeth (Fig. 197); eyes separated by 2.25x their height (Fig. 198); F1 1.32x as long as scape (Fig. 197); labrum with 6 digits; gaster almost completely covered by one visible tergite (Fig. 197) ..... *C. bouceki* sp. nov.

-- Aedeagus not exserted (Fig. 208); F1 1.26 x as long as its teeth (Fig. 209); eyes separated by 2.09 x their height (Fig. 210); F1 1.10 x as long as scape (Fig. 209); labrum with 9 digits; gaster covered by more than one visible tergites (Fig. 208) ..... *C. deprivata* (Walker)

1. *Chalcura bouceki* sp. nov.

(Figs. 192-200)

Holotype: Female: Length 4.60 mm. Head and mesosoma metallic green; petiole blackish brown with metallic green reflections; gaster brown; antenna brown except scape and pedicel yellowish brown; eyes blackish brown with silvery white reflections; ocelli reflecting blackish brown;

mandible yellow with margins reflecting brown; coxae brown; femora brown except apices pale brownish yellow, remaining parts of legs pale brownish yellow; claws dark brown; tegula pale brownish yellow; fore wing with pale brown infumation adjoining stigma; wing veins pale brownish yellow.

Head: Subtriangular in front view, width slightly more than mesosomal width in dorsal view; head 1.40 x as broad as high (excluding mandibles); POL 1.17 x OOL; diameter of median ocellus 2 x the distance between median ocellus and occipital margin; frons vertically striate extending below toruli except lateral area towards eye without striations; frons with a large area bare as in Fig. 194; lower face with scattered setigerous pits; lateral part of vertex in between posterior ocellus and eye smooth, a strong carina encircle median ocellus anteriorly (Fig. 195); occipital carina extending beyond lateral ocellus; eyes separated by 2.20 x their height, bare; scrobal depression shallow, broadly impressed; gena weakly striated; malar space 1.07x height of eye; epistomal sulcus faintly present; tentorial pit deep; clypeogenal sulci distinct, deep; clypeus smooth with hairs; supraclypeal area smooth, almost bare, lateral sulcus weak, indistinct; interantennal toruli with transverse ridge; labral digits worn out (only 1 digit seen); mandible with apical tooth long. Antenna (Fig. 193) 11 segmented; scape 3.58 as long as broad; funicle 8 segmented; F2 5.80x as long as broad, simple; remaining funicular segments serrate; F1 0.30x as long as scape, 0.81x as long as F2 + F3; clava 0.83 x as long as preceeding two segments; scape and pedicel sparsely setose; MPS small and recessed in to depressions; antenna 1.44x head and mesosoma combined.

Mesosoma: Mesoscutum lifted upwards from pronotum around spiracle laterally, no overlap of silerites; dorsum sparsely setose; mesoscutum with anterior margin abrupt; largely rugose, transverse striato-rugose anteriorly; lateral lobe of mesoscutum smooth posteriorly; notauli deeply

impressed, foveate; mesoscutum without median fovea; SSS transverse, meeting TSA through broad fovea; lateral axillar lobe large; axillular groove absent; axillular area almost smooth near to wing base; scutellum rugose without median fovea; frenal line complete medially by a line; posterior margin of scutellum rounded (Fig. 195); metanotum with broad rounded flange laterally, overlapping anterior margin of propodeum; spiracle distinctly separate from propodeal margin, with a short emargination ventrally; propodeal disc broadly rounded, evenly sculptured; callus broadly rounded, slightly raised, densely pilose; metapleural groove present; femoral groove present, shallow; upper mesepimeron with a smooth area near to femoral groove; transepimeral sulcus absent; mesepisternum with a distinct smooth area on anterior half (Fig. 196); ventral margin of mesepisternum wedge-shaped and exceeding vertically anterior to mid coxa; apex of prepectus reaching tegula; spiracle narrowly enclosed. Fore coxa with several weak transverse striations; mid coxa with few strong transverse striations; hind coxa semiglobose, smooth; claws prominent, curved and bifid apically. Fore wing (Fig. 192) 2.59x as long as broad; STV slightly angled to wing margin; wing disc with moderately dense pilose except basal area and speculum bare, with marginal fringes; hind wing venation complete, fringe present; hamuli 3 in number.

Metasoma (Fig. 192): Petiole 0.38 x as long as gaster, 1.70x as long as hind coxa, with longitudinal striato-rugose; gastral tergites smooth and shiny with few sparse setae; gaster almost completely covered by first tergite; hypopygium with 2 long hairs on each side of mid line; cerci present with a bunch of setae; ovipositor exserted, acicular.

Male: Length 5.09 mm. Head, mesosoma and petiole with metallic green reflections, eye silvery white; legs pale brownish yellow except coxae dark brown; tegula and wing veins pale yellowish brown; diameter of median

ocellus 3x the distance between median ocellus and occipital margin (Fig. 199); occipital carina present in between posterior ocellus; malar space 0.93 x height of eye; epistomal sulcus distinct; labrum with 6 digits (Fig. 198); antenna (Fig. 197) 12 segmented; scape 2.80 x as long as broad; funicle 9 segmented; F1 pectinate, 1.32 x as long as scape, 1.05 x as long as its teeth; antenna 1.53 x head and mesosoma combined; axillular area sculptured; spiracle slightly separated from propodeal margin; petiole 0.57 x as long as gaster, 2.43 x as long as hind coxa, 0.82 x as long as hind femur; aedeagus exserted, curved downward. Other characters as in female.

Host: Unknown.

Biology: Unknown.

Distribution: India (Karnataka) (Fig. 10).

Etymology: Named after Dr. Zdeneck Boucek, for his valuable contributions to the systematics of Chalcidoidea.

Material examined: **Holotype**: 1 Female, INDIA: Karnataka; Hosmota, Narendran T.C. and Party, 17.xii.1988, GK 106 (DZUC). **Paratypes**: 2 Males, same data of holotype, GK 120 (description and illustration provided) and GK 105. 1 Female, INDIA: Karnataka; Vital, Narendran T.C. & Party, 16.ii.1988, GK 101 (DZUC).

Discussion: This new species is similar to *Chalcura deprivata* (Walker) in having: (1) Scape reaching median ocellus; (2) Lateral lobe of mesoscutum smooth; (3) Propodeal spiracle with a ventral emargination; (4) Upper mesepimeron, mesepisternum and posterior part of propleuron with a smooth area and (5) Hypopygium with 2 long hairs on each side of mid line. However, this new species differs from *C. deprivata* (Walker) in the following features: (1) Ovipositor exserted (In *C. deprivata* ovipositor not exserted). (2) F1 1.05 x as long as its teeth (In *C. deprivata* F1 1.26 x as long as its teeth); (3) Aedeagus exserted (In *C. deprivata* aedeagus not exserted) and (4) Gaster almost completely covered by one visible tergite (In *C. deprivata* gaster covered by more than 2 visible tergites).

2. *Chalcura deprivata* (Walker)

(Figs. 201-212)

Eucharis deprivata Walker, 1860. *Annals and Magazine of Natural History* (3) 6:359. Type data: Ceylon. Syntype Male (BMNH), type No.5, 623. Description of male.

Chalcura deprivata; comb. nov. by Kirby, 1886. *Journal of the Linnean Society* 20: 30.

Plesiotype : Female: Length 5.10 mm. Head black, mesosoma black with metallic green reflections; antenna brown except scape and pedicel yellowish brown; eyes brownish black; ocelli reflecting pale whitish yellow; mandible pale brownish yellow with margins reflecting brown; coxae concolourous with mesosoma, fore and mid femura pale brownish yellow, hind femur brown except apices yellow, remaining parts of legs pale brownish yellow, claws dark brown; tegula pale brownish yellow; fore wing with brown infumation adjoining STV; fore wing vein brown, hind wing vein yellowish brown; petiole blackish brown; gaster brown.

Head: Subtriangular in front view, width slightly more than mesosomal width in dorsal view, 1.40x as broad as high (excluding mandibles) (Fig. 203); POL 1.33 x OOL; diameter median ocellus 1.50x the distance between median ocellus and occipital margin; frons striated as in Fig.204 extending below toruli; frons with a large area bare as in Fig. 203; lower face scattered pits; lateral part of vertex in between posterior ocellus and eye smooth, a strong carina enrcircle median ocellus anteriorly; median ocelli slightly anterior to lateral ocelli; occipital carina occiput extending beyond lateral ocellus; occiput weakly striate; scrobal depression shallow, broadly impressed; eyes separated by 2.23 x their height, slightly protruding, bare; gena striated; malar space 1.04 x height of eye; epistomal sulcus present; tentorial pit deep; clypeogenal sulci distinct, deep; clypeus smooth with hairs; supraclypeal area smooth, almost bare, lateral sulcus weak,

indistinct; inter antennal toruli with transverse striations; labrum with 10 digits; mandible well developed, protruded out with apical tooth long. Antenna (Fig. 202) 11 segmented; scape 3.66x as long as broad, reaching anterior ocellus; funicle 8 segmented; F1 4.16x as long as broad, simple; remaining funicular segments serrate; F1 1.13 x as long as scape, 0.76 x as long as F2 + F3; clava 0.91 x as long as preceding two segments; scape and pedicel sparsely setose; MPS small and recessed into depressions; antenna 1.44x head and mesosoma combined.

Mesosoma: Mesoscutum lifted upwards from pronotum around spiracle laterally, no overlap of sclerites; dorsum sparsely setose; mesoscutum with anterior margin abrupt; mesoscutum transverse striato-rugose anteriorly; lateral lobe smooth posteriorly; notauli deeply impressed, foveate; mesoscutum without median fovea; SSS transverse, meeting TSA through broad fovea; lateral axillar lobe large; axillular groove absent, axillular area near to wing base smooth; scutellum rugose, without median fovea; frenal line complete medially by a line; posterior margin of scutellum broadly rounded anterior to frenal line; frenum broadly rounded; metanotum with broad rounded flange laterally, overlapping anterior margin of propodeum, not overlapping propodeal spiracle; spiracle distinctly separate from propodeal margin (Fig. 207); spiracle with a short ventral emargination; propodeal disc broadly rounded and weakly sculptured; callus broadly rounded, slightly raised, densely pilose; metapleural groove present; femoral groove present; upper mesepimeron with a smooth area near to femoral groove; transepimeral sulcus absent; mesepisternum with a distinct smooth area on anterior half (Fig. 206); ventral margin of mesepisternum wedge-shaped, extending vertically anterior to mid coxa; propleuron with a distinct smooth area posteriorly; apex of prepectus reaching tegula; spiracle narrowly enclosed. Fore coxa with several weak transverse striations; mid coxa with few strong transverse striations; hind coxa semiglobose, smooth; claws prominent,

curved and bifid apically; hind tibia with two spurs. Fore wing (Fig. 201) 2.87 x as long as broad; STV slightly angled to fore wing margin; wing disc with moderately dense pilose except basal area and speculum bare, with marginal fringes; hind wing venation complete, fringe present; hamuli 4 in number.

Metasoma (Fig. 201): Petiole 0.25x as long as gaster, 1.45x as long as hind coxa, with longitudinal striato - rugose; gastral tergites smooth, shiny with few sparse setae; gaster covered by more than one visible tergites; hypopygium with 2 long hairs on each side of mid line; cerci present with a bunch of setae; ovipositor not exserted.

Male: Length 4.93 mm; head, mesosoma and petiole brownish black with metallic green reflections; antenna yellowish brown; eyes black; ocelli reflecting black; coxae brownish black except hind coxa yellowing brown; gaster reddish brown; head 1.35x as broad as high (excluding mandibles) (Fig. 210); POL 1.24 x OOL; diameter of median ocellus 2 x the distance between median ocellus and occipital margin (Fig. 211); occipital carina present in between posterior ocellus; eyes separated by 2.09x their height; malar space 0.90x height of eye; epistomal sulcus not distinct; labrum with 9 digits. Antenna (Fig. 209) 12 segmented; scape 2.83 x as long as broad, reaching median ocellus; funicle 9 segmented; F1 pectinate, 1.11 x as long as scape, 1.26 x as long as its teeth; antenna 1.56 x head and mesosoma. Fore wing (Fig. 208) 2.45x as long as broad; hamuli 3 in number; petiole 0.65x as long as gaster, 2.61x as long as hind coxa, 0.87x as long as hind femur. Other characters as in female.

Host: *Odontomachus haematodes* (Linnaeus) (Ponerinae) (Gahan 1940; Clausen, 1940b, 1941).

Behaviour: Oviposits into leaf buds of *Artocarpus* (Moraceae), *Codiaeum* (Euphorbiaceae) and *Cordia* (Boraginaceae) (Heraty, 2002).

Biology: Third instar (Clausen, 1940a).

Distribution: India (Kerala) (Fig. 10), Sri Lanka.

Material Examined: **Plesiotype**: Female, INDIA: Kerala; Kozhikode Dt.; Nanminda (11°26' N 75° 50' E), P. Girish Kumar, 11.iv.2004. GK 543 (DZUC). **Other material examined**: 1 Female and 2 Males, same data of plesiotype female, GK 560 (male, description and illustration provided), GK 542 & GK 55 (DZUC).

Discussion: *Chalcura deprivata* (Walker) resembles *C. aeginetus* (Walker) in having (1) First flagellar segment with a branch and (2) Mesopleura smooth above. However, it differs from *C. aeginetus* in the following characteristics: (1) Posterior part of scapulae smooth (In *C. aeginetus* (Walker) posterior part of scapulae reticulate punctate) and (2) All funicular segments slightly serrate in female (In *C. aeginetus* (Walker) 3rd - 5th funicular segments with teeth in female.

3. *Chalcura galata* sp. nov.

(Figs. 213-217)

Holotype: Male: Length 4.05 mm. Head and mesosoma blackish brown with metallic green reflections; eye greyish brown; ocelli reflecting yellowish brown; mandible yellow with brownish tinge on margins; coxae blackish brown; hind femur brown, remaining parts of legs brownish yellow; claws dark brown; tegula pale brownish yellow; fore wing with brown infumation adjoining stigma; wing veins pale brown; petiole blackish brown; gaster brown.

Head: Subtriangular in front view, width 1.24x longer than mesosomal width in dorsal view, 1.36x as broad as high (excluding mandibles) (Fig. 214); POL 1.30x OOL; diameter of median ocellus 1.75 x

the distance between median ocellus and occipital margin; frons strongly striated, extending below toruli except lateral area near to eye; lower face with scattered setigerous pits; lateral part of vertex between posterior ocellus and eye without striations; median ocellus slightly anterior to lateral ocellus (Fig.215); occipital carina present in between posterior ocellus; occiput smooth except few peripheral striations; eye separated by 1.90x their height, bare; scrobal depression shallow, broadly impressed; gena with striations; malar space 0.86 x height of eye; epistomal sulcus indistinct; tentorial pit deep; clypeus smooth with hairs; supraclypeal area smooth, lateral sulcus indistinct; labrum with 6 digits; mandible well developed with apical tooth long. Antenna (Fig. 213) 12 segmented; scape 2.75 x as long as broad, reaching median ocellus; funicle 9 segmented; F1 pectinate, 1.23x as long as scape, 1.21 x as long as its teeth; scape and pedicel sparsely setose; antenna 1.52x head and mesosoma combined.

Mesosoma: Mesoscutum lifted upwards from pronotum around spiracle laterally, no overlap of sclerites; dorsum sparsely setose; mesoscutum strongly rugose; lateral lobe of mesoscutum with a slightly smooth area posteriorly; notauli deeply impressed, foveate; mesoscutum without median fovea; SSS transverse, meeting TSA through broad fovea; lateral axillar lobe large; axillular groove absent; axillular area near to hind wing base slightly sculptured; scutellum strongly rugose without median fovea; frenal line complete medially by line; metanotum with a broad rounded flange laterally, overlapping anterior margin of propodeum, not overlapping propodeal spiracle; spiracle distinctly separated from propodel margin; spiracle with a short ventral emargination; propodeal disc strongly rugose; post spiracular sulcus present; callus slightly raised, densely pilose; metapleural groove present; upper mesepimeron almost fully sculptured; transepimeral sulcus absent; mesepisternum with a slightly smooth area near anterior half (Fig.217); ventral margin of mesepisternum wedge-shaped and extending

vertically anterior to mid coxa; propleuron almost fully sculptured (Fig. 216); apex of prepectus reaching tegula; spiracle narrowly enclosed. Fore coxa with several weak transverse striations; mid coxa with few strong transverse striations; hind coxa semiglobose, smooth; claws prominent, curved and bifid apically; Fore wing (Fig. 213) 2.48 x as long as broad; STV slightly angled to wing margin; wing disc with moderately dense pilose except basal area and speculum bare, with marginal fringes; hind wing venation complete, fringe present; hamuli 3 in number.

Metasoma (Fig. 213): Petiole 0.56x as long as gaster, 2.33x as long as hind coxa, 0.77 x as long as hind femur, with longitudinal striations; gaster completely covered by one visible tergite, smooth, shiny with sparse setae; aedeagus exserted, curved downward.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 10).

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

Material examined: Holotype: 1 Male, INDIA: Kerala; Malappuram Dt.; Calicut University Campus (11° 7' N 75° 5' E), Rajasree, 7.vii.2001, GK 390 (DZUC).

Discussion: This new species is similar to *C. deprivata* (Walker) in having: (1) F1 pectinate; (2) F1 less than 2x its teeth; (3) Petiole distinctly shorter than hind femur and (4) Hamuli 3 in number. However, it differs from *C. deprivata* in the following characteristics: (1) Labrum with 6 digits (In *C. deprivata* labrum with 9 digits); (2) Upper mesepimeron almost fully sculptured (In *C. deprivata* upper mesepimeron with a smooth area; (3) Propleuron almost fully sculptured (In *C. deprivata* propeuron with a smooth area posteriorly); (4) Aedeagus exserted (In *C. deprivata* aedeagus not

exserted) and (5) Gaster almost completely covered by one visible tergite (In *C. deprivata* gaster covered by more than two visible tergites).

4. *Chalcura nanmindica* sp. nov.

(Plates IV E & VI C; Figs. 218-222)

Holotype: Female: Length 4.79 mm. Head black, mesosoma black with dark metallic green reflections; antenna yellowish brown, except base of scape pale brownish yellow; eye blackish brown; ocelli reflecting yellowish brown; mandibles yellow with margins reflecting brown; coxae blackish brown; femora brown except apices pale brownish yellow; remaining parts of legs pale brownish yellow; claws dark brown; tegula pale brownish yellow; fore wing with brown infumation adjoining stigma vein brownish yellow; petiole blackish brown; gaster brown.

Head: Subtriangular in front view, width slightly more than mesosomal width in dorsal view; head 1.36 x as broad as high (excluding mandibles) (Fig. 219); POL 1.50x OOL; diameter of median ocellus 1.57 x distance between median ocellus and the occipital margin; frons vertically striate extending below toruli except lateral area towards eye without striations; frons with a large area bare as in Fig. 219; lower face with scattered pits; lateral part of vertex in between posterior ocellus and eye smooth, a strong carina encircle median ocellus anteriorly; median ocelli slightly anterior to lateral ocelli; occipital carina extending beyond lateral ocellus; eye separated by 2.03x their height, slightly protruding, bare; gena weakly striated; malar space 0.92 x height of eye; epistomal sulcus faintly present; tentorial pits deep; clypeogenal sulci distinct, deep; clypeus smooth with few hairs on lower half; supraclypeal area smooth, almost bare, lateral sulcus weak, indistinct; labrum with 6 digits; mandible with apical tooth long. Antenna (Fig. 220) 11 segmented; scape 3.52 x as long as broad, reaching anterior ocellus; funicle 8 segmented; F1 4.86 x as long as broad, simple,

remaining funicular segments serrate; F1 1.02 x as long as scape, 0.72 x as long as F2 + F3, clava 0.84 x as long as preceeding two segments; scape and pedicel sparsely setose; MPS small and recessed into depressions; antenna 1.44 x head and mesosoma combined

Mesosoma: Mesoscutum lifted upwards from pronotum around spiracle laterally, no overlap of sclerites; dorsum sparsely setose except at posterolateral area of mesoscutum bare; mesoscutum with anterior margin abrupt; mesoscutum rugose, transverse striato-rugose anteriorly; lateral lobe of mesoscutum smooth postero-laterally; notauli deeply impressed, foveate to carinate; mesoscutum without median fovea; SSS transverse meeting TSA through broad fovea; lateral axillar lobe large; axillular groove absent; axillular area almost smooth near to wing base; scutellum rugose without median forea; frenal line complete medially; posterior margin of scutellum almost rounded with a slight curve inwards (Fig. 221); metanotum with a broad rounded flange laterally, overlapping anterior margin of propodeum; spiracle distinctly separate from propodeal margin, with a short emargination ventrally; propodeal disc broadly rounded, weakly sculptured; callus broadly rounded, slightly raised, densely pilose; metapleural groove present; femoral groove present; upper mesepimeron with a smooth area near to femoral groove; transepimeral sulcus absent; mesepisternum with a distinct smooth area on anterior half (Fig. 222); ventral margin of mesepisternum wedge shaped and exceeding vertically anterior to mid coxa; propleuron with a distinct smooth area posteriorly; apex of prepectus reaching tegula; spiracle narrowly enclosed. Fore coxa with several weak transverse striations; mid coxa with few strong transverse striations; hind coxa semiglobose, smooth; claws prominent, curved and bifid apically; hind tibia with two spurs. Fore wing (Fig. 218) 2.59 x as long as broad; STV slightly angled to wing margin; wing disc with moderately dense pilose except basal area and speculum bare,

with marginal fringes; hind wing venation complete, fringe present, hamuli 3 in number .

Metasoma (Fig. 218): Petiole 0.31 x as long as gaster, 1.69 x as long as hind coxa, with longitudinal striato - rugose; gastral tergites smooth, shiny with few sparse setae; gaster almost completely covered by one visible tergite; hypopygium with 2 long hairs on each side of mid line; cerci present with a bunch of setae; ovipositor not exserted.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 10).

Etymology: The species is named after the collection locality.

Material examined: Holotype: 1 Female, INDIA: Kerala; Kozhikode Dt.; Nanminda (11°26' N 75°50' E), P. Girish Kumar, 4.iv.2004, GK 533 (DZUC).

Discussion: *C. nanmindica* sp. nov. closely resembles *C. deprivata* (Walker) in having: (1) General body colour; (2) Scape reaching median ocellus; (3) Lateral lobe of mesoscutum smooth; (4) Upper mesepimeron, mesepisternum and propleuron posteriorly with a smooth area; (5) hypopygium with 2 long hairs on each side of mid line and (6) Ovipositor not exserted. However, this new species differs from *C. deprivata* in the following features: (1) Labrum with 6 digits (In *C. deprivata* labrum with 10 digits); (2) Hamuli 3 in number (In *c. deprivata* hamuli 4 in number); (3) Gaster almost completely covered by 2 visible tergites (In *C. deprivata* gaster covered by more than 2 visible tergites); (4) Ocelli reflecting yellowish brown (In *C. deprivata* ocelli reflercting pale whitish yellow); (5) Eyes separated by 2.03 x eye height (In *C. deprivata* eyes separated by 2.23 x eye height) and

(6) Fore wing 2.59 x as long as broad (In *C. deprivata* fore wing 2.87x as long as broad.

5. *Chalcura neodeprivata* sp. nov.

(Plates IV F & VI D; Figs. 223-227)

Holotype: Male: Length 4.39 mm. Head, mesosoma and petiole brownish black with metallic green reflections; antenna brown except scape and pedicel yellowish brown; eye black; ocelli reflecting brownish black; mandible pale brownish yellow with margins reflecting brown; all coxae blackish brown, remaining parts of legs brownish yellow; claws dark brown; tegula pale brownish yellow; fore wing with faint brown infumation adjoining stigma, fore wing vein brown, hind wing vein yellowish brown; gaster brown.

Head: Subtriangular in front view, width 1.22 x longer than mesosomal width in dorsal view; head 1.35 x as broad as high (excluding mandibles) (Fig. 225); POL 1.09 x OOL; diameter of median ocellus 1.75 x the distance between median ocellus and occipital margin; frons strongly striated and extending below toruli except lateral areas near to eye; lower face with scattered setigerous pits; lateral part of vertex between posterior ocellus and eye without striations; median ocellus slightly anterior to lateral ocelli (Fig. 226); occipital carina present in between posterior ocellus; occiput smooth except few peripheral striations; eyes separated by 1.91 x their height, bare; scrobal depression shallow, broadly impressed; gena weakly striated; malar space 0.97 x height of eye; epistomal sulcus indistinct; tentorial pit deep; clypeogenal sulci distinct, deep; clypeus smooth with hairs; supraclypeal area smooth, lateral sulcus weak, indistinct; labrum with 8 digits; mandible well developed with apical tooth long. Antenna (Fig. 224) 12 segmented; scape 2.91x as long as broad, reaching median ocellus; funicle 9 segmented; F1 serrate, 1.22 x as long as scape, 2.04 x as long as its teeth;

scape and pedicel sparsely setose; antenna 1.63 x head and mesosoma combined.

Mesosoma: Mesoscutum lifted upwards from pronotum around spiracle laterally, no overlap of sclerites; dorsum sparsely setose; mesoscutum rugose; lateral lobe of mesoscutum with a smooth area posteriorly; notauli deeply impressed, foveate; mesoscutum without median fovea; SSS transverse, meeting TSA through broad fovea; lateral axillar lobe large; axillular groove absent; axillular area near to hind wing base smooth; scutellum rugose without median fovea; frenal line complete medially by line; metanotum with broad rounded flange laterally, overlapping anterior margin of propodeum, not overlapping propodeal spiracle; spiracle distinctly separated from propodeal margin, with a short ventral emargination; propodeal disc strongly rugose; post spiracular sulcus present; callus slightly raised, densely pilose; metapleural groove present; femoral groove present; upper mesepimeron with a smooth area near to femoral groove; transepimeral sulcus absent; mesepisternum with a smooth area on anterior half (Fig. 227); ventral margin of mesepisternum wedge-shaped and extending vertically anterior to mid coxa; propleuron smooth without sculpture posteriorly; apex of prepectus reaching tegula; spiracle narrowly enclosed. Fore coxa with several weak transverse striations; mid coxa with few strong transverse striations; hind coxa semiglobose, smooth; hind tibia with two spurs; claws prominent, curved, bifid apically. Fore wing (Fig. 223) 2.69 x as long as broad; STV slightly angled to wing margin; wing disc with moderately dense pilose except basal area and speculum bare, with marginal fringes; hind wing venation complete, fringe present; hamuli 3 in number.

Metasoma (Fig. 223): Petiole 0.66x as long as gaster, 2.44 x as long as hind coxa, 0.85 x as long as hind femur, with longitudinal striations; gaster

completely covered by first tergite, smooth, shiny with sparse setose; aedeagus not exserted.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 10).

Etymology: Named after the species *deprivata* (Walker)

Material examined: Holotype: 1 Male, INDIA: Kerala; Kozhikode, Dt.; Nanminda (11° 26' N 75° 50' E), P. Girish Kumar, 14.vi.2003, GK 387 (DZUC).

Discussion: *C. neodeprivata* sp. nov. is similar to *C. deprivata* (Walker) in having: (1) Petiole distinctly shorter than hind femur (2) Head 1.35x as broad as high (excluding mandibles), (3) Upper mesepimeron, mesepisternum and propleuron posteriorly with a smooth area, (4) Hamuli 3 in number and (5) Aedeagus not exserted. However, this new species differs from *C. deprivata* in the following characteristics: (1) F1 serrate (In *C. deprivata* F1 pectinate); (2) F1 2.04 x as long as its teeth (In *C. deprivata* F1 1.26 x as long as its teeth); (3) Labrum with 8 digits (In *C. deprivata* labrum with 9 digits) and (4) Gaster almost completely covered by one visible tergite (In *C. deprivata* gaster covered by more than one visible tergites).

6. *Chalcura sudheeri* sp. nov.

(Figs. 228-232)

Holotype: **Male**: Length 4.73 mm. Head, mesosoma and petiole brownish black antenna yellowish brown; eye blackish brown with white patches; ocelli reflecting black; mandible reflecting brownish yellow; coxae blackish brown, remaining parts of legs brownish yellow; claws dark brown; tegula pale brownish yellow; fore wing with brown infumation adjoining stigma, veins brown; gaster brown, yellowish brown towards lower half.

Head: Subtriangular in front view, width 1.40 x longer than mesosomal width in dorsal view, head 1.30 x as broad as high (excluding mandibles) (Fig. 229); POL 1.16 x OOL; diameter of median ocellus 1.75 x distance between median ocellus and occipital margin; frons strongly striated, extending below toruli except lateral areas near to eye; lower face with scattered setigerous pits; lateral part of vertex between posterior ocellus and eye without striations; median ocellus slightly anterior to lateral ocelli (Fig. 230); occipital carina present in between posterior ocellus; occiput smooth except few peripheral striations; eye separated by 2.09 x their height, bare; scrobal depression shallow, broadly impressed; gena with striations; malar space equal to height of eye; epistomal sulcus indistinct; tentorial pits deep; clypeogenal sulci distinct, deep; clypeus smooth with hairs; supraclypeal area smooth, lateral sulcus indistinct; labrum with 7 digits; mandible well developed with apical tooth long. Antenna (Fig. 228) 12 segmented; scape 2.80x as long as broad, reaching median ocellus; funicle 9 segmented; F1 pectinate, 1.17x as long as scape, 1.25 x as long as its teeth; scape and pedicel sparsely setose; antenna 1.57 x head and mesosoma combined.

Mesosoma: Mesoscutum lifted upwards from pronotum around spiracle laterally, no overlap of sclerites; dorsum sparsely setose; mesoscutum rugose; lateral lobe of mesoscutum with a smooth area posteriorly; notauli deeply impressed, foveate; mesoscutum without median fovea; SSS transverse and meeting TSA through broad fovea; lateral axillar lobe large; axillular groove absent; axillular area near to hind wing base with few striations; scutellum rugose without median fovea; frenal line complete medially by line; metanotum with a broad rounded flange laterally, overlapping anterior margin of propodeum, not overlapping propodeal spiracle; propodeum distinctly separated from propodeal margin; spiracle with a short ventral emargination; propodeal disc strongly rugose; post spiracular sulcus present; callus slightly raised, densely pilose; metapleural groove

present; femoral groove present; upper mesepimeron with a smooth area near to femoral groove; transepimeral sulcus absent; mesepisternum with a smooth area near anterior half (Fig. 232); ventral margin of mesepisternum wedge-shaped and extending vetically anterior to mid coxa; a wide groove between pronotum and propleuron (Fig. 231); propleuron smooth without sculpture posteriorly; apex of prepectus reaching tegula; spiracle narrowly enclosed. Fore coxa with several weak transverse striations; mid coxa with few strong transverse striations; hind coxa semiglobose, smooth; claws prominent, curved and bifid apically. Fore wing (Fig. 228) 2.46 x as long as broad; STV slightly angled to wing margin; wing disc with moderately dense pilose except basal area and speculum bare, with marginal fringes; hind wing venation complete, fringe present; hamuli 4 in number.

Metasoma: Petiole 0.81 x as long as gaster, 3.63 x as long as hind coxa, 0.95x as long as hind femur, with longitudinal striations; gaster covered by more than one visible tergites, smooth, shiny with sparse setose.

Female: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala) (Fig. 10).

Etymology: Named after the collector of the type specimen.

Material examined: Holotype: 1 Male, INDIA: Kerala; Kozhikode Dt.; Pookad (75° 44' E 11°23' N), K. Sudheer, 19.ix.2004,GK 606 (DZUC).

Discussion: *C. sudheeri* sp. nov. is similar to *C. deprivata* (Walker) in having: (1) F1 pectinate, (2) Eye separated by 2.09x their height, (3) Upper mesepimeron, mesepistemum and the posterior part of propleuron with a smooth area and (4) Gaster completely covered by more than one visible tergite. However, this new species differs from *C. deprivata* in the following features: (1) A wide groove between pronotum and propleuron. (In *C.*

deprivata there is no such wide groove between pronotum and propleuron); (2) Labrum with 7 digits. (In *C. deprivata* labrum with 9 digits); (3) Hamuli 4 in number. (In *C. deprivata* hamuli 3 in number) and (4) Aedeagus slightly exserted (In *C. deprivata* aedeagus not exserted).

CHECKLIST

CHECKLIST OF EUCHARITIDAE OF INDIAN SUBCONTINENT

SUBFAMILY 1 ORASEMINAE

GENUS 1 *INDOSEMA* HUSAIN AND AGARWAL

1.	*Indosema indica* Husain & Agarwal	India (New Delhi, Uttar Pradesh)

GENUS 2 *ORASEMA* CAMERON

1.	*Orasema assectator* Kerrich	India (Assam)
2.	*Orasema delhiensis* Narendran & Girish Kumar	India (New Delhi)
3.	*Orasema initiator* Kerrich	India (Assam)
4.	*Orasema maseora* sp. nov.	India (Kerala)
5.	*Orasema nirupama* sp. nov.	India (Kerala)

SUBFAMILY 2 GOLLUMIELLINAE

GENUS 3 *ANORASEMA* BOUCEK

1.	*Anorasema manii* Heraty	India (West Bengal)

GENUS 4 *GOLLUMIELLA* HEDQVIST

1.	*Gollumiella antennata* (Gahan)	India (West Bengal), Malaysia, Singapore, Bangladesh, Hong Kong, Indonesia, China, Thailand, Laos, Vietnam.
2.	*Gollumiella longipetiolata* Hedqvist	India (Uttaranchal, West Bengal), Philippines, Indonesia, Japan, Malaysia, Nepal, China, Singapore, Thailand, Taiwan

SUBFAMILY 3 EUCHARITINAE

TRIBE 1 PSILOCHARITINI

GENUS 5 *NEOLOSBANUS* HERATY

1.	*Neolosbanus diversus* sp. nov.	India (Kerala)
2.	*Neolosbanus laeviceps* (Gahan)	India (Kerala, Tamil Nadu), Sri Lanka
3.	*Neolosbanus nepalensis* Heraty	Nepal
4.	*Neolosbanus palgravei* (Girault)	India (Kerala, Karnataka) Nepal, Algeria, Australia, Japan, Papua New Guinea, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Solomon Islands, Caroline Islands.
5.	*Neolosbanus purpureoventris* (Cameron)	Nepal
6.	*Neolosbanus secus* sp. nov.	India (Kerala)
7.	*Neolosbanus trichuricus* sp. nov.	India (Kerala)

GENUS 6 *PSILOCHARIS* HERATY

1.	*Psilocharis hypena* Heraty	India (Kerala, Tamil Nadu, Himachal Pradesh), China, Indonesia, Malaysia, Philippines, Taiwan, Japan.

TRIBE 2 EUCHARITINI

GENUS 7 *ANCYLOTROPUS* CAMERON

1.	*Ancylotropus keralensis* sp. nov.	India (Kerala)

2.	*Ancylotropus manipurensis* (Clausen)	India (Manipur)

GENUS 8 *CHERIANELLA* NARENDRAN

1.	*Cherianella narayani* Narendran	India (Kerala, Tamil Nadu), Sri Lanka

GENUS 9 *STILBULA* SPINOLA

1.	*Stilbula aruna* sp. nov.	India (Kerala)
2.	*Stilbula ashokai* Narendran	India (Kerala)
3.	*Stilbula athira* sp. nov.	India (Kerala)
4.	*Stilbula atkinsoni* (Mani & Dubey)	Burma
5.	*Stilbula bangalorica* sp. nov.	India (Karnataka)
6.	*Stilbula bullista* sp. nov.	India (Kerala)
7.	*Stilbula indica* (Mani)	India (Assam)
8.	*Stilbula isula* sp. nov.	India (Kerala)
9.	*Stilbula lata* Narendran	India (Kerala)
10.	*Stilbula lepida* sp. nov.	India (Kerala)
11.	*Stilbula minispina* Heraty	India (Tamil Nadu)
12.	*Stilbula muthangensis* sp.nov.	India (Kerala)
13.	*Stilbula mysorensis* (Mani & Dubey)	India (Karnataka)
14.	*Stilbula namida* sp. nov.	India (Kerala)
15.	*Stilbula nilgiri* Heraty	India (Tamil Nadu)
16.	*Stilbula tanjorensis* (Mani & Dubey)	India (Kerala, Tamil Nadu)

GENUS 10 *SACCHARISSA* KIRBY

Boucek (1988) reported an indetermined species from Assam.

GENUS 11 *SCHIZASPIDIA* WESTWOOD

1.	*Schizaspidia andamanensis* (Mani)	India (Andaman and Nicobar Islands)
2.	*Schizaspidia anupama* sp.nov.	India (Kerala)
3.	*Schizaspidia brevifuniculata* Narendran	India (Kerala)
4.	*Schizaspidia convergens* (Walker)	Sri Lanka
5.	*Schizaspidia coromandelica* (Mani & Dubey)	India (Tamil Nadu)
6.	*Schizaspidia furcifera* Westwood	India (West Bengal)
7.	*Schizaspidia malabarica* Narendran	India (Kerala)
8.	*Schizaspidia sabariensis* (Mani & Dubey)	India (Kerala)
9.	*Schizaspidia sitarami* Narendran	India (Kerala)
10.	*Schizaspidia travancorensis* (Mani)	India (Kerala)

GENUS 12 *CHALCURA* KIRBY

1.	*Chalcura bouceki* sp. nov.	India (Karnataka)
2.	*Chalcura deprivata* (Walker)	India (Kerala), Sri Lanka
3.	*Chalcura galata* sp. nov.	India (Kerala)
4.	*Chalcura nanmindica* sp. nov.	India (Kerala)
5.	*Chalcura neodeprivata* sp.nov.	India (Kerala)
6.	*Chalcura sudheeri* sp. nov.	India (Kerala)

GENUS 13 *EUCHARIS* LATRIELLE

1.	*Eucharis casca* Fernando	Sri Lanka
2.	*Eucharis cassius* Fernando	Sri Lanka
3.	*Eucharis melantheus* Fernando	Sri Lanka

HOST-PARASITE INDEX

HOST-PARASITE INDEX OF THE GENERA TREATED IN THIS WORK

Sl. No.	Eucharitid Genera	Ant Host
1	*Orasema* Cameron	*Monomorium* Mayr (Myrmicinae: Solenopsidini) *Pheidole* Westwood (Myrmicinae: Pheidolini) *Solenopsis* Westwood (Myrmicinae: Solenopsidini) *Tetramorium* Mayr (Myrmicinae: Tetramoriini) *Wasmannia* Forel (Myrmicinae: Blepharidattini) *Formica* Linnaeus (Formicinae: Formicini) *Eciton* Latreille? (Ecitoninae: Ecitonini)
2	*Neolosbanus* Heraty	*Hypoponera* Santschi (Ponerinae: Ponerini)
3	*Psilocharis* Heraty	Unknown
4	*Ancylotropus* Cameron	*Odontomachus* Latreille (Ponerinae: Ponerini
5	*Cherianella* Narendran	Unknown
6	*Stilbula* Spinola	*Camponotus* Mayr (Formicinae: Camponotini) *Polyrachis* Smith (Formicinae: Camponotini)
7	*Schizaspidia* Westwood	*Odontomachus* Latreille (Ponerinae: Ponerini) *Gnamptogenys* Roger (Ponerinae: Ectatommini)
8	*Chalcura* Kirby	*Odontomachus* Latreille (Ponerinae: Ponerini) *Rhytidoponera* Mayr (Ponerinae: Ectatommini)

SUMMARY

SUMMARY

The present study deals with the alpha systematics of the family Eucharitidae of Kerala. Eucharitidae is the largest and most diverse group of hymenopteran parasitoids of eusocial insects. In this study, 8 genera and 33 species of eucharitid wasps have been studied and analysed systematically (Fig. 11). Among this 33 species, 3 species were collected from adjacent areas to the region of present study (Kerala).

In the present investigation, one genus belongs to the Subfamily Oraseminae, two genera to the Tribe Psilocharitini of Subfamily Eucharitinae and five genera to the Tribe Eucharitini of subfamily Eucharitinae. A total of 33 species have been studied under these 8 genera, of which 20 species are new to science. The genera *Orasema* Cameron, *Psilocharis* Heraty, *Ancylotropus* Cameron and *Cherianella* Narendran are recorded for the first time from Kerala. The following table illustrates the total number of species in each genus dealt within this study, the number of new species and the number of new records from Kerala.

Sl. No.	Genera	No. of species	No. of new species	New Records from Kerala*
1	*Orasema* Cameron	2	2	2
2	*Neolosbanus* Heraty	5	3	3
3	*Psilocharis* Heraty	1	--	1
4	*Ancylotropus* Cameron	1	1	1
5	*Cherianella* Narendran	1	--	1
6	*Stilbula* Spinola	11	8	8
7	*Schizospidia* Westwood	6	1	1
8	*Chalcura* Kirby	6	5	6

* includes the number of new species.

The summary of the systematic treatment of the genera dealt in this work is given below:

Family : Eucharitidae

Subfamily 1 : Oraseminae

Genus 1 *Orasema* Cameron

Species
1. *O. maseora* sp. nov.
2. *O. nirupama* sp. nov.

Subfamily 2 : Eucharitinae

Tribe 1 Psilocharitini

Genus 2 *Neolosbanus* Heraty

Species
1. *N. diversus* sp. nov.
2. *N. laeviceps* (Gahan)
3. *N. palgravei* (Girault)
4. *N. secus* sp. nov.
5. *N. trichuricus* sp. nov.

Genus 3 *Psilocharis* Heraty

Species
1. *P. hypena* Heraty

Tribe 2 Eucharitini

Genus 4 *Ancylotropus* Cameron

Species
1. *A. keralensis* sp. nov.

Genus 5 *Cherianella* Narendran

Species
1. *C. narayani* Narendran

Genus 6 *Stilbula* Spinola

Species
1. *S. aruna* sp. nov.
2. *S. ashokai* Narendran
3. *S. athira* sp. nov.
4. *S. bangalorica* sp. nov.
5. *S. bullista* sp. nov.
6. *S. isula* sp. nov.

7. *S. lata* Narendran
8. *S. lepida* sp. nov.
9. *S. muthangensis* sp. nov.
10. *S. namida* sp. nov.
11. *S. tanjorensis* (Mani & Dubey)

Genus 7 *Schizaspidia* Westwood

Species
1. *S. anupama* sp. nov.
2. *S. brevifuniculata* Narendran
3. *S. malabarica* Narendran
4. *S. sabariensis* (Mani & Dubey)
5. *S. sitarami* Narendran
6. *S. travancorensis* (Mani)

Genus 8 *Chalcura* Kirby

Species
1. *C. bouceki* sp. nov.
2. *C. deprivata* (Walker)
3. *C. galata* sp. nov.
4. *C. nanmindica* sp. nov.
5. *C. neodeprivata* sp. nov.
6. *C. sudheeri* sp. nov.

As part of this investigation, 755 eucharitid specimens were collected and collections made from different localities were systematically analysed in this study. All the species were properly identified and described. Redescriptions were given, in case the already known species are either poorly described or described from different geographical area. In addition to this, keys to the subfamilies, tribes and the genera of the Indian subcontinent and keys to the species under each of the genus were also provided. The Map (Fig. 2) shows an account of the distribution of the genera treated in this

study. A checklist of the genera and species of eucharitid wasps of Indian subcontinent was provided. A host-parasite index of the genera treated in this work were also included. All the type materials are kept in the collections of the Department of Zoology, University of Calicut (DZUC).

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PLATES AND FIGURES

PLATE I
Collection localities

A. Wayanad shola

B . Thenmala forest

C.Tropical Botanical Garden and Research Institute Campus, Palode

D. Koottanad, Palakkad

E. Kerala Agricultural University Campus, Vellanikkara

F . Botanical Garden, Calicut University Campus

PLATE II
Collection methods

A. Sweep Net

B. Aspirator

C. Malaise Trap

D. Yellow Pan (Moericke) Trap

PLATE III

Eucharitid species

A. *Orasema maseora* sp.nov. Male

B. *Orasema nirupama* sp.nov. Female

C. *Neolosbanus secus* sp.nov. Female

D. *Psilocharis hypena* Heraty Female

E. *Ancylotropus keralensis* sp.nov. Female

F. *Cherianella narayani* Narendran Male

PLATE IV

A. *Stilbula athira* sp. nov. Female

B. *Stilbula bangalorica* sp. nov. Male

C. *Schizaspidia anupama* sp. nov. Female

D. *Schizaspidia anupama* sp. nov. Male

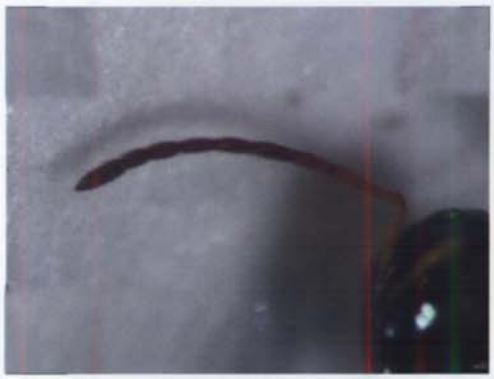
E. *Chalcura nanmindica* sp. nov. Female

F. *Chalcura neodeprivata* sp. nov. Male

PLATE V

A. *Orasema maseora* sp.nov.
Male. Antenna.

B. *Orasema nirupama* sp.nov.
Female. Antenna.



C. *Neolosbanus secus* sp.nov.
Female. Antenna.

D. *Psilocharis hypena* Heraty
Female. Antenna.

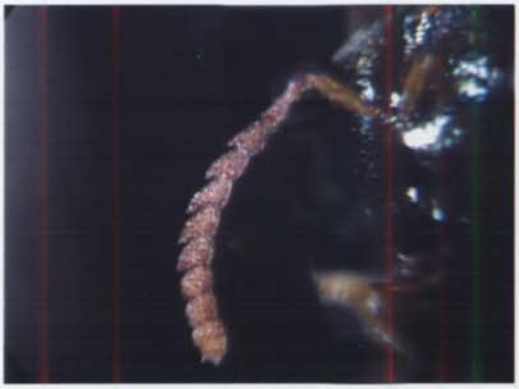
E. *Ancylotropus keralensis* sp.nov.
Female. Antenna.

F. *Cherianella narayani* Narendran
Male. Antenna.

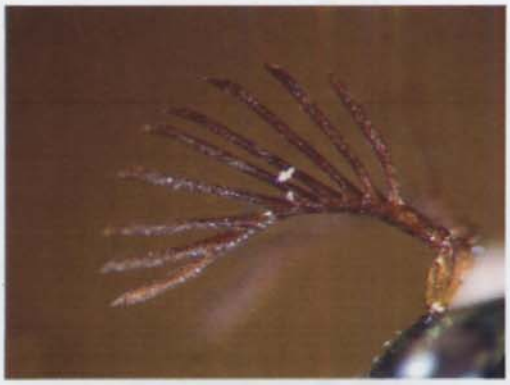
G. *Stilbula athira* sp.nov. Female.
Antenna.

H. *Stilbula bangalorica* sp.nov.
Male. Antenna.

PLATE VI



A. *Schizaspidia anupama* sp.nov. Female. Antenna.



B. *Schizaspidia anupama* sp.nov. Male. Antenna.

C. *Chalcura nanmindica* sp.nov. Female. Antenna.

D. *Chalcura neodeprivata* sp.nov. Male. Antenna.

E. *Orasema nirupama* sp.nov. Female. Metasoma.

F. *Neolosbanus secus* sp.nov. Female. Metasoma.

G. *Stilbula athira* sp.nov. Female. Metasoma.

G. *Stilbula bangalorica* sp.nov. Male. Metasoma.

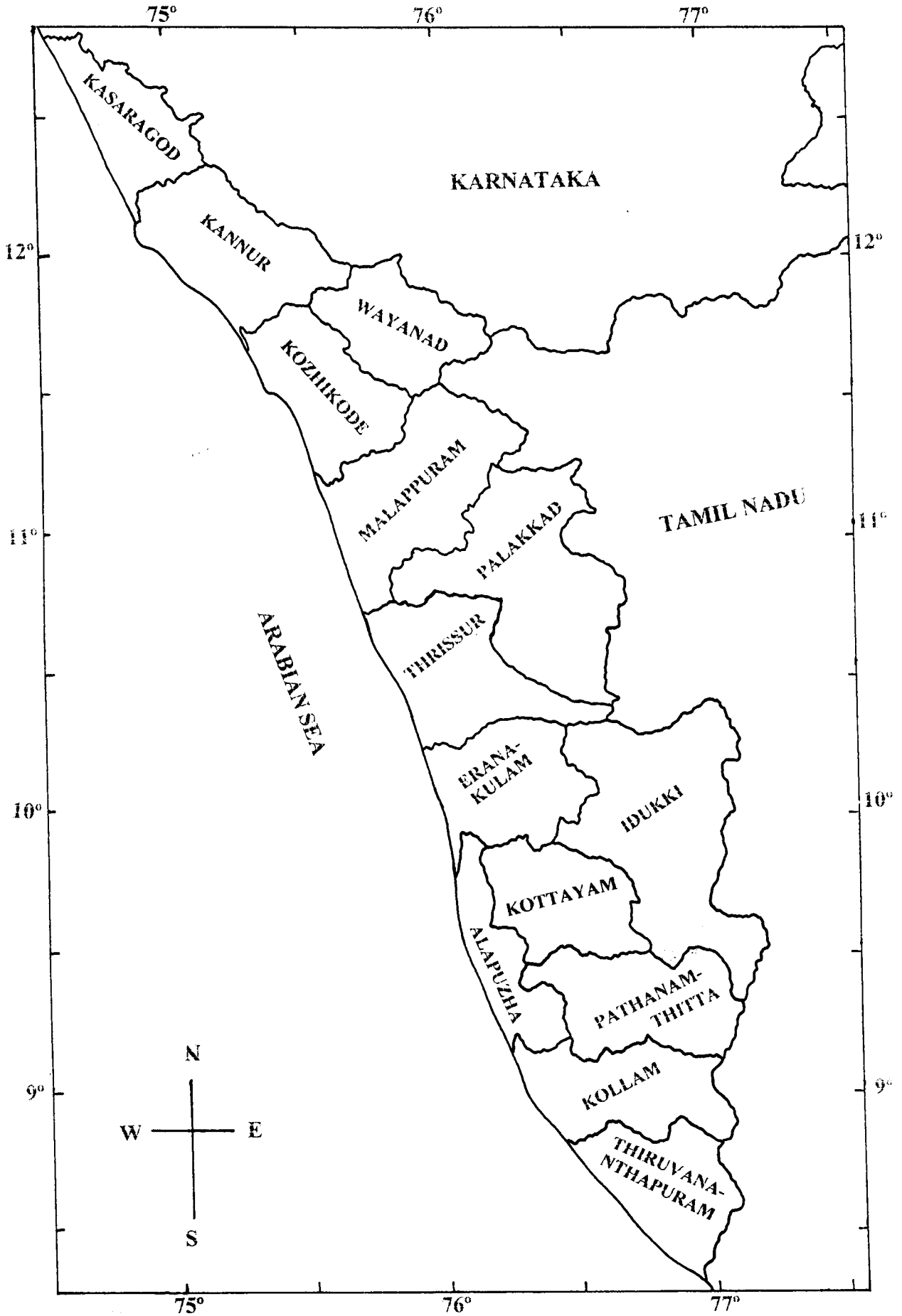


Fig.1. Kerala- The study area

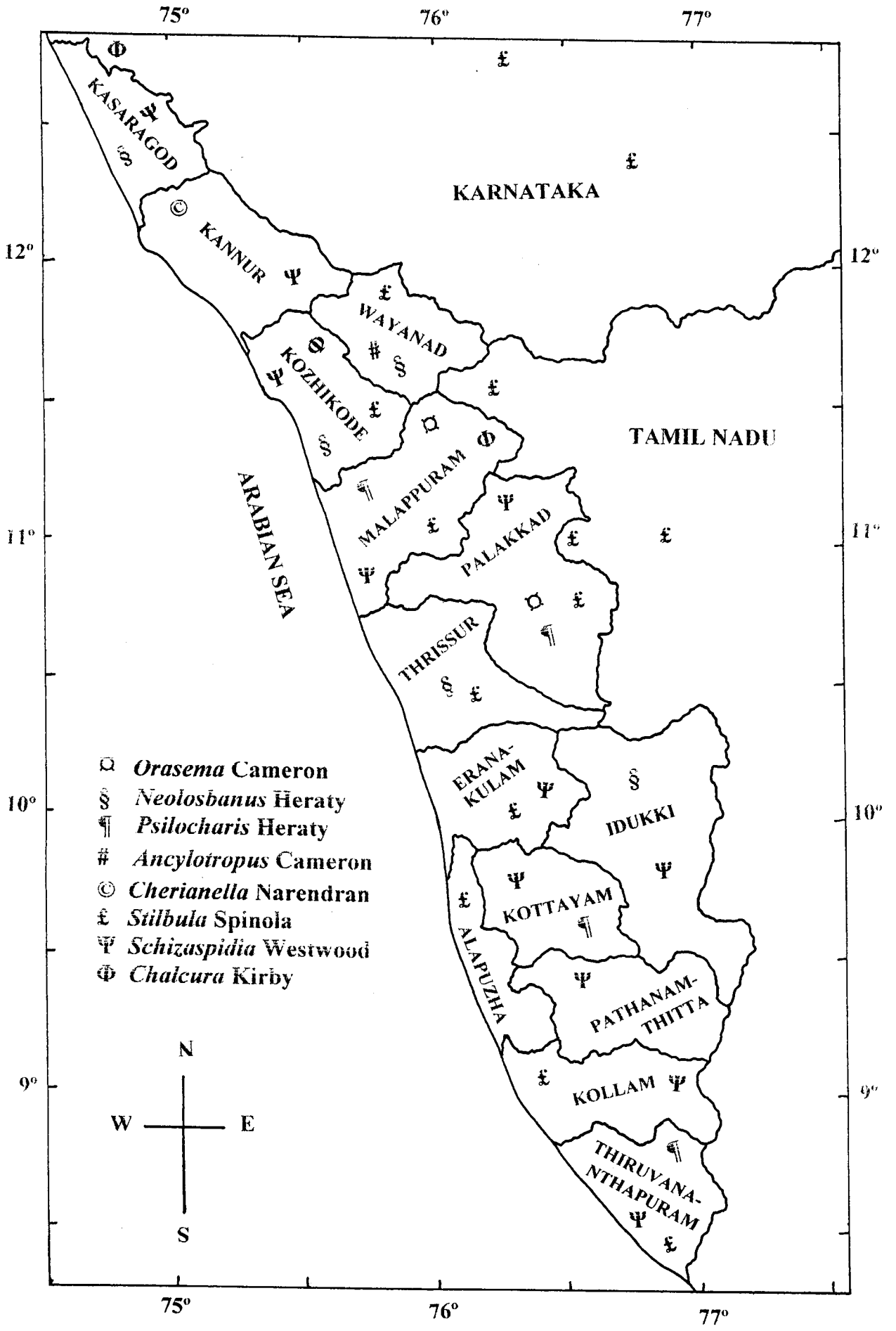


Fig.2. Distribution Map of the genera of Eucharitidae

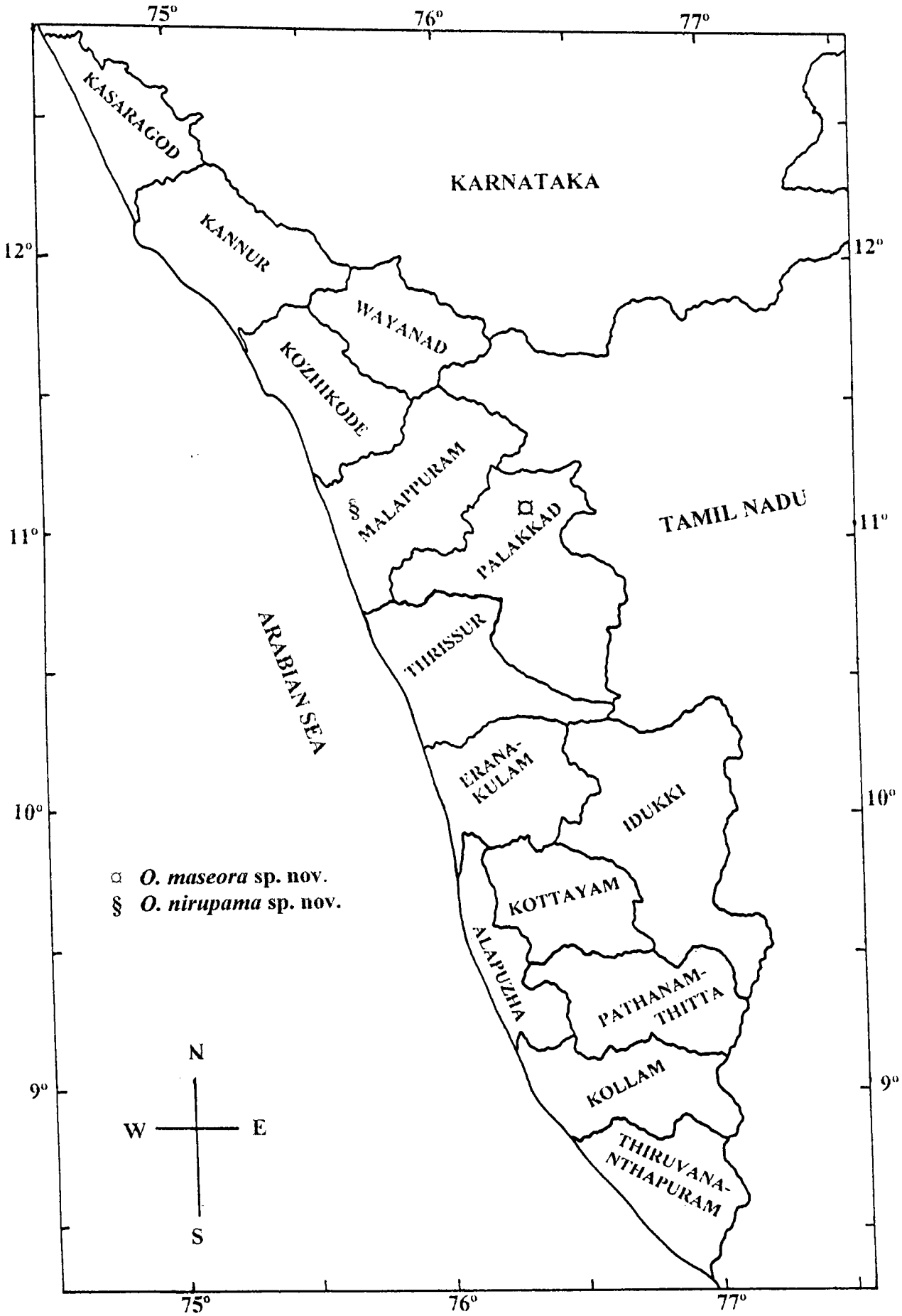


Fig.3. Distribution Map of the species of ***Orasema*** Cameron

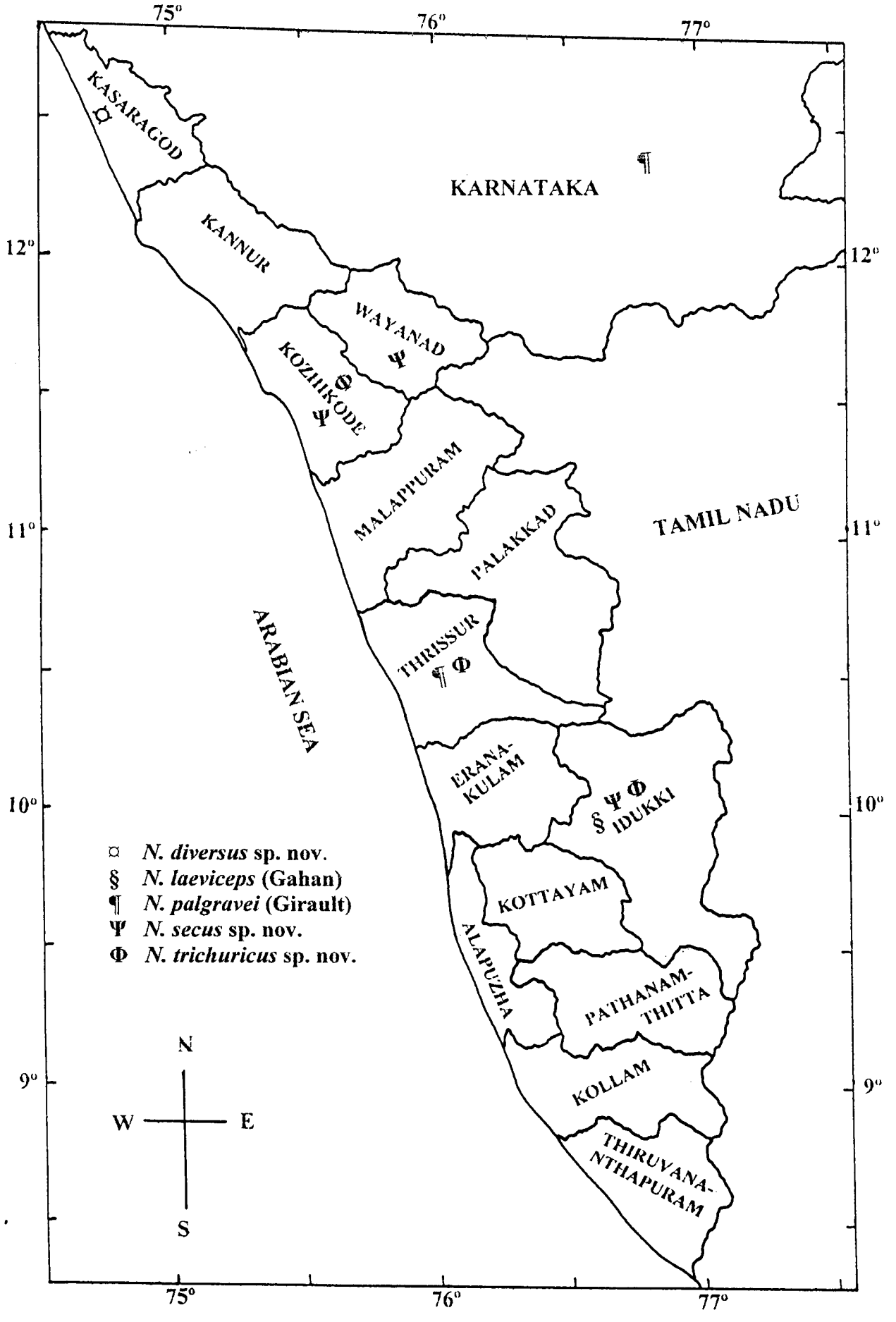


Fig.4. Distribution Map of the species of *Neolosbanus* Heraty

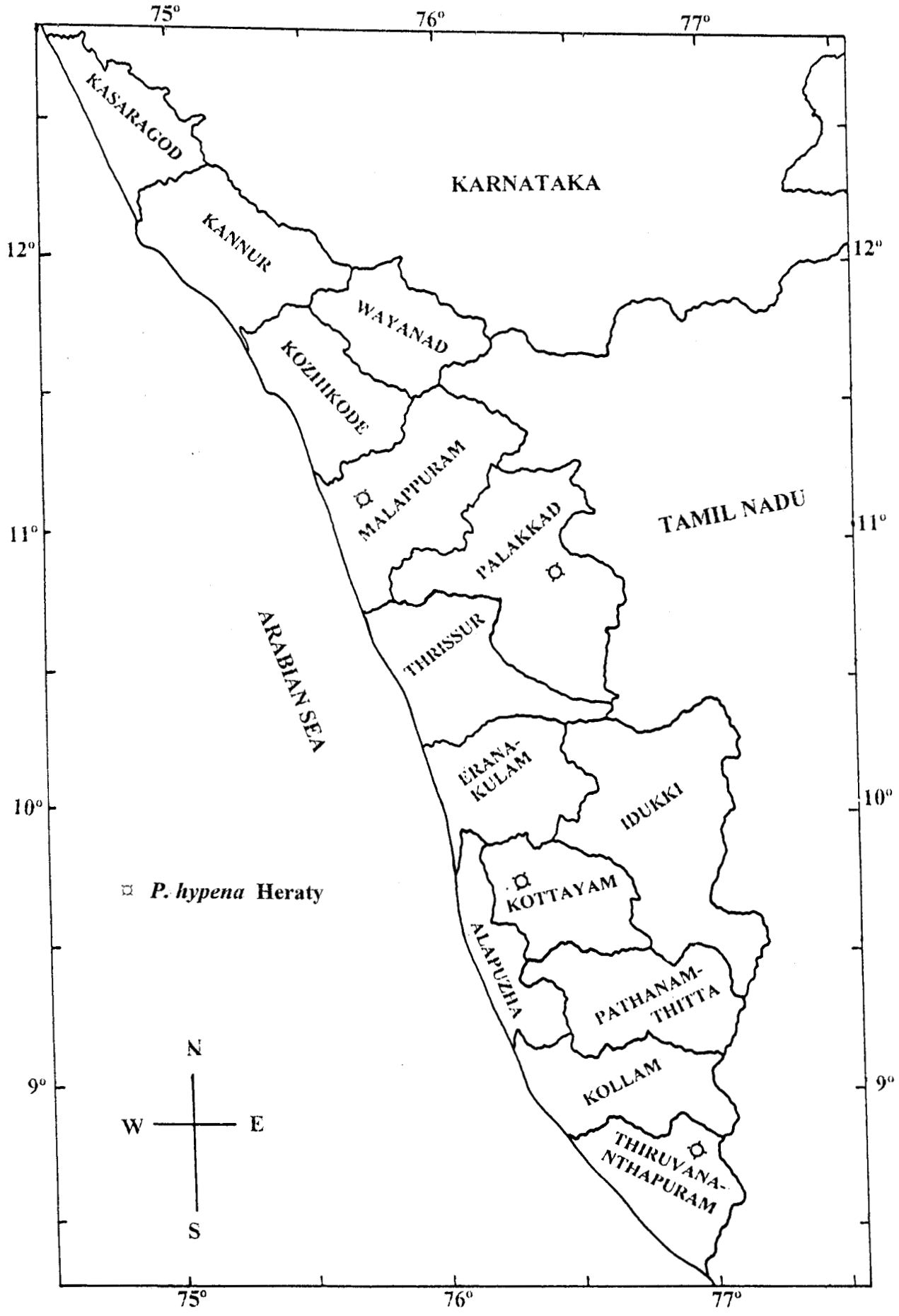


Fig.5. Distribution Map of the species of ***Psilocharis*** Heraty

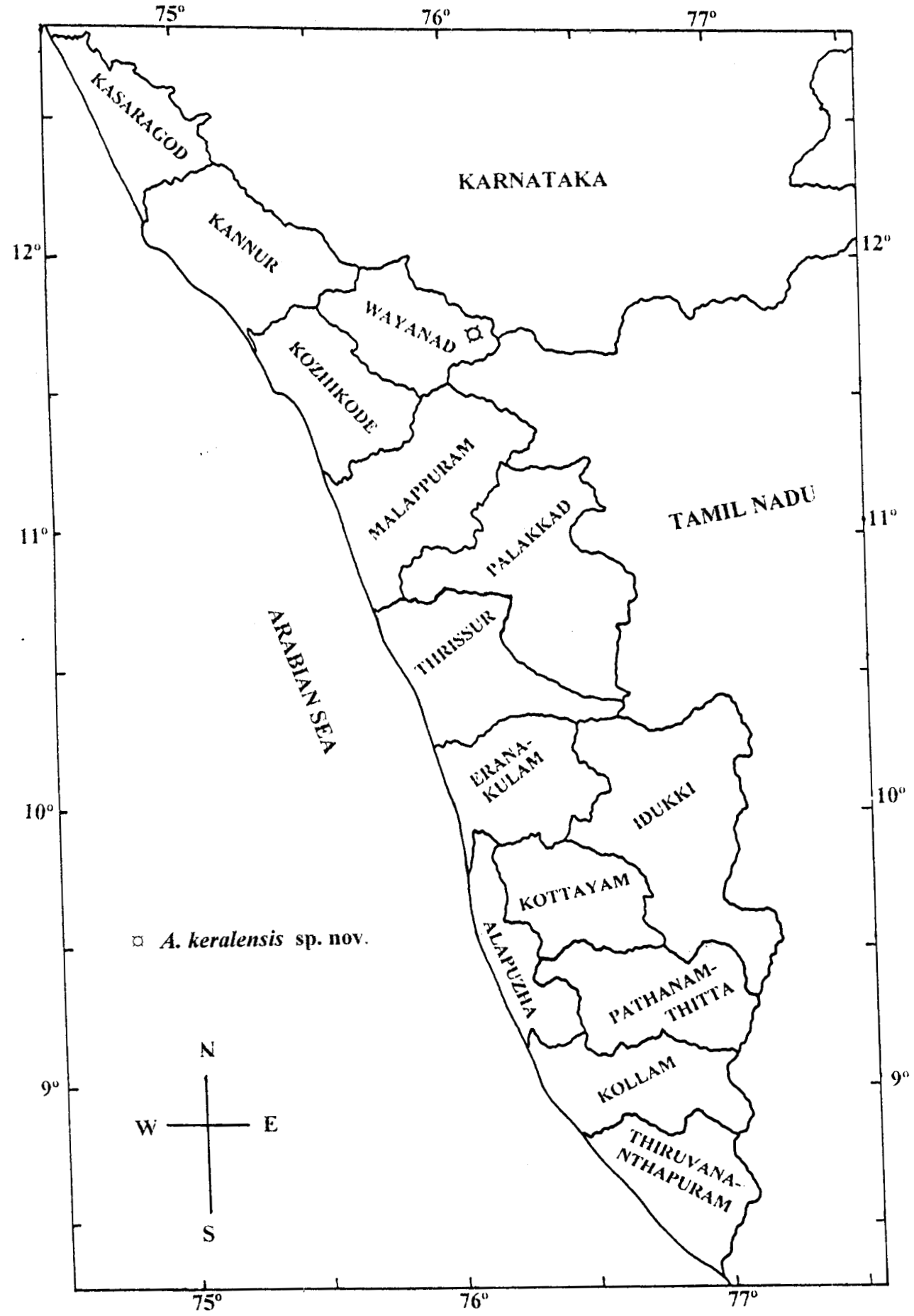


Fig.6. Distribution Map of the species of ***Ancylotropus*** Cameron

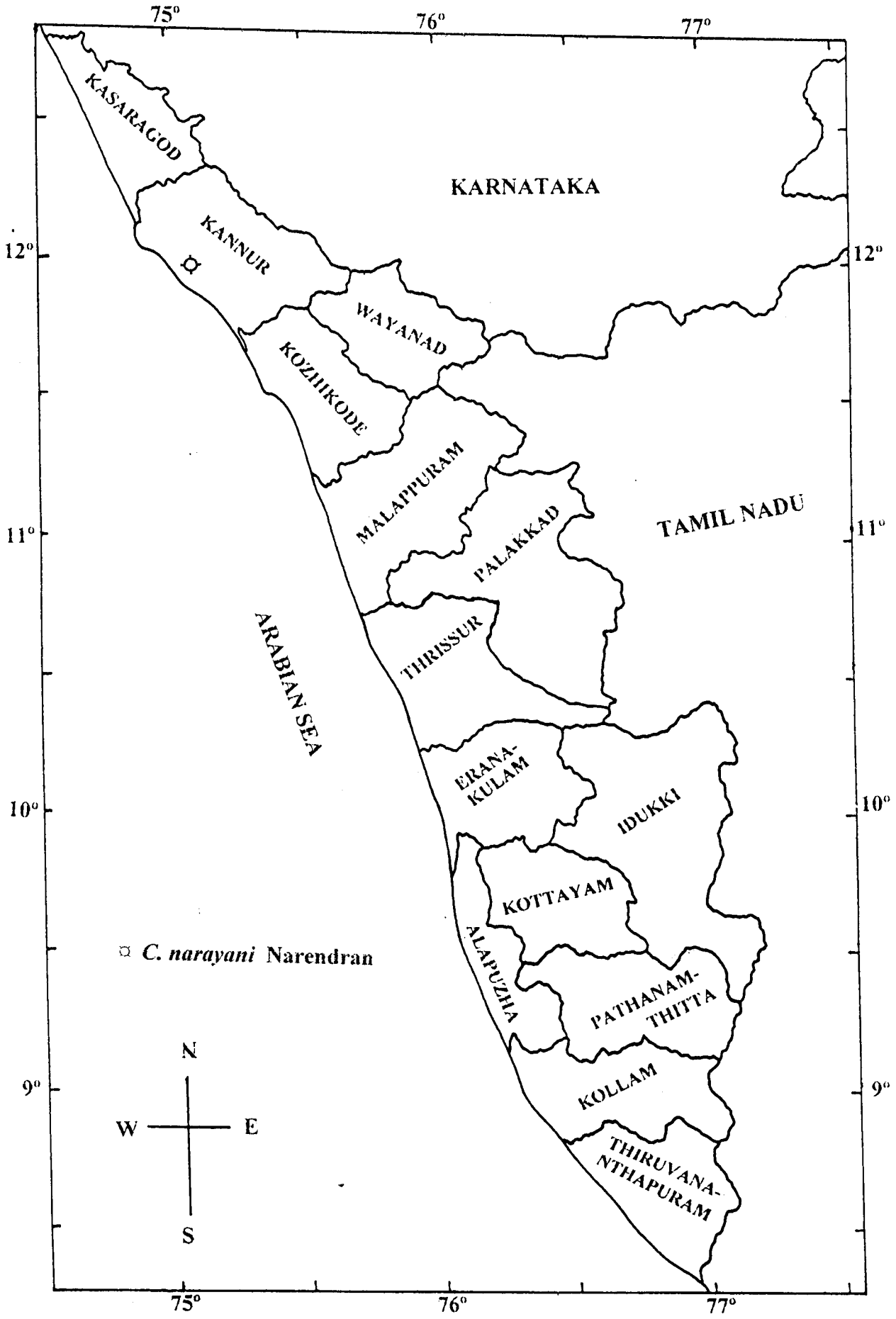


Fig.7. Distribution Map of the species of ***Cherianella*** Narendran

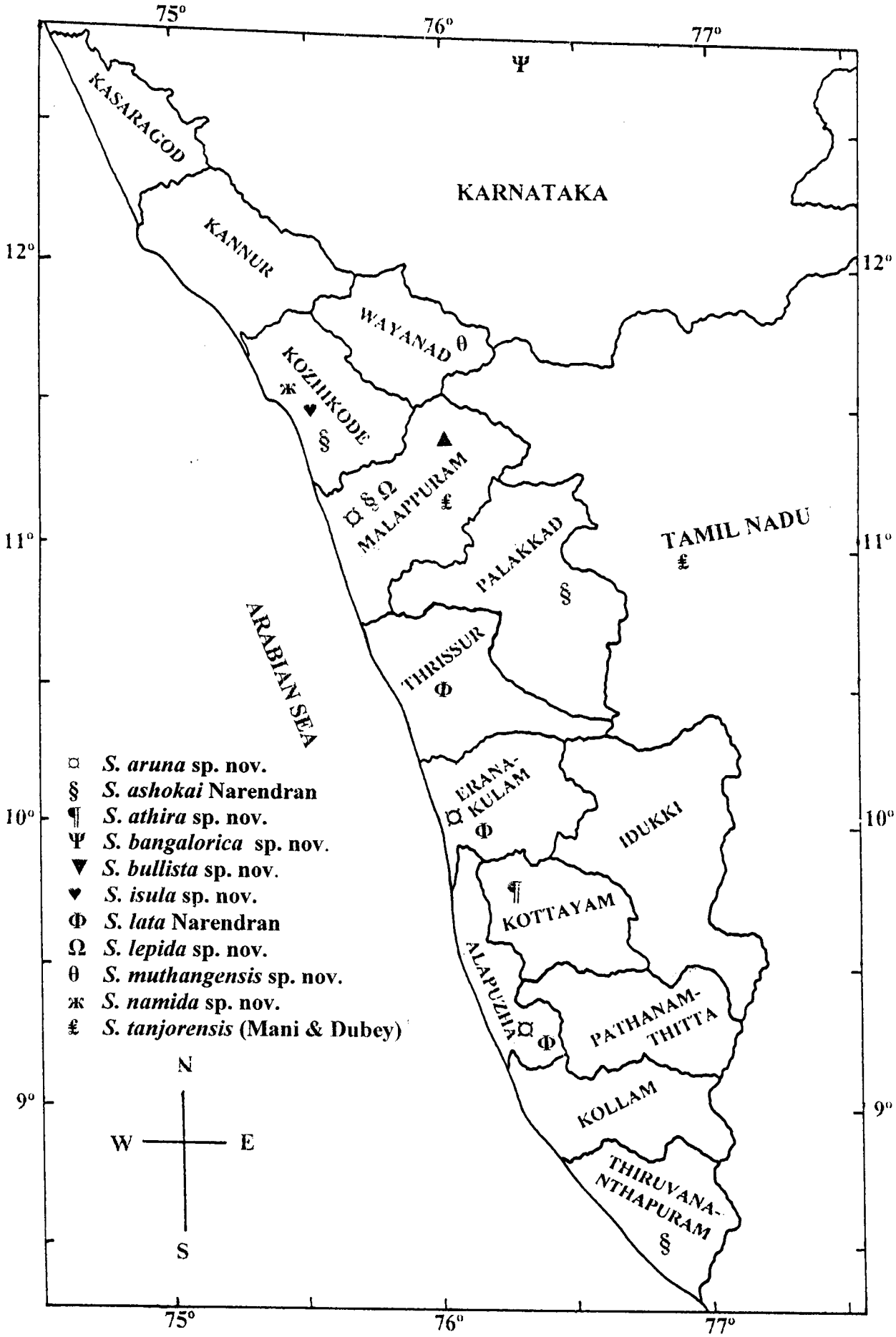


Fig.8. Distribution Map of the species of ***Stilbula*** Spinola

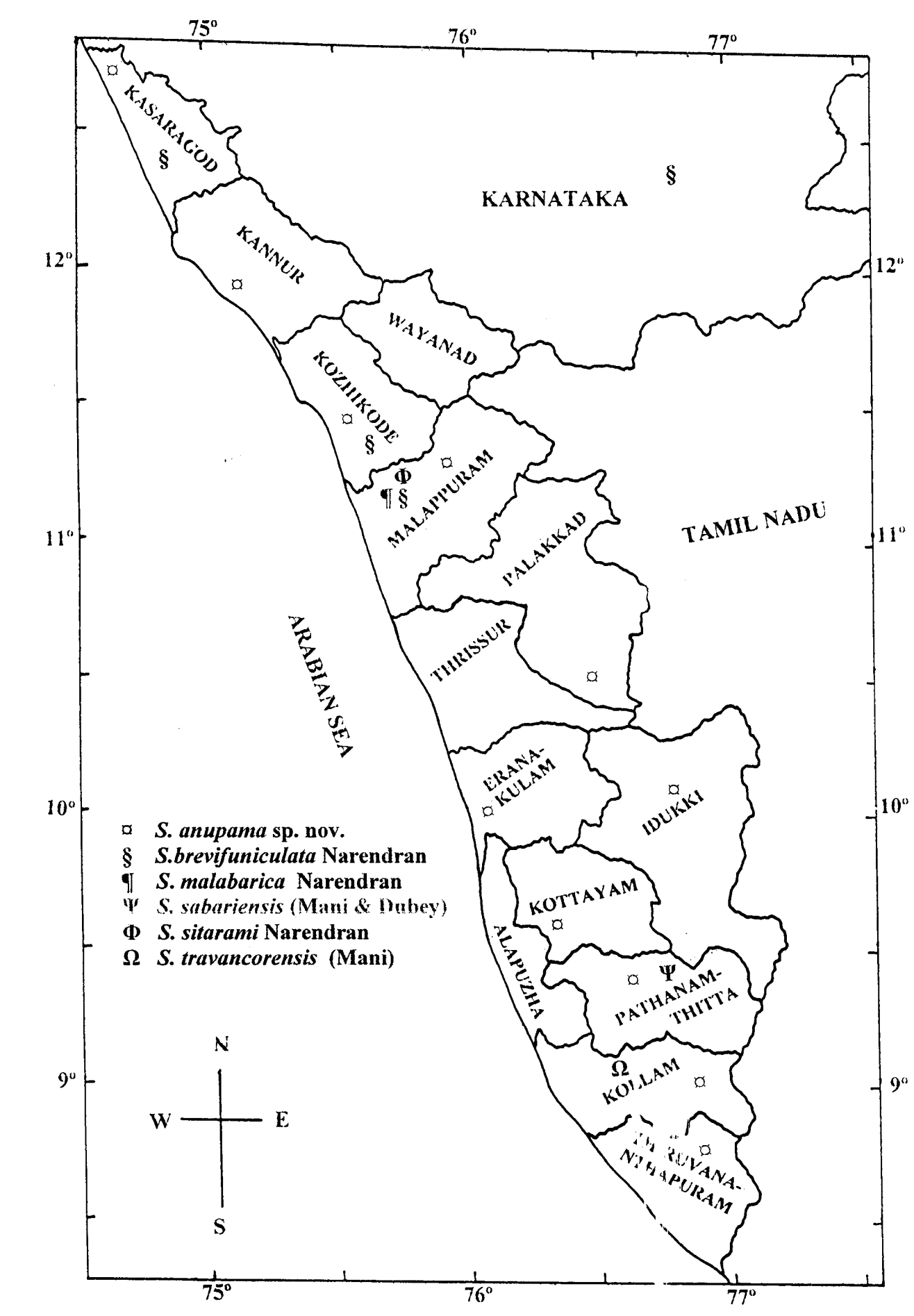


Fig.9. Distribution Map of the species of *Schizaspidia* Westwood

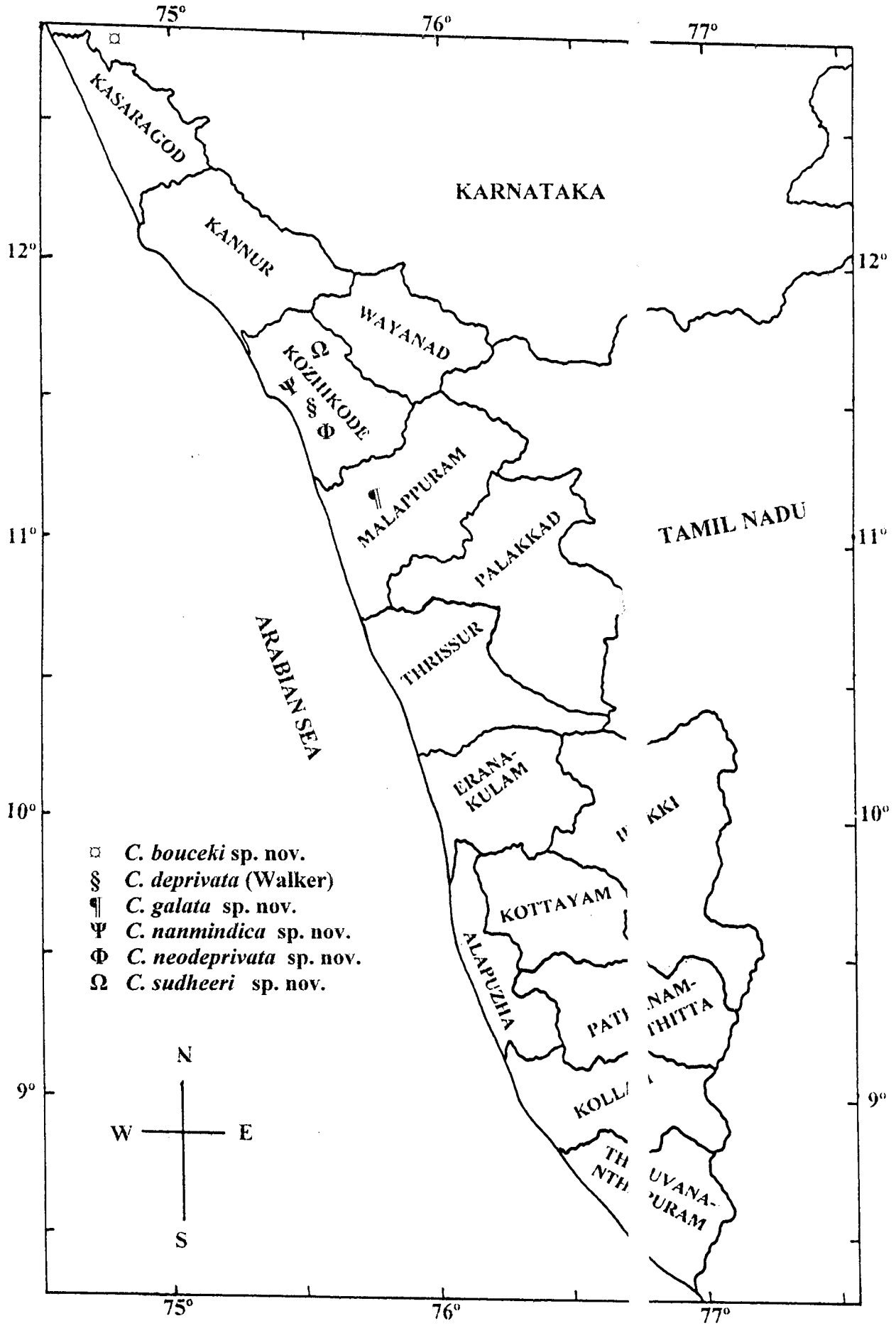
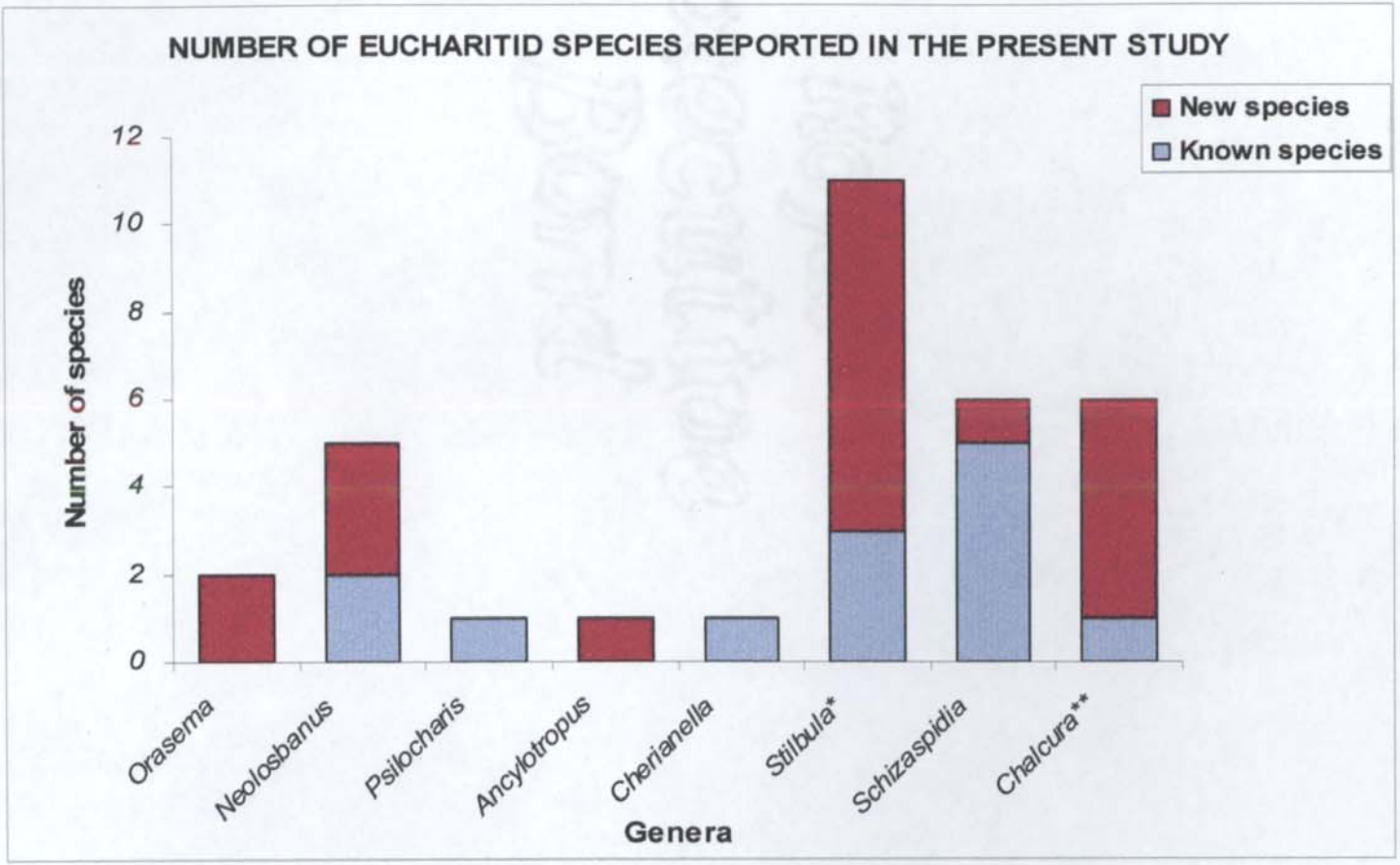
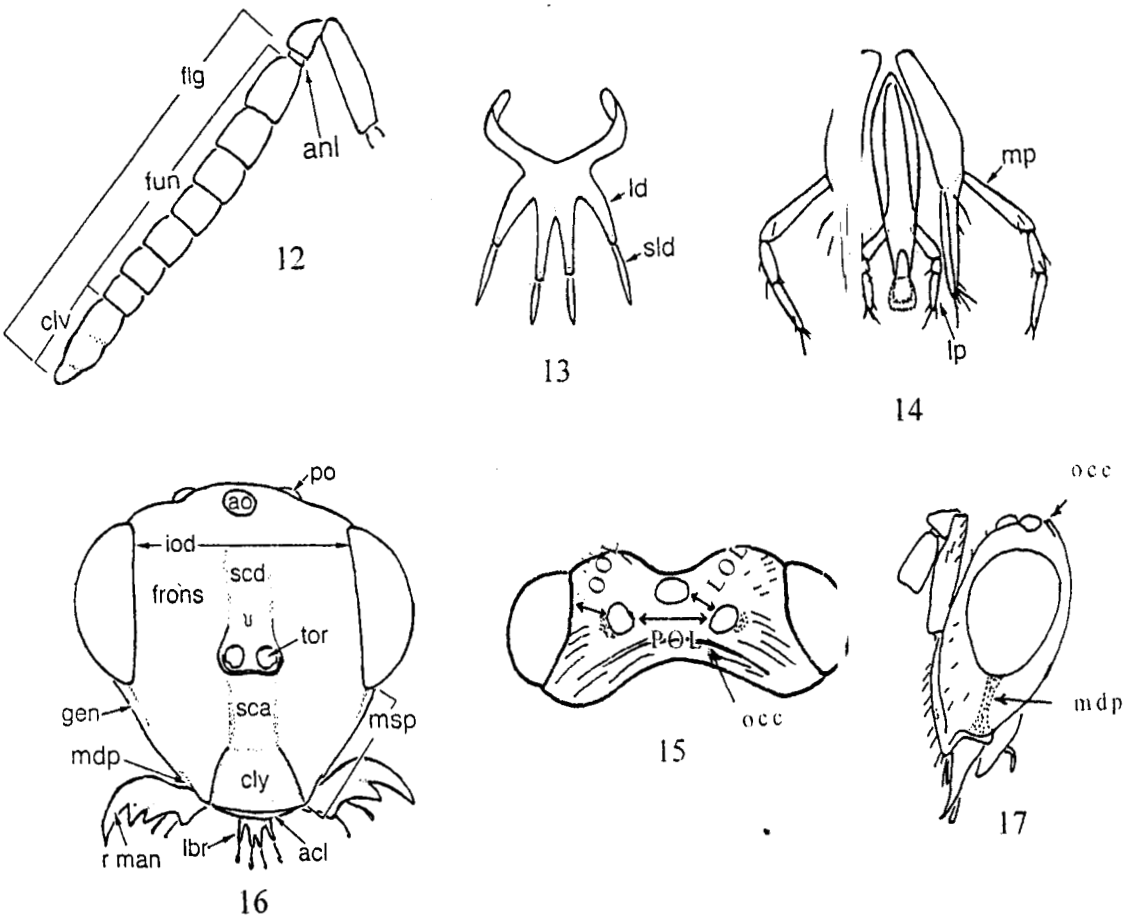


Fig.10. Distribution Map of the species of *Ch. cura* Kirby.



* including one new species from Bangalore, Karnataka
** including one new species from Hosmota and Vitel, Karnataka

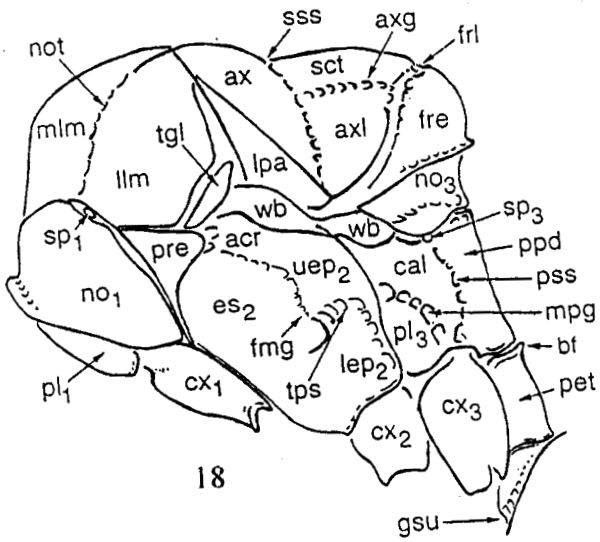
Fig. 11

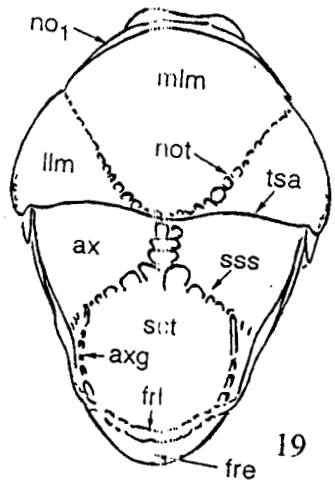


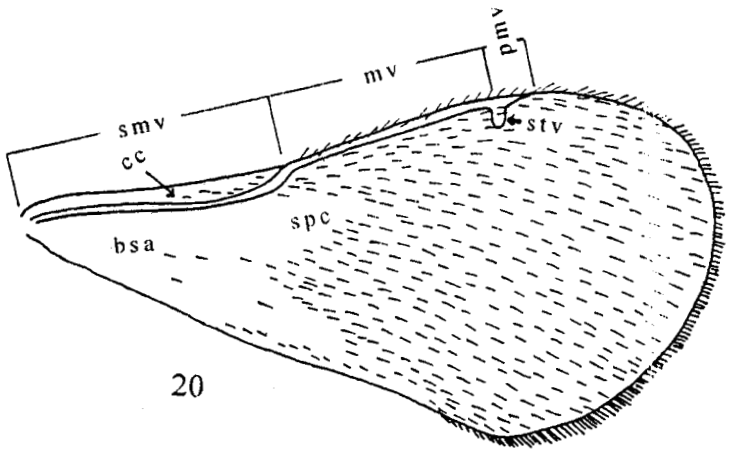
Figs. 12-17 General Morphology
12. Antenna; 13. Labrum front view; 14. Maxillary complex posterior view; 15. Head dorsal view; 16. Head front view; 17. Head lateral view.

acl	anteclypeus	iod	interocular distance	occ	ccipital carina
anl	anellus	lbd	labral digit	po	osterior ocellus
ao	anterior ocellus	lbr	labrum	r man	ight mandible
clv	clava	lp	labial palp	sca	upraclypeal area
cly	clypeus	mdp	malar depression	scd	crobal depression
flg	flagellum	mp	maxillary palp	sld	eta of labral digit
fun	funicle	msp	malar space	tor	orulus
gen	gena				

LOL Lateral ocellar distance
OOL Ocellocular distance
POL post ocellar distance

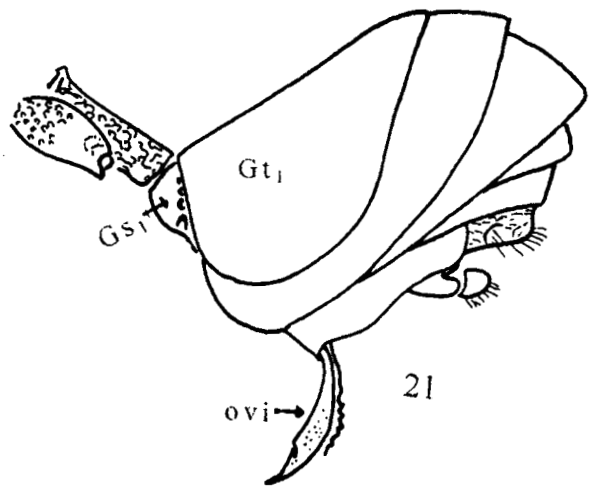


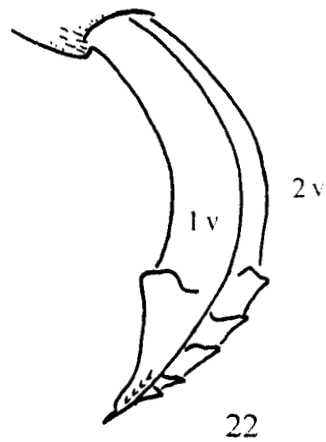




Figs. 18-20 General Morphology
18. Mesosoma lateral view; **19.** Mesosoma dorsal view; **20.** Fore wing.

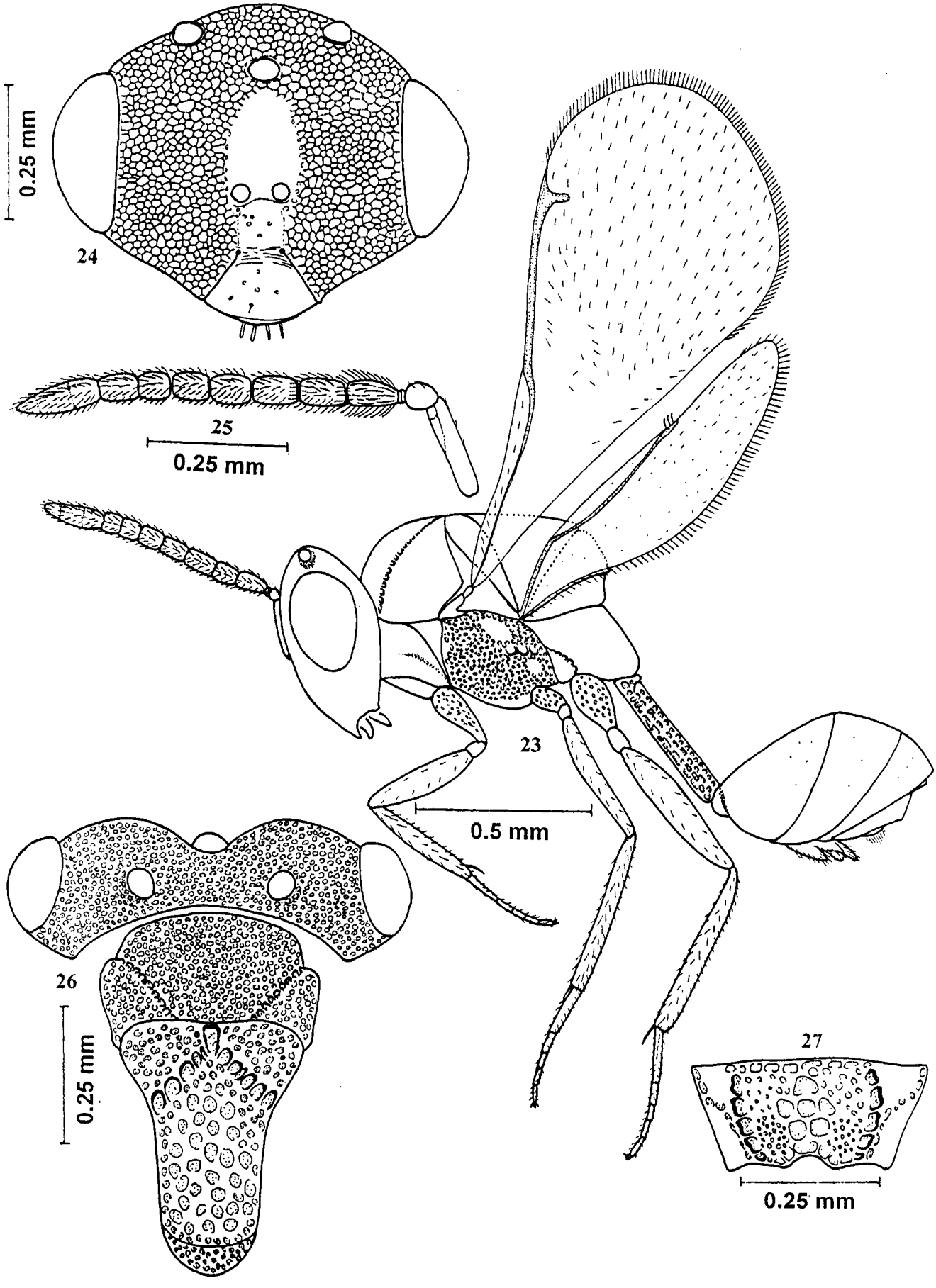
acr	acropleuron	lep_2	lower mesepimeron	ppd	propodeum
ax	axilla	llm	lateral lobe of mesoscutum	pre	prepectus
axg	axillular groove	mlm	midlobe of mesoscutum	pss	postspiracular sulcus
axl	axillula	mpg	metapleural groove	sct	scutellar disc
bf	basal flange of petiole	mv	marginal vein	smv	submarginal vein
bsa	basal area	no_1	pronotum	sp_1	prothoracic spiracle
cal	callus	no_3	metanotum	sp_3	metathoracic spiracle
cc	costal cell	not	notaulus	spc	speculum
cx	coxa	pet	petiole	sss	scutoscutellar sulcus
es_2	mesepisternum	pl_1	propleuron	stv	stigmal vein
fmg	femoral groove	pl_3	metapleuron	tgl	tegula
fre	frenum	pmv	postmarginal vein	tsa	transscutal articulation
frl	frenal line or groove			uep_2	upper mesepimeron
gsu	sulcus of first gastral sternite			wb	wing base



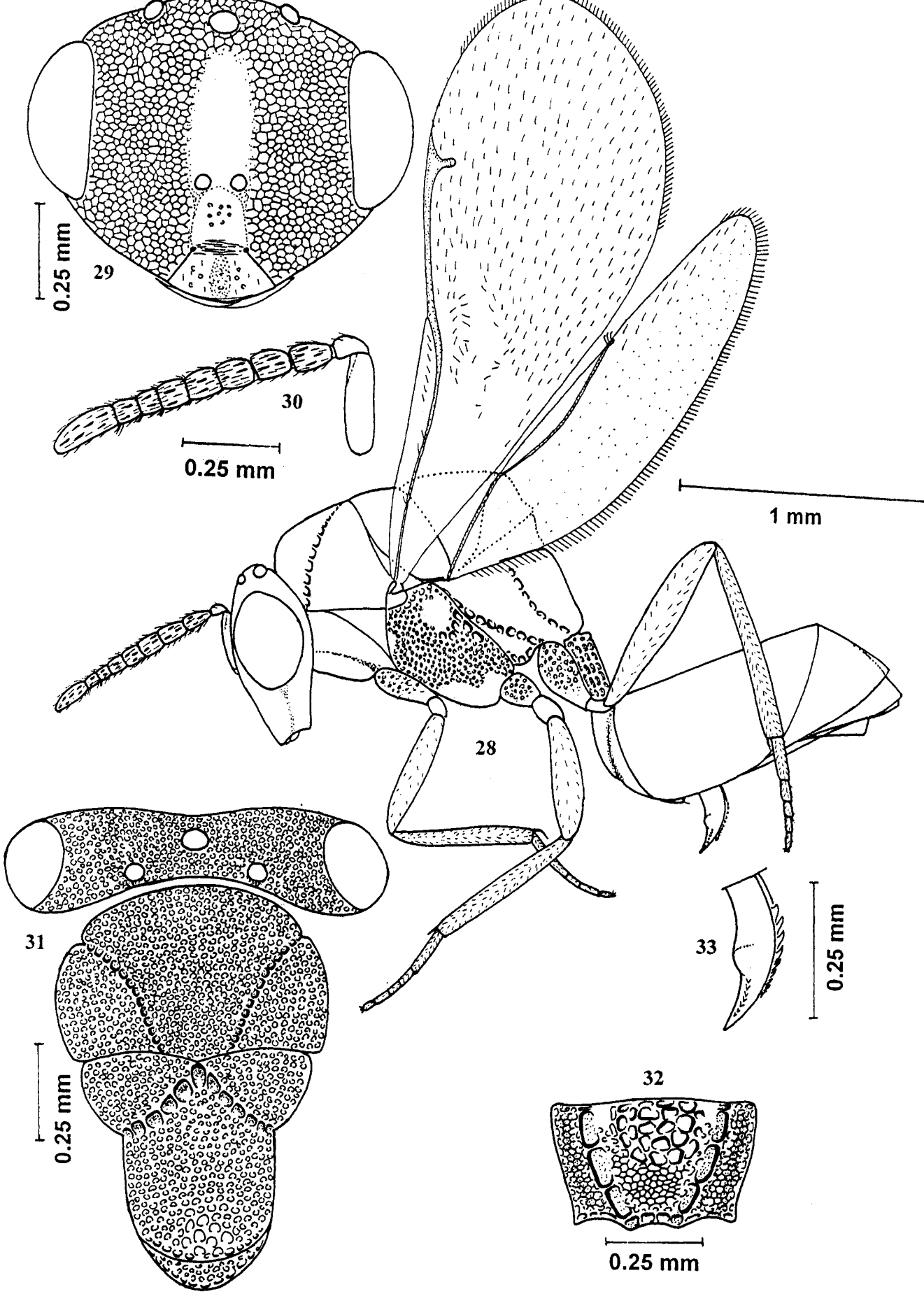


Figs. 21-22 General Morphology
21. Metasoma lateral view; **22.** Ovipositor.

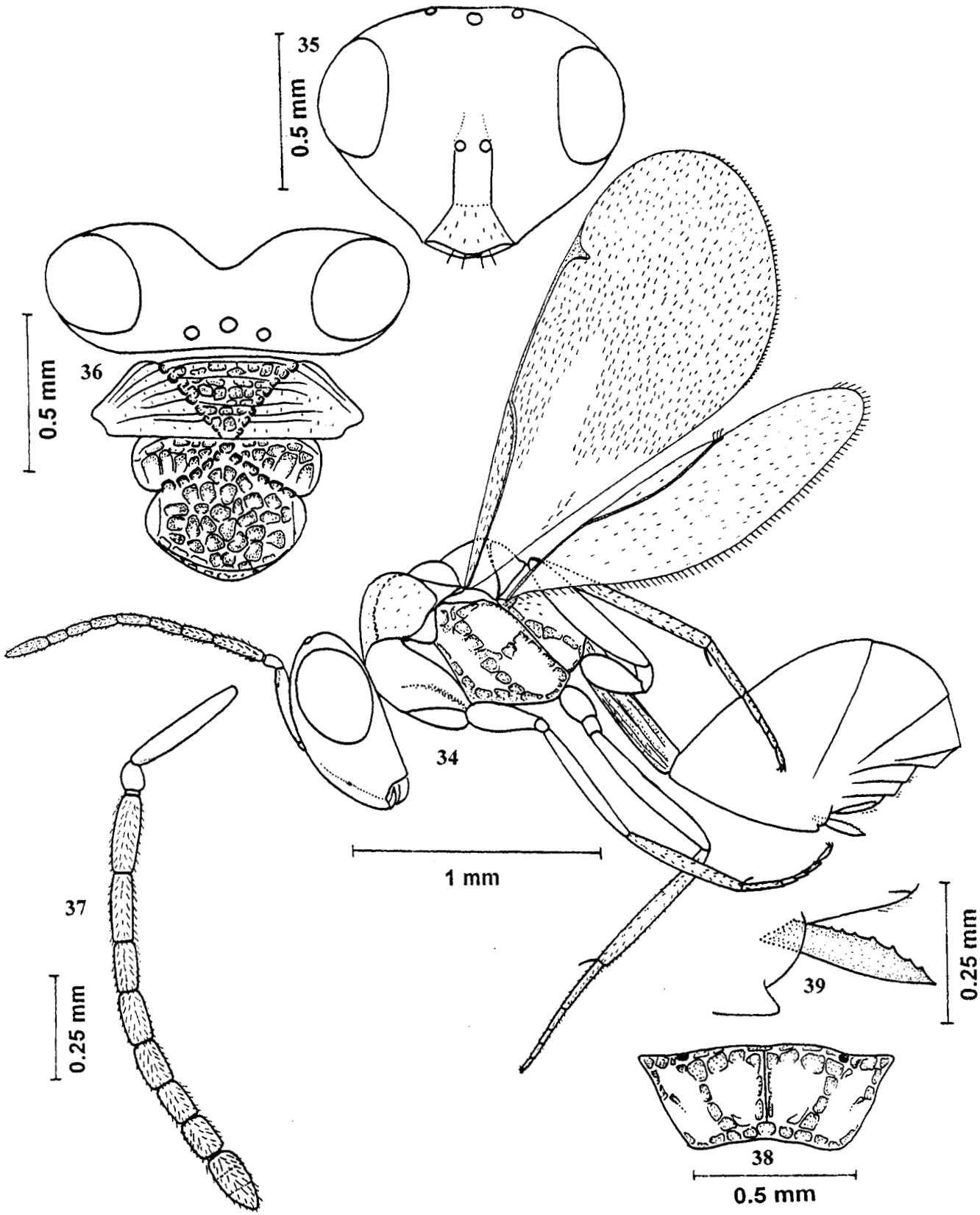
Gs1	first gastral sternite	1v	1st valvula
Gt	gastral tergite	2v	2nd valvula
ovi	ovipositor		



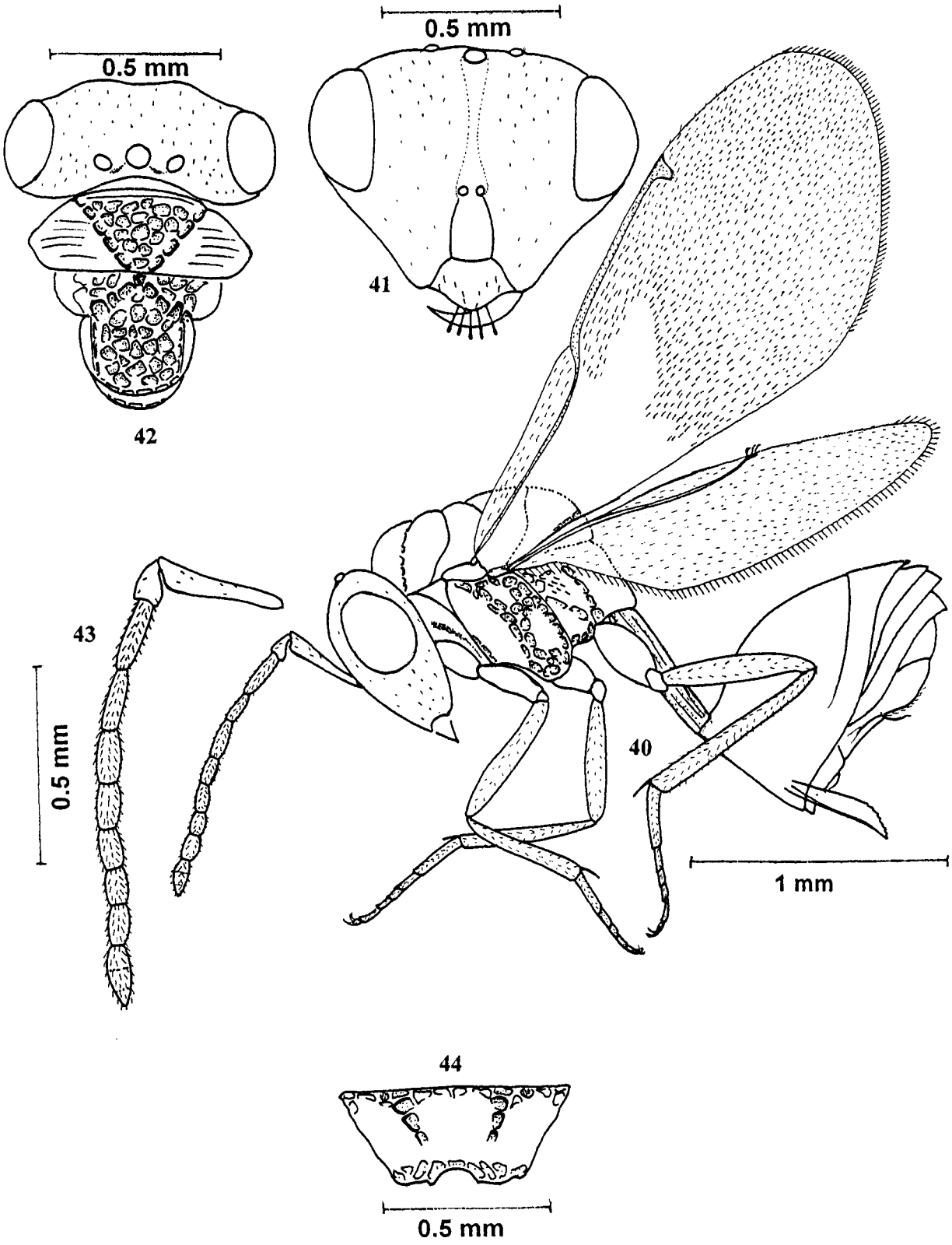
Figs. 23-27. ***Orasema maseora*** sp. nov. **Male.** 23. Body profile; 24. Head front view; 25. Antenna; 26. Head and mesosoma dorsal view; 27. Propodeum.



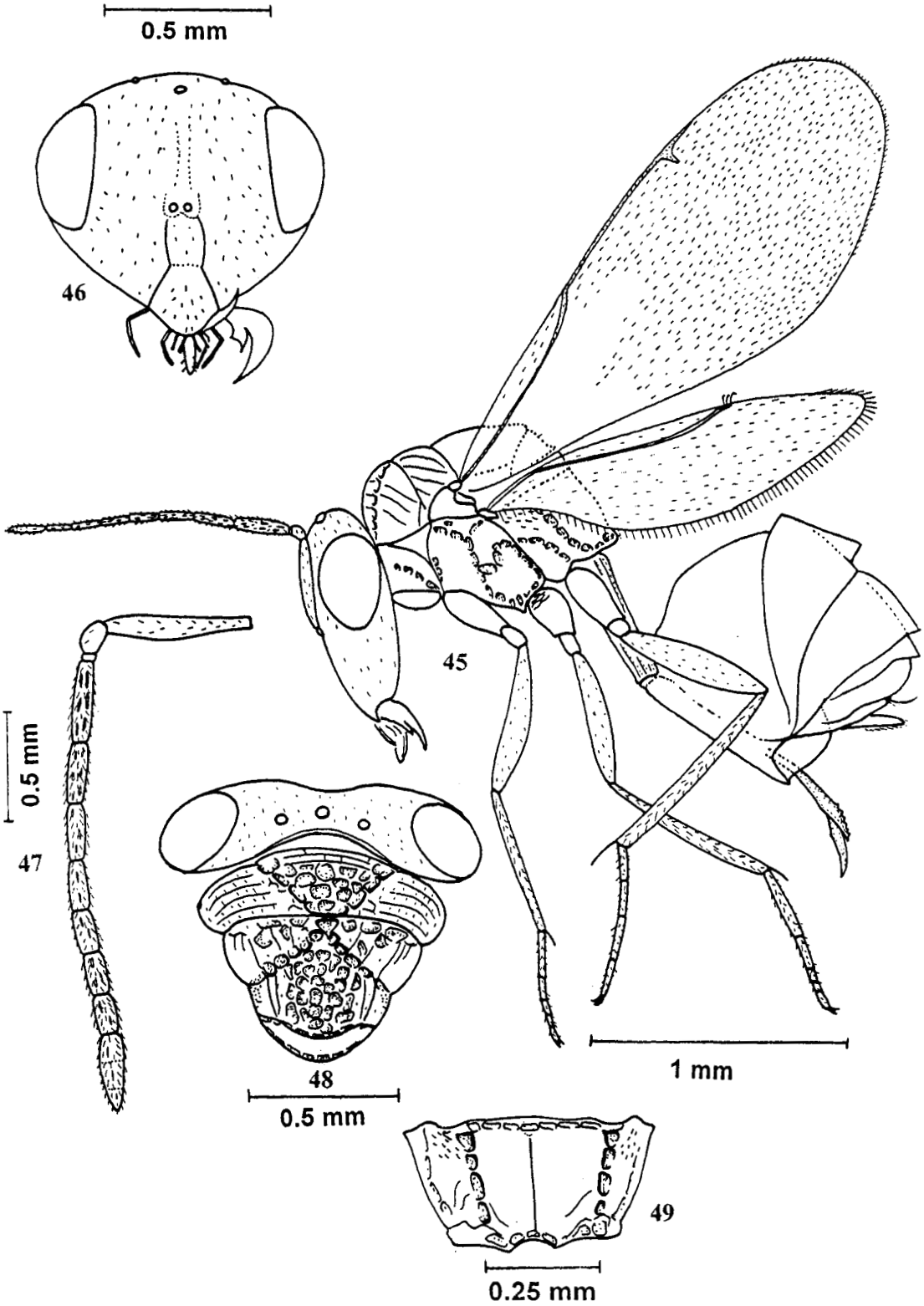
Figs. 28-33. ***Orasema nirupama*** sp.nov. **Female**. 28. Body profile; 29. Head front view; 30. Antenna; 31. Head and mesosoma dorsal view; 32. Propodeum; 33. Ovipositor.



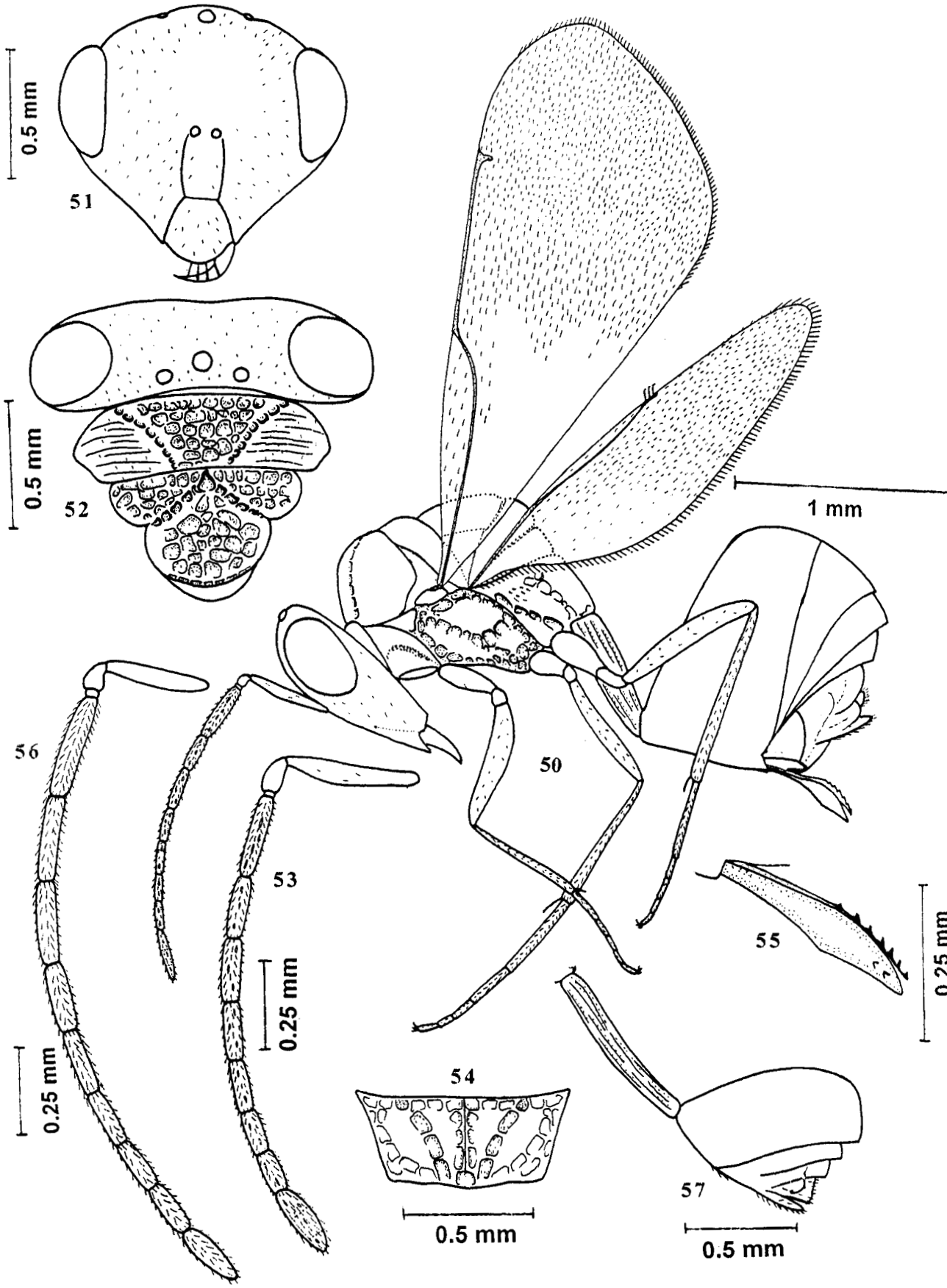
Figs. 34-39. ***Neolosbanus diversus*** sp. nov. **Female**. 34. Body profile; 35. Head front view; 36. Head and mesosoma dorsal view; 37. Antenna; 38. Propodeum; 39. Ovipositor.



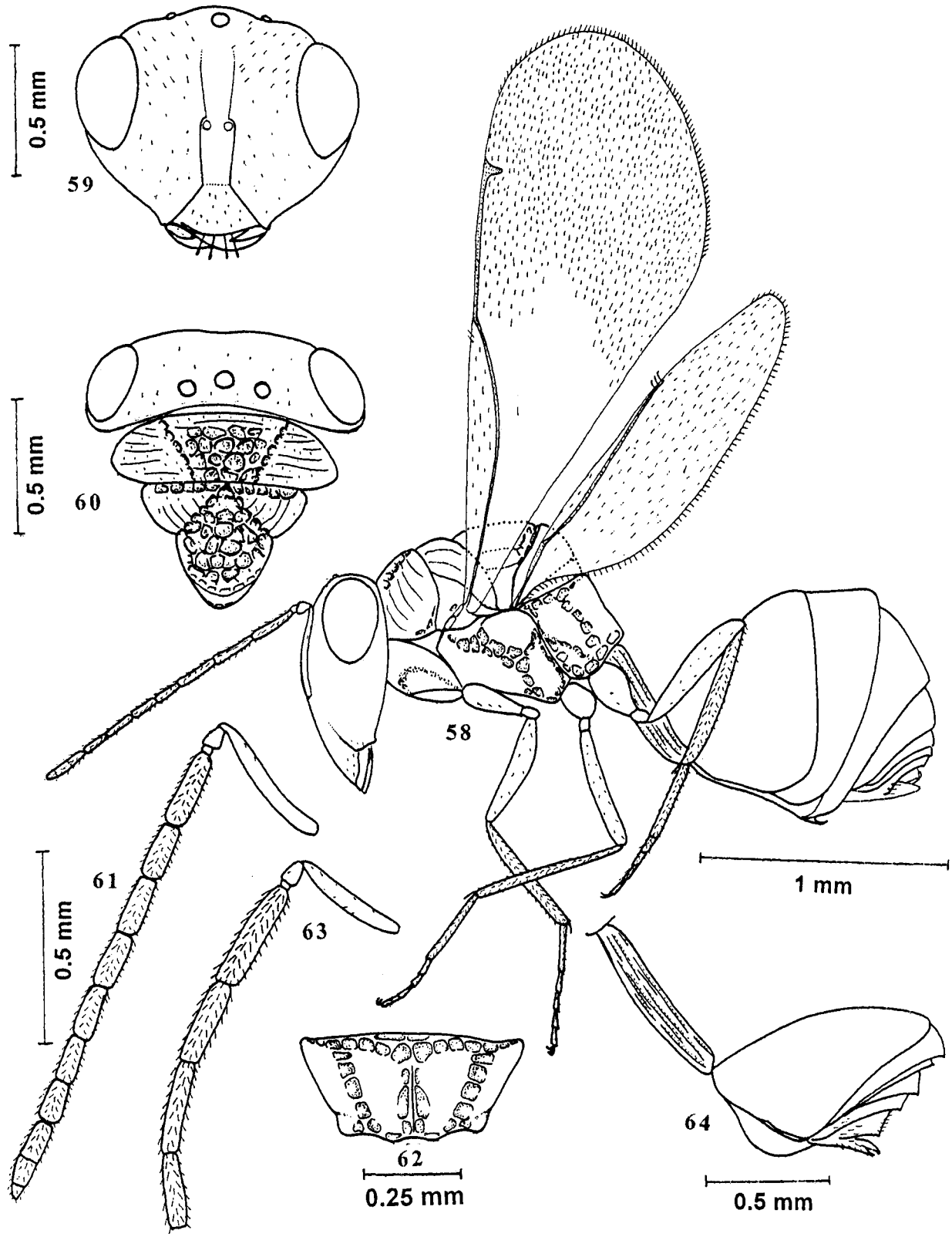
Figs. 40-44. *Neolosbanus laeviceps* (Gahan) **Female**. 40. Body profile; 41. Head front view; 42. Head and mesosoma dorsal view; 43. Antenna; 44. Propodeum.



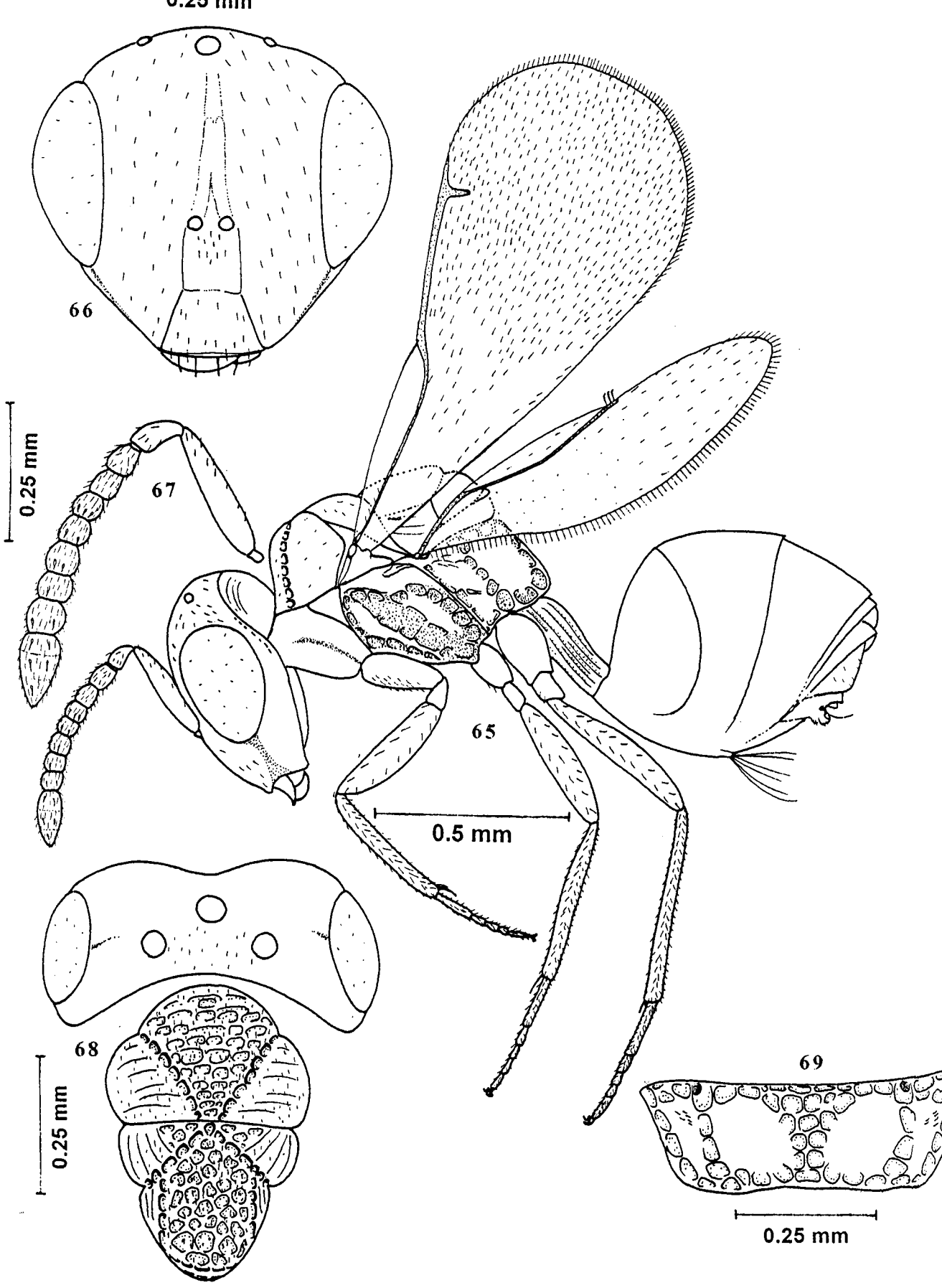
Figs. 45-49. ***Neolosbanus palgravei*** (Girault). **Female**. 45. Body profile; 46. Head front view; 47. Antenna; 48. Head and mesosoma dorsal view; 49. Propodeum.



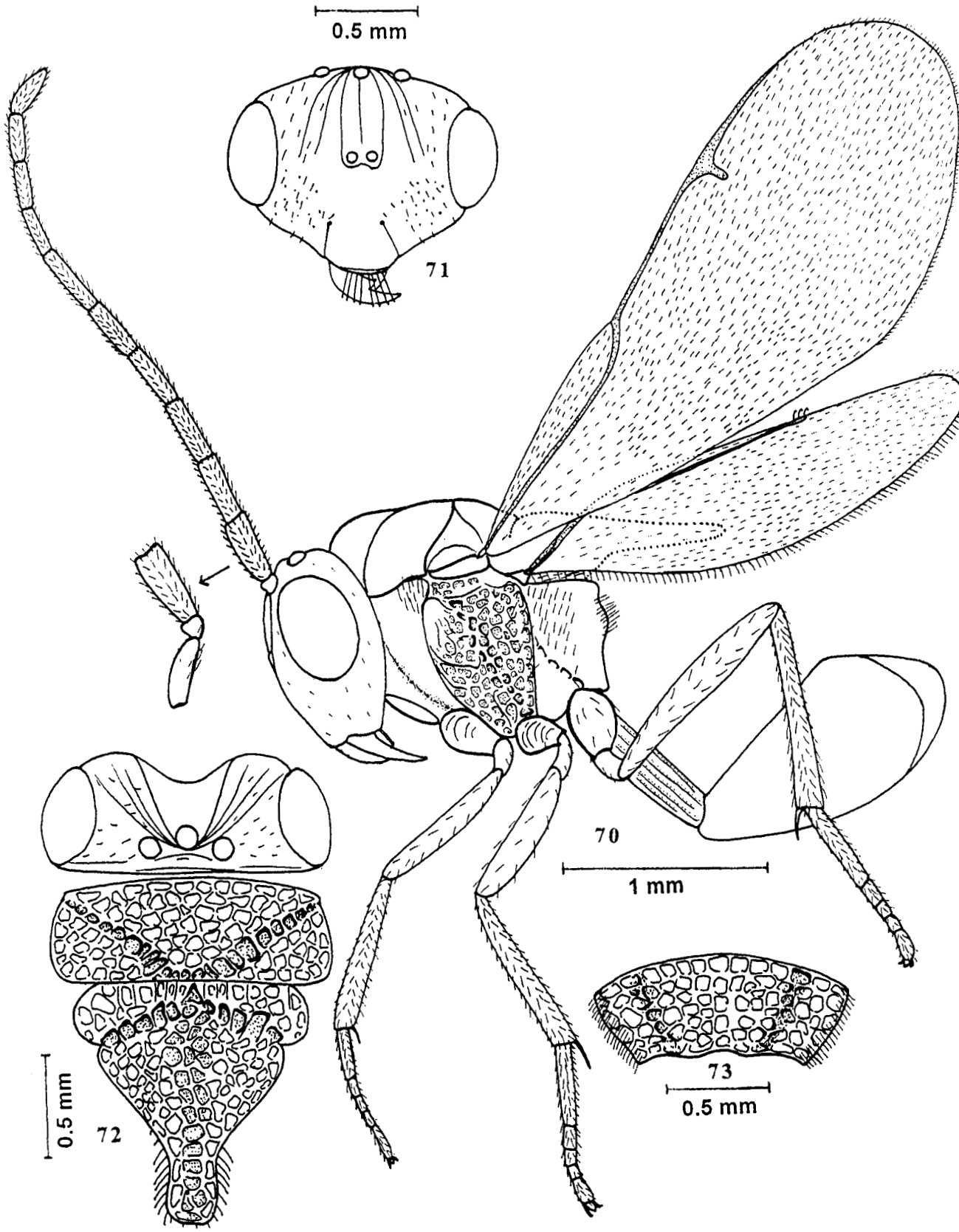
Figs. 50-55. ***Neolosbanus secus*** sp. nov. **Female.** 50. Body profile; 51. Head front view; 52. Head and mesosoma dorsal view; 53. Antenna; 54. Propodeum. 55. Ovipositor; **56-57. Male**. 56. Antenna; 57. Metasoma.



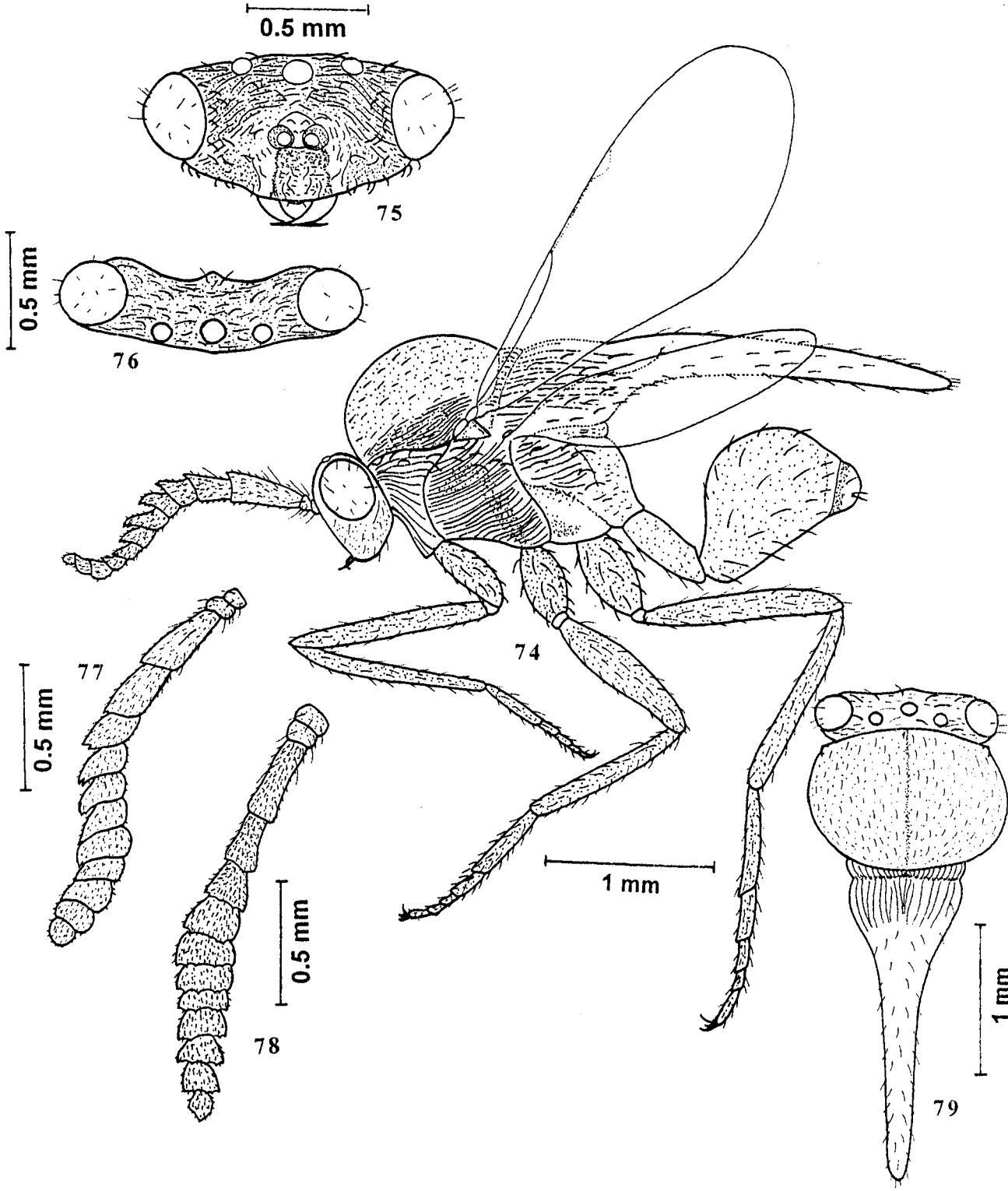
Figs. 58-62. ***Neolosbanus trichuricus*** sp. nov. **Female**. 58. Body profile; 59. Head front view; 60. Head and mesosma dorsal view; 61. Antenna; 62. Propodeum; **63-64 Male.** 63. Antenna; 64. Metasoma.



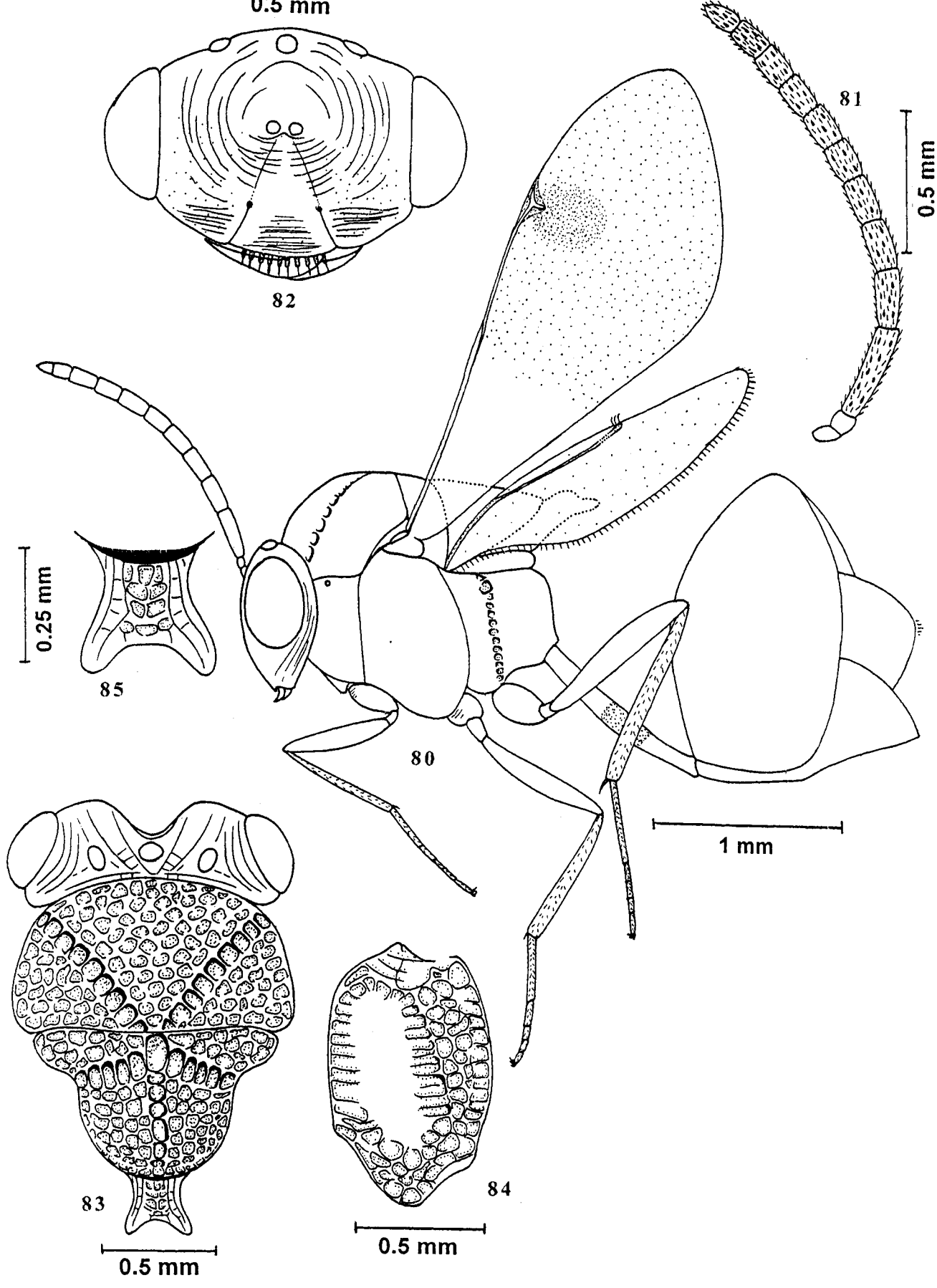
Figs. 65-69. ***Psilocharis hypena*** Heraty **Female**. 65. Body profile; 66. Head front view; 67. Antenna; 68. Head and mesosma dorsal view; 69. Propodeum.



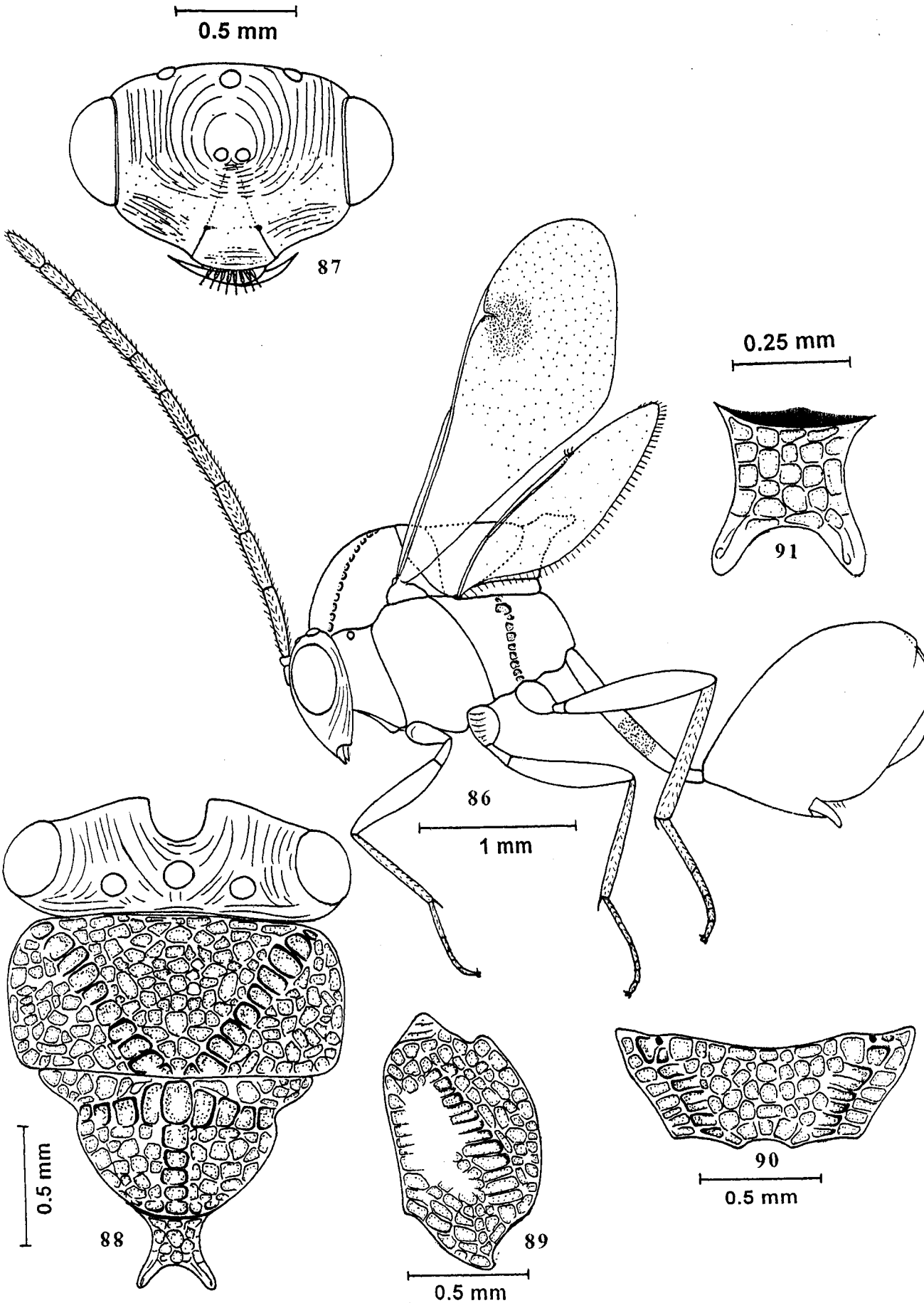
Figs. 70-73. ***Ancylotropus keralensis*** sp.nov. **Female.** 70. Body profile; 71. Head front view; 72. Head and mesosma dorsal view; 73. Propodeum.



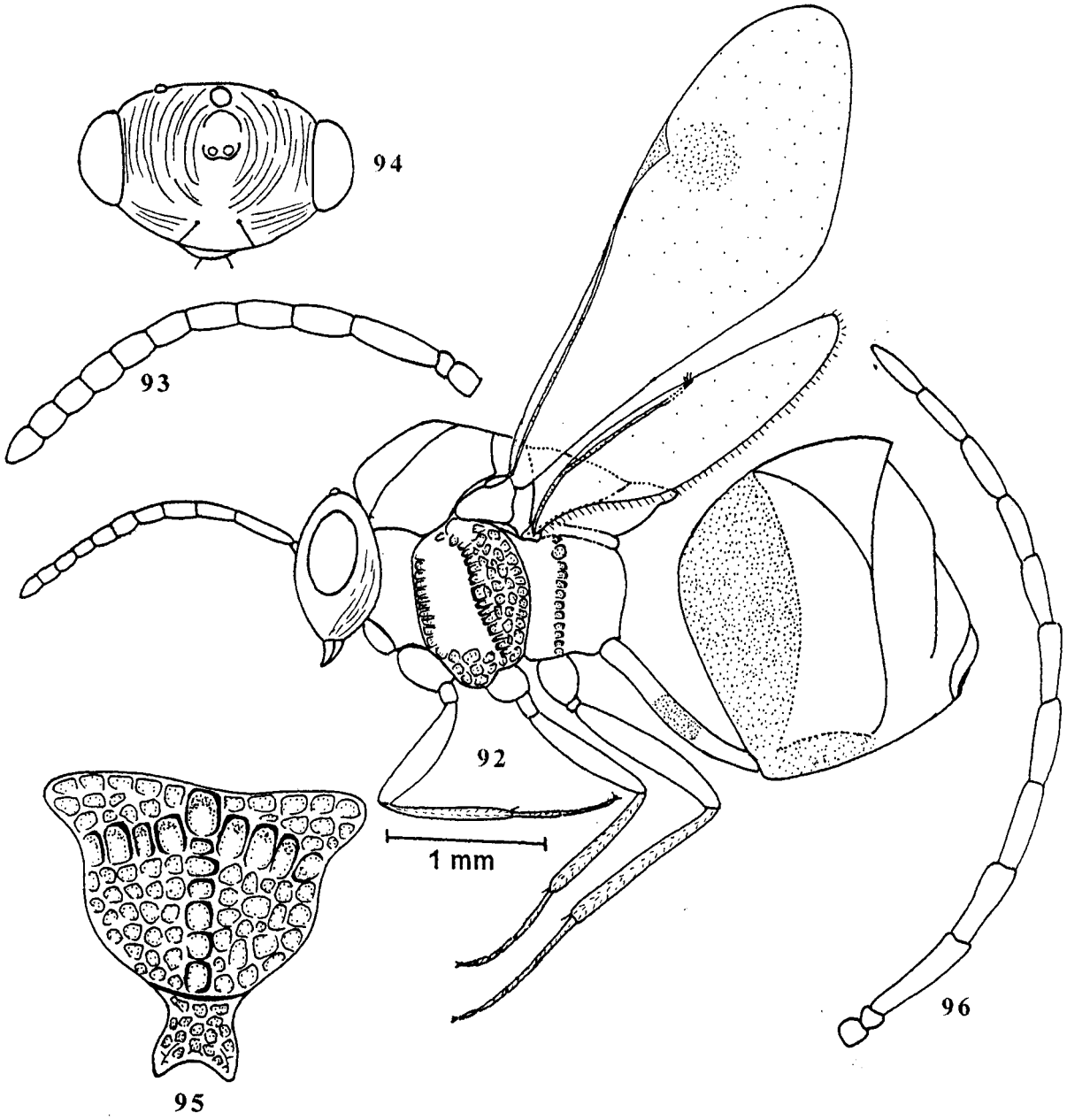
Figs. 74-79. ***Cherianella narayani*** Narendran. **Male.** 74. Body profile; 75. Head front view; 76. Head dorsal view; 77. Antenna lateral view; 78. Antenna front view; 79. Head and mesosoma dorsal view.



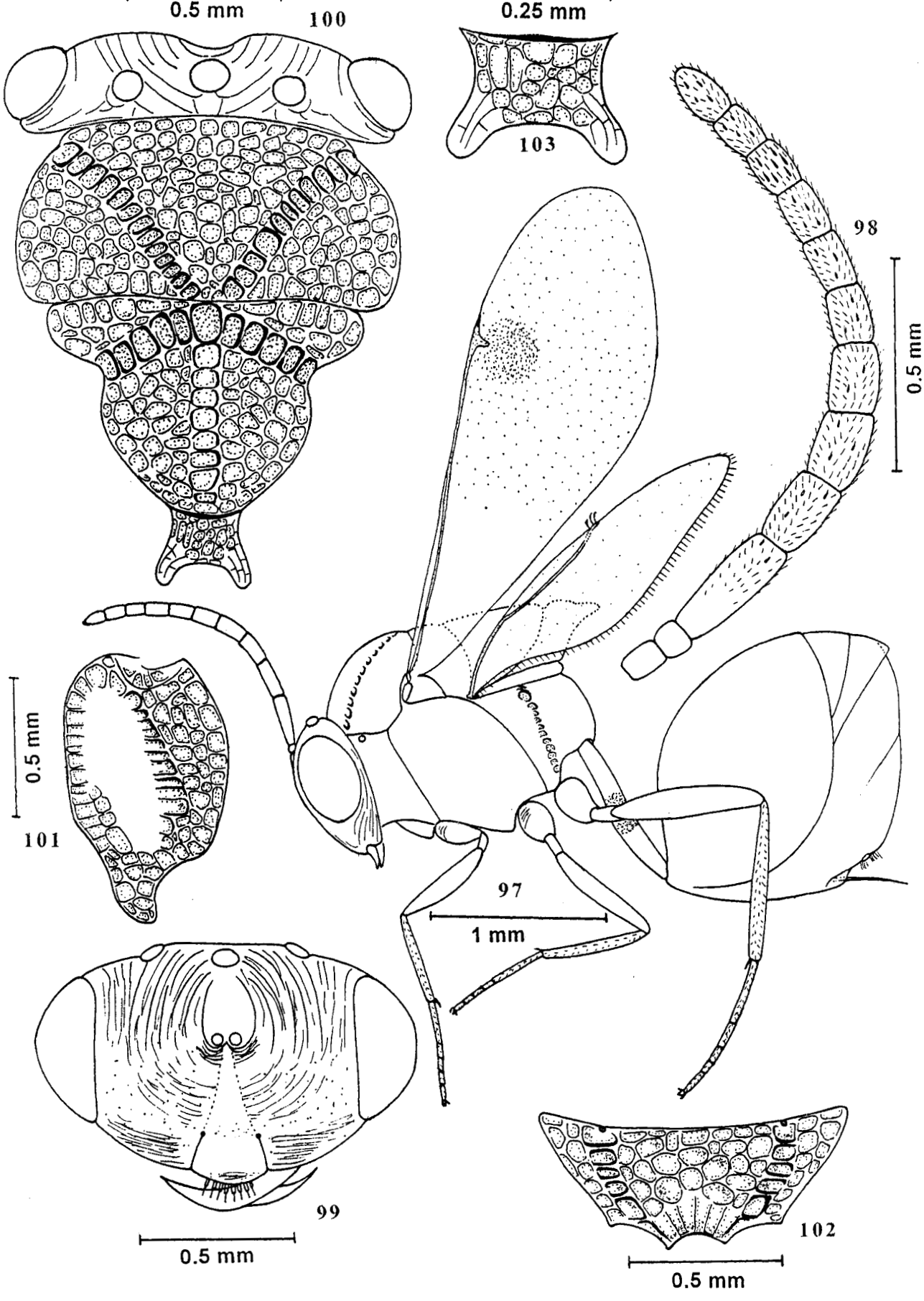
Figs. 80-85. ***Stilbula aruna*** sp. nov. **Female**. 80. Body profile; 81. Antenna; 82. Head front view; 83. Head and mesosoma dorsal view; 84. Mesopleuron; 85. Scutellar teeth.



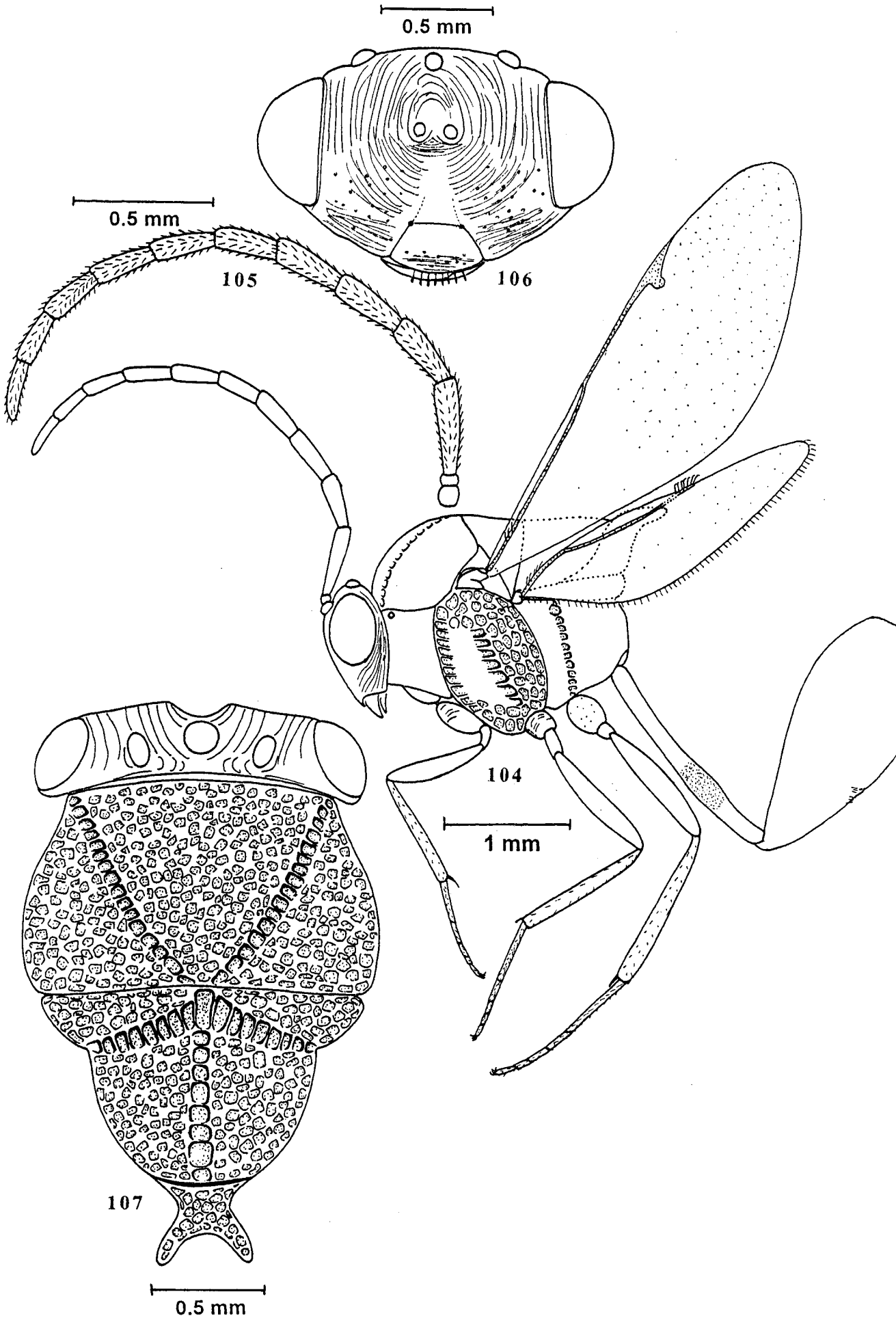
Figs. 86-91. ***Stilbula aruna*** sp. nov. **Male**. 86. Body profile; 87. Head front view; 88. Head and mesosoma dorsal view; 89. Mesopleuron; 90. Propodeum; 91. Scutellar teeth.



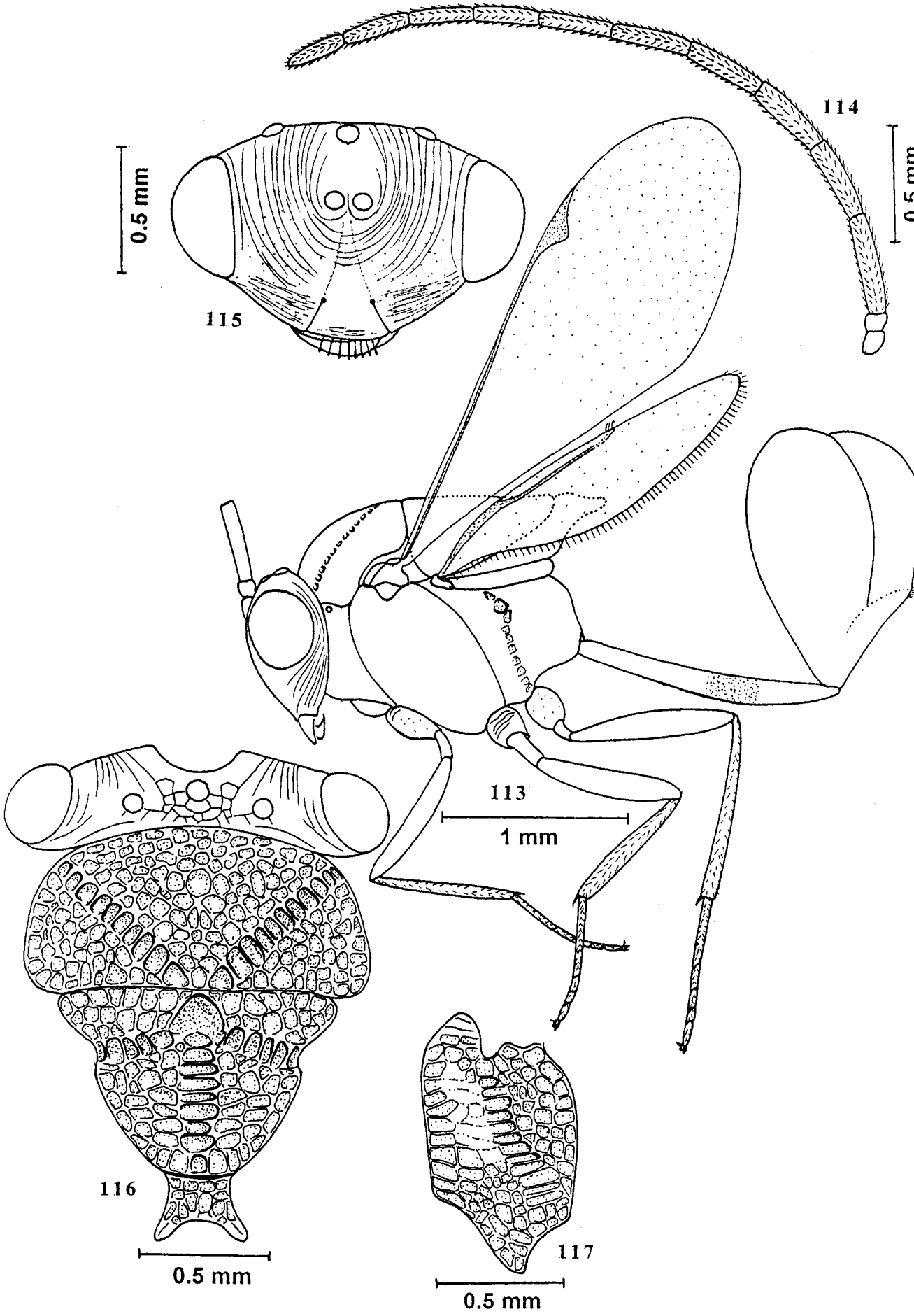
Figs. 92-95. ***Stilbula ashokai*** Narendran. **Female.** 92. Body profile; 93. Antenna; 94. Head front view; 95. Scutellum dorsal view; **Fig. 96. Male**. Antenna.



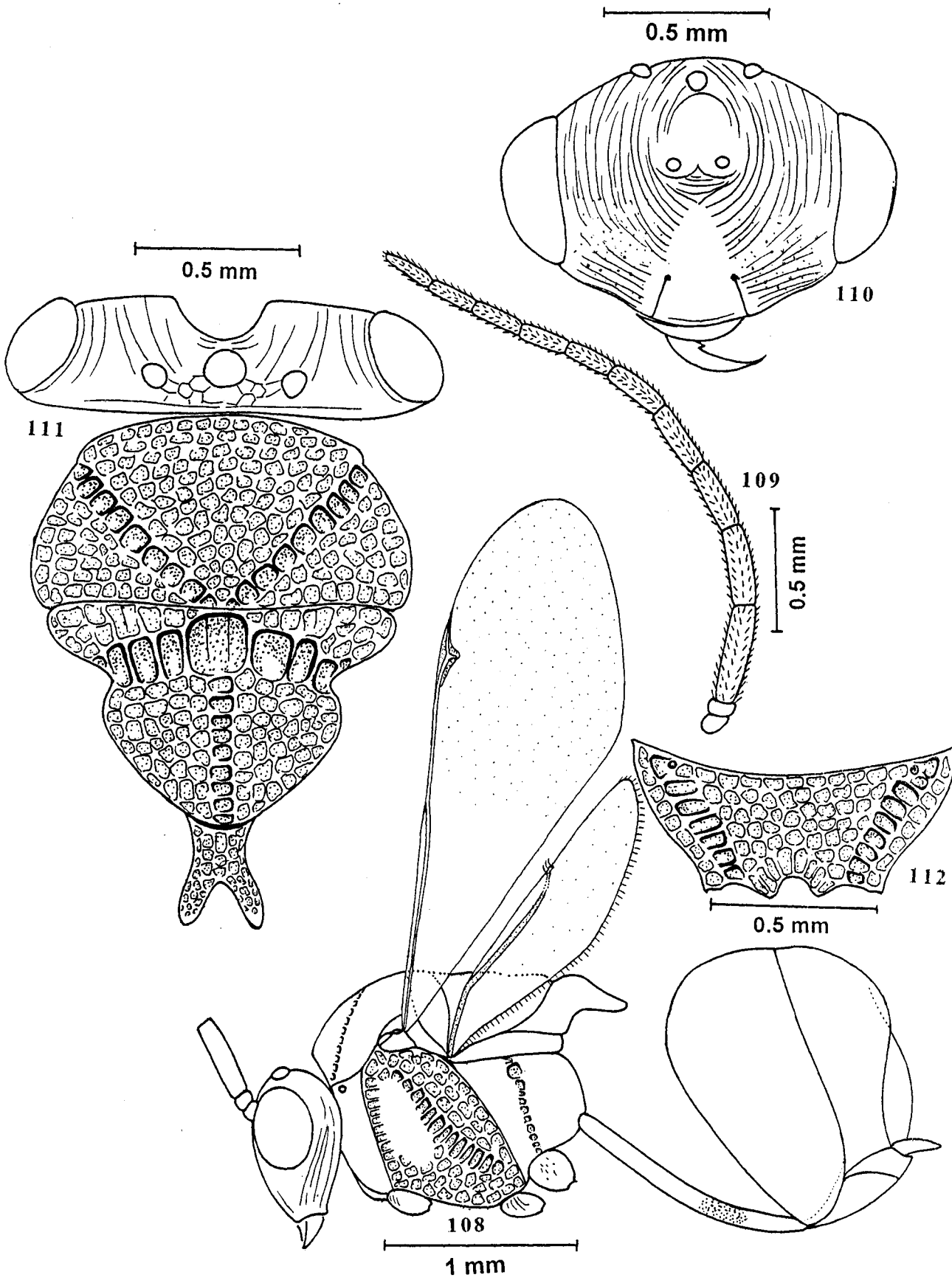
Figs. 97-103. ***Stilbula athira*** sp. nov. **Female.** 97. Body profile; 98. Antenna; 99. Head front view; 100. Head and mesosoma dorsal view; 101. Mesopleuron; 102. Propodeum; 103. Scutellar teeth.



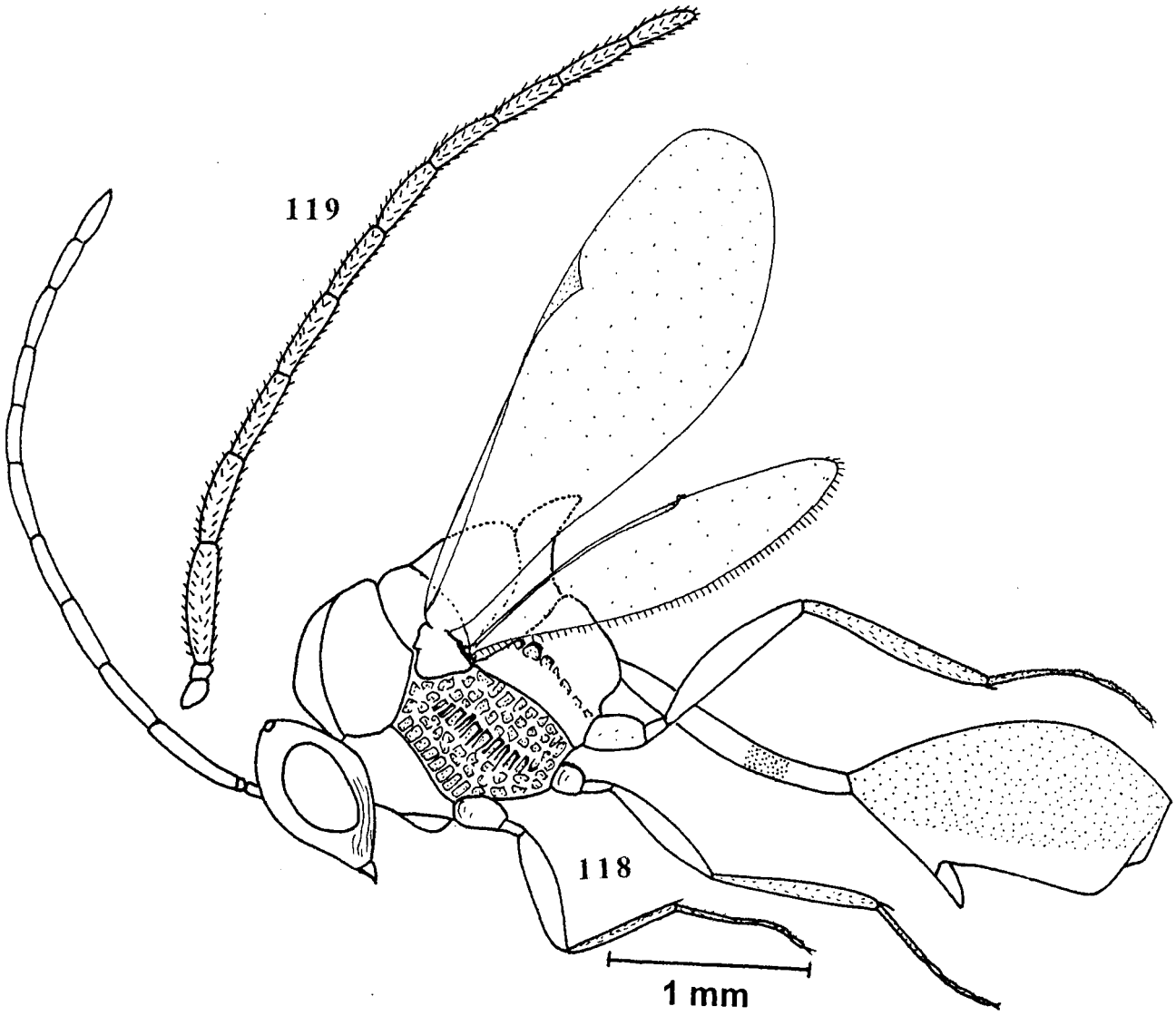
Figs. 104-107. *Stilbula bangalorica* sp. nov. **Male**. 104. Body profile; 105. Antenna; 106. Head; 107. Genitalia.

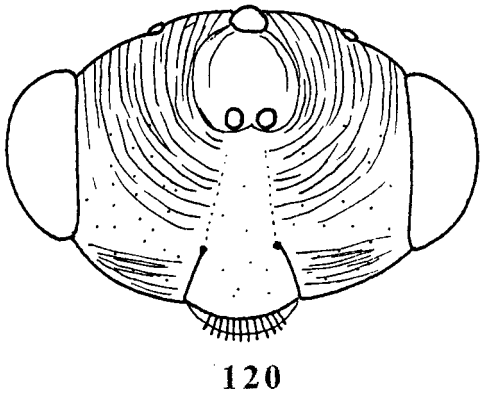


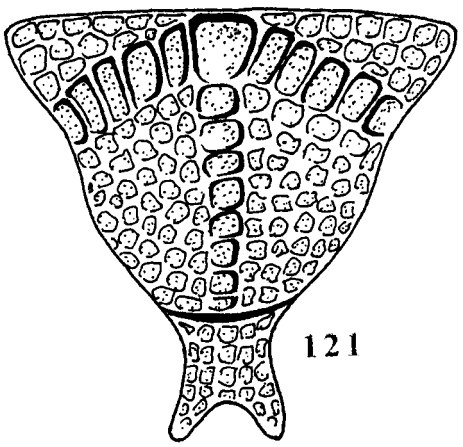
Figs. 113-117. *Stilbula isula* sp. nov. **Male**. 113. Body profile; 114. Antenna; 115. Head front view; 116. Head and mesosoma dorsal view; 117. Mesopleuron.



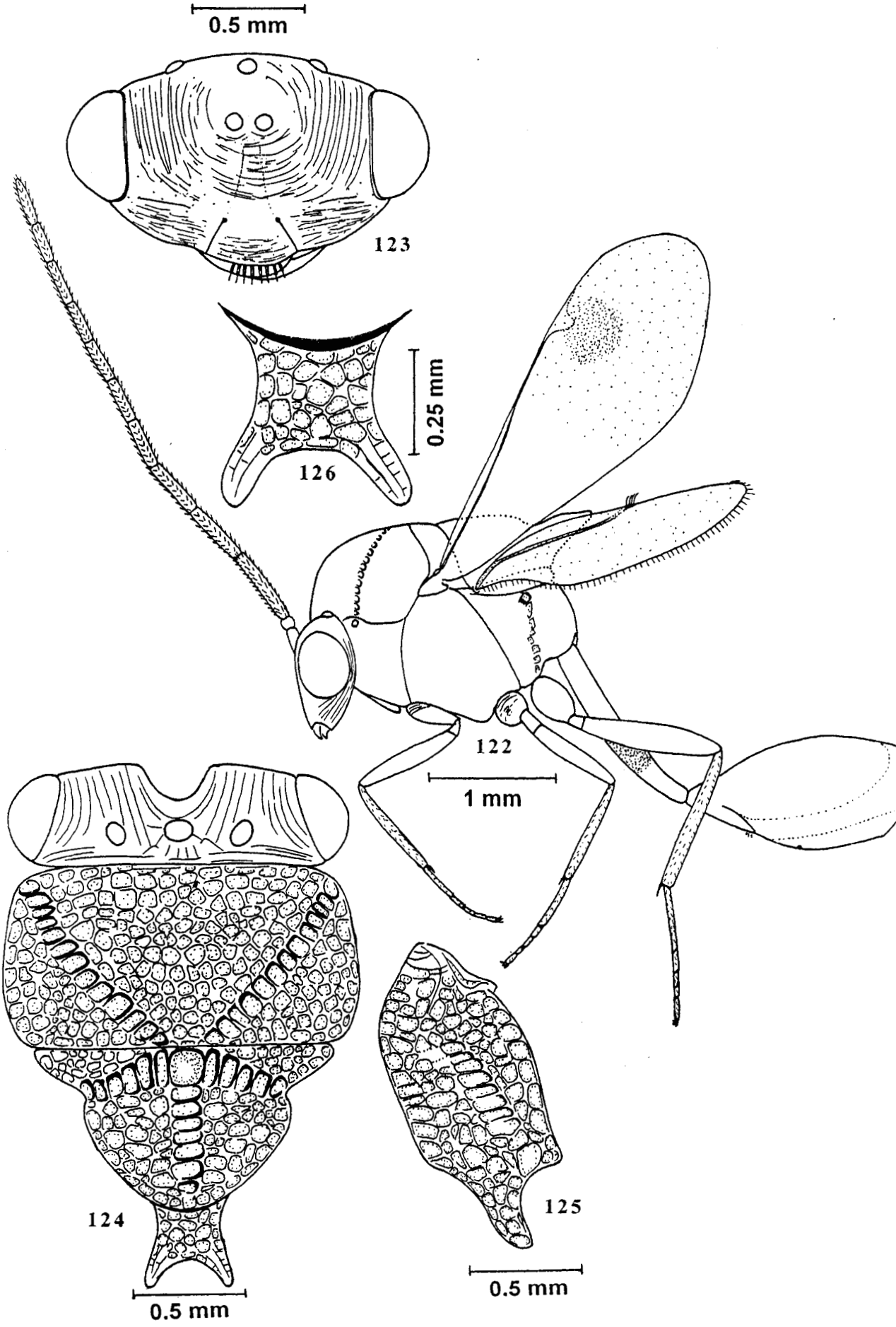
Figs. 108-112. ***Stilbula bullista*** sp. nov. **Male**. 108. Body profile; 109. Antenna; 110. Head front view; 111. Head and mesosoma dorsal view; 112. Propodeum.



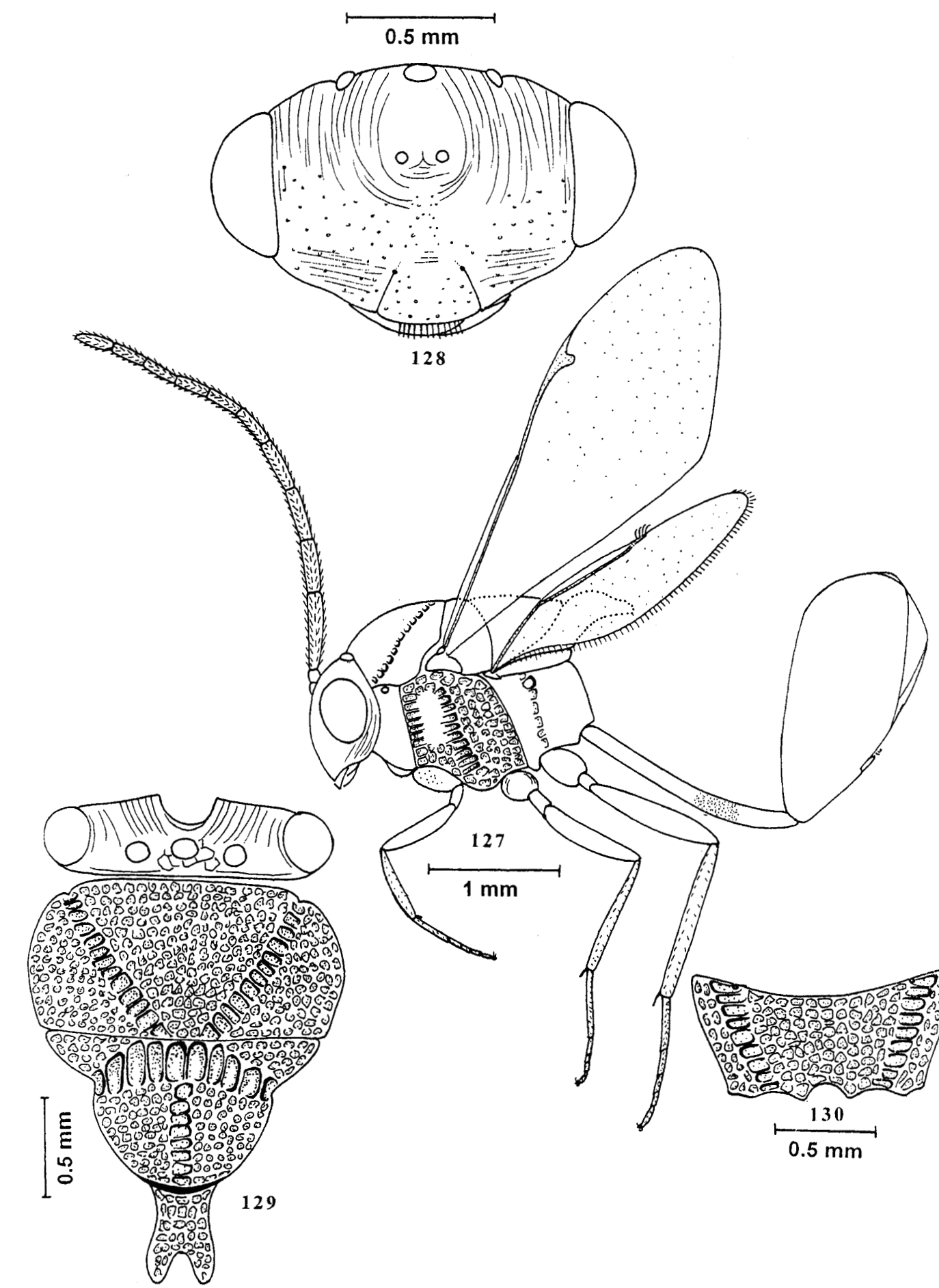




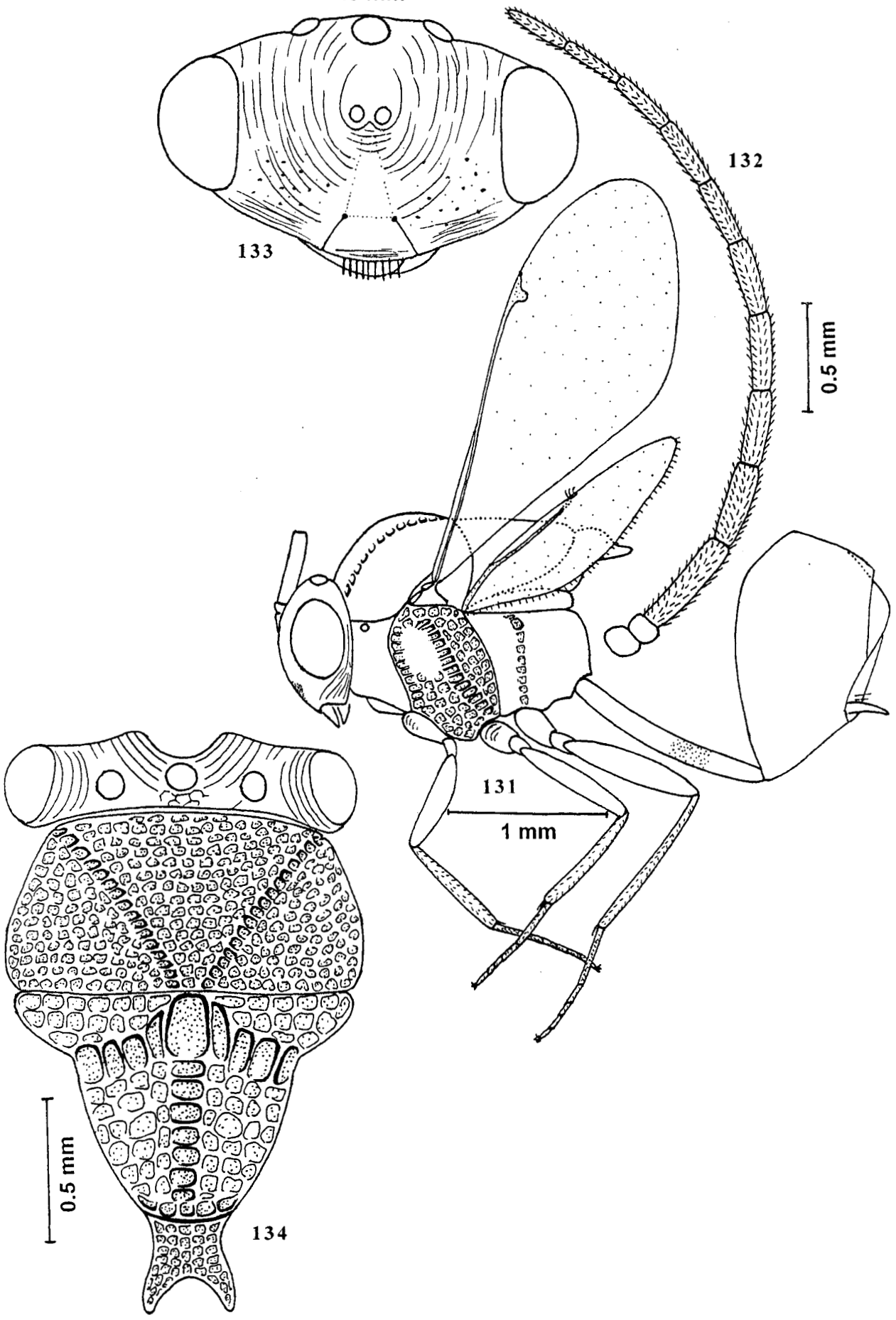
Figs. 118-121. ***Stilbula lata*** Narendran. **Male.** 118. Body profile; 119. Antenna; 120. Head front view; 121. Scutellum dorsal view.



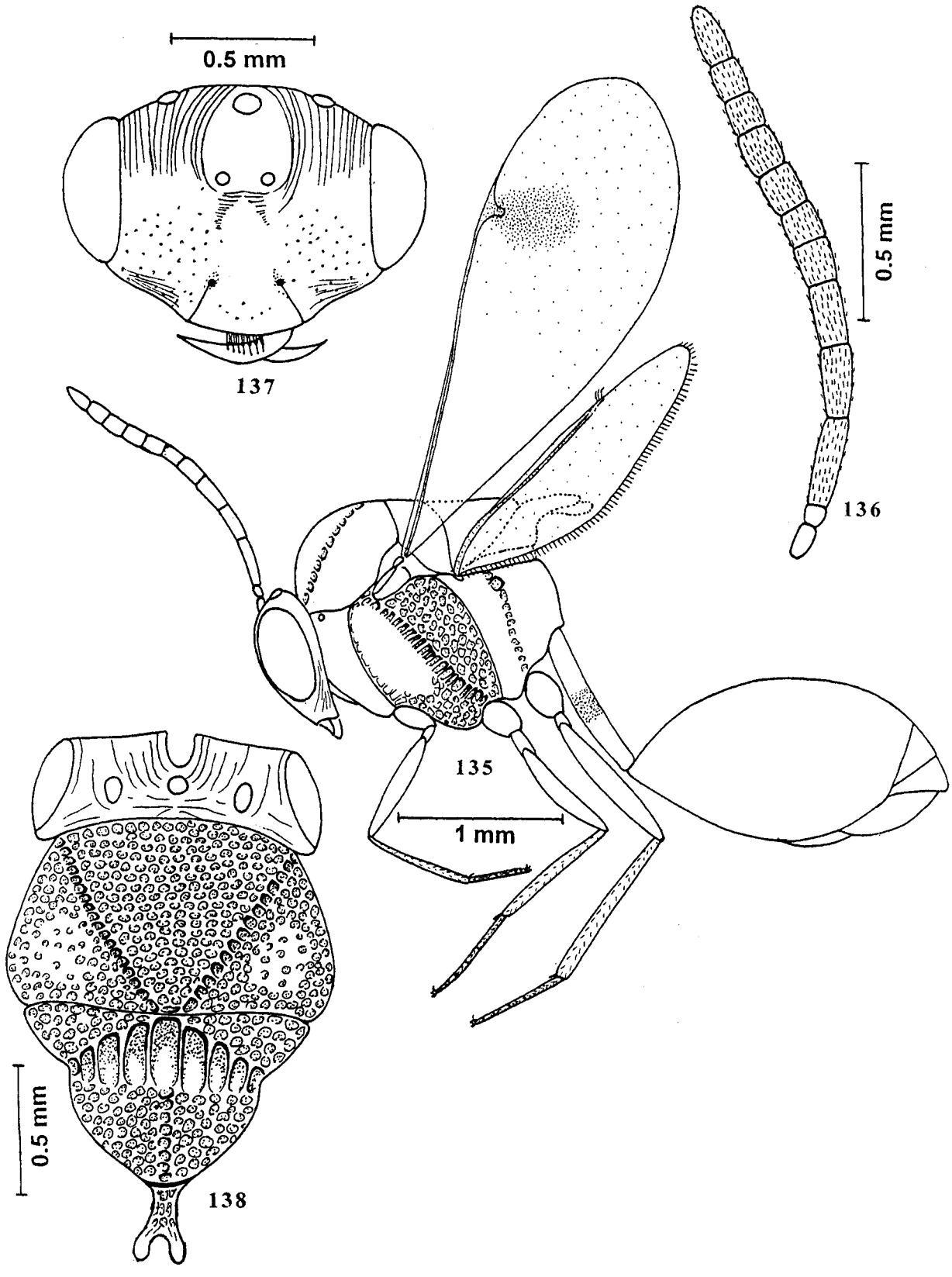
Figs. 122-126. ***Stilbula lepida*** sp. nov. **Male**. 122. Body profile; 123. Head front view; 124. Head and mesosoma dorsal view; 125. Mesopleuron; 126. Scutellar teeth.



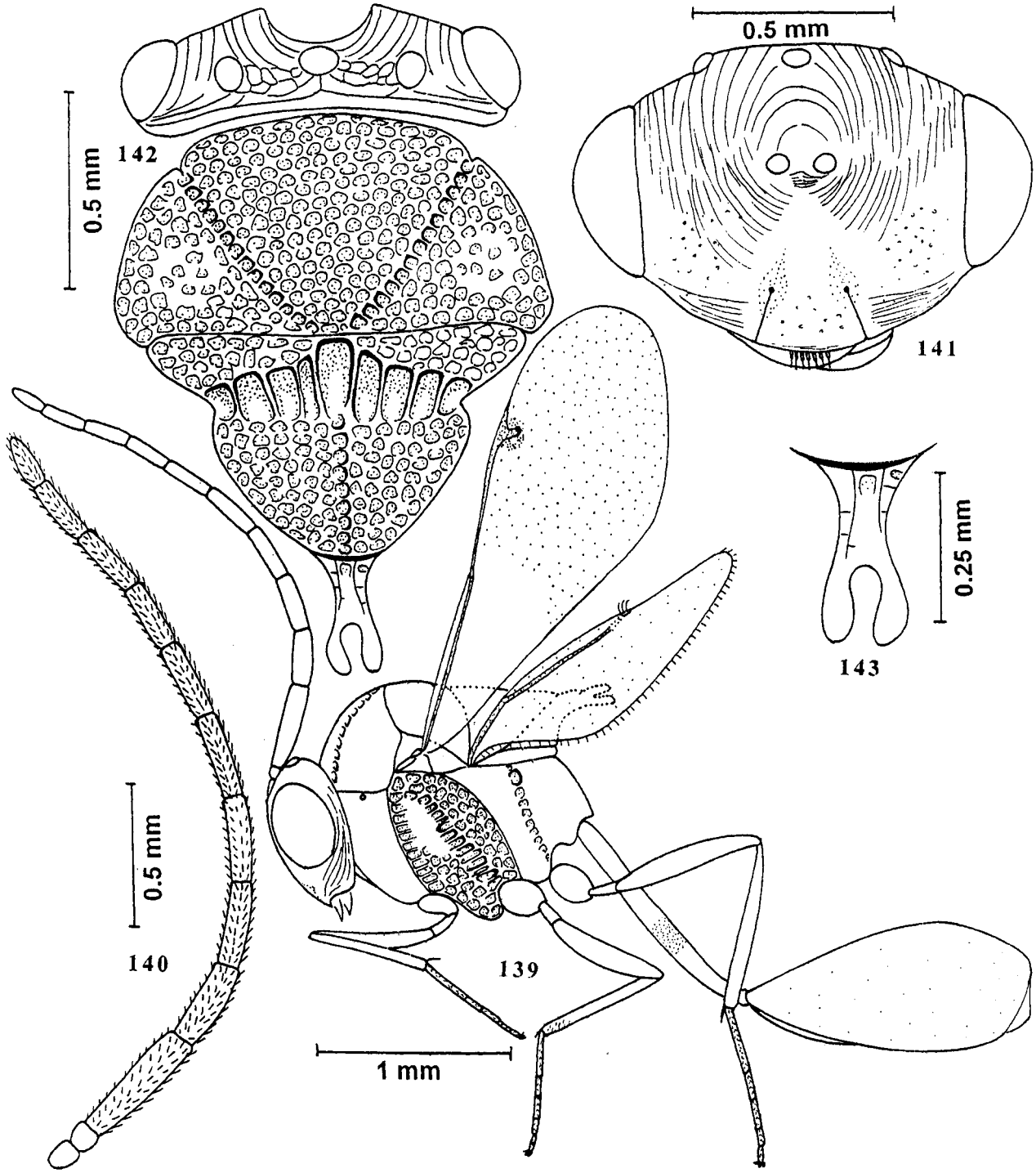
Figs. 127-130. ***Stilbula muthangensis*** sp. nov. **Male**. 127. Body profile; 128. Head front view; 129. Head and mesosoma dorsal view; 130. Propodeum.



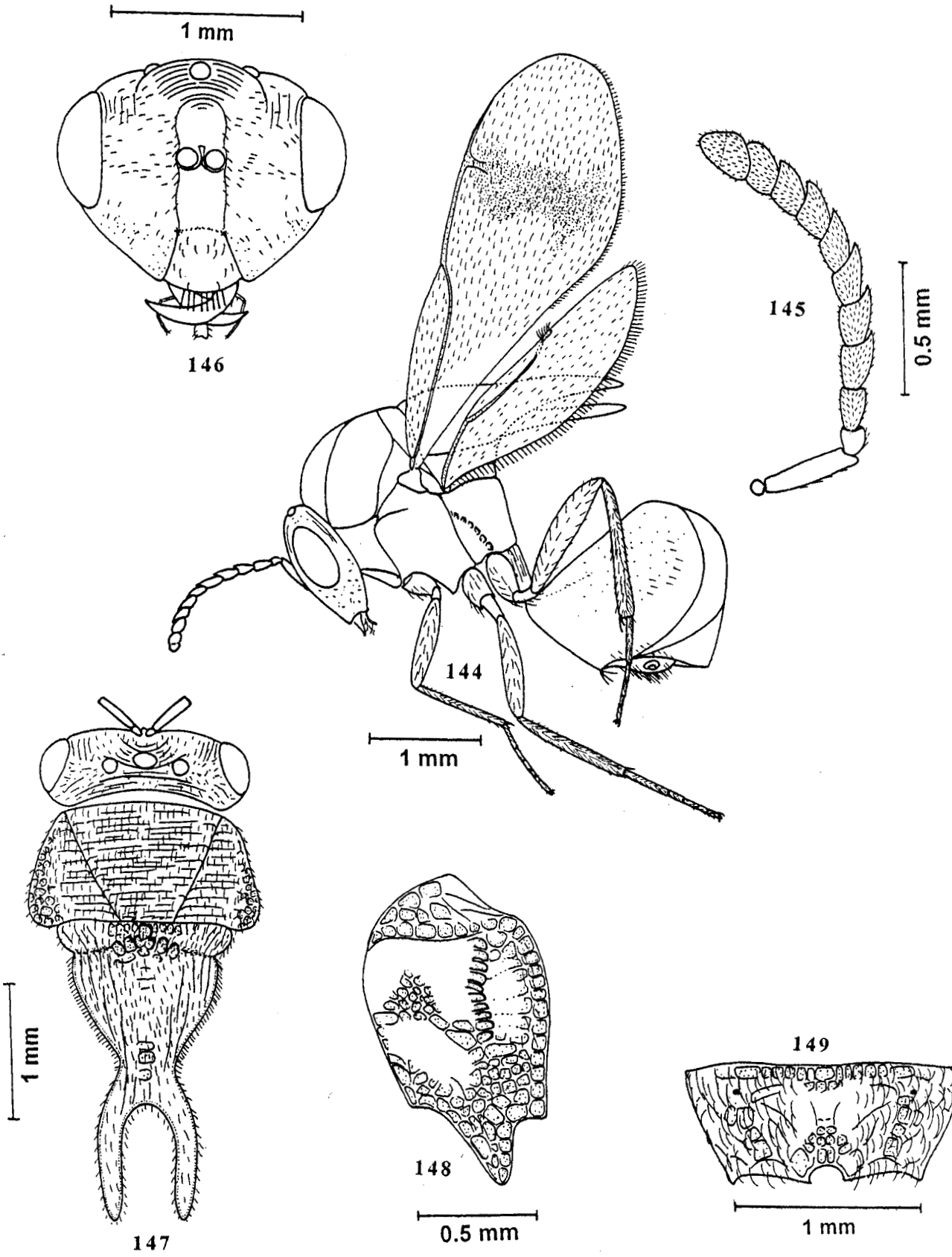
Figs. 131-134. ***Stilbula namida*** sp. nov. **Male.** 131. Body profile; 132. Antenna; 133. Head front view; 134. Head and mesosoma dorsal view.



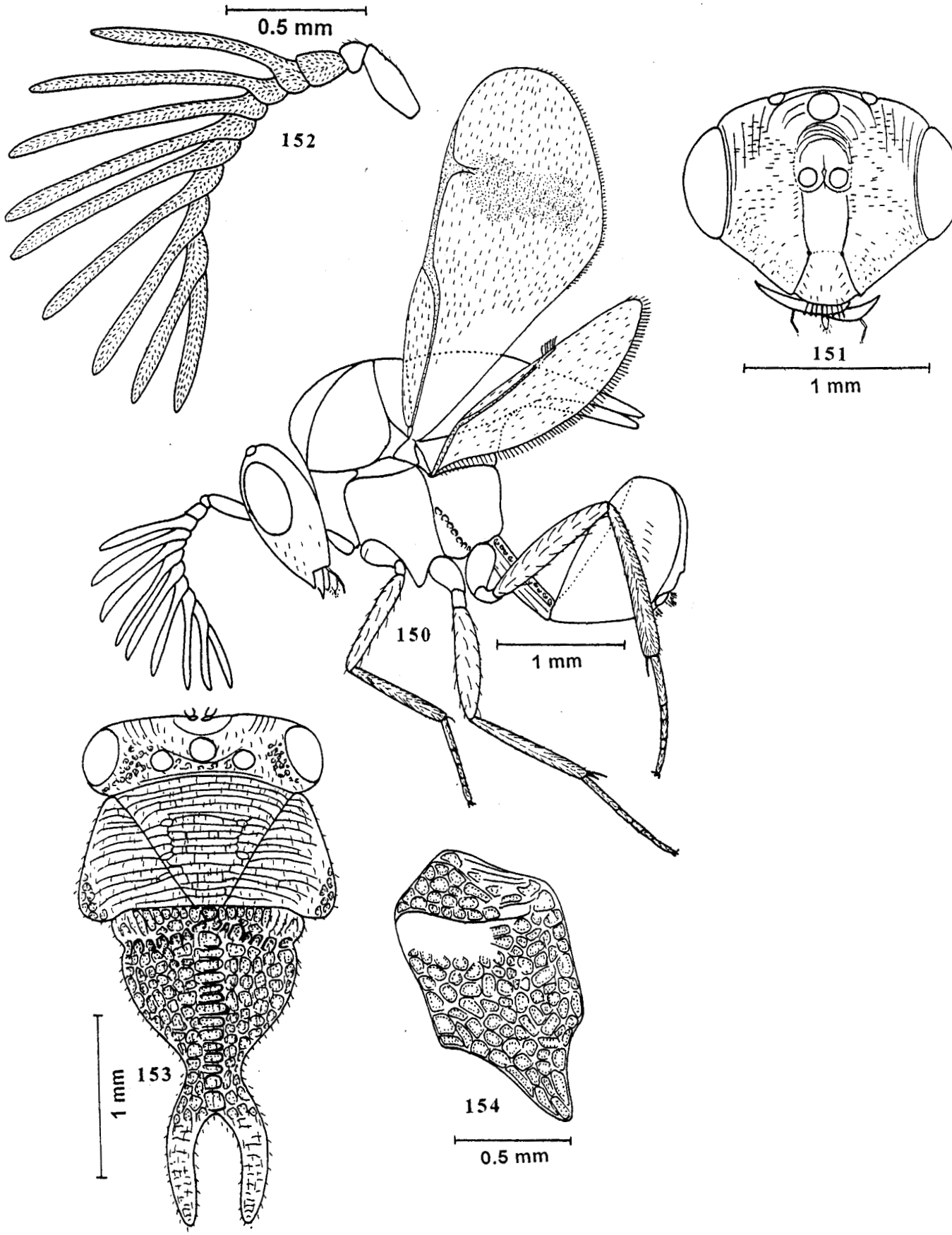
Figs. 135-138. ***Stilbula tanjorensis*** (Mani & Dubey). **Female**. 135. Body profile; 136. Antenna; 137. Head front view; 138. Head and mesosoma dorsal view.



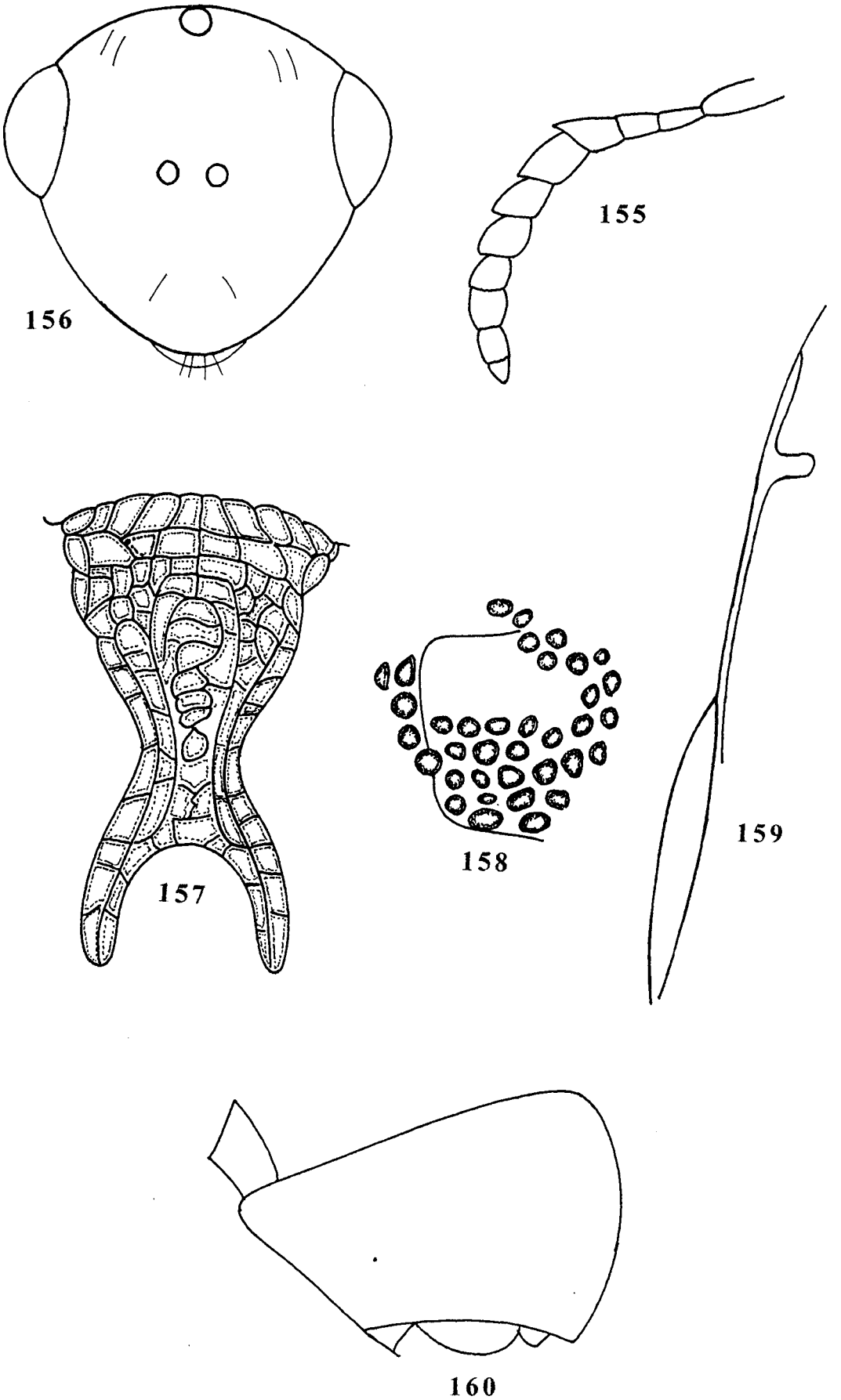
Figs. 139-143. ***Stilbula tanjorensis*** (Mani & Dubey). **Male.** 139. Body profile; 140. Antenna; 141. Head front view; 142. Head and mesosoma dorsal view; 143. Scutellar teeth.



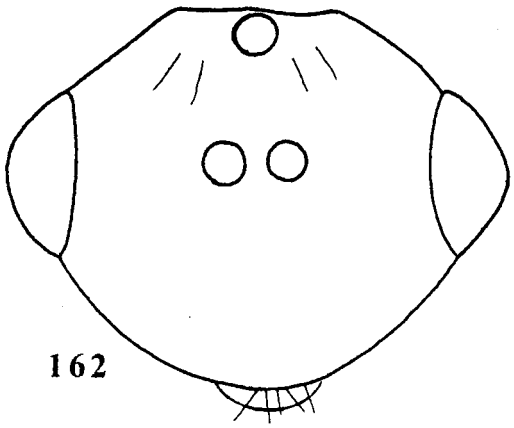
Figs. 144-149. ***Schizaspidia anupama*** sp. nov. **Female**. 144. Body profile; 145. Antenna; 146. Head front view; 147. Head and mesosoma dorsal view; 148. Mesopleuron; 149. Propodeum.

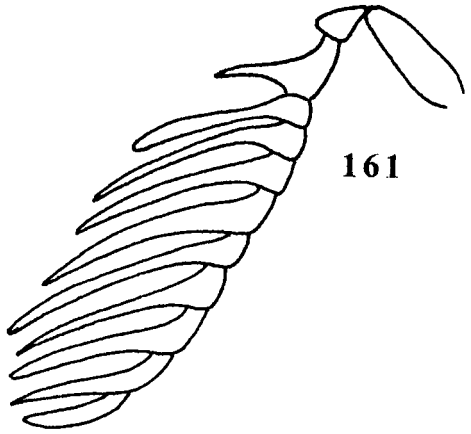


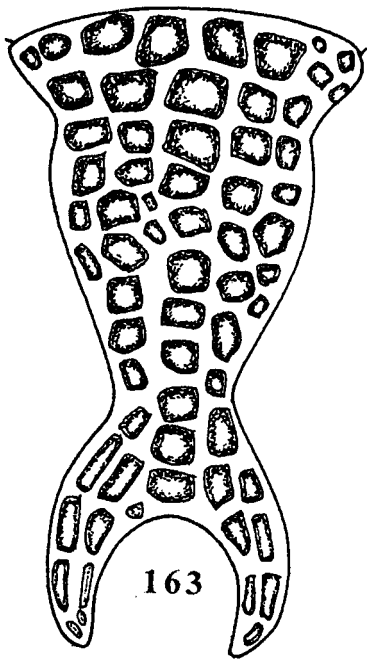
Figs. 150-154. . ***Schizaspidia anupama*** sp. nov. **Male**. 150. Body profile; 151. Head front view; 152. Antenna; 153. Head and mesosoma dorsal view; 154. Mesopleuron.

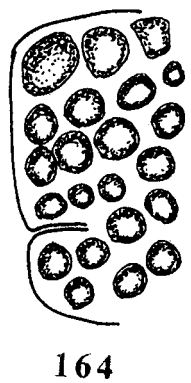


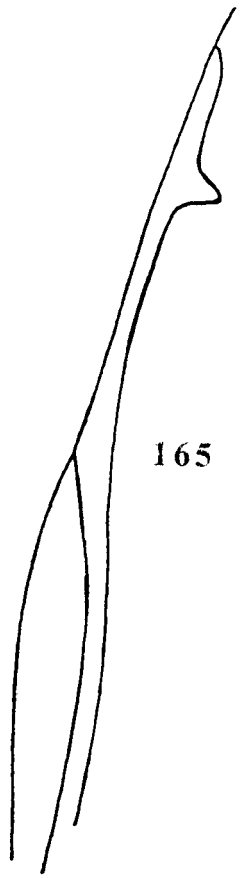
Figs. 155-160. ***Scizaspidia brevifuniculata*** Narendran. **Female.** 155. Antenna; 156. Head front view; 157. Scutellum dorsal view; 158. mesopleuron; 159. Fore wing vein; 160. Metasoma.

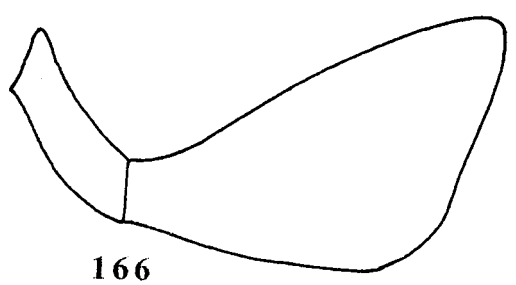




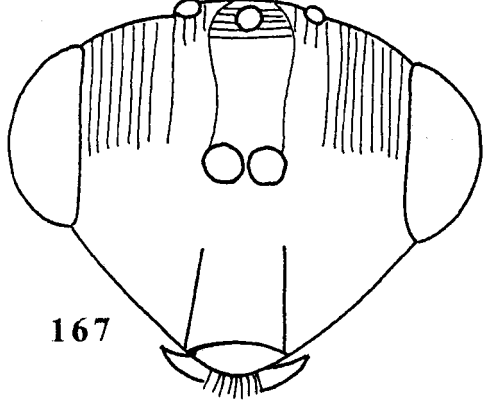


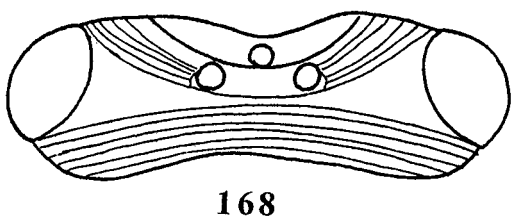


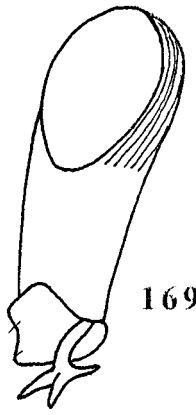


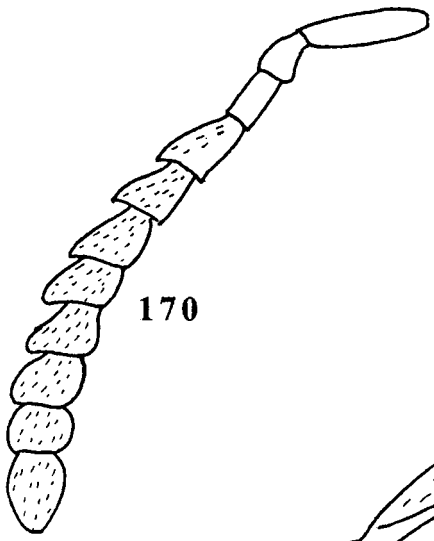


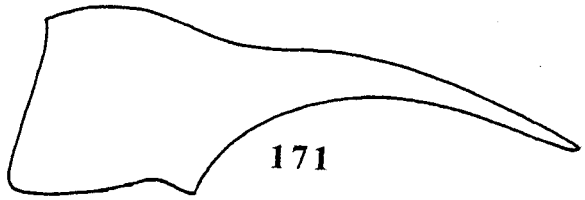
Figs. 161-166. ***Scizaspidia malabarica*** Narendran. **Male**. 161. Antenna; 162. Head front view; 163. Scutellum dorsal view; 164. mesopleuron; 165. Fore wing vein; 166. Metasoma.

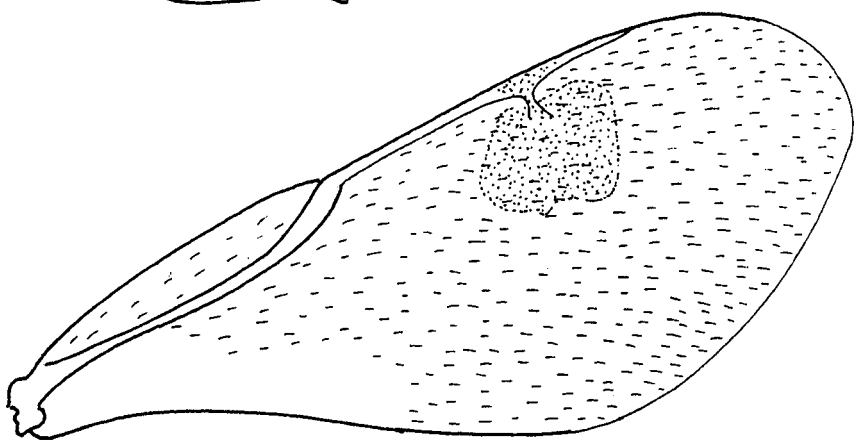


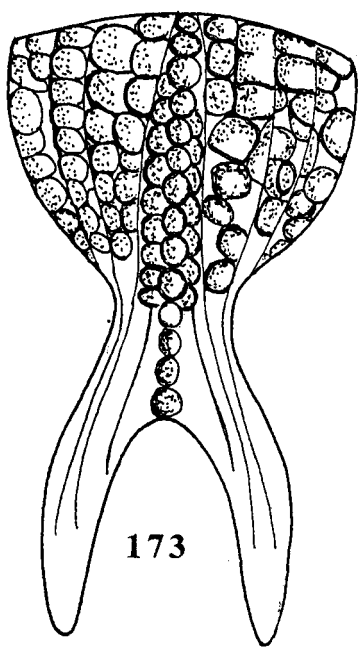


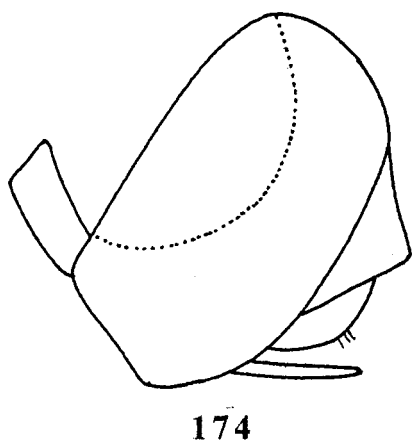




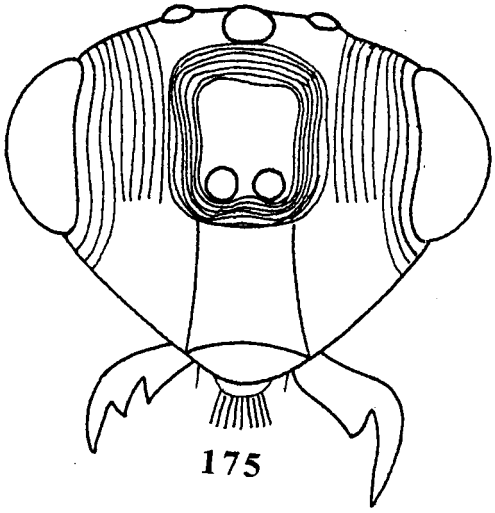


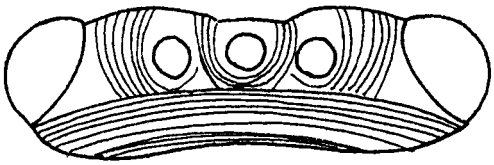


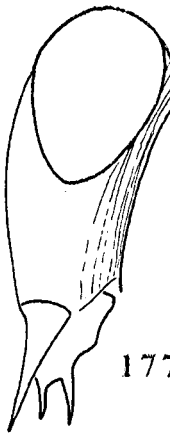


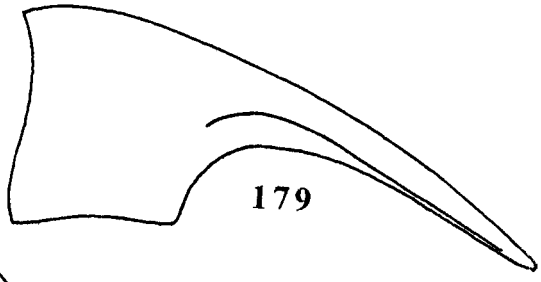


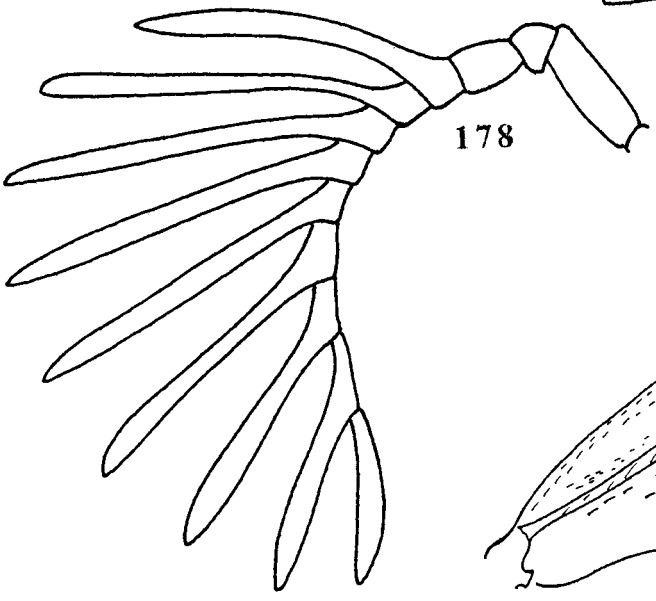
Figs. 167-174. ***Scizaspidia sabariensis*** (Mani & Dubey). **Female**. 167. Head front view; 168. Head dorsal view; 169. Head lateral view; 170. Antenna; 171. Scutellum lateral view; 172. Fore wing; 173. Scutellum dorsal view; 174. Metasoma.

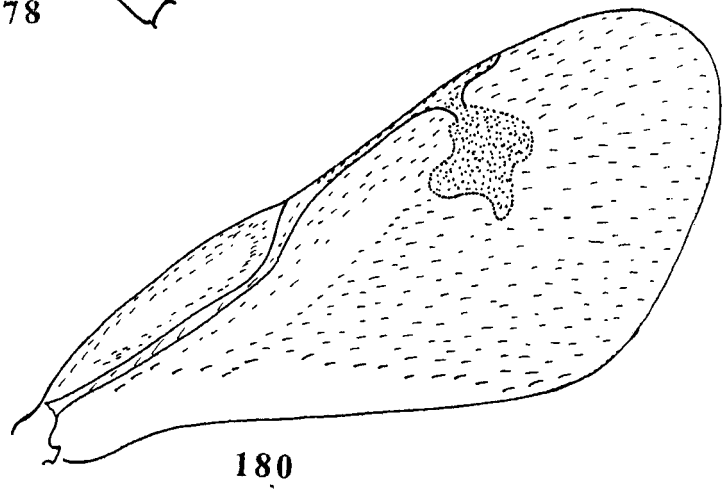


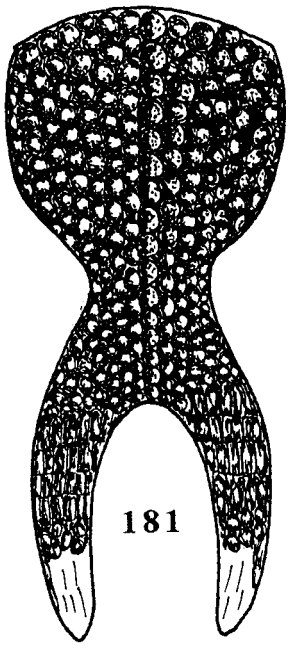


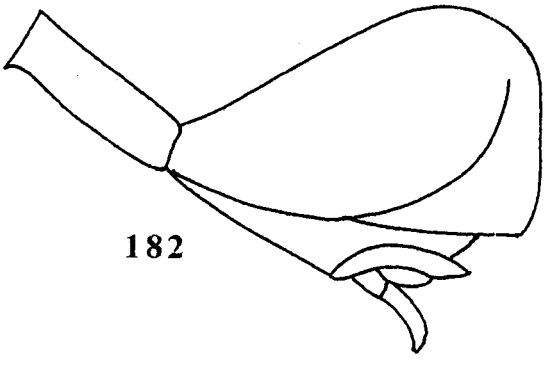




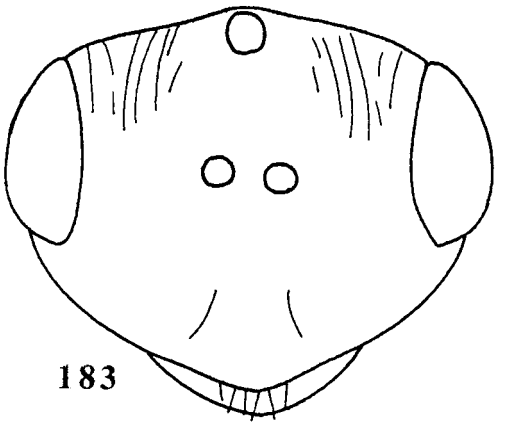


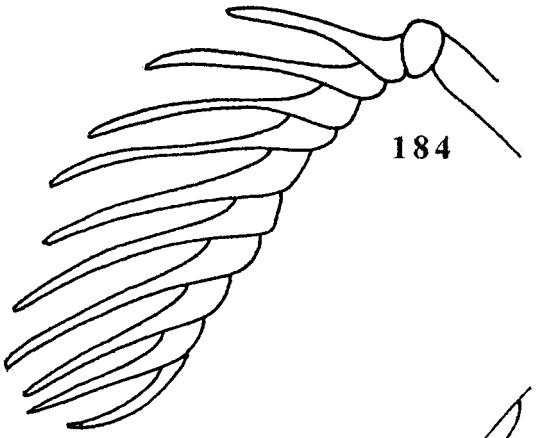


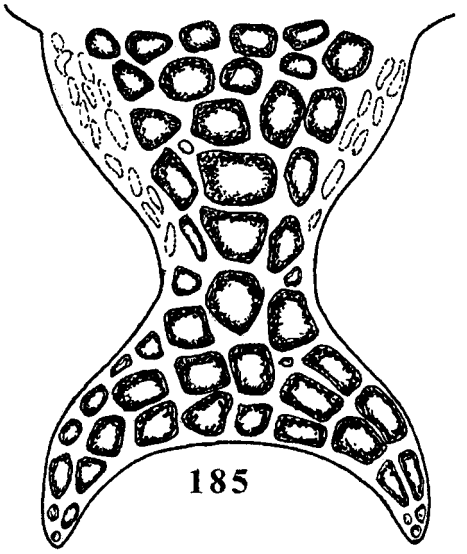


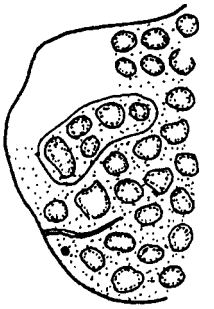


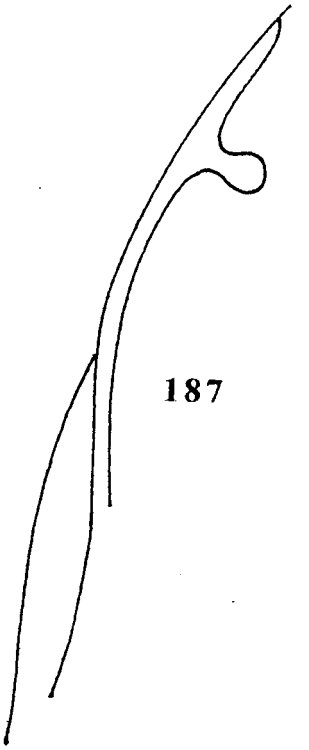
Figs. 175-182. ***Scizaspidia sabariensis*** (Mani & Dubey). **Male.** 175. Head front view; 176. Head dorsal view; 177. Head lateral view; 178. Antenna; 179. Scutellum lateral view; 180. Fore wing; 181. Scutellum dorsal view; 182. Metasoma.

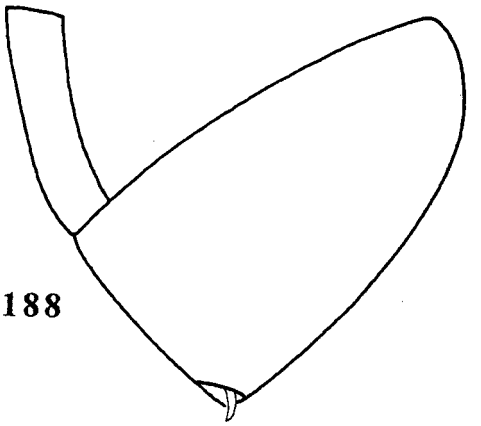




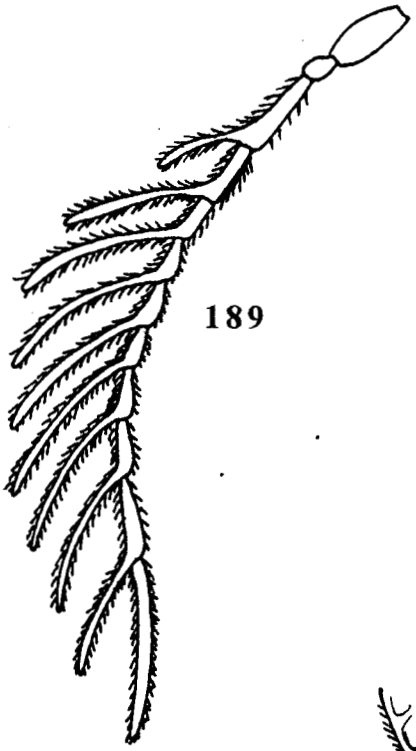


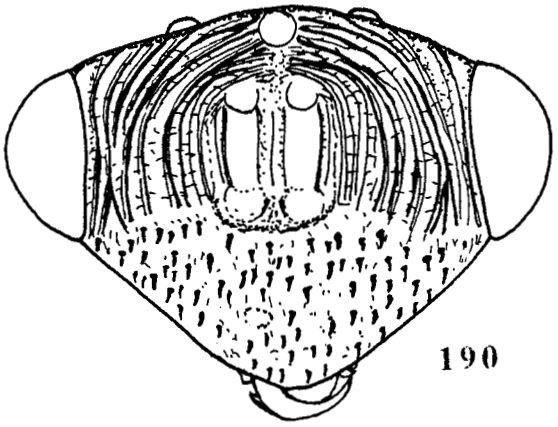


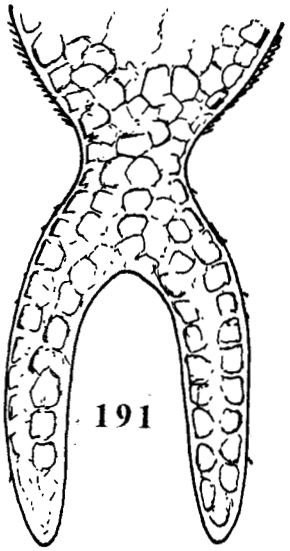




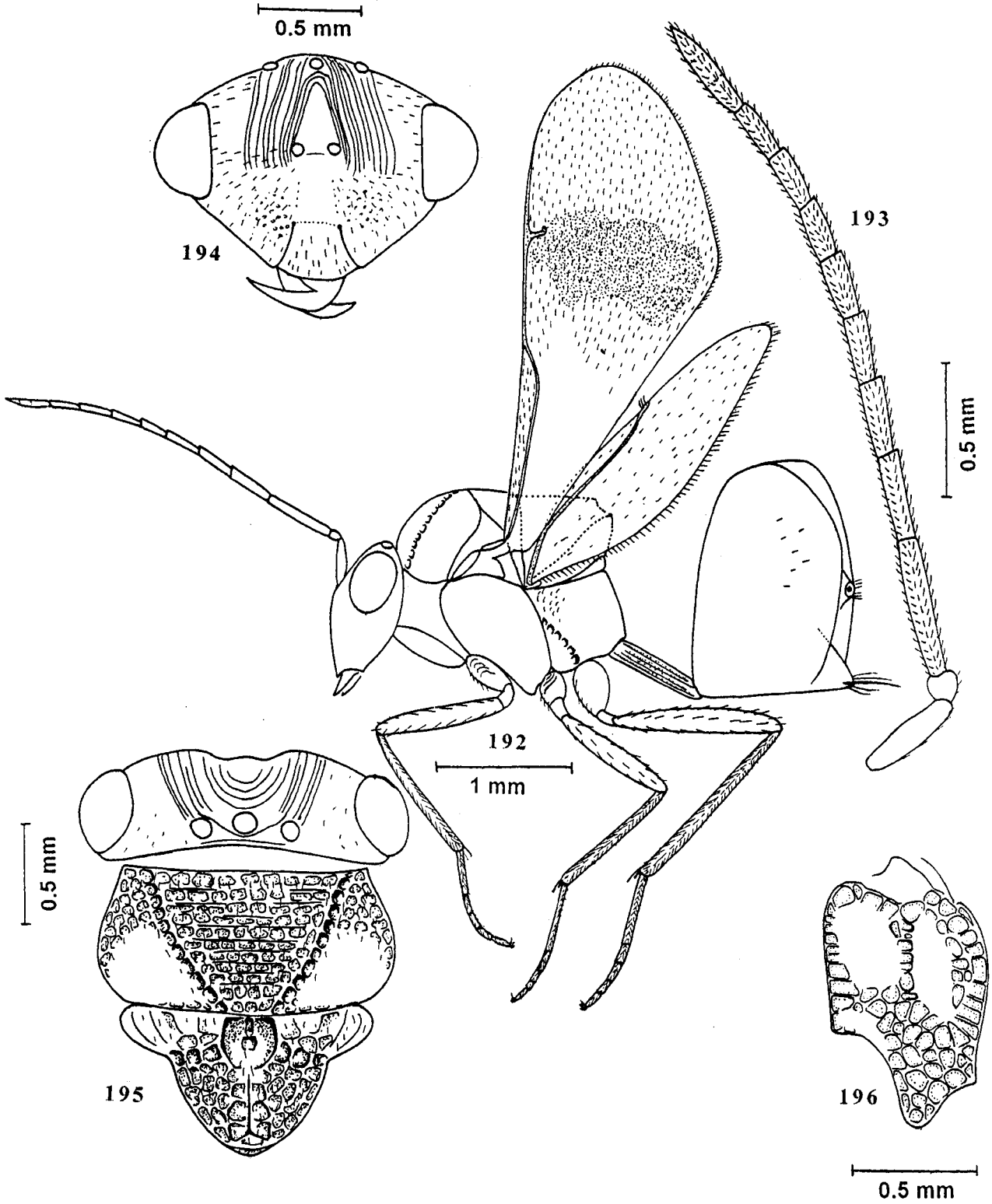
Figs. 183-188. ***Scizaspidia sitarami*** Narendran. **Male**. 183. Head front view; 184. Antenna; 185.Scutellum dorsal view; 186. mesopleuron; 187. Fore wing vein; 188.Metasoma.



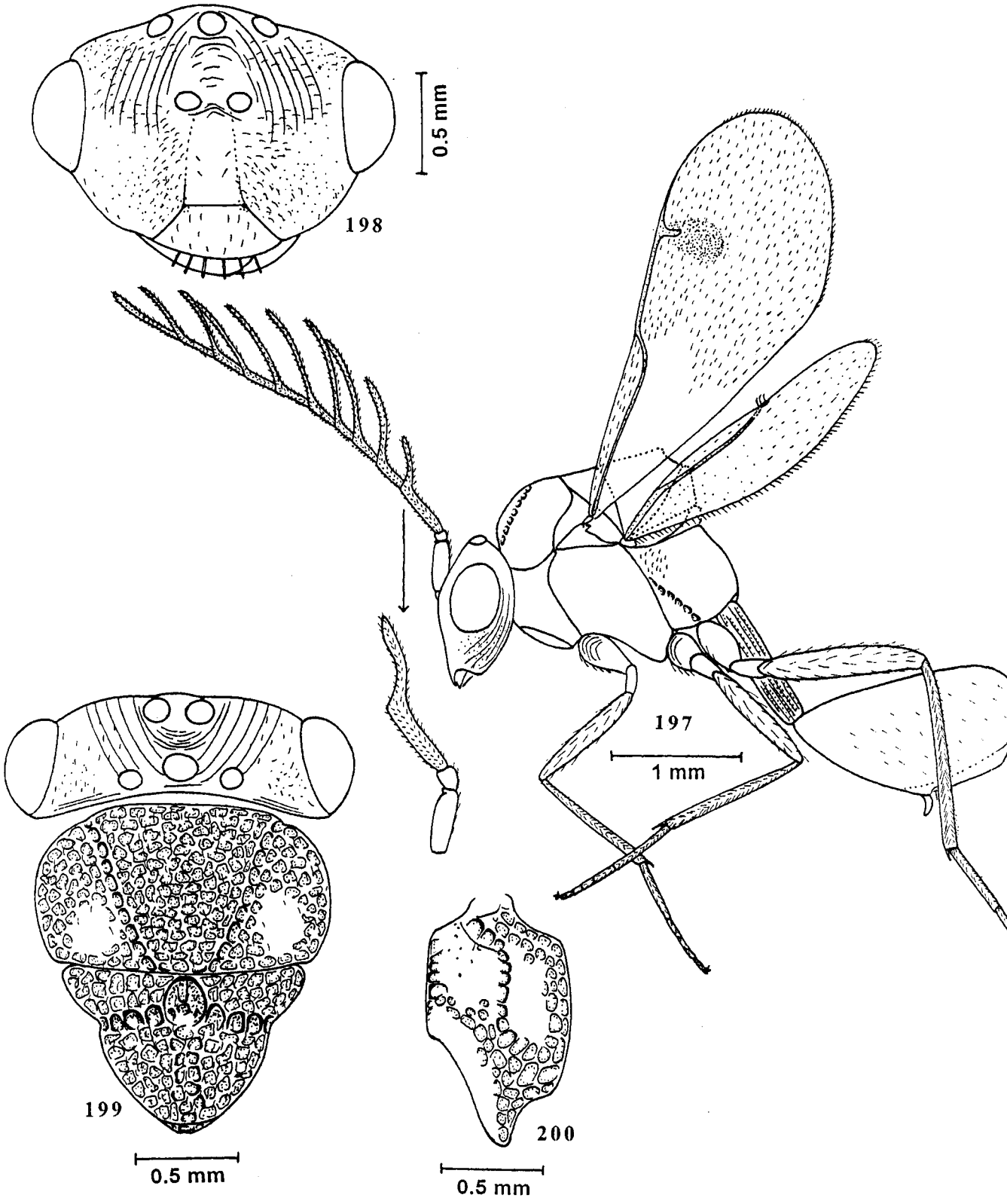




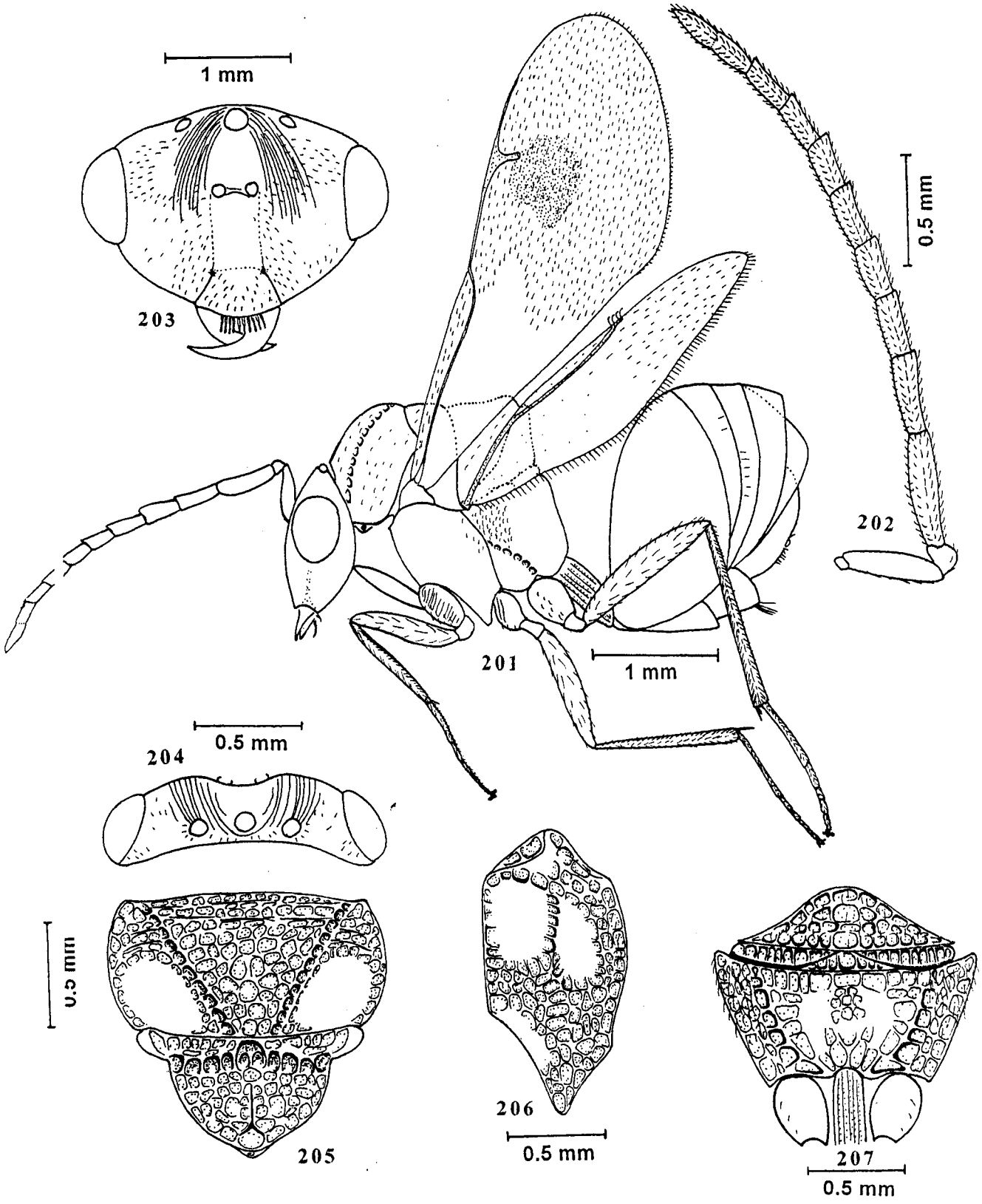
Figs. 189-191. ***Scizaspidia travancorensis*** (Mani). **Male**. 189. Male; 190. Head front view; 191. Scutellar teeth.



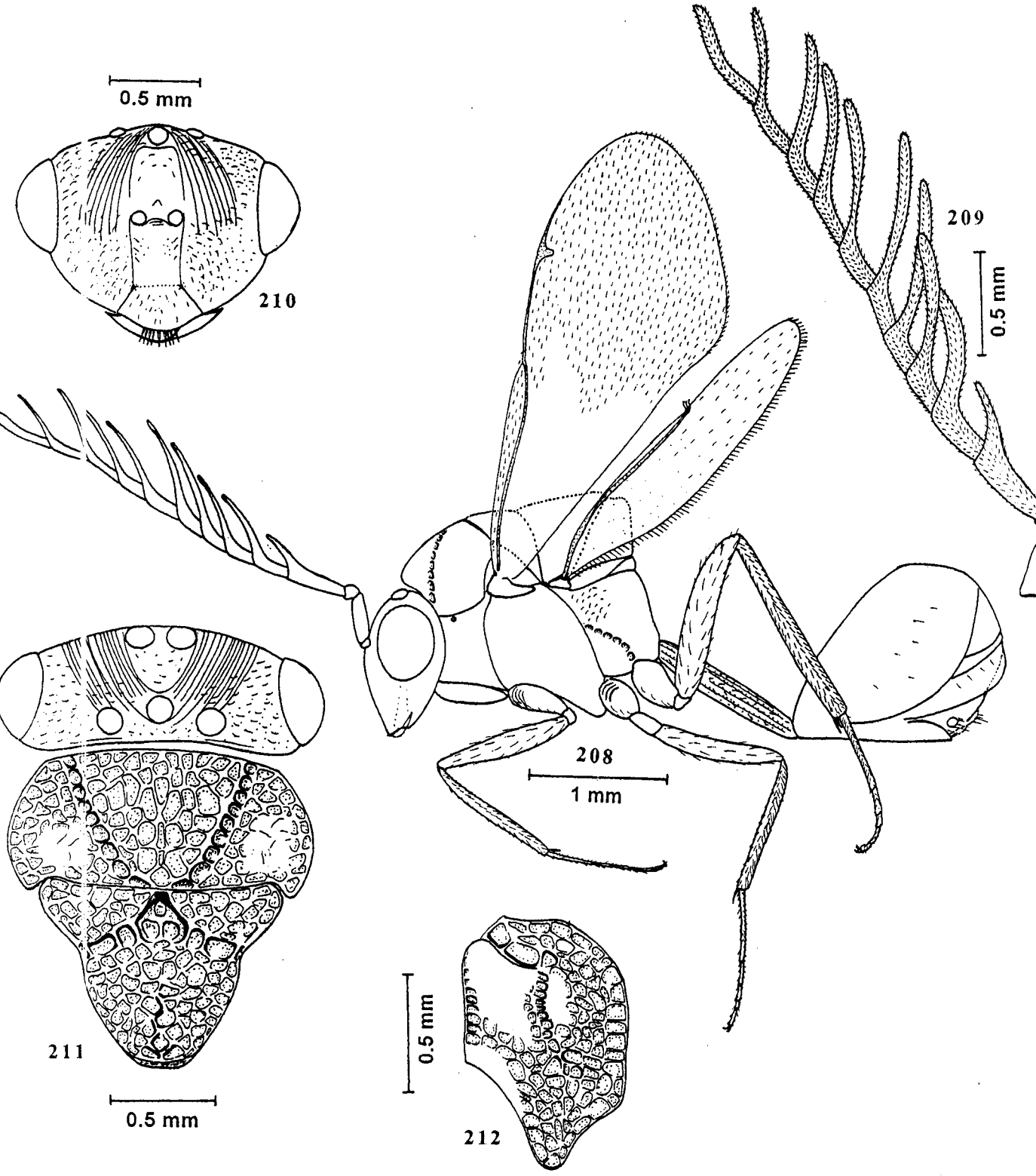
Figs. 192-196. ***Chalcura bouceki*** sp. nov. **Female**. 192. Body profile; 193. Antenna; 194. Head front view; 195. Head and mesosoma dorsal view; 196. Mesopleuron.



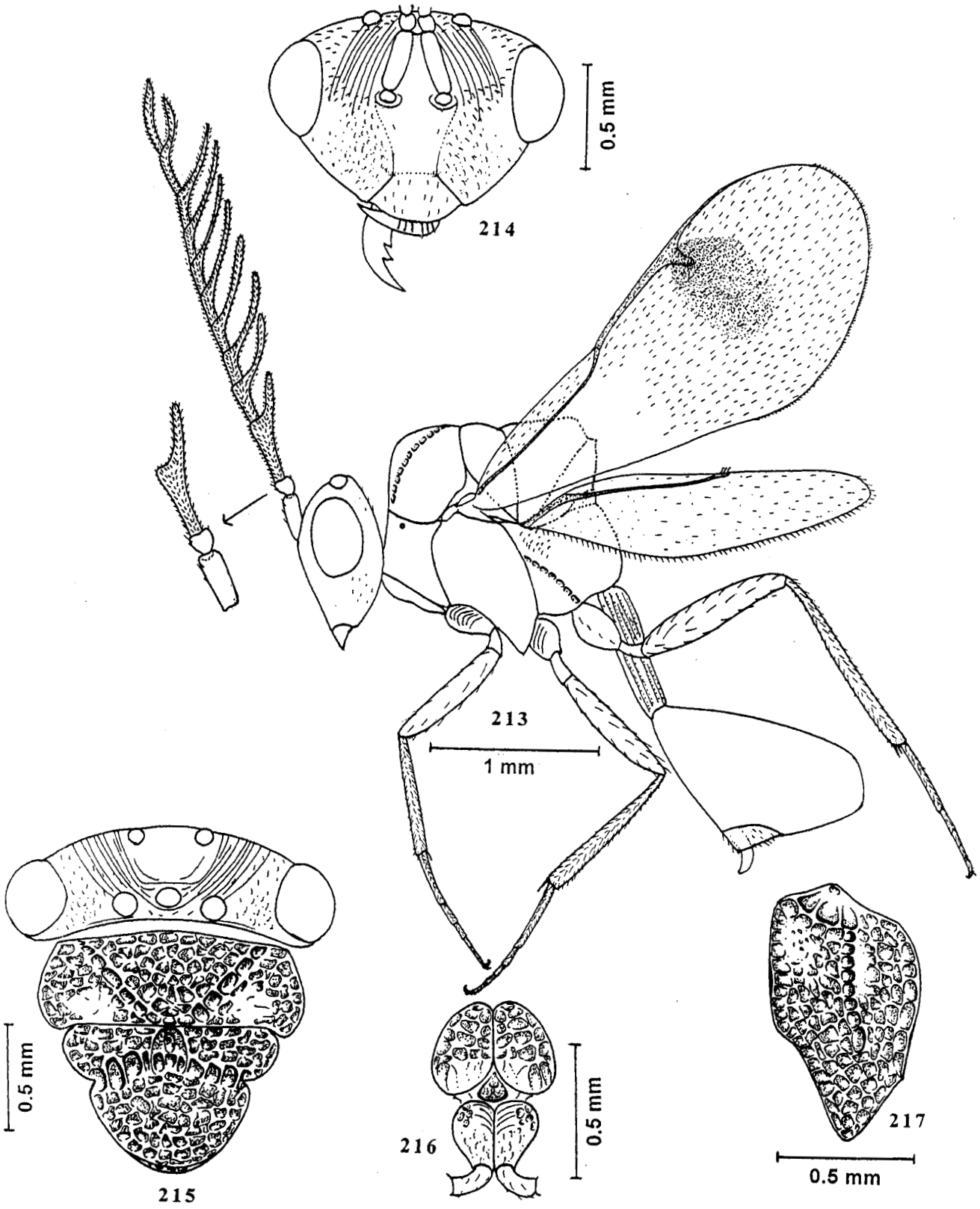
Figs. 197- 200. ***Chalcura bouceki*** sp. nov. **Male**. 197. Body profile; 198. Head front view; 199. Head and mesosoma dorsal view; 200. Mesopleuron.



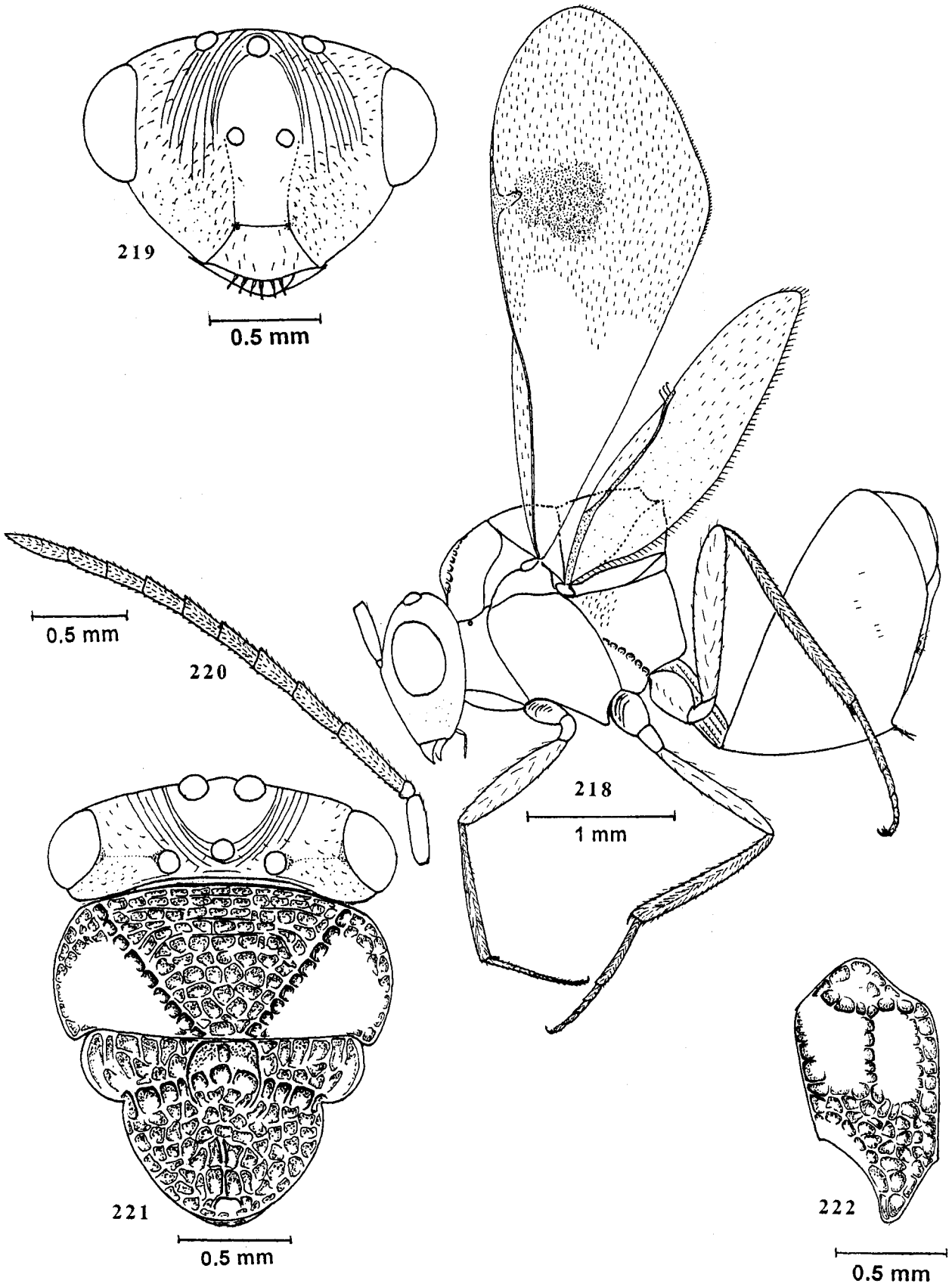
Figs. 201-207. ***Chalcura deprivata*** (Walker). **Female**. 201. Body profile; 202. Antenna; 203. Head front view; 204. Head dorsal view; 205. Mesosoma dorsal view; 206. Mesopleuron; 207. Frenal area, metanotum, hind coxa and petiole.



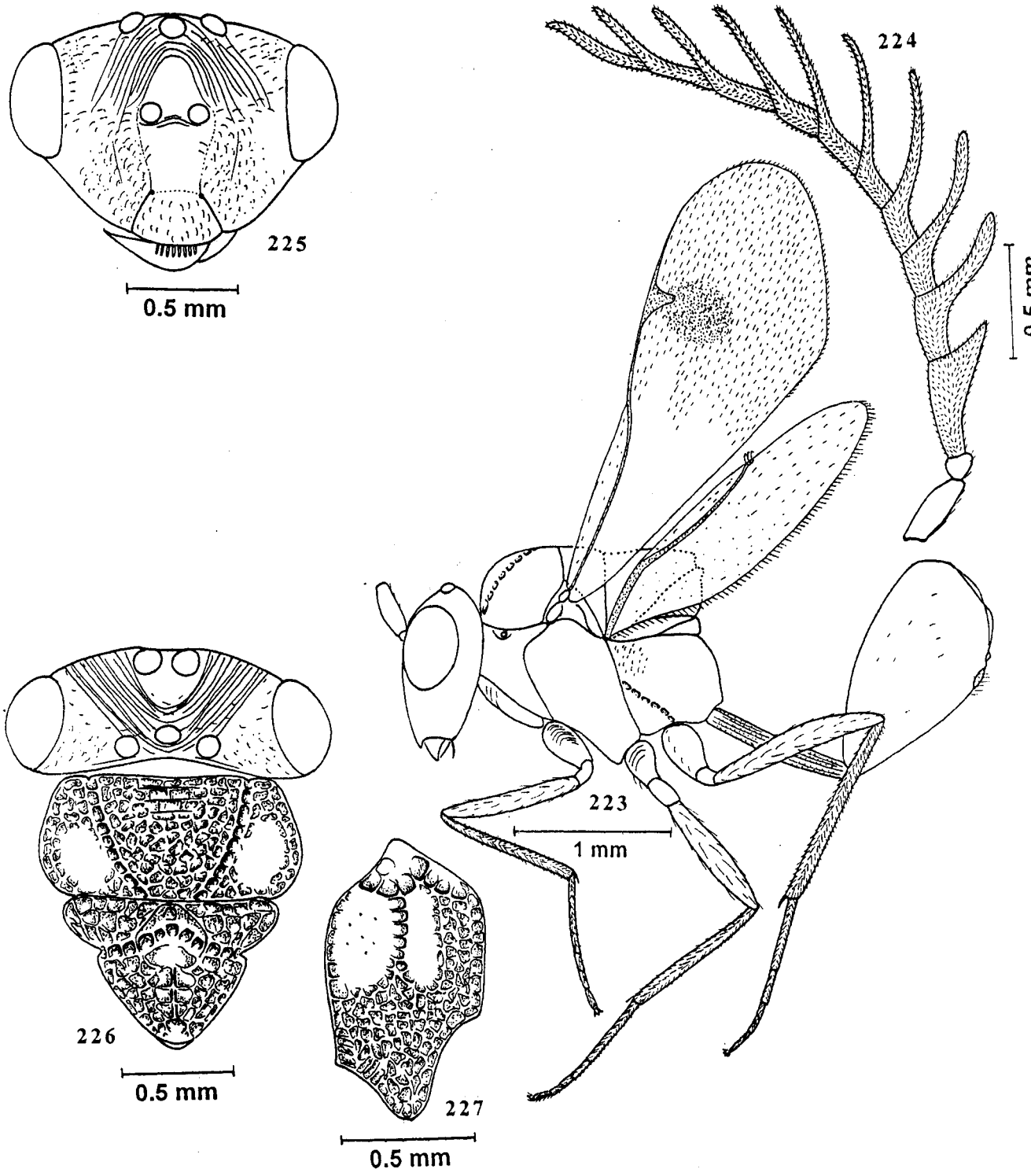
Figs. 208- 212. ***Chalcura deprivata*** (Walker). **Male**. 208. Body profile; 209. Antenna; 210. Head front view; 211. Head dorsal view; 212.Mesopleuron.



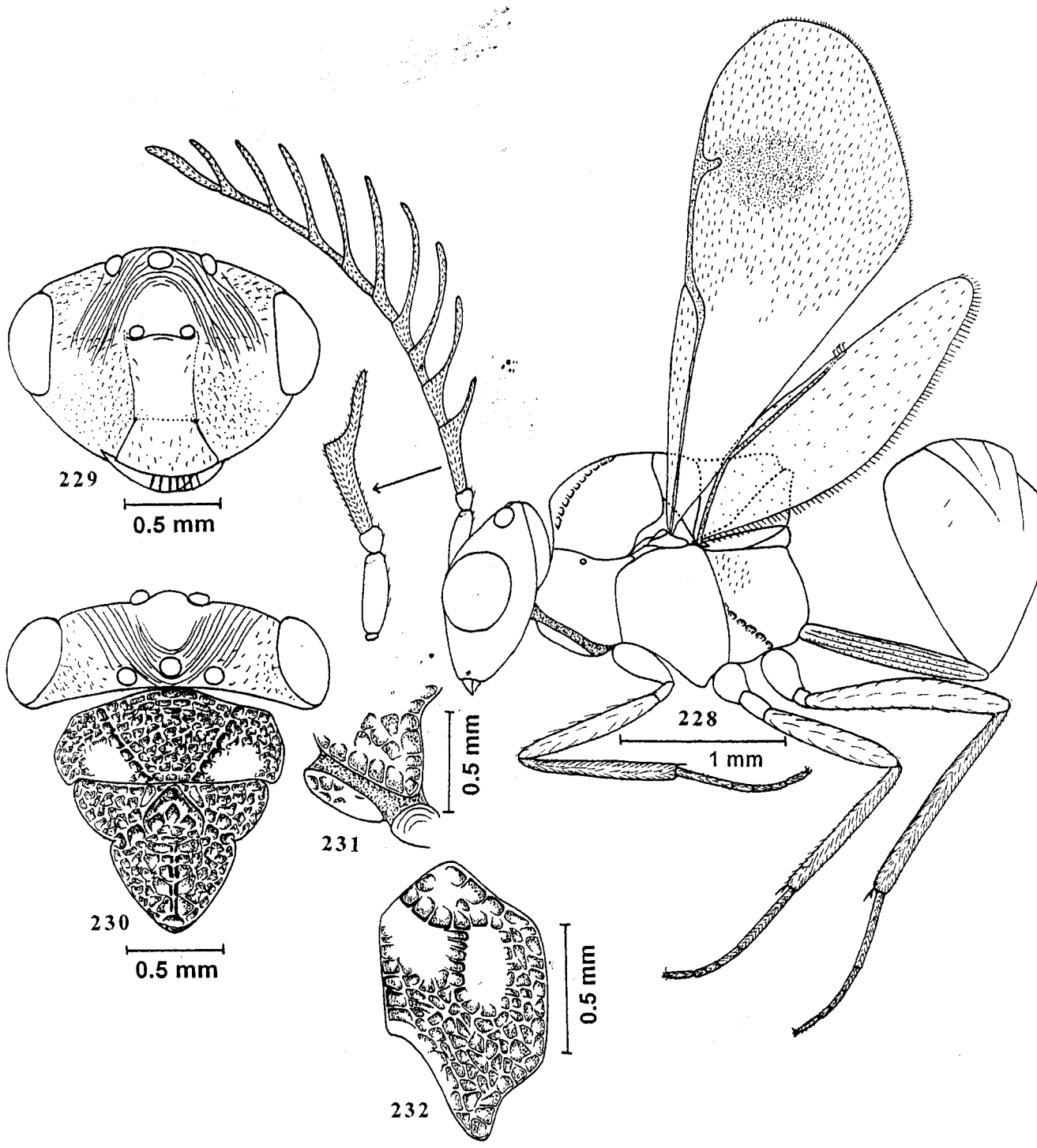
Figs. 213-217. ***Chalcura galata*** sp.nov. **Male.** 213. Body profile; 214. Head front view; 215. Head and mesosoma dorsal view; 216. Propleuron and hind coxa ventral view; 217. Mesopleuron.



Figs. 218-222. ***Chalcura nanmindica*** sp. nov. **Female**. 218. Body profile; 219. Head front view; 220. Antenna; 221. Head and mesosoma dorsal view; 222. Mesopleuron.



Figs. 223-227. ***Chalcura neodeprivata*** sp. nov. **Male**. 223. Body profile; 224. Antenna. 225. Head front view; 226. Head and mesosoma dorsal view; 227. Mesopleuron.



Figs. 228-232. ***Chalcura sudheeri*** sp. nov. **Male**. 228. Body profile; 229. Head front view; 230. Head and mesosoma dorsal view; 231. Pronotum and propleuron; 232. Mesopleuron.

Petiole absent; gaster very long, 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; ovipositor sheath distinctly produced beyond epipygium.

Etymology : Named after *Gasterichus* Boucek

Discussion : This new genus *Neogasterichus* comes extremely close to the genus *Gasterichus* Boucek but differs in the following characters:

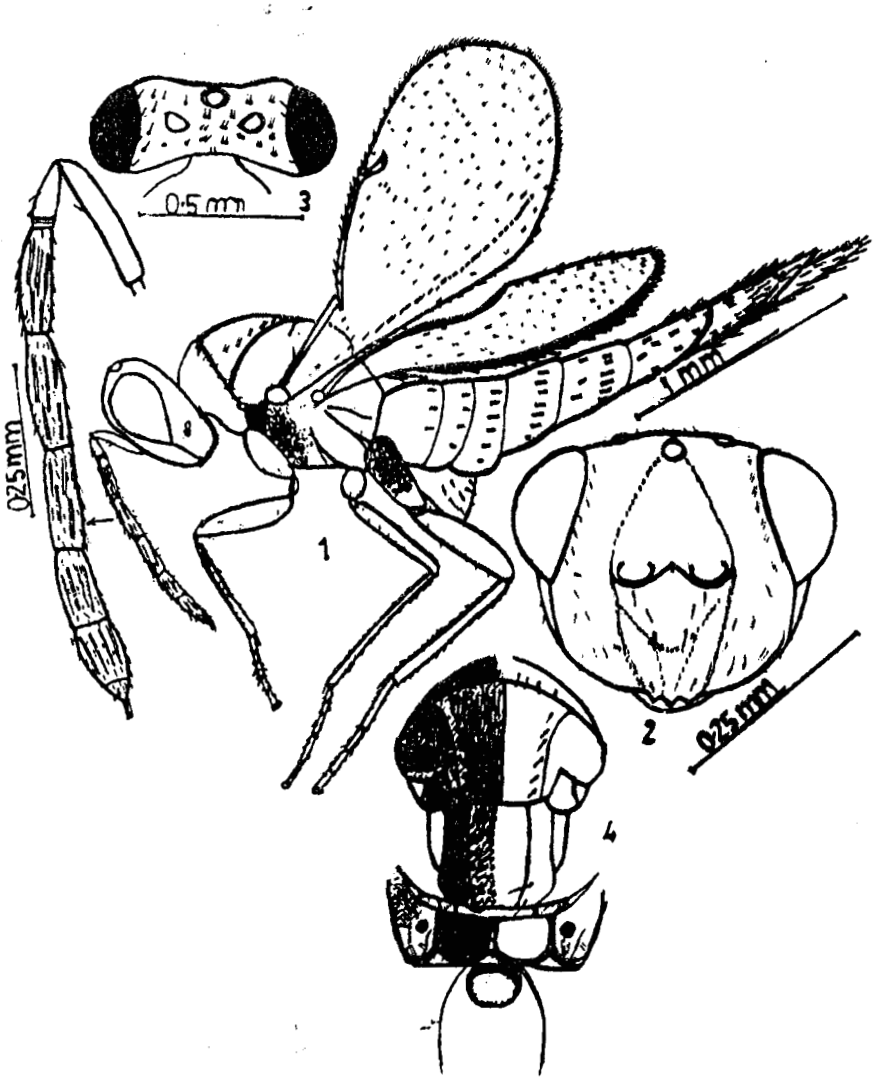
	Neogasterichus Narendran		***Gasterichus*** Boucek
1.	Malar groove deep and not replaced by straight ridge	1.	Malar groove replaced by a straight ridge, Groove on top indistinct
2.	Lower clypeal margin with 3 teeth	2.	Lower clypeal margin straight, sub emarginate
3.	Female antenna not unusually long	3.	Female antenna unusually long
4.	Pronotum with dense raised reticulation	4.	Pronotum with dense granulate sculpture
5.	Notauli with 6 pairs of adnotaular hairs	5.	Notauli with 3 pairs of adnotaular scultpure
6.	Submedian grooves of scutellum deep throughout	6.	Submedian grooves of scutellum anteriorly shallow
7.	Legs not unusually slender	7.	Legs unusually selender
8.	Hind coxa without a basal carina on dorsal side	8.	Hind coxa with a basal carina on dorsal side
9.	Petiole absent	9.	Petiole present strongly expanding backwards
10.	Ovipositor sheath distinctly and clearly well produced beyond apex of epipygium.	10.	Ovipositor sheath hardly produced beyond epipygium.

Neogasterichus longigastris Narendran sp. nov. (Figs. 1-4)

Female : Length 2.81-3.26 mm. Bright metallic green; antenna brown with scape pale yellow; eye brick red; ocelli pale yellowish brown; legs immaculate yellow except basal half of hind coxa which is concolorous with body; tegula pale yellowish brown. Wings hyaline, veins pale brown; pilosity on body white, on wings pale brown.

Head : Width in dorsal view subequal to that of mesosoma; in anterior view 1.15x its length; vertex and occiput with scattered setigerous pits, interstices smooth. POL about 2x OOL; LOL equal to OOL, occiputal carina indistinct, longitudinal median groove on occipital region clearly distinct; frons and face (area below toruli) distinctly reticulate; scrobe shallow; margins ecarinate; face with oblique ridge on either side connecting toruli and lower clypeal margin (Fig. 2); lower clypeal margin with 3 median teeth; malar sulcus distinct; maximum diameter of eye in profile 2.3x as long as malar sulcus. Antenna inserted at lower occular line; antennal formula : 11233. Relative length : width of antennal segments as follows as scape = 40 : 7; pedicel = 17 : 7; F1 = 30 : 9; F2 = 32 : 10; F3 = 29 : 10; clava = 46 : 12 with a light coloured spicula at apex partly hidden by sensillae.

Mesosoma (Fig. 4) : Pronotum with raised dense reticulations, with a line of setae on posterior side; mesoscutum with a complete median groove and raised longitudinal reticulation, slightly longer than scutellum, with a row of 6 admarginal thin hairs near notauli on either side; scutellum



Figs. 1-4 : *Neogasterichus longigastris* Narendran sp. nov. Female. **1.** Body profile; **2.** Head front view; **3.** Head dorsal view; **4.** Mesosoma dorsal view.

length subequal to its width, with raised reticulation (Fig. 4) and two pairs of setae. Propodeum with distinct median and paraspiracular carinae, submedian areas densely reticulate. Forewing length 2.15x its width, relative length of costal cell = 28, marginal vein = 33; postmarginal vein = 4; stigmal vein = 8; speculum asetose closed behind.

Metasoma : About 2.5x as long as mesosoma; first tergite with a median basal pit; tergites with setae on sides; hypopygium ending below third tergite.

Male : Unknown

Host : Unknown

Holotype : Female. INDIA : Kerala, Calicut University campus 16.v.1988, Coll. T.C. Narendran. *Paratype* : 1 Female of same data of holotype except date of collection 12.xii.1987. All types are kept in the Department of Zoology, University of Calicut (DZCU).

Discussion : The new species resembles *Neogasterichus dulciculus* Narendran sp. nov. in general appearance but differs from *N. dulciculus* in the following features.

	N. longigastris		*G. dulciculus*
1.	F3 shorter than F2	1.	F3 longer than F2
2.	Clava 1.58x length of F3	2.	Clava 1.35x length of F3
3.	Metasoma 2.5x as long as mesosoma	3.	Metasoma 1.56x as long as mesosoma
4.	Fore and mid coxa immaculate yellow	4.	Fore and mid coxa dark brown
5.	Head and body mostly bright metallic green	5.	Head and body mostly black with metallic blue reflections
6.	Maximum diameter of eye in profile 2.3x malar sulcus	6.	Maximum diameter of eye in profile a little over 1.17x malar sulcus
7.	Hypopygium not exceeding posterior margin of third tergite	7.	Hypopygium distinctly exceeding posterior margin of third tergite.
8.	LOL subequal to OOL	8.	LOL 0.8x OOL
9.	Occiput and area posterior to it with a median longitudinal groove	9.	Occiput and area posterior without a median longitudinal groove

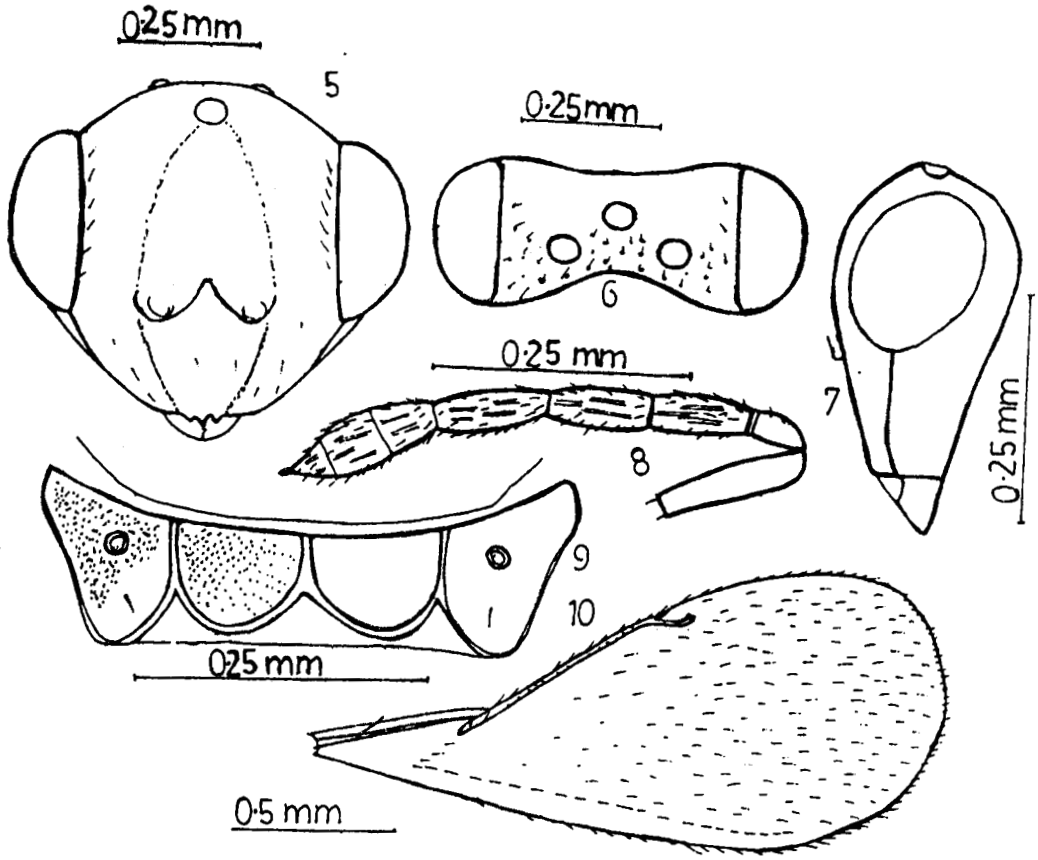
Neogasterichus dulciculus Narendran sp. nov. (Figs. 5-10)

Female : Length 2.91 mm. Black with metallic blue refringence; antenna brown with scape and pedicel pale brown; eye brownish red; ocelli dark brown; legs pale brownish yellow with hind coxa concolorous with body; fore and mid coxae dark brown; tegula dark brown. Wings hyaline, veins and pilosity brown.

Head : Width in dorsal view 1.11x width of mesosoma; in anterior view width a little more than 1.11x its length; vertex and occiput with scattered setigerous pits; interstices smooth. POL 1.7x OOL; LOL 0.8x OOL; frons and face distinctly reticulate; scrobe shallow; margin ecarinate; area below toruli with oblique ridges connecting toruli and lower clypeal margin on sides; lower clypeal margin with 3 teeth; malar sulcus distinct; maximum diameter of eye a little more than 1.17x malar sulcus. Antenna inserted at lower ocular line; antennal formula 11233. Relative length : width of antennal segments : scape = 34 : 8; pedicel = 12 : 7; F1 = 21 : 9; F2 = 24 : 9; F3 = 26 : 9; clava = 35 : 13. Clava with small spicula, partially covered by sensillae.

Mesosoma : Pronotum reticulate with a posterior transverse row of setae; mesoscutum with a complete median groove, with dense raised reticulation; mesoscutum slightly longer than scutellum, with row of six admarginal hairs near notauli on either side. Scutellum a little wider than long with raised reticulation and 2 pairs of setae. Propodeum with distinct median and paraspiracular carinae; submedian area reticulate. Forewing length 2.33x its width; relative length of costal cell 39; marginal vein = 43; postmarginal vein 2.8; stigmal vein = 9; submarginal with a single seta.

Metasoma : Petiole absent; length 1.56x length of mesosoma, first tergite with a medain shallow pit like area; gaster pubescent mainly in sides; hypopygium slightly exceeding third tergite.



Figs. 5-10 : *Neogasterichus dulciculus* Narendran sp. nov. Female. **5.** Head front view; **6.** Head dorsal view; **7.** Head side view; **8.** Antenna; **9.** Propodeum; **10.** Forewing.

Holotype : Female. INDIA, Kerala, Calicut University Campus, 20.xii.2002, Coll. T.C. Narendran and Party (DZCU).

Male : Unknown

Host : Unknown.

Etymology : Species name is taken from Latin meaning sweet.

Discussion : Already discussed under *N. longigastris* Narendran sp. nov.

ACKNOWLEDGEMENTS

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A REVIEW OF FAMILY EUCHARITIDAE (HYMENOPTERA: CHALCIDOIDEA) OF INDIAN SUBCONTINENT

P. GIRISH KUMAR
Systematic Entomology Laboratory, Department of Zoology, University of Calicut – 673 635

ABSTRACT

The Indian genera of family Eucharitidae is reviewed. The generic diagnosis, their distribution and the list of species reported from the Indian subcontinent is provided. An illustrated key to the eucharitid genera of Indian subcontinent is also provided.

INTRODUCTION

The family Eucharitidae comprises the most striking forms in the Superfamily Chalcidoidea. Most of the members of this family are brilliantly coloured and strikingly attractive. Some of them show bizarre form of thoracic scutellum. They are moderately sized individuals measuring approximately about 4-5 mm in length.

The eucharitids are probably most closely related to the Perilampidae, the only other family of the Chalcidoidea in which the prepectus is fused with the lateral part of the pronotum. The Eucharitidae is most readily distinguished from other families by the reduced pronotum and the elongated sickle-shaped mandibles.

Eucharitids have remarkable host relationships. They are parasitic on ants. The eggs are laid on plants and the primary larva (planidium type) attaches itself to the worker ants and so are carried in to the ant nest where it is transferred to the ant larva.

DIAGNOSIS

Pronotum hidden in dorsal view by the convex mesoscutum; prepetus fused with the pronotum in Eucharitinae where as in Oraseminae it is not so; in several species, apex of scutellum often produced posteriorly into a fork or horn or stump; mandibles sickle shaped; malar sulcus absent; labrum with single row of 4-16 marginal digits; antennae each with 10 to 24 segments; in some species the flagellar segments serrate or romose; forewing with usually well developed marginal vein but in some cases veins not discernible; notauli usually present; tarsi 5 segmented; gaster often with a long petiole in many species; first gastral tergum usually more than half as long as gaster; ovipositor usually concealed.

HISTORICAL REVIEW

The earlier workers who contributed to the study of Eucharitidae include Latrielle, Fabricius, Walker, Forster, Forel, Westwood, Spinola, Ashmead, Kirby, Howard and Cameron. Later Girault and Ruschka contributed to the study of this family. The recent workers who made substantial contribution include mainly Nikolskaya, Burks, Boucek, Prinsloo and Heraty. Eucharitids of the Indian subcontinent were studied by Walker, Masi, Mani, Hedqvist, Hussain & Agarwal and Narendran. Hussain & Agarwal (1983) described a new interesting genus *Indosema* from India with *Indosema indica* as the type species. Narendran (1994) described another new genus *Cherianella* from India with *Cherianella narayani* as the type species.

SYSTEMATICS

The family name was proposed first by Walker (1846) as Eucharidae. Dalla Torre (1898) corrected it to Eucharidinae, Girault (1928) used Eucharitinae and now it is known as Eucharitidae (Heraty, 1983). About 53 nominal genera and 413 nominal species are described in the world (Heraty, 2002).

According to Boucek (1988) the family Eucharitidae comprises 5 subfamilies, viz. Echthrodapinae Akapalinae, Oraseminae, Eucharitinae and Philomidinae. Echthrodapinae were transferred to Torymidae (Grissel, 1995). Based on recent morphological and molecular evidence Akapalinae may be the sister group of Eucharitidae *s.s.* (Oraseminae + Eucharitinae), and Philomidinae may be more closely associated with some Chrysolampinae (Perilampidae) (Heraty, 2002). There are 13 genera so far found in the Indian subcontinent.

KEY TO GENERA OF EUCHARITIDAE OF INDIAN SUBCONTINENT

1. Pronotum and prepectus separated as different sclerites (Fig. 8); apex of scutellum always rounded (Fig.8); antennae simple, at most 13-segmented, usually with flagellar segments anelliform (Fig. 2) 2

- Prepectus evidently fused with pronotum, although fusion sometimes indicated as groove or carina; apex of scutellum rounded, emarginate or with some form of projection (Figs. 11, 20); antennae mostly different from alternate, in males often with branches (Fig. 17, 22, 29) 5

2. First gastral sternite with transverse furrow delimiting small crescentic anterior region (fig.6); dorsal occipital margin usually rounded, rarely with carina; face usually with raised coriaceous, rugose or reticulate sculpture, rarely smooth; ovipositor always expanded (fig. 7); ventral valve usually with lateral teeth, rarely with diagonal ridges 3

- First gastral sternite evenly rounded without a transverse furrow; dorsal occipital margin with distinct carina; face smooth or smooth with scattered pits, never with strong sculptures as above; ovipositor acicular or expanded; ventral value with diagonal ridges (Fig. 5) 4

3. Transscutal articulation (between mesoscutum and axilla) obliterated (Fig. 8); palpi absent ; anellus absent; mandibles absent .....*INDOSEMA* Hussain & Agarwal

- Transscutal articulation complete; maxillary and labial palpi present (Fig.1) anellus present; mandibles present ....*ORASEMA* Cameron.

4. Clypeal margin rounded, anteclypeus absent (evenly convex to apex); Palpi each with 3 segments; femoral groove foveate; petiole gradually narrowed basally (Fig. 3, 4) ....*NEOLOSBANUS* Hearaty

- Clypeal margin straight with well-defined narrow anteclypeus; Palpi each with 2 segments; femral groove broadly impressed and smooth or reticulate; petiole abruptly narrowed basally ..... *PSILOCHARIS* Hearty

5. Scutellar apex distinctly produced (either forked or not) at its apical part (Figs. 9, 11, 20) 6

- Scutellar apex not distinctly produced, more or less rounded 10

6. Scutellar apex produced into single horn (Figs. 9, 11) 7

- Scutellum with a distinct forked process at apex (Fig. 20) 8

7. Scutellum with narrow horn with its apex blunt (Fig. 9); antennae 12 segmented (Fig. 10); notauli present (Fig. 9); thoracic sculpture pitted (Fig. 9) ..... ***ANCYLOTROPUS*** Cameron

- Scutellum with extraordinarily long horn, with pointed apex, extending beyond the gaster (Fig.11); antenna 13 segmented (Fig. 12); notauli absent (Fig. 11); thoracic sculpture granulate ..... ***CHERIANELLA*** Narendran

8. Flagellar segments cylindrical and elongate in both sexes (Figs. 13, 14); stigmal vein reduced (Fig. 15); petiole much longer and slender (Fig. 16) ..... ***STILBULA*** Spinola

- Antenna serrate in females and ramose in males (Figs. 17, 18); stigmal vein moderately long, perpendicular to marginal vein (Fig. 19); petiole longer than hind coxa..... 9

9. Antenna at most 12 segmented, with 8 or 9 branches (Fig. 17)..... ***SCHIZASPIDIA*** Westwood

- Antenna 14-16 segmented, last 3 segments sometimes less distinctly separated in females, males bear 10-12 branches, but first flagellar segment simple (Figs. 21, 22) ..... ***SACCHARISSA*** Kirby

10. Antenna usually with one anellus; flagellar segments cylindrical in both sexes (Fig. 23) 11

- Anellus always absent; flagellar segments in female often serrate, in male with a number of longer or shorter branches (Figs. 28, 29) 12

11. Scrobal depression strongly impressed medially with deep pit just below median ocellus; occipital carina present; funicular segments without basal flange; postmarginal vein long extending almost to wing apex (Fig. 24)..... ***ANORASEMA*** Boucek

- Scrobal depression shallow, poorly defined, not including median ocellus; occipital carina absent or represented by few irregular weak striae; funicular segments with basal flange, except F_1; postmarginal vein usually short (Fig. 27) .....*GOLLUMIELLA* Hedqvist

12. Apex of scutellum entire or rounded; petiole atleast twice as long as hind coxa in female; thorax densely striato reticulate except scapula usually smooth; notauli distinct .....

.....*CHALCURA* Kirby

- Apex of scutellum usually incised or with two minute spike-like plates; petiole usually short; thorax smooth and glossy, occasionally sparsely punctate; notauli indistinct .....*EUCHARIS* Latrielle

1. Genus *INDOSEMA* Hussain & Agarwal
(Fig. 6,7,8)

Indosema Hussain & Agarwal, 1983. *Boll. Lab. Ent. Agr. Filippo. Silvestri, Portici,* 40: 103. Type species: *Indosema indica* Hussain & Agarwal, by monotypy and original designation.

Diagnosis : Head without fronto-clypeal and fronto-genal sutures; antennae 10 segmented; thorax glabrous; scuto-scutellar suture wanting; scutellum much raised above gaster, not produced posteriorly (Fig. 8) forewing completely hyaline without marginal fringe; gaster without visible petiole.

Biology: It is represented by a single species *Indosema indica*. This species collected from leaves of *Ricinus communis* L. (castor bean) (Hussain & Agarwal, 1983). Boucek (1988) and Heraty (1994) suggest that *I. indica* is associated with short grasses. Boucek (1988) speculated that it may use a short leguminous plant, possibly related to *Lotus*, as a plant host for oviposition. The form of the ovipositor suggests that eggs are deposited in plant tissue within chambers formed by the ovipositor. Ovarian eggs are cylindrical and rounded at the ends with no evidence of an apical projection (Heraty, 1994).

Distribution and Species: Northern India. The valid species known from Indian subcontinent so far: *I. indica* Hussain & Agarwal.

PUBLICATIONS

Uttar Pradesh J. Zool. 23(3) : 223-228, 2003 ISSN 0256-971X

A TAXONOMIC STUDY OF A NEW GENUS OF EULOPHIDAE (HYMENOPTERA) FROM SOUTHERN MALABAR (KERALA)

T.C. NARENDRAN, K. FOUSI* AND P. GIRISH KUMAR
SYSTEMATIC ENTOMOLOGY LABORATORY, DEPARTMENT OF ZOOLOGY, UNIVERSITY OF CALICUT, KERALA-673 635, INDIA.
DEPARTMENT OF ZOOLOGY, UNITY WOMEN'S COLLEGE, NARUKARA POST, MANJERY, KERALA-676 122, INDIA*.

A new genus *viz. Neogasterichus* Narendran gen. nov. and two new species *viz. N. longigastris* Narendran sp. nov. and *N. dulciculus* Narendran sp. nov. are described and affinities discussed. The new genus comes very close to *Gasterichus* Boucek but differs from it in having the lower margin of clypeus with 3 teeth, petiole absent, malar groove not replaced by a ridge, mesoscutum with 6 pairs of adnotaular hairs and ovipositor sheath produced beyond epipygium.

INTRODUCTION

The Eulophidae is an economically important family of Chalcidoidea since it consists of several species which parasitise several species of insect pests of agricultural importance. The family contains 294 genera in the world (Noyes, 2001). In India about 60 genera including a few undescribed genera are present. In this paper an interesting new genus of the subfamily Tetrastichinae is raised, based on specimens collected from Southern Malabar. This genus is interesting because it shares several features with the genus *Gesteritchus* described by Boucek (1988) from Australia. However, this new genus differs from *Gasterichus* in very many distinctive features. The new genus and new species are described hereunder and their affinities are described. The genus does not fit to the key to Boucek (1988), Graham (1991) and La Salle (1994).

Neogasterichus Narendran gen. nov.

Type species : *Neogasterichus longigastris* sp. nov.

Diagnosis : Head non-collaspsing. Vertex very braod but short, not elevated, without transverse carina, shortly behind lateral ocelli steeply falling into excavated occiput; no temples; eye virtually bare, large, prominent, almost hemispherical. Genae strongly converging; malar groove distinct throughout (not replaced by straight ridge); occiput carina or ridge absent; lower face submedially depressed, resembling shallow foveae, tentorial pits absent; clypeal area elevated dorsally with broadly divergent ridges towards outer ridges of toruli full diameter apart, situated at lower ocular line. Female antennal funicle with 3 proximal segments, more separated than 3 segmented clava; all hispid with dense short decumbent sensillae and dense suberrect pilosity; apex of clava with spicula partly concealed by sensilla.

Pronotum moderately short, dull, with very dense raised reticulation, on sides with conspicuous pale spiracular tubercles. Mesoscutum with distinct median groove. Notauli very deep with 6 adnotaular thin hairs. Scutellum with submedian groove uniformly deep. Propodeum densely reticulate with distinct well marked median and paraspiracular carinae; legs not unusually slender; hind coxa deeply and coarsely reticulate on dorsal side; spur of hind tibia about 1.5x as long as width of tibia; basitarsus a little longer than second segment. Marginal vein longer than costal cell; latter bare, submarginal vein with one dorsal seta.

2. Genus *ORASEMA* Cameron
(Figs. 1)

Orasema Cameron, 1884. *Biol. Centr. – Amer. Hym.* 1: 104. Type species: *Orasema stramineipes* Cameron, by monotypy.

Semora Cameron, 1909. *Trans Amer. Ent. Soc.*, 35: 432. Type species: *Semora xanthopus* Cameron, by monotypy and original designation. Preoccupied by Peckham, 1892.

Eucharomorpha Girault, 1913. *Arch. Naturgesch* 79, Abt. A, H.6, 62-63. Type species *Eucharomorpha Worcester*: Girault designated by Gahan & Fagan, 1923.

Losbanus Ishii, 1932. *Bulletin of the imperial Agricultural Experimental station, Nishigahara* 3: 210. Type species: *Losbonus uichancoi* Ishii, by monotypy. Boucek, 1988. *Australasian chalcidoidea*: 521. Incorrectly placed *Losbanus* as senior synonym of *Gollumiella* Hedqvist. Current synonymy by Heraty 1992. (*Invertebrate taxonomy* 6: 586) with transfer of *L. uichancoi* to *Orasema*.

Parasemora Gemignani, 1933. *Anales del Museo Nacional de Historia natural de Buenos Aires* 37: 477-493. Type species: *Parasemora freychei* Gemignani, by monotypy.

Semorata Strand, 1942. *Folia zoologica et Hydrobiologica* 11: 393. Replacement name for *Semora* Cameron.

Semorella Ghesquire, 1946. *Rev. Zool. Bot. Africaines*, 39: 368. Replacement name for *Semora* Cameron, not Peckham.

Samorata Strand, 1947. *Folia Zool. Hydrobiol.* 11: 393. Replacement name for *Semora* Cameron, not Peckham.

Diagnosis: Head and thorax dark green with metallic reflections; head clearly smooth without any punctures or reticulations; antenna with anellus, 11-13 segmented; flagellar segments without branches; thorax strongly reticulate; axilla well developed, broadly meeting in median line; pronotum and prepectus separated as different sclerites; scutellum not apically produced; mesopleuron with punctures; wings hyaline, marginal vein longer than stigmal and postmarginal; gastral petiole elongated with longitudinal striations.

Biology: Parasites of the ants of the genera *Pheidole* Westwood and *Solenopsis* Westwood. This is the only eucharitid genus in which some species develop as endoparasites of ants. The Indian species ovipositing in to leaves of tea bushes were recorded as potential pests (Das, 1963); when ovipositing they damage the leaf by their peculiar ovipositor (Boucek, 1988).

Distribution and Species: America, Africa with Madagascar, South Asia, to east to New Guinea and Australia. The following valid species are known from Indian subcontinent so far: *O. assectator* Kerrich, and *O. initiator* Kerrich.

3. Genus *NEOLOSBANUS* Heraty

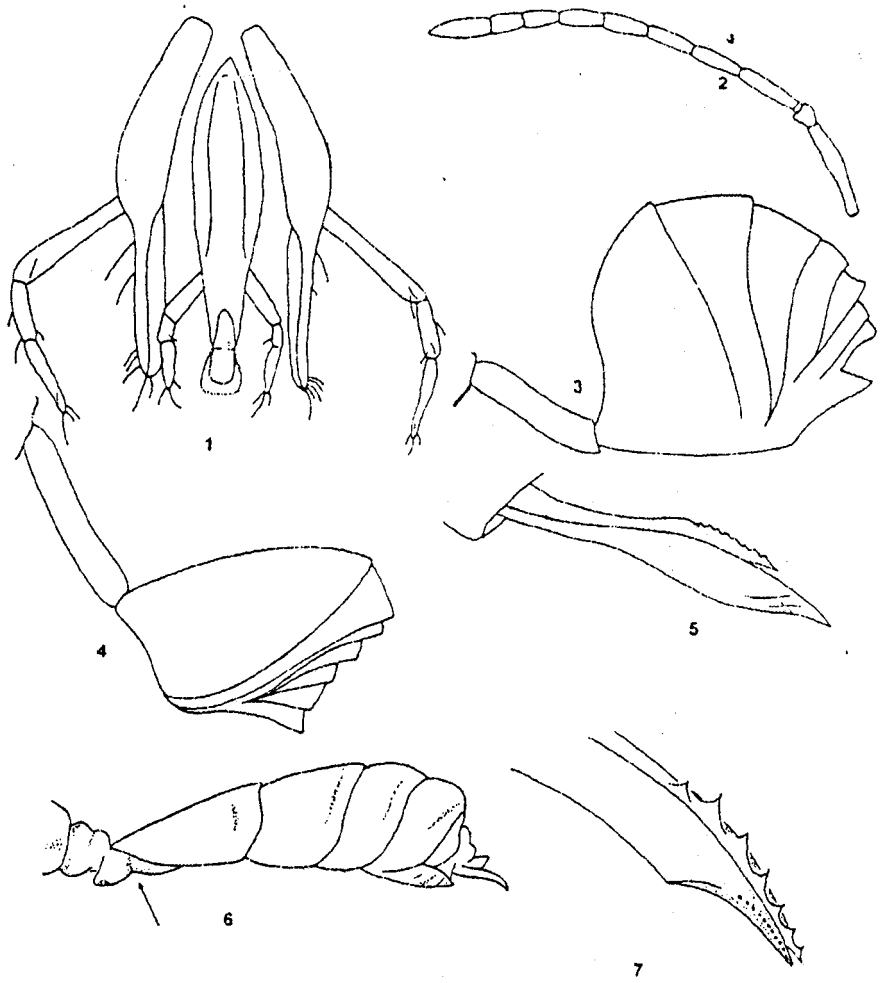
(Fig. 2, 3, 4,5)

Neolosbanus Heraty, 1994 a. *Royal Ontario Museum Life Sciences Contributions* 157 : 93-96 Types species : *Orasema palgravei* Girault, *by original designation.*

Diagnosis: Head smooth or punctate; palpi each with 3 segments; clypeal margin rounded and anteclypeus absent (evenly convex to apex); femoral groove foveate; hypopygeum bare or with few small, sublateral minute setae; petiole gradually narrowed basally; ovipositor acicular or expanded.

Biology: *Neolosbanus palgravei* and *N. gemma* were reared from pupae of *Hypoponera* sp. (Ponerinae) (Hearty, 1994 a). Larval stages and oviposition habits have been described for *N.* (= *Parapsilogoster*) *laeviceps* (Clausen, 1940 a, b) and *N. palgravei* (Hearty 1994 a). Eggs are deposited singly into punctures made by the ovipositor in to the underside of young leaves of broadleaf plants (Clausen, 1940 b; Heraty, 1994 a). *Neolosbanus palgravei* uses a wide variety of host plants (Euphorbiaceae, Monimaceae, Rutaceae, Schizaceae), *N. laeviceps* has been collected from *Atrocarpus* (Moraceae), and *N. townesi* has been associated with *Castanopsis* (Fagaceae) and bamboo (Poaceae) (Hearty, 2002).

Distribution and Species: India, Southern Japan and the Papuan subregion of Australia. Single questionable records are known from Algeria (Palaearctic) (Boucek, 1988) and Uruguay (Neotropical) (Hearty 1994 a). The valid species known from Indian subcontinent so far: *N. laeviceps* (Gahan), *N. nepalensis* Hearty, *N. palgravei* (Girault) and, *N. purpureoventris* (Cameron).



EUCHARITIDAE. Figs. 1-7. Fig. 1. *Orasema* sp. female maxillary complex (posterior) (Courtesy: Heraty, 2002), Figs. 2-5. *Neolosbanus* palgravei, Fig. 2. female antenna, Fig. 3, female gaster, Fig. 4. male gaster, Fig 5. *Neolosbanus* sp. female ovipositor (Courtesy: Herty, 2002), Figs. 6-7. *Indosema indica*, Fig. 6. male gaster, Fig. 7. female ovipositor (Courtesy: Heraty, 2002).

4. Genus *PSILOCHARIS* Heraty

Psilocharis Heraty, 1994 a *Royal Ontario Museum Life Sciences Contributions* 157 : 81-83. Types species: *Eucharis theocles* Walker, by original designation.

Diagnosis: Head smooth, palpi each with 2 segments; clypeal margin straight with well - defined and narow anteclypeus; femoral groove broadly impressed and smooth or reticulate; hypopygium with long transverse brush of hairs, or with only a few long hairs on each side of mucro; petiole abruptly narrowed basally; ovipositor acicular.

Biology : Unknown

Distribution and Species : Southern Malagasy, Ethiopian and Indo-Pacific region (north to southern Japan), including the Polynesian (east to Figi) and Australian subregions. A single questionable record is known from Argentina (Heraty, 1994 a). The valid species known from Indian subcontinent so far : *P. hypena* Hearty.

5. Genus *ANCYLOTROPUS* Cameron
(Figs. 9, 10)

Ancylotropus Cameron, 1909. *Entomologist.* 47: 299. Type species: *Ancylotropus cariniscutis* Cameron by monotypy.

Diagnosis : Body black without metallic reflections; antenna in both sexes simple, long, slender, 12 segmented (Fig. 10); dorsum of mesoscutum highly reticulate; scutellum reticulate, produced anteriorly in to a horn (Fig. 9); prepectus evidently fused with pronotum; axilla well developed; notauli distinct (Fig. 9); mesopleuron with reticulations; wings clear with setae except at basal region; petiole longitudinally striate; gaster smooth.

Biology: Unknown.

Distribution and Species: Africa, India, Indonesia, Madagascar, Malaysia (penisular and eastrn), Philippines, Thailand, Java and Borneo. The valid species known from Indian subcontinent so far *A. manipurensis* (Clausen).

6. Genus *CHERIANELLA* Narendran
(Figs. 11, 12)

Cherianella Narendran, 1994. *Geobios New Reports* 13: 94-96. Type species: *Cherianella narayani* Narendran, by monotypy and original designation.

Diagnosis: Head width distinctly less than maximum width of thorax in dorsal view (Fig. 11); head extremely smaller compared to thorax (Fig. 11), transverse; median area below antennal base raised; frons granulate; each mandible sickle shaped; hind ocelli situated on posterior border of vertex; antenna 13 segmented with scape very short, subequal to pedicel (Fig. 12). Thorax with pronotum not visible from dorsal view (Fig. 11); mesoscutum greatly swollen with dorsum finely granulate and with characteristic adpressed setae (Fig. 11); notauli absent (Fig. 11); scutellum with a

long posterior single horn without emargination at apex (Fig. 11); forewing venation indiscernible.

Biology: Unknown.

Distribution and Species: India and Africa. The valid species reported from Indian subcontinent so far *C. narayani* Narendran.

7. Genus *STILBULA* Spinola
(Figs. 13, 14, 15, 16)

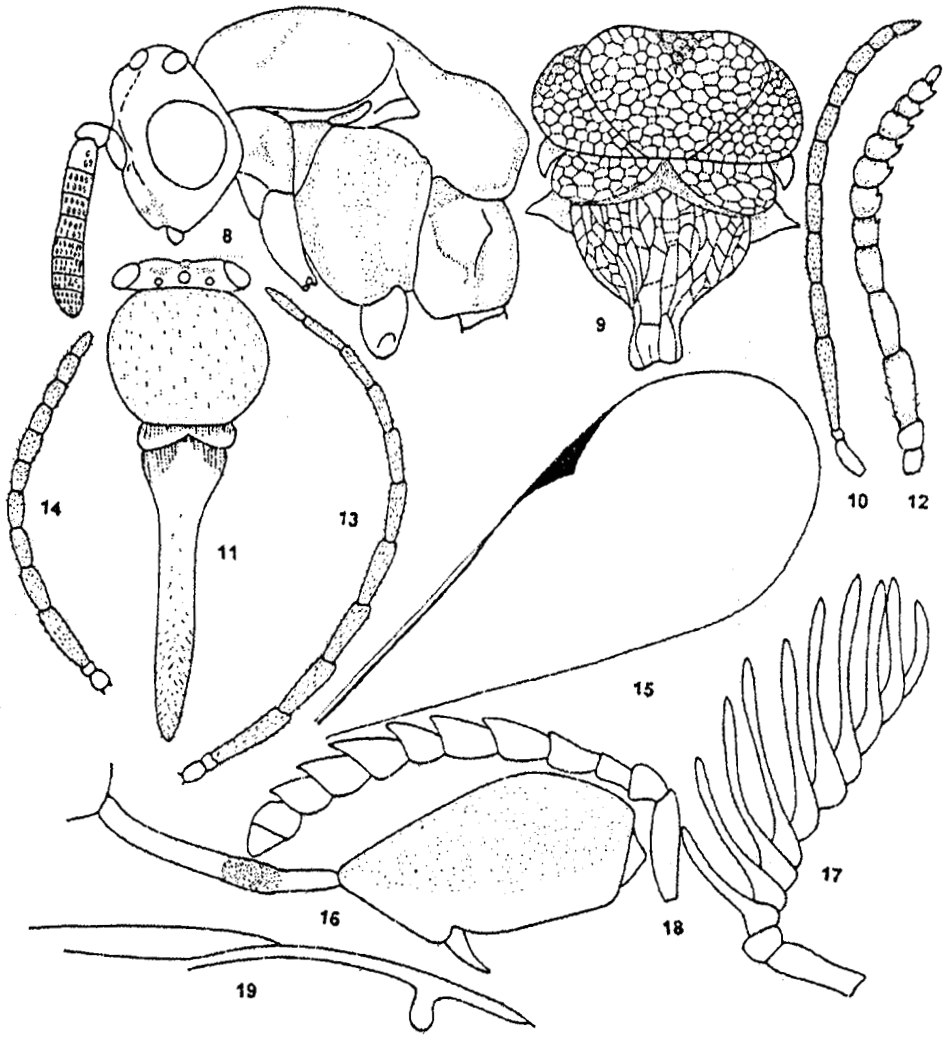
Stilbula Spinola, 1811. *Annls. Mus. Hist. Nat. Paris*, 17: 150, Type species: *Ichneumon cyniformis* Rossi, by monotypy.

Eltolada Cameron, 1909. *Enomologist, London*, 42: 230. Type species: *Eltolada trimaculata* Cameron, by designation of Gahan & Fagan, 1923.

Diagnosis: Body black with dark green or coppery metallic reflections; head transverse as wide as thorax; frons striated longitudinally or circularly around torulus; clypeus smooth; antenna in both sexes 12 segmented, 11091, simple, pedicel cup shaped, flagellar segments tubular, in females antenna shorter than in males (Figs. 13, 14); thorax densely alveolate or punctured; scutellum with short, forked tooth like process; notauli distinct; mesopleuron punctate with a more or less large smooth area; prepectus fused with pronotum anteriorly; forewing with costal cell very narrow, stigmal vein reduced (Fig. 15), with or without infumation around stigmal vein; gastral petiole long and slender (Fig. 16).

Biology: Indian and Korean species oviposit in leaves of various shrubs or trees, *S. cyniformis* in Southern Europe among young seeds of Compositae flower heads. They develop in ant nests of the genus *Camponotus* and allied genera. The Philippine *S. polyrhachicida* was reared from cocoons of another formicine, *Polyrachis dives* Smith. (Boucek, 1988).

Distribution and Species: Africa, Eurasia to Southeast reaching Australia. The following valid species are known from Indian subcontinent so far: *S. ashokai* Narendran, *S. atkinsoni* (Mani & Dubey), *S. indica* (Mani), *S. lata* Narendran, *S. minispina* Heraty, *S. mysorensis* (Mani & Dubey) *S. nilgiri* Heraty and *S. tanjorensis* (Mani & Dubey).



EUCHARITIDAE. Figs. 8-19. Fig. 8. *Indosema indica* female. Head and thorax (Courtesy: Heraty, 1994), Figs. 9-10. *Ancylotropus cariniscutis* female; Fig. 9. thorax dorsal view; Fig. 10. antenna; Figs. 11-12. *Cherianella narayani* female; Fig. 11. head and thorax dorsal view, Fig. 12. antenna, Figs. 13-14. *Stibula ashokai*, Fig. 13. male antenna; Fig. 14. female antenna, Figs. 15-16. *Stibula lata* male; Fig. 15. forewing, Fig. 16. male gaster, Figs. 17-19. *Schizaspidia* spp., Fig. 17. *S. sitarami* male antenna, Fig. 18. *S. sabariensis* female antenna (Courtesy, Hedqvist, 1978), Fig. 19. *S. sitarami* male fore wing.

8. Genus *SCHIZASPIDIA* Westwood
(Figs. 17, 18, 19, 20)

Schizaspidia Westwood, 1835. *Proc. Zool. Soc. London.* 3: 69. Type species: *Schizaspidia furcifera* Westwood, by monotypy.

Lactocantha Shipp, 1894. *Entomologist, London,* 27: 188. Type species. *Thoracantha nasua* Walker, by monotypy and original designation.

Psygmatocera Enderlein, 1912. *Ent. Mitt.*, 1: 146. Type species: *Psygmatocera ceylonica* Enderlein, by monotypy and original designation.

Astilbula Girault, 1913. *Arch. Naturgesch.*, 79: Abt. A, H.6, 101. Type species *Astilbula aenea* Girault, by monotypy.

Neokapala Girault; 1913. *Trans. R.. Soc. S. Australia*, 37: 92. Type species: *Neokapala furcatella* Girault, by monotypy and original designation.

Kapatella Girault, 1932. *New pests from Australia* 10: 4. Type species: *Kapatella transstriata* Girault, by monotypy.

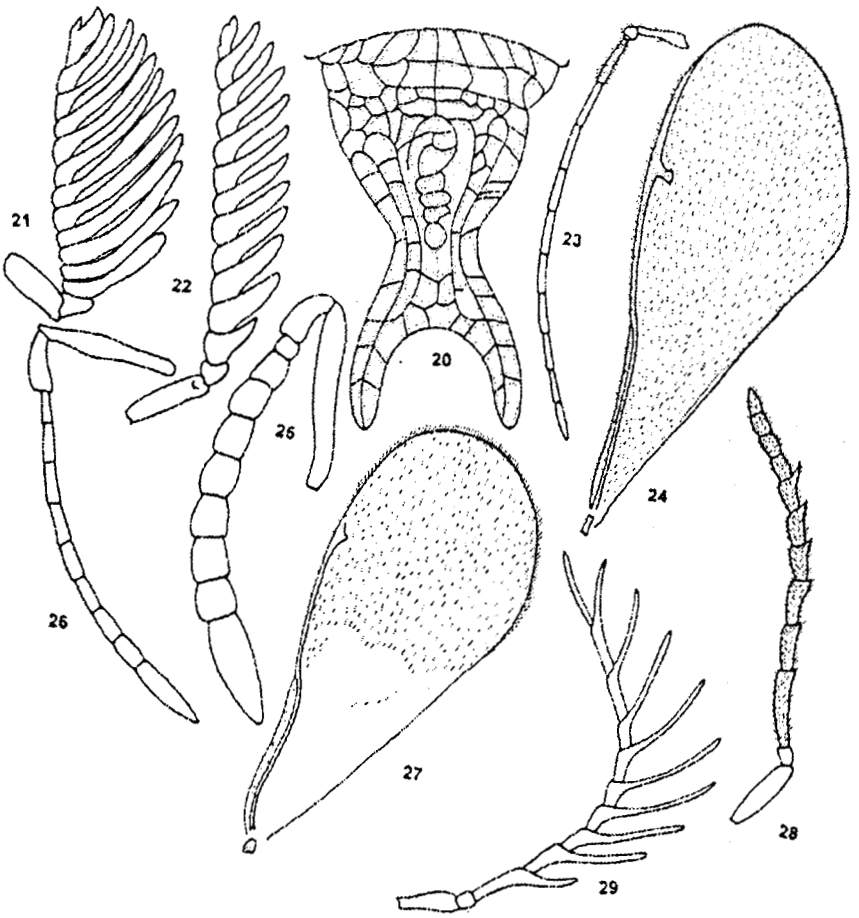
Thoracanthella Girault, 1940. *Revta Soc. Ent. Argentina*, 10: 323. Type species: *Thoracanthella emersoni* Girault, by monotypy.

Kapaloides Mani, 1942. *Indian J. Ent..*, 4: 155. Type species: *Kapaloides travencorensis* Mani, by original designation.

Diagnosis: Body blue, green or black with metallic refrigence; head transverse, smooth with upper part of frons longitudinally striated; gena obliquely striated; mandibles well developed with teeth 2:3; antenna in both sexes 12 segmented, female 11082, male 11091, serrate in females, ramose in males (Figs. 17, 18); thorax with very deep punctures; notauli distinct; axillae broadly united medially; scutellum with forked process at apex (Fig. 20) costal cell of forewing broad, wings with marginal fringe, stigmal vein moderately long perpendicular to marginal vein (Fig. 19); basal part of forewing more or less bare; gastral petiole longer than hind coxa, cylindrical, smooth, punctate or striate.

Biology: The Ceylonese *S. convergens* (Walker) was reared from the ant *Odontomachus haematodes* (L) (Gahan, 1940: 431). The egg and the planidium larva of the Philippine *S. nasua* (Walker) (= *Kapala foveatella*), oviposited in to young leaves of *Gliricidia sepium* and *Leucaena glauca* (Ishii, 1932: 208).

Distribution and Species: From India to South China (and Taiwan) to Queensland and to the Tonga and Samoa Islands. The following valid species are known from Indian subcontinent so far: *S. andamanensis* (Mani), *S. brevifuniculata* Narendran, *S. convergens* (Walker), *S. coromandelica* (Mani & Dubey), *S. furcifera* Westwood, *S. malabarica* Narendran, *S. sabariensis* (Mani & Dubey), *S. scutellaris* Masi, *S. sitarami* Narendran and *S. travancorensis* (Mani).



EUCHARITIDAE. Figs. 20-29. Fig. 20. *Schizaspidia brevifuniculata* female scutellum, Figs. 21-22. *Saccharissa* sp., Fig. 21, female antenna (Courtesy: Boucek, 1988), Fig. 22. male antenna (Courtesy: Boucek, 1988), Figs. 23--24. *Anorasema manii*, Fig. 23. male antenna (Courtesy: Heraty, 1992), Fig. 24. male forewing (Courtesy: Heraty, 1992), Figs. 25-27. *Gollumiella* sp., Fig. 25. femal antenna (Courtesy: Heraty, 1992), Fig 26. male antenna (Courtesy: Heraty, 1992), Fig. 27. female forewing (Courtesy: Heraty, 1992), Figs. 28-29. *Chalcura* sp., Fig. 28. female antenna (Courtesy: hedqvist, 1978); Fig. 29. male antenna (Courtesy: hedqvist, 1978).

9. Genus *SACCHARISSA* Kirby
(Figs. 21, 22)

Saccharissa Kirby, 1886. *Journal of the Linnean Society, Zoology* 20: 37. Type species: *Eucharis contigens* Walkar: by original designation.

Diagnosis: Very close to *Schizaspidia* Westwood and *Ancylotropus* Cameron; differs mainly in having 14-16 segmented antennae, last 3 sometimes less distinctly separated in females, antennae of females serrate; males ramose but first flagellar segment simple (Figs. 21, 22).

Biology: Unknown.

Distribution and species: Oriental region (Assam, South east China, North Borneo), reaching Australia. Boucek (1988) reported an indetermined species from Assam.

10. Genus *ANORASEMA* Boucek
(Figs. 23, 24)

Anorasema Boucek, 1988. *Australasian chalcidoidea* : 522. Type species: *Eucharis pallidipes* Cameron, 1909, by original designation.

Diagnosis: Head smooth, with minute and sparse decumbent hairs; occipital margin as sharp ridge just behind ocelli; scrobes distinct and reaching median ocellus; genae straight, slightly concave at mouth corners; mandibular teeths 3:3; antenna very slender, long, filiform; 12-13 segmented; one thin discoid anellus discernible in female, indistinct in male (Fig. 23); thorax slightly elongate, bare with rugose alveolation; apex of scutellum rounded; legs very slender and long, hind basitarsus as long as rest of tarsus; forewing extensively and conspicuously pubescent, venation distinct, postmarginal vein almost as long as the marginal (Fig. 24).

Biology: Not known. The structure of the ovipositor is broad and cylindrical which suggests that female deposit their eggs in to incisions made in plant tissue (Heraty, 1992).

Distribution and Species: Indo-Chinese, Malayan, and Philippine subregions of the Indo-Pacific. The valid species known from Indian subcontinent so far: *A. manii* Heraty.

11. Genus *GOLLUMIELLA* Hedquist
(Figs. 25, 26, 27)

Gollumiella Hedqvist, 1978. *Steenstrupia, zool. Mus.* University of Copenhagen Vol. 4: 230. Type species: *Gollumiella longipetiolata* Hedqvist, 1978 by original designation.

Losbanus Boucek, 1988. *Australasian chalcidoidea*: 521-522. (not *Losbanus* Ishii, 1932).

Diagnosis: Face including vertex and gena smooth and polished; scrobal depression shallow and poorly defined, not including median ocellus; mandibular teeths 3:2; antenna 10-12 segmented (usually 11), antenna of male generally slender than that of female and with slightly longer pilosity (Figs. 25, 26); thorax generally rugose- areolate with scattered small setae; legs, including coxae, smooth and shiny; hind tibia with 2 apical spurs; wings with upper and lower surfaces densely pilose, veins distinct (Fig. 27).

Biology: Boucek (1988) reported collections of *G. longipetiolata* on the leaves of *Mangifera indica* L. (Anacardiaceae) in India, and *G. antennata* on a shrub with soft leaves in China. In Malaysia, Heraty (1992) collected specimens of *G. antennata* on *Eugenia* sp. (Myrtaceae). Clausen (1940) observed oviposition of *G. antennata* on leaves of *M. indica* and *Erythrina* sp. (Leguminosae) (Heraty, 1992).

Distribution and Species: Indo-Chinese, Malayan, Philippine, Papuan and Australian regions. The following valid species are known from Indian subcontinent so far: *G. antennata* (Gahan) and *G. longipetiolata* Hedqvist.

12. Genus *CHALCURA* Kirby
(Figs. 28, 29)

Chalcura Kirby, 1886. *J. Linn. Soc. London (Zool.)* 20: 30. Type species: *Eucharis deprivata* Walker, by monotypy and original designation.

Rhipipallus Kirby, 1886. *J. Linn. Soc. London.* 20: 31. Type species: *Eucharis volusus* Walker, by original description.

Epimetagea Girault, 1913. *Can. Ent.* 45: 225-226. Type species. *Epimetagea purpurea* Girault, by original designation.

Chalcurelloides Girault, 1913. *Arch. Naturgesch.* 79: 46. Type species: *Chalcurelloides hyalinus* Girault by original designation.

Chalcurelloidella Girault, 1913. *Arch. Naturgesch.* 79: 100. Type species: *Chalcuroidella orientalis* Girault, by original designation.

Chalcurella Girault, 1913. *Trans. R. Soc. S. Aust.* 37: 94. Type species: *Chalcurella nigricyanea* Girault, by original designation.

Astilbula Girault, 1913 *Trans. R. Soc. S. Aust.*, 37: 96. Type species: *Astilbula magnifica* Girault, by original designation.

Chalcuroides Girault, 1913. *Trans. R. Soc. S. Aust.*, 37: 115. Type species: *Chalcuroides versicolor* Girault, by original designation.

Arhipipallus Girault, 1936. pp.3 (Girault: Sydney). Type species. *Rhipipallus turneri* Kirby, by original designation.

Parachalcura Girault, 1940. *Revta. Soc. ent. argent.*, 10: 324. Type species: *Parachalcura ramosa* Girault by monotypy.

Diagnosis: Body metallic green; antenna 1182 in female, 1191 in male, in males flagellar segments with branches, shorter or lacking on first segment (Figs. 28, 29); frons usually striated on upper half, with punctures on lower half; clypeus smooth; thorax densely striato-reticulate except scapula usually smooth; notauli distinct; scutellum striato-reticulate, often with a median ridge, acuminate or without a posterior process, sometimes with a post frenal transverse carina; prepectus evidently fused with pronotum anteriorly; propodeum strongly sculptured without a median carina; forewing with costal cell not especially narrow, stigmal vein slightly elongated; gastral petiole atleast twice as long as hind coxa.

Biology: *Chalcura affinis* was reared from an *Odontomachus* species. The Philippine *C. montana* (Girault) deposits eggs on leaves on *Sandricum* and *Premna* (Boucek, 1988).

Distribution and species: From Sri Lanka to the Philippines, to the Marshall and Samoa Islands, New Guinea and Australia. The valid species known from Indian subcontinent so far: *C. deprivata* (Walker).

13. Genus *EUCHARIS* Latrielle

Eucharis Latrielle, 1802. *Hist. Nat. Crust. Insect.* 3: 210. Type species: *Cynips adscendens* Fabricius, by monotypy.

Diagnosis: Body black; antenna without anelli, flagellar segments serrate in female, ramose in male; prepectus fused to pronotum; mesoscutum large, expanded; scutellum at apex usually incised or with two minute spike-like plates, upturned; thorax smooth and glossy, occasionally sparsely punctate; notauli indistinct; gastral petiole usually short.

Biology: Unknown.

Distribution and Species: Sri Lanka. The following valid species are known from Indian subcontinent so far: *E. casca* Fernando, *E. cassius* Fernando and *E. melantheus* Fernando.

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A NEW SPECIES OF *CALOSOTA* CURTIS (HYMENOPTERA: EUPELMIDAE) FROM INDIA

T.C.Narendran, P.V.Anitha, P.Girish Kumar and S.Santhosh.
Systematic Entomology Laboratory, Department of Zoology,University of Calicut, (Kerala)-673635,India.

ABSTRACT

A new species, *Calosota kottiyoorica* Narendran and Anitha sp.nov. is described from India and compared with its closest relatives.

Keywords: *Calosota*, new species, Eupelmidae, India.

INTRODUCTION

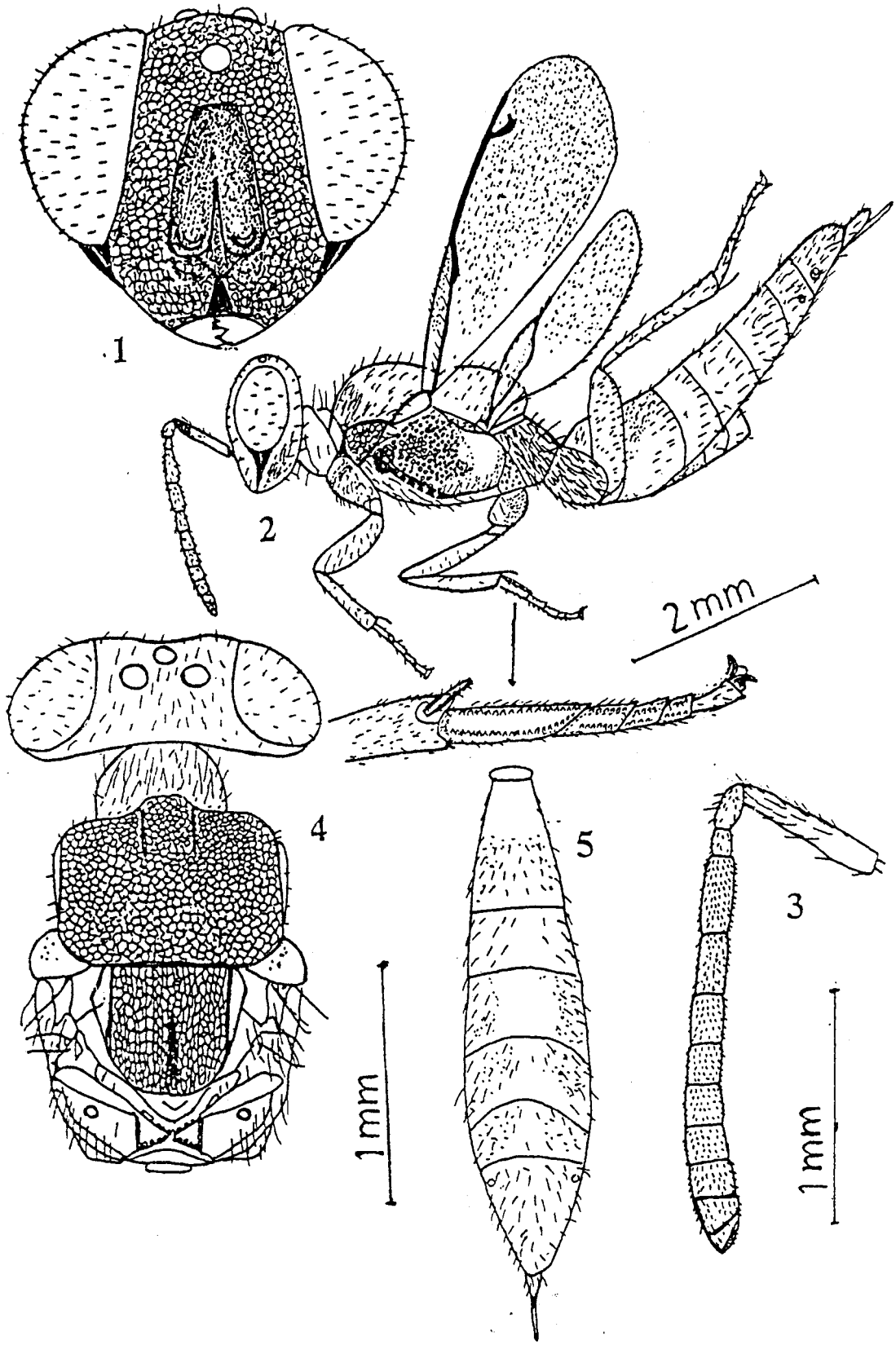
The genus *Calosota* Curtis is so far represented in India by a single species *Calosota shyama* described by Narendran (Narendran, 1996). Since then no species was added to the Indian fauna. The other Oriental species known are *Calosota frequens* described from Seychelles by Masi (1917) and *Calosota stenogastra* described from Taiwan by the same author (Masi, 1926). Girault (1927) described *Calosota splendida* from Philippines. In this paper another new species collected from the undisturbed peripheral areas of Kottiyoor forest of North Kerala, India is described.

Calosota kottiyoorica Narendran and Anitha sp.nov.
(Figs.1 –5)

Holotype: Female: Length 7.1mm.Black. Head in front view with ventral 0.75 (to level slightly dorsad of scrobes) with dull metallic green reflection, but with inter antennal areas, clypeus, edges of toruli and malar area black; a spot below front ocellus with dull metallic reflection (when viewed at some angle); frontovertex dull black. Eye pale yellow with dark patches; ocelli black; basal part of mandibles red. Antenna black with scape reddish brown except black apex. Sides of pronotum, propodeum and metanotum with dull metallic green reflection. Fore and mid legs black with trochanter, bases of femora, apices of tibiae and tarsi pale yellowish brown; hind leg: coxa black with metallic green reflection; remaining segments yellowish red with apices and tarsi paler. Wings hyaline with veins pale brown, pilosity brown. Pubescence on body white.

Head: Width in anterior view 1.3x its length; head width in dorsal view 3.1x its median length; maximum diameter of eye in side view 2.13x malar space length; POL 1.6x OOL; frons and vertex distinctly punctate; vertex evenly curved into occiput; head, vertex, occiput and eye pubescent; scrobe deep, margin carinate on sides, ecarinate on upper border; inter antennal projection reaching middle; clypeus triangular, smooth and shiny, its lower margin slightly concave; mandibles bidentate. Antenna inserted at level of lower margin of eye; eyes diverging towards lower side of frons; scape not exceeding front ocellus. Relative measurement of length: width of antennal segments. Scape = 31:6; pedicel = 9:4; Fl_1 (anellus) = 5:4; Fl_2= 15:6; Fl_3= 12:6; Fl_4= 10:7; Fl_5= 8:7; Fl_6= 8:8; Fl_7= 7:8; Fl_8= 7:8; Clava (2 segmented) = 11:8.

*E-mail: drtcnarendran@yahoo.com


1
2
2mm
4
5
3
1mm
1mm

EXPLANATION OF FIGURES

Figs. 1 – 5 :. *Calosota kottiyoorica* Narendran and Anitha sp.nov

Female

1. Head in front view;
2. Body profile
3. Antenna;
4. Head and mesosoma, dorsal view;
5. Gaster dorsal view.

Mesosoma: Pronotum smooth and shiny with sparse reticulation, pubescent; mesonotum densely and closely punctate; notauli parallel, incomplete; scutoscutellar suture straight; scutellum closely and longitudinally punctate, puncture relatively smaller than that of mesoscutum, with median shallow furrow containing punctures; prepectus coarsely punctate: acropleuron with distinct pits, except posterior upper smooth and shiny part, lower epimeron micropunctate; scutellar axillar complex quadrate; length of scutellum a trifle longer than its width: propodeum with a short and thick median carina and two submedian grooves containing pits, submedian and lateral parts smooth and shiny, callus densely pubescent; middle legs with two rows of pegs on metatarsus to fourth tarsal segment; fifth tarsal segment without pegs.Hind coxa densely pubescent, wings hyaline with brownish venation.Relative lengths of veins: SMV = 30; MV =24; PMV = 9; STV = 6.

Metasoma: 1.5x as long as mesosoma in side view; gaster sessile; densely pubescent on sides, finely coriaceous-strigulose from T2 to T5; T6 coarsely sculptured.
Male: Unknown
Host: Unknown
Etymology: Species is named after Kottiyoor forest from where it is collected.

MATERIAL EXAMINED

Holotype: female, INDIA: Kerala, Kannur district (Kottiyoor forest)17.ii.2003.Coll.T.C.Narendran and Party(DZUC).Paratype: 1 Female, INDIA.Kerala Calicut Uni. Campus May1987.Coll.P.M.Sureshan(DZUC). Holotype is deposited in Department of Zoology, University of Calicut but eventually will be transferred to Western Ghat Regional Station of Zoological Survey of India, Calicut.

DISCUSSION

This new species differs from the only other Indian species *Calosota shyama* in having:

1. mesothorax nonmetallic (in *Calosota shyama* mesothorax metallic green);
2. propodeum with median carina and submedian grooves (in *Calosota shyama* no median carina and submedian grooves);
3. scutellum with a median punctate furrow (in *Calosota shyama* no such furrow present);

4. clava two segmented and not swollen (in *Calosota shyama* clava three segmented and swollen);
5. head with broad sulcus below eyes (no such sulcus in *Calosota shyama*)

and in several other features

This new species does not fit to the descriptions of the other Oriental species viz. *Calosota (Hylephila) stenogastra* Masi, *Calosota frequens* Masi and *Calosota splendida* Girault.

ACKNOWLEDGEMENTS

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A TAXONOMIC STUDY OF A NEW GENUS AND TWO NEW SPECIES OF TETRASTICHINAE (HYMENOPTERA: EULOPHIDAE) FROM SOUTHERN INDIA

T.C. Narendran, P. Girish Kumar and S. Santhosh

Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kozhikode, Kerala 673635, India
Email: drtcnarendran@yahoo.com

ABSTRACT

Aprostoporoides *Narendran, gen. nov., with two new species* Aprostoporoides curiosus *Narendran, sp. nov., and* Aprostoporoides manjericus *Narendran, sp. nov., are described. The affinities of the new genus are also discussed.*

KEYWORDS

Aprostoporoides, Aprostoporoides curiosus, A. manjericus, *Eulophidae, Hymenoptera, India*

ABBREVIATIONS

DZUC - Department of Zoology, University of Calicut; F1-F3 - funicular segments 1-3; MV - marginal vein; MS - malar sulcus; OOL - ocellocuar distance; PMV - postmarginal vein; POL - postocellar distance; SMV - submarginal vein; STV- stigmal vein

The subfamily Tetrastichinae is represented by 22 valid genera in the Indian subcontinent. In this paper an interesting new genus is described from Kerala. The new genus does not fit to any of the keys of Narendran (2003), LaSalle (1994), Graham (1991) and Boucek (1988). The types are in the T.C. Narendran's (TCN) collection at the Department of Zoology, University of Calicut.

***Aprostoporoides* Narendran, gen. nov.**

Type species: *Aprostoporoides curiosus* Narendran sp. nov.

Etymology

Arbitrary combination of letters, masculine gender.

Diagnostic features

Head, mesosoma and metasoma bright metallic green; head not collapsing, with distinct, relatively large well separated setigerous pits on frons and vertex; lower margin of (Fig. 2) clypeus distinctly bilobed; scrobe large; ocelli enclosed in a circle of groove (Fig. 3); front ocellus in a subtriangular groove; each lateral ocellus connected to the adjacent eye by a grooved line which slightly expands, just outside the ocellus to form a fovea; antennal formula 11433; Fl nearly 4x as long as broad; MS straight with a triangular deep fovea below eye; lateral panel of pronotum unusually deep and concave; occipital carina absent. Mesosoma shiny with weak reticulations; midlobe of mesoscutum with 3-4 pairs of admarginal setae, a weak median line on mesoscutum distinct; prepectus large, raised, shiny, with faint reticulations; axillae moderately advanced anteriorly; scutellum wider than long with three pairs of setae, anterior pair nearer to sublateral line (Fig. 4), middle pair very shorter than anterior setae (needs careful focussing and lighting to see the middle pair of setae though the setal pits can be detected); dorsellum 4.3- 4.5x as broad as long. Propodeum with a deep fovea connecting spiracle and posterior margin of propodeum; spiracle partly masked by a part of side of propodeum.

DISCUSSION

This new genus comes near the genera *Aprostocetus* Westwood, *Anaprostocetus* Graham and *Neotrichoporoides* Girault. This new genus differs from *Aprostocetus* in having: 1) scutellum with 3 pairs of setae, 2) pronotal panel deeply concave, 3) prepectus raised, 4) hind coxa with a transverse groove on basal part of outer disc; ocellar area enclosed in a subcircular groove, front ocellus in a subtriangular enclosure; MS with a deep triangular pit below eye and head with large setigerous pits.

The new genus resembles *Anaprostocetus* in having: 1) bright metallic green body, 2) Fl more than 2x as long as its width 3) ocellus in a subcircle and connected to eye. However it differs from *Anaprostocetus* in having: 1) scutellum with 3 pairs of setae 2) pronotal panel with a deep concavity, 3) hind coxa without a dorsal carina, 4) paraspiracular carina absent and 5) hind coxa with a transverse groove at outer basal side.

This new genus resembles *Neotrichoporoides* in having a fovea below eyes and relatively long SMV. However it differs from *Neotrichoporoides* in the characters given under diagnosis.

***Aprostoporoides curiosus* Narendran, sp. nov.**

(Figs. 1-6)

Materials examined

Holotype: Female on card, 16.ii.2003, Kavinissery, Kannur, Kerala, coll. T.C. Narendran and party, MoEF337.

Paratypes: Two females, 16.ii.2003, Kavinissery, Kannur, Kerala, coll. T.C. Narendran and party, MoEF343, MoEF351; four females, 23.i.2003, Chowki, Kasaragod, Kerala, coll. T.C. Narendran and party, MoEF101, MoEF125, MoEF133, MoEF134; one female, 22.i.2003, Kudlu, Kasaragod, MoEF77; one female, 16.ii.2003, Azhikode (near Kannur), Kerala, coll. T.C. Narendran and party, MoEF521; one female, 27.ii.1979, Kanjikuzhi (near Alleppey), Kerala, coll, T.C. Narendran and party, MoEF134. All types are deposited at DZUC.

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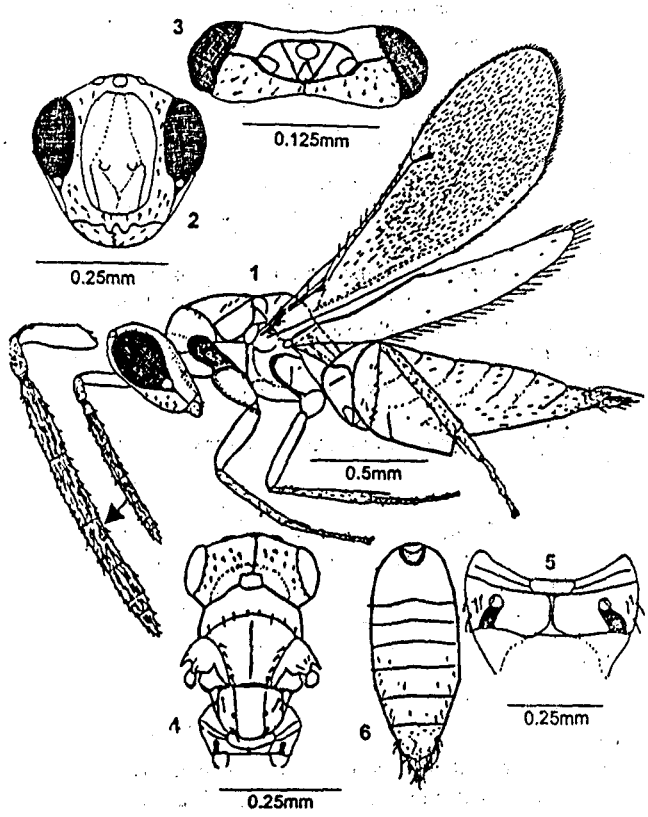


Figures 1-6. **Aprostoporoides curiosus** *Narendran, sp. nov.* ***1 - Body profile; 2 - Head front view; 3 - Head dorsal view; 4 - Head and mesosoma dorsal view; 5 - Propodeum; 6 - Gaster dorsal view.***

Female: Length 2.09-2.3mm. Bright metallic green; scape yellow with dorsal apical part brown; pedicel dark brown with apical ventral part paler; flagellum dark brown; eyes brownish red (in some paratypes pale red or pale yellowish red). Legs whitish-yellow with following parts as follows: anterior basal part of forecoxa pale brown with metallic green; foretarsi brown; mid coxa pale brown; hind coxa concolorous with body, fourth hind tarsus and pretarsus dark brown. Pubescence white; wings hyaline with veins pale yellowish-brown; pilosity of wings brown.

Head: With scattered large setigerous pits (Figs. 2 & 4); width subequal to length in anterior view; width in dorsal view 3.75x its median dorsal length; POL 2.1xOOL; ocelli triangle delimited by a distinct grooved line which slightly expands just outside the hind ocellus to form a fovea. Eyes bare, its maximum diameter in profile 1.92x length of malar sulcus which is straight and ends in a fovea below eye; mandibles tridentate. Antennal scape shorter than eye, reaching level of front ocellus, nearly 4x as long as broad; pedicellus plus flagellum 1.15x width of mesosoma, pedicellus 2.5x as long as broad, half length of Fl; F2 a little shorter than F1, about 2x as long as F3; claval length subequal to Fl, bluntly pointed; sensillae on flagellum moderately numerous.

Mesosoma: about 1.2x as long as broad; propodeal slope 60°; pronotum 0.44x length of mesoscutum; mid lobe of mesoscutum slightly broader than long anteriorly, moderately convex, shiny with extremely fine engraved reticulation; median line of mesoscutum weak but distinct; with three to four adnotaular setae on either side. Scutellum about 0.77x length of mesoscutum, 1.25x as broad as long, moderately convex, sculptured as mesoscutum but rather more finely; submedian lines well marked, slightly nearer to sublateral line than to each other enclosing a space 2x as long as broad; scutellum with three pairs of setae. Dorsellum 4.3-4.5x as broad as long, shiny with extremely fine engraved reticulation. Propodeum (Fig. 5) distinctly longer than dorsellum; paraspiracular carina absent but a deep fovea connects spiracle and posterior margin of propodeum; submedian areas mostly shiny with weak and faint reticulation; median carina slightly raised; rather thin and sharp expanding posteriorly; callus with four to five setae. Metapleuron a little raised, weakly reticulate. Legs of median length and thickness; hind coxa a little over 2x as long as wide with a transverse cross groove on basal disc, without a dorsal carina, outer surface moderately reticulate; hind femur about 4x as long as broad; spur of hind tibia 0.6x length of basitarsus; spur of mid tibia 0.63x length of basitarsus. Forewing 3.26x as long as broad; a little exceeding tip of gaster; costal cell slightly shorter than MV, 9-10.5x as long as broad; SMV with three dorsal setae; MV 5.75x as long as STV; STV at 40°-60°, with moderately long uncus; PMV rudimentary; speculum closed below by cubital line of setae. Gastral petiole indistinct; gaster collapsing on dorsal side, 1.32x as long as head plus mesosoma combined, acuminate; ovipositor sheath exserted; one of the cercal setae longer than others, slightly sinuate; tip of hypopygium reaches a little before half length of gaster.

Male: Unknown.

Host: Unknown.

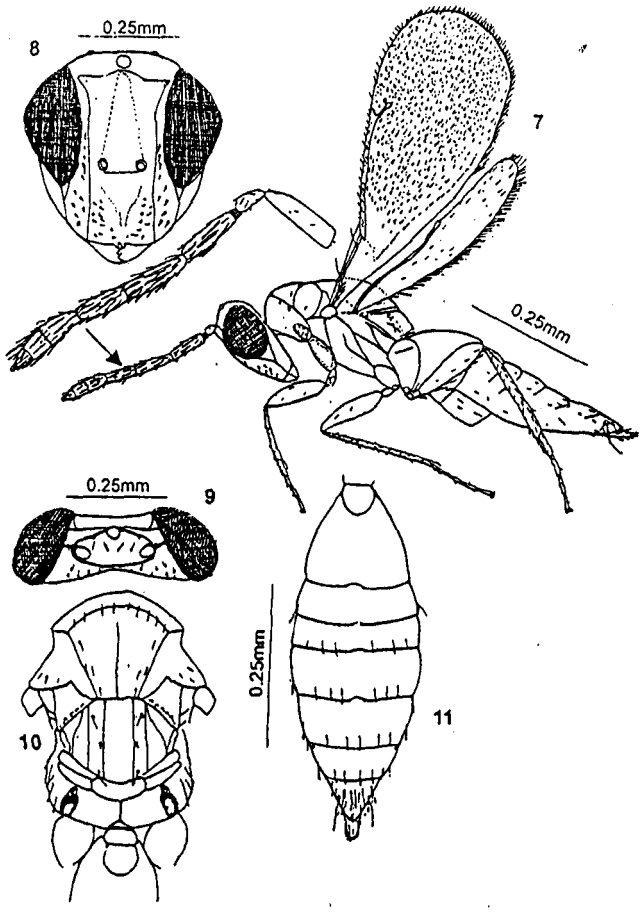
Aprostoporoides manjericus Narendran, sp. nov. (Figs. 7-11)

Material examined

Holotype: Female, 20.vii.2003, Manjeri, Kerala, coll. T.C. Narendran and party (DZCU), MoEF1276

Female: Length 2.2mm. Metallic green; antenna dark brown with scape pale yellow; eye brownish red. Legs whitish-yellow with following parts as follows: basal part of forecoxa brown with metallic green; mid coxa pale brown; hind coxa concolorous with mesosoma with apex pale yellow; fourth hind tarsus pale brown. Pubescence white; wings hyaline with veins pale yellowish brown; wings pilosity pale brown.

Head: (Figs. 8 & 9) with scattered large setigerous pits on lower frons and occiput; upper frons without distinct setigerous pits; width of head in anterior view subequal to its length; width in dorsal view 4.16x its median dorsal length; POL 3x OOL; ocelli triangle limited by a distinct grooved line which slightly expands outside the hind ocellus and connect eye; front ocellus not



Figures 7-11. **Aprostoporoides manjericus** ***Narendran, sp. nov.*** ***7 - Body profile; 8 - Head front view; 9 - Head dorsal view; 10 - Mesosoma dorsal view; 11 - Gaster dorsal view***

enclosed in a triangular groove. Eye bare, its maximum diameter in profile 1.81x length of malar sulcus which is straight and ends in a fovea below eye; mandible tridentate. Antennal scape shorter than eye, reaching front ocellus, 3.5x as long as broad; pedicellus plus flagellum 1.47x width of mesosoma; pedicellus 2.2x as long as broad, subequal to half length of F1; F2 a little larger than F1, 1.31x length of F3; claval length 1.3x length of F1, bluntly pointed, sensillae on flagellum moderately numerous.

Mesosoma: 1.3x as long as broad; propodeal slope 50°, pronotum 0.42x length of mesoscutum; mid lobe of mesoscutum slightly broader; median line of mesoscutum distinct with four adnotaular setae on either side. Scutellum 0.91x as long as mesoscutum, 1.36x as broad as long, moderately convex, sculptured as on mesoscutum but rather more finely; submedian line slightly nearer to sublateral line than to each other, enclosing a space 2.72x as long as broad; scutellum with three pairs of setae. Dorsellum 3.3x as broad as long, shiny without reticulation. Propodeum (Fig. 9) distinctly longer than dorsellum; paraspiracular carina absent but a deep fovea connects spiracle and posterior margin of propodeum, submedian areas extremely shiny with faint reticulation, hardly distinct under certain light position, median carina slightly raised, rather thin and sharp expanding posteriorly; callus with four to five setae. Metapleuron a little raised, weakly reticulate, mostly shiny; prepectus large, raised and shiny with weak reticulation; pronotal panel with a concavity. Legs of median length and thickness; hind coxa mostly smooth and shiny about 2x as long as wide with transverse cross groove on basal part of outer disc without a dorsal carina; hind femur 4x as long as broad; spur of hind tibia 0.66x length of basitarsus; spur of mid tibia 6.25x length of basitarsus. Forewing length 2.6x its width, reaching tip of gaster but not clearly exceeding it. Costal cell shorter than MV; SMV with two dorsal setae; MV 5x STV; STV at 40°-60° with moderately long uncus; PMV rudimentary; speculum closed below by cubital line of setae.

Gaster: Petiole extremely small, transverse, thin; gaster collapsing on dorsal side, 1.17x as long as head plus mesosoma combined, acuminate; ovipositor sheath exserted; one of the cereal setae longer than others, slightly sinuate; tip of hypopygium reaches a little before middle of gaster.

Male: Unknown.

Host: Unknown.

Discussion

This new species differs from *Aprostoporiodes curiosus* having: (1) Fl a little shorter than F2 (in curiosus Fl a little longer than F2); (2) anterior ocellus not enclosed in a triangular groove); (3) SMV with 2 dorsal setae (in curiosus SMV with three dorsal setae); (4) gaster 1.17x as long as head plus mesosoma (in curisus gaster 1.32x as long as head plus mesosoma); (5) admarginal setae not in a row or line (in curiosus admarginal setae of mesoscutum more or less in a line or row).

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A NEW SUBGENUS AND TWO NEW SPECIES OF TETRASTICHINAE (HYMENOPTERA: EULOPHIDAE) FROM BORNEO

T. C. Narendran [1], Lambert Kishore [2], M. C. Vyjayandi [3], S. Santhosh [1], P. Girish Kumar [1] and M. Sheeba [1],

[1] Systematic Entomology Laboratory, Department of Zoology, University of Calicut- 673 635, Kerala, India.

ABSTRACT

A new subgenus *Neotetrastichus* Narendran of the genus *Tetrastichus* Haliday is raised with the type species *Tetrastichus* (*Neotetrastichus*) *vadanatus* Narendran sp. nov. The new subgenus differs from the nominal subgenus *Tetrastichus* in having unusually large falcate mandibles, hypopygium ending before middle of gaster and relatively long epipygium. Another interesting new species *Iniostichus kamijoi* Narendran is also described from Borneo. It differs from its nearest relative *I. kumatai* Kamijo & Ikeda in having speculum present, funicle not separated from clava and in several other features.

Key words: Hymenoptera, Chalcidoidea, Eulophidae, Tetrastichinae, *Neotetrastichus*, *Iniostichus*, New subgenus, New species, Borneo.

INTRODUCTION

In our studies on the taxonomy of Oriental Eulophidae, Dr. Steven L. Heydon of Bohart Museum of Entomology, University of California, Davis, California, USA (UCDC) sent us a large collection of Eulophidae on loan. This yielded two interesting new taxa (viz. *Neotetrastichus* Narendran sub. gen. nov. and *Iniostichus kamijoi* Narendran sp. nov. from Borneo. These new taxa do not fit to any of the taxa of Tetrastichinae dealt by Graham (1987,1991), La Salle (1994), Schauff *et al.* (1997), Narendran *et al.* (2002,2003a, 2003b, 2004) Ubaidillah and La Salle (1996).

MATERIALS AND METHODS

The card-mounted specimens were studied under Leica M6 Stereozoom Microscope (Leica, Switzerland) and the drawings were made using the drawing tube of the Leica microscope. The drawings were enlarged to appropriate size using the KB enlarger of model B2M.

ABBREVIATIONS USED: CL_1 to CL_3 = claval segments 1 to 3; F_1 to F_3 = funicular segments 1 to 3; MV = marginal vein; OOL = ocellocular distance; PMV = post marginal vein; POL = postocellar distance; SMV = submarginal vein; STV = stigmal vein; T1 to T_5 = Tergites 1 to 5; UCDC = Bohart Museum, University of California, USA.

RESULTS AND DISCUSSION

Neotetrastichus Narendran sub. gen. nov.

[2] Department of Zoology, Malabar Christian College, Calicut-673 001, Kerala, India.
[3] Department of Zoology, Providence Women's College, Calicut-673 009, Kerala, India.

Type species: *Tetrastichus* (*Neotetrastichus*) *vadanatus* Narendran sp. nov.

Diagnosis: Mandibles unusually large, falcate with a tubercle like inner tooth on either mandible; maxillary palp relatively long, toruli situated a little above lower ocular line; malar sulcus present; antennal scape slightly exceeding vertex; mesoscutum with a median groove; with 5 pairs of adnotaular setae; forewing with speculum present but closed behind by cubital line of setae; SMV with one dorsal seta; propodeum with paraspiracular carinae and median carinae; epipygium a little more than 2x length of sixth tergite in dorsal view; one of the cercal setae longer than others.

***Tetrastichus* (*Neotetrastichus*) *vadanatus* Narendran sp. nov.**
(Figs. 1 – 7)

Holotype: Female: Length 3mm. Head and Mesosoma black with slight blue reflection; eyes pale brownish yellow with reddish patches; ocelli pale reflecting yellow; mandibles yellowish brown; antenna brown with scape pale yellow; legs pale brownish yellow with hind coxa concolorous with mesosoma; gaster predominantly brown with epipygium and ovipositor sheath darker; wings hyaline with slight infumation; veins and pubescence on wing disc pale brown; pubescence on body dirty white.

Head: width in anterior view 1.39x its length (from tip to lower margin of clypeus); width in dorsal view 2.69x its length; frons reticulate with large, shallow, scattered pits on frons; lower clypeal margin slightly sinuate (fig.2); upper clypeal margin and tentorial pits indistinct; eye height in profile 2.62x length of malar sulcus; malar sulcus slightly curved; mandibles unusually large and long with its apex hooked, with a small hook like tubercle on inner submedian margin (fig. 2); POL subequal to OOL. Antennal toruli situated distinctly above lower ocular line; antennal formula 11233; scape slightly exceeding level of vertex. Relative length: width of antennal segments: scape = 19: 4; pedicel = 8: 4; F_1 = 13: 5; F_2 = 12: 5; F_3 = 12: 4; clava = 24: 4.

Mesosoma: Pronotum without cross carina, reticulate; mesoscutum a little longer than scutellum, with a deep median groove, with 5 admarginal setae on either side; scutellum width subequal to its length; submedian groove nearer to each other than to sublateral lines on posterior half; dorsellum undivided; propodeum with median and plical carinae present; surface coarsely reticulate; spiracle separated from anterior margin by a distance subequal to its diameter; Hind coxa reticulate on outer dorsal side. Forewing (fig.5) length 2.52x its maximum width; SMV with single dorsal setae; speculum present, closed behind by cubital line of setae. Relative lengths: SMV = 27; MV = 51; STV = 10; Hind wing broadly pointed at apex (fig.6).

Metasoma: Petiole indistinct, 2.23x as long as mesosoma; second tergite shortest; fourth and fifth tergites subequal in length; epipygium a little more than 2x dorsal length of sixth tergite

Male: Unknown.

Host: Unknown.

Etymology: Named after the genus *Tetrastichus*

Material Examined: Holotype: Female. BORNEO: Sarawak, SW Gunung Buda 64 km s. Limbang. 4°13'N 114°56'E. 16-21.xi.1996. Coll. S. L. Heydon & S. Fung (UCDC).

Discussion: This new subgenus differ from the nominal subgenus *Tetrastichus* Haliday in having a combination of characters: (1) large unusual falcate mandible with tubercle like inner tooth (Fig.2) (In *Tetrastichus* no such mandibles are met with); (2) antennal scape exceeding level of vertex (Fig.1);(In *Tetrastichus* scape not exceeding level of vertex); (3) relatively long epipygium (In *Tetrastichus* epipygium not so long); (4) hypopygium ending before middle of gaster (In *Tetrastichus* not so).

Aprostocetus maculates (Khan&Shafee) (Khan & Shafee, 1988, Hayat & Shahi, 2004) is also characterized by large mandibles with falcate inner tooth and slightly curved malar sulcus but the new species *T. vadanatus* has inverted 'Y' shaped paraspiracular carina on propodeum as a distinct generic character of *Tetrastichus*.

The new subgenus resembles the genera *Chytrolestes* LaSalle and *Chaenotetrastichus* Graham in having large falcate mandible but differ from these in several other characters (Graham, 1987, LaSalle, 1994). Future studies may reveal whether this new subgenus deserves a separate new genus status or not when more specimens are available.

***Iniostichus kamijoi* Narendran sp. nov.**
(Figs. 8 – 10)

Female: Length 1.9 mm. Head and prothorax brown; mesoscutum, mesopleuron, metapleuron, sides of propodeum black; submedian areas of propodeum dark brown; pedicel and flagellum black, scape whitish yellow with apex darker; eye brownish gray; ocelli pale reflecting yellow; all legs whitish yellow; petiole black; gaster dark brown; wings hyaline, with veins and pubescence on disc pale brown; pubescence on body white

Head: Non collapsing; in anterior view 1.4x its length (excluding mandibles); width in dorsal view 1.53x its length; eyes separated by 1.3x their height in anterior view; longitudinal carina present between antennal toruli; tentorial pits very large situated on upper clypeal corners; clypeus distinctly demarcated, lower margin arcuate. Eye pilose; height of eye in profile 2.42x length of malar space; postocciput with a longitudinal groove as in *Asecodes* group of *Closterocerus* Westwood; malar sulcus very slightly curved anteriorly; mandible tridentate; scape slender not quite exceeding level of vertex; Flagellum with one anellus followed by six segments, all separated by constrictions without any demarcation of clava and funicle; flagellar segments (except anellus) with distinct sensillae and long hairs (fig. 8); apical segment with a long spine; scape faintly reticulate; relative measurements of length: width of segments: scape = 16:5; pedicel = 6:4; F_1 = 6:5; F_2 = 7:5; F_3 = 7:5; F_4(= CL_1) = 7:5; F5 (= CL_2) = 5:4; F_6 (= CL_3) = 3.5: 3; Combined length of pedicel and flagellum 1.33x breadth of head; F_1 equal in length of pedicel; F3 distinctly longer than pedicel.

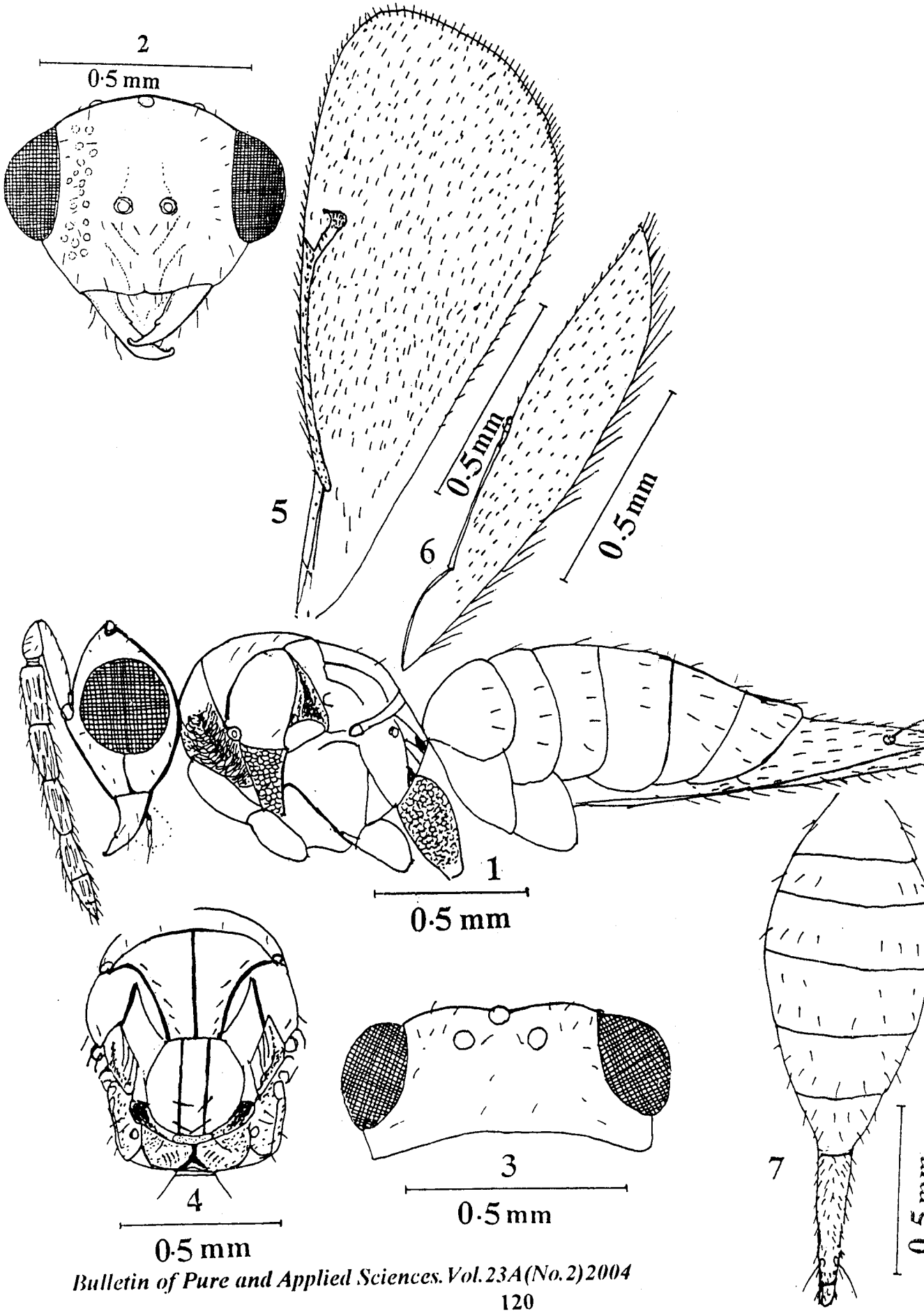
Legends of Figures

Figs. 1 – 7 ***Tetrastichus* (*Neotetrastichus*) *vadanatus*** Narendran sp. nov.

Female. 1. Body profile; 2. Head anterior view; 3. Head in dorsal view; 4. Mesosoma in dorsal view; 5. Forewing; 6. Hind wing; 7. Metasoma in dorsal view;

Figs. 8 – 10 ***Iniostichus kamijoi*** Narendran sp. nov.

Female. 8. Body profile; 9. Body in dorsal view; 10. Head front view.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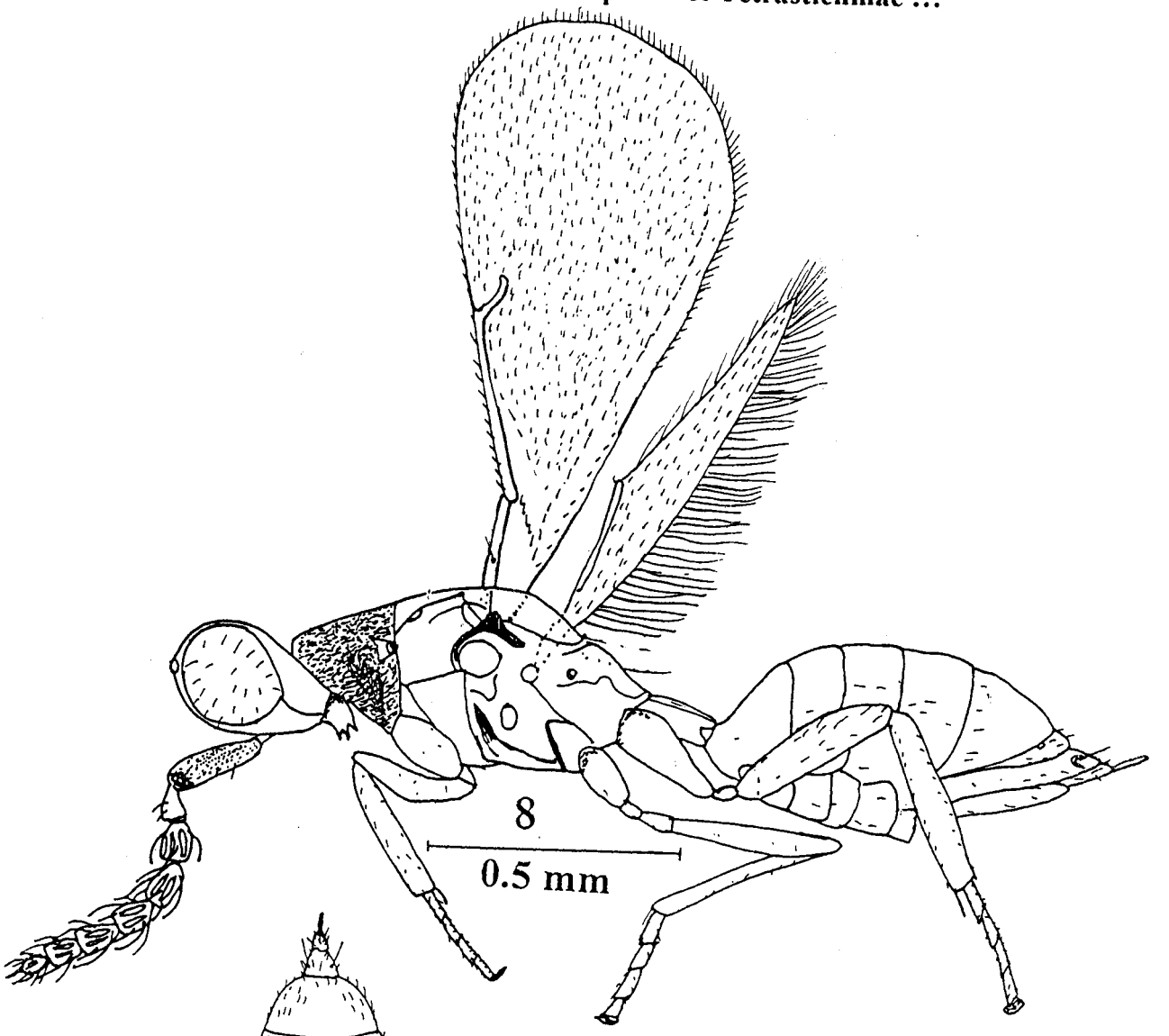
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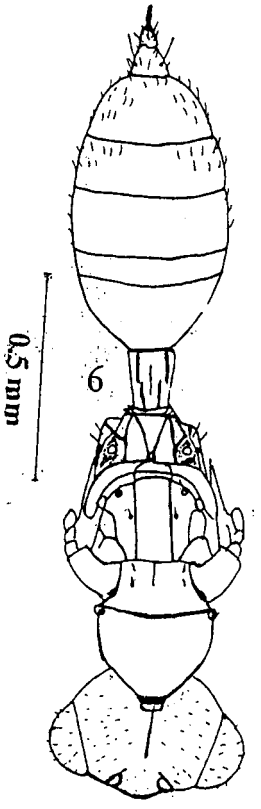
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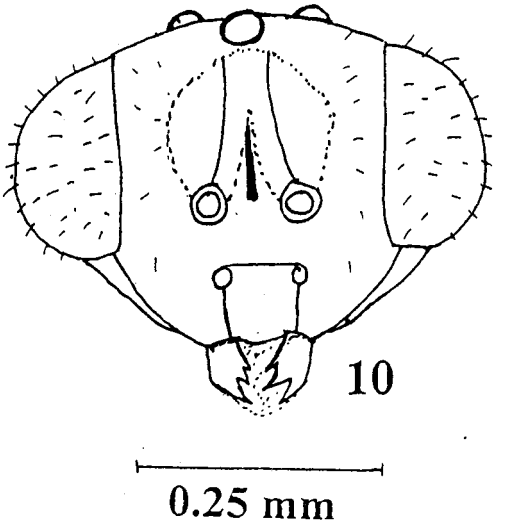
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0.25 mm

Mesosoma: 1.62x as long as broad; pronotum1.21x as broad as long; faintly reticulate as occiput; mesoscutum more strongly reticulate than pronotum; with two pairs of short adnotaular setae with a weak median groove indicated posteriorly; scutellum length subequal to length between sublateral lines, submedian lines slightly nearer to sublateral lines than to each other; median area finely reticulate, not at all polished; anterior pair of setae slightly behind middle; dorsellum reticulate on anterior part; propodeum medially 3x as long as dorsellum, smooth; median groove very smooth in the form of a pit situated anteriorly, followed by diverging carinae (fig. 9); paraspiracular carinae strong; spiracular area deep. Prepectus large; metapleuron not reaching hindwing base. Forewing (fig. 1) 2.17x as long as broad, densely setose, speculum present, closed behind by cubital line of hairs; SMV with a single dorsal setae; MV 1.63x as long as costal cell; 4.4x as long as STV.

Metasoma: Petiole a little longer than propodeum, 1.33x as long as broad; with dorsal carinae (fig.9). Gaster (excluding petiole) a little longer than mesosoma, 2.1x as long as broad; all tergites finely reticulated; reticulation stronger on T_5; T2 shortest.

Male: Unknown

Host: Unknown

Etymology: The species name is after Dr. Kazuaki Kamijo for his significant contributions to the systematic study of Chalcidoidea.

Material Examined: Holotype: Female. BORNEO: Sarawak, SW Gunung Buda, 64 km s. Limbang. 4° 13`N 114° 56'E. 26.xi.1996. Coll. S. L. Heydon (UCDC). (Another female specimen (not examined) reported by Kamijo and Ikeda (1997) from Borneo, Crocker Range, Keningan, Sabah, Coll. 12.ix.1988. ex *Cryphiomystis* sp. collected by T. Kumata may belong to this species as far as the descriptions both specimens almost tally each other.)

Discussion: This species comes very near to *Iniostichus kumatai* Kamijo & Ikeda in the key to species by Kamijo & Ikeda (1997), but differs in having (1) forewing with speculum (without speculum in *I. kumatai*); (2) scutellum with submedian lines not narrow (in *I. kumatai* submedian lines narrow); (3) F_1 not shorter than pedicel (F_1 shorter than pedicel in *I. kumatai*);(4) F_3 longer than pedicel (not so in *I. kumatai*); (5) funicle and clava not distinctly separated (separated in *I. kumatai*).

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We are grateful to Dr. Steven L. Heydon of University of California, Davis, U.S.A. for kindly sending several specimens of Eulophidae for our studies. One of the author, M. Sheeba is grateful to Council of Scientific and Industrial Research, New Delhi for the award of research fellowship. We also record our gratitude to the Authorities of University of Calicut for providing the necessary facilities.

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TWO NEW SPECIES OF *STILBULA* SPINOLA (HYMENOPTERA: EUCHARITIDAE) FROM YEMEN

T.C. Narendran and P. Girish Kumar

Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala 673635, India

ABSTRACT

Two new species of Stilbula *Spinola viz.,* S. tonyi *sp. nov. and* S. yemenica *sp. nov. are described from Yemen.*

KEYWORDS

Hymenoptera, Eucharitidae, Stilbula tonyi *sp. nov.,* Stilbula yemenica *sp. nov., Yemen*

ABBREVIATIONS

DZUC - Department of Zoology, University of Calicut; F1-F10 - Flagellar segments 1 to 10; OOL - Ocellocular line; POL - Postocellar line; SMV - Submarginal vein; SSS - Scutoscutellar sulcus.

The genus *Stilbula* was raised by Spinola in 1811 on the type species *Ichneumon cyniformis* Rossius. *Stilbula vitripennis* Masi is the only one species so far reported from the Middle east (Masi, 1934; Boucek, 1951; Noyes, 2003; Heraty, 2002). In this paper we describe two new species of *Stilbula* from Yemen. This is the first report of this genus from Yemen. The new species neither fit to the keys of Nikolskaya (1952), Trjapitzin (1987), Peck, Boucek and Hoffer (1964) and Narendran & Sheela (1996), nor does it fit to the description of any known species.

Stilbula tonyi sp. nov.

(Figs. 1 - 6)

Material examined

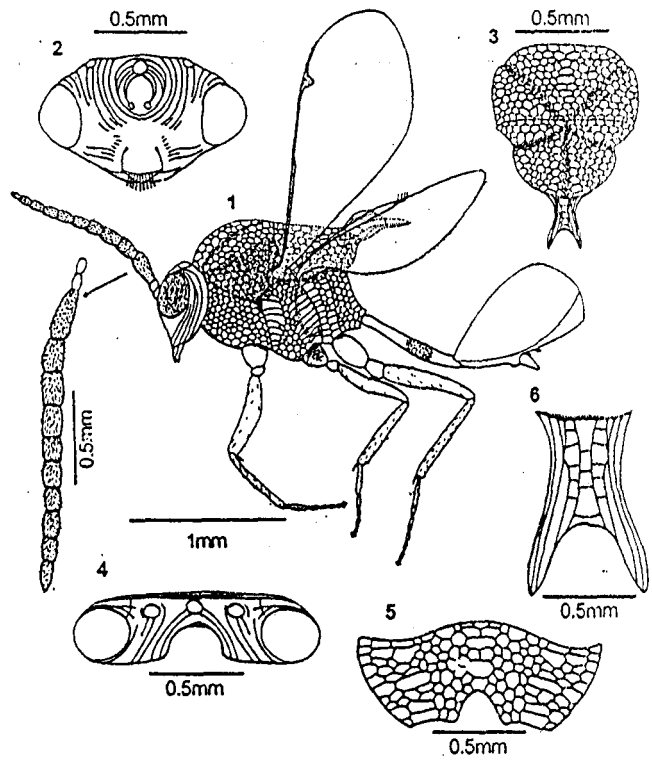
Holotype: Female, 16.x.2000 - 31.xi.2000, Al Lahima, Yemen, Coll. A. Van Harten and A.M. Hager. Holotype deposited in the Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC). Reg.No. GK 360.

Etymology: Named after Dr. Tony van Harten for his generous gift of chalcidoids for our studies.

Diagnostic features

Female: Length 3.72mm. Head green with metallic refrigence; upper part of mesosoma brown with metallic reflections, greenish reflections in certain lights, lower part green with metallic reflections, scutellar process brown, tegula and lateral side of lateral lobe brownish-yellow; mandibles, scape and pedicel brownish-yellow, funicular segments pale brownish-yellow, ocelli pale yellow; eye dark brown; all coxae yellowish-brown with apices paler; trochanter and femur yellow, tibia pale yellow, tarsal segments whitish, all claws brown; gastral petiole white with pale yellow band near middle; wings hyaline, stigma and SMV pale brown.

Head: Width in anterior view 1.76x its median length (excluding mandibles) (Fig. 2); POL 3.36 x OOL (Fig. 4); median ocellus separated from occipital margin by its own diameter; frons with distinct oblique and semicircular striations (Fig. 2) extending from ocellar area to supraclypeal area; clypeal area slightly striate and shiny; epistomal sulcus faintly distinct; clypeogenal sulci and tentorial pits deep and distinct; vertex and scrobe longitudinally striate; mouth plate 9 digitate; gena obliquely striated; eyes separated in front view by 2.85x height of eye; antenna (Fig. 1) 12 segmented; relative proportions of length : width as follows: scape - 5.25 : 3; pedicel 5.5 : 3, F_1 - 17.7 : 6, F_2 - 11 : 7, F_3 - 11 : 7, F_4 - 11 : 6.5, F_5 - 8 : 6, F_6 - 8.6 : 6, F_7 - 8 : 5, F_8 - 9 : 5.5; F_9 8 : 4.5, F_{10} - 10 : 3.5.



Figures 1-6. **Stilbula tonyi *sp. nov. (Female)***
1 - Body profile; 2 - Head anterior view; 3 - Thorax dorsal view; 4 - Head dorsal view; 5 - Propodeum; 6 - Scutellar process

Mesosoma: Thorax with mesoscutum and scutellum deeply and closely punctate; interstices carinate; notauli distinct and alveolate; SSS carinate; scutellum with a median longitudinal fovea; scutellum wider than distance between SSS and frenal carina; each tooth of posterior scutellar process shorter than stalk of scutellar process, 2x as long as its width (Fig. 6); width

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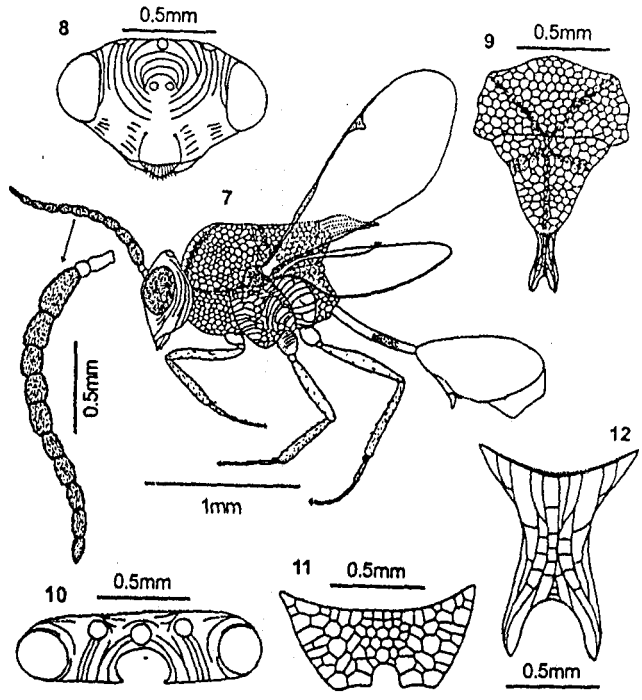
of sctellar stalk 1.16x less than its length (excluding teeth) (Fig. 6); propodeum completely punctate, interstices carinate, without median carina, callus bare (Fig. 5); mesopleuron punctate without a patch of smooth area (Fig. 1); fore and hind coxa mostly smooth and shiny, midcoxa distinctly striated on sides; forewing (Fig. 1) 2.57x as long as its maximum width, without marginal fringe; lower margin of hind wing with marginal fringes; hamuli 4 in number.

Metasoma: (Fig. 1) excluding petiole 1.74x its height in side view; tergites smooth and polished; petiole smooth, distinctly shorter than remaining part of gaster (4:4.75), longer than hind femur (4:1.3), slightly swollen near middle.

Male: Unknown.

Host
Unknown.

Remarks
This new species differs from the only other species *S. vitripennis* Masi from Middle East in the following features: (1) each tooth of posterior scutellar process shorter than stalk of scutellar process (in *S. vitripennis* each tooth of postreior scutellar process longer than stalk of scutellar process) (2) gastral tergum pale brown (in *S. vitripennis* gastral tergum dark brown) and (3) F_1-F_6 pale brownish-yellow (in *S. vitripennis* F_1-F_6 dark brown).



Figures 7-12. **Stilbula yemenica *sp. nov. (Female)***
7 - Body profile; 8 - Head anterior view; 9 - Thorax dorsal view; 10 - Head dorsal view; 11 - Propodeum; 12 - Scutellar process

Stilbula yemenica sp. nov.
(Figs. 7 - 12)

Material examined
Holotype: Female, 16.x.2000 - 31.xii.2000, Al Lahima, Yemen, Coll. A. Van Harten and A.M. Hager. Holotype deposited in the Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC). Reg. No. GK 361.

Etymology
Named after the country of origin of the specimen.

Diagnostic features
Female: Length 4.79mm. Head and thorax green with metallic refrigence; mandibles, scape and pedicel brownish-yellow; funicular segments pale brownish-yellow; ocelli pale yellow; eye dark brown; tegula pale brown; fore and mid coxae yellowish-brown with apices paler; hind coxa dark brown with apices paler; remaining parts of legs pale yellow; all claws brown; distal part of scutellar teeth dark brown; gastral petiole white with pale yellow band near middle, wings hyaline; stigma and SMV pale brown.

Head: Width in anterior view 1.67 x its median length (excluding mandibles) (Fig. 8); POL 2.26 x OOL (Fig. 10); median ocellus separated from occipital margin by less than its own diameter; frons with distinct oblique and semicircular striations (Fig. 8) extending from ocellar area to supraclypeal area; clypeal area slightly striate and shiny; supraclypeal area smooth and shiny; epistomal sulcus faintly distinct; clypeogenal sulci and tentorial pits deep and distinct; vertex and scrobe longitudinally striate; mouth plate 10 digitate; gena obliquely striated; eyes separated in front view by 3.29x height of eye; antenna (Fig. 7) 12 segmented; relative proportions of length : width as follows: scape - 10:5.5, pedicel - 3.5:6, F_1 - 20:8.5; F_2 - 13.5:8.5; F_3 - 12.5:7.5; F_4 - 10.5:8; F_5 - 12:7.5; F_6 - 10:6; F_7 - 11:6.5; F_8 - 10.5:5.5, F_9 - 10.5:4.5; F_{10} - 10:3.5.

Mesosoma: Thorax with mesoscutum and scutellum deeply and closely punctate, interstices carinate; notauli distinct and alveolate; mesoscutum without a median fovea; SSS carinate; scutellum with a median longitudinal fovea; scutellum wider than distance between SSS and frenal carina; each tooth of posterior scutellar process shorter than stalk of scutellar process, 1.56x as long as its width; width of scutellar stalk 1.44x less than its length (excluding teeth) (Fig. 12); propodeum completely punctate, interstices carinate, without median carina, callus bare (Fig. 11); mesopleuron punctate without a patch of smooth area (Fig. 7); fore and hind coxae mostly smooth and shiny, mid coxa distinctly striated on sides; fore wing (Fig. 7), 3.47x as long as its maximum width, without marginal fringes; lower margin of hind wing with marginal fringes; hamuli 3 in number.

Metasoma: (Fig. 7) excluding petiole 1.64x its height in side view; tergites smooth and polished; petiole smooth, distinctly shorter than remaining part of gaster (35:51), longer than hind femur (35:8), slightly swollen near the middle.

This new species resembles *Stilbula tonyi* sp. nov. in general appearance but differs from *S. tonyi* sp. nov. in the following features:

S. tonyi sp. nov.	*S. yemenica* sp. nov.
Mouth plate 9 digitate	Mouth plate 10 digitate
Stalk of scutellar process distinctly shorter than that of *S. yemenica* sp. nov.	Stalk of scutellar process distinctly longer than that of *S. tonyi* sp. nov.
Scutellar teeth distinctly longer than that of *S. yemenica* sp. nov.	Scutellar teeth distinctly shorter than that of *S. tonyi* sp. nov.
Width of scutellar stalk 1.16x less than its length (excluding teeth)	Width of scutellar stalk 1.44x less than its length (excluding teeth)
Hamuli four in number	Hamuli three in number
Median ocellus separated from occipital margin by its own diameter	Median ocellus separated from occipital margin by less than its own diameter.
POL 3.36 x OOL	POL 2.26 x OOL
Eyes separated in front view by 2.85x height of eye	Eyes separated in front view by 3.29x height of eye.
Fore wing 2.57x as long as its maximum width	Fore wing 3.47x as long as its maximum width.
Upper part of thorax brown with metallic reflections, greenish reflections in certain lights, scutellar process brown, lower part green with metallic reflections, tegula and lateral side of lateral lobe brownish-yellow	Thorax green with metallic refrigence except tegula; tegula pale brown; distal part of scutellar teeth dark brown.

Male: Unknown.

Host
Unknown.

Remarks
This new species differs from the only other species *S. vitripennis* Masi from Middle East in the following features: (1) each tooth of posterior scutellar process shorter than stalk of scutellar process (in *S. vitripennis* each tooth of posterior scutellar process longer than stalk of scutellar process) (2) gastral tergum pale brown (in *S. vitripennis* gastral tergum dark brown) and (3) F_1-F_6 pale brownish-yellow (in *S. vitripennis* F_1-F_6 dark brown).

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On a new genus and a new species of Entedoninae (Hymenoptera: Chalcidoidea: Eulophidae) from India

T. C. Narendran*, P. Girish Kumar and S. Santhosh

Systematic Entomology Laboratory, Department of Zoology, University of Calicut, 673635, Kerala, India
Email: drtcnarendran@yahoo.com

ABSTRACT: A new genus *Bomyiabius* Narendran and a new species *Bomyiabius frontus* Narendran are described from Kerala state (India). The diagnosis and difference with other related genera are also provided. © 2004 Association for Advancement of Entomology

KEYWORDS: Eulophidae, *Bomyiabius*, new species, India

INTRODUCTION

Eulophidae is one of the economically important families of Chalcidoidea. Many species of this family are parasitic on several species of insect pests of agricultural crops. Unfortunately their taxonomy at alpha level is still incomplete especially in Kerala where rich unexplored fauna awaits discovery. During the course of an inventory on the eulophid fauna of Kerala, we came across an interesting taxon of Entedoninae, which neither fits, to any of the available important keys (Hayat, 1985; Trjapitzyn and Koslyukov, 1987; Boucek, 1988; Mani, 1989 Schauff *et al.*, 1997) nor to any of description of known genera or species of Entedoninae. Hence this interesting genus and species are described below.

The types of new species are deposited in the TCN collections of Systematic Entomology Laboratory, Department of Zoology (DZUC), University of Calicut.

Abbreviations

DZUC = Department of Zoology, University of Calicut; F_1–F_3 = Funicular segments 1 to 3; MV = Marginal vein; OOL = Ocellocular line; PMV = Postmarginal vein; POL = Postocellar line; STV = Stigmal vein; T_1–T_7 = Tergites 1 to 7.

*Corresponding author

***Bomyiabius* Narendran gen. nov.**

Type species: *Bomyiabius frontus* Narendran sp. nov.

Diagnosis

Head stout, non collapsing with *X* shaped frontal grooves; occipital carina sharp. postocciput steeply declining; mouth small, narrowed, lower face slightly compressed from sides; In side view mandibles looks swollen, bulging posteriorly; eyes slightly concave on anterior inner orbits on lower side; funicular segments petiolate, clava with apical spicule. Pronotum with anterior margin carinate; mesoscutum with notauli distinct only anteriorly. Propodeum with a median strip of carinate margins, plicae parallel, not converging to nucha, with a pit on either side of each plica on inner basal side, petiole reticulate-granulate, T_1 longest, last tergite about 2.2*x* as long as preceding one

DISCUSSION

Bomyiabius gen.nov. comes in between *Pediobomyia* Girault (Girault, 1913) and *Pediobius* Walker (Walker, 1846). It resembles *Pediobomyia* in having small narrow mouth; lower face narrowly comes in median part and in similar sculpture on scutellum. It differs from *Pediobomyia* in having parallel plicae on propodeum (In *Pediobomyia* plicae converging towards nucha); a pit on either side of each plica basally (not so in *Pediobomyia*); propodeal median strip not granulate (granulate in *Pediobomyia*) and last tergite 2.2*x* as long as preceding tergite (not so in *Pediobomyia*, much shorter).

Bomyiabius resembles *Pediobius* in having similar type of reticulations on dorsum of mesoscutum and scutellum and in parallel plicae on propodeum. However it differs from *Pediobius* in having narrow lower face, smaller mouth (not so in *Pediobius*), parallel plicae of propodeum not widely spaced as those of *Pediobius*. *Bomyiabius frontus* resembles the African *Pediobius acraconae* Kerrich (Kerrich, 1973) in the general shape of gaster but differs from it in generic characters.

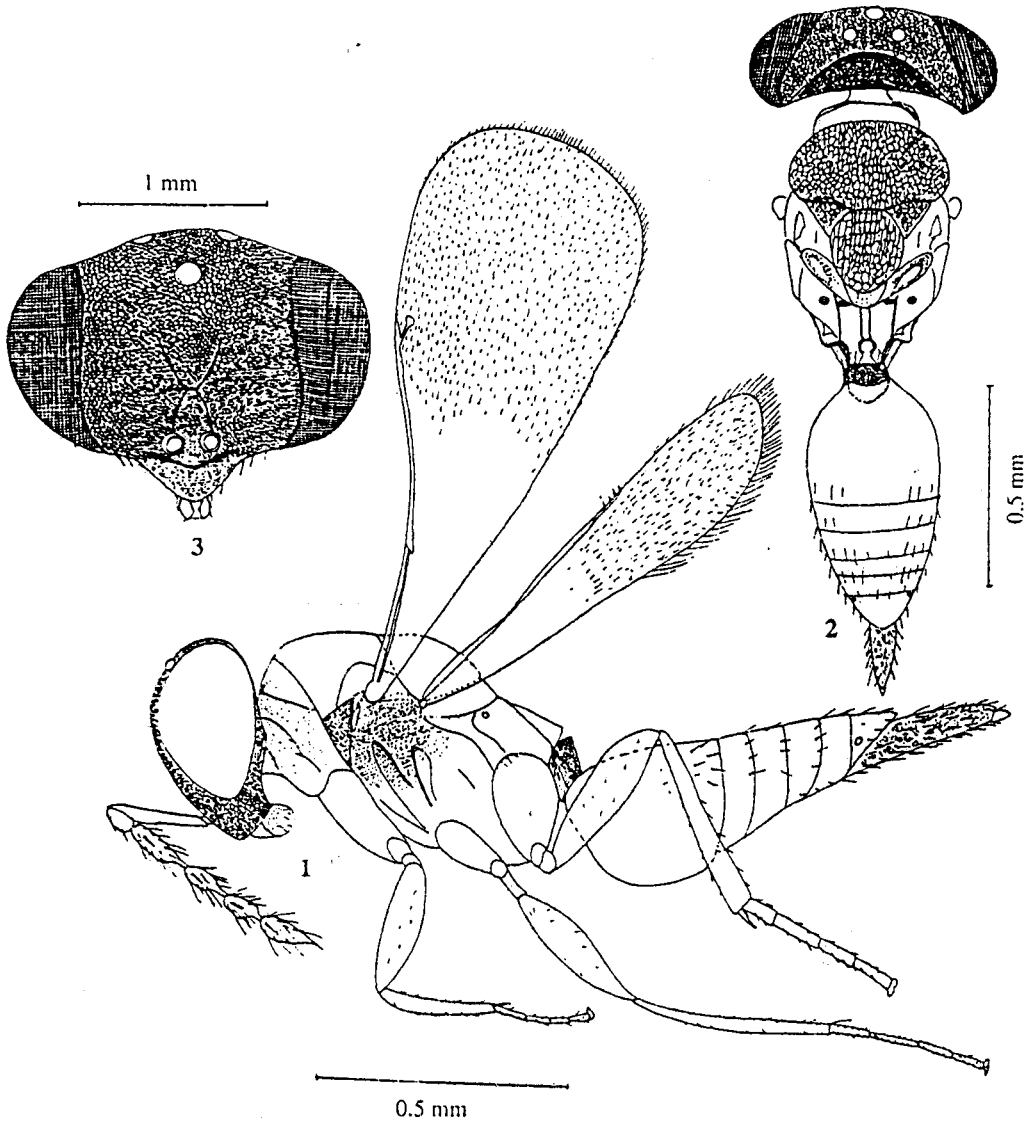
Etymology

The genus name is taken from *Pediobomyia* and *Pediobius*. Masculine gender. The species name after the narrow lower frons.

***Bomyiabius frontus* Narendran sp. nov. (Figs. 1–3)**

Female

Length 1.67–1.69 mm. Black; eye dark brown; ocelli pale reflecting yellow; antenna dark brown with scape pale yellowish brown; median and submedian areas of propodeum and T_1 with metallic greenish blue reflections. Legs pale brownish yellow with fore and mid coxae, fore and hind femur (except bases and apices) darker; basal one third of hind coxa dark with metallic green reflections; pretarsi dark brown; pubescence pale brown except the darker hairs on last tergite.



FIGURES 1–3: *Bomyiabius frontus* Narendran sp.nov. Female 1. Body Profile 2. Body dorsal view 3. Head front view

Head

(Figs 2 and 3) Width 1.29x its median length; frons and vertex distinctly reticulate; head width in dorsal view 5.04x its median length (excluding postocciput). POL slightly more than OOL (8 : 7); antennal toruli at level of lower ocular margin; antennal formula 11032. Relative length: width of antennal segments: scape = 22:4; pedicel = 7:4: F1 =16:5: F2 =11:5, F3 =10:5, clava =15:5 with a spicule at apex.

Mesosoma

Pronotum smooth; mesoscutum distinctly and closely reticulate; axilla not well advanced anteriorly, scutellum longitudinally reticulate on two- third area from basal margin, remaining part without in a definite deviation; metanotum with a cup shaped median part. Propodeum (Fig. 2) with submedian area shiny, posterior part with a short nucha. Forewing length 2.47*x* its maximum width, pilose on distal half, proximal half bare; relative length of costal cell 32, MV 51, PMV 5 and STV 5.

Metasoma

(Figs 2 and 3) Petiole 1.75*x* as long as its width in dorsal view; T_1 length 0.3*x* length of gaster in dorsal view; 0.33*x* length of gaster in side view, gaster a little longer than head plus mesosoma; T_4 to apex more pubescent than T_1 to T_3.

Male

Unknown

Host

Unknown

Material examined

Holotype. Female, India: Kerala, Thiruvananthapuram, Mannamkonam, 16.iv.2003. T. C. Narendran and Party. Reg. No. MoEF 2776 (DZUC). Paratypes: 1 Female, India: Kerala, Ernakulam, Kalady, 12.i.2004. T. C Narendran & party Reg. No. MoEF 2050 (DZUC); 2. Female, India: Kerla, Idukki, Vandiperiyar, Pasumala 8.i.2004. T. C Narendran and party. Reg. No. MoEF 1957 (DZUC).

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Walker, F. (1846) Characters of some undescribed species of Chalcidites (continued). *Annels. and Magazine of Natural History* 17: 177–185.

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NEW DESCRIPTION ZOOS' PRINT JOURNAL 19(12): 1704-1705

A NEW SPECIES AND A NEW RECORD OF THE GENUS *MACROGLENES* WESTWOOD (HYMENOPTERA: PTEROMALIDAE) FROM INDIA

T.C. Narendran [1], P.M. Sureshan [2], P. Girish Kumar [3] and S. Santhosh [3]

[1,3] Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Malappuram District, Kerala 673635, India
[2] Zoological Survey of India, Western Regional Station, Pune, Maharashtra 411044, India
Email: [1] drtcnarendran@yahoo.com

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A NEW SPECIES AND A NEW RECORD OF THE GENUS *MACROGLENES* WESTWOOD (HYMENOPTERA: PTEROMALIDAE) FROM INDIA

T.C. Narendran [1], P.M. Sureshan [2], P. Girish Kumar [3] and S. Santhosh [3]

[1,3] Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Malappuram District, Kerala 673635, India
[2] Zoological Survey of India, Western Regional Station, Pune, Maharashtra 411044, India
Email: [1] drtcnarendran@yahoo.com

ABSTRACT

The genus Macroglenes *Westwood is reported for the first time from India with the description of a new species from Kerala. Its distinguishing characters from other species are also discussed.*

KEYWORDS

Hymenoptera, Kerala, Macroglenes sivani *Narendran and Sureshan, sp. nov., new species, new record, Pteromalidae, India.*

ABBREVIATIONS

F1-F5 - Funicular segments 1 to 5; OOL - Ocellocular distance; POL - Postocellar distance; SMV - Submarginal vein; MV - Marginal vein; PMV - Postmarginal vein; STV - Stigmal vein; DZUC - Department of Zoology, University of Calicut; ZSIC - Western Ghats Regional Station of Zoological Survey of India, Kozhikode

The genus *Macroglenes* was described by Westwood (1832) from Europe. Graham (1969) dealt with the species of North Western Europe under the generic name *Pirene* Haliday. Later, Boucek (1988) redefined the genus giving its junior synonyms including *Pirene* Haliday. According to Boucek (1988) the members of the genus *Macroglenes* are distributed in Europe (11 species), East Asia (2 species), North America (2 species) and Australia (at least 12 undescribed species). In this paper we report the presence of this genus for the first time in India based on specimens collected from the Kerala state, which proved to be an undescribed species. The same is described below.

The types of the new species described here are deposited in the Narendran Collection of the Systematic Entomology Laboratory of DZUC, but eventually will be transferred to ZSIC.

Macroglenes sivani Narendran and Sureshan, sp. nov.

(Figs.1 - 4)

Material examined

Holotype: Female, 19.ii.2003, Kottiyur forests (75°55'E & 11°52'N) Kannur, Kerala, coll. T.C. Narendran and party, DZUC.
Paratype: 1Male, 8.i.2004, Vandiperiyar (77°05'E & 09°32'N) Idukki, Kerala, coll. T.C. Narendran and party, DZUC.

Distribution

India: Kottiyur forests (Kannur) and Vandiperiyar High ranges (Idukki) of Kerala. The specimens were collected by sweep net method.

Etymology

Arbitrary combination of letters.

Diagnostic characters

Female: Length 1.36mm. Black, shiny; eyes brownish-red with margins yellowish-brown; ocelli pale reflecting yellow. Antenna, forelegs and mid legs brown with tarsi paler; hind leg blackish-brown with knees, apex of tibia and tarsi paler. Gaster blackish-brown with hypopygium and ovipositor sheath brown. Wings hyaline with veins fuscous, pilosity brown. Pubescence on body dirty white.

Head: Width in anterior view 1.21x its length; width in dorsal view 3.2x its median length. Edge of occiput just behind the ocelli rather sharp. Eye length 1.43x its width in side view, sparsely pilose. POL 1.7x OOL. Malar space more than 0.35x eye length. Antenna with scape shorter than an eye, 4.7x as long as broad; pedicellus 1.67x as long as broad, a little shorter than combined length of 3 anelli+F1+F2 (15:16.1); F1 transverse, anelliform; F2 1.5x as wide as its length; F3 a little longer than F1; 1.33x as broad as long; clava subequal in length to combined length of anelli+F1+F2, 2.6x as long as its width; flagellum clothed with rather short hairs.

Mesosoma: Not depressed, arched dorsally. Pronotum reticulate, sparsely pilose; mesoscutum and scutellum with delicate, faint though distinct reticulations. Notauli complete; mesoscutum with three pairs of setae; mesoscutum 2.48x as broad as long; scutellum 1.3x as long as its width; frontal groove distinct but weak; six setae present, two pairs on scutellum, and one on each axilla; dorsellum semicircular and smooth. Propodeum slightly slanting, gently declining, smooth without a median carina; spiracle circular close to metanotum, callus with one bristle on posterior part and one on anterior part on each side. Legs with a well developed and regular pectin on hind tibia, extending over whole length of hind tibia except its proximal quarters. Forewing length 2.59x its maximum width; lower surface of costal cell with two or three short hairs, upper surface with four setae at distal part; basal cell asetose; speculum open below, extending below marginal vein, with a row of 4-5 setae below MV on lower surface if any, maximum length of marginal fringe 0.18x maximum width of disc. Relative length of costal cell and veins: Costal cell - 46; MV - 32; PMV - 6; STV - 9; a break present between parastigma and MV.

Gaster: In dorsal view, length 1.8x length of mesosoma, collapsed laterally; hypopygium very long, its tip situated beyond mid length of gaster (Fig. 3); ovipositor length subequal to length

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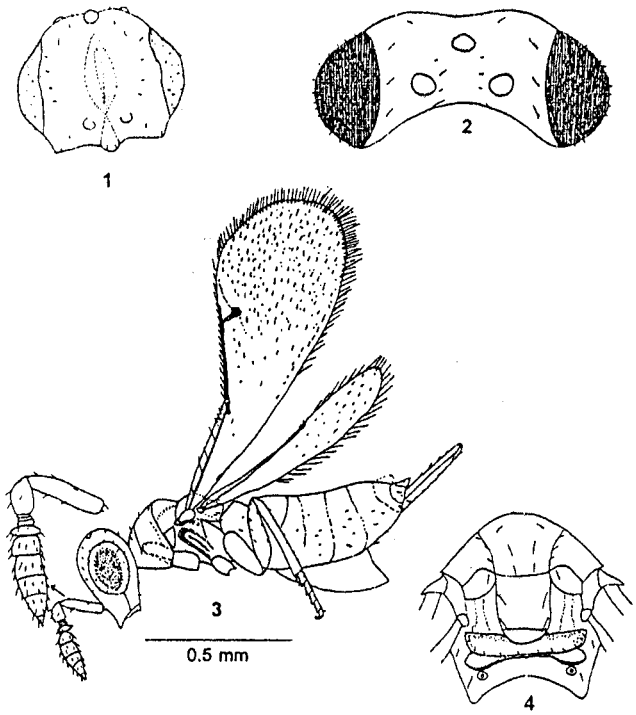

Figures 1-4. **Macroglenes sivani** ***Narendran and Sureshan, sp. nov. (Female).***
1 - Head in anterior view; 2 - Head in dorsal view; 3 - Body profile; 4 - Part of mesosoma in dorsal view.

of hind tibia.

Male: Similar to female in all features except for a short gaster

Host
Unknown.

Discussion

This species differs from *Macroglenes graminae* Haliday i the key to species of north Western Europe by Graham (1969 but differs from it in having: (1) Exerted part of ovipositc sheaths equal or subequal to length of hind tibia (i *Macroglenes graminae* exerted part of ovipositor slightly mo than one-third length of hind tibia); (2) F5 without distin sensillae (in *Macroglenes graminae* F5 with distinct sensillae (3) Length of clava subequal to combined length of anelli+F1+F (in *Macroglenes graminae* distinctly longer than combine length of anelli+F1+F2) and in several other features.

It does not come closer to any of the Australian speci described by Girault (1925a, 1925b) under the generic nan *Phocion* Girault which according to Boucek is a synonym *Macroglenes*.

Current status of habitat

The specimens were collected from Kottiyur and Vandiperiy forest areas (outer periphery). These areas are not four disturbed, by human interference or by any other agent.

Acknowledgement

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ZOOS' PRINT JOURNAL 20(3): 1805-1806

A NEW SPECIES OF *TORYMUS* DALMAN (HYMENOPTERA: TORYMIDAE) FROM WEST MALAYSIA

T.C. Narendran [1] and P. Girish Kumar

Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala, 673635, India
Email: [1] drtcnarendran@yahoo.com

ABSTRACT

A new species of Torymus, Torymus kovaci, *phytophagous on the clumps of* Gigantochloa scortechinii *Gamble in West Malaysia is described.*

KEYWORDS

Hymenoptera, West Malaysia, Torymidae, Torymus kovaci *sp. nov., new species.*

ABBREVIATIONS

DZUC - Department of Zoology University of Calicut; F1-F7 - Funicular segments 1 to 7; MV - Marginal vein; OOL - Ocellocular distance; PMV - Postmarginal vein; POL - Postocellar distance; SMV - Submarginal vein; STV - Stigmal vein; ZSIC - Zoological Survey of India, Western Ghats Regional Station, Kozhikode.

The genus *Torymus* was erected by Dalman in 1820 based on the type species *Ichneumon bedeguaris* Linnaeus. Graham and Gijswijt (1998) revised the European species of *Torymus* and synonymised *Diomorus* Walker with *Torymus*. In the Oriental Region, *Torymus* is represented by 11 species, namely, *T. cupreus* (Spinola) (= *Diomorus cupreus* (Spinola)), *T. indicus* (Ahmad) (= *Diomorus orientalis* Masi), *T. calcaratus* (Nees) (= *Diomorus calcaratus* (Nees)), *T. ailomorphi* (Kamijo) (= *Diomorus ailomorphi* Kamijo), *T. orissaensis* (Mani), *T. chaubattiensis* Bhatnagar, *T. neepalensis* Narendran, *T. sharmai* Sureshan & Narendran, *T. beneficus* Yasumatsu & Kamijo, *T. sinensis* Kamijo and *T. varians* Walker (Narendran, 1994; Grissell, 1995; Graham & Gijswijt, 1998; Sureshan & Narendran, 2002; Noyes, 2004). Here one new species is described from West Malaysia.

Torymus kovaci sp. nov.

(Figs. 1-6)

Material examined

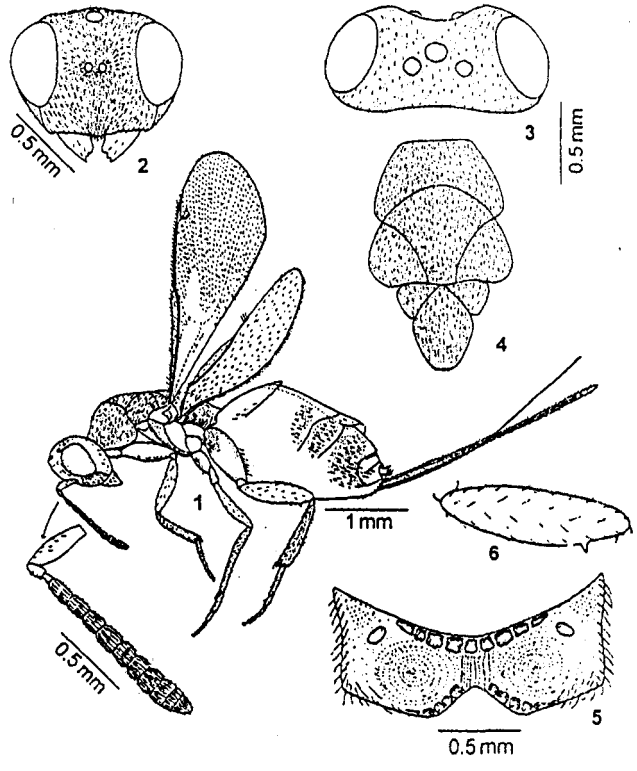
Holotype: Female, 11.viii.1994, Ulu Gombak, West Malaysia, Coll. D. Kovac.

Paratypes: 2 Females, 7.iv.1995, Gombak Field Studies Centre, West Malaysia; 2 Females, 8.iv.1995, Ulu Gombak, West Malaysia. All specimens are collected by D. Kovac.

All type specimens are deposited in TCN Collections in the Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC) for the time being but eventually will be transferred to the Western Ghats Regional Station, Zoological Survey of India, Kozhikode (ZSIC).

Etymology

Named in honour of Dr. D. Kovac (Germany) who collected the specimens.



Figures 1-6. **Torymus kovaci *sp. nov. (female)***
1 - Body profile (lateral view); 2 - Head (front view); 3 - Head (dorsal view); 4 - Pronotum, mesoscutum and scutellum; 5 - Propodeum; 6 - Hind femur

Diagnostic features

Female: Length 4.86mm (excluding ovipositor sheath); ovipositor sheath 3.5mm. Head and dorsum of mesosoma brown with metallic green reflections; scape, pedicel and anellus yellowish-brown, funicular segments black; clava dark brown; eye reddish-grey; ocelli yellowish-brown; mandible reddish-brown; mesopleuron, epimeron and metapleuron dark brown; mesepisternum brown with metallic-green reflections; basal part of hind coxa dorsally having brownish patch up to middle; all femora yellowish-brown; apical tarsal segment pale brownish; all tibia pale yellow; all tarsi yellowish-white; claws dark brown; first gastral tergum brown, remaining portion upto middle of gaster pale yellowish-white, beyond middle dark brown with metallic green reflections; wings hyaline; venation dark brown; dorsal valve of ovipositor sheath dark brown, ventral valve pale brown, ovipositor brownish-red with pinkish reflections.

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Head: Width (Fig. 2) 1.33x its median length up to lower clypeal margin (excluding mandibles); head (Fig. 3) width in dorsal view 2.53x its median length; eyes bare; POL 1.23x OOL; vertex, frons and face granuloso-striate (Fig. 2); clypeus smooth; malar space 0.32x length of eye; malar sulcus distinct (Fig. 2); mandibles tridentate; head with dense pubescence. Antennal formula 11173 (Fig. 1); relative measurements of length: breadth of antennal segments: scape 24.5 : 7.5; pedicel - 7:4; anellus 4:3; F_1 - 10:5; F_2 - 9:6; F_3 - 8.6:6.5; F_4 - 9:7.5; F_5 - 7:6.75; F_6 - 7:8; F_7 - 7:9; clava - 16:9; scape reaching median ocellus.

Mesosoma: Pronotum, mesoscutum and scutellum with dense pubescence except at lateral part of pronotum; median width 2.79x its median length (Fig. 4); pronotum with distinct anterior dorsal carina, area anterior to dorsal pronotal carina smooth, pronotum with transverse striations. Mesoscutum median length 2.17x pronotal median length; maximal width of mesoscutum 1.41x its median length (Fig. 4); mesoscutum with midlobe transversely striated, lateral lobe granuloso-striate; notauli deep. Scutellum length 1.43x its width (Fig. 4); axilla and scutellum with transverse striations; hind margin of scutellum carinate separated by a narrow groove; frenal area almost smooth. Propodeum shiny with faint striations (Fig. 5), median carina absent, spiracle oval shaped, lateral margin with a few long hairs extending towards posterior margin. Metapleuron, mesepimeron and epimeron smooth without hairs except at posterior margin of metapleuron near to hind coxa; mesepisternum with faint transverse striations, medially with a row of long hairs (Fig. 1). Hind coxa stout, length 2.6x width, almost shiny; dorsal area of coxae near to trochanter having few long hairs; hind femur slender with distinct subapical tooth (Fig. 6). Forewing (Fig. 1) length 2.91x its maximum width; length of costal cell 1.85x length of MV, MV 3.05x PMV, PMV 1.8x STV; SMV with a row of dorsal setae; speculum bare; cubital line of setae extending to cubital cell.

Gaster: (Fig. 1) sessile; 1.34x longer than mesosoma; exserted part of ovipositor distinctly shorter than combined length of mesosoma and gaster; ovipositor sheath 1.38x length of gaster; pilosity on ovipositor sheath moderately long.

Male: Unknown.

Remarks

The specimens are phytophagous on the culms of Bamboo plant *Gigantochloa scortechinii* Gamble (Family: Poaceae).

This new species closely resembles *T. indicus* (Ahmad) in having (1) length of exserted part of ovipositor distinctly less than length of thorax and gaster; (2) frenum smooth and shiny and (3) propodeum without a median carina or fovea. However this species differs from *T. indicus* in having (1) length of ovipositor sheath 3.5mm (in *T. indicus*, length of ovipositor sheath 2.1mm); (2) hind femur yellowish-brown (in *T. indicus*, hind femur metallic green with more violet and bluish tinge; its apex brown); (3) hind tibia pale yellow (in *T. indicus*, hind tibia proximal half yellow; distal half blackish-brown); (4) POL 1.23x OOL (in *T. indicus*, POL 2x OOL); (5) scape reaching front ocellus, about 2.5x as long as F_1 (in *T. indicus*, scape not reaching front ocellus, about 2x as long as F_1; (6) forewing with MV 2.88x PMV; STV 0.55x PMV (in *T. indicus*, forewing with MV 1.55x PMV; STV 0.38x PMV).

T. kovaci sp. nov. is also similar to *T. calcaratus* (Nees) in having (1) ovipositor length more than 2.5x length of hind tibia; (2) malar space more than 0.3x length of eye and (3) external surface of hind coxa largely smooth. However, *T. kovaci* sp. nov. differs from *T. calcaratus* (Nees) in the following features: (1) propodeum between spiracles shiny with faint circular striations on two sides, some weak longitudinal striations in the middle area and some large pits on anterior and posterior margin of propodeum (in *T. calcaratus*, propodeum between spiracles areolate rugose); (2) pronotum about 2.79x as wide as long (in *T. calcaratus*, pronotum about 2.33x as wide as long); (3) exserted part of ovipositor distinctly shorter than length of body (in *T. calcaratus*, exserted part of ovipositor distinctly longer than length of body); (4) dorsal area of coxae near to trochanter having few long hairs (in *T. calcaratus*, hind coxa dorsally bare).

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AN INTERESTING NEW SPECIES OF *NESOLYNX* ASHMEAD (HYMENOPTERA : EULOPHIDAE) FROM BORNEO

T. C. Narendran, P. Girish Kumar, S. Santhosh, M. Sheeba, M. C. Vyjayandi* and Lambert Kishore+

Systematic Entomology Laboratory, Department of Zoology, University of Calicut - 673 635, Kerala, India.

*Department of Zoology, Providence Women's College, Calicut - 673 009, Kerala, India.

+Department of Zoology, Malabar Christian College, Calicut - 673 001, Kerala, India.

ABSTRACT

An interesting new species *viz.*, *Nesolynx sigmophorae* is described from Borneo and its affinities are discussed. It differs from all known species in having vertex like that of the genus *Sigmophora* sixth tergite subvertical and declined to anterior ventral side and fifth tergite with raised micropunctate.

Keywords: *Hymenoptera, Eulophidae, Nesolynx, New species, Borneo.*

INTRODUCTION

The genus *Nesolynx* was established by Ashmead (1905) based on the type species *Nesolynx flavipes* Ashmead from Philippines. The genus is widely distributed in tropical and subtropical countries, with warmer parts of temperature zones of Europe, Africa and Asia to New Guinea and Australia (Boucek, 1976,1988). Seven species are already known from Oriental Region (Noyes, 2004). They are *N. cinctiventris* (Girault), *N. flavipes* Ashmead, *N. javanica* (Ferriere), *N. nigricoxis* (Ferriere), *N. phaeosoma* (Waterston), *N. thymus* (Girault) and *N. zygaenarum* (Ferriere). In this paper a unique species new to science is described and this new species may be raised to a new genus when more specimens are available for studies.

MATERIALS AND METHODS

The card - mounted specimens were studied under Leica MZ6 Stereo zoom Microscope (Leica, Switzerland) and the drawings were made using the drawing tube of the Leica microscope. The drawings were enlarged to appropriate size using the KB enlarger of model B2M.

F_1 to F_3 = funicular segments 1 to 3; MV = marginal vein; OOL = ocellocular distance; PMV = postmarginal vein; POL = postocellar distance; SMV = submarginal vein; STV = stigmal vein; UCDC = Bohart Museum, University of California, USA.

RESULTS AND DISCUSSION

Nesolynx sigmophorae **Narendran sp. nov (Figs. 1-4):**

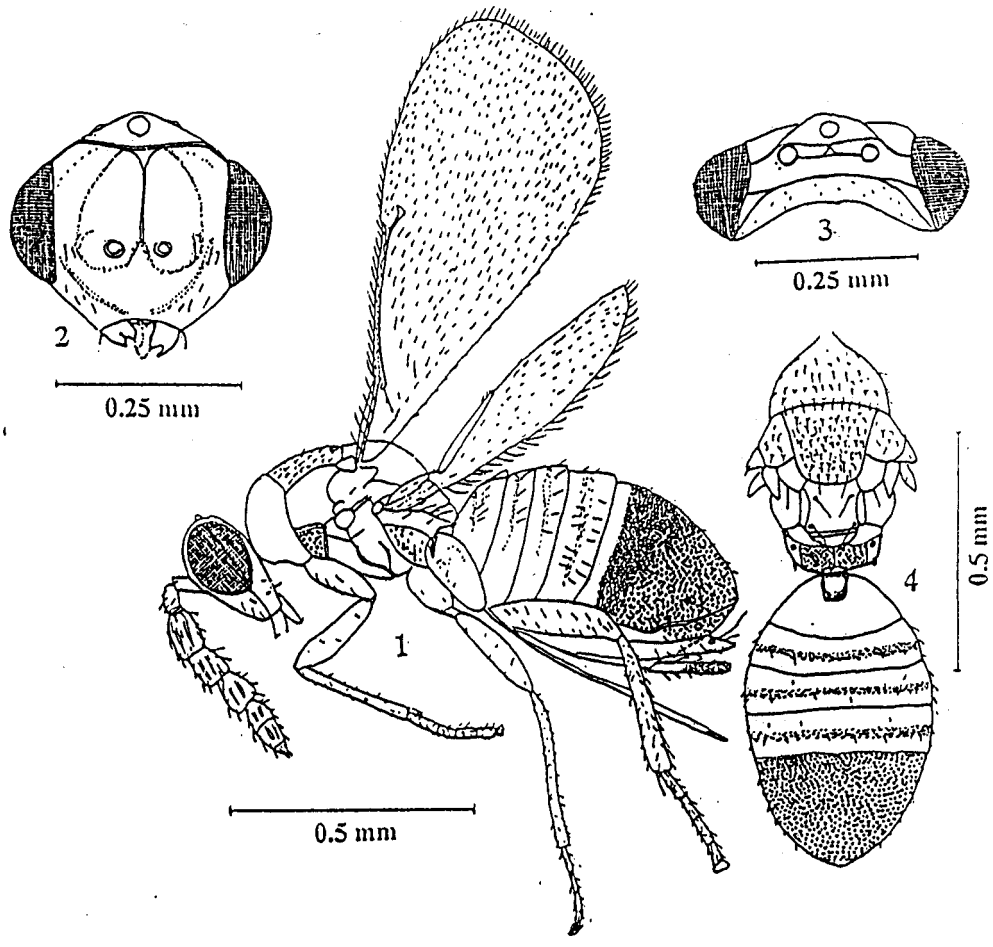
Holotype: Length 1.15 mm. Brownish yellow; eye and ocellus reflecting pale yelow; antenna brown with scape, pedicel and anelli pale brownish yellow; all legs and mesopleura pale yellow; forns, vertex, pronotum, mesoscutum and gaster yellowish brown; wings hyaline with veins pale brownish yellow, pubescence pale brown.

Head: Not collapsing; width in anterior view 1.24x its length (excluding mandibles), width in dorsal view 3x its median length; frons rugose; vertex with a transverse carinae between median and hind ocelli, another transverse carina connect hind ocelli; occipital margin carinate; clypeus minutely bilobed, upper margin not delimited; scrobe broad, with a median paler line expanded near front ocellus, lower frons with paler streaks converging mesad from parascrobal space; frons and genae pubescent; POL 3x OOL; malar sulcus distinct, without a basal fovea below eye; height of eye in profile 2.5x length of malar space; mandible bidentate, inner margin of inner right tooth broad and minutely serrate. Antennal formula 11233. Relative length: width of antennal segments: space = 8.2:2.3; pedicel = 7:3; F_1 = 10:7; F_2 = 9.7; F_3 = 9:7; Clava = 15:6.

Mesosoma: Pronotum shorter and a little narrower than mesoscutum; pronotum and mesoscutum abundantly pilose and a pair of longer setae near posterior margin of mesoscutum; hairs placed on tubercles (Fig. 4); scutellum length subequal to its width, mostly smooth. Propodeum distinctly reticulate, with a median weak carina and lateral plicae; with a small pointed tooth like process on either side of posterior corner of propodeum; spiracle round, rim exposed, near to anterior margin, distance from anterior margin to spiracle less than diameter of spiracle. Forewing (Fig. 1) length 2.2x its maximum width; pubescence moderately dense; SMV with 5 dorsal setae; relative lengths: SMV = 17; MV = 36; PMV =2; STV = 6; speculum closed behind by cubital line of setae. Hind coxa with a basal fovea on dorsobasal side; hind femur setose on outer disc.

Metasoma: Petiole very short, hidden, hardly visible; gaster length 1.45x length of mesosoma; first to fourth tergites reticulate in middle; fifth tergite with characteristic, distinct raised closed pits (not reticulations); sixth tergite subvertical and slightly declined to anterior side (Fig. 1); epipygium with one seta longer than others on either side; ovipositor sheath exerted.

Male: Unknown.



Figs.1-4. *Nesolynx sigmophorae* Narendran sp. nov. Female. 1. Body profile; 2. Head front view; 3. Head dorsal view; 4. Mesosoma and metasoma in dorsal view.

Host: Unknown.

Etymology: Named after the genus *Sigmophora* because of its similarity of vertex with that genus.

Material examined: Holotype: Female: BORNEO: Sarawak, SW. Gunung Buda, 64 kms. Limbang. 4°13'N 114°56'E. 16-21. xi. 1996. Coll. S. L. Heydon and S. Fung (UCDC).

This new species differs from all other known species in the following unique characters : 1) vertex with strong transverse carinae behind front ocellus and between hind ocelli (Fig. 3); 2) sixth tergite subvertical and declining anteriorly (Fig. 1);3) fifth tergite not reticulate but with distinct raised micropits.

These characters may deserve higher weight deserving generic status and may eventually be considered so when more specimens are available. Hence for the time being it is placed in *Nesolynx*. The vertex clearly resembles *Sigmophora* but most other features like the mesoscutum, frons, clypeus etc, are of *Nesolynx*.

ACKNOWLEDGEMENT

We are grateful to Dr. Steven L. Heydon of University of California, Davis, USA for kindly sending several specimens of Eulophidae for our studies. We also record our gratitude to the Authorities of University of Calicut for providing the necessary facilities.

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Taxonomic study of three new species of *Ropalidia* Guerin (Hymenoptera : Vespidae) from Kerala, India

Lambert Kishore*, T. C. Narendran and P. Girish Kumar

Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala - 673 635.
* Department of Zoology, Malabar Christian College, Calicut, Kerala - 673 001, Kerala, India.

ABSTRACT

Three new species of *Ropalidia viz.*, *Ropalidia* (*Anthreneida*) *sridharani* Lambert and Narendran sp. nov., *Ropalidia* (Icariella) anupama Lambert and Narendran sp. nov. and *Ropalidia* (*Icarielia*) *travancorica* Lambert and Narendran sp. nov. are described and illustrated. Comparison with related species are also provided.

Keywords: *Vespidae, Ropalidia, New species, Kerala, India.*

INTRODUCTION

The genus *Ropalidia* was raised by Guerin (1831) with type species *Ropalidia maculiventris*. Later Saussure (1853-58) and Bingham (1897) contributed to the study of the Indian species under different names.

The genus *Ropalidia* Guerin (1831) is widely distributed throughout the warmer parts of Old World. So far 34 species have been described from Indian subcontinent. In this paper we describe three new species from Kerala, India. These three new species do not fit to the key of Das and Gupta (1989) or to the descriptions of any species so far known from the world.

Holotypes are deposited at Department of Zoology, University of Calicut (DZCU) but eventually will be transferred to Western Ghats Regional Station, Zoological Survey of India, Kozhikode (ZSIK).

MATERIALS AND METHODS

All the species were collected by using sweeping net specially made for the purpose. The dried specimens were mounted on rectangular cards. The mounted specimens were held on No. 3 Asta insect pins of size 38mm x 0.5mm. Taxonomic studies were done by using M3Z wild stereozoom (Switzerland) and Leitz-Wetzlar (Germany) microscopes. The

figures were drawn using the drawing tube of M3Z and enlarged using KB enlarger of model B2M.

Abbreviations used: DZUC = Department of Zoology, University of Calicut; ZSIK = Western Ghats Regional Station, Zoological Survey of India, Kozhikode (ZSIK).

RESULTS AND DISCUSSION

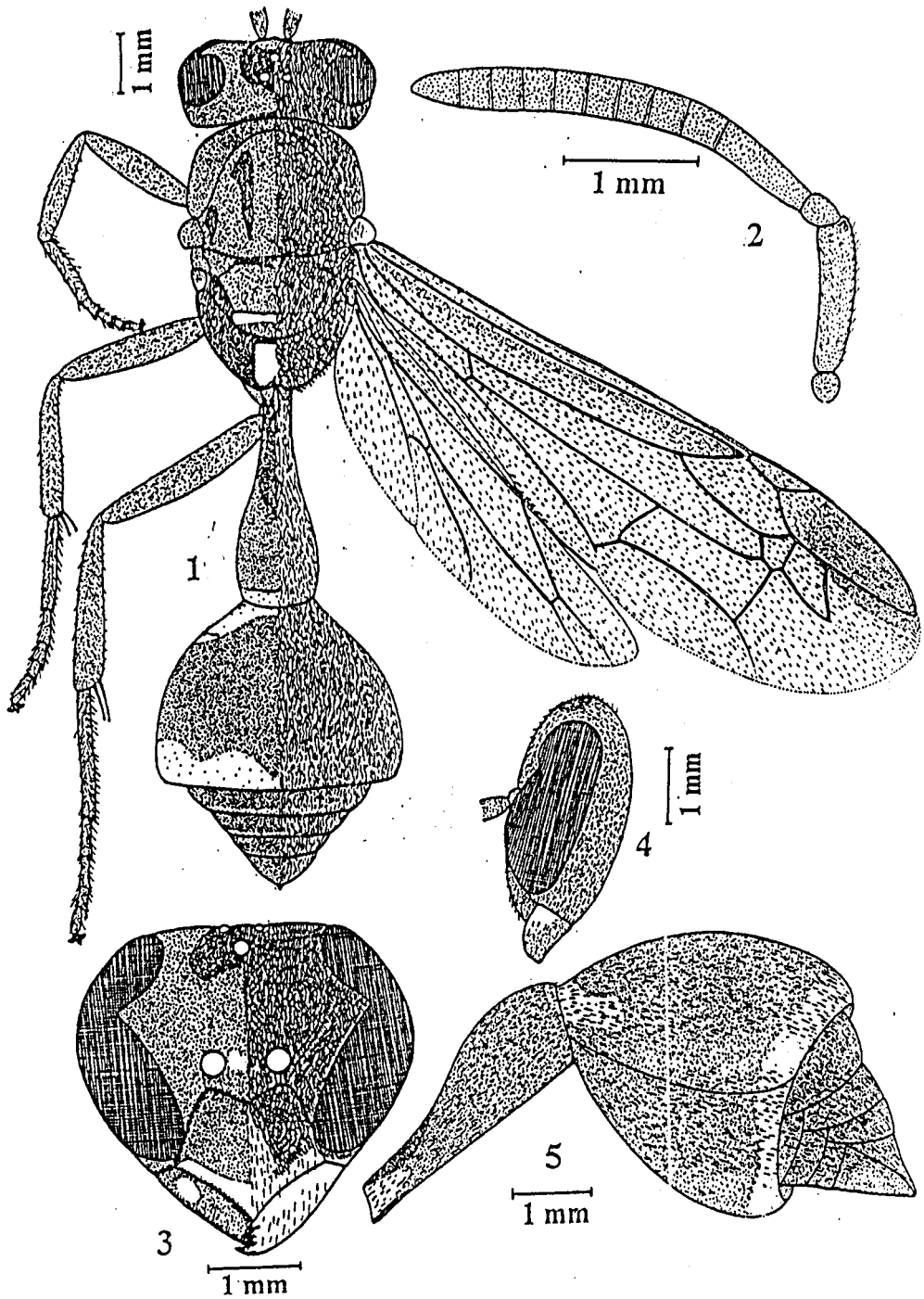
1. *Ropalidia (Anthreneida) sridharani* Lambert and Narendran sp. nov.:
Holotype : Female: Length 13.92 mm.

Colour: Reddish brown with yellow and black markings: Yellow markings as follows: apical margin of clypeus partially, base of mandible broadly, a small irregular spot on interantennal space, anterior margin of pronotum in middle faintly, postscutellum broadly, sides of propodeum, sides of metasomal petiole and its apical margin, base of second metasomal tergite irregularly and apical margin narrowly, front of fore coxae and mid coxae, lateral sides of the hind coxae.

Black markings as follows: faintly just above antennal sockets, joints of flagellomeres and last antennal segments, irregular spot on occiput enclosing ocelli, mesonotum entirely except two pairs of irregular brown markings, mesopleuron ventrally, metapleuron almost entirely, propodeum except yellow markings, dorsal side of metasomal petiole and metasomal tergites. Wings yellow, three fourth of radial cell blackish brown; stigma yellow; veins dark brown.

Head: Covered with short silvery pubescence; width in anterior view 1.3x as long as distance between front ocellus and lower labral margin (Fig. 3); head width in dorsal view 3.675x distance between front ocellus and posterior occipital margin, slightly broader than mesosoma (1.15x); clypeus 1.28x wider than long (Fig. 3), with long hairs on apical margin, upper margin emerginate,m apical margin pointed, with few scattered punctures; supraclypeal area, interantennal space, inner orbit, ocular sinus, vertex and temple, smoothly punctate; interocular distance 1.2x more on vertex than at clypeus; interocellar distance 0.4x as long as ocellocular and 1.6x the diamter of posterior ocellus; temple 0.55x narrower dorsally towards vertex and smaller than eye in profile (Fig. 4); antenna with scape length 1.46x length of first flagellar segment; second flagellar segment 0.37x as long as first flagellar segment (Fig. 2), 1.06x as long as wide at apex; apical antennal segment 1.3x longer than wide; all other segments subequal to each other.

Mesosoma: Stout; covered with silvery pubescence; pronotum, mesonotum, scutellum and postscutellum (except a shiny triangular mark) strongly and reticulately punctate; mesopleuron strongly punctate, ventral metapleuron smooth, dorsally striated; propodeum finely striated, posterior side with long haris.



Figs. 1-5. *Ropalidia (Anthreneida) sridharani* Lambert and Narendran sp. nov. Female: (1) Dorsal view of body (2) Antenna (3) Front view of head (4) Lateral view of head & (5) Metasoma.

Metasoma: covered with the fine silvary small hairs; smoothly and reticulately punctate; metasomal petiole 1.12x longer than hind femur (Fig. 5) and 2.5x as long as wide; second metasomal tergite 1.35x wider than long (Fig. 1), second metasomal tergite 1.15x as long as and 2.8x as wide as metasomal petiole.

Male : Unknown;
Biology: Unknown.

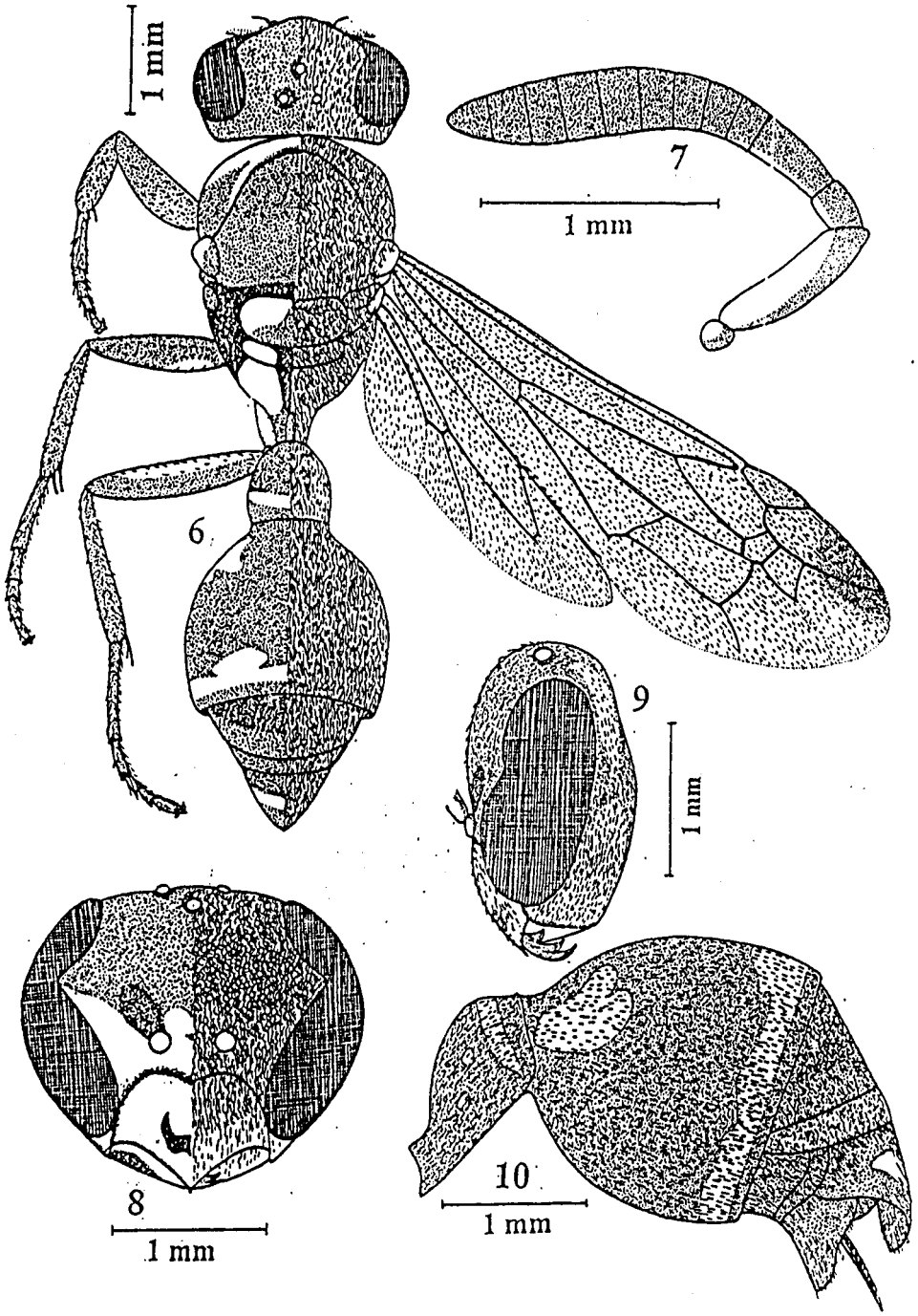
Material examined: Holotype: female. India; Kerala, Malappuram district, Nilambur (11°17' N 76°14' E), Coll. Sridharan, 15.xi .2000 (DZUC).

Etymology: Named after Mr. Sreedharan, who collected the specimn.

This new species comes closer to *Ropalidia* (*A.*) *stigma* (Smith) in the key to the subgenera and species occurring in the Indian subregion (Das and Gupta, 1989). However it differs from *Ropalidia* (*Anthreneida*) *stigma* in following characters: (1) In *Ropalidia* (*A.*) *sridharani* Lambert and Narendran sp. nov. clypeus without brownish marking and with apical part yellow band. [In *Ropalidia* (*A.*) *stigma* the clypeus with brownish marking on centre and apical partl yellow band partially]. (2) In *Ropalidia* (*A.*) *sridharani* clypeus wider than long (In *Ropalidia stigma* clypeus longer than wide). (3) In *Ropalidia* (*A.*) *sridharani* pronotum, mesoscutum, scutellum and mesopleuron behind epicnemial carina with close strong reticulate punctures. [In *Ropalidae* (*A.*) *stigma* pronotum, mesoscutum, scutellum and mesopleuron behind epicnemial carina with close superficial punctures] (4) In *Ropalidia* (*A.*) *sridharani* mesonotum black with two pairs of irregular dark brown mark. [In *Ropalidia* (*A.*) *stigma* mesonotum reddish brown without any markings]. (5) In *Ropalidia* (*A.*) *sridharani* without yellow markings on inner orbit, ocular sinus, a broad line on temple and scutellum. [In *Ropalidia* (*A.*) *stigma* with yellow markings on inner orbit, ocular sinus, a broad line on temple and scutellum]. (6) In *Ropalidia* (*A.*) *sridharni* basal margin of clypeus not black [In *Ropalidia* (*A.*) *stigma* basal margin of clypeus black]. (7) In *Ropalidia* (*A.*) *sridharani* basal margin of the second sternite yellow [In Ropalidia (A.) stigma the basal margin of second metasomal tergite and sternite with large yellow spots].

2. *Ropadilia* (*Icarielia*) *anupama* **Lambert and Narendran sp. nov.**:
Holotype: Female: Length 8 mm.

Colour: Reddish brown with yellow and black markings. Yellow markings as follows: Clypeus entirely except an irregular mark at centre, middle and apex of labrum, a line below antennal scape, all antennal flagellomeres at base, interantennal space, ocularsinus, upper and lower region of temple broadly, base of pronotum and apical margin of pronotum; metanotum almost entirely, two spots on postmentanotum, sides of propodeum broadly, a short line on



Figs. 6-10. ***Ropalidia (Icariella) anupama*** Lambert and Narendran sp. nov. Female: (6) Dorsal view of body (7) Antenna (8) Front view of head (9) Lateral view of head & (10) Metasoma.

mesopleuron, upper parts of fore coxa, mid coxa and hind coxa, dots on fore tarsal segments, mid tarsal segments and hind tarsal segments. Black markings as follows: A blackish brown spot on centre of clypeus, small line just above clypeal emargination, upper margin of clypeus, base of mandible, each ocellus separately, mesoscutum anterior end narrowly, posterior end broadly, metascutum except yellow marking on sides and centre of propodeum. Radial cell apical half dark brown; stigma yellow; veins brown.

Head: Covered with short silvery pubescence; width in anterior view 1.25x as long as distance between front ocellus and lower labral margin(Fig.8),headwidth in dorsalview 3.75x distance between front ocellus and posterior occipital margin, slightly wider than mesosoma; clypeus 1.5x wider than long (Fig. 8) with long hairs on apex, pointed, upper margin slightly emerginate, with few scattered punctures; mandible with scattered punctures; supraclypeal area, interantennal space, inner orbit, ocular sinus, vertex and temple smoothly punctate; interocular distance1.25xmore on vertex than at clypeus; interocellar distance 0.75x as long as ocellocular distance2.5xas equal as posterior ocellus; temple 5x distinctly narrower dorsally towards vertex (Fig. 9), 0.5x smaller than eye in profile; antennae 1.05x closer from each other than eye, antenna with scape length 1.94x length of first flagellar segment; second flagellar segment0.33xas long as first flagellar segment, second flagellar segment 0.6x as long as wide at apex (Fig. 7), third antennal segment2.11xas long as wide at apex, apical antennal segment as wide as long; all other segments subequal.

Mesosoma: Stout, covered with small silvery pubescence; pronotum, mesonotum and mesopleuron reticulately, smoothly and closely punctate; scutellum, postscutellum, and metapleuron with scattered punctures; interspace between punctures more than diameter of punctures; propodeum finely striated, posterior side with long hairs.

Metasoma: Covered with fine silvery small hairs; smoothly and reticulately punctate; metasomal petiole as long as hind femur, 1.7x as long as wide at swollen apical part; second metasomal tergite 1.13x wider than long (Fig. 6), second metsomal tergite 1.27x as long as, 2.76x as wide as metasomal petiole.

Male : Unknown;
Biology : Unknown.

Material examined: Holotype: Female, India: Kerala, malappuram district, Calicut University Campus (11°7′N 75°52′E), Coll. T. C. Narendran, 6.ix.2000 (DZUC). Paratype: 1 Female. India: Kerala, Malappuram district, Calicut University Campus (11°7′N 75°52′E), Coll. T. C. Narendran, 6.ix.2000 (DZUC). 1 Female. India: Kerala, Kozhikode district, Elathoor(11°20′N 75°44′E), Coll. Sridharan, 6viii.2000 (DZUC).

Etymology: The Sanskrit word 'anupama' means incomparable.

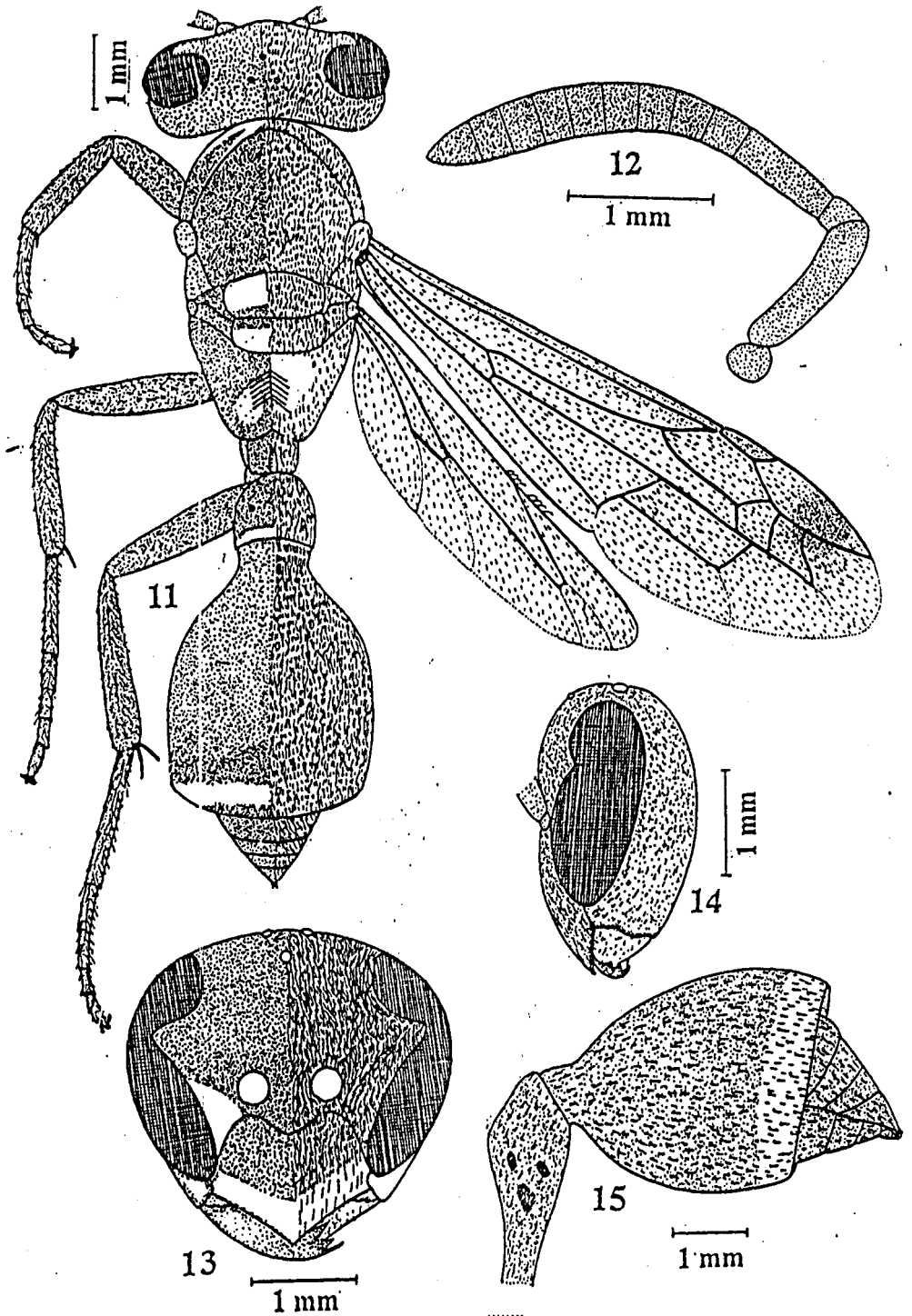
This new species comes closer to *Ropalidia* (*I.*) *malaisei* Van der Vecht and *Ropalidia* (*I.*) *scitula* Bingham in the key to the subgenera and species occurring in the Indian subregion by Das and Gupta (1989). However it differs from *Ropalidia* (*I.*) *malaisei* and *Ropalidia* (*I.*) *scitula* in many characters. It differs from *Ropalidia* (*I.*) *malaisei* in the following characters: (1) In *Ropalidia* (*I.*) *anupama* Lambert and Narendran sp. nov. propodeum completely and finely striated [In *Ropalidia* (*I.*) *malaisei* propodeum striated only at centre]. (2) *Ropalidia* (*I.*) *anupama* scutellum and postscutellum brown with yellow markings [*Ropalidia* (*I.*) *malaisei* scutellum and postscutellum black with yellow markings]. (3) In *Ropalidia anupama* metasomal petiole not 2x as long as wide at swollen apical region. (In *Ropalidia* (*I.*) *malaisei* the gastral petiole 2x as long as wide as the swollen apical part]. (4) *Ropalidia* (*I.*) *anupama* body reddish brown [*Ropalidia* (*I.*) *malaisei* body black].

Ropalidia (*I.*) *anupama* differs from *Ropalidia scitula* Binham in the following characters: (1) In *Ropalidia* (*I.*) *anupama* median groove normal and distinct (In *Ropalidia* (*I.*) *scitula* median groove wide at base and narrowed at apex. (2) In *Ropalidia* (*I.*) *anupama* scutellum and post scutellum brown with yellow markings (In *Ropalidia* (*I.*) *scitula* scutellum and postscutellum black with red markings]. (3) In *Ropalidia* (*I.*) *anupama* third antennal segment not more than 2x as long as wide at apex [In *Ropalidia* (*I.*) *scitula* third antennal segment than 2x as long as wide at apex]. (4) *Ropalidia* (*I.*) *anupama* body reddish brown (*Ropalidia scitula* body black).

3. *Ropalidia* (*Icarielia*) *travancorica* Lambert and Narendran sp. nov:
Holotype: Female: Length 11.56 mm.

Colour: Brown, with pale yellow markings. Pale yellow markings as follows: Apical margin of clypeus, two markings at lower sides of mandible, lower sides of antennal scape, in between antennal socket and eye, anterior margin of pronotum, a marking on mesopleuron just below wing, lower margin and upper margins of scutellum and postscutellum, small markings on sides of propodeum, pale fasica on second sternite and fore coxa basally. Wings hyaline; veins brown; radial cell with apical cloud; stigma brown.

Head: Covered with short silvery pubescence; width in anterior view 1.12x as long as distance between front ocellus and lower labral margin (Fig. 13), width in dorsal view 4.6x distance between front ocellus and posterior occipital margin, 1.2x wider than mesosoma; clypeus 1.45x wider than long (Fig. 13), apical margin pointed with long hairs, lower margin emarginate, with few scattered punctures; mandible with scattered punctures; suparaclypeal area, inter antennal space, inner orbit, ocular sinus, vertex and temple with fine superficial punctures; inter space between punctures smooth, in yellow area inter space larger than the diameter of the punctures; interocular distance more on vertex than at clypeus (1.18x), interocellar distance 0.42x as long as ocellocular distance and 3x diameter of posterior ocellus;



Figs. 11-15. *Ropalida (Icarielia) travancorica* Lambert and Narendran sp. nov. Female: (11) Dorsal view of body (12) Antenna (13) Front view of head (14) Lateral view of head & (15) Metasoma.

temple 0.31x distinctly narrower dorsally towards vertex (Fig. 14) and smaller than eye in profile; antenna 0.88x farther from eyes than to each other, antenna with scape length 1.52x length of first flagellar segment (Fig. 12), second flagellar segment 0.34x as long as first flagellar segment; second flagellar segment 1.12x as long as wide at apex; apical antennal segment 0.86x wider than long; all other segments subequal.

Mesosoma: Stout, covered with silvery pubescence, very long white hairs at posterior side of propodeum, pronotum, mesonotum and mesopleurum closely and reticulately punctate; scutellum and postscutellum with long hairs, porpodeum with strong transverse striation almost completely.

Metasoma: Petiole 1.35x longer than hind femur, about 2.5x as long as wide; second metasomal tergite 1.32x longer than wide, second metasomal tergite (Fig. 11) 1.32x as long as and 2.55x as wide as metasomal petiole, oblique cut at apex; metasomal petiole strongly swollen just after end of basal slit.

Male : Unknown
Biology : Unknown.

Material examined: Holotype: Female. India: Kerala, Travancore, Thiruvanathapuram District, Palayam Kotta (8°29'N 76°55''E), Coll. Thovali. 3.xii.1998 (DZUC).

Etymology: Named after the Travancore region of Kerala state from where the specimen is obtained.

This new species comes closer to *Ropalidia* (*Icarielia*) *scitula* Bingham in the key to subgenera and species occurring in the Indian subregion (Das and Gupta, 1989). However it differs from *Ropalidia* (*Icarielia*) *scitula* in the following characters: (1) In *Ropalidia* (*Icarielia*) *travancorica* Lambert and Narendran sp. nov. the second flagellar segment 0.34x as long as wide at apex [*Ropalidia* (*Icarielia*) *scitula* it is 2x as long as wide at apex]. (2) In *Ropalidia (Icarielia) travancorica* propodeum strongly striated in middle [In *Ropalidia (Icarielia) scitula* it is very weakly striated. (3) In *Ropalidia (Icarielia) travancoria* temple 0.31x as wide as eye in profile [In *Ropalidia (I.) scitula* it is 0.5x as wide as eye in profile]. (4) *Ropalidia (Icarielia) travancorica* 11.5(mm in length and body brown in colour. [*Ropalidia (Icarielia) Scitula* 7 mm in length and body black in colour].

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ALPHA TAXONOMY OF THREE NEW SPECIES OF EULOPHIDAE (HYMENOPTERA: CHALCIDOIDEA) OF INDIA

T. C. Narendran, P Girish Kumar and S. Santhosh

Systematic Entomology Lab, Department of Zoology, University of Calicut, Calicut - 673635, India.

*E-mail: drtcnarendran@yahoo.com

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ABSTRACT - Three new species of Eulophidae viz. *Quadrastichus longiclavatus* Narendran sp.nov., *Obesulus keralicus* Narendran & Girish kumar sp.nov. and *Aceratoneuromyia wayanadensis* Narendran & Santhosh sp.nov. are described and differences from the related species are given.

Keywords : Hymenoptera, Eulophidae, new species, *Quadrastichus*, *Obesulus*, *Aceratoneuromyia*

INTRODUCTION

The Eulophidae is one of the important families of Chalcidoidea as its several species are good biological control agents of several species of insect pests of agricultural importance (Narendran, 2001). The taxonomy of Eulophidae is still in its infant stage especially in Kerala where rich unexplored fauna awaits discovery. In our studies of the research project assisted by the Ministry of Environment and Forest, New Delhi on the biosystematics of Eulophidae, we came across three interesting new species, which are described below. Their distinguishing features with the related species are also provided.

MATERIALS AND METHODS

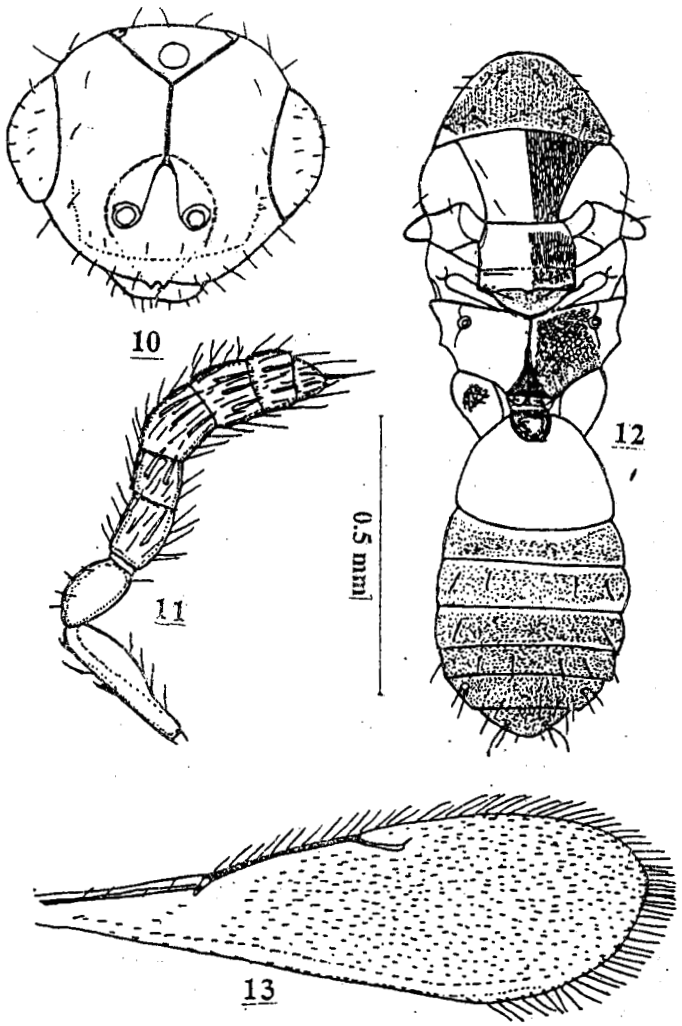
The specimens were collected using sweep net and curated as described by Narendran (2001). The specimens were card mounted and held by Asta Insect pins of size 3 made by Newy Goodman Ltd, England. The card-mounted specimens were studied under Leica M6 Stereozoom Microscope (Switzerland made) and the drawings were made using the drawing tube of the Leica microscope. The drawings were enlarged to appropriate size using the KB enlarger of model B2M.

Abbreviations used: F_1 to F_4 = Funicular segments 1 to 4; CL_1 to CL_3 = Claval segments 1 to 3; OOL = Ocellocular distance; POL = Postocellar distance; T_1 = 1st tergite; SMV = Submarginal vein; MV = Marginal vein; PMV =Post marginal vein; STV = Stigmal vein; DZUC = Department of Zoology, University of Calicut. ZSIK = Western Ghats Regional Station of Zoological Survey of India, Kozhikode.

RESULTS AND DISCUSSION

1. ***Quadrastichus longiclavatus* Narendran sp.nov.** (Figs.1-4)

Holotype: *Female*: Length 1.3mm. Pale brownish yellow; eye brick red; ocelli brownish



Figs. 9 - 12. ***Aceratoneuromyia wayanadensis*** **Narendran & Santhosh sp.nov.**

Holotype: Female, 10. Head in anterior view; 11. Antenna; 12. Body in dorsal view; 13. Forewing.

reticulate on anterior half, weakly on posterior half; hind coxa weakly reticulate on dorsal side; hind femur 3.6x as long as broad; spur of mid tibia a little longer than basitarsus; basitarsus of mid leg sub equal in length to fourth mid tarsal segment. Forewing length (excluding marginal fringe) 3.12x its maximum width; costal cell subequal in length to MV (Fig.11); a decolorized break between parastigma and base of MV present; front edge of MV with 11 long setae, longest seta distinctly shorter than STV; length of marginal fringe about 0.3x length of hind tibia; marginal cilia of hind wing 0.5x breadth of wing

Metasoma: (Fig.12) distinctly shorter than mesosoma, 1.73x as long as broad, obtuse apically; ovipositor sheath not visible;

hypopygium extending distinctly more than half of metasoma; tergites shiny with very fine delicate alutaceous sculpture except T_1; a basal fovea on T_1 present; longest cercal seta very slightly curved.

Male: Unknown

Host: Unknown

Etymology: The species is named after Wayanad where the collection locality of the type species is located.

Material examined: *Holotype*: Female. INDIA: Kerala: Wayanad District: Thonikadavu, 76°3'-5'E 11°37'-39'N, 7.ii.2003. Coll. T. C. Narendran & Party. Reg.No.MoEF 4136. Type deposited in DZUC but eventually will be transferred to ZSIK.

Discussion: This species does not fit to Graham's (1991) key to species but comes near *A. indica* (Silvestri). However this new species differs from *A. indica* in having:

1) Propodeum distinctly longer than scutellum (in *A. indica* propodeum shorter than scutellum); 2) F_3 longer than wide (in *A. indica* F_3 not longer than wide); 3) T_2 sub equal in length of T_3 (in *A. indica* T_2 longer than T_3); 4) A cross line just in front of level of anterior pair of scutellar setae (no such cross line in *A. indica*); 5) Dorsum is attached to propodeum concealing median part of metanotum (in *A. indica* dorsum is clearly separated from propodeum by metanotum as in figure 91 of LaSalle, 1994) and 6) Forewing with costal cell 21x as long as its breadth (in *A. indica* costal cell 8-9x as long as its breadth).

This new species also does not come near *A. kamijoi* described by Ikeda (1999) and *A. atherigonae* described by Ferriere (1960).

ACKNOWLEDGEMENTS

We are grateful to the Ministry of Environment and Forest, New Delhi for a financial grant for this research. We also thank Dr.E.E.Grissell of Systematic Entomology Laboratory, United States Department of Agriculture, c/o U.S. National Museum of Natural History, Washington D. C., U.S.A. for examining the specimens of *Aceratoneuromyia indica* (Silvestri) present in the Museum and providing the required information on them. We also thank the authorities of the Univ. Calicut for facilities.

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ZOOS' PRINT JOURNAL 20(7): 1915-1916

ON A NEW GENUS AND A NEW SPECIES OF *EULOPHIDAE* (HYMENOPTERA: CHALCIDOIDEA) FROM THE PADDY FIELDS OF SOUTHERN INDIA

T.C. Narendran [1,2], P. Girish Kumar [1,4], S. Santhosh [1] and P.A. Sinu [3]

[1] Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala 673635, India
[3] Ashoka Trust for Research in Ecology and Environment (ATREE), No. G 59, 5th A Main Road, Hebbal, Bangalore, Karnataka 560024, India
Email: [2] drtcnarendran@yahoo.com; [4] k_p_girish@yahoo.co.in

ABSTRACT

A new genus viz. Kiggaella *Narendran with the type species* Kiggaella oryzae *Narendran sp. nov. is described from the paddy fields of Karnataka, India. It resembles the genus* Minotetrastichus *Graham in general appearance but differs from it in having scutellum without submedian groove, forewing more than 3x as long as broad and one of the central setae much larger than any of the remaining ones.*

KEYWORDS

Hymenoptera, Chalcidoidea, Eulophidae, Kiggaella *gen nov.,* Kiggaella oryzae *sp. nov., Karnataka, India.*

ABBREVIATIONS

DZUC - Department of Zoology, University of Calicut; F1-F3 - Funicular segments 1to3; MV - Marginal vein; OOL - Ocellocular distance; PMV - Postmarginal vein; POL - Postocellar distance; SMV - Submarginal vein; STV - Stigmal vein

INTRODUCTION

Rice crop is often attacked by several insect pests in South and Southeast Asia. Many parasitoids belonging to parasitic Hymenoptera have been recorded from rice pests (Pathummal Beevi *et al.*, 2000; Konishi *et al.*, 2004). Some of these parasitoids may prove useful in future biocontrol programmes against these pests. In this paper we record and describe a genus and species of Tetrastichinae of Eulophidae, hitherto undescribed. It did not fit to any of the genera of Eulophidae dealt by Subba Rao and Hayat (1985), Boucek (1988), Graham (1991), La Salle (1994), Schauff *et al.* (1997) or any other genera listed by Noyes (2004). The type specimens are deposited in the collections of Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC)

Kiggaella Narendran gen. nov.

Type species: *Kiggaella oryzae* Narendran sp. nov.

Etymology

Named after the locality Kigga of Karnataka state, India.

Diagnostic features

Head partly collapsing; eye convergent to inner side; antennal toruli situated above lower ocular line, nearer to eye than to each other; frontal fork absent; antennal formula 11233; scape not exceeding vertex, clava without apical spine or spicule; occiput not margined; clypeus not delimited, lower clypeal margin clearly bilobed; mandibles bidentate; malar sulcus distinct; mesosomal dorsum smooth and shiny; mesoscutum with three pairs of adnotaular setae; axillae advanced anteriorly; scutellum without submedian grooves or lines with 3 pairs of setae (median pair worn out but pits distinct); scutellum a little shorter than mesoscutum; forewing length a little more than 3x as long as broad; SMV with two dorsal setae; propodeum smooth with median carina; propodeal spiracle exposed, separated from hind margin of metanotum by less than its diameter; one of the cercal setae very long and not subequal to any other cercal setae. Body metallic green with lower part of head, posterior marginal area of lateral panel of pronotum and legs (except hind coxae) pale whitish-yellow.

DISCUSSION

This new Genus comes to *Minotetrastichus* Graham in the key to species of Graham (1991) but clearly differs from it in having: (i) scutellum without submedian grooves or lines (in *Minotetrastichus* scutellum with submedian grooves); (ii) Scutellum with three pairs of setae (2 pairs only in *Minotetrastichus*); (iii) forewing clearly more than 3x as long as broad (in *Minotetrastichus* forewing never 3x as long as broad); (iv) one of the cercal setae very long, sinuate and not subequal to any of the other cercal setae (in *Minotetrastichus* cercal setae is not so lengthy)

Graham (1991) states that in some groups of *Aprostocetus* Westwood the submedian grooves on scutellum is absent but in such cases body is black and non metallic and clava with apical seta and tip of hypopygium situated at not more than 0.6x length of gaster. Though in the nature of cercal setae, lower clypeal margin and antenna, this genus comes near *Aprostocetus*, differs in the combination of characters mentioned under diagnosis of the genus given above.

Kiggaella oryzae Narendran sp. nov. (Figs. 1-6)

Material examined

Holotype: Female, 16.x.2003, Kigga (75°13'-15'E & 13°28'-30'N), Sringeri, Karnataka, coll. P.A. Sinu, MoEF 4371(DZUC).

Paratypes: 6 Females (MoEF 4374 - MoEF 4379) and 2 Males (MoEF 4372 & MoEF 4373) of same collection data of Holotype; 1 Female, 16.ii.2003, Kavinissery (75°21'-23'E, 11°50'-52'N), Kannur Dt., Kerala, coll. T.C. Narendran & party (MoEF 318) (All types are deposited in DZUC).

Etymology

Species name is after Rice (*Oryza sativa* L. (Family: Poaceae)) since the specimens were obtained from paddy field.

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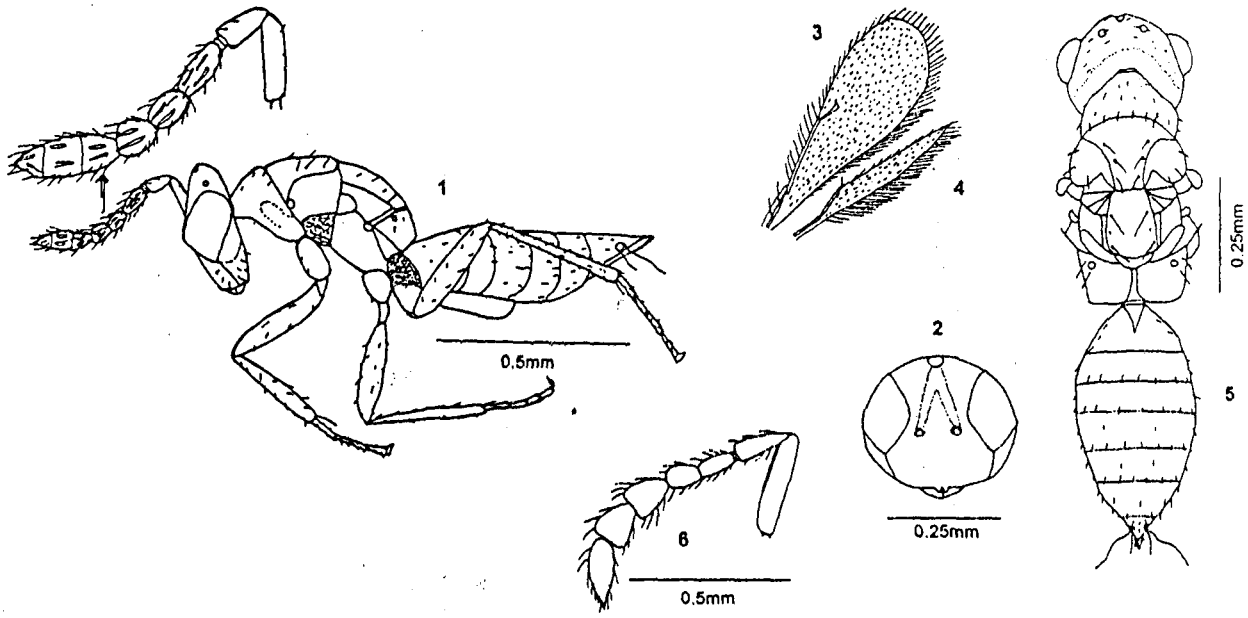

Figures 1-6. **Kiggaella oryzae** *Narendran sp. nov. (1-5 Female).*
1 - Body profile; 2 - Head front view; 3 - Fore wing; 4 - Hind wing; 5 - Body dorsal view; 6 - Male antenna

Holotype: Female. Length 1.2mm. Metallic green with slight darkish tinge; lower frons, gena and all legs pale yellow with basodorsal part of hind coxa concolourous with mesosoma; eye and ocelli dark brown; wings hyaline with veins pale yellow, pubescence pale white.

Head: Partly collapsing; width in anterior view a little wider than its length (69:64); width in dorsal view 1.42x its maximum length; eye (Fig. 2) convergent towards frons; eye height in profile 2.1x length of malar space; malar sulcus distinct, not curved, without a basal fovea below eye; occiput not margined but yellow colour separates head as upper and lower halves (Fig. 5); POL a little more than 1.6x OOL. Relative length: width of antennal segments: scape - 19:6; pedicel - 15:7; F1 - 16:7; F2 - 12:8.5; F3 - 12:10; clava - 29:9; mandible weakly bidentate.

Mesosoma: Smooth and shiny; pronotum conical, without a cross ridge or carina; mesoscutum with three pairs of adnotaular setae; axillae a little advanced anteriorly; scutellum longer than wide; dorsellum not medially divided; propodeum without plicae or costula; prepectus longer than tegula, weakly reticulate; metanotum reaching hind wing base. Fore wing with relative length of veins: SMV - 21; MV - 36; PMV - absent; STV - 11; hind wing with a basal stalk.

Metasoma: Petiole hardly visible; gaster a little longer than mesosoma, with a basal fovea on first tergite; one of the cercal setae much longer than any of the remaining ones, sinuate.

Male: Similiar to female except antennal formula 11241, funicular segments (Fig. 6) yellowish-white with side margins and apical margins pale brown; ventral side of scape with a distinct ventral plaque on anterior half.

Host: Unknown.

Biology: Unknown.

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ZOOS' PRINT JOURNAL 20(7): 1920-1923

THREE NEW SPECIES OF *ROPALIDIA* GUERIN (HYMENOPTERA: VESPIDAE) FROM SOUTHERN INDIA

Lambert Kishore [1], T.C. Narendran [2,3] and P. Girish Kumar [2,4]

[1] Department of Zoology, Malabar Christian College, Kerala 673001, India.
[2] Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala 673635, India
Email: [3] drtcnarendran@yahoo.com (corresponding author); [4] k_p_girish@yahoo.co.in

ABSTRACT

Three new species viz., *Ropalidia* (*Anthreneida*) *bangalorica* Lambert and Narendran sp. nov., *R.* (*A.*) *indica* Lambert and Narendran sp. nov. and *R.* (*A.*) *rodialipa* Lambert and Narendran sp. nov. are described in this paper from southern India. Comparison with related species are also provided. *R.* (*A.*) *bangalorica* Lambert and Narendran sp. nov. can be distinguished from other species in having second metasomal tergite not petiolate and propodeum without close fine striations. *R.* (*A.*) *indica* Lambert and Narendran sp. nov. differs from other species in having temple smaller than eye in profile, second metasomal tergite without yellow marking at base and mesosoma and metasoma reddish-brown. *R.* (*A.*) *rodialipa* Lambert and Narendran sp. nov. can be distinguished in the presence of following combination of characters: median line of median groove of propodeum not distinct, temple distinctly shorter than eye in profile, absence of yellow mark on interantennal space and metasomal petiole with apical yellow band .

KEYWORDS

Hymenoptera, Vespidae, Ropalidia, *new species, India.*

ABBREVIATIONS

DZUC - Department of Zoology, University of Calicut;
ZSIK - Western Ghats Regional Station, Zoological Survey of India, Kozhikode.

The genus *Ropalidia* was described by Guerin (1831) with type species *Ropalidia maculiventris*. Later Saussure (1853-58) and Bingham (1897) contributed to the study of the Indian species under different names. The genus *Ropalidia* Guerin (1831) is widely distributed throughout the warmer parts of the old world. So far 34 species have been described from the Indian subcontinent. In this paper we describe three new species from southern India, which do not fit in the key of Das and Gupta (1989) or the descriptions of any species so far known from the world.

Holotypes are deposited at Department of Zoology, University of Calicut (DZUC) but eventually will be transferred to Western Ghats Regional Station, Zoological Survey of India, Kozhikode (ZSIK).

***Ropalidia* (*Anthreneida*) *bangalorica* Lambert and Narendran sp. nov.**
(Figs. 1-5)

Material examined

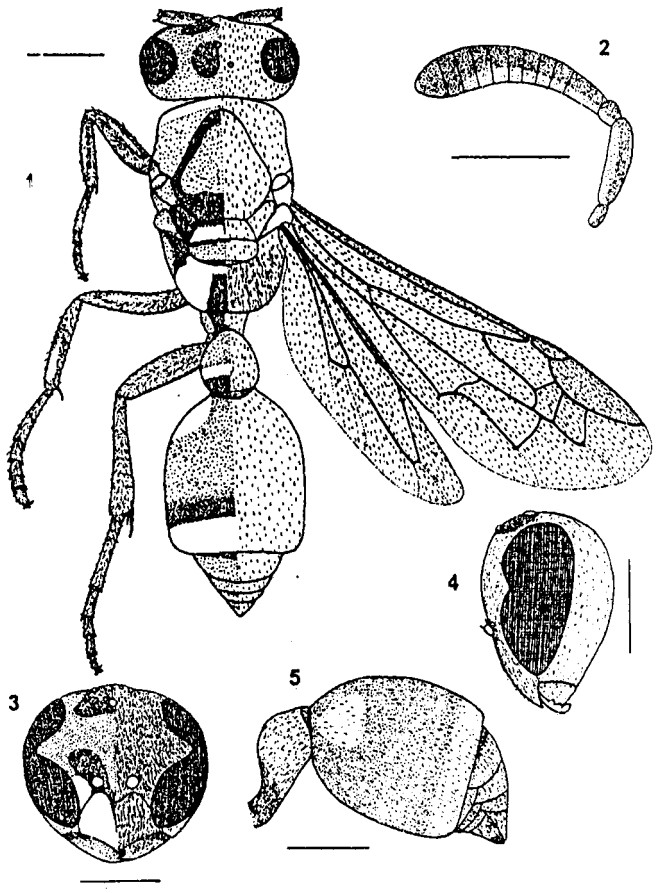
Holotype: Female, 12.viii.1996, Bangalore (12°58'N & 77°35'E), Karnataka, coll. O.K. Remadevi, LK 103 (DZUC).

Etymology

Named after the type locality.

Diagnostic features

Female: Length 8mm. Brown with yellow and black markings.



Figures. 1-5.* Ropalidia (Anthreneida) bangalorica *Lambert and Narendran sp. nov. (Female). Scale = 1mm.
1 - Body dorsal view; 2 - Antenna; 3 - Head front view; 4 - Head lateral view; 5 - Metasoma

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Yellow markings as follows: clypeus except centre, two lines on lower margin of mandible, lower sides of antennal scape and flagellomeres, a marking between toruli, a line towards ocular sinus, a line on anterior margin of pronotum, two spots on upper margin of scutellum, a pair of spots on postscutellum, two elongated marks on sides of propodeum, pale band on apical margin of metasomal petiole, a broad band on apical margin of second metasomal segment, an irregular spot on base of second metasomal segment on sides, fourth and fifth segment with pale apical band, fore coxa completely, mid coxa partially, hind coxa sides, a line on fore femur and fore tibia, a line on mid tibia and hind tibia. Black markings as follows: a line on base of mandible, middle region of clypeus, upper emargination of clypeus, a pair of line just above antennae towards ocular sinus, triangular mark enclosing ocelli, a spot on side of pronotum, inner margin of mesocutum broadly, a spot below tegula, margins of meso and metapleuron, upper margins of scutellum and postscutellum, middle of propodeum, upper sides of propodeum, base of the petiole, base of second metasomal segment. Wings hyaline; apex of radial cell and stigma brown; veins brown.

Head: (Figs. 1, 3 and 4) Covered with short silvery pubescence; width in anterior view 1.25x as long as distance between front ocellus and lower labral margin (Fig. 3), head width in dorsal view 3.06x distance between front ocellus and posterior occipital margin, wider than mesosoma (46:42); clypeus wider than long medially (27:19.5) (Fig. 3), apical area with long hairs, apical margin pointed, upper margin emarginated, moderately close shallow punctures; mandible with few scattered fine superficial punctures, long hairs; supraclypeal area, interantennal space, inner orbit of ocular sinus, vertex and temple with fine superficial punctures; inter spaces between punctures smooth; in yellow area interspace larger than diameter of puncture; interocular distance more on vertex than at clypeus (36.5:26.5); interocellar distance 0.62x ocellocular distance and 4x diameter of posterior ocellus; temple distinctly narrower dorsally towards vertex (Fig. 4) and smaller than eye in profile; antennae 0.76x farther from eyes than to each other; antenna with scape length 2.2x length of first flagellar segment; second flagellar segment 2.25x as long as first flagellar segment (Fig. 2), 0.6x as long as wide at apex; apical antennal segments 1.35x wider than long; all other segments subequal.

Mesosoma: (Fig. 1) Stout; covered with silvery pubuscence; pronotum, mesoscutum and mesopleuron behind epicnemial carina closely and reticulately punctate; sides of postscutellum and scutellum with deep punctures; epicnemial carina not distinct; ventral metapleuron with moderately close deep punctures, with a few strong oblique striations; propodeum without lateral carinae, without close fine striations; hairs on propodeum larger towards posterior.

Metasoma: (Figs. 1 and 5) Metasomal petiole shorter than hind femur, strongly swollen just after end of basal slit; second metasomal tergite slightly longer than wide (46.5:41), normal and not petiolate, obliquely cut off at apex.

Male: Unknown.

Host Insect: *Inglisia bivalvata* Gr. (Hemiptera: Coccidae).

Host Plant: *Santalum album* Linn. (Family: Santalaceae).

Biology: Unknown.

DISCUSSION

This new species comes closer to *Ropalidia* (*Anthreneida*) *fasciata* (Fabricius) in the key to the subgenera and species occurring in the Indian subregion by Das and Gupta (1989). However it differs from *R.* (*A.*) *faciata* in the following characters: (i) In *R.* (*A.*) *bangalorica* the second metasomal tergite normal and not petiolate (In *R.* (*A.*) *faciata* second metasomal tergite petiolate; (ii) In *R.* (*A.*) *bangalorica* propodeum without close fine striations (In *R.* (*A.*) *faciata* propodeum with striations); (iii) In *R.* (*A.*) *bangalorica* a broad yellow line on temple absent (In *R.* (*A.*) *faciata* a broad yellow line present); (iv) In *R.* (*A.*) *bangalorica* scutellum and postscutellum partially yellow coloured (In *R.* (*A.*) *faciata* scutellum and postscutellum entirely yellow); and (v) In *R.* (*A.*) *bangalorica* a yellow spot present on interantennal space, not exceeding frons. (In *R.* (*A.*) *faciata* a yellow mark present between the antennae and exceeding towards frons.

Ropalidia (*Anthreneida*) *indica* Lambert and Narendran sp. nov.

(Figs. 6-10)

Material examined

Holotype: Female, 26.i.1994, Kasaragod (12°30'N & 74°59'E), Kerala, India, coll. K. Gopi, LK 101 (DZUC).
Paratype: Female, 26.i.1994, same as holotype, LK 102 (DZUC).

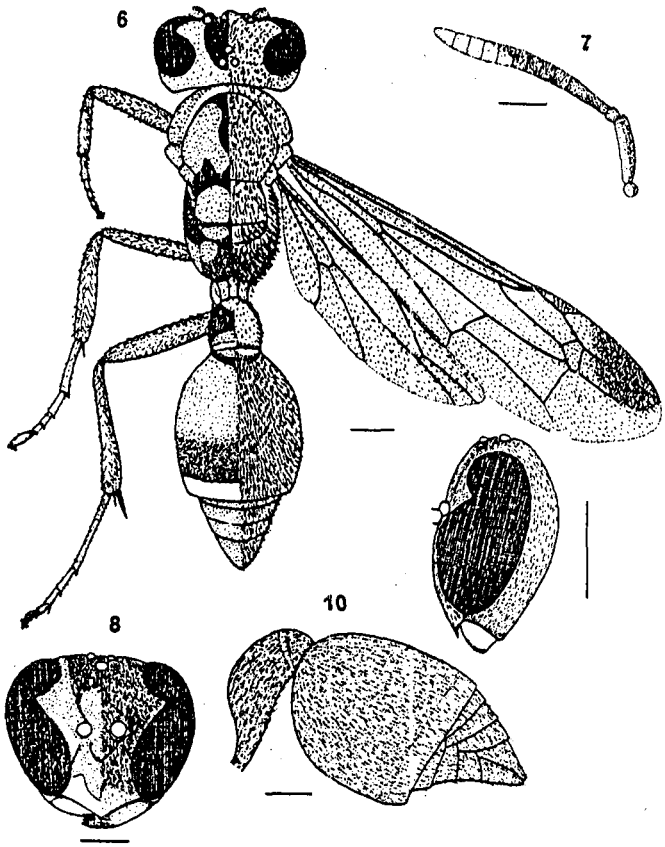
Etymology

Named after the country of origin.

Diagnostic features

Female: Length 13.08mm. Reddish-brown with yellow and black markings. Yellow markings as follows: apical margin of clypeus irregularly; base of mandible broadly; a line below antennal scape, seven to twelve segments of the antenna entirely, mid anterior margin of pronotum, apical margin of metasomal petiole and second metasomal segment faintly, all tarsi, hind tibia and upper region of fore tibia. Black markings as follows: a spot at centre of clypeus, apical margin and emargination; just above antennal socket, frons, vertex enclosing ocelli, outer margin of mesoscutum and an irregular mark from anterior side to posterior side, just below wings, mesopleuron and metapleuron, almost all mesosomal sutures, ventral sides of meso and metapleuron. Wings yellowish; three fourth of radial cells and last cubital cell blackish-brown; stigma yellow; veins dark brown.

Head (Figs. 6, 8 and 9). Covered with short silvery pubescence; width in anterior view 1.31x as long as distance between front ocellus and lower labral margin (Fig. 8), head width in dorsal view 3.9x distance between front ocellus and posterior occipital



Figures 6-10. **Ropalidia (Anthreneida) indica** *Lambert and Narendran sp. nov. (Female). Scale = 1mm. 6 - Body dorsal view; 7 - Antenna; 8 - Head front view; 9 - Head lateral view; 10 - Metasoma*

margin, wider than mesosoma (44:36); clypeus wider than long medially (26:21) (Fig. 8) with long hairs on apical margin, pointed, upper margin emarginate, with few scattered punctures; mandible with scattered punctures; supraclypeal area, interantennal space, inner orbit, ocular sinus, vertex, and temple moderately punctate; temple with long silvery hairs; interocular distance more on vertex than at clypeus (32:22.5); interocellar distance 0.23x as long as ocellocular distance and as equal as diameter of posterior ocellus; temple distinctly narrower dorsally towards vertex and smaller than eye in profile (Fig. 9); antennae farther from each other than from eyes (7:5), antenna with scape length 1.4x length of first flagellar segment; second flagellar segment 0.35x as long as first flagellar segment (Fig. 7), 0.93x as long as wide at apex; apical antennal segment 1.38x longer than wide, all other segments subequal.

Mesosoma (Fig. 6). Stout; covered with silvery pubescence; pronotum, mesonotum, scutellum, postscutellum (except a triangle mark on centre) and mesopleuron strongly punctate; ventral metapleuron smooth with few scattered punctures, side of ventral metapleuron with striations, propodeum with long hairs and lateral carinae, covered with fine silvery hairs, reticulately punctate.

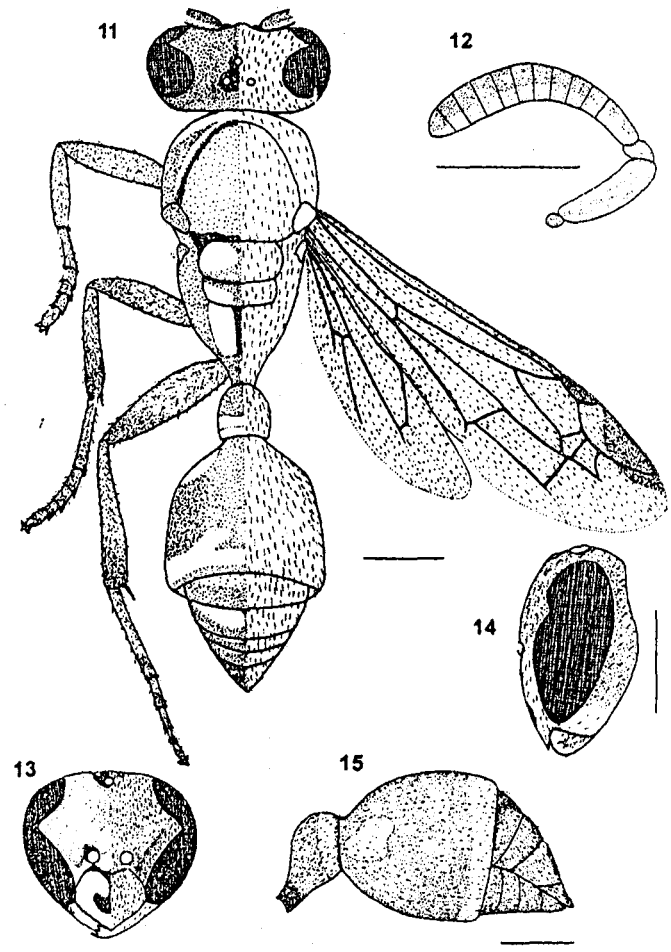
Metasoma (Figs. 6, 10). Metasomal petiole longer than hind femur, second metasomal tergite longer than wide (43.5:36).

Male: Unknown.

Biology: Unknown.

DISCUSSION

This new species comes closer to *Ropalidia (Anthreneida) ruficollaris* (Cameron) in the key to the subgenera and species occuring in the Indian sub region by Das & Gupta (1989). However, it differs from *R. (A.) ruficollaris* in the following characters: (i) In *R. (A.) indica* temple smaller than eye in profile (in *R. (A.) ruficollaris* temple as equal as eye in profile); (ii) Second metasomal tergite in *R. (A.) indica* without yellow marking at base (In *R. (A.) ruficollaris* second metasomal tergite with yellow marking at base); (iii) In *R. (A.) indica* last six (apical) flagellomeres of the antenna yellow (In *R. (A.) ruficollaris* apical six flagellomers of the antenna black above); (iv) In *R. (A.) indica* apical margin of the clypeus yellow (In *R.(A.) ruficollaris* a triangular mark present at apical margin of clypeus; and (v) In



Figures 11-15. **Ropalidia (Anthreneida) rodlalipa** *Lambert and Narendran sp. nov. (Male). Scale = 1mm. 11 - Body dorsal view; 12 - Antenna; 13 - Head front view; 14 - Head lateral view; 15 - Metasoma*

R. (*A.*) *indica* mesosoma and metasoma reddish-brown (In *R.* (*A.*) *ruficollaris* mesosoma and metasoma black).

Ropalidia* (*Anthreneida*) *rodialipa
Lambert and Narendran sp. nov.
(Figs. 11-15)

Material examined
Holotype: Male, 19.viii.2000, Elathur [11°20'N & 75°44'E], Kozhikode District, Kerala, coll. Sreedharan, LK 104 (DZUC).
Paratype: Male, 8.viii.2001, same as holotype, LK 105 (DZUC).

Etymology
Species name is an anagram of *Ropalidia*.

Diagnostic features
Male: Length 8.55mm. Reddish-brown with yellow markings. Yellow markings as follows: upper sides of mandible, clypeus entirely except an irregular spot on centre, a line below antennal scape, interantennal space, basal margin of pronotum, fore coxa and hind coxa almost entirely, lower sides of fore femur and hind femur, propodeum except centre, metasomal petiole and second metasomal tergite with narrow apical fascica, pale yellow bands on third, fourth and fifth metasomal tergite. Brown markings as follows: an irregular spot at centre of clypeus, base of mandible, margins of mesoscutellum and at centre of propodeum. Wings yellowish hyaline; apical half of radial cell dark brown; stigma yellow.

Head: (Figs. 12, 14 and 15). Covered with short silvery pubescence; width in anterior view 1.23x as long as distance between front ocellus and lower labral margin (Fig. 13); head width in dorsal view 4.1x distance between front ocellus and posterior occipital margin, wider than mesosoma (41:35); clypeus wider than long medially (25.5:21.5) (Fig. 13), with small hairs, shiny, pointed, upper margin slightly curved, with few scattered punctures; mandible with scattered punctures; supra clypeal area, interantennal space, inner orbit and ocular sinus smoothly punctate; frons and temple strongly and reticulately punctate; interocular distance more on vertex than at clypeus (32.5:25.5); interocellar distance 0.66x as long as ocellocular distance, 2x diameter of posterior ocellus; temple slightly narrower dorsally towards vertex and smaller than eye in profile (Fig. 14); antennae not farther from each other than eye (7.5:7); antennae with scape length 2.88x length of first flagellar segment; second flagellar segment 0.41x as long as first flagellar segment (Fig. 12), 0.7x as long as wide at apex; apical antennal segment 1.37x wider than long; all other segments subequal.

Mesosoma: (Fig. 11). Stout; covered with silvery pubescence; long whitish hairs at posterior side of propodeum; pronotum, mesonotum and mesopleuron closely and strongly punctate; metapleuron with strong striations; propodeum without striations; median line of median groove of propodeum not distinct; postscutellum declive, placed below level of scutellum.

Metasoma: (Figs. 11 and 15). Metasomal petiole shorter than hind femur (Fig. 11); second metasomal tergite wider than long (35.5:31); all metasomal segments reticulately punctate, covered with fine silvery hairs.

Female: Unknown.

Biology: Unknown.

Discussion
This new species comes closer to *Ropalidia* (*Anthreneida*) *jacobsoni* (Buysson) in key to the subgenera and species occuring in Indian subregion by Das and Gupta (1989). However it differs from *R. (A.) jacobsoni* in the following characters: (i) In *R.* (*A.*) *rodialipa* median line of median groove of propodeum not distinct (In *R.* (*A.*) *jacobsoni* the median line of median groove of propodeum distinct); (ii) In *R.*(*A.*) *rodialipa*, a yellow mark on interantennal space absent (In *R.* (*A.*) *jacobsoni* a yellow mark on interantennal space present); (iii) In *R.* (*A.*) *rodialipa* metasomal petiole with apical yellow band (In *R.* (*A.*) *jacobsoni* metasomal petiole without yellow band); and (iv) In *R.* (*A.*) *rodialipa* temple distinctly shorter than eye in profile (In *R.* (*A.*) *jacobsoni* temple slightly shorter than eye in profile.

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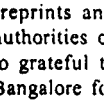

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ON A NEW GENUS AND TWO NEW SPECIES OF EULOPHIDAE (HYMENOPTERA: CHALCIDOIDEA) FROM ORIENTAL REGION

T. C. Narendran*, P. Girish Kumar and S. Santhosh

Systematic Entomology Lab., Department of Zoology, University of Calicut, Calicut- 673635, India.
*E-mail: drtcnarendran@yahoo.com

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ABSTRACT - A new genus *Neogaleopsomyia* Narendran gen. nov. with its type species *Neogaleopsomyia idukkiensis* Narendran sp.nov. is described and its distinguishing features from related genera are provided. A new species *Neogaleopsomyia budaensis* Narendran sp. nov. is described from Borneo. *Neogaleopsomyia* is similar to *Galeopsomyia* Girault in having all gastral tergites distinctly reticulate dorsally but paraspiracular carina absent, posterior margin of propodeum without transverse carina and scape exceeding the level of vertex. Unlike *Paragaleopsomyia* Girault first tergite of *Neogaleopsomyia* is reticulate dorsally and SMV with two or more dorsal setae.

Key words : Hymenoptera, Eulophidae, Tetrastichinae, *Neogaleopsomyia*, new species, Oriental, India, Borneo.

INTRODUCTION

Eulophidae represents an economically important family of Chalcidoidea. Many species are important parasitoids of agricultural pests. During the course of our survey of eulophid parasitoids from Southern Western Ghats of Peninsular India we came across a previously undescribed genus and a species. These are described here and its morphological differences with related genera are discussed. The type of *Neogaleopsomyia idukkiensis* Narendran sp. nov. is deposited in the Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC) and *Neogaleopsomyia budaensis* Narendran sp. nov. in the Bohart Museum, California, U.S.A. (UCDC).

MATERIALS AND METHODS

The specimens were collected through sweeping of vegetation using sweepnet and curated as described by Narendran (2001). The specimens were card mounted and held by Asta Insect pins of size 3 (Newey Goodman Ltd, England). Dr. Steven L. Heydon sent the specimen of *N. budaensis* to us on loan from Bohart Museum, California. The card-mounted specimens were studied under Leica M6 Stereo zoom Microscope (Leica, Switzerland) and the drawings were made using the drawing tube of the Leica microscope. The drawings were enlarged to appropriate size using the KB enlarger (model B2M).

Abbreviations used : ASL = Above Sea Level; DZUC = Department of Zoology, University of Calicut; F_1 to F_3 = Funicular

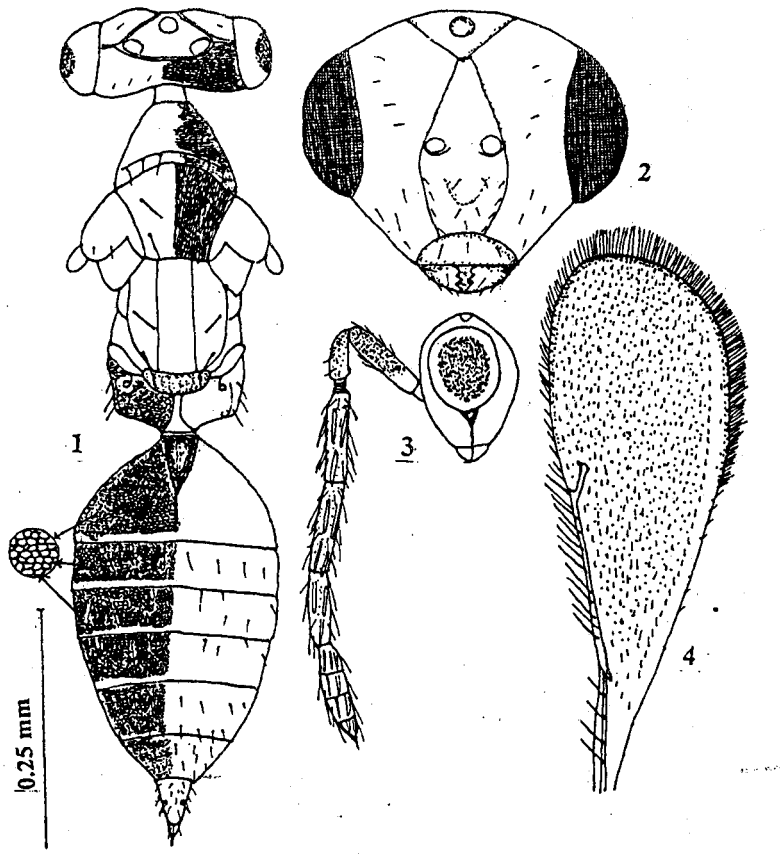

Fig. 1 - 4 : *Neogaleopsomyia idukkiensis* female: 1, body (dorsal view); 2, head (anterior view); 3, head and antenna (lateral view); 4, forewing.

height in profile 2.2x length of malar sulcus. Antennal formula 11434; scape 3.82x as long as its width. Relative length: width of antennal segments: scape = 23:6; pedicel = 9:5; F_1 = 24:6; F_2 = 25:6; F_3 = 20:6; clava = 26:7 with a specula at apex (Cl_1 = 8:6; Cl_2 = 6:7; Cl_3 = 7:9; Cl_4 = 5:5)

Mesosoma : Pronotum subtriangular with a cross line near posterior margin (visible only under certain lightings); pronotal spiracle very distinct and directed to lateral side; mesoscutum with 2 pairs of adnotular setae; surface distinctly reticulate, with a median groove; scutellum 1.2x as long as mesoscutum and 1.2x as long as distance between two sublateral lines; dorsellum width 3x its median length; propodeum with a median raised flat and smooth carina which becomes diverged posteriorly (Fig.1); surface distinctly reticulate; paraspiracular carina and transverse carina on posterior margin absent. Prepectus reticulate; upper epimeron separated from lower epimeron by a transverse groove. Forewing length (excluding marginal fringe) 3.1x its maximum width; speculum setose; SMV

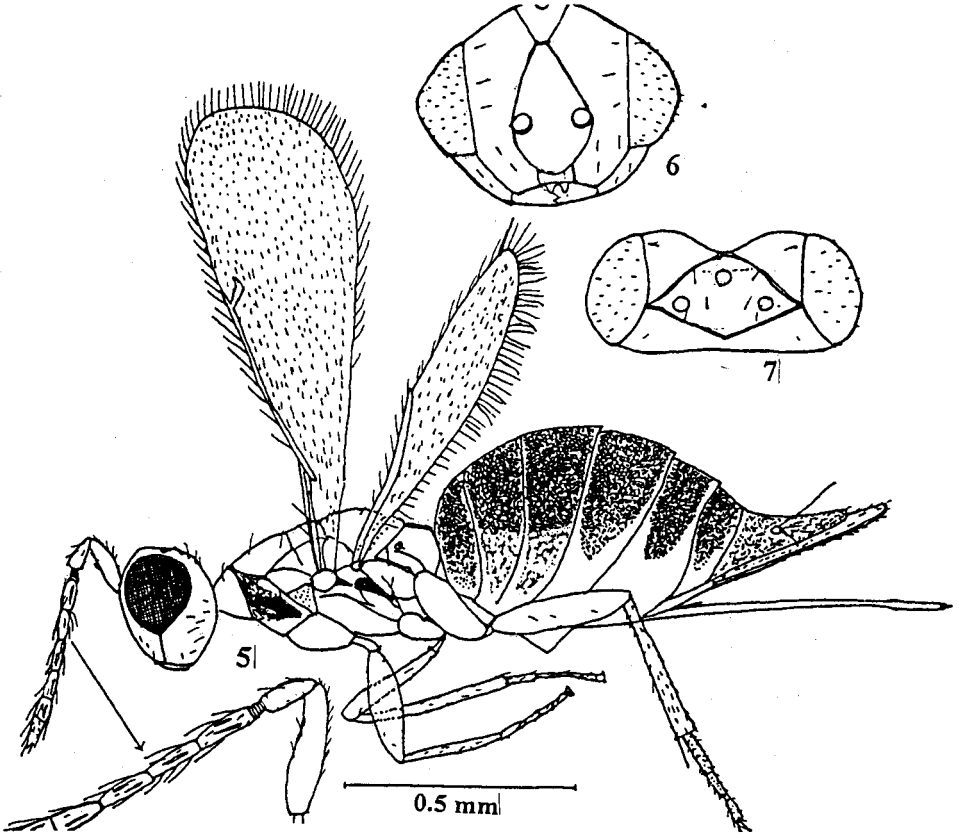

Fig. 5 - 7 : *Neogaleopsomyia budaensis* female. 5. Body profile: 6. Head in front view: 7. Head in dorsal view.

with 4 dorsal setae; MV with 13-15 long setae; marginal fringe as in figure 4. Relative lengths of forewing veins: SMV = 32; MV = 51; PMV = 1; STV = 9; costal cell = 34.

Gaster : Gaster 1.2x longer than Mesosoma (112:93); all tergites reticulate dorsally; first tergite with a triangular basal fovea, which leads to posterior side as a median groove (Fig.1).

Male : Unknown.

Host : Unknown.

Distribution : India, Southern Kerala, Idukki.

Material examined : *Holotype*: Female : INDIA: Kerala: Idukki, 76°58'E 9°51'N, elevation 1194 m ASL, 27.ii.1989 Coll.T.C.Narendran & Party. Reg. No. MoEF 3193, *Paratype*: 1 Female with same data as holotype, Reg.No.MoEF 3210. 1 Female, INDIA: Kerala, Manjeri, Naredran, T. C. & Party, 30.9.2003. Regd. No. MoEF 1522; 1 Female, INDIA : Kerala, Mantody, Narendran T. C. & Party, 22.2.1988, Regd. No. MoEF 4692; 1 Female, INDIA: Kerala, Aralam, Narendran, T. C.

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Etymology : The species is after the locality from which the type specimen was collected.

***Neogaleopsomyia budaensis* Narendran sp. nov.** (Figs.5 - 7)

Description

Holotype* : *Female: length 1.7mm. Body metallic green; eye pale yellow; ocelli reflecting yellow; antenna pale brownish yellow with scape whitish yellow; reddish brown tinge on vertex and posterior margin of gastral tergites; epipygium, sides of gaster and sternites pale brown; ovipositor sheath dark brown, ovipositor yellowish brown; legs whitish yellow with dorsobasal part of hind coxa darker; tegula pale yellowish white; pubescence on body white. Wings hyaline with veins pale whitish yellow; pubescence pale yellow.

Head : Width in dorsal view 2.25x its maximum length; width in anterior view 1.22x its length, scrobal grooves separately and narrowly join frontal fork (Fig. 6) in front of front ocellus; face with a raised ridge below toruli meeting clypeus (Fig. 6); lower clypeal margin distinctly bilobed; mandibles bidentate; ocelli surrounded by a groove with a connection to eye on either side (Fig.7); frons and vertex reticulate; eye height in profile 2.62x length of malar sulcus. Antennal formula 11434; scape 4.37x as long as its length. Relative length: width of antennal segments: scape = 35:8; pedicel = 15:5; F_1 = 16:5; F_2 =15:4; F_3 = 15:4; clava = 37: 6 with a specula at apex (Cl_1 = 13:5; Cl_2 = 9:5; Cl_3 = 7:6; Cl_4 = 8:4)

Mesosoma : Pronotum subtriangular, cross line hardly distinct; pronotal spiracle distinct and directed towards dorsal side; mesoscutum with 3 pairs of adnotular setae (posterior most pair worn-out but setal pits distinct); surface distinctly reticulate, without a median groove; scutellum 1.1x as long as mesoscutum and subequal to distance between sublateral lines; dorsellum width 3x its median length; propodeum with a median raised carina (carina not flat and smooth) diverged posteriorly (Fig.1); surface weakly reticulate; paraspiracular carina and posterior transverse carina absent. Prepectus faintly reticulate; upper epimeron not separated from lower epimeron by a transverse groove. Forewing length (excluding marginal fringe) 3.05x its maximum width; speculum setose; SMV with 2 dorsal setae; MV with 8 dorsal setae; marginal fringe as in figure 5. Relative lengths of forewing veins: SMV = 26; MV = 44; PMV = 4; STV = 7; costal cell = 29.

Gaster : Gaster 1.97x longer than

Mesosoma (114:58); all tergites reticulate dorsally; first tergite without a basal fovea.

Male : Unknown.

Host : Unknown.

Distribution : Borneo, Sarawak

Material examined : *Holotype*: Female: Borneo: Sarawak, S.Gunung Buda. 64 km. s.Limbang. 4°12'N 114°56'E, 19.xi.1996. S. L. Heydon (UCDC).

Etymology : The species is after the type locality, Buda of S.Gunung Buda, Sarawak.

Remarks : This new species resembles the type species *N. idukkiensis* in generic characters but differs from it in having; 1) Without a fovea below eye (with a fovea below eye in *N. idukkiensis*); 2) SMV with 2 dorsal setae (in *N. idukkiensis* SMV with 4 dorsal setae); 3) Pronotal spiracle directed upwards (in *N. idukkiensis* pronotal spiracle directed sideward); 4) Upper epimeron not separated from lower epimeron (in *N. idukkiensis* upper epimeron separated from lower epimeron); 5) Mesoscutum with 3 pairs of dorsal setae (in *N. idukkiensis* mesoscutum with 2 pairs of dorsal setae); 6) Lower clypeal margin distinctly bilobed (in *N. idukkiensis* lower clypeal margin entire); 7) First gastral tergite without a basal fovea (with fovea in *N. idukkiensis*); 8) Mesoscutum without a median groove or line (with a median groove in *N. idukkiensis*); 9) Gaster 1.97x as long as mesosoma (in *N. idukkiensis* gaster 1.2x as long as mesosoma).

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A TAXONOMIC STUDY OF *ANAPROSTOCETUS* GRAHAM (HYMENOPTERA: EULOPHIDAE)

T. C. NARENDRAN [1], K. FOUSI [2], P. GIRISH KUMAR [1],
S. SANTHOSH [1], & P. A. SINU [3]
1. Department of Zoology, University of Calicut, Kerala-673635, India
E-mail: drtcnarendran@yahoo.com
2. Department of Zoology, Unity Women's College, Narukara - P. O.,
Manjeri, Kerala-676122, India
3. Ashoka Trust for Research in Ecology and Environment (ATREE),
No. G 59, 5th A Main Road, Hebbal, Bangalore, Karnataka-560024, India

ABSTRACT. Three new species of *Anaprostocetus,* viz., *Anaprostocetus keralicus* Narendran & Girish Kumar, *Anaprostocetus areos* Narendran & Fousi, and *Anaprostocetus sringeriensis* Narendran & Santhosh are described. A key to the world species of *Anaprostocetus* is given.

Key words: Taxonomy, Eulophidae, New species, India, Oriental Region, *Anaprostocetus.*

Introduction

Anaprostocetus was erected by Graham (1987) with *Anaprostocetus dehraensis* Graham as the type species from Dehra Dun, India. In the same paper he transferred *Entedon acuminatus* Ratzeburg (parasitic on the Tenthredinid *Euura* spp.) to *Anaprostocetus*. The latter species is widely distributed in the Holarctic Region. LaSalle (1994) redefined the genus while studying the North American genera of Tetrastichinae. Sheng (1995) described *Anaprostocetus cenxiensis* from China. We describe here three new species from India. A key to species of *Anaprostocetus* Graham is included.

All the types are in the T.C.N. Collections of the Department of Zoology, University of Calicut (DZUC) and will be transferred to Zoological Survey of India, Kozikode (ZSIK) in due course of time.

The following abbreviations are used in the text: F_1 to F_3 = Funicular segments 1 to 3; OOL = Ocellocular distance; POL = Postocellar distance; Cl_1 = First claval segment; Cl_2 = Second claval segment; ODP = Posterior ocellar diameter; SMV = Submarginal vein; MV = Marginal vein; PMV = Postmarginal vein; STV = Stigmal vein; BMNH = The Natural History Museum, London; DZUC = Department of Zoology of University of Calicut. ZSIK = Western Ghats Regional Station of Zoological Survey of India, Kozikode.

Key to the species of *Anaprostocetus* Graham

1. Clava as long as or longer than combined length of F_1+F_2 2
-- Clava distinctly shorter than combined length of F_1+F_2 4
2. Clava as long as F_2+F_3; gaster 3.1x as long as broad; fore wing 2.45x as long as broad. China ..... ***cenxiensis*** Sheng
-- Clava distinctly longer than F_2+F_3; other characters partly or completely different 3

3. Clava nearly 3x as long as broad; Cl_1 and Cl_2 not or hardly longer than broad; pedicellus 2.2x as long as broad; malar sulcus slightly curved, 0.66x as long as length of eye; OOL about 2x OD. Holarctic ..... ***acuminatus*** (Ratzeburg)
-- Clava 3.7x as long as broad; Cl_1 and Cl_2 distinctly longer than broad; pedicellus 2.5x as long as broad; malar sulcus not curved, 0.39x as long as length of eye; OOL 1.25x OD. India ..... ***sringeriensis***, sp. nov.
4. F_1 distinctly shorter than F_2; malar space 0.33x length of eye; pronotum 0.4x as long as mesoscutum; fore wing 2.18x as long as broad; speculum closed behind by cubital line of setae; MV 3.62x STV; gaster 3.32x as long as broad, 1.33x combined length of head plus mesosoma; last tergite 1.22x as long as broad. India ..... ***areos***, sp. nov.
-- F_1 distinctly longer than or as long as F_2; other characters partly or completely different 5
5. Clava 3.5x as long as broad; claval length 0.77x combined length of F_2+F_3; pedicellus 0.54x as long as F_1; fore wing 2.51x as long as broad; gaster 3.6x as long as broad last tergite 2.8x as long as broad. India ..... ***keralicus***, sp. nov.
-- Clava 2.8x as long as broad, claval length 0.66x combined length of F_2+F_3; pedicellus 0.45x as long as F_1; fore wing 2.35x as long as broad; gaster 4.2x as long as broad; last tergite 2x as long as broad ..... ***dehraensis*** Graham

1. *Anaprostocetus keralicus* Narendran & Girish Kumar, sp. nov. (Figs. 1-5)

Female: Length 3.63 mm. Bright metallic green. Antenna brown with scape, basal part of pedicel and anelli paler; eyes dark red, ocelli black; coxae (except their paler tips) concolorous with mesosoma; fore femur testaceous with outer side of basal part darker; fore tibia and tarsi testaceous; hind femur light brown with apex paler; hind tibia and tarsi pale yellow; all pretarsi dark brown; tegula pale yellow; wings hyaline; fore wing veins yellow with its border brown.

Head: (Figs. 2&3) about as broad as mesoscutum; 2.53x as broad as its maximum length in dorsal view; POL 1.5x OOL; OOL 1.33x ODP; ocellar triangle delimited by grooved lines; each lateral ocellus connected to adjacent eye by a grooved line which expands just outside the ocellus, to form a subtriangular fovea. Head in front view 1.14x its length, sparsely clothed with extremely short pubescence; malar space 0.58x length of eye in profile; sulcus slightly curved; head moderately shiny with extremely fine reticulation. Antenna with scape distinctly shorter than eye, reaching median ocellus, 4.28x as long as broad; pedicellus plus flagellum 1.14x breadth of mesoscutum; pedicellus 2.4x as long as broad; 0.54x as long as F_1; anelli 3, distinctly visible; funicular segments decreasing in length; F_1 - 3x, F_2 - 2.85x, F_3 - 2.28x as long as broad, clava 3.5x as long as broad; Cl_1 and Cl_2 little longer than broad; sensillae of flagellum moderately dense.

Mesosoma: (Fig. 1&4) 1.5x as long as broad; pronotum 0.75x length of mesoscutum; mid lobe of mesoscutum as broad as or slightly broader than long, moderately convex, shiny with fine engraved reticulation; median sulcus distinctly strong, slightly broadening towards posterior side; mesoscutum with 9 adnotaular setae on each side; scutellum 1.28x as broad as long; submedian lines slightly nearer to sublateral lines than to each other, enclosing a space 2.62x as long as broad; scutellum 0.55x length of mesoscutum; space between submedian lines nearly equal to the length of a posterior seta of scutellum; anterior pair of setae slightly behind the middle; dorsellum 4.66x as broad as long, moderately shiny, with fine engraved reticulation. Propodeum slightly longer than dorsellum,

very narrowly emarginate before petiole; surface between paraspiracular carinae with strong, raised reticulation; median carina raised, rather thin and sharp and slightly expanding posteriorly; paraspiracular carinae strong and curved; areas between these and spiracles moderately shiny with delicate, alutaceous sculpture; spiracle round, separated by their own diameter; callus with 5-6 setae; metapleuron with sculpture slightly raising. Hind coxa 2x as long as its width, with a distinct curved dorsal carina, outer surface with slightly raised reticulation rather finer than that of propodeum; hind femur 4x as long as broad; spur of mid tibia 0.71x length of basitarsus. Fore wing length 2.51x its maximum width, hardly reaching tip of gaster; costal cell distinctly shorter than MV (23:30), about 9x as long as broad; SMV with 7 dorsal setae; MV 4.5x as long as STV, its anterior dorsal side with 32 setae; speculum open below, disc beyond it sparsely setose.

Gaster: (Fig.5) 3.68x as long as broad, 1.4x as long as head plus mesosoma, acute and acuminate posteriorly; last tergite 2.8x as long as broad; tip of hypopygium a little before half of gaster.

Male: Unknown.

Host: Unknown.

Distribution: India: Kerala.

Holotype: Female (on card, Reg. No.MoEF 3712). INDIA: Kerala, Wayanad District, Pookode Lake. (76°3'-6'E, 11°37'-39'N) 8.ii.2003, Coll. T.C.Narendran & Party (DZUC). *Paratypes*: 2 Females (on card, Reg. No. MoEF 4128,4129) INDIA: Kerala, Palaghat District, Parambikulam.(76°38'- 42'E, 10°26'-30'N) 22.xii.1985. Coll. T.C.Narendran & Party (DZUC).

Variation: In paratypes metallic colour is more bluish.

Etymology: The species epithet is after the state, Kerala, where the type locality is situated.

Comments: This new species comes near *A. dehraensis* in general appearance but can be separated by the key characters given above.

2. *Anaprostocetus areos* Narendran & Fousi, sp. nov. (Figs. 6-8)

Female: Length 1.91mm. Dark metallic bluish green. Antenna brown with scape, pedicel and anelli paler; eyes brick red; ocelli reflecting yellowish brown; Fore coxae dark brown with apex paler; fore femur brown on outer side with apex and inner side paler; all tibiae and all tarsi pale yellow; mid femur and hind femur pale yellow with basal half slightly darker; tegula pale yellow. Wings hyaline; fore wing veins pale brownish yellow.

Head: (Fig. 7) as broad as mesoscutum; 3.8x as broad as its maximum length in dorsal view; POL 1.58x OOL; OOL 1.28x ODP; ocellar triangle delimited by a distinct grooved line; each lateral ocellus connected to adjacent eye by a grooved line which expands just outside ocellus to form a subtriangular fovea. Head in front view 1.02x as wide as its length; sparsely clothed with extremely short pubescence; malar space 0.33x length of eye in profile; malar sulcus not curved; head moderately shiny with fine reticulation. Antenna with scape distinctly shorter than eye, reaching front ocellus, 4.3x as long as broad; pedicellus plus flagellum 1.33x breadth of mesoscutum; pedicellus 1.6x as long as broad; 0.61x as long as F_1; anelli 3, quite distinctly visible in certain lights; F_1 shorter

than F_2; F_1- 2.25x, F_2 – 2.5x, F_3 – 1.7x as long as broad; clava 3x as long as broad, distinctly shorter than combined length of F_2+F_3; sensillae moderately dense.

Mesosoma: (Fig.6) 1.47x as long as broad; pronotum 0.4x length of mesoscutum; mid lobe of mesoscutum as broad as long, moderately convex, shiny with fine engraved reticulation, median line distinct throughout, strong, 6-7 adnotaular setae on each side. Scutellum 1.33x as broad as its median length, 0.75x length of mesoscutum; submedian lines nearer to sublateral lines than to each other, enclosing a space 2.5x as long as broad; anterior pair of setae slightly behind the middle. Dorsellum 3.5x as broad as long, dull, reticulate; propodeum distinctly longer than dorsellum, slightly emarginate just before petiole; surface between paraspiracular carinae with strong, raised reticulations; median carina raised, not thin, slightly expanding posteriorly; paraspiracular carinae curved, not very strong; space between carina and spiracle smooth but not very shiny; spiracle round, separated from metanotum with a distance lesser than half diameter of spiracle; callus with 3 setae; metapleuron with sculpture slightly raised; hind coxa 1.88x as long as its width, with a distinct curved dorsal carina, outer surface with distinct raised reticulation, rather finer than that of propodeum; hind femur 4.5x as long as broad; spur of mid tibiae 0.75x length of basitarsus; fourth segment of mid and hind tarsi shorter than basitarsus; forewing 2.15x as long as broad; costal cell slightly shorter than MV, 13.5x as long as broad; SMV with 4 dorsal setae; MV 3.6x as long as ST, its front edge with 16-18 dorsal setae; speculum closed behind by cubital line of setae.

Gaster: (fig.8) 3.32x as long as broad; 1.33x as long as head plus mesosoma, acute and acuminate posteriorly; last tergite 1.22x as long as broad; tip of hypopygium a little after middle of gaster.

Male: Unknown.

Host: Unknown.

Distribution: India: Kerala.

Holotype: Female, (on card, Reg. No. MoEF 4130). INDIA: Kerala, Alappuzha District, Kanjikuzhi (76°21'-23'E, 9°39'-41'N), 27.ii.1989, Coll.T.C.Narendran & Party (DZUC). *Paratype*: 1 Female, (on card, Reg. No.MoEF 4131) INDIA: Kerala, Malappuram District, Calicut University Campus (75°50'- 52'E, 11° 7'– 9'N) 8.ix.1986. Coll. T.C.Narendran & Party (DZUC).

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

Comments: This new species differs from all other known species by having F_1 shorter than F_2 and in several other features as mentioned in the key above.

3. *Anaprostocetus sringeriensis* Narendran & Santhosh, sp. nov. (Figs. 9-11)

Female: Length 2.36mm. Metallic blue with violet and green reflections. Antenna brown with scape, pedicel and anelli pale yellowish brown; eyes brick red; ocelli dark brown; coxae except their tips concolorous with mesosoma; fore femur pale yellow with dark brown on outer three fourth from base and half from base on inner side; fore tibiae and tarsi pale yellow; mid femur, tibia and tarsi pale yellow with basal one third of tibia darker; hind femur pale yellow with basal half dark brown; hind tibia and tarsi pale yellow; tegula pale yellow. Wings hyaline; fore wing veins pale brownish yellow.

Head: (Fig.10) as broad as mesoscutum; 2.57x as broad as its maximum length in dorsal view; POL 1.2x OOL; OOL 1.25x ODP; ocellar triangle delimited by a distinct grooved line; each lateral ocellus connected to adjacent eye by a grooved line which expands just outside ocellus to form a subtriangular fovea. Head in front view 1.08x as wide as its length; sparsely clothed with extremely short pubescence; malar space 0.39x length of eye in profile; malar sulcus not curved; head moderately shiny with fine reticulation. Antenna with scape distinctly shorter than eye, reaching front ocellus, 3.22x as long as broad; pedicellus plus flagellum 1.5x breadth of mesoscutum; pedicellus 2.5x as long as broad, 0.75x as long as F1; anelli 3, distinctly visible; funicular segments decreasing in length, F_1 = 2.83x, F_2 = 2.25x, F_3 = 2x as long as broad; clava 3.7x as long as broad, distinctly longer than combined length of F_2+F_3; sensillae of flagellum dense.

Mesosoma: (Fig.9) 1.66x as long as broad; pronotum 0.5x length of mesoscutum; mid lobe of mesoscutum as broad as long, moderately convex, shiny with fine engraved reticulation, median line distinct throughout, strong, 7 adnotaular setae on each side. Scutellum 1.6x as broad as its median length, 0.6x length of mesoscutum; submedian lines slightly nearer to sublateral lines than to each other, enclosing a space 2.8x as long as broad; space between the submedian lines nearly equal to a posterior seta of scutellum; anterior pair of setae slightly behind the middle. Dorsellum 4x as broad as long, dull, reticulate; propodeum distinctly longer than dorsellum (3:2), distinctly emarginate just before petiole; surface between paraspiracular carinae with strong, raised reticulations; median carina raised, rather thin, sharp and slightly expanding posteriorly; paraspiracular carinae strong and curved; areas between carinae and spiracles moderately shiny with delicate, not raised, alutaceous sculpture; spiracle round, separated from metanotum with less distance than half diameter of spiracle; callus with 3 setae; metapleuron with sculpture slightly raised; hind coxa 1.63x as long as its width, with a distinct curved dorsal carina, outer surface with distinct raised reticulation, rather finer than that of propodeum; hind femur 3.6x as long as broad; spur of mid tibiae 0.71x length of basitarsus; fourth segment of mid and hind tarsi shorter than basitarsus; fore wing length (95:39) 2.43x its maximum width; costal cell (28:33) distinctly shorter than MV, 9x as long as broad; SMV with 4 dorsal setae; MV 5.3x as long as ST, its front edge with 20 dorsal setae; speculum partly closed by cubital line of setae.

Gaster: (Fig. 11) 2.82x as long as broad; 1.08x as long as head plus mesosoma, acute and acuminate posteriorly; last tergite 1.44x as long as broad; tip of hypopygium a little before half of gaster.

Male: Unknown.

Host: Unknown.

Distribution: India: Karnataka.

Holotype: Female, (on card, Reg. No.MoEF 2455). INDIA: Karnataka, Sringeri (75° 13'-15'E, 13°28'-30' N), 28.v.2003, Coll. P.A.Sinu.

Etymology: The specific name is derived from the name of the type locality, Sringeri.

Comments: This new species resembles *A. acuminatus* in having somewhat similar colour but can be separated from that species by the key given above.

Acknowledgments

We are grateful to the Ministry of Environment and Forests, New Delhi for financial assistance for this research. We thank Dr. John S. Noyes, BMNH, and London for send-

ing relevant reprints and Prof. Mohammad Hayat, Aligarh Muslim University, for reviewing this paper. We also thank the authorities of the University of Calicut for basic facilities.

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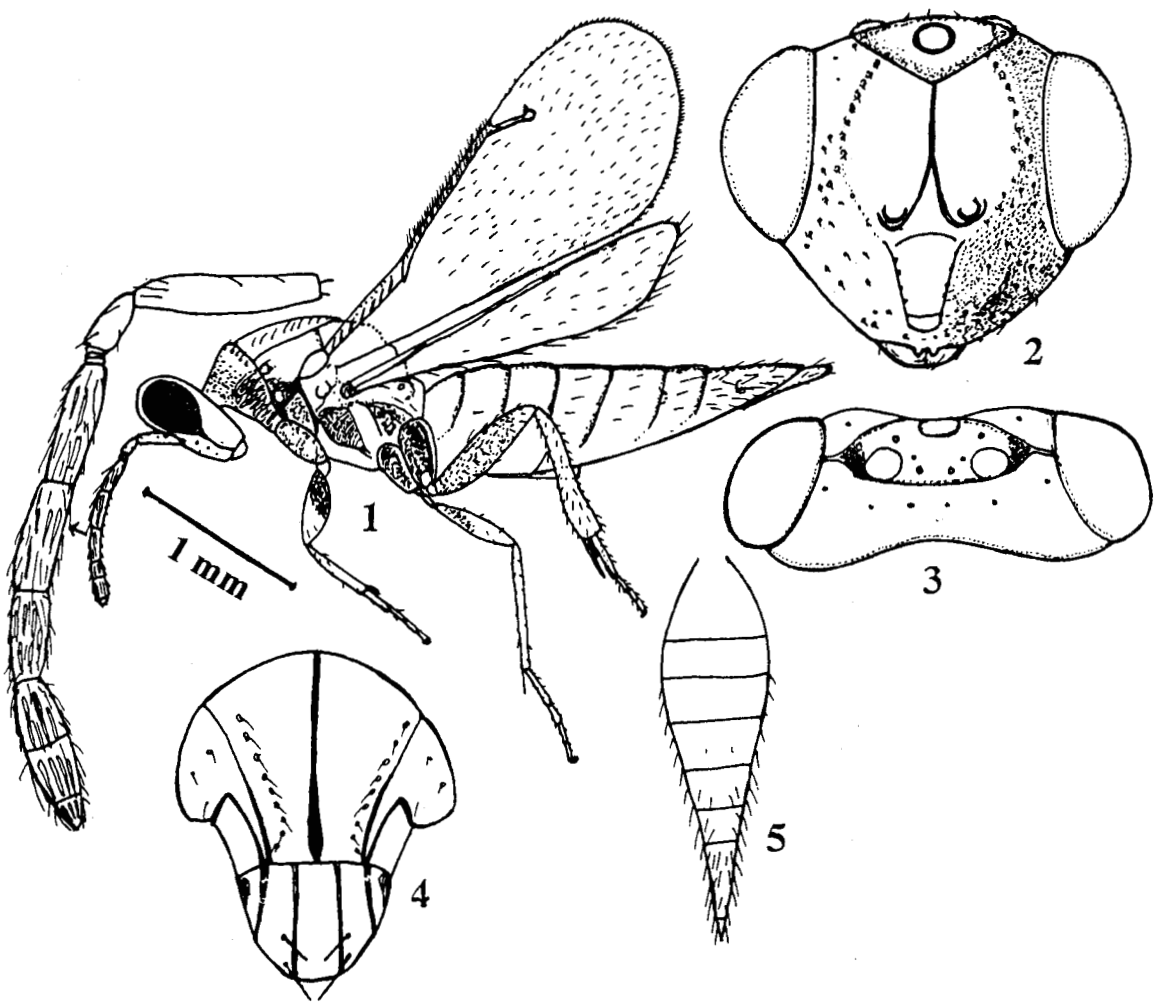
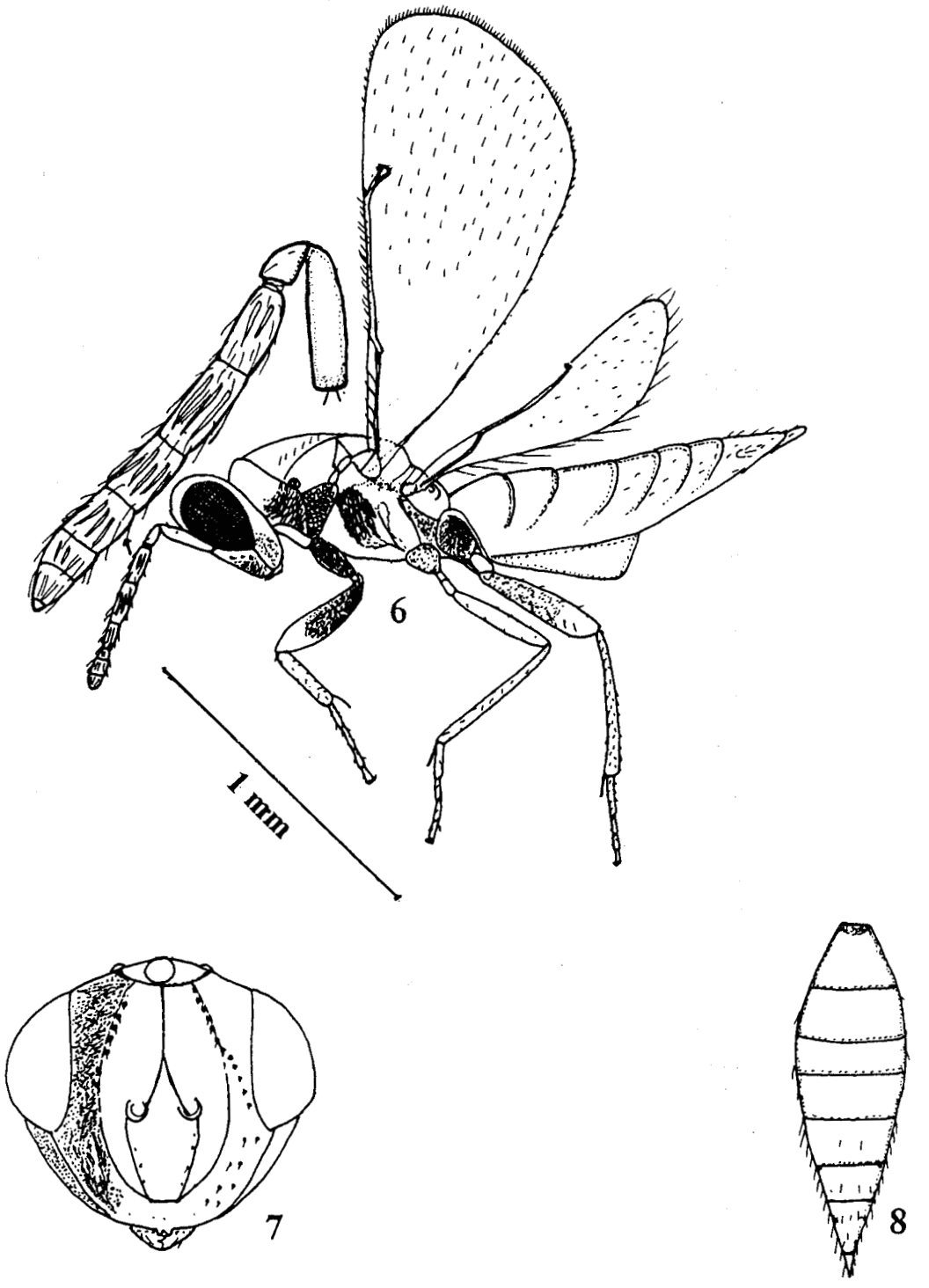
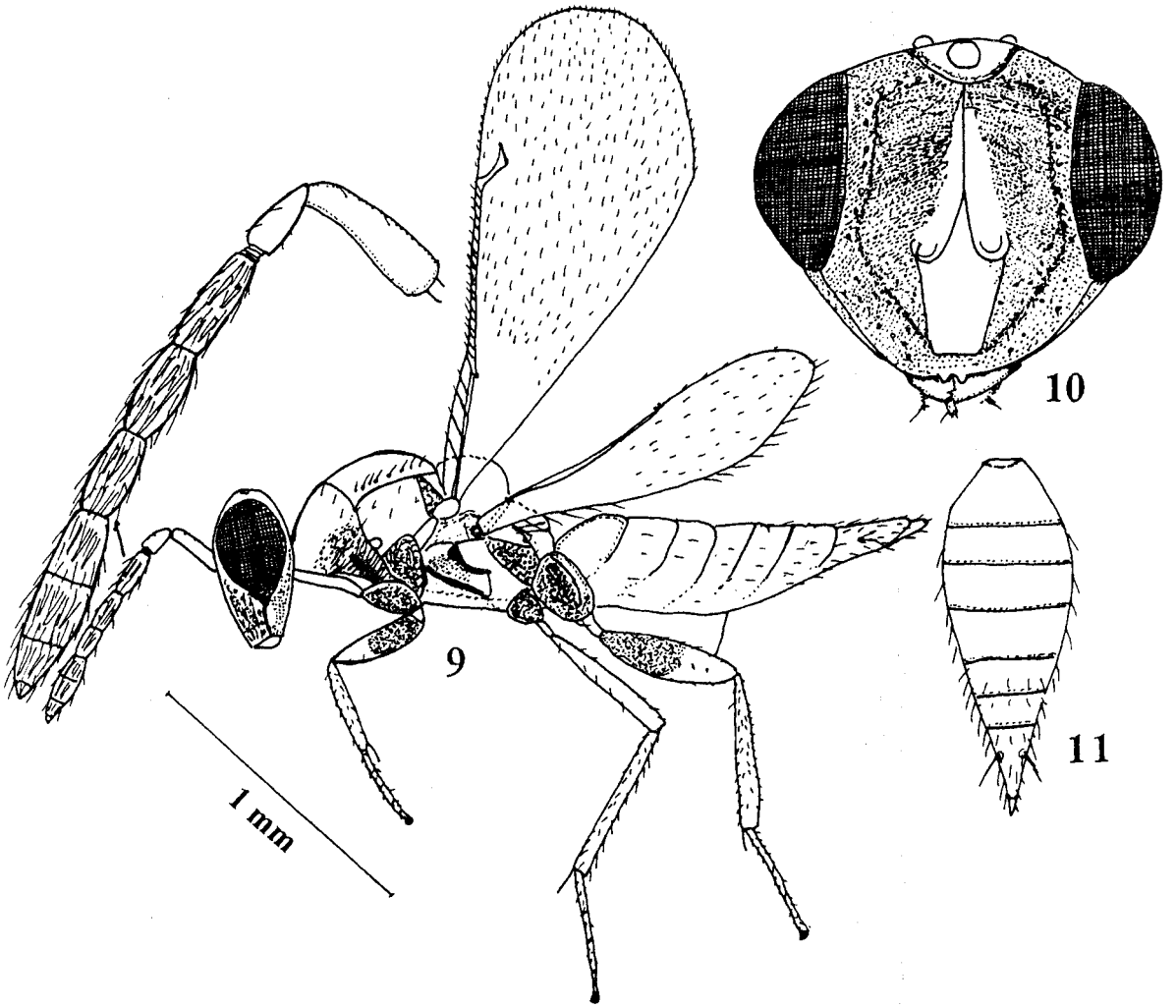


Figs. 1 - 5. *Anaprostocetus keralicus* Narendran & Girish Kumar, sp. nov., Holotype female: 1, body in profile; 2, head in anterior view; 3, head in dorsal view; 4, mesoscutum and scutellum in dorsal view; 5, gaster in dorsal view.



Figs. 6 - 8. *Anaprostocetus areos* Narendran & Fousi, sp. nov., Holotype female: 6, body in profile; 7, head in anterior view; 8, gaster in dorsal view.



Figs. 9 – 11. *Anaprostocetus sringeriensis* Narendran & Santhosh, sp. nov., Holotype female: 9, body in profile; 10, head in anterior view; 11, gaster in dorsal view.

A New Species of Eulophidae (Hymenoptera: Chalcidoidea) from Kerala, India

T.C. Narendran,[1,*] S. Santhosh[1,*] and P. Girish Kumar[1]

A new species, *Tamarixia sheebae,* is described and illustrated. *Tamarixia sheebae* differs from *T. bicolor* Mercet and *T. radiata* Waterston in having the apex of gaster tilted upwards. It emerged from leaf galls of *Terminalia arjuna* (Roxb.) Wright & Arn. (Combretaceae), a tree with many medicinal properties in addition to its timber value.
KEY WORDS: Hymenoptera; Chalcidoidea; Eulophidae; Tetrastichinae; *Tamarixia; Terminalia arjuna;* new species; India.

INTRODUCTION

The genus *Tamarixia* Mercet, 1924, belonging to the subfamily Tetrastichinae, is represented by about 40 described species including 33 species which are reported from Palaearctic, four species each from Nearctic and Neotropical, three species each from Ethiopian and Australian, and two species from Oriental regions (6). Among the two species known from Oriental regions, namely, *Tamarixia bicolor* Mercet (5) and *Tamarixia radiata* Waterston (8), the latter is widely distributed except in the Australian region. Kostjukov (3) treated *Tamarixia* as a subgenus of *Tetrastichus*, and Bouček (1), Graham (2) and LaSalle (4) treated it as a genus. Graham (2) revised European species. The new species emerged from the leaf galls on *Terminalia arjuna* (Roxb.) Wright & Arn. (Combretaceae), which is a large evergreen tree native to peninsular India and Sri Lanka. In addition to its timber value, it has many medicinal properties. The bark of *T. arjuna* is used in the treatment of polyuria, and skin, heart and blood diseases (7).

MATERIALS AND METHODS

The leaf galls were collected from the host plant and kept in an emergence cage. The specimens were mounted on cards and studied under a Leica MZ6 Stereozoom microscope. The drawings were made with a drawing tube attached to the microscope.

Abbreviations: DZUC = Department of Zoology, University of Calicut; F_1 to F_3 = funicular segments 1 to 3; MV = marginal vein; OOL = ocellocular distance; PMV = postmarginal vein; POL = postocellar distance; SMV = submarginal vein; STV = stigmal vein.

Tamarixia sheebae Narendran sp. nov.

(Figs. 1-3)

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[1]Systematic Entomology Laboratory, Dept. of Zoology, University of Calicut, Kerala, 673635 India. *Corresponding authors [e-mail: drtcnarendran@yahoo.com; nairssanthosh@rediffmail.com].

Holotype: Female: Length 1.1 mm. Black; eye pale brownish red; ocelli pale brown; antennae pale brownish yellow with scape pale yellow; pedicel dorso-basally brown mandibles dark brown; legs pale yellow with basal half of hind coxa partly black; gaster black dorsally, lateroventrally pale yellow; with a large median yellow patch spreading from base to third tergum. Wings hyaline with veins pale yellow, pubescence on body and wings pale brown.

Head (Fig. 2): Width in dorsal view 1.7× its maximum length; clypeus not delimited, its lower margin entire; occiput with fine reticulations; occipital foramen situated slightly below center of head; mandibles bidentate, inner tooth barely distinct. POL 2.18x OOL; malar sulcus distinct; eye height in profile 2.66x length of malar sulcus. Antennae inserted a little above lower ocular line, antennal formula 11233. Ratio of length to width of antennal segments: scape = 32:8; pedicel = 13:8; F_1 = 13:9; F_2 = 11:9; F_3 = 11:13; clava = 24:12.

Mesosoma: Mesoscutum, scutellum, dorsellum and propodeum lying in the same plane. Pronotum slightly wider than mesonotum in dorsal view, 0.7× as long as mesoscutum, with an exposed spiracle directed upwards on posteriolateral corner; mesoscutum finely reticulate with two pairs of adnotaular setae, one in anterior half and one in posterior half; scutellum almost as long as mesoscutum, the maximum width between sublateral lines, a little more than 1.6× its length, with 2 pairs of setae; scutellum transverse; dorsellum smooth with transverse fovea on either side; spiracle circular and rim fully exposed; submedian areas of propodeum with weaker reticulations than on scutellum. Forewing length 2.36× its maximum width. SMV with one dorsal seta; MV with 8–9 dorsal setae; PMV absent; STV 2.92× as long as MV; costal cell slightly larger than MV; disc moderately pilose; marginal fringe short (Fig. 1); speculum closed behind by cubital line of setae; basal line of setae weak; basal cell otherwise asetose.

Metasoma: Subsessile; slightly longer than mesosoma, petiole slightly distinct from dorsal view, transverse; hypopygium extending over half length of gaster; first tergite larger than any of the remaining tergites; ovipositor exerted, tilted upwards.

Male: Unknown.

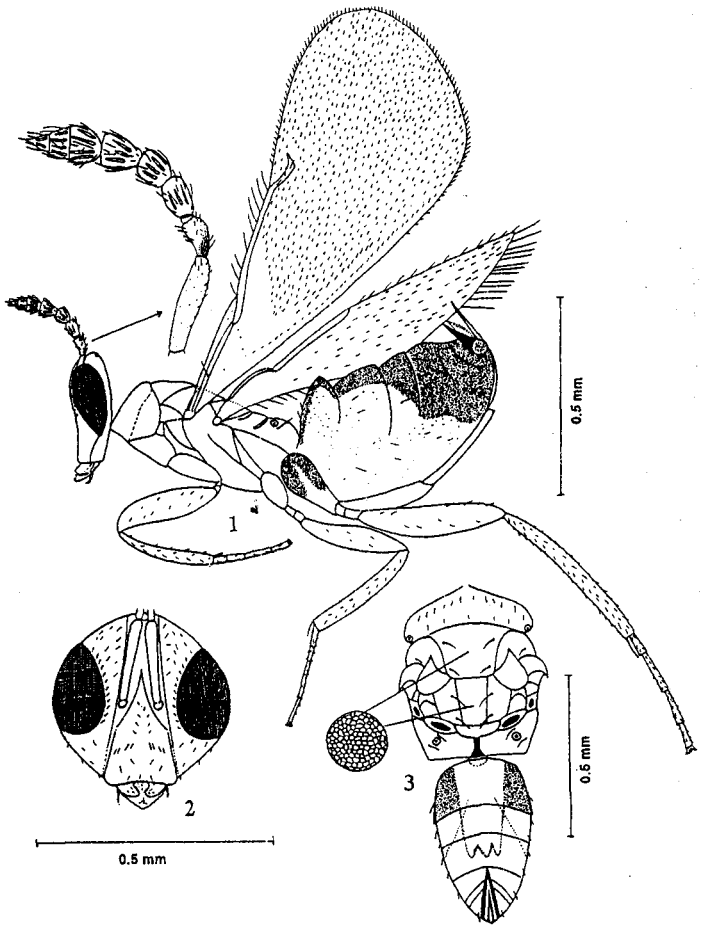
Host: Emerged from leaf galls of *Terminalia arjuna* (Roxb.) Wright & Arn. (Combretaceae). The subglobose galls were 20-25 mm long and 10-15 mm broad. *T. arjuna* found heavily infested with the unknown gall insect, particularly in the rainy season.

Etymology: Named after M. Sheeba, who collected the leaf galls.

Material examined: *Holotype*: Female: India: Kerala, southeastern Malabar, Malappuram District, Manjeri, 11°7' N 76°7' E, 02.X.2004. Coll. M. Sheeba, rearing, voucher no. MoEF 4510 (DZUC). *Paratypes*: Three females with same data as holotype. All types deposited in DZUC.

DISCUSSION

Tamarixia sheebae sp. nov. differs from *Tamarixia radiata* Mercet in having: face with 9-11 bristles along each orbit (in *T. radiata,* face with only 7–8 bristles along each orbit); outer and inner propodeum homogeneously with weak reticulations (in *T. radiata,*



Figs. 1-3. *Tamarixia sheebae* Narendran sp. nov. female. Fig. 1. Body profile; Fig. 2. Head anterior view; Fig. 3. Mesosoma and Metasoma in dorsal view.

propodeum smooth near keel but rougher and slightly raised pattern on outer half); head as long as broad (in *T. radiata,* head broader than long); toruli at one-half distance from anterior ocellus to mouth margin (in *T. radiata* toruli at one-third distance from anterior ocellus to mouth margin); scape one-fourth longer than club excluding spur (in *T. radiata,* scape one-fifth longer than club excluding spur); F1 1.4× as long as broad (in *T. radiata,* F1 half as broad as long); apex of gaster tilted upwards (in *T. radiata,* apex of gaster not tilted); ovipositor protruding (in *T. radiata,* ovipositor barely protruding).

Tamarixia sheebae sp. nov. differs from *Tamarixia bicolor* Waterston in having: scape reaching the level of median ocellus (in *T. bicolor,* scape does not reach the level of median ocellus); F1 and pedicellus subequal (in *T. bicolor,* pedicellus longer than F1); club 2× as long as broad (in *T. bicolor,* club 2.5–2.8× as long as broad); club distinctly three-segmented (in *T. bicolor,* club not distinctly segmented); hind femora 4× as long as broad (in *T. bicolor,* hind femora barely 3× as long as broad); costal cell subequal to MV or slightly longer (in *T. bicolor,* costal cell 1.5× as long as MV); front edge of MV with nine setae (in *T. bicolor,* front edge of MV with four or five setae); mesosoma 1.5× as broad as gaster (in *T. bicolor,* gaster as broad as mesosoma); gaster black dorsally with pale yellow

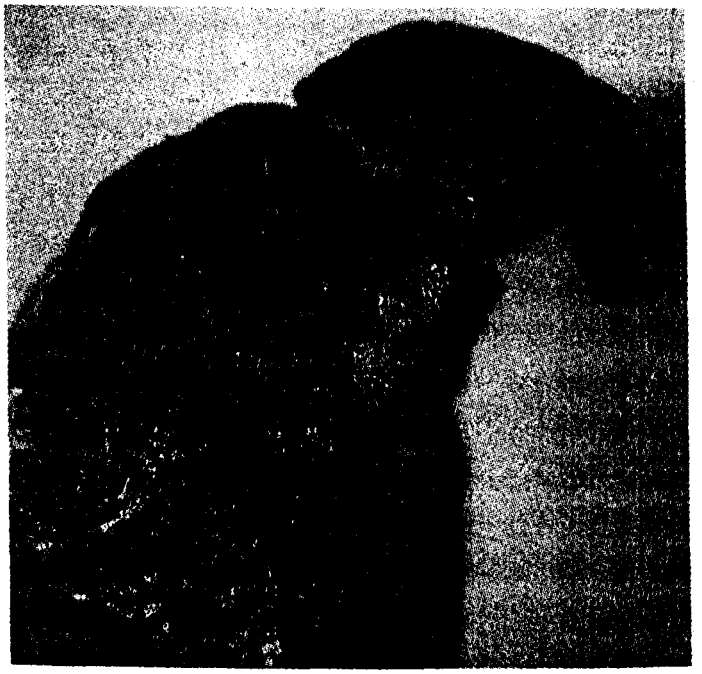


Fig. 4. Photograph of the unknown leaf gall on *Terminalia arjuna* from which *Tamarixia sheebae* were collected.

patch basally around petiole (in *T. bicolor,* gaster pale yellow with brown patch basally around petiole); apex of gaster tilted upwards (in *T. bicolor,* apex of gaster not tilted).

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Three new species of *Torymus* Dalman (Hymenoptera: Torymidae) from Himachal Pradesh (India) along with a key to species of Indian Subcontinent

T. C. Narendran*[1], P. Girish Kumar[1], K. Sudheer[1], P. M. Sureshan[2] and S. Chakrabarti[3]

[1]*Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala 673635, India*
[2]*Zoological Survey of India, Western Regional Station, Pune 411044, India*
[3]*Himalayan Forest Research Institute, Shimla 171001, India*

ABSTRACT: Three new species *viz.*, *Torymus himachalicus* Narendran and Sureshan sp. nov., *T. stom* Narendran and Sudheer sp. nov. and *T. absonus* Narendran and Kumar sp. nov. parasitic on galls of Oak trees from Himachal Pradesh are described. Seven species have been reported from the Indian subcontinent *viz.*, *T. calcaratus* (Nees) (=*Diomorus calcaratus* (Nees)), *T. chaubattiensis* Bhatnagar, *T. cupreus* (Spinola) (=*Diomorus cupreus* (Spinola)), *T. indicus* (Ahmad)(=*Diomorus orientalis* Masi), *T. nepalensis* Narendran, *T. orissaensis* (Mani) and *T. sharmai* Sureshan and Narendran. Key to the ten species of the genus *Torymus* Dalman of Indian subcontinent is also provided.

INTRODUCTION

Dalman (1820) erected the genus *Torymus* with *Ichneumon bedeguaris* Linnaeus as its type species. Narendran (1994) studied the species of *Torymus* Dalman of Indian subcontinent and Grissell (1995) revised the world species. While revising the European species of *Torymus*, Graham and Gijswijt (1998) synonymised the genus *Diomorus* Walker under *Torymus*. Out of eleven species known from the Oriental region (Noyes, 2004), the species *viz.*, *T. calcaratus* (Nees) (=*Diomorus calcaratus* (Nees)), *T. chaubattiensis* Bhatnagar, *T. cupreus* (Spinola) (=*Diomorus cupreus* (Spinola)), *T. indicus* (Ahmad) (=*Diomorus orientalis* Masi), *T. nepalensis* Narendran, *T. orissaensis* (Mani) and *T. sharmai* Sureshan and Narendran have been reported from the Indian subcontinent (Sureshan and Narendran, 2002). Besides three

*Corresponding author

new species from Himachal Pradesh, a key to the ten species from Indian subcontinent is also provided.

All type specimens are deposited in T.C.N collections in the Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC) for the time being but eventually will be transferred to the Western Ghats Regional Station, Zoological Survey of India, Kozhikode (ZSIK).

Abbreviations used: DZUC = Department of Zoology, University of Calicut; F1-F7 = Funicular segments 1 to 7; MV = Marginal Vein; OOL = Ocellocular distance; PMV = Post marginal vein; POL = Postocellar distance; SMV = Submarginal vein; STV = Stigmal Vein; ZSIK = Zoological Survey of India, Western Ghats Regional Station, Kozhikode.

Torymus himachalicus Narendran and Sureshan sp.nov. (Figs 1–6)

Female

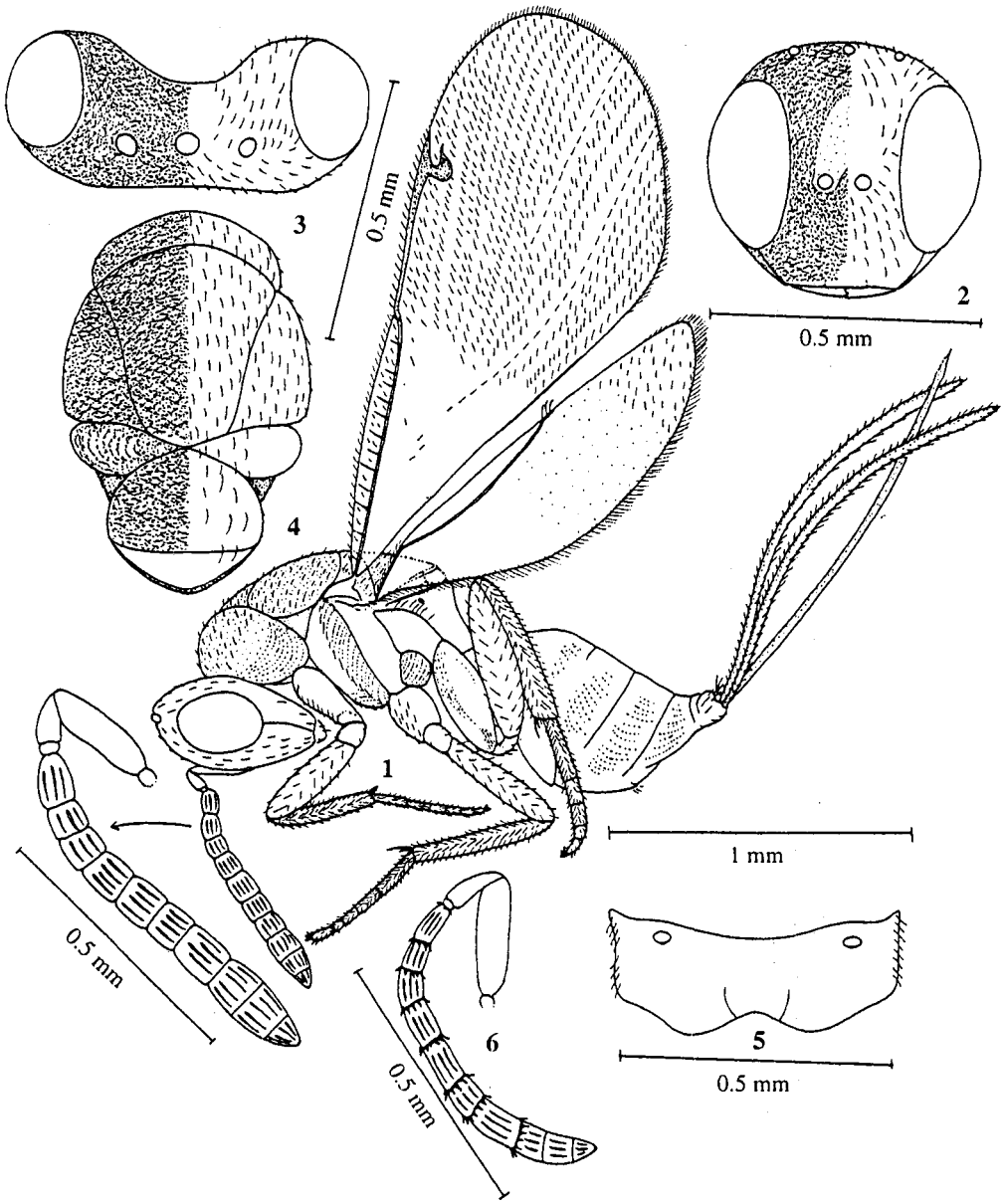
Length 1.89 mm. (excluding ovipositor sheath); ovipositor sheath 1.41 mm. Body blackish brown with metallic green reflections; antenna dark brown except base of scape yellowish brown; eye blackish brown; ocelli yellowish brown, pinkish red in certain lights; extreme tips of all femora yellowish brown; all trochanters dark yellowish brown; hind tibia dark brown except at extreme tips paler; fore tibia, mid tibia and all tarsal segments yellowish brown except last tarsal segments and claws dark brown; wings hyaline; venation brown; ovipositor brownish yellow; ovipositor sheath blackish brown.

Head

Width (Fig. 2) 1.08x its median length up to lower clypeal margin (excluding mandibles); width in dorsal view (Fig.3) 3.45x its median length; eyes bare; POL 2.3xOOL; head rather granuloso-striate (Fig. 2); clypeus smooth; malar space 0.28x length of eye; malar sulcus distinct; head with moderately dense pubescence. Antennal formula 11173 (Fig. 1); antenna with toruli well above lower eye line, slightly nearer to clypeus than to median ocellus; relative measurements of length: width of antennal segments: scape=27.5:8; pedicel=11:5.5; anellus=2.5:4.5; F1=12:8; F2=7.5:8.5; F3=8:9; F4=10:9; F5=9:9.5; F6=8:9; F7=11:9.5; clava=24:11; scape not reaching median ocellus; clava shorter than three preceding segments combined; sensilla numerous.

Mesosoma

Rather strongly convex; pronotum and mesoscutum with dense pubescence except at lateral part of pronotum; median width of pronotum 4.35x its median length (Fig. 4); pronotum, mesoscutum and scutellum with transverse striations; pronotal collar rounded anteriorly. Mesoscutum width 1.22x its median length (Fig. 4); notauli deep. Scutellum length 0.91x its width. (Fig. 4), and sparsely long hairs; frenal groove well defined; frenum and metanotum almost smooth; propodeum as in Fig. 5,



FIGURES. 1–6: *Torymus himachalicus* Narendran and Sureshan sp. nov. (Figs 1–5: Female): 1. Body profile - lateral view, 2. Head-front view, 3. Head-dorsal view, 4. Pronotum, mesoscutum and scutellum, 5. Propodeum, 6. Male antenna.

smooth, spiracle oval shaped, lateral margin with few long hairs; metapleuron and mesepimeron smooth without hairs; epimeron with distinct reticulations visible in certain lights; mesepisternum with faint transverse striations (Fig. 1), medially with

a row of hairs (Fig. 1). Hind coxa stout, length 2.8x width. Forewing (Fig. 1) length 2.39x its maximum width; SMV 1.85x MV; MV 4.46x PMV; PMV 1.07x STV; SMV with a row of dorsal setae as in Fig. 1.

Gaster

Sessile (Fig. 1); shorter than mesosoma (0.95x); ovipositor sheath 1.63x length of gaster; exserted part of ovipositor distinctly shorter than combined length of mesosoma and gaster (0.8x); pilosity on ovipositor sheath moderately long.

Male

Length 1.64 mm. Differs from female in colour which is more dark; length of antenna smaller, thick setae present at tip of each funicular segments (Fig. 6).

Host

Round gall on leaf of Oak trees.

Material examined

Holotype: Female: India, Himachal Pradesh, Korgu, Sarahan (2165 metres, 31°31′N 77°48′E), Shimla, 20.v.2004, Coll. S. Chakrabarti.

Paratype

1 male, same data as for holotype.

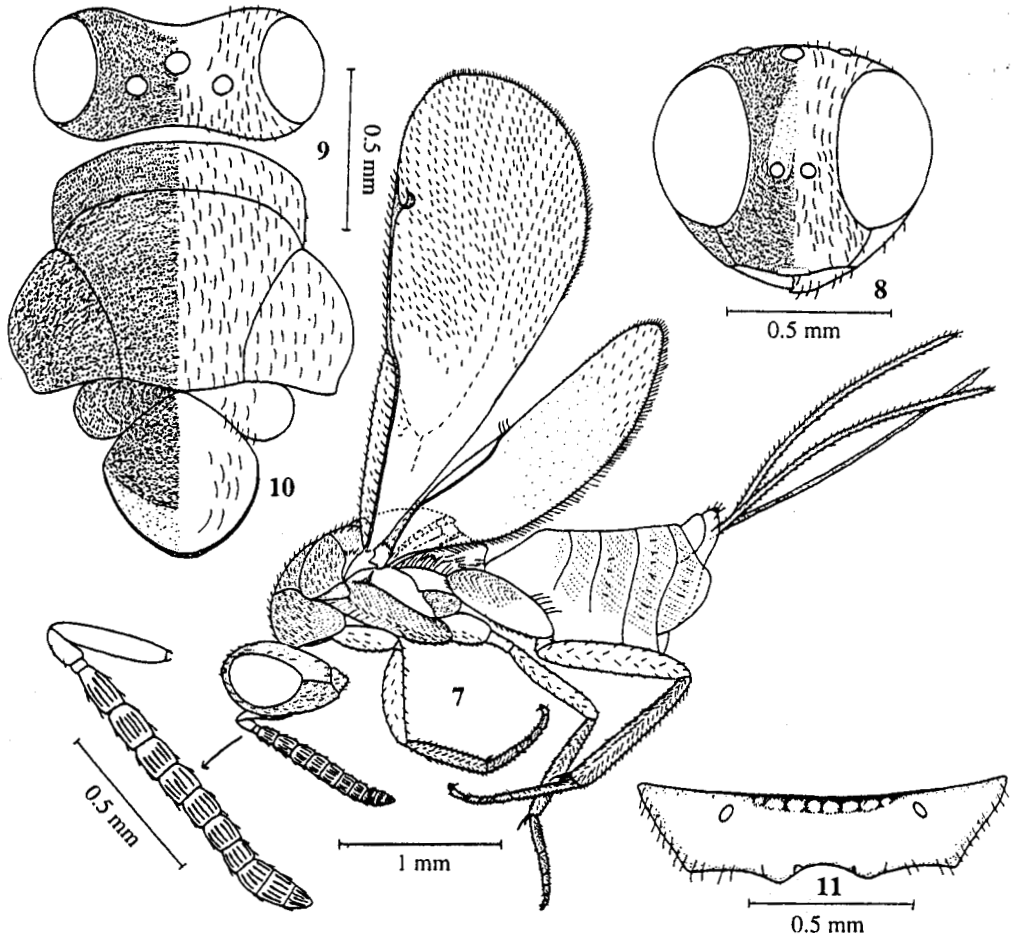
Etymology

The species name is after Himachal Pradesh, the state from where the specimens are collected.

Remarks

This new species resembles *T. sharmai* Sureshan and Narendran in having (1) Eyes bare, (2) Ovipositor sheath distinctly longer than gaster, (3) Frenal area almost shiny and (4) Propodeal median carina absent. However, this species differs from *T. sharmai* in having (1) Gaster sessile (in *T.sharmai* gaster with a very short petiole); (2) Frenal groove present (in *T. sharmai* frenal groove absent) and (3) POL 2.3x OOL (in *T. sharmai* POL 2.5x OOL).

This new species also resembles *T. stom* Narendran and Sudheer sp. nov. in having (1) Gaster sessile, (2) Clava distinctly shorter than three preceding segments combined and (3) exserted part of ovipositor distinctly shorter than the combined length of head and mesosoma. However, this species differs from *T. stom* sp. nov. in having (1) Frenal groove present (in *T. stom* frenal groove absent); (2) Fore wing length 2.39x its maximum width (in *T. stom* fore wing length 2.64x its maximum width); (3) SMV



FIGURES. 7–11: *Torymus stom* Narendran and Sudheer sp. nov. female. 7. Body profile – lateral view, 8. Head– front view, 9. Head– dorsal view, 10. Pronotum, mesoscutum and scutellum, 11. Propodeum.

1.85x MV(in *T. stom* SMV 1.48x MV); (4) Gaster shorter than (0.95x) mesosoma (in *T. stom* gaster longer than mesosoma); (5) Ovipositor sheath 1.63x length of gaster (in *T. stom* ovipositor sheath 1.29x length of gaster) and (6) Hind femur blackish brown with metallic green reflections except at tips (in *T. stom* hind femur yellowish brown).

Torymus stom Narendran and Sudheer sp. nov. (Figs 7–11)

Female

Length 3.24 mm. (excluding ovipositor sheath); ovipositor sheath 1.94 mm. Body blackish brown with metallic green reflections; antenna brown except scape yellowish brown; eye brown; ocelli pale yellowish brown; tegula yellowish brown; legs yellowish brown except all coxae dorsobasally and claws brown; wings hyaline; venation pale brown; ovipositor yellowish brown; ovipositor sheath blackish brown.

Head

Width (Fig. 8) 1.16x its median length up to lower clypeal margin (excluding mandibles); width in dorsal view (Fig. 9) 2.8x its median length; eyes bare; POL 2.3xOOL; head rather granuloso-striate (Fig. 8); clypeus smooth; malar space 0.25x length of eye; malar sulcus distinct; head with moderately dense pubescence. Antennal formula 11173 (Fig. 7); antenna with toruli well above lower eye line, slightly nearer to clypeus than to median ocellus; relative measurements of length: width of antennal segments: scape=27.5:5.5; pedicel=10.5:5; anellus=2:3.5; F1=12:6; F2=10:7; F3=8.5:7; F4=8:7.5; F5=8:7.5; F6=7.5:7; F7=6:7; clava=18:7.5; scape not reaching median ocellus; clava distinctly shorter than three preceding segments combined; sensilla numerous.

Mesosoma

Rather strongly convex; pronotum and mesoscutum with dense pubescence except at lateral part of pronotum; median width of pronotum 4.95x its median length (Fig. 10); pronotum, mesoscutum and scutellum with transverse striations, striations weaker on frenal area; pronotal collar rounded anteriorly. Mesoscutum width 1.68x its median length (Fig. 10); notauli deep. Scutellum length 1.06x its width (Fig. 10), with sparsely long hairs; frenal groove absent; propodeum (Fig. 11) largely smooth, laterally with faint striations, median carina absent, spiracle oval shaped, lateral margin with few long hairs extending towards posterior margin; metapleuron and mesepimeron smooth without hairs except at posterior margin of metapleuron near to hind coxa;epimeron with distinct reticulations visible in certain lights; mesepisternum with transverse striations with moderate hairs. Hind coxa stout, length 2.85x width, anterior dorsal portion with striations, dorsal area near to trochanter having few long hairs. Fore wing (Fig. 7) length 2.64x its maximum width; SMV 1.48x MV; MV 4.4x PMV; PMV 1.5x STV; SMV with a row of dorsal setae as in Fig. 7, speculum bare; cubital line of setae extending to cubital cell.

Gaster

Sessile (Fig. 7); longer than mesosoma (1.07x); ovipositor sheath 1.29x length of gaster; exserted part of ovipositor distinctly shorter than combined length of mesosoma and gaster (0.66x); pilosity on ovipositor sheath moderately long.

Male

Unknown.

Host

Round gall on leaf of Oak trees.

Material examined

Holotype: Female: India, Himachal Pradesh, Shogi (1597 metres, 31°3′N 77°7′E), Shimla, 12.iii.2004, Coll.S.Chakrabarti.

Paratypes

3 females, same data as for holotype.

Etymology

The species name is arbitrary combination of letters.

Remarks

This new species closely resembles *T. sharmai* Sureshan and Narendran in having (1) Eyes bare, (2) Ovipositor sheath distinctly longer than gaster, (3) frenal groove absent and (4) Propodeal median carina absent. However, it differs from the same in having: (1) Gaster sessile (in *T. sharmai* gaster with a very short petiole); (2) Body length 3.24 mm (excluding ovipositor sheath) (in *T. sharmai* body length 1.8 mm (excluding ovipositor sheath)); and (3) Ovipositor sheath length 1.94 mm (in *T. sharmai* ovipositor sheath length 1 mm).

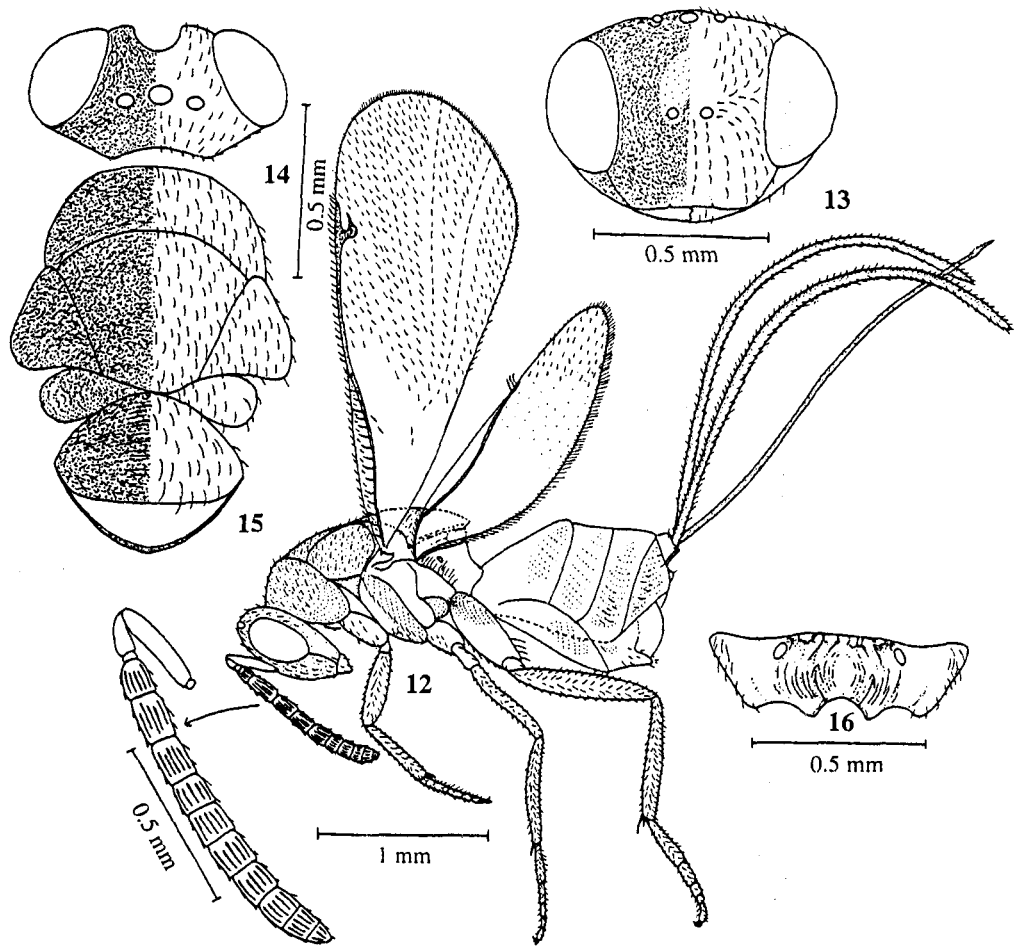
Torymus absonus Narendran and Kumar sp. nov. (Figs 12–16)

Female

Length 2.58 mm. (excluding ovipositor sheath); ovipositor sheath 3 mm. Body blackish brown with metallic green reflections; antenna dark brown except base of scape yellowish brown; eye brown; ocelli yellowish brown, with red reflections; extreme tips of all femora, fore and mid tibia, extreme tips of hind tibia, first four tarsal segments of all legs and ovipositor yellowish brown; hind tibia in middle, fifth tarsal segments of all legs, claws and ovipositor sheath dark brown; wings hyaline; SMV pale brown; MV, STV and PMV dark brown.

Head

Width (Fig. 13) 1.42x its median length up to lower clypeal margin (excluding mandibles); width in dorsal view (Fig. 14) 2.62x its median length; eyes bare; POL 2x OOL; head rather granuloso-striate (Fig. 13); clypeus smooth; malar space 0.37x length of eye; malar sulcus distinct (Fig. 13); head with moderately dense pubescence. Antennal formula 11173 (Fig. 12); antenna with toruli well above lower eye line, length between toruli and clypeus almost equal to length between toruli and median ocellus; relative measurements of length: width of antennal segments: scape=22:5; pedicel=10:4.5; anellus=2:3.5; F1=8.5:6.5; F2=11:7.5; F3=10.5:7; F4=8:7.5; F5=8:8; F6=9:8; F7=8:8; clava=18:7; scape not reaching median ocellus; clava distinctly shorter than three preceding segments combined; sensilla numerous.



FIGURES. 12–16: *Torymus absonus* Narendran and Kumar sp. nov. female. 12. Body profile – lateral view, 13. Head-front view, 14. Head-dorsal view, 15. Pronotum, mesoscutum and scutellum, 16. Propodeum.

Mesosoma

Rather strongly convex; pronotum and mesoscutum with dense pubescence except at lateral part of pronotum; pronotal collar rounded anteriorly; median width of pronotum 3.33x its median length (Fig. 15); pronotum, mesoscutum and scutellum with transverse striations. Mesoscutum width 1.7x its median length (Fig. 15); notauli deep. Scutellum length 0.86x its width (Fig. 15); sparsely setose; frenal groove well defined; frenum and metanotum smooth; propodeum as in Fig. 16; metapleuron and mesepimeron smooth without hairs except at posterior margin of metapleuron near to hind coxa; epimeron with distinct reticulations visible in certain lights; mesepisternum with transverse striations, with moderate hairs. Hind coxa stout, length 2.62x width, anterior dorsal portion with faint striations, tending to be reticulate; dorsal area near

to trochanter having few long hairs (Fig. 12). Fore wing (Fig. 12) length 2.59x its maximum width; SMV 1.51x MV; MV 4.14x PMV; PMV 1.4x STV; SMV with a row of dorsal setae; speculum bare.

Gaster

Sessile (Fig. 12); shorter than mesosoma (0.95x); ovipositor sheath 2.6x length of gaster; exserted part of ovipositor distinctly longer than combined length of mesosoma and gaster (1.07x); pilosity on ovipositor sheath moderately long.

Male

Unknown.

Host

Finger galls on leaf of Oak trees.

Material examined

Holotype: Female: India, Himachal Pradesh, Shogi (1597 metres, 31°6′N 77°10′E), Shimla, 12.iii.2004, Coll.S.Chakrabarti.

Paratype

1 Female: India, Himachal Pradesh, Jhungi (2220 metres, 31°32′N 76°54′E), Sundernagar, 24.ii.2004, Coll. S.Chakrabarti.

Etymology

The species name is taken from latin meaning "different".

Remarks

This new species is similar to *T. nepalensis* Narendran in having (1) Length of exserted part of ovipositor distinctly longer than body (2) Frenum smooth and shiny (3) POL 2x OOL and (4) Propodeal median carina absent. However it differs from *T. nepalensis* in having (1) Length of body (excluding ovipositor) 2.58 mm (in *T. nepalensis* Length of body (excluding ovipositor) 4.88 mm); (2) Length of ovipositor 3 mm (in *T. nepalensis* length of ovipositor 6.89 mm); (3) Frenal groove present (in *T. nepalensis* frenal groove absent) and (4) Gaster (excluding ovipositor) distinctly shorter than (0.9x) mesosoma (in *T. nepalensis* gaster (excluding ovipositor) distinctly longer than mesosoma).

Key to species of *Torymus* Dalman of the Indian subcontinent

1. Hind femur with distinct subapical tooth 2
– Hind femur without subapical tooth 4
2. Head and thorax coppery red or honey red, deeply and umbilicately punctate; gaster with purple green reflections; fore wing distinctly darkened; STV expanded apically; all femora rusty brown with purple reflections; ovipositor as long as gaster ..... *T. cupreus* Spinola
– Characters not as in above combination, partly or completely different 3
3. Length of exserted part of ovipositor distinctly more than length of body; antenna, mandible, all tibiae, mid femur and ovipositor rusty brown or black, generally bright metallic green with bluish and violet tinge on parts; MV a trifle longer than 3x PMV ..... *T. calcaratus* Nees
– Length of exserted part of ovipositor distinctly less than length of body; scape with yellow colour on all sides or on ventral side; other characters not as in above combination, partly or completely different ..... *T. indicus* Ahmad
4. Length of exserted part of ovipositor distinctly more than length of body 5
– Length of exserted part of ovipositor distinctly less than length of body 7
5. F1 anelliform so that antenna appears to have two ring segments; body black to dark green; femora brownish violet; tibiae and tarsi brown; gaster black *T. orissaensis* (Mani)
– Characters not as in above combination, partly or completely different 6
6. Frenal groove absent; gaster (exclusing ovipositor) distinctly longer than mesosoma ..... *T. nepalensis* Narendran
– Frenal groove present (Fig. 15); gaster (exclusing ovipositor) distinctly shorter than (0.9x) mesosoma ..... *T. absonus* Narendran and Kumar sp. nov.
7. Eyes pubescent; ovipositor sheath a little shorter than gaster ... *T. chaubattiensis* Bhatnagar
– Eyes bare; ovipositor sheath distinctly longer than gaster 8
8. Gaster with a very short petiole; hind coxal length 2.5x width; POL 2.5x OOL; clava almost as long as three preceding segments combined ..... *T. sharmai* Sureshan and Narendran
– Gaster sessile; hind coxal length 2.8-2.85x width; POL 2.3x OOL; clava distinctly shorter than three preceding segments combined 9
9. Frenal groove present (Fig. 4); fore wing (Fig. 1) length 2.39x its maximum width; SMV 1.85x MV; ovipositor sheath 1.63x length of gaster; hind femur blackish brown with metallic green reflections except at tips .... *T. himachalicus* Narendran and Sureshan sp. nov.
– Frenal groove absent (Fig. 10); fore wing (Fig. 7) length 2.64x its maximum width; SMV 1.48x MV; ovipositor sheath 1.29x length of gaster; hind femur yellowish brown ..... *T. stom* Narendran and Sudheer sp. nov.

TORYMUS NEPALENSIS NARENDRAN

Torymus neepalensis* Narendran, 1994. Torymidae and Eurytomidae of Indian Subcontinent, 21. *Lapsus calami.

The original name *Torymus neepalensis* Narendran, 1994 is an incorrect original spelling since the correct spelling of the country is Nepal and not Neepal. Hence it is emended here as *Torymus nepalensis* Narendran as per Article No. 32.5 of the Code of Zoological Nomenclature.

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NEW SPECIES AND A KEY TO SPECIES OF *PARASTEPHANELLUS* ENDERLEIN (HYMENOPTERA: STEPHANIDAE) OF PAPUA NEW GUINEA

T C NARENDRAN, K SUDHEER, P GIRISH KUMAR, S SANTHOSH AND M SHEEBA
SYSTEMATIC ENTOMOLOGY LABORATORY, DEPARTMENT OF ZOOLOGY
UNIVERSITY OF CALICUT, 673 635, KERALA, INDIA
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ABSTRACT

Five new species of *Parastephanellus* viz. *P.zoniotus Narendran* sp. nov., *P.euphorbiae* Narendran and Sudheer sp.nov., *P.zandanus* Narendran and Girishkumar sp. nov., P.gadagkari Narendran and Santhosh sp. nov. and *P. picrocarpusi* Narendran and Sheeba sp. nov. are described and illustrated. *P.zoniotus* Narendran sp. nov. is similar to *P. gadagkari* Narendran and Santhosh sp. nov. but differs in having the anterior two-thirds of preanular part of pronotum cross carinate and frons below anterior tooth reticulate-punctate with cross-carinae. *P . euphorbiae* Narendan and Sudheer sp.nov. differs from the closely resembling species of *P.malayanus* Cameron and P.rubripictus Elliot in having nine cross carinae and a median groove on the vertex. *P.zandanus* Narendran and Girishkumar sp. nov. can be distinguished from *P. pygmaeus* Enderlein in the sculpture on vertex and post-vertex. *P. picrocarpusi* Narendran and Sheeba sp. nov. differs from the other species of the genus in having a short median sulcus on vertex and four deep smooth irregular pits on the peripeciolar depression . *P. gadagkari* Narendran and Santhosh sp.nov. closely resembles *P. zoniotus* Narendran but differs in having preanular part of pronotum cross reticulate-striate and frons strongly cross striate from base of posterior tooth to toruli. The species *P. rubripictus* Elliot is reported for the first time from Papua New Guinea . A key to species of *Parastephanellus* of Papua New Guinea is provided

Key words: *Parastephanellus* Enderlein, Stephanidae, New species, Key, Papua New Guinea.

INTRODUCTION

So far only three species of *Parastephanellus* Enderlein are known from Papua New Guinea (Elliot 1922). They are *P. damellicus* (Westwood), *P. malayanus* (Cameron) and *P. pygmaeus* (Enderlein). In this paper, a fourth species *P. rubripictus* Elliott which is originally described from Borneo (=Kalimantan) is reported from Papua New Guinea for the first time, based on the female specimen collected by L.E. Cheesman 65 years ago in March 1936 (with the BMNH collection No. BM 1936-271). In addition to this, five new species from the region are described. The new species do not fit to the descriptions of any of the known species of *Parastephanellus* dealt with by Elliott (1922, 1926, 1927, 1928), Kieffer (1916), Madhl (1993) and Narendran and Sheela (1995). A key to species to *Parastephanellus* of Papua New Guinea is also provided.

MATERIALS AND METHODS

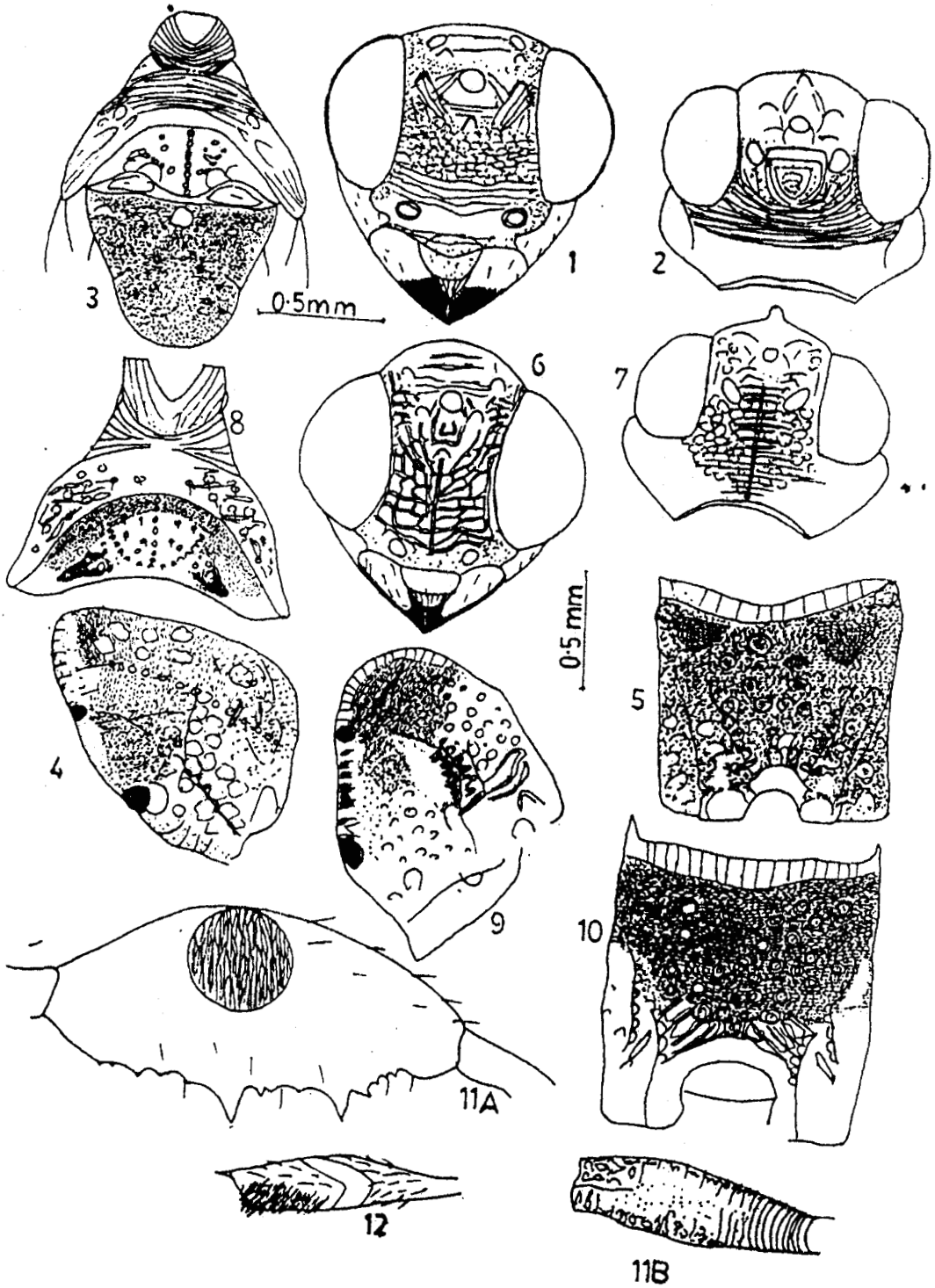
The specimens were provided by the Natural History Museum, London, UK. M3Z Wilc Stereozoom (Switzeland) and Leitz Wetzlar (Germany) microscopes were used for taxonomic studies. The figures were drawn using the drawing tube of M3Z stereozoom and enlarged using KB enlarger of model BZM.

RESULTS AND DISCUSSION

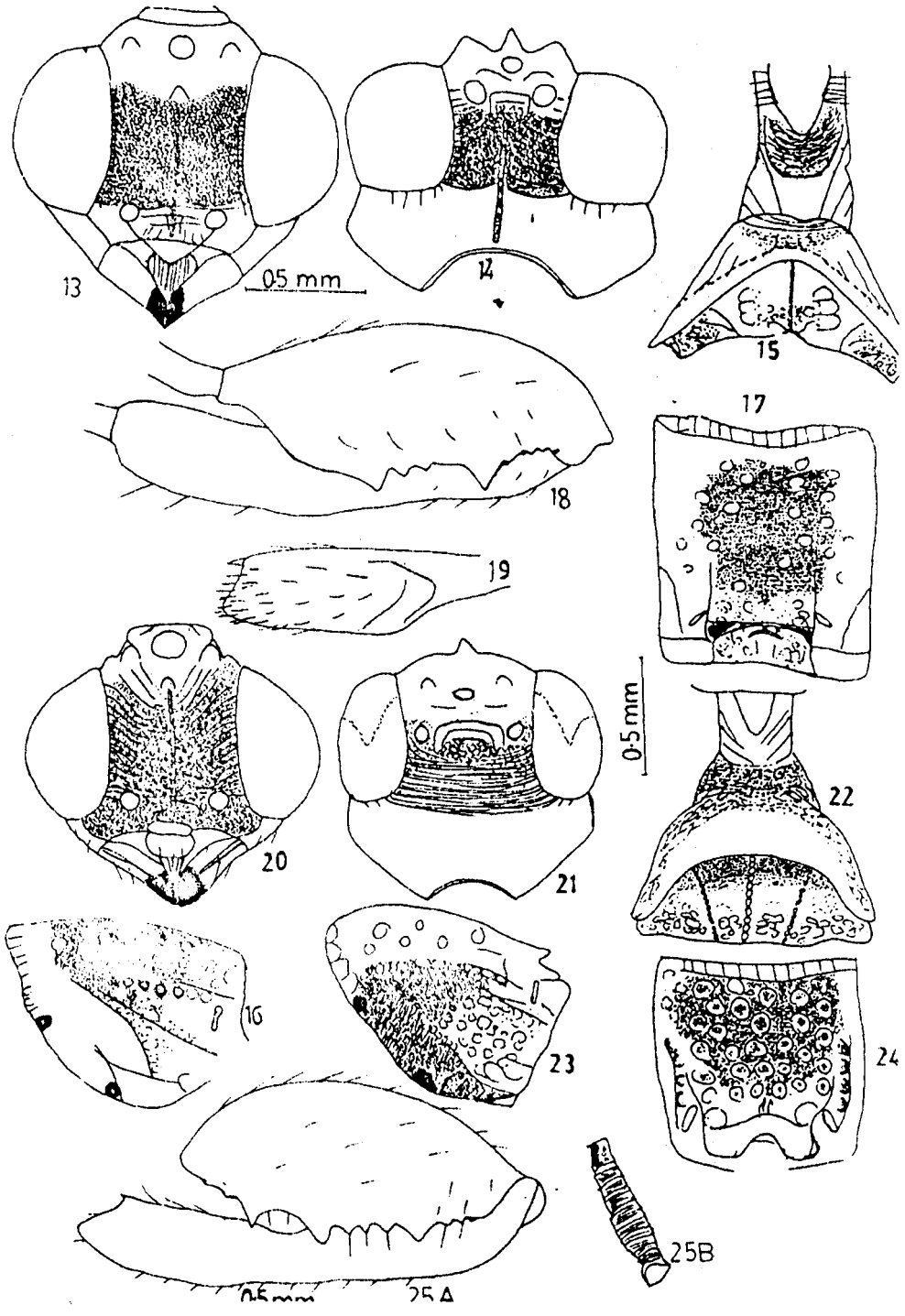
Parastephanellus zoniotus Narendran sp. nov. (Figs. 1-5))

Female: Length: 5.38 mm (excluding ovipositor); ovipositor length: 8.83 mm. Frons and vertex dark liver brown; areas between and below antennal toruli light brown; a broad yellowish white band on each side, starting from the side of post-vertex, passing through temples and near posterior eye margin and meeting base of mandible. Antenna reddish brown with scape fuscous; maxillary palp pale brown with basal segment darker; eye reflecting yellow with black tinge; apical area of mandible black; frontal teeth with paler bases; ocelli blackish brown. Mesosoma black. Fore leg: coxa black, femur brown with base and apex paler; tibia pale brown; tarsi yellowish brown. Midleg: coxa liver brown; femur pale liver brown with base and apex paler; tibia brown with apex paler; tarsi pale yellowish brown with two-thirds from apex to base of metatarsus slight darker. Hind leg: coxa black with liver brown tinge; trochanter pale brown; femur and tibia reddish brown; metatarsus pale yellow, remaining tarsi pale reddish brown. Tegula pale brown. Wings hyaline, veins pale yellowish brown. Gastral petiole pale liver brown; remaining part of metasoma liver brownish black, apex of hypopygium pale yellow; ovipositor pale brown; ovipositor sheath pale liver brown. Pubescence dirty white.

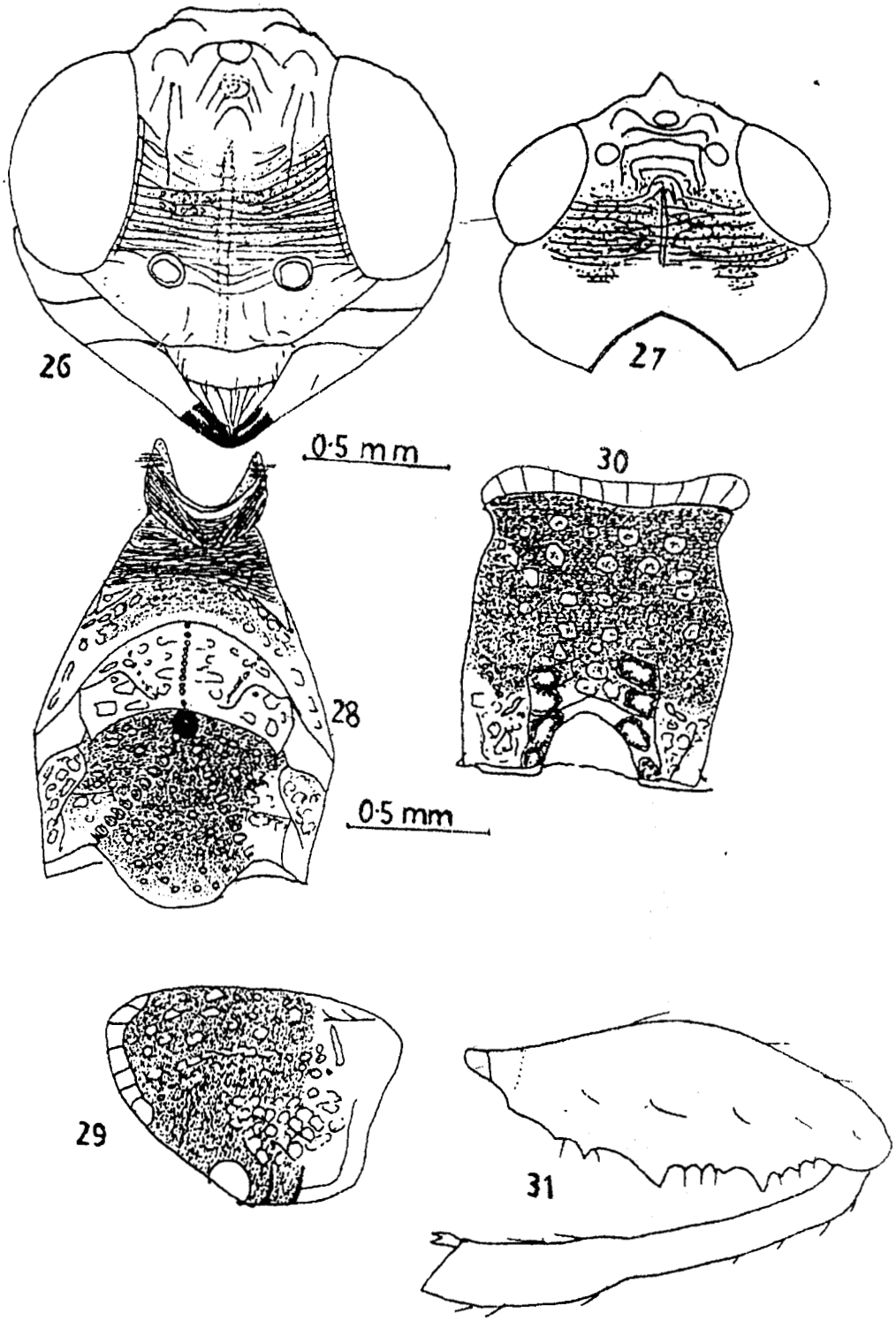
Head: (Figs. 1,2) width in anterior view 1.4x distance between front ocellus and lower margin of labrum; width in dorsal view 1.6x distance between front ocellus and posterior occipital margin; frons reticulate below anterior tooth; area above toruli trans-striate; with oblique carinae below middle teeth; ocellocular area longitudinally striate; vertex with 3 transverse carinae, followed by coarse median reticulation and transverse striae; striae not forming median groove or line; postvertex smooth and shiny; gena and postorbital region smooth and shiny; posterior margin of head sharply bordered; occipital carina narrow. POL 8.5x OOL; head with 5 teeth. Antenna with scape 2x as long as pedicel; second flagellar segment 1.6x as long as first; third segment 1.4x as long as second; fourth as long as third; fifth a little shorter than fourth.



Figs. 1-5. *Parastephanellus zoniotus* Narendran sp. nov. (female): 1. Head anterior view; 2. Head dorsal view; 3. Pro and mesonotum; 4. Metapleuron; 5. Propodeum. Figs. 6-12. *Parastephanellus euphorbiae* Narendran & Sudheer sp. nov. (female): 6. Head in anterior view; 7. Head in dorsal view; 8. Pronotum and mesoscutum; 9. Metapleuron; 10. Propodeum; 11A. Hind femur; 11B. Hind coxa dorsal view; 12. Inner view of Hind tibia in part.



Figs. 13-19. *Parastephanellus zandanus* Narendran & Girish Kumar sp. nov. (female): 13. Head in anterior view; 14. Head in dorsal view; 15. Pronotum and mesoscutum; 16. Metapleuron; 17. Propodeum; 18. Hind femur and tibia; 19. Distal part of hind tibia in inner view. Figs. 20-25. *Parastephanellus gadagkari* Narendran & Santhosh sp. nov.; 20. Head in anterior view; 21. Head in dorsal view; 22. Pronotum and Mesoscutum; 23. Metapleuron; 24. Propodeum; 25A. Hind femur and tibia; 25B. Hind coxa dorsal view.



Figs. 26-31. *Parastephanellus picrocarpusi* Narendran & Sheeba sp. nov. (female): 26. Head in anterior view; 27. Head in dorsal view; 28. Pronotum and mesoscutum; 29. Metapleuron; 30. Propodeum; 31. Hind femur and tibia.

Mesosoma: Colo with longitudinal carinae; pronotal fold distinct; anterior two third of preannular part transversely striate, sides sparsely punctate; posterio marginal area smooth; ruga preanular weakly distinct. Mesoscutum with a mediar line of pits, submedian area sparsely pitted; notauli with four or five pits; axilla sparsely pitted, interstices minutely coriaceous reticulate; scutellum with sparse pits; interstices broad and microreticulate; axilla separated from each other by a large pit on anterior part of scutellum. Mesopleuron striate on anterior dorsal half with dirty white pubescence, posterior dorsal half smooth and shiny, ventral side sparsely transversely striate. Metapleuron (Fig.4) with pleuropodial fovea separated from metapleural fovea by smooth area followed by shagreened area (Fig.4); metapleural fovea with 3 or 4 carinae behind. Propodeum (Fig.5) with sparse shallow pits, interstices and inside of pits micro reticulate, median length of propodeum 0.31x length of petiole; parapeciolar depression distinct, reticulato-punctate; frontal impression of propodeal spiracle with a row of shallow pits. Relative length of pronotum 10; mesoscutum7; scutellum 9.5; propodeum 14.5; petiole 46. Forewing length 4.76x its maximum width. Hind coxa with coarsely and irregularly annulate carinate, interstices between carinae weakly and irregularly striate, base of coxa irregularly carinate, dorsum of hind coxa relatively with weaker carinae and striae; length of hind coxa 0.6x length of petiole; hind femur as long as hind coxa, 2.64x as long as its maximum width, ventral margin with 3 large teeth, basal region with two very small tubercle-like projections; interspace between median and distal teeth with 4 small denticles; interspace between distal large tooth and apex with 3 small denticles; hind tibia longer than hind femur.

Metasoma: Petiole uniformly annulate with carinae, distal end smooth and shiny. petiole as long as combined length of postpetiolar segments in dorsal view; first post petiolar segment 2.4x as long as second segment; third postpetiolar segment slightly shorter than second; first postpetiolar tergite smooth and shiny with faint longitudinal reticulation (visible only under certain lighting) on anterior two-thirds. posterior two-thirds with faint transverse reticulation; following tergites (except last one) faintly and transversely reticulate; last tergite with relatively stronger and larger reticulations, its posterior margin emarginate dorsally. Terebra 3.7x as long as combined length of postpetiolar segments, as long as 1.7x length of metasoma (excluding terebra).

Male : Unknown.

Host : From rubber plant trunk.
Holotype : Female: PAPUA NEW GUINEA, Songara Pl.; Propondetta, 14.iv.1972. Coll. E. Hasson (BMNH-P.877). *Paratype*: 1 Female, PAPUA NEW GUINEA, Kokoda, vi.1933.Coll.L.E.Cheesman (BMNH) (No.BM.1933-427).

Etymology : The species name is a combination of letters.

2. *Parastephanellus euphorbiae* Narendran and Sudheer sp.nov.(Figs. 6-12)

Female: Length 10.2 mm (excluding terebra). Terebra length 13.2 mm. Black; eye blackish dull yellow; ocelli reflecting yellow with blackish tinge, inner basal part of frontal teeth pale brown; clypeal region and labrum pale brownish yellow; mandible pale brownish yellow with apex black which extend to base weakly through lateroventral region. Antenna pale brown on basal segments which becomes darker towards distal segments. Maxillary palp pale brown. Area from base of mandible to postvertex with a brownish yellow band behind eye. Fore and mid legs reddish brown with coxa darker and mid metatarsus yellow (with tip pale brown); hind leg black with trochanter, non-swollen proximal part of tibia and tarsi brown. Wings hyaline with veins brownish black, stigma black with basal part yellow. Metasoma black with anterior end of post-petiolar segment, apex of hypopygium and sides of distal segment pale brown; ovipositor pale brown; ovipositor-sheath dark brown. Pubescence dirty white.

Head: (Figs. 6&7) width in anterior view 1.5x distance between front ocellus and lower labral margin; width in dorsal view 1.6x distance between front ocellus and posterior occipital margin. Frons irregularly carinate-punctate, with a median longitudinal carina reaching anterior frontal tooth from middle region between antennal toruli (Fig. 6); vertex with 9 cross carinae (Fig. 7); other regions of vertex coarsely pitted and carinate, with a median groove like depression; postvertex irregularly carinate-striate with sides smooth; posterior margin of occiput bordered. POL 3x OOL; head with 5 teeth of which anterior one larger. Antenna with scape about 1.7x as long as pedicel; second flagellar segment 1.33x length of first; third 1.25x as long as second; fourth as long as third; fifth a little shorter than fourth.

Mesosoma: Pronotal fold distinct; sides irregularly pitted, median region smooth; mesoscutum with a median line of pits, anterior area weakly reticulate, remaining

part sparsely pitted as in figure 8. Axilla with deep irregular widely spaced pits interstices shagreened and shiny; scutellum with sparse pits; median region o axilla unpitted, shiny and faintly reticulate. Mesopleuron with sparse pits interstices minutely reticulate on anterior half, with dense dirty white pubescence. Metapleuron with metapleural fovea separated from propodeal fovea with 6 or 7 deep pits, area above these pits anteriorly minutely reticulate with irregular pits as in figure 9. Propodeum (Fig. 10) with 19 to 20 deep pits on sulco crenulado. surface with moderately deep pits, interstices and inside of pits reticulate; median length of propodeum 0.61x length of petiole. Relative length of pronotum 8; mesoscutum 5; scutellum 12; propodeum 16; petiole 26. Forewing length 5x its maximum width. Hind coxa (Fig. 11B) with annulate carinae on distal part. remaining part coarsely carinate-punctate with a shiny microsculptured median area on outer side. Length of hind coxa 0.71x length of petiole; hind femur (Fig 11A) distinctly longer than hind coxa, a little more than 2x as long as its maximum width, ventral margin with two large teeth, anterior to basal large teeth with 5 tubercles or denticles; between basal and distal large teeth with 3 denticles. beyond distal larger teeth with 4 denticles of varying size. Hind tibia densely pubsecent on inner apex (Fig. 12).

Metasoma: Petiole with close annulate carinae which becomes irregular at base, apex smooth and shiny; petiole distinctly shorter than combined length of rest of metasoma (14:20); length of first postpetiolar segment in dorsal view a little more than 2.6x length of second postpetiolar segment; third postpetiolar segment equal to fourth segment. First postpetiolar segment smooth and shiny without any faint reticulation visible; second postpetiolar tergite with faint microsculptures; third, fourth and fifth postpetiolar tergites faintly and transversely reticulate; last tergite emarginate posteriorly, strongly shagreened; terebra 3.4x combined length of postpetiolar segments, 2x length of metasoma (excluding terebra).

Male : Unknown.
Host : From *Euphorbia geniculata* plant.
Etymology : The species name is after *Euphorbia* plant.
Holotype : Female, PAPUA NEW GUINEA, Songara Pl. Propondetta, 7.v.1969 Coll. E. Hasson (BMNH)

3. *Parastephanellus zandanus* Narendran and Girish Kumar sp. nov. (Figs. 13-19)

Female: Length 7.4 mm; terebra 7 mm. Pale yellowish brown; eye black with pale brown dorso-posterior margin, tips of frontal teeth and ocelli with darkish tinge, postpetiolar segments 2,3 and 4 and mesosoma slightly darker. Pubescence silvery on anterior part of mesopleuron; wings hyaline, veins pale transparent.

Head: (Figs. 13 & 14) Width in anterior view 1.47x distance between front ocellus and lower margin of labrum, width in anterior view 1.47x distance between front ocellus and lower margin of labrum, width in dorsal view 1.72x distance between front ocellus and posterior margin; frons finely and densely punctate (Fig. 13); vertex with two cross carinae followed by punctate area and cross carinae as in figure 14. A median fovea splits the cross carinae on vertex; postvertex smooth and shiny; posterior margin of head bordered; occipital carina dorsally narrow and linear; POL 3.5x OOL; head with 5 teeth. Antenna with scape length 2x length of pedicel; second flagellar segment 1.25x as long as first; third segment 1.4x as long as second; fourth flagellar segment slightly longer than third; fifth subequal to fourth in length.

Mesosoma: Pronotum with carina apicale with moderately dense pubescence on sides; pronotal fold with deep excavated area; colo relatively long (Fig. 15); preanular region shiny with faint microreticulation; femural impression with oblique carinae; ruga preanular weakly distinct; posterior marginal area smooth; mesoscutum with a median line of pits, notauli visible. surface sparsely pitted (Fig. 15); axilla closely and irregularly pitted; axilla separated from each other by a large pit anterior to scutellum; scutellum smooth and shiny without any pit. Mesopleuron densely pubescent on anterior side, interstices shagreened; metapleuron with interfoveolar area without distinct carinae. Median length of propoedum 0.31x length of petiole; dorsal region of propodeum with sparse shallow pits (Fig. 17), interstices wide and minutely reticulato-punctate. Spiracular frontal impression with a row of shallow pits; margin externa distinct; parapeciolar depression smooth and shiny. Relative measurements of length of pronotum 9; mesoscutum 5; scutellum 8; propodeum 10; petiole 32; combined length of postpetiolar segments 32; terebra 92. Hind coxa smooth on dorsal side, weakly annulate on sides; length of hind coxa 0.6x length of petiole; hind femur subequal in length to hind coxa, a little more than 2x as long as its maximum width; ventral margin with two large teeth, without distinct tubercles at base, interspace between

large teeth with two denticles, beyond distal large tooth with 3 very small tubercles. Hind tibia with inner depression subtriangular (Fig. 19).

Metasoma: Petiole distinctly annulate; dorsobasal area and apex weakly reticulate; petiole length equal to length of postpetiolar segments combined; length of first postpetiolar segments 3.5x as long as second; third and second subequal in length; distal half of first postpetiolar segment and following segments except last one, cross reticulate faintly. Last tergite more distinctly reticulate, and emarginate at posterior margin. Terebra 3.8x combined length of postpetiolar segment, 1.61x as long as metasoma (excluding terebra).

Male : Unknown.
Host : On *Euphorbia geniculata.*
Holotype : Female: PAPUA NEW GUINEA; 23.iv.1969, Coll. E. Hasson (BMNH).
Etymology : The species name is combination of letters.

4. *Parastephanellus gadagkari* Narendran and Santhosh sp. nov. (Figs. 20-25)

Female: Length 8.6 mm. Terebra 10 mm. Black with following parts otherwise. Temple and gena pale brown with a pale brownish yellow band running from base of mandible to upper end of temple; lower part of frons (face) including clypeus and labrum, area between and below antennal toruli, pale reddish brown. Mandibles pale brown with apical area black, bases of frontal teeth pale reddish brown; front ocellus black; hind ocelli pale blackish yellow; eyes pale blackish yellow; basal segment of maxillary palp brownish black; remaining segments of maxillary palp pale brown (antenna missing). Tegula pale brownish black; adjacent area below fore and hind wing blackish brown; fore and mid legs liver brown; metatarsus whitish yellow; postpetiolar segments and ovipositor-sheath liver brownish black; ovipositor pale brown. Wings hyaline, stigma and veins dark brown. Pubescence dirty white.

Head: (Figs. 20, 21) Width in anterior view a little more than 1.4x distance between front ocellus and lower labral margin; width in dorsal view a little more than 1.45x distance between front ocellus and postoccipital margin; frons with transverse and oblique carinae, interstices reticulate and rugose, with a median longitudinal sulcus. Vertex with 3 cross carinae, posterior most one (third one) shorter than second (Fig. 21), carinae followed by reticulation and cross striae;

postvertex smooth and shiny; occipital carina narrow; POL 10x OOL; head wi five teeth.

Mesosoma: Carina apicale distinct, without pubescence; colo with strong obliqu carinae; pronotal fold with deep excavated area; preanular region cross striat and reticulate; femural impression with large oblique irregular pits and carinae ruga preanular weak; posterior marginal area smooth and shiny. Mesoscutum with a median line of pits; notauli distinct and pitted; surface of mesoscutum cross reticulate and rugose. Axillae separated by a large pit anterior to scutellum; axilla sparsely pitted, interstices broad and reticulate; scutellum distinctly reticulate. Mesopleuron densely pubescent on anterior half, strongly rugose and reticulate with sparse shallow pits. Rugosities and pubescence sparser towards posterior side of mesopleuron. Metapleuron (Fig. 23) finely and faintly reticulate on interfoveolar area with 4 or 5 carinae. Median length of propodeum (Fig. 24) a little less than 0.3x length of petiole; propodeum with irregular, subcircular, shallow pits, interstices and inside of pits reticulate; parapiciolar depression smooth and shiny, spiracular frontal impression distinct. Relative length of body parts: Pronotum 6.5; Mesoscutum 4; scutellum 7; propodeum 10; petiole 34; combined length of postpertiolar segments in dorsal view 35; terebra 123. Hind coxa (Fig 25B) length 0.53x length of petiole, with strong and broken annulate carinae, base with a longitudinal pit and irregular carinae and punctae and reticulations. Hind femur a little longer than hind coxa (20:18), a little more than 2.3x as long as its own maximum width. Ventral margin of hind femur with 3 large teeth and two basal tubercles; interspace between middle and distal larger teeth with 3 denticles; beyond distal larger tooth with 3 different sized denticles (Fig. 25A).

Metasoma: Petiole annulate, basal area with irregular carinae and rugosities; distal tip smooth; length of petiole equal to combined length of postpetiolar segments; median dorsal length of first postpetiolar tergite 2.6x median dorsal length of second postpetiolar segment; third postpetiolar segment a little shorter than second and subequal to fourth. First postpetiolar segment with very faint longitudinal microreticulations (visible only in certain lighting) on anterior dorsal half, posterior dorsal half with very faint cross reticulations, second to last tergite with very faint cross reticulations; last tergite with stronger cross reticulation; last tergite emarginate posteriorly. Terebra 3.61x as long as combined length of postpetiolar segments; 1.78x as long as metasoma (excluding terebra).

Male : Unknown.
Host : Unknown.

Etymology : Named after Prof. Ragavendra Gadagkar for his significant contributions of the ethology of Hymenoptera.

HOLOTYPE : Female: PAPUA NEW GUINEA, Aml. 23.x.1957. Coll. J. Smart. (BMNH) (Coll. No. BMNH-1957-693).

5. *Parastephanellus picrocarpusi* Narendran and Sheeba sp. nov. (Figs. 26-31)

Female: Length 12.62 mm (excluding terebra); terebra 12.75 mm Black with following parts as follow: frons reddish brown with area above anterior frontal tooth slightly darker; gena and temple brownish red with a yellow band running from gena to temple; clypeus, labrum and mandibles reddish brown with apex of mandible black; antenna from toruli to third flagellar segment reddish brown, from third segment onwards becoming darker and darker; eye pale yellow with large black patches; ocelli reflecting pale yellow; postocellar area and postvertex reddish brown; fore and mid legs brown with coxa and femur darker, tarsi paler. Hind leg: coxa black; trochanter liver brown with apex yellowish white; hind femur and tibia black with apical rim of femur, apex of tibia and tibial spur reddish brown; metatarsus whitish yellow with apex brown; remaining segments darker; apex of petiole, base of first petiolar segment and hypopygium reddish brown; postpetiolar segments black and ovipositor sheath black; terebra pale yellow. Wings hyaline with stigma dark brown, veins pale brownish yellow. Pubescence white.

Head: (Figs. 26 & 27) Width in anterior view a little more than 1.3x distance between front ocellus and lower labral margin; width in dorsal view a little more than 1.7x distance between front ocellus and occipital carina; frons with transverse carinae, interstices reticulate and rugose, with a median longitudinal shallow sulcus. Vertex with 3 interocellar cross striae, followed by irregular carinae divided by a median longitudinal sulcus; postvertex smooth and shiny; occipital carina narrow, forming subacute angle medially (Fig. 27). POL 10x OOL; head with 5 teeth. Antennal scape 2x as long as first flagellar segment and equal to third flagellar segment; fourth shorter than third but equal to fifth in length.

Mesosoma: Carina apicale distinct with pubescence, colo with strong oblique carinae and striae; pronotal fold with moderate excavation; preannular region

cross striato-reticulate with sparse irregular pits; ruga preannular weak; posterior margin smooth and shiny. Mesoscutum with a median line of pits; notauli distinct and pitted; surface irregularly pitted (Fig. 28); axilla separated by a large pit anterior to scutellum; axillae and scutellum sparsely pitted, interstices broad and reticulate. Mesopleuron densely pubescent on anterior dorsal part, moderately reticulate on anterior half, mostly smooth on posterior half. Mesopleuron (Fig. 29) finely reticulate on interfoveolar area; postfoveolar area with two carinae, interstices between carinae reticulate. Median length of propodeum a little more 0.35x length of petiole; propodeum with subcircular shallow pits, interstices and pits reticulate (Fig.29); parapeciolar depression with 4 deep smooth pits, spiracular frontal impression not very pronounced. Relative lengths of body parts: Pronotum 10; mesoscutum 5; secutellum 8; propodeum 15; petiole 42; hind coxa 22; hind femur 24; combined length of postpetiolar segments 41; terebra 121. Hind coxa a little more than 0.52x length of petiole, with coarsely annulate carinae, with a basodorsal large pit. Hind femur (Fig.31) a little longer than hind coxa, 2.4x as long as its maximum width, ventral margin tridentate with a tubercle behind basal tooth, interspace between middle and distal teeth with 3 denticles of varying size, distalmost denticle being the smallest.

Metasoma: Petiole annulate, basal area with irregular carinae and rugosities, distal tip smooth; length of petiole subequal to combined length of postpetiolar segments; median dorsal length of first petiolar tergite 2.55x length of second postpetiolar tergite; third postpetiolar tergite equal to second in length; fifth a little shorter than third; terebra about 3x combined length of postpetiolar segments, a little longer than 1.45x metasoma; first postpetiolar segment with faint longitudinal irregular sculptures on anterior dorsal half, posterior half with faint cross reticulation; remaining tergites from second to last with faint cross reticulations; last tergite with cross reticulation more distinct than those other tergites. Pygidium emarginate posteriorly on dorsal side.

Male : Unknown.
Host : On *Picrocarpus indicus.*
Etymology: Species name is after *Picrocarpus*
Holotype : Female: PAPUA NEW GUINEA, Seripa'a Central. 8.v.1969. Coll. Ivaxai, H. (BMNH).

KEY TO SPECIES OF *PARASTEPHANELLUS* ENDERLEIN OF PAPUA NEW GUINEA

(Based on females)

1. Hind femur with 3 large teeth on ventral margin.....2
- Hind femur with 2 large teeth on ventral margin.....4
2. Hind femur with trochantellus whitish yellow (basal end of femur); vertex (Fig.27) with a short median sulcus; peripeciolar depression with 4 deep smooth irregular pits (Fig.30); length of terebra 3x combined length of postpetiolar segments ..... *P. PICROCARPUSI* Narendran and Sheeba sp.nov.
- Hind femur with trochantellus (or basal end of femur) not whitish yellow, concolorous with femur or trochanter; vertex not as above; peripeciolar depression different; terebra distinctly longer than 3.5x combined length of postpetiolar segments..... 3
3. Anterior two-thirds of preanular part of pronotum (Fig.3) cross carinate; hind coxa 0.6x length of petiole; frons below anterior tooth reticulate-punctate with cross carinae (Fig.1) below; POL 8.5x OOL ....*P. ZONIOTUS* Narendren sp.nov.
- Preanular part of pronotum cross reticulate-striate (Fig.22); hind coxa 0.53x length of petiole; frons (Fig.20) strongly cross striate from base of posterior tooth to toruli; POL 10x OOL .....*P. GADAGKARI* Narendran and Santhosh sp.nov.
4. Body mainly yellowish brown or pale brownish yellow..... 5
- Body mainly black 6
5. Vertex and occiput obsoletely transaciculate; petiole finely rugose and shorter than combined length of postpetiolar segments; second flagellar segments scarcely 1.5x as long as first segment..... ..... *P. PYGMAEUS* Enderlein
- Vertex (Fig. 14) with two interocellar cross carinae, followed by punctate area and several cross cairnae divided by a median sulcus, post vertex smooth and shiny; petiole as long as combined length of post petiolar segments; second flagellar segments 1.25x as long as first .... *P. ZANDANUS* Narendran and Girish Kumar sp. nov.
6. Terebra slightly shorter than body; vertex with a very conspicuous cross

carina behind which the head is carinate rugose, becoming trans-striate towards strongly bordered posterior margin .....
.....*P. DAMELLICUS* Westwood.

- Terebra as long as body or longer than body; vertex not exactly as above 7

7. Petiole distinctly shorter than combined length of post-petiolar segments; vertex with 9 cross carinae (Fig.7) and a median groove .....
.....*P. EUPHORBIAE* Narendran and Sudheer sp.nov.

- Petiole as long as combined length of postpetiolar segments; vertex not as above..... 8

8. Stigma black; vertex arcuate striate; propodeum smooth with large diffused punctures ..... *P. MALAYANUS* Cameron

- Stigma brzown; vertex post vertex trans-rugose; propodeum coarsely and reticulately rugose .....
.....*P. RUBRIPICTUS* Elliott

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Record of three new species of Eulophidae (Hymenoptera: Chalcidoidea) along with a new report of genus *Necremnoides Girault* from Indian subcontinent

T.C. Narendran*, P. Girish Kumar and S. Santhosh

Systematic Entomology Laboratory, Department of Zoology, University of Calicut, Kerala - 673 635, India

ABSTRACT

Three new species of Eulophidae belonging to three different genera viz. *Necremnoides harithodaris* Narendran sp. nov., *Diglyphomorphomyia kairali* Narendran and Girish Kumar sp. nov., *Pediobius kalpetticus* Narendran and Santhosh sp. nov. are described. The genus *Necremnoides* Girault is reported for the first time from India Subcontinent. *Diglyphomorphomyia kairali* sp. nov. differs from all other species in having a forked propodeal carina; *Pediobius kalpetticus* sp. nov. differs from its nearest relative *P. sorror* Kerrich in having different proportion of antennal segments, long ovipositor sheath and without bronze reflections.

The genus *Necremnoides* was raised by Girault (1913) based on the type species *Necremnoides tricarinatus* Girault from Queensland, Australia. Later the same author (Girault, 1915) described another species *Necremnoides fiilvipropodeum* from Queensland. In this paper a new species of the genus is described which is the first report from India. The *Diglyphomorphomyia* was raised by Girault (1913). So far only one species *of Diglyphomorphomyia* is known from India viz. *Diglyphomorphomyia rufescens* (Motschulsky). In addition two undescribed species are discovered from Kerala by Narendran *et al.* (2005). A third species that is new to science is described here below. The genus *Pediobius* is represented by 26 species from India (Noyes, 2004.). In this paper an interesting new species with a long ovipositor sheath is described. The types of new species described here are deposited in the Narendran Collection of the Systematic Entomology Laboratory of DZUC, but eventually will be transferred to ZSIC.

MATERIALS AND METHODS

The specimens were collected using sweep net and curated as described by Narendran (2001). The specimens were card mounted and held by Asta Insect pins of size 3 made by Newy Goodman Ltd, England. The card-mounted specimens were studied under Leica M6 Stereo zoom Microscope (Switzerland made) and the drawings were made using the drawing tube of the Leica microscope. The drawings were enlarged to appropriate size using the KB emarger of model B2M.

RESULTS AND DISCUSSION

1. *Necremnoides harithodaris* Narendran sp. nov.

Female: Length: 1.45 mm. Head dark brown with lower face pale yellowish brown; ocelli yellowish brown; eye dark brown with pale yellow margin. Antenna brown with scape and F1 pale brownish yellow. Mesosoma yellowish brown; legs pale yellow; gaster dark metallic green. Wings hyaline, veins pale brown with stalk of stigmal vein paler. Pubescence on head and body yellowish white with stronger setae on mesosoma darker.

Head: Width 1.27x its length in anterior view; width in dorsal view (68:23) a little more than 2.95x its median length; vertex transversely reticulate; occipital carina present; eyes pilose; maximum diameter of eye in profile a little over 3.5x (32:9) length of malar space; distance between toruli to anterior ocellus 3.2x distance between toruli to lower mouth margin; scrobe margin ecarinate. POL 1.5x OOL; malar

*E-mail: drtcnarendran@yahoo.com

groove distinct. Relative length: width of antennal segments, scape = 23:5; pedicel =16:6; F1 = 19:10; F2 = 11:8; F3 = 16:8; F4 = 12:9; clava= 23:7.

Mesosoma: Pronotum without transverse carina; notauli a little curved and convergent towards posterior side, ending at inner angles of axilla; midlobe of mesoscutum not protruding backwards; mesoscutum with 2 pairs of setae, distinctly punctate, interstices narrow and smooth, ecarinate; axilla with anterior margin in line with scutoscutellar suture, weakly reticulate; scutellum length a trifle longer or subequal to mesoscutum; with distinct close pits, interstices weakly reticulate, ecarinate, with 2 pairs of strong setae, sublateral grooves shallow, hardly join each other posteriorly. Propodeum with median carina forked at base; plicae distinct (Fig. 4); costula arising from plica join side margin; propodeum with 5-6 setae on side margin. Forewing hyaline, length 2.42x its maximum width; speculum present and closed posteriorly by cubital line of setae. Relative length of forewing veins: SMV = 41; MV = 60; PMV = 15; STV = 17.

Gaster: Distinctly longer than mesosoma, ovate; T1 with a basal fovea, with long pubescence from second tergite to apex of gaster, weakly granulate-reticulate as in figure 6; one cereal seta longer than remaining setae on either side.

Male: Similar to female except in the following features: gaster distinctly shorter than mesosoma; gaster black with T1 yellow; funicular segments subequal in length except F4, which is shorter than remaining ones.

Host: Unknown.

Etymology: Arbitrary combination of letters.

Material examined: Holotype: Female, Kozhikode district, Nanminda (75° 48'E 11° 25'N) coll. T.C. Narendran and Party, 14.ii.2004 (DZUC). Paratype: Male, same data of Holotype (DZUC).

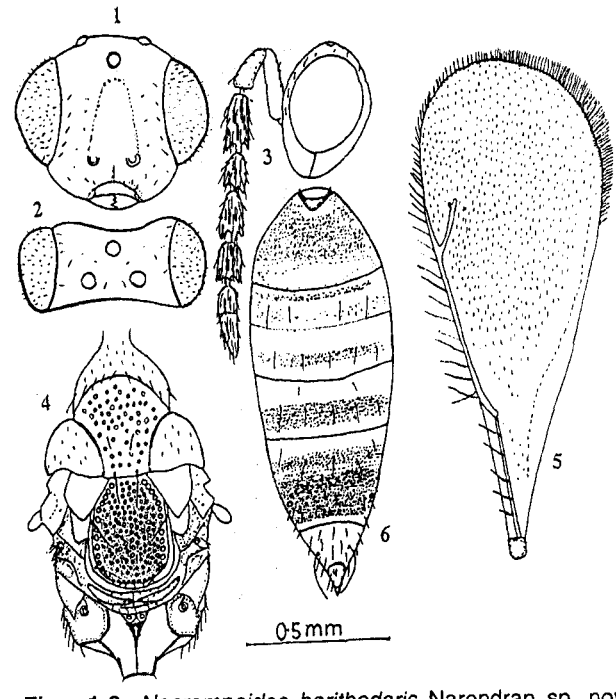
Discussion: This is the first record of the genus *Necremnoides* Girault from Indian Subcontinent (Oriental Region). There are only 2 species so far recorded under this genus.

Australian species *Necremnoides tricarinatus* Girault (Girault, 1913) differs from this species in having:

1. pedicel shorter than any of the funicular segments (not so in *Necremnoides harithodaris* sp.nov.);
2. F2 to F4 gradually shortening (not so in *Necremnoides harithodaris* sp.nov);
3. MV about equal to SMV or a little longer (in *Necremnoides harithodaris* sp.nov MV 1.46x length of SMV) and
4. body olive green (in *Necremnoides harithodaris* sp.nov mesosoma yellowish brown).

The second species *Necremnoides fulvipropodeum* sp.nov. differs from *Necremnoides harithodaris* in having:

1. pedicel not quite as long as F4 (in *Necremnoides harithodaris* sp.nov. pedicel distinctly longer than F4 [16:12]);
2. gaster with a short petiole (in *Necremnoides harithodaris* sp.nov. gaster without a petiole) and
3. mesosoma predominantly dark metallic green except propodeum; postscutellum and petiole chestnut brown (in *Necremnoides harithodaris* sp.nov mesosoma yellowish brown completely)



Figs. 1-6. *Necremnoides harithodaris* Narendran sp. nov. Female: 1. Head in anterior view; 2. Head in dorsal view; 3. Head and antenna in profile; 4. Mesosoma in dorsal view; 5. Forewing; 6. Gaster in dorsal view.

2. *Diglyphomorphomyia kairali* Narendran and Girish Kumar sp.nov. (Figs. 7-9)

Female: Length: 2.25 mm. Pale brownish yellow; eyes brownish black with margin paler, ocelli black; antenna brownish black with scape and pedicel pale brownish yellow; median part of metanotum, median propodeal carina, brownish black; gaster with black patches on sides and middle of second, third and fourth tergites. Wings hyaline with infuscation a little distance below stigmal vein (Fig. 8) Pubescence pale brown with stronger setae on mesosoma darker.

Head: Width in anterior view (70:53) 1.32x its length; width in dorsal view (68:20) 3.4x its median dorsal length. Vertex rugosoreticulate; eyes pilose; occipital carina present; distance between toruli to anterior ocellus 3.8x distance between toruli to mouth margin; scrobe margin ecarinate. POL 1.85x OOL; maximum diameter of eye in profile 2.2x malar space; malar groove distinct. Relative length: width of antennal segments; scape = 30:5; pedicel = 116; F1 = 19:7; F2 = 10:9; F3 = 10:9; F4 == 9:9; clava * 18:8.

Mesosoma: Pronotum without transverse carina; notauli a little curved, convergent towards posterior side, ending at outer angles of axilla; midlobe of mesoscutum not protruding markedly posteriorly, with 3 pairs of strong setae, distinctly punctate, interstices narrow and smooth, ecarinate; axilla with anterior margin in line with scutellar suture, finely reticulate; scutellum 1.24x as long as mesoscutum, with distinct close pits, interstices narrow and smooth, ecarinate without additional setae except two pairs of strong setae; sublateral grooves of scutellum pitted and joins each other posteriorly. Propodeum (Fig. 8) with a median carina which becomes divided and forked at the proximal half (anterior half) and with a raised lamina at base; plicae and costulae distinct; propodeal neck distinct; space between plicae and median carina mostly smooth, faintly reticulate; each lateral margin of propodeum with 4-5 setae. Forewing hyaline with brown infuscation a little distance below stigmal vein (Fig. 8); length of forewing 3.15x its maximum width; speculum sparsely setose, closed behind with cubital line of setae. Relative length of SMV = 45; MV = 49; PMV = 19; STV = 15. Cubital vein straight at base.

Gaster: As long as mesosoma or subequal to mesosoma; ovate. T1 largest, a little shorter than half-length of gaster; one cercal seta slightly longer than other setae.

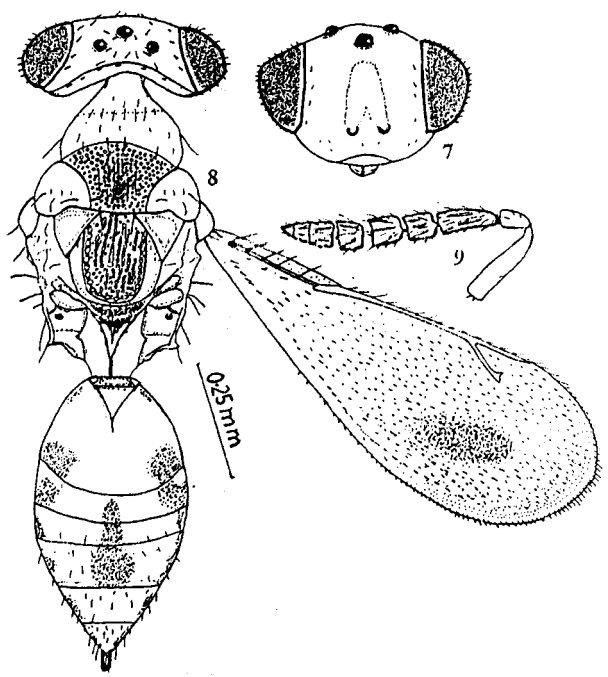
Male: Similar to female except the following: gaster distinctly shorter than mesosoma, black with T1 yellow.

Host: Unknown.

Material examined: Holotype: Female, INDIA: Kerala, Kannur district, Kottiyoor forests (75° 55' E 11° 52' N), 17.ii.2003, coll. T.C. Narendran and party. Paratype: 1 Female of same data of holotype except date 19.ii.2003; 1 Female, Kerala, Malappuram district, Calicut University Campus (75° 52' E 11° 7' N), 20.iv.2001, coll. T.C. Narendran and party. All specimens at DZUC.

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

Discussion: This species differs from all other species of *Diglyphomorphomyia* in having proximally forked median carina of propodeum.



Figs. 7-9. *Diglyphomorphomyia kairali* Narendran and Girish Kumar sp. nov. Female: 7. Head in anterior view; 8. Body profile dorsal view; 9 Antenna.

3. *Pediobius kalpetticus* Narendran and Santhosh sp.nov. (Figs. 10-14)

Female: Length: 3.4 mm. Head and mesosoma metallic blue with violet and green tints; eye black; ocelli pale reflecting yellow; antenna black with scape pale yellow; gaster black with T1 metallic green with violet tint on three fourths from the base. Wings hyaline, with veins and pilosity pale yellow on head and mesosoma, pilosity of caudal region dirty white. Legs yellow with hind coxa concolourous with mesosoma except pale apex; mid coxa slightly brownish yellow.

Head: Width seen from above, 3x its median length; width in anterior view 1.41x its length; ocelli relatively large, having fine keels running back from ocellus and side ways from each lateral ocellus (Fig. 12); vertex mostly smooth and shiny; frontal fork running upwards and bending and reaching vertex (Figs. 10 and 12); area above frontal fork mostly smooth and shiny, area below frontal fork reticulate (Fig. 10); eyes rather finely and sparsely hairy. POL equal to OOL; maximum diameter of eye in profile 4x length of malar space; malar space depressed and slightly concave; malar groove indistinct; distance between front ocellus and toruli 3.55x distance between toruli and mouth margin. Antenna with scape 5x as long as its breadth. Relative length: width of antennal segments: scape = 35:7; pedicel = 14:8; F1 = 20:10; F2 = 20:9; F3 =21:8; clava = 30:7.

Mesosoma: Pronotum with lateral angles prominent, posterior margin slightly emarginate; notauli fine and sharply impressed and as in figure 12; notaular pits broad smooth with a seta on its inner margin on either side, outer margin not broadened; midlobe of mesoscutum reticulate, scapula finely striate reticulate; scutellum distinctly pitted (Fig. 12), longer than mesoscutum, its maximum width subequal to its length. Propodeum with median carina diverging at posterior end; plicae distinct, spiracular area with a blunt tooth on either side; nucha shiny, well rounded at apex. Hind tibial spur straight reaching well beyond apex of metatarsus. Forewing length about 7x its maximum width, speculum closed behind by cubital line of setae. Relative measurement of length of following veins: SMV = 40; MV = 60; PMV = 10; STV = 6.

Gaster: Petiolate; petiole broader than long (4:3), reticulate, anterior margin strongly raised. T1 largest, less than half as long as gaster, smooth and shiny; remaining tergites as in figure 12, well pubescent with relatively long hairs (Figs. 12 and 14). Ovipositor sheath long, 2.42x as long as epipygium in dorsal view.

Male: Unknown.

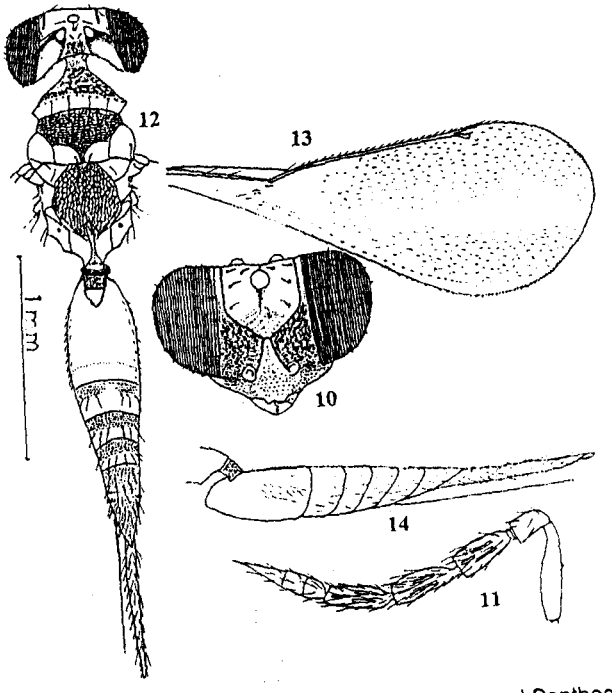
Host: Unknown.

Material examined: Holotype: Female, INDIA: Kerala. Wayanad district, Kalpetta, Thonikadavu (76° 5' E 11° 37' N) 7.ii.2003, coll. T.C. Narendran and party (DZUC).

Etymology: The species is named after its locality of collection, Kalpetta.

Discussion: This comes near *Pediobius sorror* Kerrich (Kerrich, 1973) in the key to Southern Asiatic and Australian species but *Pediobius sorror* differs from *Pediobius kalpetticus* sp.nov. in having:

1. scape 7x as long as broad (in *Pediobius kalpetticus* sp.nov.scape only 5x as long as broad);



Figs. 10-14. *Pediobius kalpetticus* Narendran and Santhosh sp. nov. *Female:* 10. Head in anterior view; 11. Antenna; 12. Dorsal view; 13. Forewing; 14. Gaster in lateral view.

2. all funicular segments nearly 2x as long as its width (not so in *P. kalpetticus* sp.nov.)
3. notaular pits dull bronzy longitudinal impressions (in *P. kalpetticus* sp.nov. notaular pits are smooth and shiny);
4. scutellum longitudinally striate in anterior half (distinctly pitted in *P. kalpetticus* sp.nov.);
5. frontovetex mostly red-violet (in *P. kalpetticus* sp. nov. frontovertex mostly bluish violet or greenish violet);
6. scape and pedicel strongly blue-green (in *P. kalpetticus* sp.nov. scape pale yellow and pedicel black) and
7. legs greater part blue-green (in *P. kalpetticus* sp.nov. legs greater part yellow).

ACKNOWLEDGEMENTS

We are grateful to the Ministry of Environment and Forests, New Delhi for financial assistance for this research. We thank Dr. John LaSalle, CSIRO, Australia for sending some useful reprints of research publications. We also thank the authorities of the University of Calicut for basic facilities.

Abbreviations used

F1 to F4 = Funicular segments 1 to 4; OOL = Ocellocular distance; POL = Postocellar distance; T1 = 1st tergite; SMV = Submarginal vein; MV = marginal vein; PMV =post marginal vein; STV = stigmal vein; DZUC = Department of Zoology of University of Calicut. ZSIC = Western Ghats Regional Station of Zoological Survey of India, Calicut.

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(Accepted : March 25, 2005)

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A STUDY ON THE TAXONOMY OF *DIGLYPHOMORPHOMYIA* GIRAULT (HYMENOPTERA : EULOPHIDAE) OF INDIA

T.C. Narendran, P. Girish Kumar, S. Santhosh and P.A. Sinu,
Systematic Entomology Laboratory, Department of Zoology, University of Calicut,
Kerala-673 635, India

E-mail: drtcnarendran@yahoo.com

ABSTRACT : The genus *Diglyphomorphomyia* Girault is represented by four species in India. They are *D. rufescens* (Motschulsky), *D. nexius* (Narendran), *D. nigra* Narendran sp.nov. and *D. sringeriensis* Narendran sp.nov. *D. nexius* is transferred to *Diglyphomorphomyia* from *Elachertus* as comb.nov. and commented on. A key to Indian species is also provided.

KEY WORDS : Taxonomy, *Diglyphomorphomyia*

INTRODUCTION

Girault[1] raised the genus *Diglyphomorphomyia* based on the type species *Diglyphomorphomyia nigriscutellum* Girault from Queensland, Australia. He also described two other species from Australia under the names *Sympiesomorphelleus albiclava* and *S.specimenipennis*[2]. Long before Girault discovered this genus *Diglyphomorphomyia* in 1913, Motschulsky[3] described a species of this genus under the name *Cheiloneurus rufescens* (Encyrtidae) in 1863 from Sri Lanka. Later Boucek[4] transferred these three species to *Diglyphomorphomyia.* So far only *D.rufescens* is known from India. In this paper two more species which are undescribed are reported and described from India. The types of new species described here are deposited in the Narendran Collection of the Systematic Entomology Laboratory of DZUC, but eventually will be transferred to ZSIC.

MATERIALS AND METHODS

The specimens for this study were collected by using sweepnet as mentioned by Narendran[6]. *D.sringeriensis* was collected by using pit-fall trap. Observations in the laboratory were carried using Leica M6 Stereozoom microscope (Switzerland made). The figures were drawn using the drawing tube of Leica microscope. The specimens were card mounted and held by Asta Insect pins of size 3 made by Newy Goodman Ltd., England.

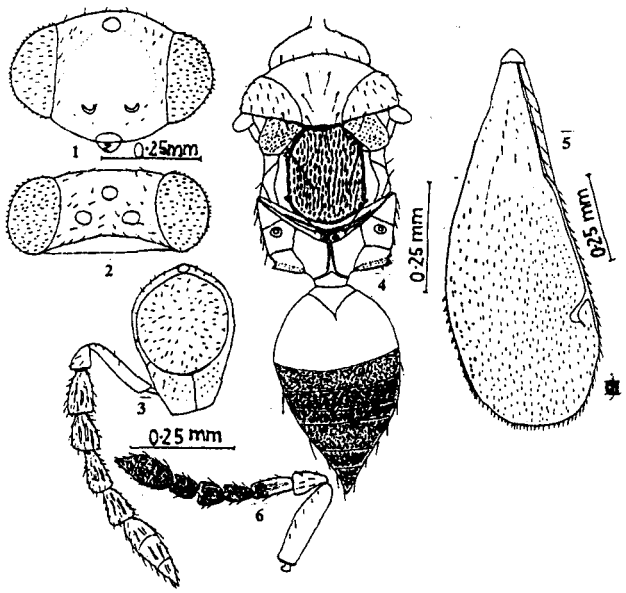
Abbreviations used : F1 to F4 = Funicular segments 1 to 4; OOL = Ocellocular distance; POL = Postocellar distance; SMV = Submarginal vein; MV = Marginal vein; PMV = Postmarginal vein; STV = Stigmal vein; DZUC = Department of Zoology of University of Calicut; ZSIC = Western Ghats Regional Station of Zoological Survey of India, Calicut

RESULTS AND DISCUSSION

1. *Diglyphomorphomyia nigra* Narendran sp.nov. (Figs. 1-6)

Male : Length : 1.4mm; Forewing length : 1.09mm; Black; eye yellowish grey; ocelli pale reflecting yellow; scape pale brownish yellow; pedicel brown; flagellum dark brown; legs pale yellow; setae pale yellow.

Head : width 1.39x its length in anterior view; width in dorsal view 2.4x its median dorsal length; vertex transversely reticulate; eyes pilose; occipital carina present; distance between toruli and anterior ocellus 2.8x distance between toruli and mouth margin; scrobe ecarinate;



Figs. 1 to 6 : *Diglyphomorphomyia nigra* Narendran sp. nov.

Male : 1. head in anterior view; 2. head in dorsal view; 3. head and antenna profile; 4. mesosoma and gaster in dorsal view; 5. forewing; 6. female antenna

POL 2x OOL; maximum diameter of eye in profile a little over 2.6x length of malar space; malar groove distinct. Relative length: width of antennal segments: scape = 24:5; pedicel = 10:8; Fl == 17:10; F2 = 14:1 I; F3 = 16:9; F4= 14:10; clava= 32:10.

Mesosoma : Pronotum without transverse carina; notauli curved, convergent towards posterior side (Fig. 4); midlobe of mesoscutum not protruding markedly backwards, with 3 pairs of strong setae, distinctly reticulate punctate; interstices narrow and somewhat carinate irregularly; axilla with anterior margin in line with scutoscutellar suture, finely reticulate; scutellum a little longer than mesoscutum (37:31), with longitudinally arranged longitudinal pits as in figure 4; interstices narrow, somewhat carinate longitudinally, with 2 pairs of setae; sublateral grooves of scutellum pitted and join each other posteriorly. Propodeum with a median carina bifurcating posteriorly, anteriorly meeting a perpendicular lamina, containing two dorsal pits; plicae distinct with a transverse carina joining outer margin; another transverse carina present anterior to spiracle; propodeal neck distinct but relatively shorter than that of *sringeriensis;* space between plicae and median carina smooth and shiny, margin of propodeam with 4-5 setae. Forewing hyaline, its length 2.64x its maximum width, densely pilose; speculum present, closed posteriorly by cubital line of setae. SMV with 5-6 dorsal setae. Relative length of fore wing veins: SMV -45; MV-45; PMV - 15; STV - 10; cubital vein straight at base

Gaster : A little shorter than mesosoma (6:8), ovate; Tl 0.4x length of gaster.

Female : Length 1.52mm. Similar to male except in the following characters:Antenna as in figure 6; gaster longer than mesosoma, basal yellow colour less pronounced than that of female; ovipositor sheath 0.8x length of gaster; ovipositor not exerted.

Host : Unknown.

Material examined : Holotype : Male, INDIA : Kerala, Calicut University Campus (75° 52' E 11° 7' N), 3.xii.2002. coll. T.C.Narendran & party (DZUC). Paratype: 1 Male, of same data of holotype except coll. Date 16.ix.2002.(ZSIC) 1 female, Kerala, Vazhani forest, 3.vii.2003., coll. T.C. Narendran & party (DZUC).

Distribution : INDIA : Kerala, Malappuram and Trichur Districts.

Etymology : The species name denotes the black colour of the body.

Discussion : This new species differs from the other Indian species in having:

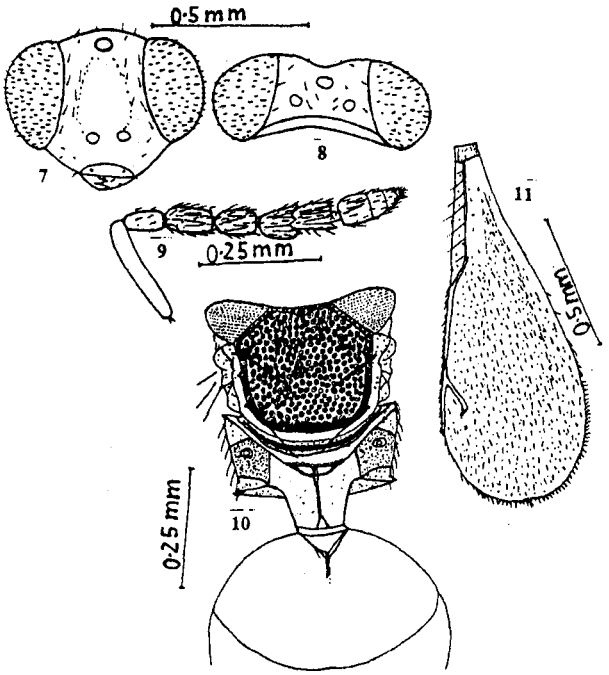
1. Scutellum with longitudinally arranged pits (Fig. 4).
2. Speculum present
3. Head, mesosoma and metasoma black (except Tl with yellow colour partly).

It resembles the Australian species *D.nigriscutellum* Girault in having scutellum

black but *D.nigriscutellum* differs from *nigra* in having:

1. head and mesoscutum blood red (head and mesoscutum black in *D. nigra);*
2. gaster yellowish brown with black patches (gaster black with yellow colour in Tl in male, slightly in female);
3. F4 as long as pedicel (F4 shorter than pedicel in *D. nigra)* and
4. scutellum with scattered pin punctures on the disc (in *D.nigra* scutellum with close longitudinally arranged pits).

2. Diglyphomorphomyia sringeriensis Narendran sp.nov.



Figs. 7 to 11 : *Diglyphomorphomyia sringeriensis* Narendran sp. nov.

Female : 7. head in anteriopr view; 8. head in dorsal view; 9. antenna; 10. scutellum, propodeum and parts of Tl in dorsal view; 11. forewing

Female : Length: 1.9mm. Forewing: length: 1.31mm. Head and mesosoma brown; eyes yellowish brown; ocelli reflecting pale yellow; antenna pale yellow; setae. pale brownish yellow (reflecting golden yellow at certain angles); legs and gaster yellow.

Head : 1.23x as wide as its length (69:56) in anterior view; width in dorsal view 3.57x its median length. Vertex finely reticulate; eyes pilose; occipital carina present; distance between toruli to anterior ocellus 3x distance between toruli to mouth margin; scrobe ecarinate. POL 2.8x OOL; maximum diameter of eye in profile 2.75x malar space; malar groove distinct. Relative length: width of antennal segments: scape 39:6; pedicel 14:7; Fl = 16:9; F2 = 15:9; F3 = 14:10; F4 =14:10; clava 24:10.

Mesosoma : Pronotum without transverse carina; notauli a little curved, convergent towards posterior side, ending at outer angle of axilla; mid lobe of mesoscutum not protruding markedly posteriorly, with three pairs of strong setae, distinctly punctate, interstices narrow and smooth, ecarinate; axilla with anterior margin in line with scutellar suture, finely reticulate; scutellum a little longer than mesoscutum (16:13) with distinct close pits (fig.9), interstices narrow and smooth, ecarinate without additional setae except two pairs of strong setae; sublateral grooves of scutellum pitted and joins each other posteriorly. Propodeum with a median carina which meets anterior margin with a raised conspicuous perpendicular lamina containing two pits; plicae distinct with a transverse carina joining outer margin; another transverse carina distinct anterior to spiracle; propodeal neck distinct, space between plicae and median carina mostly smooth, faintly reticulate; each lateral margin of propodeum with 7-8 setae. Forewing (fig. 11) hyaline, 2.44x as long as its maximum width, densely pilose, speculum absent, SMV with 6-7 dorsal setae. Relative length of SMV=33; MV=35; PMV=18; STV=12; cubital vein straight at base.

Gaster : A little longer than mesosoma (11:9), ovate; Tl a little less than half length of gaster(17:21); one circle seta longer than remaining ones on either side; exserted part of

ovipositor 0.38x as long as gaster.

Male : Unknown.

Host : Unknown.

Material examined : Holotype: Female, INDIA: Karnataka, Sringeri (75° 15 'E 13°29'N). 5.v.200. coll.P.A.Sinu (ZSIC)

Distribution : INDIA: Kamataka, Sringeri.

Etymology : The species name is after the locality of collection.

Discussion : The new species resembles *Diglyphomorphomyia rufescens* (Motschulsky) and *D. nexius* (Narendran) in having somewhat similar sculpture of mesoscutum. *D. rufescens* differs from this new species in having:

1. Fl length 1,45x length of F2 (in *D.sringeriensis* Fl sub equal in length to F2);
2. F4 sub equal to F3 (in *D.sringeriensis* F4 subequal in length to F3);
3. postocciput distinctly reticulate (not so in *D.sringeriensis);*
4. forewing with infumation near middle (without infumation in *D.sringeriensis);*
5. Tl with a median shallow groove extending from basal fovea to near distal margin (in *D. sringeriensis* the groove does not reach near middle from basal fovea);
6. mesosomal setae blackish-brown in all lightings (in *D.sringeriensis* mesosomal setae look golden brown in certain angle of light);
7. gaster with blackish patches and yellowish-brown (in *D.sringeriensis* gaster completely yellow) and
8. propodeum distinctly reticulate (in *D. sringeriensis* propodeum smooth and *shiny). D.nexius* can be easily separated from *D. sringeriensis* by using the key given in this paper.

3. ***Diglyphomorphomyia rufescens*** (Motschuisky) (Figs. 12-18)

Cheiloneurus rufescens Motschulsky 1863. *Bull. Soc. Imp. Nat. Moscou,* 36 (3) : 53

Comys rufescens (Motschulsky), Howard (1896) *Proc. U.S. Nat. Mus.,* 18:640.

Diglymomorphyia rufescens (Motschulsky), Boucek, 1988, Australasian Chalcidoidea, CAB International, Wallingford, 649.

Redescription :

Female : Length: 2.21mm. Rufotestaceous; scape, apical half of F4 and clava pale yellow; eyes dark reddish-brown with margins paler; setae brownish-black; gaster pale brownish yellow with sides and middle part black as in figure 18; last tergite and ovipositor sheath black; legs pale yellow.

Head : width (fig. 13) 1.2x its length in anterior view; 4x its median length in dorsal view (fig. 13); vertex reticulate; occiput distinctly granulo-reticulate (fig. 16); occipital carina present; eyes pilose; maximum diameter of eye in profile 4.5x malar space; distance between toruli to anterior ocellus 2.17x distance between toruli and lower mouth margin; scrobe ecarinate. POL 3.2x OOL; malar groove distinct, maximum diameter of eye in profile 4.5x malar space. Relative length: width of antennal segments: scape 33:6; pedicel 12:15; Fl = 17:5.1; F2 = 11:7; F3 = 12:8; F4 =10:8;clava 19:11.

Mesosoma : Pronotum without transverse carina; notauli a little curved and convergent towards posterior side, ending at inner angles of axilla; mid lobe of mesoscutum not protruding markedly backwards, with three pairs of strong setae, distinctly punctate, interstices narrow and smooth, ecarinate; axilla with anterior margin

in line with scuto-scutellar suture, distinctly reticulate; scutellum longer than mesoscutum (45:35) with distinct deep pits and a median pit like depression, interstices smooth, narrow and ecarinate with two pairs of setae; sub-lateral grooves deeply pitted and join each other posteriorly. Propodeum (fig. 16) with median carina and plicae, a transverse carina running from posterior part of each plica to outer margin of propodeum; spiracle with a transverse carina anteriorly; propodeum with 6-7 setae on lateral margin. Forewing hyaline with brown infuscation posterior to STV (fig. 17); speculum absent; cubital line of setae straight from base; forewing length about 3x its maximum width. Relative lengths of veins: SMV = 42; MV = 42; PMV = 15; STV = 12.

Gaster : As long as mesosoma, ovate; T1 0.31x length of gaster; basal fovea narrowing to median groove reaching posterior margin; one cercal seta on either side more than 2x length of the remaining seta; ovipositor sheath exserted.

Male : Unknown.

Host : Unknown.

Material examined : I female, INDIA: North Kerala, Thamarasseri (75°52'E 11°25'N), 18.ix.2003. coll. Sabu K. Thomas (DZUC).

Distribution : INDIA: Kerala, Calicut District.

Discussion : This species can be separated from all other Indian species using the key given in this paper. The Australian species *D.specimenipennis* Girault resembles *D. rufescens* in having somewhat similar colour of gaster. However, it differs from *D. rufescens* in having:

1) F3 shorter than F2 (not so in *D. rufescens*);
2) mesoscutum and scutellum reticulo-punctate (in *D. rufescens mesoscutum* and scutellum deeply and closely punctate without any reticulation);
3) general body colour orange yellow with apex of scutellum faded lemon yellow (general body colour rufotestaceous including apex of scutellum in *D. rufescens*); and
4) F1 and F2 yellowish white (F1 and F2 black in *D. rufescens*).

4. *Diglyphomorphomyia nexius* (Narendran) comb.nov.

Elachertus (Neoelachertus) nexius Narendran, 2004.*Rec.Zool.surv.* India.

Diagnosis : Female. 1.83mm. Similar to *D. rufescens* (Motschulsky) except for the following: Head and mesosoma pale brownish yellow; F2 and F3 (in some cases F4 also) black; F1 subequal to F2; clava 2.5x as long as preceding segment; sublateral grooves hardly distinct at posterior margin. The Australian species *Diglyphomorphomyia albiclava* Girault resembles *D.nexius* in the general colour of the body but differs from *D.nexius* in having:

1) Forewing slightly stained with pale yellow;
2) F4 as long as pedicel; and
3) scutellum with a few pin punctures (in *D.nexius* scutellum with close large pits).

Girault[2] states that T2 of *D.albiclava* occupy a third of gaster. *Diglyphomorphomyia specimenipennis* also resembles *Diglyphomorphomyia nexius* in general colour but differs from *D.nexius* in having:F3-F4 black; first segment of clava subequal to pedicel in length and 3) F1 nearly as long as clava.

The subgenus *Neoelachertus* is a new junior synonym of *Diglyphomorphomyia* Girault (syn.nov.).

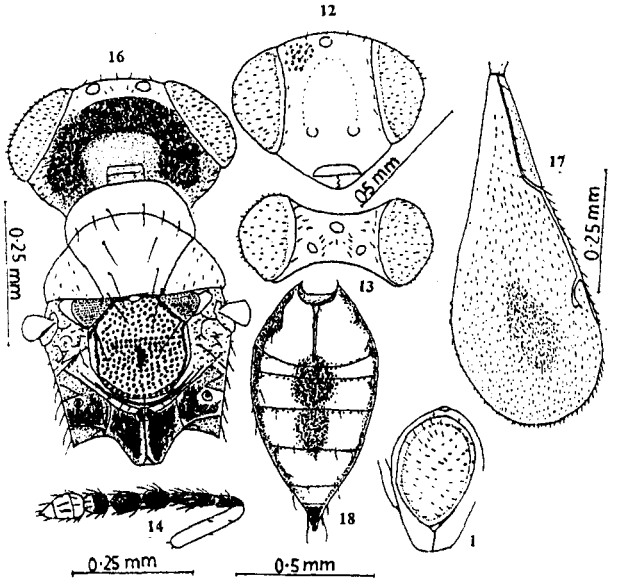
Male : Unknown

Host : Unknown

Material examined : Apart from Holoytype of *D. nexius,* 1 female: INDIA: Kerala, Thiruvananthapuram, Mannamkonam 76° 56'E 8° 30'N, 16.iv.2003, coll. T C

Narendran and Party (DZUC). 1 female: South Kerala, Idukki, Vandiperiyar 77° 5'E 9°35'N, 8.i.2004. coll T.C.Narendran and party (DZUC)

Distribution: INDIA, Kerala: Kannur, Thiruvananthapuram and Idukki districts.



Figs. 8 to 18 : *Diglyphomorphomyia rufescens* (Motschulsky)

Female : 12. head in anterior view; 13. head in dorsal view; 14. antenna; 15. head inprofile; 16. head and mesosoma in dorsal view; 17. fore wing; 18. gaster

KEY TO INDIAN SPECIES OF *DIGLYPHOMORPHOMYIA* GIRAULT

1. Head, mesosoma and metasoma black with T1 partly or completely pale yellow; mesoscutum and scutellum (fig.4) with longitudinally arranged close pits; fore wing with speculum present
   _____ *D.nigra* Narendran sp.nov.
   - Head, mesosoma and metasoma not black; sculpture of mesoscutum and scutellum not as above; forewing with speculum absent___2
2. Gaster completely yellow without any black markings; median groove of T1 not reaching posterior margin; forewing with pale yellow veins and pilosity without infuscation below STV; antenna completely pale yellow
   _____ *D.sringeriensis* Narendran sp.nov.
   - Gaster not completely yellow, with black patches on lateral margins and middle; median groove of T1 may or may not reach posterior margin; forewing with brown infuscation below STV_____3
3. Head and mesosoma reddish brown; F1 a little shorter than 1.6x F2; clava 1.9x as long as preceding segment; pedicel and funicle mostly black; lateral grooves of scutellum meet at posterior margin.
   _____ *D. rufescens* (Motschulsky)
   - Head and mesosoma pale brownish yellow; F1 subequal in length to F2; clava 2.5x as long as preceding segment; only F2 and F3 and in some cases F4 black, other segments pale brownish yellow; lateral grooves of scutellum hardly meet at posterior margin
   _____ *D.nexius* (Narendran)

ACKNOWLEDGEMENTS

We are grateful to Ministry of Environment and Forests, New Delhi for financial assistance. We are also grateful to the authorities of the University of Calicut for facilities.

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TWO NEW SPECIES OF TETRASTICHINAE (HYMENOPTERA: EULOPHIDAE) FROM BORNEO

T. C. Narendran, P. Girish Kumar and Lambert Kishore*

Systematic Entomology Lab, Dept. of Zoology, University of Calicut, Calicut - 673 635, India.
*Department of Zoology, Malabar Christian College, Calicut - 673 001, India.

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ABSTRACT - Two new species of Tetrastichinae viz. *Tetrastichus bellus* Narendran & Girish sp. nov. and *Mischotetrastichus borneichus* Narendran & Lambert sp. nov. are described and differences from related species are given.

Keywords: Hymenoptera, Eulophidae, Tetrastichinae, *Tetrastichus, Mischotetrastichus*, new species, Borneo.

INTRODUCTION

In our studies on the taxonomy of Oriental Eulophidae, we came across two interesting new species of *Tetrastichinae viz. Tetrastichus bellus* Narendran & Girish sp. nov. and *Mischotetrastichus borneichus* Narendran & Lambert sp. nov. from Borneo. These new taxa do not fit to any of the taxa of Tetrastichinae listed by Noyes (2005).

MATERIALS AND METHODS

The card mounted specimens were studied under Leica M6 Stereozoom Microscope (Switzerland made) and the drawings were made using the drawing tube of the Leica Microscope. The drawings were enlarged to appropriate size using the KB enlarger of model B2M.

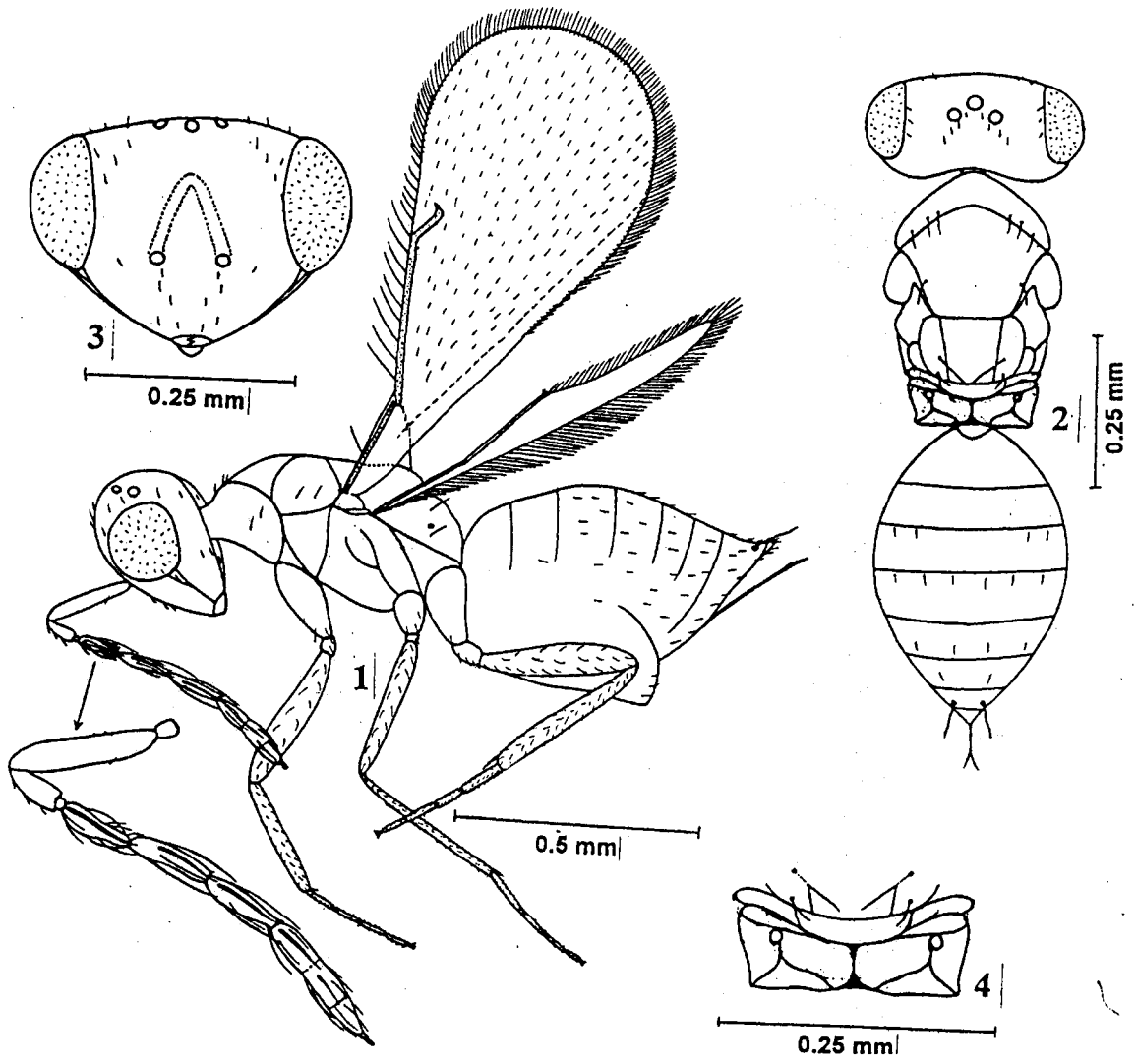
Abbreviations used : F1 to F3 = Funicular segments 1 to 3; MV = Marginal vein; OOL = Ocellocular distance; PMV = Postmarginal vein; POL = Postocellar distance; SMV = Submarginal vein; STV = Stigmal vein; UCDC = Bohart Museum, University of California, USA.

RESULTS AND DISCUSSION

1. *Tetrastichus bellus* Narendran & Girish sp. nov. (Figs.1-4)

***Holotype*:** Female: Length 1.38mm. Body immaculate whitish yellow, delicate; antenna with scape brownish yellow except at base brown, remaining parts brown; eye pale red; ocelli reflecting yellowish brown; mandible brown; ovipositor brown; wings hyaline with veins pale yellowish brown.

Head: Head width in anterior view 1.37x its length (excluding mandibles); width in dorsal view 2.21x its maximum length; temple broad; tentorial pits indistinct; clypeogenal sulcus not complete, present near to lower clypeal margin; lower clypeal margin entire, not emarginated; mandible tridentate; scrobal depression deep forming a groove not reaching median ocellus (Fig.3); eyes with minute pubescence; eye height in profile 1.52x length of malar space; malar sulcus distinct with a relatively small



Figs.1-4 : *Tetrastichus bellus* Narendran & Girish sp.nov. **Female.**

1. Body profile; 2. Head, mesosoma and metasoma in dorsal view; 3. Head in front view and 4. Propodeum.

subocular fovea; frontofacial sulcus absent; occiput not margined; OOL 1.6x POL. Antennal toruli situated just above level of lower margin of eye; antennal formula 11133 (Fig. 1), flagellum with long pubescence and sensillae, sensillae often exceeding each segment; scape 1.17x as long as eye height in profile, about 2.83x length of pedicel; F1 1.33x length of pedicel, F2 1.25x length of F1; F3 equal to F2; clava 1.8x as long as F3; apex of clava with a spicule.

Mesosoma : Not flattened, smooth; pronotum relatively large (Fig.2), 4.28x as wide as its maximum length, anterior margin almost straight medially; mesoscutum without median groove (Fig.2), with a pair of setae on either side near to axilla; axillae strongly and angulately advanced; scutellum with two strong submedian grooves, anterior pair of setae erect and long, situated after

Etymology : The species name is from Latin meaning pretty and lovely.

Material examined : *Holotype*: Female: BORNEO: Sarawak, S. Gunung Buda, 64Km S, Limbang, 4° 12' N 114° 56' E, 23.xi.1996, Coll. S.L. Heydon & S. Fung (UCDC). Paratypes : 4 Females: BORNEO: Sarawak, S. Gunung Buda, 64Km S, Limbang, 4° 12'N 114° 56'E, 16-26.xi.1996, Coll. S.L. Heydon & S. Fung (UCDC).

Discussion : This new species differs from all the known Oriental species of *Tetrastichus* Haliday in following combination of characters: completely immaculate whitish yellow head and body, lower clypeal margin entire, not emarginated, mesoscutum with a single adnotaular setae on either side, OOL 1.6x POL; scape exceeding level of vertex; apex of clava with a spicule, antenna with long sensillae often exceeding each segment, speculum closed behind by cubital line of setae, eyes pubescent and highly delicate body.

2. *Mischotetrastichus borneichus* Narendran & Lambert sp. nov. (Figs.5-9)

Holotype : Female: Length 1.28mm. Head and mesosoma blackish brown; antenna brown except scape pale brown; eye silvery white, ocelli reflecting pale yellow; legs yellowish brown except tibia and tarsi pale yellow; petiole pale brown; gaster and ovipositor brown; tip of last gastral tergite white; wings hyaline with veins yellow.

Head : In dorsal view 2.04x as broad as long, with occiput weakly emarginated; vertex and occiput distinctly reticulate, finely so just above foramen magnum; no transverse ridge just in front of median ocellus; antennal scrobes rather deep, without median carina; two deep ridges on frons from just above antennal toruli reaching the transverse ridge in front of posterior ocelli; ocelli surrounded by a groove which connects the compound eyes on either side (Fig.6); malar sulcus slightly curved; malar space about 0.61x height of eye; tentorial pits small; anterior margin of clypeus truncate; antenna (Fig.5) 11433; scape reaching median ocellus, sculptures indistinct or absent; combined length of pedicel and flagellum 2.83x breadth of head in profile; pedicellus slightly longer than F1; F3 slightly longer than F2; F2 slightly longer than F1; flagellum with long setae.

Mesosoma : 1.46x as long as broad. Not depressed in dorsal view; pronotum short, coarsely reticulate with median area weakly so; mesoscutum 3.4x as long as pronotum medially; mid lobe dull, weakly sculptured, sculptures on basal half longitudinally, without median groove; 3 pairs of adnotaular setae present; scapular flanges linear. Scutellum distinctly transverse with weak minute longitudinal striations, submedian and sublateral lines distinct; anterior setae situated before middle; dorsellum faintly reticulate; prepectus reticulate. Propodeum (Fig.9) with hind margin deeply emarginated, longer than dorsellum medially, median area with few faint reticulations, median carina narrow, well pronounced, complete with a slight groove anteriorly; paraspiracular carina distinct. Forewing (Fig.5) 2.29x as long as its maximum width; STV 0.22x as long as MV; front edge of MV with 8 bristles which are about as long as STV; speculum rather small; longest cilia shorter than STV.

Metasoma : Petiole as long as broad in dorsal view, a little longer than propodeum, almost smooth with 3 weak longitudinal carinae; gaster 1.42x as long as broad, with

tip of hypopygium at 0.44x length of gaster; tergites with faint reticulations.

Male : Unknown.

Host : Unknown.

Etymology : The species name is a combination of letters derived from Borneo and *Mischotetrastichus.*

Material examined : *Holotype*: Female: BORNEO: Sarawak, S. Gunung Buda, 64Km S, Limbang, 4° 13'N 114° 56' E, 16-21.xi.1996, Coll. S.L. Heydon & S. Fung (UCDC).

Discussion : This new species comes to *Mischotetrastichus petiolatus* Erdos in the key to Japanese species of *Mischotetrastichus* by Kamijo and Ikeda (1997). However *M. borneichus* Narendran and Lambert sp. nov. differs from *M. petiolatus* in having: (1).Ocelli surrounded by a groove which connects the compound eyes on either side in *M. borneichus* (not so in *M. petiolatus*); (2). Mesosoma not depressed dorsally in *M. borneichus* (mesosoma somewhat depressed dorsally in *M. petiolatus*); (3). Petiole a little longer than propodeum in *M. borneichus* (petiole distinctly longer than propodeum in *M. petiolatus*); (4). Mesoscutum with 3 adnotaular setae on each side in *M. borneichus* (mesoscutum with 2 adnotaular setae on either side in *M. petiolatus*) and (5). Mesoscutum without a median groove in *M. borneichus* (mesoscutum with a median groove in *M. petiolatus*).

This new species does not fit to any other known species of *Mischotetrastichus* Graham listed by Noyes (2005).

ACKNOWLEDGMENTS

We are grateful to Dr. Steven L. Heydon of University of California, Davis, USA for kindly sending several Eulophid specimens for our studies. We also thank the authorities of University of Calicut for providing the necessary facilities.

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THREE NEW SPECIES OF PTEROMALIDAE (HYMENOPTERA : CHALCIDOIDEA) FROM MIDDLE-EAST

T.C. NARENDRAN, P. GIRISH KUMAR, M. SHEEBA AND LAMBERT KISHORE*
SYSTEMATIC ENTOMOLOGY LABORATORY, DEPARTMENT OF ZOOLOGY,
UNIVERSITY OF CALICUT, CALICUT-673 635, INDIA.
DEPARTMENT OF ZOOLOGY, MALABAR CHRISTIAN COLLEGE,
KOZHIKODE-673 001, INDIA*.
E-mail : <drtcnarendran@yahoo.com>

Three new species of Pteromalidae *viz. Eumacepolus yemensis* Narendran sp. nov., *Merisomorpha gatra* Narendran sp. nov. and *Hemitrichus longigaster* Narendran sp. nov. are described from Yemen. The genera *Eumacepolus*, *Merisomorpha* and *Hemitrichus* are recorded for the first time from Middle-east. Each new species is compared with related species.

Key words : Hymenoptera, Chalcidoidea, Pteromalidae, *Eumacepolus*, *Merisomorpha*, *Hemitrichus*, new species, Yemen.

INTRODUCTION

The genus *Eumacepolus* was raised by Graham (1957). The genus *Hemitrichus* was raised by Thomson (1878, as a subgenus of *Dimachus*). The genus *Merisomorpha* was erected by Girault (1913) and is known only so far from Australia and India. All these three genera are reported from Middle-East (The Middle-East countries : Egypt, Jordan, Syria, Iraq, Kuwait, UAE, Yemen, Oman and Iran) for the first time in this paper by describing three new species. They are also compared with the related species. These new species differ from all the species of the respective genera dealt with Boucek (1965 & 1988), Graham (1969) and Sureshan (2003). All type specimens are deposited in the TCN Collections, Systematic Entomology Laboratory, Department of Zoology, University of Calicut (DZUC) and eventually will be transferred to Western Ghats Regional Station, Zoological Survey of India, Kozhikode (ZSIK).

RESULTS AND DISCUSSION

Eumacepolus yemensis Narendran sp. nov. (Figs. 1-8)

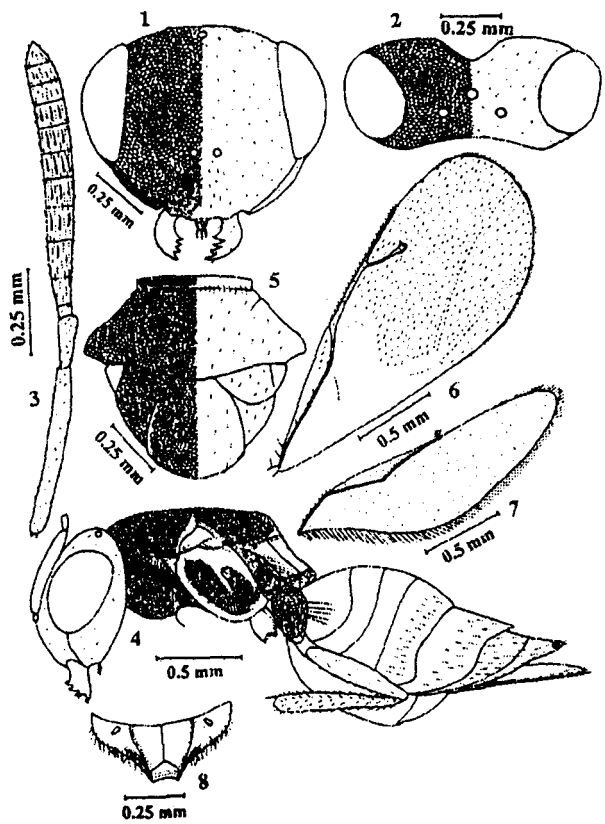
Holotype : Female : Length 3.2 mm. Head and mesosoma metallic green; antenna brown with scape paler; mandibles pale brown with teeth darker; eyes brick red with anterior and dorsal margin paler; ocelli pale reflecting yellow; legs with all coxae concolourous with mesosoma; remaining segments pale yellow with femora reddish brown (except base and apex in fore and mid femora and at base of hind femur paler); gaster brown with metallic green refringence on T_1 and T_6; tegula pale yellow; wings hyaline and veins pale yellow and apex of stigma slightly darker; pilosity of wing base brown.

Head : Width in anterior view 1.27x its medain length from vertex to lower clypeal margin (Fig. 1); width in dorsal view (Fig. 2) 2.38x its maximum dorsal length, wider than mesosoma; frons and vertex distinctly reticulate; clypeus demarcated with longitudinal broken striae, its lower margin slightly emaginate; both mandibles quadridentate; POL 1.45 x OOL; occiput not magined, without any transverse ridge. Antennal toruli located on a slightly swollen area below lower ocular line; antennal formula (Fig. 3) 11173; scape reaching front ocellus but not exceeding level of vertex; relative measurements of length; width of antennal segments as follows : scape = 56 : 6;

56 : 6; pedicel = 17 : 7; anellus = 4 : 4; F_1 = 9 : 6; F_2 = 12 : 8; F_3 = 12 : 9; F_4 = 9 : 9; F_5 = 9 : 10; F_6 = 9 : 10; F_7 = 7 : 10; Cl_1 = 7 : 10; Cl_2 = 7 : 10; Cl_3 = 7 : 7; antenna longer than width of head in anterior view; multiporous plate sensilla in a single row on each funicular segment from F_2-F_7.

Mesosoma (Fig. 5) : Pronotum distinctly margined and slightly raised anteriorly, with a single row of setae near posterior margin, wih a deep fovea at posterior corner at the junction with mesoscutum on either side; lateral panel of pronotum with a deep broad oblique furrow; axilla slightly advanced; pronotum, mesonotum and scutellum with distinct raised reticulations; notauli not complete, indicated slightly on anterior side; scutellum length subequal to its width, without distinct frenal area; mesoscutum and scutellum with sparse short pubescence. Propodeum (Fig. 8) slanting posteriorly, with distinct complete plicae and median carina; surface of propodeum otherwise smooth and shiny; spiracle oval; callus with several setae; propodeal nucha absent. hind tibia with a single apical spur. Forewing (Fig. 6) length 2.46x its maximum width; basal cell asetose; speculum open behind; basal line indicated but without setae; cubital line of setae not reaching speculum marginal fringes very short; relative length of forewing veins : SMV = 51; MV = 25; PMV = 21; STV = 15.

Gaster (Fig. 4) : Sessile; not collapsing; 1.4x length of mesosoma; 2.55x as long as broad in dorsal view; a trifle longer that combined length of head and mesosoma; posterior margin of T_1 slightly convex posteriorly; T_1 to T_5 smooth and polished; T6 rugulose; cercal setae not very long; ovipositor sheath exerted posteriorly; apex of hypopygium reaching well behind middle of gaster.



Figs. 1-8 : *E. yemensis* Narendran sp. nov. Female. **1**. Head (Front view); **2**. Head (Dorsal view); **3**. Antenna; **4**. Body profile; **5**. Pronotum, mesonotum and scutellum (Dorsal view); **6**. Forewing; **7**. Hindwing; **8**. Propodeum (Dorsal view).

Male : Unknown

Host : Unknown

Material examined : Holotype : Female . YEMEN; Ar Rujum. Coll. A. Van Harten and A.M. Hager, 16.X.2000-15.i.2001 (DZUC). Reg. No. MoEF Y-5.

Etymology : Named after the country of origin of the specimen.

Discussion : This new species comes near *Eumacepolus* (*Oxycepolus*) *pulcher* Graham (Graham, 1969) in having antennal flagellum weakly clavate and scape as long as eye. However, this new species differs from *E. pulcher* and all other known species of *Eumacepolus* in having second anellus transformed in to F_1 (with antennal formula 11173) and in several other combination of characters. This species also resembles *E. muscidifurax* Girault and Sanders in having with 7 funicular segments but differs from it in having (1) MV not widened in basal half and (2) hind margin of T_1 not trilobed.

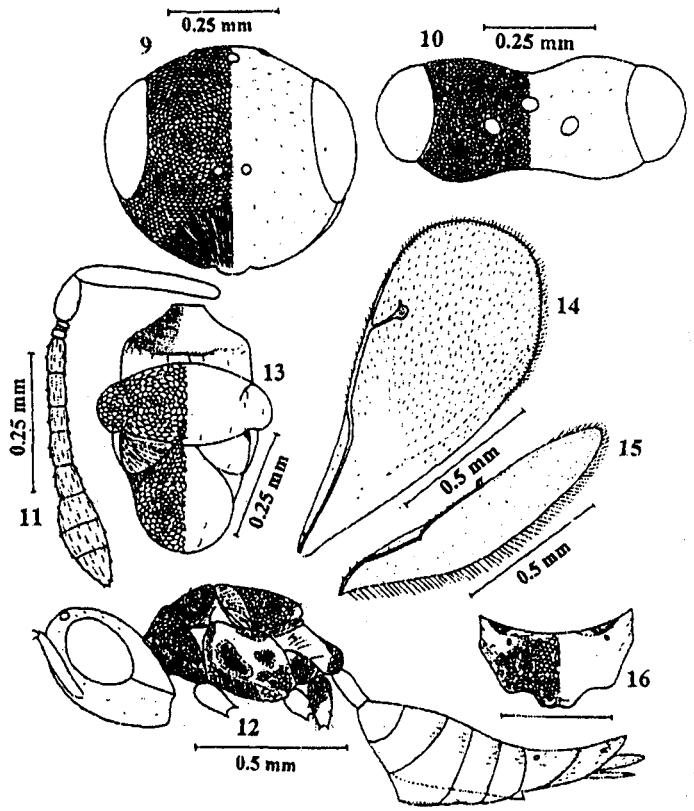
Merisomorpha gatra Narendran sp. nov. (Figs. 9-16)

Holotype : Female : Length 2 mm. Head and mesosoma black with metallic refringence; antenna pale brown with scape pale brownish yellow; eye greyish yellow; ocelli reflecting pale yellow; madibles pale brown; fore and hind coxae darker; middle region of femora and tibiae slightly brown with bases and apices paler; middle coxa yellowish brown; all tarsi whitish yellow; pretarsus darker; wings hyaline with veins and pilosity pale brown; pubescence on body silvery.

Head : Width in anterior view (Fig. 9) 1.11x its median length; width in dorsal view (Fig. 10) 2.5x its maximum length; POL 1.2x OOL; occiput not margined; frons and vertex distinctly reticulate; pubescence very small; eyes separated 1.3x their height; eye height 1.4x its width in side view, 1.7x length of malar sulcus; clypeus longitudinally striate. Antenna (Fig. 11) inserted a little above level of lower ocular margin; toruli a little nearer to lower margin of clypeus than to front ocellus; scape slender, reaching front ocellus, length equal to eye height; length of pedicel plus flagellum 0.54x head width; pedicel distinctly longer than F_1; third anellus a little longer tha others; all funicular segments a little longer than wide; clava slightly longer than combined length of three preceding segments.

Mesosoma (Fig. 13) : Length 1.41x its width, pubescence very short and sparse; pronotal collar finely reticulate-striate, with a median moderate carina; mesoscutum with distinct slightly raised reticulations; notaul incomplete; scutellum similarly sculptured, joins mesoscutum with a narrow area; frenal line not indicated; scutellum distinctly longer than mesoscutum (34 : 26). Propodeum (Fig. 16) medially 0.63x as long as scutellum; median area with distinct raised reticulations; median carina and plicae absent; submedian channels hardly distinct. Forewing (Fig. 14) length 2.3x width, pilosity moderately dense; speculum open behind; basal hairline with 3 or 4 setae; PMV distinctly shorter than MV (19 : 27); relative length of forewing veins : SMV = 49; MV = 27; PMV = 19; STV = 13.

Gaster (Fig. 12) : Distinctly longer than head and mesosoma combined; 2.5x as long as hind tibia; petiole not sinuate or fusiform, 2.6x as long its width, not widened medially, throughout of uniform width, not embraced by an extention of first gastral sternite below; hind margin of T_1 to T_6 not incised in middle; T_3 longer than T_2 but not longer than T_1 in dorsal view.



Figs. 9-16 : *M. gatra* Narendran sp. nov. Female. **9**. Head (Front view); **10**. Head (Dorsal view); **11**. Antenna; **12**. Body profile; **13**. Pronotum, mesonotum and scutellum (Dorsal view); **14**. Forewing; **15**. Hindwing; **16**. Propodeum (Doresal view).

Male : Unknown

Host : Unknown

Material examined : Holotype : Female. YEMEN; Ar Rujum. Coll. A. Van Harten 9.iv.2001-5.vi.2003 (DZUC). Reg. No. MoEF Y-4.

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

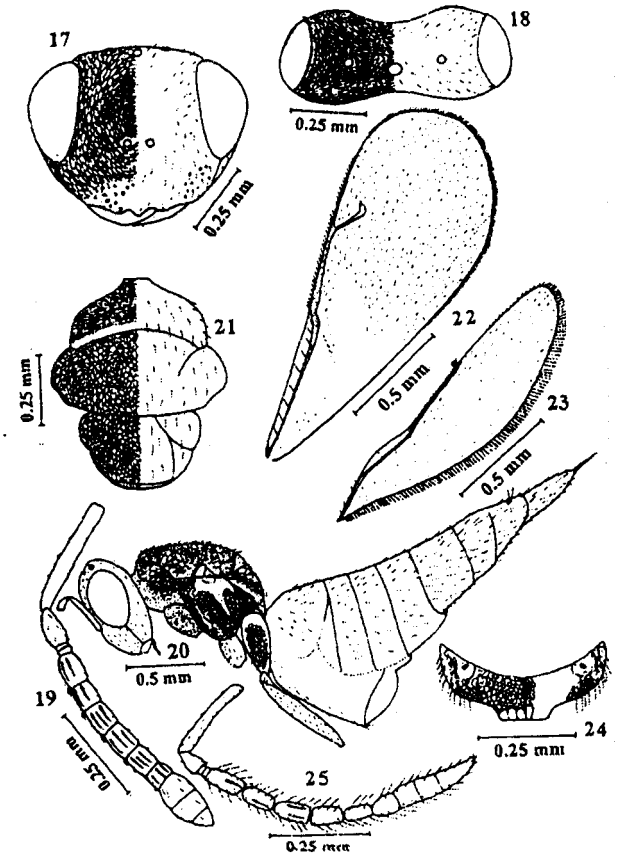
Discussion : This new species differs from all other known species of *Merisomorpha* in having long yellow petiole of uniform width, not sinuate, without embracing the extension of first gastral sternite and anterior margin of scutellum narrowly joins mesoscutum. This species may deserve placement under a new subgenus or genus when better known and more specimens are available for study.

Hemitrichus longigaster Narendran sp. nov. (Figs. 17-25)

Holotype : Female : Length 3.3 mm. Black; head and mesosoma with very slight metallic green refrigence; scape brownish yellow; pedicel brown; remaining antennal segments black; eye grey; ocelli reflecting yellow; legs pale brownish yellow with fore-and hind coxae concolourous with mesosoma; tegula brown; SMV pale yellow; MV, STV and PMV pale yellowish brown; wings hyaline with slight yellowish tinge; pubescence on body pale brown.

Head : Width in anterior view (Fig. 17) 1.15x its median length; width in dorsal view (Fig. 18) 2.42x its maximum length; POL 2.41 x OOL; occiput not margined, without any transverse ridge near occipital foramen; frons and vertex distinctly reticulate; lower frons on either side of clypeal area with sparse distinct pits (Fig. 17); frons with moderately dense short pubescence; eyes separated 1.2x their height; eye height 1.62x its width in profile, 2.33x length of malar sulcus; clypeus shiny and nearly smooth; its anterior margin with a median blunt tooth. Antenna (Fig. 19) inserted a little above level of lower ocular margin; scape slender, not reaching front ocellus, its length shorter than eye height; length of pedicel plus flagellum 0.56x head width in anterior view; pedicel a little shorter that F1; antennal formula 11263; F_1 to F_5 a little longer than wide; F_6 wider than long; clava a little longer than combined length of 2.5 preceding segments.

Mesosoma : Length 1.34x its maximum width; pronotal collar reticulate, without any cross ridge or carina; mesoscutum with slightly raised dense reticulations; notauli incomplete; scutellum similarly sculptured; frenal line distinct; scutellum distinctly shorter than mesoscutum (26 : 30); dorsellum posteriorly subangular with strong reticulations. Propodeum 0.67x as long as scutellum; median area distinctly reticulate (Fig. 24) with a short posterior nucha, with a median carina; plicae absent. Forewing (Fig. 22) 2.9x as along as its width; MV slightly wider proximally, gradually narrowing distally; speculum somewhat closed behind by vague line of cubital setae; basal line of weak setae present; pilosity feeble; relative length of forewing veins : SMV = 54; MV = 32; PMV = 30; STV = 13.



Figs. 17-25 : *H. longigaster* Narendran sp. nov. Female. **17**. Head (Front view); **18**. Head (Dorsal view); **19**. Antenna; **20**. Body profile; **21**. Pronotum, mesonotum and scutellum (Dorsal view); **22**. Forewing; **23**. Hindwing; **24**. Propodeum (Doresal view); **25**. Antenna, Male.

Gaster (Fig. 20) : Polished and shiny with sparse pubescence on dorsal side; 1.94x as long as combined length of head plus mesosoma; 3.4x as long as broad; last tergite 2x as long as its basal breadth.

Male : Similar to female except for shorter gaster; antenna as in Fig. 25.

Host : Unknown

Material examined : Holotype : Female. YEMEN; Ar Rujum. Coll. A Van Harten and A.M. Hager. 16.x.2000-15.i.2001 (DZUC) Reg. No. MoEF Y-1. Paratypes : 1 E, same date as holotype; 1 Γ. YEMEN; Ar Rujum. Coll. A Van Harten. 9.iv.2001-5.vi.2001 (DZUC).

Etymology : The species is named after the nature of gaster, which is relatively long.

Discussion : It comes near *Hemitrichus oxygaster* Boucek described from Moldavian SSR (Boucek, 1965; Graham, 1969) in having propodeum with a nucha. It differs from *H. oxygaster* in having : (1) MV 2.4x as long as STV (in *H. oxygaster* MV 1.8x as long as STV); (2) Gaster about 2x (1.94x) as long as head plus mesosoma (in *H. oxygaster* gaster 1.5x head plus mesosoma) and in several other features.

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