

**SYSTEMATIC STUDIES ON SOME SUBFAMILIES OF  
PTEROMALIDAE (HYMENOPTERA: CHALCIDOIDEA)  
OF KERALA STATE**

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UNIVERSITY OF CALICUT FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY IN ZOOLOGY**

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## CERTIFICATE

This is to certify that this thesis is an authentic record of the work carried out by **Mrs. Mini. T.V.**, from February 1995 to October 1998 in the Department of Zoology, University of Calicut, 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 Mrs. Mini T.V. has passed the Ph.D. Preliminary Qualifying Examination in 1997.

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## DECLARATION

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

Date: 26-X-1998

  
MINI. T.V.

***Dedicated  
to  
My Beloved Parents***

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# CONTENTS

Sl. No.		Page No.
1.	INTRODUCTION	1
2.	CHAPTER I REVIEW OF LITERATURE	3
3.	CHAPTER II	
	A. MATERIALS AND METHODS	28
	B. SYSTEMATIC STATUS OF THE FAMILY PTEROMALIDAE	36
	C. DIAGNOSTIC CHARACTERS OF THE FAMILY PTEROMALIDAE	39
	D. KEY TO THE SUBFAMILIES OF PTEROMALIDAE OF ORIENTAL REGION	40
	E. ABBREVIATIONS	43
4.	CHAPTER III OBSERVATIONS AND RESULTS	
	A. TAXONOMIC DESCRIPTIONS	
	Subfamily: 1. SPALANGIINAE	44
	Genus 1. <i>SPALANGIA</i> Latrielle	45
	KEY TO THE <i>SPALANGIA</i> SPECIES OF INDIA	47
	1. <i>Spalangia endius</i> Walker	48
	2. <i>Spalangia cameroni</i> Perkins	51
	3. <i>Spalangia gemina</i> Boucek	53
	4. <i>Spalangia obscura</i> Boucek	55
	5. <i>Spalangia nigroaenea</i> Curtis	57
	Subfamily II. PANSTENONINAE	59
	Genus 1. <i>PANSTENON</i> Walker	60
	1. <i>Panstenon collaris</i> Boucek	61
	Subfamily III. EUNOTINAE	64
	KEY TO THE INDIAN GENERA OF EUNOTINAE	65
	Genus 1. <i>CEPHALETA</i> Motschulsky	66
	KEY TO THE INDIAN SPECIES OF <i>CEPHALETA</i> MOTSCHULSKY	67
	1. <i>Cephaleta nirupama</i> sp. nov.	68

2.	<i>Cephaleta australiensis</i> (Howard)	71
3.	<i>Cephaleta hayati</i> Farooqi	73
4.	<i>Cephaleta brunniventris</i> Motschulsky	75
Genus 2. <b>MORANILA</b> Cameron		79
1.	<i>Moranila californica</i> (Howard)	80
Genus 3. <b>NEOCEPHALETA</b> gen. nov.		83
1.	<i>Neocephaleta malabarensis</i> sp. nov.	84
Genus 4. <b>SCUTELLISTA</b> Motschulsky		87
1.	<i>Scutellista cyanea</i> Motschulsky	88
Subfamily IV. <b>ORMOCERINAE</b>		90
Genus 1. <b>SYSTASIS</b> Walker		91
KEY TO THE INDIAN SPECIES OF <b>SYSTASIS</b> WALKER		92
1.	<i>Systasis cenchrivora</i> Farooqi & Menon	93
2.	<i>Systasis dasyneurae</i> Mani	95
3.	<i>Systasis indicus</i> sp. nov.	98
4.	<i>Systasis curiosus</i> sp. nov.	100
5.	<i>Systasis dalbergiae</i> Mani	102
6.	<i>Systasis vischnu</i> Motschulsky	104
7.	<i>Systasis lepidus</i> sp. nov.	106
8.	<i>Systasis malabarensis</i> sp. nov.	108
Subfamily V. <b>DIPARINAE</b>		111
KEY TO THE INDIAN GENERA OF <b>DIPARINAE</b>		111
Genus 1. <b>DIPARA</b> Walker		112
KEY TO THE ORIENTAL SPECIES OF <b>DIPARA</b> WALKER		113
1.	<i>Dipara keralensis</i> sp. nov.	114
2.	<i>Dipara ecarinata</i> sp. nov.	116
3.	<i>Dipara nitigastrea</i> sp. nov.	118
4.	<i>Dipara distincta</i> sp. nov.	120
Genus 2. <b>GRAHAMISIA</b> Delucchi		123
1.	<i>Grahamisia kozhikodensis</i> sp. nov.	124
Genus 3. <b>NETOMOCERA</b> Boucek		127
KEY TO THE ORIENTAL SPECIES OF <b>NETOMOCERA</b> BOUCEK		128
1.	<i>Netomocera nigra</i> Sureshan & Narendran	128



2.	<i>Netomocera clavata</i> sp. nov.	131
	Genus 4. <b>PARURIOS</b> Girault	134
1.	<i>Parurios malabarensis</i> sp. nov.	135
	Subfamily VI. <b>CEROCEPHALINAE</b>	138
	KEY TO THE INDIAN GENERA OF <b>CEROCEPHALINAE</b>	138
	Genus 1. <b>CEROCEPHALA</b> Westwood	139
1.	<i>Cerocephala dinoderi</i> Gahan	140
	Genus 2. <b>THEOCOLAX</b> Westwood	143
1.	<i>Theocolax elegans</i> (Westwood)	144
	Subfamily VII. <b>CLEONYMINAE</b>	147
	KEY TO THE INDIAN GENERA OF <b>CLEONYMINAE</b>	147
	Genus 1. <b>GROOCA</b> Sureshan & Narendran	149
1.	<i>Grooca coorgensis</i> Sureshan & Narendran	150
	Genus 2. <b>ODDERA</b> Westwood	153
1.	<i>Oodera ahoma</i> (Mani & Kaul)	154
	Genus 3. <b>RIEKISURA</b> Boucek	156
1.	<i>Riekisura keralensis</i> Narendran	157
	Genus 4. <b>SOLENUMA</b> Westwood	159
1.	<i>Solenura ania</i> (Walker)	160
5.	<b>CHECKLIST OF PTEROMALID SPECIES OF INDIA BELONGING TO 20 GENERA OF THE SUBFAMILIES SPALANGIINAE, PANSTENONINAE, EUNOTINAE, ORMOCERINAE, DIPARINAE, CEROCEPHALINAE AND CLEONYMINAE</b>	163
6.	<b>HOST-PARASITE INDEX</b>	168
7.	<b>SUMMARY</b>	172
8.	<b>REFERENCES</b>	176
9.	<b>PLATES AND FIGURES</b>	
10.	<b>PUBLICATION</b>	

## INTRODUCTION

Biological control is one of the oldest, most effective means of achieving insect control. Pteromalidae, representing as the third largest family of hymenoptera have great diversity in morphological and biological aspects. These minute wasps play an important role in the biological control of serious pests all around the world. They maintain a sort of balance in nature, preventing mass breeding of their particular hosts, and reducing their epidemic outbreaks.

Pteromalids inhabit almost all terrestrial ecosystem. The great majority of Pteromalids are primary or secondary parasites attacking a large range of insects in their various stages of development. A few species even oviposit into the adults of some beetles (curculionidae, scolytidae). The larvae of some other Pteromalid species develop as predators on eggs, e.g. of Coccids (Eunotinae) or of Spiders. Some are known to be gallformers e.g. an Australian species of *Trichilogaster* Mayr which controls a species of Acacia growing as a weed in South Africa (Boucek, 1988).

Some species of the family have been proved to be of particular value in biological control of insect pests, for instance *Pteromalus puparum* Linn. was successfully introduced in to Australia, New Zealand and Pacific ocean islands' for the control of turnip butterfly, *Pieris rapae* Linn., a serious pest of agricultural crops in these places (Nikolskaya, 1952). The same species was also credited with bringing about a marked reduction in the population of cabbage butterfly, *Ascia rapae* Linn. in New Zealand, *Dinarmus acutus*

(Thomson) was released against *Bruchus* spp. in USA. *cryptogaster vulgaris* was released in Canada against dipterous leaf miners on *Ilex aquifolium*. *Spalangia endius* walker have been used against *Exorista sorbillans* weid (Dipt: Tachinidae) parasitising *Bombyx mori*.

The most useful reference work for Pteromalid taxonomy in the Northern Hemisphere is that of Graham (1969). The best work for the Australasian area is that of Boucek (1988), who treats 28 subfamilies, 235 genera and lists all of the species from the region. Boucek *et al.* (1978) published an updated list of Pteromalidae of the Indian sub-continent. A key to the 80 genera of Indian Pteromalidae was published by Farooqi and Subba Rao (In Subba Rao & Hayat, 1985). An illustrated key to west-palaearctic genera of Indian Pteromalidae was published by Boucek and Rasplus (1991).

The studies on Indian Pteromalidae is poorly known. Their potentialities as effective biological control agents are not fully exploited in our country. The same is true with the systematics of Pteromalidae in India. Hence the present investigation was undertaken with a view to bring out the taxonomic data of Pteromalidae of Kerala and to provide useful workable key to the species and genera of seven subfamilies, viz. Spalangiinae, Ormocerinae, Panstenoninae, Diparinae, Eunotinae, Cerocephalinae and Cleonyminae. In this present work I have followed the classification of Boucek (1988).

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***Chapter I***

## REVIEW OF LITERATURE

The family Pteromalidae constitutes one of the largest families of Chalcidoidea. The knowledge about these parasitoids is very scanty in the southern most parts of India especially Kerala. Here an attempt has been made to review the literature on the systematics of Pteromalidae of the world with particular emphasis to the oriental fauna.

The prominent early workers of the group includes SWEDERUS, DALMAN, FORSTER, FABRICIUS, MAYR, MOTSCHULSKY, HALIDAY, WESTWOOD, SAUNDERS, RILEY, HOWARD etc. Since 1945 much excellent work has been done in revising the older taxa and describing new ones by BOUCEK, DELUCCHI, ERDOS, FERRIERE, HEDQVIST, KERRICH, VON ROSEN and others. Among those who contributed to the faunistics and taxonomy of Indian Pteromalidae, mention may be made of MANI (1938, 1939, 1942, 1989), AHMAD & MANI (1939), BHATNAGAR (1952), CAMERON (1891, 1906), CRAWFORD (1913), DUTT & FERRIERE (1961), FERRIERE (1930, 1931, 1939), GAHAN (1919, 1925). HOWARD (1896), MASI (1924, 1927), FAROOQI & MENON (1972, 1973), BOUCEK (1973), BOUCEK *et al.* (1978) and FAROOQI & SUBBA RAO (1985, 1986). It was BOUCEK *et al.* (1978) who tried to project a more complete picture of Pteromalidae of India and adjacent countries.

The study of Pteromalids may be said to have begun with LINNAEUS (1758) who described the species *Pteromalus puparum* and *Dinotiscus Colon* under the names *Ichneumon puparum* and *Sphex colon*

respectively from Sweden. He again in 1761 described the species *Habrocytus capreae* under the name *Cynips capreae*. SWEDERUS in 1795 erected the genus *Pteromalus* with *Ichneumon puparum* Linn. as the type species. FABRICIUS in 1798 added to the family one more species, *Cleonymus laticornis* under the name *Ichneumon depressus* Fabricius. He again in 1804 described another species *Diplolepis depressa* Fabricius. Later LATREILLE in 1805 erected a new genus in the family named *Spalangia* with *S. nigra* Latreille from France as type species. He also described another new genus *Cleonymus* in 1809 with *Diplolepis depressa* Fabricius as type species.

During the later years several new genera were added to the family by the efforts of SPINOLA. He erected genera which included *Chrysolampus*, *Sphegigaster*, *Halticoptera*, *Callitula* etc. in the year 1811. DALMAN in 1820 first isolated the family Pteromalini which is the second earliest group name available in the superfamily Chalcidoidea. In the same paper he erected the genus *Cratomus*. In 1827 CURTIS's effort yielded a new genus to the family named *Colas* with *C. dispar* Curtis as type species. This was followed by WESTWOOD, who described the genus *Cheiropachus* in 1828. WESTWOOD's contribution towards the taxonomy of Pteromalidae was undoubtedly noticeable in the later years. He erected several genera like *Theocolax*, *Cerocephala*, *Macroglenus*, *Trigonoderus* etc. under the family in 1832.

WALKER in the year 1833 described in his *Monographia Chalciditum* several genera like *Syntomopus*, *Miscogaster*, *Merismus*,

*Psilocera*, *Pachyneuron*, *Dipara* etc. from Europe. In the same year he erected the family Miscogasteridae. A new genus named *Gastrancistrus* was also described by WESTWOOD in the same year with *G. vagans* Westwood as the type species. WALKER again in 1834 erected the genus *Systasis* with *Systasis encyrtoides* Walker as type species. In the same year NEES and ESENBECK described new species like *Asaphes suspensus* and *Spalangia fuscipes* under the family. Again in 1837 WALKER erected a new genus *Notanisus* with *Notanisus versicolor* Walker as the type species. Later HALIDAY in 1844 established a group under Pteromalidae called tribus Pirenianii. GRAHAM (1969) classified it as Pirenini of the subfamily Miscogasterinae. In the same work he also described a new genus *Agamerion* with *Miscogaster gelo* Walker from Sydney as the type species.

RATZEBURG made significant quantum on Pteromalidae. In 1844 he erected the genus *Roptrocerus* with *Pachycerae xylophagorum* Ratzeburg from E. Germany as the type species. In 1846 WALKER further enriched the family by adding another new genus *Panstenon* with *Miscogaster oxylus* Walker from Europe as the type species. His contribution again continued in the later years also. In 1848 he described another new genus *Macromesus* with *M. amphiretus* Walker as type species. In 1852 Ratzeburg further described a new Palaearctic species namely *Pteromalus* (*Schizonotus*) *Seiboldi* Ratzeburg (Later the subgenus was raised to the level of genus by ASHMEAD in 1904).

In 1856 FORSTER brought together an heterogenous assemblage of genera under the family name Cleonymidae. He also placed the genus

*Asaphes* Walker under the name *Isocratus* in his family Miscogasteridae. Later MOTSCHULSKY in 1859 described new genera like *Cephaleta* and *Scutellista* with *C. purpuriventris* Motch. and *S. cyanea* Motch. from Ceylon as type species respectively. Later WESTWOOD in 1868 erected new genera like *Thaumasura* and *Solenura* with *T. terebrator* W from Southern Australia and *S. telescopica* W. as type species from South East Asia. This was followed by WALSH and RILEY in 1869 who described a new species *Chalcidiphagus* from Canada under the genus *Homoporus* Thomson. WALKER mentioned a group Eunotines first under the family Pteromalidae in 1872, then formally called as the subfamily Eunotinae by ASHMEAD in 1904. Genera *Amotura* and *Oodera* were further added to the family by WESTWOOD in 1874.

THOMSON gave a notable contribution towards the study of Pteromalidae. He described several genera and species under the family in his standard work "Hymenoptera Scandinaviae" (1876, 1878). ASHMEAD distinguished a subfamily Polychrominae under the family Cleonymidae in 1889. This was followed by RILEY in 1890, who described the genus *Ophelosia* with *O. crawfordi* Riley from Australia as the type species. During the following years prominent work was also done by HOWARD. In 1894 he erected a new genus *Herbertia* with *H. lucens* Howard as type species. Another contribution came from ASHMEAD in the same year. He described the genus *Paracarotomus* with *P. cephalotes* Ash. as type species from West Virginia. This was followed by HOWARD who described the genus *Aphobetis* in 1896 with *A. maskelli* Howard from New Zealand as the type species. In 1899 ASHMEAD again enriched the family by describing a



new genus *Chalcidiscelis* with *C. koebeli* Ashmead as the type species from Australia.

ASHMEAD's contribution was very valuable to the family. In the year 1904 his monumental work on Chalcidoidea was published. In that work he keyed out the subfamilies, tribes and genera of Pteromalidae, Cleonymidae and Miscogasteridae. High value has been given to the mandibular dentition and some other characters, which led him to define some artificial groups which are in fact heterogenous. In the same year he first classified the subfamily Eunotinae under Pteromalidae. Workers like SCHMIEDEKNECHT (1909), MUESEBECK, KROMBEIN and TOWNES (1951), NIKOLSKAYA (1952) and PECK, BOUCEK and HOFFER (1964) considered it as the tribe under the subfamily Pteromalinae. Later GRAHAM (1969) retained the subfamily status of Eunotinae. ASHMEAD also added several new genera like *Acanthometopon*, *Nasonia*, *Pachycrepoides* etc. to the family Pteromalidae in the same work.

Followed by ASHMEAD, SCHMIEDEKNECHT (1909) made a major work on Pteromalidae. In some ways it was an improvement on Thomson's work. A new genus *Lariophagus* with *L. texanus* Crawford as the type species has been described by CRAWFORD in the same year which contributed further to the knowledge of Pteromalidae. In 1910 GIRAULT & SAUNDERS added the genus *Muscidifurax* to the family. In the following year CRAWFORD's contribution continued. In 1911 he erected a new genus *Agiommatius* with *A. sumatraensis* Crawford as the type species. During the later years major contribution towards the study of the family

Pteromalidae was made by GIRAULT (mainly 1912-1941). Most of his publications deal with descriptions of Australian fauna. RUSCHKA's effort yielded a new genus to the family in 1912, namely *Anisopteromalus* with *A. mollis* Ruschka as the type species.

CRAWFORD further contributed much to the study of the family during the year 1913. He described several new genera and species, most of them were collected from the Indian Region, viz. *Zacalochlora* gen. nov. with *Z. milleri* Crawford as type species. *Trichomalopsis* gen. nov. with *T. shirakii* Crawford as type species and *Aplastomorpha* gen. nov. with *A. pratti* Crawford as the type species. He also reported the species *Bruchobius laticeps* Ashmead and *Bruchobius colemani* Crawford from Bangalore and Mysore in the same paper. In the same year KURDJUMOV added a new genus. *Eupteromalus* to the family with *Pteromalus nidulans* Thomson as the type species. GIRAULT also enriched the family in the same year by describing several genera like *Amoturella isoplatoides*, *Coelocyboides parurios*, *Amerostenus*, *pachyneuronella*, *Neapterolelaps*, *Sphegipterosema*, *Eurydinotomorpha*, *Sphegipterosemella* etc. from Australia. During 1915 WATERSTON contributed little to the study of oriental fauna. He described three new species viz. *Polycystus propinquus*, *Trigonogastra rugosa* and *Trigonogastra megacephala* from Ceylon. In the same year GIRAULT again added to the family several new genera like *Miscogasteriella*, *Toxeumorpha*, *Acroclisoides*, *Trigonogastrella*, *Perilampella*, *Tomicobiella*, *Acroclisella*, *Neopolycystus* etc.

During the year 1917 MASI described a new genus from the Seychelles Islands named *Notoglyptus* with *N. virescens* Masi as the type species. This

was followed by GAHAN (1919) who published a report on the collection of Indian parasitic hymenoptera belonging to the superfamily Chalcidoidea and Serphoidea collected by Ramakrishna Ayyar. The same paper included three species of Pteromalidae viz. *Eupteromalus parnarae* sp. nov., *Meraporus vandinei* Tucker and *Bruchobius colemani* Crawford. In 1920 GIRAULT again contributed to the study of Pteromalidae by describing genera like *Eupelmophotismus*, *Neochalcissia*, *Eurytomomma*, *Nerotolepsia* etc. This was followed by WATERSTON during the year 1922 who described a new genus of *Pteromalidae* named *Oedaule* with *O. stringifrons* Waterston as the type species. In the same year GIRAULT further enriched the family with new genera viz. *Westwoodiana*, *Eunotomyia* and *Australeunotus*.

During 1923 GAHAN & FAGAN contributed remarkably to the systematics of Chalcidoidea. In the Bulletin of United States National Museum, they published a complete catalogue of all the known genera of Chalcidoidea. The same work included almost all genera of Pteromalidae known upto date. In the same year RUSCHKA erected the genus *Perniphora* with *P. robusta* Ruschka as the type species. During the later years MASI again contributed much to the study of Pteromalidae during the later years. He described genera like *Conomorium* and *Dinarmoides* in 1924. Later GAHAN (1925) described a new species of Pteromalidae named *Cerocephala dinoderi* from Philippines. This was followed by TIMBERLAKE who described several new species of Pteromalidae, including a good number collected from India also during the year 1926. In the same year MASI erected a new genus *Glyptosticha* with *G. flavipes* Masi as type species.

FERRIERE's contribution towards the study of oriental Pteromalidae was noteworthy. In 1930 he described two new species of Pteromalidae from Malay Peninsula and Srilanka viz., *Agiommatus attaci* Ferriere and *Trigonogastra brunneicornis* Ferriere under the subfamily Sphegigasterinae. MOKREZECKI in 1933 added a new genus to pteromalidae viz. *Mokrezeckia* with *Pteromalus pini* Hartig as the type species. In 1934 KRYGER also worked on certain Pteromalidae and published keys to genera. In the same year FERRIERE again described few new genera and species of Pteromalidae under the subfamily Pireninae. They are *Bairamlia nidicola* sp. nov., *Platecrizotes* gen. nov. and *Platecrizotes sudanensis* sp. nov. He also provided a detailed key to the genera of the subfamily in the same paper.

During 1936 GIRAULT added a new genus to the family named *Delislea* with *D. pattersoni* Girault as the type species. In 1937 RAMAKRISHNA AYYAR and MANI described a new South Indian species of Pteromalidae named *Neocatolaccus indicus*, parasitic on cotton borer-beetle *Pempheres affinis* Fabr. from Coimbatore. GIRAULT again contributed to the family in the year 1938 by describing a new genus *Austroterobia* with *A. partibrunnea* Girault as the type species. This was followed by FERRIERE who published in 1939 a paper on Chalcid flies attacking noxious beetles in India and New Guinea. In that paper he reported two species of Pteromalidae viz. *Dinarmus coimbatorensis* sp. nov. and *Aplastomorpha calandrae* Howard from India. In the same year GIRAULT's effort yielded a new genus to the family named *Inkaka* having *I. quadridentata* Girault as type species.

MANI's contribution towards the study of Indian Pteromalidae stands prominent. In 1939 he reported several new species of Pteromalidae from India under the family Miscogasteridae viz. *Bruchobius maculatus* (Masi), *Bruchobius vagabundus* Timberlake and *Bruchobius colemani* Crawford. In the same year AHMAD & MANI described a new genus and species of Indian Pteromalidae parasitising linseedmidge *Dasyneura lini* Barnes, namely *Systasis dasyneurae* sp. nov. and *Ecrizotomorpha* gen. nov. They also provided detailed biology and morphology of *Systasis dasyneurae* in the same paper. In 1941 MANI reported *Dinarmus sauteri* Masi from India and synonymised *Dinarmus coimbatorensis* Ferriere under *D. sauteri* Masi. His contribution continued in 1942 also. He described a new species named *Systasis dalbergiae* parasitic on the larvae of *Contarina dalbergiae* Mani from Dehra Dun. ERDOS in 1946 described a new genus named *Bugacia* with *B. arenaria* Erdos as the type species. In 1947 Gahan & Ferriere published an elaborate paper on some gall inhabiting Chalcidoidea belonging to the subfamily Lamprotatinae and tribe Brachyscelidiphagini.

During the following years several workers contributed remarkably towards the systematics of Indian Pteromalidae. One among them was BHATNAGAR, who published an account on the family in 1951. He reported several species of Pteromalidae from the country viz. *Pachyneuron ferrieri* Mani, *Aplastomorpha calandrae* (Howard), *Pachycrepoideus indicus* sp. nov. and *Bruchobius laticeps* Ashmead under the family Miscogasteridae. In 1952 a new genus named *Xiphydriophagus* has been described under the family Pteromalidae by FERRIERE. In the same year NIKOLSKAYA published an elaborate paper on the chalcid fauna of USSR. In the same

work he treated the family Pteromalidae under five separate families viz. Cleonymidae, Pteromalidae, Tridymidae, Miscogasteridae and Splangidae. He included 18 genera under Cleonymidae, 62 under Pteromalidae, 27 under Miscogasteridae, 24 under Tridymidae and 4 under Spalangidae. He also provided diagnostic characters of each family and keys to the genera. MANI & KURIAN in 1953 described two new species of Pteromalidae namely *Pachycrepoideus coorgensis* and *Pachycrepoideus arcotensis* from Bangalore and North Arcot respectively. They also provided information about the species *Bruchobius laticeps* Ashmead in the same paper.

BURKS in 1954 published a list of parasitic wasps of the *Catolaccus* group in America. In the same paper he gave a detailed history of the genus *Catolaccus* and also included taxonomy and key to the genera in the same year. BOUCEK contributed much to the world fauna of Pteromalidae by describing new genera like *Netomocera*, *Dibrachella*, *Anisoptermalia* and *Rohatina*. In 1955 he erected the genus *Rakosina* under the family with *R. deplanata* Boucek as the type species from Czechoslovakia and Hungary. A curious new genus *Neodipara* from Hungary was also described in the same year by ERDOS. It was based on the type species *N. perbella* Erdos (only males). Later GRAHAM in 1956 described one more new genus *Thinodytes* in the family with *Miscogaster cyzicus* Walker as the type species. Other workers who contributed to the world fauna of Pteromalidae in the same year are DELUCCHI and GRAHAM. They added several new genera like *Cyrtoptyx* Delucchi, *Chlorocytus* Graham and *Oxysychus* Delucchi in the family.

During the year 1957 FERNANDO contributed little to the oriental fauna in the form of one new species *Coelocyba musila* reared from the eggs of a Tettigonid from Ceylon. This was followed by SHARMA and SUBBA RAO who described in 1958 a new Indian species of Pteromalidae namely *Asaphes swaraji* from Kalka (N. India). In the same year BOUCEK added another new genus to the family named *Austrogerrhus* with *A. gloriosus* Boucek as the type species.

During the following years the family was immensely enriched with several new genera, species, subspecies, families, tribes etc. from all over the world. Indian fauna was also enriched considerably. DUTT & FERRIERE in 1961 described two new Indian species *Neocatolaccus nupserhae* and *Norbanus accuminatus* parasitising the Jute stem girdler *Nupserha bicolor* Thomson and *Nupserha postbrunnea* Dutt from West Bengal. In the same year BOUCEK described a new species *Neodipara masneri* from Czechoslovakia. In the same year in another publication he synonymised *Heterolaccus* Masi under *Pteromalus*. Later in 1962 ASKEW published a small paper on the collection of Chalcidoidea in the Manchester Museum in which he accounted eight species of Pteromalidae belonging to the family Cleonymidae. In the same year DELUCCHI erected the genus *Grahamisia* with *Grahamisia setosa* as the type species.

During the year 1963 BOUCEK published an elaborate paper on the systematics of Pteromalidae in which he reviewed the Holarctic African oriental, Australian and Neotropical species of *Spalangia* Latrielle with tentative keys. He also reviewed the species known from Pacific islands. In

the same paper he also dealt with the species misplaced under the genus *Spalangia* and redescribed the genus *Platecrizotes* Ferriere. Another remarkable contribution towards the family during the same year was that of PECK, who published an elaborate catalogue of the Nearctic chalcidoidea. The work included several genera and species of Pteromalidae. In the same year KAMIJO revised the genus *Glyptosticha* Masi. He transferred the species *Glyptosticha nigricans* Masi to another new genus *Trigonoderoides* and also described a new species *G. sulcata* in the same paper. During the same year HEDQVIST also described a new genus and two new species of Diparini from Angola.

A remarkable contribution from PECK *et al.* came in the form of a Key in 1964. They published an elaborate key to the family Pteromalidae, included nearly all the European genera described until 1955. In the same year HEDQVIST published a note on Diparini and according to him the tribe Diparini comprises 21 known genera and he also added another genus *Diparisca* to the tribe. This was followed by one of BOUCEK's contribution towards the family. In 1965 he published notes on synonymy and new classification of certain chalcid flies mostly from the Palaearctic region, Ceylon and elsewhere. The same paper included seven species of Pteromalidae. Later BOUCEK in 1967 described a new genus under the family named *Tricolas* with *T. xylocleptis* Boucek as type species.

HEDQVIST's contribution towards the family continued in the year 1968 also. He published notes on the trigonoderus group of Pteromalidae. In that paper he gave diagnostic characters of the tribe Trigonoderini, keys



to the genera and keys to the species of each group. In the same year CHISHTI & SHAFEE described a new Indian species *Halticoptera imphalensis* from Imphal. During 1969 also HEDQVIST contributed much to the taxonomy of Pteromalidae. He published the characters of the tribe Diparini and gave a key to the genera of the tribe. Descriptions of each genus and key to the species of some genera under the tribe has been given in the same paper. In another publication of the same year he provided a key for the 13 genera of tribe Cerocephalini and provided synonymical, distributional and biological notes for each species. In the same paper he described several new species and genera.

BURKS also made a remarkable contribution towards the study of Pteromalidae during 1969. He made a study of the species of *Spalangia* of United States National Museum. In the same paper he redescribed the types of 9 species described by ASHMEAD, GIRAULT, RICHARDSON and HOWARD, gave their present conditions and designated the lectotypes. The most outstanding work on Pteromalidae was published by GRAHAM in 1969. He published a very elaborate monograph on Pteromalidae of North Western Europe. In that work he keyed out the family upto species level, provided full synonymy at all levels and also added the distribution and known biology for each species. More than 800 species are dealt with and described four new genera and 87 new species.

HEDQVIST in 1971 described a new species of the genus *Neodipara* Erdos from Spain and also provided a key to the known species. In another paper of the same year he described a new genus *Diparomorpha* under the

subfamily Diparinae from Angola. He divided the Diparinae into tribes Diparini, Lelapini and Netomocerini. In another paper of the same year he described three new species of *Netomocera* viz., *N. alboscopus*, *N. africana* and *N. rufa*. In the same year from India MANI contributed a new species *Acrodisis melanagromyzae*. It was reared from the pupae of *Phytomyza syngenesiae* complex mining the leaf of *Helianthus* in Agra. HEDQVIST further contributed to the knowledge of Pteromalidae by revising the genus *Syntomopus* Walker in 1972. In the same paper he described a new species *S. agromyzae* and gave a key to the European species. BOUCEK in the same year supplemented the GRAHAM's work of 1969 by revising the European species of several genera of Pteromalidae and by descriptions of new taxa. In another paper of the same year he described a new genus and species of Pteromalidae parasitic on sphecids in S. America viz. *Trichokaleva* gen. nov. and *T. microstigma* sp. nov. In the same year FAROOQI & RAMDAS MENON described a new species of *Systasis* namely *S. cenchrivora* infesting seeds of *Cenchrus* sp. ROOMI, KHAN & KHAN also described a new oriental species of Pteromalidae named *Pteromalus schwenkei* from Pakistan.

During the next year remarkable quantum of studies on Indian Pteromalidae were made by few workers. In 1973 SUBBA RAO described a new genus and species viz. *Obtusiclava oryzae* gen. nov. parasitising *Pachydiplosis oryzae*, a serious pest of rice in India. This was followed by FAROOQI & RAMDAS MENON in the same year, erected two new genera and species viz. *Pilkhanivora nigra* gen. nov. sp. nov. *Parapilkhanivora testacea* gen. nov. sp. nov. from Delhi. They also provided a key to separate three genera recorded from India under the tribe Brachyscelidiphagini.

SUBBA RAO in the same year again described four new species viz. *Norbanus africanus*, *Homoporus aegyptiaeus* (both from Africa), *Mokrzeckia orientalis* from Indonesia and India and *Mokrzeckia indica* from India. He also gave a key to the *Mokrzeckia* species.

MANI *et al.* in 1973 also added several new species of Indian Pteromalidae under the family Cleonymidae, viz. *Chalcedectus indicus*, *Lycisia ahoma*, *Macromesus gardneri*, *Thaumasura indica* and *Zapachia beesoni*. They also reported *Soleneura telescopica* Westwood from India in the same paper. BOUCEK in the same year described a new genus with an evaniform gaster and named it as *Asoka*. He also described two new species *Asoka appendigaster* from Taiwan and *A. petiolatus* from Srilanka and Malaya in the same paper. During the year 1973 HEDQVIST's contribution to the world fauna was remarkable. He described two new genera viz., *Smeagolia* with type species *S. perplex* from South Sweden and *Nazgulia petiolata* gen. nov. sp. nov. from Sweden. In the same year KAMIJO and TAKADA made a study on the Japanese fauna. They studied the pteromalid hyperparasitoids of Aphids. In that paper they dealt with genera *Asaphes* Walker with 2 species, *Coruna* Walker with 2 species *Pachyneuron* Walker with five species and *Euneura* Walker with 2 species. They also gave keys to the genera and species.

During the year 1974 another remarkable work on Indian Pteromalidae was published by MANI *et al.*, in which they described 7 new species of *Pachyneuron* and redescribed the species *Coruna clavata* Walker. They also provided a key to the species of *Pachyneuron* in the same paper.

BOUCEK in the same year in one of his publications on Chalcidoidea dealt with alphabetically the 14 genera and 49 species described by RONDANI. The work included 18 species of Pteromalidae. In another publication of the same year he described and illustrated one new genus *Szelenyinus* with *S. brevicornis* as the type species from Italy. In another paper he reclassified Eutrichosomatinae as a subfamily of Pteromalidae and gave keys to the genera and species of the subfamily in the same year. SARASWAT & MUKERJEE contributed little to the Indian Pteromalidae during 1975. They reported 4 species under the family Pteromalidae and 3 species under Cleonymidae from India.

BURKS work during the year 1975 was remarkable. He reviewed 72 species of chalcidoidea described by WALKER from N. America north of Mexico. The work included 24 species of Pteromalidae. In the same year keys to the Swedish species of *Halticoptera spinola*, *Halticopterina* Erd., *Schimitschekia* Boucek and *Thinodytes* Graham was published by Hedqvist. A new species *Halticoptera longipterolus* has been described. In the same year he also published a list of Swedish species of Chrysolampini and described a new genus *Beornina* with *B. femorata* as type species.

In 1976 HUGGERT described a new genus named *Zdenekia* and three new species viz. *Spathopus monotanus*, *Zdenekia plana* and *Spanopus hedqvisti* and also described the males of *Stichomischus longiventris*, which were unknown earlier. During the year 1976 YOSHIMOTO's contribution was also noteworthy. In one paper he described a new subgenus *Nearctomophaga* under the genus *Dorcatomophaga* (*Nearctomophaga*) *jonesi*

from N. America. In another publication he described a new genus *Playaspalangia* with *P. rothi* as type species from Mexico during the same year. BOUCEK also published an excellent work in the same year. In that paper he described seven new genera and 11 new species of African Pteromalidae and placed 6 generic and 2 specific names in synonymy. In the same year GORDH also erected a new genus *Arachnopteromalus* from Missouri.

HEDQVIST's contributions towards the taxonomy of Pteromalidae continued in the next year also. He described three new genera and species from South Sweden viz. *Brimeria clavata* gen. nov. sp. nov., *Brokkia paradoxa* gen. nov. sp. nov. and *Elderia suecica* gen. nov. sp. nov. In another publication of the same year he selected a lectotype for *Pteromalus groenlandicus* (Holmgren) and transferred the species to *Pachyneuron groenlandicus* (Holmgren) comb. nov. with *Pachyneuron umbratam* Delucchi as a synonym. Another remarkable contribution from BOUCEK was published in the same year in which he provided a summary of work carried out by him over 19 years on the fauna of Yugoslavia. He treated 949 species of Chalcidoidea alphabetically which included 253 species of Pteromalidae. In the same year KAMIJO also erected a new genus *Spinancistrus* from Japan. In the same paper he also described three species under ormocerini.

YOSHIMOTO made valuable contribution towards the family in 1977. In one of his papers he made a revision of the North American Diparinae and in another he described a new species *Spalangiopelta ciliata*

from N. America. The first authentic and comprehensive work on Pteromalidae from India and adjacent countries was made in 1978 by BOUCEK *et al.* They published a review of the family which included 82 genera (56 of them with 86 identified species and another 26 in which the species couldn't be identified). The taxonomic reclassification resulted in many changes including 21 generic transfer (new combinations) and 30 new specific synonymies. In the same year BOUCEK described two new oriental genera *Oricoruna* and *Manineura*. In the same year HEDQVIST also added several new genera and species. In one paper he described a new genus *Guancheria* and in another publication he erected a new subfamily Dvaliniinae under Pteromalidae. He also provided a key to the known genera of Dvaliniinae.

During 1979 TAKADA & KAMIJO contributed a little to the Japanese fauna. One of their publications deals with hymenopterous parasites of garden pea leaf miner *Phytomyza horticola* Gourea which included four Pteromalid species. In the same year based on a study of Chalcidoidea from Madeiran Island GRAHAM listed out 27 species of Pteromalidae which in turn included one new species *Miscogaster glabricula*. During 1980 African fauna of Pteromalidae was studied by PRINSLOO. In one of his papers he transferred the species *Bruchobius magnus* Rowher to *Dinarmus*. FAROOQI in the same year described a new Indian species namely *Cephaleta hayati* reared on *Cerococcus* sp. from Madhya Pradesh, Maharashtra and Tamil Nadu. WIEBS in the same year described three new species of fig insects belonging to Epichrysomallinae of Pteromalidae

viz., *Odontofroggattia corneri*, *O. galili*, *O. ishi* from Perak, Malaya, Solomon Islands and Penang.

During 1981 SUBBA RAO's efforts yielded five new species of the Oriental Pteromalidae. They are *Propicroscytus indicus*, *Colotrichnus agromyzae*, *Mokrzeckia menzeli*, *Gastrancistrus magniferae* and *Psilocera ghanii*. In the same year GRISSEL redescribed the species *Cerocephala eccoptogastri* Masi and *C. rufa* Walker. According to him the name *C. rufa* has been incorrectly applied to a nearctic species that is actually the Palearctic species *C. eccoptogastri* Masi. In 1981 KAMIJO studied the Pteromalid wasps reared from Cynipid galls from Japan in which he dealt with six species. KAMIJO & GRISEEL in 1982 synonymised *Eupteromalus* Kurdjumov with *Trichomalopsis*. KAMIJO further made a study of Pteromalid parasites of forest pests in Japan on the same year in which he dealt with nine species.

KAMIJO's contribution towards the Japanese fauna continued in the following year also. In 1983 he redefined the genus *Elatoides* Nikolskaya and placed it in the tribe Sphegigasterini of Miscogasteridae. In the same year KAMIJO and BIBAI made a remarkable study on Japanese Pteromalidae in which they described four new species. FAROOQI in the same year published an account on Indian Eunotinae in which he provided a key to the Indian genera and another key to the Indian species of *Cephaleta* Motschulsky. He also described a new species *Ophelosia indica* in the same paper.

Later in the year 1984 GRAHAM contributed much to the European fauna. In one of his publications he listed out 11 species of Pteromalidae from Madeira Island collected by Mr. A. Van Harten. In another paper he provided notes on Pteromalid wasps associated with *Euphorbia* plants. In the same year PRINSLOO published an illustrated guide to the parasitic wasps associated with the citrus pests in South Africa, which included 4 species of Pteromalidae. NARENDRAN in the same year reviewed the species of Pteromalidae affecting plant galls.

GRISSEL in 1985 gave a valuable contribution. He proposed new synonymies and nomenclatural changes in Pteromalidae. They were *Systellogaster* Gahan 1917 = *Tritneptis* Girault 1908, *Paradibrachys* Girault 1917 = *Pseudocatolaccus* Masi 1908 and Dvaliniinae Hedqvist 1978 = Colotrechininae Thomson 1876. In the same year FAROOQI and SUBBA RAO contributed a key to the Indian genera of Pteromalidae in the review of chalcidoidea of India and the adjacent countries published by SUBBA RAO and HAYAT. In 1986 BOUCEK erected a new subgenus under the genus *Gastrancistrus* namely *Mangistrus*. In the same paper he also described a new species namely *Gastrancistrus (Mangistrus) cherryi*. In a catalogue of chalcidoidea published by SUBBA RAO and HAYAT 1986, FAROOQI and SUBBA RAO contributed a catalogue of the Pteromalid fauna of India. The catalogue included 78 genera and 90 species, and which remains one of great importance in the family as far as Indian fauna is concerned. In 1988 HEYDON and GRISSEL reported the genus *Toxeuma* Walker for the first time from the Nearctic region which is represented by four new species.



Apart from all above the monumental work of BOUCEK on Australasian Chalcidoidea came during the year 1988. He made a biosystematic revision of 14 families of Australasian Chalcidoidea. In that work he identified 28 subfamilies and 235 genera in Pteromalidae. A brief surveys of the biology, morphology and distribution of the family and a good key to the genera have been provided. Many species were commented on with new records on biology and distribution and in many cases lectotypes were designated. MANI in 1989 published an elaborate work on the fauna of chalcidoidea from India and the adjacent countries in two parts. Part one contains informations about all the known genera and species of Pteromalidae.

During 1990 SURESHAN and NARENDRAN described two new species of Indian Pteromalidae viz. *Eurydinotomorpha malabarensis* and *Netomocera nigra* from Kerala. They synonymised *Asoka* Boucek with *Eurydinotomorpha* Girault and provided keys to the oriental species of *Eurydinotomorpha* and Afro-Oriental species of *Netomocera*. In the same year GRISSEL and SCHAFF published an hand book of the families of Nearctic Chalcidoidea in which they dealt with the family Pteromalidae also. In 1991 NARENDRAN *et al.* contributed a few publications to the study of Indian Pteromalidae. In one of the publications they described a new species of *Delislea* viz. *D. rahimani* from Kerala. This was the first report of the genus from the oriental region. In another publication on some important and beneficial chalcids associated with sericulture, NARENDRAN *et al.* provided a systematic account of the Pteromalid

parasites *Pachycrepoideus veerannai* sp. nov. and *Spalangia endius* Walker from *Exorista sorbillans* Wied, a serious pest of *Bombyx mori* in South India.

BOUCEK and RASPLUS published an illustrated key to West-Palaearctic genera of Pteromalidae, which included 221 genera and 10 subgenera, accompanied by records of synonymy etc. The work included 491 elaborate drawings and 110 electroscan photographs. This was followed by DARLING, who revised the world species of *Spalangiopelta* MASI. In the same year DARLING again erected a new genus *Bopha* under the family from South Africa. This was the first record of the subfamily Ceinae outside the Holarctic and Neotropical regions. NAUMAN revised the Australian genus *Enoggera* Girault in the same year. He redescribed the five known species of the genus.

GRAHAM contributed much during 1992. He described the European species of the genus *Conomorium* Masi. A new species of *Zdenkiana* Huggert is also described from France viz., *Zdenkiana bisulcata*. He further enriched the family by revising the Western European *Psilocera* Walker with descriptions of three new species viz. *P. seiugata*, *P. rufipes* and *P. confusa*. In the same year a new species of *Synedruss* Graham namely *Synedruss crassicornis* is also described. In the same year ZHONGQI discovered the genus *Agiommatus* Crawford from South China. In the same paper he described a new species of *Agiommatus* namely *Agiommatus jahuana*. Narendran in the same year described a new species of *Reikisura* Boucek namely *Reikisura keralensis* from India. In the same year Askew gave an account of 7 species of Pteromalidae which are new to Britain. He

also mentioned about other uncommon species. GRAHAM's work continued during 1993 also. He revised the European species of the genera *Trigonoderus* Westwood and *Plutothrix* Foerster. In the same year DAWEI and HONG described a new species of *Lamprotatus* Westwood namely *Lamprotatus carinatus*. SANTIS and FIDALGO in the same year described four new species of *Aditrochus* Ruebsaamen viz. *A. bouceki*, *A. chilensis* from Chile. *A. coihuensis* and *A. gnirensis* from Argentina. *A. coihuensis* was obtained from galls on *Nothofagus dombeyi* and *A. gnirensis* from galls on *N. antarctica*. They also redescribed the species *A. fagicolus* Ruebsaamen obtained from galls on *N. pumilio*.

SURESHAN and NARENDRAN contributed much during 1994. They described two new species viz., *Trichomalus kannurensis* and *Uniclypea kumarani*, *Trichomalus* Thomson and *Uniclypea* Boucek are recorded for the first time from India. A key to species of *Uniclypea* is also provided. They also described a new species of a little known genus of Pteromalidae namely *Oniticellobia longigastra*. In the same year DELVARE and RASPLUS erected a new genus of Pteromalidae namely *Spodophagus*, an important parasite of *Spodoptera littoralis* which is resistant to several classes of insecticides in Madagascar. The genus is described with the single species *S. lepidopterae* comb. n., which was originally described from Madagascar by Risbec (1952) in the genus *Oxyglypta*. In the same year NIEVES and GARRIDO described a new species of *Trichomalus* from Spain viz., *Trichomalus alonsoi* from galls of *Pericartielus durieu*. AGARWAL in the same year described a new species of *Merismomorpha* Girault namely *M. yousufi*.

During the year 1995 DARLING described two new palaerctic species of *Spalangiopecta* Masi viz. *S. alboaculeate* from England and *S. shiko* from Japan. They also provided additional information and illustrations for *S. procera*. In the same year SURESHAN and NARENDRAN described two new species of *Psilocera* Walker viz., *P. vinayaki* and *P. clavata* from Kerala. In the same year they also described a new genus namely *Neopistenia* with *N. coorgensis* as type species from Karnataka. In 1996 GARRIDO and NIEVES revised six species of pteromalids described by Mercet, five from Spain and one from Fernando Poo. They also described another two species, labelled as new by Mercet but whose description was never published. They also synonymised *Mesopolobus blascoi* Askew with *Eutelus maculipennis* Mercet, 1923. *Hispanolelaps coxalis* Mercet (1927) was correctly synonymised with *Dipara petiolata* Walker (1883). In the same year TAVARES redescribed *Caenacis espinosai* (Brethes, 1927) comb. n.

KAMIJO contributed a lot during 1996 to the Japanese fauna. He described a new species of *Merismus* Walker from Japan. In the same paper he also provided notes on *M. megapterous* Walker which is recorded for the first time from Japan. Its host records are also given. In the same year he described four new species of *Cleonymus* Latreille from Japan viz. *C. ryukyuensis*, *C. ceratinae*, *C. serrulatus* and *C. togashii*. Host records are given for two new species, one reared from a small carpenter bee and the other from Cerambycids as a primary and a secondary parasitoid. A key to the Japanese species is provided. In the same paper they synonymised *Paracleonymus* Masi with *Cleonymus* Latreille. In the same year he redefined

*Schimitschekia* Boucek. *S. populi* Boucek reared from *Paraphytomyza populi* is recorded for the first time from Japan. He also described a new species *S. katoi* reared from *Chromatomyia suikazurae* Sasakawa. In the same year SURESHAN and NARENDRAN described a new species of *Agiommatus* Crawford namely *Agiommatus geethae* parasitising the eggs of *Spodoptera litura* (Fab.) on mulberry from Karnataka. A key to the species of *Agiommatus* is also provided. ZHONGQI in the same year gave an account of the parasitic wasps on bark beetles in China. He treated 27 genera and 71 species of which 2 genera 53 species are new.

SURESHAN and NARENDRAN contributed during 1997 also. They described a new name *Grooca* for *Neoepistenia* Sureshan & Narendran (1995) since *Neoepistenia* is already preoccupied by *Neoepistenia* Hedqvist (1958). In the same year LASALLE, POLASZEK and NOYES described a new white fly parasitoid *Idioporus affinis* gen. nov. sp. nov. from Central America. They created a new tribe idioporini for it. Giant white fly *Aleurodicus dugesii* Cockerell (Homoptera: Aleyrodidae) is a potential biological control agent of this white fly which is a recently introduced pest in California, Louisiana and Texas. In the same year NARENDRAN and MINI described a new species of *Cleonymus* Latreille viz. *Cleonymus malaicus* from Malaysia.

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## ***Chapter II***

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## A. MATERIALS AND METHODS

### 1. Collection Work

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

#### *a. Study area*

Specimens for the present work were collected from different parts of Kerala. 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 between the high western-ghats on the east and the Arabean 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 76 m, (2) Midlands 7.6 to 76 m and (3) Lowlands below 7.6 m.

The Highlands slope down from the western ghats which rise to an average height of 900 m, with a number of peaks well over 1800 m 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 coconuts 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 Pteromalidae 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. Average humidity and average rainfall during the period from 1995-1998 are 81 and 4258 cm respectively.



## 2. Methods of collection

### *a. Sweep net and Sweeping*

Pteromalids 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 Pteromalids since a relatively good diversity of species could be collected within a short time.

The type of net most suitable for sweeping is of particular design. The net is originally designed by Noyes (1982) which is based on the first design drawn up during 1950 by Boucek. The frame of the net (Fig. 2) is triangular in shape and is made up of aluminum with sides measures 48 x 46 x 48 cm. The triangular frame increases the surface area of the net in contact with the ground when sweeping grassland.

The net (Fig. 2) handle was made up of  $\frac{3}{4}$ " 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 60 cm in length and is made up of thin cotton cloth which allows the easy passage of air. The top 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 an area where the vegetation is as diverse as possible. A grassland with a good selection of flowering plants surrounded by several different kinds of bushes and trees formed an excellent location for collection. Sweeping was done as described by Noyes (1982). Pteromalids collected in the net was immediately sucked in to an aspirator (Fig. 3).

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 insects they are transported to 70% alcohol for further examination.

#### *b. Rearing*

Suspected hosts were collected and placed them in a suitable receptacle to await the emergence of parasites. For large host samples such as plant materials containing galls etc. an emergence box was used. The host samples were put in the emergence box.

#### *c. Malaise trap*

A suitable design of Malaise trap 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 about 6' wide, 3'6" high at one end and 6'6" at the other end.

#### *d. Yellowpan 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 square which is painted bright yellow on the inside and some neutral colour, such as black on the outside. 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.

### **3. Storing and Preserving**

#### *a. unmounted material*

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 damage to the stored specimens.

#### *b. 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.

#### 4. Mounting

##### a. *Card mounting*

The method followed in the present work is that adopted by Boucek and Noyes (Noyes, 1982). The specimen was mounted on a card rectangle, 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 mandibles were clearly visible.

The materials used for card mounting were:

- 1) a fine zeropoint brush
- 2) a pair of fine needles or pins
- 3) water soluble glue
- 4) a pair of fine forceps
- 5) mounting cards measuring 14 x 5 mm.

The specimens to be mounted, either freshly killed or relaxed specimens in alcohol, were first of all dried. For this, the specimen was placed with a drop of alcohol on an absorbant 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 rectangle. 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

met. Then a fine brush was taken and it was moistened by a minute quantity of saliva from the tongue. 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 so 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 avoiding shrinking of delicate specimens due to air drying a method proposed by Sharkey (1988) was adopted. The specimens were immersed in 95% ethyl alcohol and 100% ethyl alcohol each for 24 hours, then in chloroform for two hours, after which they were air dried. The air dried specimens were mounted using the usual method. For mounting, Hertel & Reuss Stereozoom microscope (German made) was used.

The specimens thus mounted on the cards were held on entomological pins (Asta insect pins No.3: 38 mm x 0.5 mm 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, exact locality, collector, date and host known (if known). Naphthalene balls and thymol crystals were placed inside the boxes containing mounted specimens in order to protect them from attack by other insects and from fungal growth respectively.

### ***b. Mounting on microslides***

For detailed studies of certain parts of the body such as antennae, legs etc. microslides were prepared. The required parts were first removed from the specimen. Heavily sclerotized structures were first subjected to clearing before being mounted. For clearing parts were soaked in 10% KOH solution for 24-48 hours. When the parts were sufficiently cleared, they were washed with glacial acetic acid; followed by distilled water and dehydrated through graded series of alcohols. The cleared materials were then mounted in DPX.

### **5. Observations**

Observations were mostly done on card mounted specimens under olympus (Japan made) and M3Z WILD stereozoom (Switzerland made) microscopes.

### **6. Measurements**

The specimens were measured using micrometer under Leitz wetzlar microscope (German made).

### **7. Illustrations**

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.

## B. SYSTEMATIC STATUS OF THE FAMILY PTEROMALIDAE

The family Pteromalidae represents one of the largest families of chalcidoidea, consisting of about 551 genera and approximately 3003 species from the world (GRISSELL & SCHAUFF, 1990). This family is very rich and diverse in forms. Within the chalcidoidea the pteromalidae are rivalled only by the Encyrtidae and Eulophidae in terms of the number of recognised genera and species. There is some regional variation, with probably relatively fewer species of Pteromalids in the tropics than in temperate regions. The family however includes a much wider variety of forms than the two other named families together. The limits of the family are not yet satisfactorily stabilised, in spite of recent considerable advances in the knowledge about the family. As with any large taxa, especially a poorly defined one, in Pteromalidae also the approach of classification differs widely from taxonomist to taxonomist.

'Pteromalini' the second earliest available group name in the chalcidoidea, was proposed by DALMAN (1820). The present subfamilies Miscogasterinae, Ormocerinae and Cleonyminae were considered as separate families by WALKER (1833). His diagnosis was very vague. WESTWOOD (1839) added 'spalangiides' and also placed Torymidae in Pteromalidae. HALIDAY (1844) separated pireniani. FORSTER (1856) attempted a further elaboration of the system, treating all the previously proposed groups as different families. This was changed by Thomson (1876, 1878) who replaced *Ormocerides* by Tridymina and accepted as tribes

(now regarded as subfamilies), pirenina, spalangina and Pteromalina, the last one with several subtribes including Miscogastrides and Cleonymides. THOMSON's system became the basis for Ashmead's classification in his work of 1904. He divided the species now included in Pteromalidae into three families viz. Miscogasteridae (with four subfamilies), Cleonymidae (with two subfamilies) and Pteromalidae (with six subfamilies). ASHMEAD's system was largely followed by GIRAULT. Later on, the three subfamilies were united again in pteromalidae by PECK (1951) with subfamilies Sphegigasterinae and Pteromalinae, each with nine tribes. The publication of NIKOLSKAYA (1952) contains the pteromalids in five families viz. Miscogasteridae, Spalangidae, Cleonymidae, Tridymidae and Pteromalidae.

Monumental work on European Pteromalidae by GRAHAM (1969) had a major impact on the classification of the family Pteromalidae. He has provided a basis for future work on the family throughout the world. He recognised 15 subfamilies in the family Pteromalidae. RIEK (1970) expressed a broader view in the taxonomy of Pteromalidae by including Ormyridae, Perclampidae and Eucharitidae in the family but these groups were considered as separate families by others. BOUCEK (1988) provided the more recent classification of Pteromalidae. He transferred the subfamily Chrysolampinae of GRAHAM back to perilampidae. Altogether 28 subfamilies were defined by him although almost half of them are based on single or very few genera. Some of his subfamilies are upgraded groups from GRAHAM's (1969) classification, others are exclusively or mainly of southern distribution. In the present work I have followed the classification



of BOUCEK (1988). BOUCEK *et al.* (1978) and FAROOQI & SUBBA RAO (in SUBBA RAO & HAYAT 1986) reported representative genera under 12 subfamilies of BOUCEK (1988) from India and the adjacent countries. They are Cleonyminae, Diparinae, Spalangiinae, Cerocephalinae, Asaphinae, Herbertiinae, Eunotinae, Austroterobiinae, Miscogasterinae, Pireninae, Ormocerinae and Pteromalinae.

## C. DIAGNOSTIC CHARACTERS OF THE FAMILY

### PTEROMALIDAE

Because of the great diversity and plasticity in the external morphology of these insects, tremendous taxonomic difficulties are met with for defining the limits of the family. For the same reason it is possible only to give a generalised diagnosis of the family here.

#### DIAGNOSIS

Moderate to large chalcidoids, colour often blackish or metallic green but also paler; head round, rarely narrower below; ventral margin of the gena weak and slanting; antennae usually with more than one ring segment; pronotum usually transverse; mesoscutum with complete or incomplete notaular grooves; propodeum frequently has sublateral carinae, termed plicae, running longitudinally near the spiracles; posteriorly the propodeum often extended as narrow nucha; shape of gaster varying considerably; gaster broadly joined to the propodeum or petiolate; the petiole sometimes long and slender gaster ranging from short, broad to long-slender and acutely pointed at apex; forewing with venation well developed, mv usually relatively long; tarsi five segmented, the forelegs rarely with femur enlarged, swollen or with hind femur swollen as in chalcididae.

D. KEY TO THE SUB FAMILIES OF PTEROMALIDAE OF  
ORIENTAL REGION

(Modified from Boucek, 1988)

1. Antennal toruli situated on lower margin of head overhanging the mouth; antenna with 7 funicular segments, but no anellus; gaster on distinct petiole; marginal vein very long, stigmal and post marginal veins short. .... SPALANGIINAE
- Toruli situated atleast slightly above mouth margin antennal formula different; venation different ..... 2
2. Head subprognathous or globose, with large ridge or tooth between antennae; anellus absent and with strong occipital carina; wings if not reduced, without conspicuous pilosity but with fine long marginal fringe, sometimes with a tuft at parastigma. .... CEROCEPHALINAE
- Head quite different, antennae and wings not as above .....3
3. Pronotum dorsally rounded or at least without transverse edge medially often with smooth strip or raised longitudinal line; hind margin only moderately emarginate; thorax usually punctured ..... CLEONYMINAE
- Pronotum not as above ..... 4
4. Notauli incomplete and wide apart; marginal vein widened in basal part. .... PTEROMALINAE
- Notauli mostly clearly complete; if incomplete (some diparinae) then marginal vein not widened in basal part. .... 5

5. Second tergite of petiolate gaster very large, covering most of dorsum, dorsally more or less fused with the first tergite; head with no temple. Scutellum anteriorly with 2 deep pits. .... ASAPHINAE
  - Second tergite never covering most of gaster; temple and antenna different; scutellum without double deep pit at base ..... 6
6. First tergite greatly enlarged, convex, non-collapsing covering more than 1/3 of gaster; antennal sockets usually close to each other ..... 7
  - First tergite never bell shaped not so convex and large, if covering over 1/3 of gaster then either itself collapsing from base or whole gaster dorsally caving in; antennal sockets usually rather wide apart ..... 8
7. Head including large eyes, thorax dorsally and wings regularly densely pilose; never with paired bristles. .... HERBERTIINAE
  - Head and thorax not as above but often with paired dark bristles. .... DIPARINAE
8. Pronotum dorsally not visible, strongly reduced mandibles with long teeth. .... AUSTROTEROBIINAE
  - Pronotum dorsally visible mandibular teeth not so long ..... 9
9. Pronotum narrow; axillar grooves anteriorly more or less meeting so that scutellum does not reach or only narrowly reaches mesoscutum. .... ORMOCERINAE
  - Pronotum not much narrow; axillar grooves wide apart so that scutellum broadly borders on mesoscutum. .... 10
10. Clypeal margin with deep median incision and asymmetric teeth marginal vein slender. .... MISCOGASTERINAE

- Clypeal margin without deep median incision and asymmetric teeth; marginal vein not slender ..... 11
- 11. Antennae inserted above centre of the very convex face; pronotum long, subconical in lateral view, wings unusually narrow. ....  
..... PANSTENONINAE
- Antennae inserted below the centre of the face, pronotum not as above, wings not so narrow ..... 12
- 12. Gena posteriorly carinate; clypeal margin not produced, anellus absent. .... EUNOTINAE
- Gena not posteriorly carinate; clypeus conspicuous, its sides converging, lower margin produced; antenna often with 1 or 2 mostly very small, anelli. .... PIRENINAE

## E. ABBREVIATIONS

### 1. Abbreviations of Depositories

BMNH	British Museum (Natural History), London, England
BPBM	Bernice Pauahi Bishop Museum, Honolulu, Hawaii
DZCU	Department of Zoology, University of Calicut, Kerala, India
IARI	Division of Entomology, Indian Agricultural Research Institute, New Delhi, India
NM	Entomologicke Oddeleni, Narodni Museum, Praha, CSSR.
USNM	United States National Museum of Natural History, Washington DC, U.S.A.
ZMMS	Moscow State University Museum, Moscow, USSR.
ZSI	Zoological Survey of India, Calcutta, India

### 2. General Abbreviations

F	Female
M	Male

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*Chapter III*  
***Observation and Results***

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## A. TAXONOMIC DESCRIPTIONS

### Subfamily SPALANGIINAE

#### Diagnosis

Body black or slightly metallic; Head and thorax often with some distinct punctures or rugosity. Head elongate; antennae inserted near mouth; thorax elongate, flat, pronotum narrower than mesonotum; conical, parapsidal furrows deep; scutellum without sublateral lines but often with punctate frenal line. Forewing disc flat pubescent, without a tuft of scales. Abdomen petiolate.



## Genus SPALANGIA Latreille

*Spalangia* Latreille, 1805, Hist. nat. crust. ins. 13: 227-228. Type-species (by monotypy): *Spalangia nigra* Latreille.

*Prospalangia* Brethes, 1915, An. Soc. Cient. Argent. 79: 314. Type species (orig. design). *Prospalangia platensis* Brethes. Synonymy by Boucek. 1963: 433.

### Diagnostic features

Body with antennae and legs (except tarsi in most species) black, rarely with a weak metallic gloss, generally smooth between piliferous punctures which may be very sparse; head prognathous, with antennae shifted forward over the mouth border; toruli wide apart, space between them flat, depressed, broad; antenna dull black, flagellum and pedicel with dense and extremely short pilosity, mostly filiform, always with 7 funicular segments without anellus, in male first funicular segment longer than pedicel. Eyes with sparse but long hairs; in front of median ocellus a punctate median groove; pronotum with low subhorizontal neck with transverse rugosity, and convex, bell shaped collar part; mesoscutum between punctate notaular grooves with irregular punctures; rarely a cross-row; propodeum with shiny submedian areas separated by a strip of alveolae expanding forward and becoming double, sides of propodeum punctate-rugulose; horizontal hind corners projecting. Fore basitarsus always enlarged. Forewing with very long marginal vein but very short, subequal, post marginal vein and stigmal vein, latter strongly bent; wing disc with distinct though fine pilosity never maculate. Petiole of gaster

always conspicuous, bearing longitudinal ribs; gastral body convex but low, hind margins of first two tergites broadly emarginate; the first with deep basal fovea; ovipositor sheaths subexserted.

#### *Distribution*

Cosmopolitan.

#### *Biology*

Primary parasites of Diptera; some species attack synanthropic flies, sheep maggot-flies and tachnid flies and are of major importance. Several have been used in biological control of such flies. The host flies include *Stomoxys calcitrans*, *Musca domestica*, *Sarcophaga*, *Calliphora*, *Pycnosoma*, *Exorista sorbillans* and *Chrysomyia* spp. (Boucek, 1988).

#### *Remarks*

Five species of *Spalangia* have so far been reported from India and these species are represented in the collection of the present investigation.

Haliday (1833) was the first author to establish for this genus an independent tribe called then *Spalangiae*. Westwood (1839) named the "subfamily spalangiides" and Forster, (1856) attributed the group the status of a family *Spalangoidae*.

## KEY TO THE SPALANGIA SPECIES OF INDIA

1. Pronotum with distinct, isolated cross-line of dense punctures just before hind margin (Fig. 12) ..... 2
- Pronotum without distinct and isolated cross-line (Fig. 22) .....  
.....*obscura* Boucek
2. Pronotal collar anteriorly step-like (Fig. 25) and margined by distinct ridge; its disc more or less smooth, lateral parts umbilicately punctured ..... *nigroaenea* Curt.
- Pronotal collar anteriorly rounded or very low and then with some transverse rugae sculpture of disc varied ..... 3
3. Pronotal collar semiglobose (Fig. 12) polished, but almost regularly beset with large piliferous punctures ..... *endius* Walk.
- Collar less arched, (Fig.16) crowdedly rugose punctured ..... 4
4. Head distinctly oblong, antennae (Fig. 15) longer, second funicle segment oblong, distal ones quadrate ..... *cameroni* Perkins
- Head hardly longer than wide, antennae shorter, second funicle segment subquadrate, following ones transverse (Fig.19)  
..... *gemina* Boucek

*Spalangia endius* Walker

(Figs. 11-14)

*Spalangia endius* (Walker, 1839, Monogr. Chalcid., 1:96. M. James Isle  
(Lectotype, BMNH).

*Plesiotype*: Female: Length 2.7 mm.

*Colouration*: Body shining black, tegula and veins brown, tarsi testaceous except at tips.

*Head*: (Figs. 11,13) slightly longer than wide in frontal view, in lateral view twice as long as wide. Umblicately punctured with inter spaces as wide or wider than punctures themselves and with sparse, long hairs. Mandibles 2-dentate. Malar space moderately converging shorter than longer diameter of eyes. Malar grooves distinct. Eyes small, non prominent, hairy; frons with a punctate median groove in front of median ocellus extending to about middle of scrobe below. Scrobe broad, shallow. Antenna inserted just above clypeal margin, toruli wide apart; scape slender granulated nearly as long as following five segments combined. Pedicel twice as long as first funicular segment; anelli absent. Club nearly as long as preceding three segments combined. POL 1.25x OOL. Vertex rounded posteriorly with occipital carina.

*Thorax*: Longer than wide. Pronotum (Fig.12) with a low subhorizontal neck with transverse rugosity and a convex collar region with sculpture similar to head and with a distinct crenulate cross line before hind margin, collar rounded anteriorly, not margined. Mesoscutum

between punctate notaular grooves with irregular punctures; notauli not reaching transscutal line; axillae not meeting medially. Scutellum with a few punctures sublaterally in front of frenal cross line; frenum occupying 1/3 forming a belt slightly broader than metanotum. Propodeum with shiny submedian areas separated by a strip of median alveolate double row, strongly narrowed posteriorly, with fine carina only in anterior half. Sides of propodeum punctate - rugulose, hind corner projecting; nucha short, smooth. Prepectus triangular, rugose extending to base of tegula. Macropterous. Wings hyaline with pubescence as in figure. Costal cell 1.6x longer than marginal vein, mv 5.7x that of pmv, the latter equal to that of stv. Fore basitarsus enlarged.

*Gaster* (Fig.11): convex, longer than thorax, finely granulate, petiole 1.7x as long as broad almost parallel sided with several longitudinal carinae; first tergite with hind margin slightly incurved with distinct fovea at base; hind margin of second tergite broadly incurved; third tergite largest with hind margin more or less straight. Subsequent tergites small, compressed, with hind margins incurved, narrowed at apex; ovipositor sheaths slightly exerted.

*Male*: Length 2.4 mm. Head hardly shorter than long, eyes more protruding than in female. First funicle segment cylindrical, longer than pedicel (Fig. 14) Forewing slightly infumated, strongly pubescent. Propodeal median double groove subparallel sided. Petiole fully, twice as long as broad.

*Host:* Hyperparasitic on *Bombyx mori* L. (Lepid: Bombycidae) through *Exorista sorbillans* Weid. (Dipt: Tachinidae) (Narendran *et al.*, 1992).

*Distribution:* India (Kerala) Cosmopolitan

*Plesiotype:* Female, INDIA, Kerala, C.U. Campus, Mini 3.VI-1995 (DZCU).

*Other materials examined:* IF, INDIA, Kerala, C.U. Campus, Mini, 3.VI-1995; IF, INDIA, Kerala, Nirmalagiri, Mini, 2.IV.1996; IF, INDIA, Kerala, Malampuzha, Sureshan, 3.XII.1988; IF, INDIA, Kerala, Kasargod, Sureshan, 27.11.1988; IF, INDIA, Kerala, T.C. Narendran, 3.IV.1987; IF, INDIA, Kerala, C.U. Campus, Kasargod, Sureshan, 27.11.1988; IF, INDIA, Kerala, C.U. Campus, Mini, 5-IV-1996; IF, INDIA, Kerala, Nirmalagiri, Mini, 2-IV-1996; IF, INDIA, Karnataka, Bangalore, G. Veerannai, 4.IV.1991; IF, INDIA, Karnataka, Bangalore, G. Veerannai, 4.IV.1991, IM, INDIA, Kerala, C.U. Campus, Sureshan, 5.IV.1989; IM, INDIA, Karnataka, Bangalore, G. Veerannai, 4.IV.1991 (All in DZCU).

#### *Discussion*

This species is similar to *Spalangia cameroni* Perkins in most of the features, but differs from it in having scutellum with only a few punctae sublaterally, and in having stv as long as pmv (In *S. cameroni* Scutellum with several punctures in lateral corners; stv shorter than pmv).

*Gaster*: Petiole 1.8x as long as broad; gastral tergites polished, T3 the largest, 1.2x as long as preceding tergites combined.

*Male*: Length 2.3 mm. Head longer than broad; gena twice eye length. Scape reaching anterior ocellus, nearly as long as following four segments combined (Fig. 18). F1 twice as long as pedicel. Abdominal petiole about 2.3x as long as broad.

*Host*: Dipterous puparia (Farooqi Subba Rao 1986).

*Distribution*: India (Kerala, Karanataka, Delhi).

*Plesiotype*: Female, INDIA, Kerala, Silent Valley, Sureshan, 9.XII.1987 (DZCU).

*Other materials examined*: 1F, INDIA, Kerala, C.U. Campus, T.C. Narendran, 4.11.1986. 1M, INDIA, Kerala, C.U. Campus, Mini, 3-V.1996 (All in DZCU).

#### *Discussion*

*Spalangia cameroni* perkin's differs from other species in having pronotal collar leaving a broadly triangular smooth disc.

*Spalangia gemina* Boucek

(Figs. 19 & 20)

*Spalangia gemina* Boucek, 1963. Acta Ent. Mus. Nat. Pragae, 35: 484. M.F. Mauritius (BMNH).

*Plesiotype*: Female: Length 3 mm.

*Colouration*: Body black, hardly with any metallic tinge; tarsi pale testaceous except dark claw segments.

*Head* (Figs. 19, 20): In front view slightly wider than long, eyes moderately prominent; genae straightly converging. Maximum diameter of eyes 1.2x as long as malar space; Inside view head about twice as long as thick; frons densely umbilicately punctate, interspaces very narrow, about as wide as punctures; scrobe deep; scape granulate, slender, about as long as following five segments combined; pedicel twice as long as wide, about 1.2x as long as F1, the latter 1.4x as long as broad; F2 quadrate following ones transverse, club slightly longer than preceding two segments combined.

*Thorax*: Pronotal collum transversely carinaceous, with crenate crossline off hind margin; piliferous punctures elevated, tubercle like. Mesoscutum with median longitudinal raised carina, anteriorly rugulose-punctate. Metanotum as short as frenum, propodeum with double alveolate row triangularly expanded anteriorly; median carina in front half



only nucha very short, with deep alveolae at its base; spiracular furrows very narrow, deepened in to fovea posteriorly. Forewing bare on upper surface below submarginal vein; mv 5.6x as long as pmv, the latter as long as stv (Fig.19).

*Gaster*: Petiole 1.4x as long as broad almost parallel sided, with distinct carinae gaster ovate, polished; T2 distinctly emarginate, in the middle, 4x as long as T3; ovipositor not exerted.

*Male*: Head slightly shorter than broad (27: 28.5); genae dull, crowdedly punctate, scape as long as following four segments combined. Pedicel almost 1.5x as long as broad, F1 twice as long as broad and about 1.7x as long as pedicellus; funicle segments 2 to 7 subequal; club as long as preceding two segments combined, about 2.5x as long as broad.

*Hosts*: *Adisura atkinsoni* Moore, dipterous puparia (Farooqi and Subba Rao, 1986).

*Distribution*: India (Kerala, KT, TN, WB)

*Plesiotype*: Female, INDIA, Kerala, Muthanga, Mini, 6.X.1995 (DZCU).

### *Discussion*

*Spalangia gemina* Boucek differs from *Spalangia endius* walker, *Spalangia cameroni* perkins and *Spalangia nigroaenea* Curtis in having head in front view as long as wide, petiole 1.4x as long as wide, nucha with deep alveolae at its base. Differs from *Spalangia obscura* Boucek in having pronotum with distinct crenulate cross-line off hindmargin.

*Spalangia obscura* Boucek

(Figs. 21-23)

*Spalangia obscura* Boucek, 1963. Acta Ent. Mus. Nat. Pragae, 35: 488. F.

Philippines: Luzon (NM).

*Plesiotype*: Female: Length 1.7 mm.

*Colouration*: Body black, without distinct metallic lustre; tarsi testaceous, more or less infuscate at claws.

*Head* (Figs. 21, 23): In frontal view as long as broad; densely umbilicately punctured with very narrow interspaces and short dense hairs; Scrobe shallow; temple sparsely punctured and occipital carina low. Gena shorter than eye width; malar sulcus distinct. Antenna not long, distinctly widened toward tip; scape longitudinally striate, fully as long as following five segments combined; pedicellus twice as long as wide, about twice as long as F1, the latter 1.2x as long as broad, F1 to F7 transverse. Clava almost twice as long as wide, shorter than three preceding segments together.

*Thorax* (Fig.22): pronotum with broad piliferous punctures before the collar, this not margined without distinct crenulate cross line before hind margin. Mesoscutum densely rugoso-punctate scutellum with distinct, coarsely crenate crossline, umbilicately punctate, except in median third; propodeum with median alveolate double row, moderately narrowed in the middle; median carina not raised. Mesopleura smooth on elevated

parts. Hind trochanter above with distinct callus. Forewing with abundant hairs on cubital fold and below distal half of sub marginal vein; mv 5.7x as long as pmv, the latter slightly longer than stv.

*Gaster*. (Fig. 21) petiole twice as long as broad, parallel sided with numerous erect hairs laterally; gaster ovate, polished; third tergite the largest. Ovipositor tip hardly exerted.

*Male*: Unknown

*Host*: Tachinid fly in *Tirathaba mundella* Walker (Farooqi and Subba Rao, 1986).

*Distribution*: India (Kerala, Karnataka).

*Plesiotype*: Female, INDIA, Kerala, Kakkayam, Mini, 8.XI.1996 (DZCU).

*Other material examined*: 1F, INDIA, Kerala, C.U. Campus, Mini, 16.VI.1995 (DZCU).

#### *Discussion*

*Spalangia obscura* Boucek differs from all other species in having pronotum without distinct posterior crenulate crossline and petiole 2x as long as thick.

*Spalangia nigroaenea* Curtis

(Figs. 24-26)

*Spalangia nigroaenea* curtis, 1839. British Ent., 16, fol. 740:2. M. (Curtis coll. Melbourne).

*Plesiotype: female:* length 2.8 mm.

*Colouration:* Body metallic black, tarsi testaceous except tips.

*Head* (Fig. 24, 26): In frontal view distinctly longer than broad; umbilicately punctured with interspaces about as wide as punctures; eyes moderately prominent, their longer diameter as long as malar space; scapus superficially rugulose, very slender, as long as 5½ following segments combined; pedicellus longer than F1, the latter about twice as long as broad, the following funicle segments decreasing in length. Clava narrow, 2.4x as long as broad, equal in length to preceding 2.5 segments together.

*Thorax:* Pronotum with deep caudal crenulate crossline parallel to hind margin, collar (Fig.25) subpentagonal, distinctly ridged anteriorly, the ridge bordered by a row of punctures. Impunctate part of mesoscutum polished; scutellum smooth except one to three punctures in lateral corners with distinct frenal crossline. Propodeum with double median row of small alveolae, median carina developed only anteriorly; nucha short, smooth. Basal cell of forewing bare; mv 5x as long as pmv, the latter as long as stv. Stigmal vein strongly curved. Trochanter of hind leg with moderate callus above.

*Gaster*: Petiole somewhat expanded anteriorly, about 1.9x as long as broad with longitudinal carinae, gastral tergites granulate. T3 largest about 0.8x preceding tergites combined; ovipositor exerted.

*Male*: Head only as long as broad, eyes protruding. Scape as long as following three segments combined. F1 about 3.5x as long as broad, as long as clava, about 2.5x as long as pedicellus. Abdominal petiole about 2.3x as long as broad, with abundant hairs laterally.

*Hosts*: *Chrysomyia aenea*; *Musca domestica* L. (Farooqi and Subba Rao, 1986).

*Distribution*: Cosmopolitan.

*Plesiotype*: Female, INDIA, Kerala, Mukali, Sureshan, 10.XII.1987 (DZCU).

#### *Discussion*

*Spalangia nigroaenea* Curtis differs from other species in having pronotal collar anteriorly subpentagonal, distinctly ridged, the ridge bordered by a row of punctae.

## Subfamily PANSTENONINAE

### Diagnosis

Antennae inserted above centre of the very convex face. Pronotum long, sub conical in lateral view about as long as high or nearly so; wings unusually narrow, forewing at least 3.3x as long as broad and hairy, marginal vein fully 3x as long as the stigmal; petiole widening caudad; rugose, transverse to subquadrate.

## Genus *PANSTENON* Walker

*Panstenon* Walker, 1846:29. Type species *Miscogaster oxylus* walker, by monotypy.

*Caudonia* Walker, 1850: 125-126. Type species *Caudonia agylla* Walker, by monotypy. Synonymy by Kerrich & Graham, 1957: 276.

### Diagnostic features

Head broader than thorax; Antennae inserted very high; formula 11263. Thorax fairly convex, pronotum with surface almost smooth, dorsally sloping anteriorly slightly concave. Mesonotal reticulation - puncturation conspicuous; notauli moderately deep. Forewing long, narrow without speculum. Gaster sublanceolate. First tergite the largest.

### Distribution

India (Kerala), North America, Europe, Africa.

### Biology

The species are associated with grasses and their hosts seem to be insect eggs and larvae developing in the internodes of the grass stems.

### Remarks

This is the first report of the genus from oriental region with the African species *collaris*.

The genus *Panstenon* was recognised correctly by Forster (1856) and Thomson (1878). Originally placed by Walker in Pteromalidae. Erdos had

already (1955: 296) proposed a new subfamily panstenoninae in which he included *Panstenon* Walker.

*Panstenon collaris* Boucek

(Figs. 27-30)

*Panstenon collaris* Boucek, 1976. J. ent. soc. sth. Afr. 39:17.

*Plesiotype: Female:* length 2.2 mm.

*Colouration:* Metallic green, but following parts testaceous; scapes, legs with coxae, pronotum, petiole and gaster ventro-anteriorly, often to greater extent, sometimes even along median line; wings hyaline.

*Head* (Figs. 27,28,30): In front view 1.4x as broad as long, dorsally about 2.3 x as broad as long. POL 1.6x OOL. Antennae inserted above the centre of the convex face; distance between toruli and lower margin of clypeus 2x greater than that between toruli and median ocellus. Length of eye 1.2x its breadth, 2.2x greater than malar space. Antennal formula 11263; anelli elongate transverse. Scape reaching median ocellus. Funicular segments pale, equal in length. Pedicel equal in length to first funicular segment. Club twice as long as broad, equal in length to preceding two segments combined.

*Thorax:* Fairly convex, pronotum with surface almost smooth, dorsally sloping, anteriorly slightly concave, posteriorly with fine cross wrinkle. In dorsal view sides arched, constricted posteriorly, 1.1x as wide



as long. Mesonotal reticulation-puncturation conspicuous; notauli moderately deep, propodeum irregularly alveolate-rugulose, (Fig. 29) slightly less than that of scutellum in length, 2.5x as broad as long. Plicae traceable but not strong. Forewing (Fig. 27) narrow, long about 3.2x as long as broad, no speculum; marginal vein 1.1x as long as post marginal vein, the latter 2.9x as long as stigmal vein.

*Gaster*: About as long as thorax in profile, but slightly broader. Petiole transverse, equal in length to its width, tapering forwards, T1, the largest, following tergites gradually decreasing in length.

*Male*: Unknown

*Host*: Unknown

*Distribution*: India (Kerala), Africa

*Plesiotype*: Female, INDIA, Kerala, C.U. Campus, Mini, 25.IV.1995 (DZCU).

*Other materials examined*: 1F, INDIA, Kerala, C.U.Campus, Mini, 25.IV.1995; 1F, INDIA, Kerala, Aaralam Farm, Mini, 16.XII.1995; 1F, INDIA, Kerala Aaralam Farm, Mini, 16.XII.1995; 1F, INDIA, Kerala, Thekkady, T.C. Narendran 27.IX.1985; 1F, INDIA, Kerala, Thekkady, T.C. Narendran, 15.II.1987; 1F, INDIA, Kerala, Malampuzha, T.C.Narendran, 21.II.1987; 1F, INDIA, Kerala, Silent Valley, Sureshan, 9. XII.1987; 1F, INDIA, Kerala, Silent Valley, Sureshan 9.XII.1987; 1F, INDIA, Kerala, Kakkayam, Mini, 8.IX.1996.(All in DZCU).

### *Discussion*

This African species is similar to the European *P. oxylus* (Walker) but differs mainly in having pronotum pale yellow and virtually without cross carina, sculpture of body still finer, in female, antennae inserted still higher with scapes exceeding vertex level by almost half their length.

## Subfamily EUNOTINAE

### Diagnosis

Head subtriangular in front view with occiput hollow and crescentic; post ocelli touching the occipital edge which is sharp. Gena posteriorly carinate; clypeal margin not produced; antenna with four or five segments between pedicel and clava, first of which may be shortened anelliform; always inserted below ventral edge of eyes; thorax pilosity mostly replaced by distinct and sparse bristles, rarely uniformly pilose. Parapsidal furrows complete but not touching posteriorly; scutellum large, sometimes produced behind covering part of gaster; propodeum mostly concealed, if not then narrowed posteriorly to form a distinct neck; forewings with postmarginal and stigmal veins subequal. In most of the species first tergite the largest.

## KEY TO THE INDIAN GENERA OF EUNOTINAE

1. Scutellum produced as a flat roof over the gaster (Fig. 50) gena posteriorly edged ..... *SCUTELLISTA* Motschulsky  
— Scutellum convex and only moderately produced over propodeum (Fig. 45) gena carinate ..... 2
2. Hind coxa with distinct dorsal crest of hairs. Forewing often with central infumation (Fig.44) ..... *MORANILA* Cameron  
— Hind coxa without distinct dorsal crest of hairs. Forewing without central infumation ..... 3
3. Scutellum without short hairs; propodeal neck long ..... *OPHELOSIA* Riley  
— Scutellum with short hairs; propodeal neck short ..... 4
4. Antenna clavate, with five funicular segment; T1 covering almost half of gaster ..... (Fig. 40) *CEPHALETA* Motschulsky  
— Antenna not clavate with four funicular segments; T1 not reaching about half of gaster ..... (Fig. 46) *NEOCEPHALETA* gen. nov.

## Genus *CEPHALETA* Motschulsky

*Cephaleta* Motschulsky, 1859. Etudes Ent., 8:173. Type species: *Cephaleta purpureiventris* Motschulsky, by designation of Ashmead, 1904.

*Cardiogaster* Motschulsky, 1863. Bull. Soc. Imp. Natur. Moscou, 36:72. Type species: *Cardiogaster fusciventris* Motschulsky, by monotypy. Synonymy by Boucek, 1965: 547.

*Anysis* Howard, 1896. Canad. Ent., 28: 167. Type species: *Anysis australiensis* Howard, by monotypy. Synonymy by Boucek, 1965: 547.

*Eurycephalus* Ashmead, 1903. Indian Mus. Notes, 5:61. Type species: *Eurycephalus alcocki* Ashmead, by monotypy. Pre-occupied by Gray 1832. Synonymy by Boucek, 1965: 547.

*Eurycranium* Ashmead, 1904. Mem. Carnegie Mus., 1:326. Replacement name for *Eurycephalus* Ashmead. Synonymy by Boucek, 1965: 547.

### Diagnostic features

Gena strongly shiny between hairs, posteriorly carinate; antennal formula 1153; clavate; thorax shiny between hairs which are placed on papillae; hind corner of propodeum forming a sharp straight vertical edge with an angular tooth dorsally. Wings entirely pubescent; abdomen somewhat cordiform.

### Distribution

India (Kerala), Bangladesh, Srilanka, Pakistan.

## Biology

Parasitic on *Cerococcus* species (Boucek, 1988).

## Discussion

Four species of *Cephaleta* have so far been reported from India. In this work four species are dealt with of which one is new to science.

*Cephaleta* is very close to *Scutellista* and the two genera are segregated by the different shape of the gena, the lateral aspects of the propodeum and the general lack of microsculpture on the head and thorax in *Cephaleta*.

## KEY TO THE INDIAN SPECIES OF *CEPHALETA* MOTSCHULSKY

1. Female antennae strongly clavate, distal two funicular segments quadrate to transverse, pedicel longer than F1 (Fig. 40) .....  
..... *brunniventris* Motschulsky
- Female antennae not so strongly clavate; distal most funicular segments almost quadrate, pedicel longer or as long as F1 ..... 2
2. Pedicel as long as first funicular segment; female antennae comparatively less clavate (Fig. 39a) ..... *hayati* Farooqi
- Pedicel longer than F1, female antennae moderately clavate ..... 3
3. Postero lateral angles of propodeum acutely produced when seen from the lateral side (Fig. 31) ..... *nirupama* sp. nov.
- Postero lateral angles of propodeum rectangular when seen from the lateral side (Fig. 34) ..... *australiensis* (Howard)

*Cephaleta niripama* sp. nov.

(Figs.31-33)

*Holotype*: Female: Length 1.76 mm.

*Colouration*: Head black; eyes and front ocellus whitish grey; Hind ocelli brownish black. Antennal scape and basal segment of club pale brown; remaining segments of antenna blackish brown with metallic green reflections on pedicel. Hind trochanter pale yellowish brown; Fore femora blackish brown with apical one third pale brown, remaining part of all legs pale yellowish brown except fifth tarsal segment and pretarsus, wings hyaline. Gaster pale brownish yellow with T6 and ovipositor sheaths metallic greenish black.

*Head* (Figs. 31,32,33) : In front view 1.38x broader than high; in dorsal view 3x as wide as long. Genae smooth and posteriorly carinate; malar sulcus indistinct; temples slightly concave; frons faintly reticulate and faintly striate with moderately dense white pubescence. Convex interantennal area reaching to middle of scrobes, this about 2x as broad as breadth of torulus; clypeus almost bare; maximum diameter of eyes in profile 1.3x length of malar space. POL 4x OOL; occiput sharply margined. Antennal formula 1153; clavate, scape including toruli 0.8x the combined length of pedicel and funicular segments. Pedicel twice as long as F1; F2 1.6x as long as F1, following ones gradually decreasing in length; F5 as long as broad.

*Thorax:* With dense setigerous minute pits on pronotum and mesoscutum, interstices smooth wider than the pit, scutellum faintly striate and reticulate with moderately dense pubescence; apex rounded with distinct margin. Pronotum plus mesonotum combined fully 1.5x as broad as long and about 1.6x that of scutellum in dorsal view; mesoscutum 1.2x as long as scutellum; postero-lateral angles of propodeum acutely produced when seen from side. Mesopleuron with episternum depressed and reticulately punctate while epimeron convex, smooth in upper half and finely reticulately striate in the lower half. Forewings entirely pubescent (Fig. 31); mv about 3x length of pmv (15:5), the latter a little longer than stv (5:4); stigma somewhat transversely quadrate with a long uncus. Legs with middle tibial spur half as long as its basi tarsus, the latter 0.7x the rest of the distal segments together.

*Abdomen:* Somewhat cordiform, about 1.4x length of thorax in sideview. T1 longest 2.7x as long as T2, rest much decreasing in width to form the conical tip of gaster.

*Male:* Unknown.

*Host:* Scale insects on *Acacia nilotica*.

*Distribution:* India (Kerala, Tamilnadu).

*Holotype:* Female, INDIA, Kerala, C.U. Campus, Sureshan, 3.V.1988 (DZCU).



*Paratype:* 1F, INDIA, Tamilnadu, Mangarai, Madhavanpillai, 7.IX.1995 (nine specimens of the same data) (All in DZCU).

*Etymology:* The species name is taken from Sanskrit meaning unique (uncomparable).

#### *Discussion*

This species comes to the first couplet of the key to Indian species of *Cephaleta* Motschulsky by Farooqi (1983) but differs from *Cephaleta brunniiventris* Motschulsky in having

- (1) Female antennae not so strongly clavate (in *C. brunniiventris* distinctly well clavate).
- (2) Abdomen about 1.7x length of thorax in side view (In *C. brunniiventris* abdomen 1.2x length of thorax).
- (3) Gaster pale brownish yellow (In *C. brunniiventris* black with metallic green reflections).

*Cephaleta australiensis* (Howard)

(Figs. 34-36)

*Anysis australiensis* Howard, 1896, *Canad. Ent.*, 28:167.

*Cephaleta australiensis* Boucek, Subba Rao & Farooqi, 1978, *orient. ins*; 12(4):  
438.

*Plesiotype*: *Female*: Length 1.2 mm.

*Colouration*: Head and gaster blackish brown; thorax blue black; antenna brownish yellow; eyes whitish grey; legs yellowish brown, wing veins dark brown, forewing infuscated, hind wing hyaline.

*Head* (Figs. 34, 36): In dorsal view about twice as broad as long; Face delicately Shagreened and with fine sparse punctures; genae smooth and posteriorly carinate, uniformly convex malar sulcus indistinct; frons faintly reticulate with moderately dense white pubescence. Maximum diameter of eyes 1.3x length of malar space, antennae inserted below lower margin of eyes, moderately clavate; pedicel shorter than first two funicular segments combined, first about one third of second; all funicular segments longer than broad; club slightly shorter than preceding four segments combined.

*Thorax*: Delicately reticulate with moderately dense white pubescence; apical 0.33 of scutellum with raised reticulations to give the appearance of close circular shallow punctae; metanotum and pleura smooth; metanotum with a median longitudinal carina; posterolateral angles of propodeum

rectangular with the lateral margin; mv 3.7x as long as pmv, the latter about as long as stv.

*Gaster* (Fig.34): Smooth, slightly longer than that of thorax in profile; First tergite the largest, remaining tergites gradually decreasing in length, tapering towards apex.

*Male*: Antennae with first funicular segment slightly curved. Scape of male about as long as pedicel and first funicular segment combined.

*Hosts*: Coccid on *Hibiscus rosasinensis*, *Gossypium* sp., *Cerococcus* on *Alternanthera philoxeroides*, mealy bug on *cajanus indicus* (Mani, 1989).

*Distribution*: India (Kerala, Aligarh, Assam, Orissa) Srilanka.

*Plesiotype*: Female, INDIA, Kerala, Malampuzha, Sureshan, 13.1.1986 (DZCU).

#### *Discussion*

*Cephaleta australiensis* differs from *Cephaleta hayati*<sup>Farooqi</sup> in having.

1. Pedicel longer than first funicular segment (In *Cephaleta hayati* Farooqi pedicel as long as first funicular segment).
2. Postereo lateral angles of propodeum rectangular when seen from the lateral side. (In *Cephaleta hayati* postero - lateral angles of propodeum obtuse with the lateral margin).

*Cephaleta hayati* Farooqi

(Figs. 37-39)

*Cephaleta hayati* Farooqi, 1980. J. Ent. Res., 4: 119. M, F. India; Hoshangabad (IARI).

*Female*: Length 1.28 - 1.92 mm.

*Colouration*: Head thorax and all coxae blackish with metallic blue tint, more so on the pleuron and hind coxae; abdomen dark brown with metallic green reflections; legs excluding pale tarsi fuscus; antennae brown with paler scape; wings slightly brownish, with a clear streak near posterior basal margin, subhyaline subapically; venation dark testaceous.

*Head* (Fig. 37,39a): Broader than high in ratio, 35:24.5 with roundish eyes which are only slightly longer than wide (15:13), covered with minute sparse white pubescence; genae posteriorly rather flat. Face microscopically reticulately striate, with rather denser punctures bearing white hairs except on clypeus and on scrobes; convex inter antennal area reaching to middle of scrobes, this about 2.2x as broad as breadth of torulus; clypeus bare except for a premarginal row of four hairs, the median two being longest. Antennae clavate, width of clava slightly less than double the width of first funicular segment (6:3.5); scape including toruli slightly more than half of the combined length of pedicel and funicle (14:25); pedicel as long as the first funicular segment, this twice as long as broad,

following ones gradually decreasing in length, fifth as long as broad; clava slightly more than 2.5 preceding segments together.

*Thorax:* With pubescence on dorsum, dense long reddish brown hairs along posterior margin of scutellum; sculpture superficially similar to that of head, but consisting of small piliferous tubercles with faint reticulations in between their inter spaces; pronotum plus mesonotum combined fully twice as broad as long and about 0.75x as long as scutellum; length of scutellum variable, 1.3 to 1.6x as long as mesoscutum, extending over half of first gastral segment. Postero-lateral angles of propodeum obtuse with the lateral margin. Mesopleuron with episternum depressed and reticulately punctate while epimeron convex smooth in upper half and finely reticulately striate in the lower half. Forewings entirely pubescent, marginal vein about 2.5x the length of postmarginal (21.5: 8.5), the latter a little longer than the stigmal vein (8.5:7); stigma somewhat transversely quadrate with a long uncus. Legs with middle tibial spur half as long as its basitarsus (9:16), the latter only slightly shorter than rest of the distal segments together.

*Abdomen:* Somewhat cordiform, (Fig. 37) the first tergum which is longest, more or less parallel sided, rest much decreasing in width to form the conical tip of gaster. Size of gaster highly variable depending on the segments if they are retracted or drawn out.

*Male:* Length 0.80 - 1.32 mm. Similar to the female except for the colour of coxae which are with a brownish tint; antennae not clavate,

funicle including pedicel much longer than the head length (27:22), pedicel much shorter than the first funicular segment (5.5:9); (Fig. 39b) eyes more than the genae (22:23). Abdomen much shorter as most of the segments are retractile.

*Host:* *Cerococcus* sp. (Coccidae:Homoptera) (Farooqi, 1980).

*Distribution:* India: Hoshangabad (M.P), Manmad (Maharashtra) and Valandur (Tamilnadu).

#### *Discussion*

The above redescription is based on the description of Farooqi (1980). Since the specimen was collected from an area near to the Kerala state, it is included in the present study.

This species differs from *C. brunniiventris* Motschulsky and *C. australiensis* (Howard) in having a large scutellum projecting over the gaster.

### ***Cephaleta brunniiventris* Motschulsky**

(Figs. 40-43)

*Cephaleta brunniiventris* Motschulsky, 1859. Etudes Ent., 8:174. F. Srilanka (ZMMS).

*Cephaleta purpureiventris* Motschulsky, 1859. Etudes Ent., 8:174. F. Srilanka (ZMMS).

*Pteromalus magniceps* Walker, 1860. Ann. Mag. Nat. Hist., (3)6: 359. M. Srilanka (Lectotype, BMNH).

*Encyrtus obstructus*, Walker, 1860. Ann. Mag. Nat. Hist. (3)6: 359. M.  
Srilanka (Lectotype, BMNH).

*Cardiogaster fusciventris* Motschulsky, 1863. Bull. Soc. Imp. Nat. Moscou  
36(2): 72. Synonymy by Boucek, 1965: 547.

*Cephaleta brunniventris* Motschulsky, 1863, Bull. Soc. Imp. Nat. Moscou,  
36(3): 73.

*Eurycephalus alcocki*, Ashmead, 1903. Indian Mus. Notes 5:61. Synonymy by  
Boucek, 1965: 547.

*Eurycranium saissetiae*, Ashmead, 1905. Proc. U.S. Natn. Mus. 29:405.  
Synonymy by Boucek, 1965: 547.

*Plesiotype*: Female: Length 1.5 mm.

*Colouration*: Head and thorax shiny black; pedicel and terminal  
segment of club brownish yellow, remaining antennal segments yellowish  
brown; coxae concolorous with body; femora and tibiae with some brown  
and more or less suffused with dark metallic reflections; tarsi yellowish  
brown; terminal tarsal segments fuscous. Abdomen shiny purple-violet  
becoming yellowish brown at base.

*Head* (Figs. 40, 42, 43): In dorsal view 3x broader than high; genae  
smooth and posteriorly carinate; malar sulcus indistinct, malar space  
shorter than eye length. Frons faintly reticulate; convex inter antennal area  
reaching to middle of scrobes. Scrobe not reaching median ocellus; occiput  
sharply margined. POL 4x OOL. Antennal formula 1153; distinctly clavate;  
scape not reaching median ocellus; slender, as long as the funicular

segments combined. Pedicel about 2x as long as thick. F1 shortest, a little shorter than pedicel. Segments 3-5 very slightly decreasing in length and gradually becoming thicker; club a little shorter than the preceding three segments combined.

*Thorax* (Fig.43): With dense setigerous minute pits on pronotum and mesoscutum; interstices smooth, wider than the pit; apical part of scutellum with raised reticulations to give the appearance of close circular, shallow punctae, extending over part of propodeum. Propodeum subquadrate, its postereolateral angles acute with the lateral margin. Forewing sub hyaline, with some brownish infuscation basally; mv little over 0.50 of smv the later as long as stv.

*Abodmen* (Fig. 40): Almost as long as thorax, T1 as long as following three tergites combined. Ovipositor slightly exserted.

*Male*: Length: 1.7 mm. Antennal formula 1143, (Fig. 41) club and funicular segments longer than in female; malar space almost equal to eye length; gaster narrow.

*Hosts*: *Asterolecanium* sp, *Cerococcus hibisci*, *Ceroplastes pseudoceriferus*, *Ceroplastes* sp, *Chloropulvinaria psidii*, Saissetia coffeae (Farooqi & Subba Rao, 1986).

*Distribution*: India (Kerala, Karnataka, Uttarpradesh, Goa) Sri Lanka. Pakistan.



*Plesiotype:* Female, INDIA, Kerala, C.U. Campus, Mini, 3.VII.1996 (DZCU).

*Other materials examined:* 1F, INDIA, Kerala, Malampuzha, Sureshan, 13.1.1986; 1F, INDIA, Kerala, C.U. Campus, Sureshan, 1.VII. 1986; 1M, INDIA, Kerala, Mohana, Tiruvannur, 21.IV.1996; 1M, INDIA, Kerala, C.U. Campus, Sureshan, 3.V.1989 (All in DZCU).

#### *Discussion*

*Cephaleta brunniventris* Motschulsky differs from its nearest relative *C. australiensis* (Howard) in having

- 1) Female antennae strongly clavate (In *C. australiensis* Female antennae not so strongly clavate).
- 2) Postero-lateral angles of Propodeum acutely produced as seen from the lateral side. (In *C. australiensis* postero-lateral angles of propodeum rectangular when seen from the lateral side).

## Genus *MORANILA* Cameron

*Tomocera* Howard, 1881. Rept. U.S. Dept. Agric. Ent., for 1880:368. Type-species: *Tomocera californica* Howard, by monotypy. Synonymy by Burks, 1958:75.

*Moranila* Cameron, 1883. Trans. Ent. Soc, London, p.188. Type-species: *Moranila testaceipes* Cameron, by monotypy.

*Dilophogaster* Howard, 1886. Ent. Amer., 2:98. Replacement name for *Tomocera* Howard. Synonymy by Burks, 1958:75.

*Eunotomyia* Masi, 1917. Novit. Zool., 24: 297, Type-Species: *Eunotomyia festiva* Masi, by monotypy. Synonymy by Boucek, 1988:356.

*Aphobetoidus* Ashmead, 1904a: 328. Type species *Aphobetoides comperei* Ashmead by original designation. Synonymy by Boucek, 1988:356.

*Muscidea* Girault, 1915 (232): 323-324. Type species *Muscidea brunneiventris* Girault by original designation. Synonymy by Boucek, 1988: 356. Preoccupied by *Muscidea* Motschulsky, 1883.

*Eurycraniella* Girault, 1916(274): 227. Type species: *Eurycranium baeusomorpha* Girault. Synonymy by Boucek, 1988:356.

*Muscideoidea* Girault, 1916 (274): 227. Synonymy by Boucek, 1988:356. Replacement name for *Muscidea* Girault.

### Diagnostic features

Head less strongly transverse, genae not concave, eye not horizontally elongate, vertex acutely margined behind, antennae inserted below level of lower orbital border close to the mouth; antennal formula 1153; face projecting broadly between antennae; pronotum margined,

narrower than mesonotum. Scutellum wider behind than in front. Hind coxa with dorsal crest of hairs and basal pilosity. Femora not thickened, forewing often with central infumation, first tegite the largest, covering more than half of gaster; remaining tergites very short.

#### *Distribution*

India (Kerala, Karnataka), Australia, Newzealand, Newguinea.

#### *Biology*

Mainly parasites of various coccids (Boucek, 1988).

#### *Discussion*

Only one species of *Moranila* viz. *Moranila californica* have so far been reported from India and is represented in the collection of the present investigation. No other species were known with certainty and so *Moranila* just replaced *Tomocera* for the species *Californica*.

#### *Moranila californica* (Howard)

(Figs. 44 & 45)

*Tomocera californica* Howard, 1881. Rept. U.S. Dept. Agr. Ent. for. 1880: 368.

M.F. USA: California (USNM).

*Moranila testaceiceps* cameron, 1883. Proc. Trans. ent. soc. London, 188-189  
synonymy by Howard, 1896:165.

*Tomocera ceroplastis* Perkins, 1906. Proc. Hawaii. ent. Soc., 1:75. Synonymy  
by Burks, 1979:783.

Tomocera glabriventris Girault, 1915. Mem. Queensland Mus; 4:207,

Synonymy by Girault, 1927:334.

Tomocera flaviceps Girault, 1915. Mem. Queensland Mus; 4:208.

Synonymy by Burks, 1979:783.

*Plesiotype*: Female: Length 1.9 mm.

*Colouration*: Body blue black, shiny, Head, scape and legs except tibiae testaceous, tibiae and rest of antennal segments yellowish brown.

*Head* (Figs. 44, 45): In dorsal view broader than thorax; (46:37) occipital carina distinct, not strongly transverse; genae not concave; Head in front view 1.5x as broad as long; Face smooth; frons faintly reticulate; POL 1.8x OOL; scrobe not reaching median ocellus; antennae inserted well below the lower margin of eyes, clavate; antennal formula 1153; scape longer, almost equal in length to the combined length of pedicel and funicular segments. Club twice as long as broad, equal to preceding four segments combined.

*Thorax* (Fig. 45): Finely reticulated, lines not raised; long setae from cephalic margin of pronotum; pronotum plus mesoscutum 1.1x as long as scutellum. Scutellum finely striate longitudinally and near apex bearing a very fine convex cross-suture. Propodeum short, glabrous, constricted in to a neck, with lateral carinae but the median one at base only. Apical margin of forewing hyaline; veins with setae; mv 1.6x as long as stv, the latter thrice as long as pmv. Hind coxa with dorsal crest of hairs and basal pilosity.

*Gaster* (Figs. 44, 45): Broadly separated on sides; petiole transverse scaly; first tergite the largest, covering more than half of gaster, following tergites very short.

*Male*: Unknown

*Host*: *Saissetia* sp. (Farooqi & Subba Rao 1986).

*Distribution*: India (Kerala, Karnataka).

*Plesiotype*: Female, INDIA, Kerala, C.U. Campus, Mini, 2.V.1996 (DZCU).

#### *Discussion*

This species differs from *Moranila comperei* (Ashmead) Comb. n. in having well clavate antenna, club as long as preceding four funicular segments combined. (In *Moranila comperei* antenna not clavate, club longer than preceding four funicular segments combined).

## **NEOCEPHALETA gen. nov.**

**Type species:** *Neocephaleta, malabarensis* sp. nov. (monotypy).

### **Diagnostic features**

Gena posteriorly carinate; malar sulcus indistinct; frons faintly reticulate; scrobe deep not reaching median ocellus; POL twice OOL. Vertex with four pairs of bristles. Antennae inserted below the lower margin of eyes; antennal formula 1143. Thorax reticulate with a row of long setae directed backwards; pronotum short, scutellum convex and only moderately produced over propodeum; propodeum short with a median carina. Wings hyaline, veins with a row of long setae. T1 the largest, following tergites gradually decreasing in length. Ovipositor slightly exerted.

### *Distribution*

India (Kerala).

### *Biology*

Unknown.

### *Discussion*

This genus closely resembles *Cephaleta* Motschulsky in general appearance, mostly in the shape of gaster, convex scutellum moderately produced over propodeum and colour of head and thorax. It differs from *Cephaleta* in having

1. Antennae not clavate with four funicular segments (Antennal segments clavate and with five funicular segments in *Cephaleta*).
2. Hind corner of propodeum not forming a sharp straight vertical edge (In *Cephaleta* hind corner of propodeum forming a sharp straight vertical edge with an angular tooth dorsally. First tergite not reaching half of gaster (first tergite covering about half of gaster in *Cephaleta*).

It resembles *Ophelosia* Riley and *Moranila* cameron in having gena posteriorly carinate, thorax with a row of long hairs directed backwards, antennae inserted below the lower margin eyes.

#### *Etymology*

*Neocephaleta*, name from *Cephaleta* owing to the close resemblance of this genus to *Cephaleta* Motschulsky.

#### *Neocephaleta malabarensis* sp. nov.

(Figs.46-49)

*Holotype*: Female: Length 1.1 mm.

*Colouration*: Head, scape, pedicel, coxae and femur pale testaceous; remaining part of antennae and legs yellowish brown. Ocelli brown; thorax black; abdomen yellowish black.

*Head* (Figs. 46, 47, 49): In dorsal view 6x as broad as long; gena posteriorly carinate; malar sulcus indistinct frons faintly reticulate; scrobe deep not reaching median ocellus. Maximum diameter of eyes in profile 2.1x length of malar space. POL 2x OOL. Vertex with four pairs of bristles. Head in front view 1.6x broader than long. Antennae inserted below the lower margin of eyes. Antennal formula 1143; scape twice as long as pedicel, latter 1.5x as long as F1. Funicular segments are of equal length; club twice as long as broad, 1.6x as long as preceding two segments together.

*Thorax*: Reticulate with a row of long setae directed backwards; pronotum short, scutellum convex and only moderately produced over propodeum, as long as the combined length of pronotum and mesonotum. Propodeum short with a median carina. Wings hyaline, (Fig.46) veins with a row of long setae; mv twice as long as pmv, the latter equal to stv.

*Gaster* (Figs. 46, 48): T1 the largest, 1.75x longer than T2, following tergites gradually decreasing in length. Slightly longer than that of thorax in profile. Ovipositor slightly exerted.

*Male*: Unknown.

*Distribution*: India (Kerala).

*Holotype*: Female, INDIA, Kerala, Malampuzha, T.C. Narendran, 19.VI.1988, (DZCU).

*Paratype*: 1F, INDIA, Kerala, Malampuzha, T.C. Narendran, 19.VI.1988; 1F, INDIA, Kerala, C.U. Campus, T.C. Narendran 19.IV.1986;



1F, INDIA, Kerala, C.U. Campus, Mini, 22.VII.1995; 1F, INDIA, Kerala, C.U. Campus, Mini, 22.VII.1995; 1F, INDIA, Kerala, C.U. Campus, T.C. Narendran,19.IV.1986 (All in DZCU).

*Etymology:* The species is named after its collection locality.

## Genus *SCUTELLISTA* Motschulsky

*Scutellista* Motschulsky 1859. Etudes Ent., 8:172. Type-species: *Scutellista cyanea* Motschulsky, by monotypy.

*Aspidocoris costa*, 1863. Annali Accad. Aspiranti Nat. Napoli, 3:25. Type-species: *Aspidocoris cyaneus* Costa, by monotypy. Synonymy by Boucek, 1966:35.

*Enargopelte* Foerster, 1878. Verh. Naturh. ver. preuss. Rheinl., 35:62. Type-species: *Enargopelte obscura* Foerster by monotypy. Synonymy by Boucek, 1956:35.

### Diagnostic features

Head very thick, lenticular, wider than thorax, acutely margined behind; antennae with 8 or 9 segments, clavate; annelli absent, antennae inserted below level of lower orbital borders; mandibles with 3 teeth, inner tooth obtuse. Scutellum largely reticulate extending over great part of abdomen; posterior edge of propodeum forms a rounded lobe with longitudinal rugae on the outer surface. Forewing hairy in basal part, First tergite with hair tuft basally.

### Distribution

India, Srilanka, Africa, Australia.

### Biology

The larvae feed as predators on the eggs and young larvae of the coccid host under its scale cover. The hosts include several serious pest

species in the genera *Ceroplastes*, *Coccus*, *Saissetia* and *Lecanium* (Boucek, 1988).

#### *Discussion*

This genus is morphologically closest to the Holarctic *Eunotus* walker and the tropical *Cephaleta* Motschulsky. *Scutellista* is characterised mainly by the enlarged scutellum which expands as a flat roof over greater part of abdomen.

Only one species of *Scutellista* viz. *Scutellista cyanea* Motschulsky have so far been reported from India.

#### *Scutellista cyanea* Motschulsky

(Fig. 50)

*Scutellista cyanea* Motschulsky, 1859. Etudes Ent., 8:172. M, F. Srilanka (ZIASL).

**Male:** Length: 0.75 mm.

**Colouration:** Body blue black, shiny, clothed with fine brownish pubescence, with blue reflections; eyes black, wings hyaline.

Body shortly ovate, convex, finely rugosely punctate; head transverse, narrow, sub carinate; between antennae; impunctate, triangularly impressed above carina; antennae inserted in the middle of face, in female clavate. Scape elongate, subcylindrical; pedicel short, transverse. Funicular segments 1-5 short, slightly thicker; sixth segment

large, elongate ovate. Segments in male linear, slender; scape elongate; pedicel short, segments 1-4 of funicle subcylindrical, subequal, fifth segment longer, conical.

*Thorax:* Transverse, a little narrower than head, narrowed behind scutellum convex, large, long, triangularly arcuate, rounded apically. Wings longer than abdomen; hind tibial spur long.

*Abdomen:* As wide as thorax, subquadrate, glabrous, shiny.

The above characters are that of male.

*Hosts:* Lecanium spp. *Parasaissetia nigra*, *saissetia oleae* (Farooqi & Subba Rao, 1986).

*Distribution:* India. Srilanka.

*Remarks:* The above account is based on the redescription by Mani (1989). This species is included in the present work because it is likely that this species may be found in the region later.

large, elongate ovate. Segments in male linear, slender; scape elongate; pedicel short, segments 1-4 of funicle subcylindrical, subequal, fifth segment longer, conical.

*Thorax:* Transverse, a little narrower than head, narrowed behind scutellum convex, large, long, triangularly arcuate, rounded apically. Wings longer than abdomen; hind tibial spur long.

*Abdomen:* As wide as thorax, subquadrate, glabrous, shiny.

The above characters are that of male.

*Hosts:* Lecanium spp. *Parasaissetia nigra*, *saissetia oleae* (Farooqi & Subba Rao, 1986).

*Distribution:* India. Srilanka.

*Remarks:* The above account is based on the redescription by Mani (1989). This species is included in the present work because it is likely that this species may be found in the region later.

## Subfamily ORMOCERINAE

### Diagnosis

Head without occipital carina. Antennae never inserted very low on face, mostly near to, sometimes above centre; either 13-segmented or 12-segmented. Toruli rather close together except with a few males which have unusually enlarged scapes; clypeus rather small if its lower margin produced, then it may be bilobate. Thorax with complete and deep notauli and scutellum mostly narrowed anteriorly. Gaster mostly sessile; first tergite not greatly enlarged; hind margins of anterior tergites emarginate or excised in middle.

## Genus SYSTASIS Walker

*Systasis* Walker, 1834. Ent. Mag., 2: 296. Type species *Systasis encyrtoides* Walker; designated by Westwood, 1839.

*Guieralia* Risbec, 1951. Mem. Inst. Francaise Afrique Noire, 13: 253. Type species: *Guieralia guierae* Risbec, by monotypy.

*Paruriella* Girault, 1913 (169): 308, and (175) 107. Type species *Paruriella australiensis* Girault; by original designation. Synonymy by Boucek, 1988: 310.

### Diagnostic features

Body dark metallic green or blue; head and thorax reticulately sculptured, with scattered umbilicate punctures on the head. Antennae 12-segmented with the formula 11253; inserted at the middle of face. Complete, deep, sharply cut and sinuate parapsidal furrows on the mesonotum; wings hyaline with a large speculum at the distal end of marginal vein, thus making a row of long erect hairs on the under surface.

### Distribution

Cosmopolitan.

### Biology

Mainly phytophagous in habit (Boucek, 1988).

### Remarks

Altogether four species have so far been reported from India. In the present work eight species are dealt with of which four are new to science.

The genus *Systasis* was erected by Walker in 1834 and the type species *Systasis encyrtoides* Walker was designated in 1840 by Westwood.

*Systasis* is nearest to *Semiotellus* Westwood but most of its numerous species can be easily recognised by the usual lack of coarse punctures on the thoracic dorsum, deeply reticulate propodeum and the marginal vein with a row of long erect hairs on the under surface.

#### KEY TO THE INDIAN SPECIES OF SYSTASIS WALKER

1. Thorax highly convex (Fig. 51) ..... 2
- Thorax moderately convex (Fig. 55) ..... 3
2. Antennae shorter, pedicel as long as first two funicular segments together (Fig. 51) ..... *cenchrivora* Farooqi and Menon
- Antennae not shorter, pedicel not as long as first two funicular segments together (Fig. 80) ..... *malabarensis* sp. nov.
3. Both mandibles tridentate, funicular segments quadrate ..... 4
- Left mandible only tridentate; funicular segments not as above ..... 5
4. Pedicel 2x as long as first funicular segment; funicular segments subequal (Fig. 67) ..... *dalbergiae* Mani
- Pedicel 1.4x as long as first funicular segment; funicular segment equal (Fig. 59) ..... *indicus* sp. nov.
5. Body stout (Fig. 71) ..... *vischnu* Motschulsky
- Body not stout ..... 6



6. Gaster elongate, median carina slightly indicated (Fig. 78) .....  
 ..... *lepidus* sp. nov.
- Gaster not much elongate median carina well developed ..... 7
7. Funicular segments equal, club as long as preceding two segments  
 combined (Fig. 63) ..... *curiosus* sp. nov.
- Funicular segments subequal; club longer than preceding two  
 segments combined (Fig. 55) ..... *dasyneurae* Mani

*Systasis cenchrivora* Farooqi & Menon

(Figs. 51-54)

*Systasis cenchrivora* Farooqi & Menon, 1972. Mushi, 46: 111. M, F. India:  
 Delhi (IARI).

*Plesiotype*: Female: Length 1.1 mm.

*Colouration*: Body dull green; eyes pale chocolate brown; ocelli pale yellowish brown; scape pale brown with tips darker, remainder of antenna dark brown. Fore and hind coxae concolorous with thorax; middle coxa brown, femora dark brown with greenish reflection on hind femora; tibiae brown with tips paler, tarsi testaceous with tips darker, tegulae and veins pale brown, wings hyaline.

*Head* (Figs. 51, 52, 54): Uniformly and closely reticulate with scattered umbilicate punctures. Pubescence longer on lower face. In dorsal view head width 2.2x its length. POL 3x OOL. In front view head width

1.2x its length. Temples rounded; genae compressed, about 0.4x eye length, mandibles bidentate. Clypeus 1.4x as wide as long, its anterior margin slightly emarginate. Antennae shorter, inserted middle of face. Scrobe deep; scape short, not reaching median ocellus, pedicel length little greater than half of scape, as long as first two funicular segments together. All funicular segments transverse; club twice as long as broad, about as long as scape. Funicular and club with longitudinal sensillae.

*Thorax:* Highly convex along median longitudinal line. Uniformly and moderately reticulate; pronotum very narrow mesad, as broad as mesonotum, the latter 1.6x as wide as long. Axillae very steep. Scutellum as long as broad, propodeum (Fig. 53) with a slightly indicated median carina. Spiracles small, rounded. Forewing 2.2x as wide as long, mv 2.3x as long as pmv, the latter 1.3x longer than stv. A row of eight erect hairs below marginal vein; costal cell with only three hairs towards its distal end; speculum large; general pubescence sparse.

*Abdomen:* Conic-ovate, dorsally collapsing, 1.2x as that of thorax in profile. T1, the largest, T2 very small; remaining tergites gradually decreasing in size. Ovipositor highly exerted.

*Male:* Essentially the same as female except that the colour is somewhat more shiny, especially at head and thorax and the antennae are a little longer, with funicular segments subquadrate except the distal most which is slightly longer than wide.

*Host:* Seeds of *Cenchrus ciliaris* (Farooqi & Subba Rao, 1986).

*Plesiotype:* Female, INDIA, Kerala, Anakampoyil, Mini, 6.XI.1996 (DZCU).

#### *Discussion*

This species comes closer to *Systasis sepositus* Girault but differs from it in having

- 1) First funicular segment quadrate (In *Systasis cenchrivora* first funicular segment slightly wider than long).
- 2) Second funicular segment shorter than first (In *S. cenchrivora* F1 and F2 equal in size).
- 3) Propodeum with a distinct median carina (In *S. cenchrivora* propodeum only with a weakly developed median carina).

#### ***Systasis dasyneurae* Mani**

(Figs. 55-58)

*Systasis dasyneurae* Mani, 1939. Indian J. Agric. Sci., 9: 535. M, F. India: Karnal (IARI).

*Plesiotype:* Female: Length 2 mm.

*Colouration:* Body bright metallic green; eyes dark coppery red; antennae dark brown with basal part of scape paler; all coxae and hind femora concolorous with thorax; basal three fourths of fore and mid femora

dark coppery brown; tibiae and tarsi yellowish brown; terminal tarsal segment brownish, veins dark brown.

*Head* (Figs. 55,56,57): Transverse in front view 1.4x as wide as long, somewhat wider than thorax, viewed from in front nearly rounded; frons convex, densely reticulately sculptured and rugosely punctured, sparsely and finely setose; vertex rather narrow mesad, with a depression, latero-caudad of lateral ocelli. Height of eyes 1.9x malar space; POL 3.5x OOL; clypeus truncate mesad; Left mandible tridentate and right with an additional very minute denticle between second and third teeth. Antennae inserted above lower margin of eyes, ring joints 2, first transverse, second thicker and slightly wider; scape reaching front ocellus; pedicel slightly longer than first funicular segment. Funicular segments subequal; club slightly longer than preceding two segments together.

*Thorax*: Closely reticulately sculptured. Mesonotum also with scattered larger, coarser thimble punctures; axillae subreticulately sculptured and slightly advanced into the region of the scapulae; width of scutellum cephalad is about half length, sculpture reticulate, without cross furrow before apex. Propodeum very short and almost hidden by scutellum mesally, expanding laterally reticulately sculptured; with well developed median and lateral carinae (Fig. 58). Forewings hyaline, about 2.2x as long as broad; mv 2.3x that of pmv the latter 1.5x that of stv. Nine long setae in a straight line caudad of and parallel to marginal vein, marginal fringes moderately short.

*Gaster*: Conic ovate, sculpture scaly with sparse white pubescence denser apically than basally; gaster including ovipositor 1.4x that of thorax in profile.

*Male*: Length about 1.5 mm except scape below and at base, antennae dark brown; funicular segments elongated; first funicular segment distinctly longer than pedicel but equal to combined lengths of pedicel and the two ring joints. Club about as long as two preceding segments combined. Mesonotum with umbilicate punctures more sparse than in female. Propodeum moderately broad mesad. Forewings with stigma relatively larger. Abdomen about two thirds rest of body, other characters as in female.

*Host*: *Dasyneura lini* Barnes, second instar larvae (Farooqi & Subba Rao, 1986).

*Distribution*: India (Kerala, UP, MP).

*Plesiotype*: Female; INDIA, Kerala, C.U. Campus, Mini, 3.XI.1996 (DZCU).

*Other materials examined*: 1F, INDIA, Kerala, Anakkampoyil, Mini, 6.XI.1996; 1F, INDIA, Kerala, Muthanga, Mini, 6.X.1995; 1F, INDIA, Kerala, Chindaki, Sureshan, 13.XII.1987; 1F, INDIA, Kerala, Kasargod, K.C. Gopi & party, 14.X.1995; 1F, INDIA, Kerala, Palghat, 13.XII.1987; 1F, INDIA, Kerala, C.U. Campus, T.C. Narendran, 7.IV.1987; 1F, INDIA, Kerala, C.U. Campus, Sureshan, 3.IV.1989 (All in DZCU).

### *Discussion*

This species resembles *Systasis varipes* Girault in size, colour and in the lateral carinae on propodeum but differs in the relatively longer post marginal vein. From *S. henrici* Gir. it differs in the tridentate mandible.

### *Systasis indicus* sp. nov.

(Figs. 59-62)

*Holotype*: Female: Length 1.9 mm.

*Colouration*: Body metallic greenish blue; eyes cupreous; ocelli yellowish white; antennae brown with basal part of scape paler. Forecoxae, hind coxae and hind femora concolorous with thorax; mid coxae and other parts of legs brown except base and tips of fore femora, hind tibiae, fore and mid tibiae testaceous. Tegulae and veins pale brown. Wings hyaline.

*Head* (59, 60, 62): Finely reticulate, lower face shiny with scattered punctures and pubescence. In dorsal view 2.7x as wide as long. POL 4x OOL. In front view 1.4x as wide as long. Malar space .47x eye length; both mandibles tridentate. Scape reaching median ocellus; pedicel 1.4x as long as F1. All funicular segments quadrate, equal. Club twice as long as broad, as long as preceding three segments combined.

*Thorax*: Moderately convex, uniformly and moderately reticulate. Pronotum very narrow, mesoscutum 1.5x as wide as long. Scutellum wider

than long. Propodeum with a distinct median carina (Fig. 61). Relative lengths of smv:mv:pmv:stv as 33:21:11:8.

*Gaster*: Elongate, oval, dorsally collapsing; length 1.5x that of thorax in profile. T1 the largest, T2 smallest, T4 longer than T3; ovipositor and ovipositor sheaths strongly protruded out.

*Male*: Unknown.

*Host*: Unknown.

*Distribution*: India (Kerala).

*Holotype*: Female, INDIA, Kerala, C.U. Campus, Mini, 25.IV.1996 (DZCU).

#### *Discussion*

This species comes close to *Systasis dalbergiae* Mani but differs from it in the following features:

1. Pedicel 1.4x as long as first funicular segment (In *S. dalbergiae* pedicel twice as long as first funicular segment).
2. All funicular segments quadrate and equal (In *S. dalbergiae* funicular segments subequal).

*Systasis curiosus* sp. nov.

(Figs. 63-66)

*Holotype*: Female: Length 1.8 mm.

*Colouration*: Body metallic greenish blue with golden reflection; ventral part of gaster brown; eyes cupreous; ocelli pale brown; antennae brown, paler on basal part of scape; legs with coxae and hind femora concolorous with thorax. Fore and mid femora, hind tibiae dark brown with base and tips paler, all other parts of legs pale yellowish brown with tips of tarsi and middle of mid tibiae brown. Tegulae and veins pale brown; wings hyaline.

*Head* (Figs. 63, 64, 65): Moderately reticulate, finer on lower face with scattered punctures and white pubescence. In dorsal view head width 2x its length. POL 3.3 OOL; in front view head width 1.4x its height, malar space length .65x eye length; clypeus smooth, antennae inserted middle of face, scrobe deep; scape reaching median ocellus; scape twice as long as pedicel, which is slightly longer than first funicular segment; funicular segments equal in length, longer than broad except last one which is quadrate. Club twice as long as broad, equal in length to preceding two segments together.

*Thorax*: Moderately raised, reticulate; length 1.2x its width; pronotal collar very narrow; mesoscutum width 1.5x its length. Scutellum slightly wider than long; propodeum width 4.6x its length, median carina well



developed; forewing length twice its width; space below marginal vein with nine erect setae; mv 2.3x as long as pmv, the latter 1.2x as long as stv. The relative lengths of smv : mv : pmv : stv as 33 : 21 : 9 : 6.

*Gaster*: Short, ovate; length 1.3x that of thorax, dorsally collapsing; T1 the largest, T2 smallest, T3 and T4 almost equal; remaining tergites gradually decreasing in length. Ovipositor not exerted.

*Male*: Unknown.

*Host*: Unknown.

*Distribution*: India (Kerala).

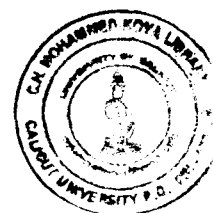
*Holotype*: Female, INDIA, Kerala, Silent Valley, Sureshan, 9.XII.1987 (DZCU).

*Etymology*: The species name is taken from the latin word meaning strange.

#### *Discussion*

This species comes to couplet 2 of the key to Indian species of *Systasis* Walker by Farooqi and Menon but differs from *Systasis dasyneurae* Mani in having

1. Funicular segments equal except last which is quadrate (In *S. dasyneurae* funicular segments subequal).
2. Lateral carinae absent (In *S. dasyneurae* lateral carinae present).
3. Club as long as preceding two segments together (In *S. dasyneurae* club longer than preceding two segments together).



*Systasis dalbergiae* Mani

(Figs. 67-70)

*Systasis dalbergiae* Mani, 1942. Indian J. Ent., 4: 157. M, F. India: Dehra Dun (IARI).

*Plesiotype*: Female: Length 1.7 mm.

*Colouration*: Body bright metallic green; eyes dark coppery red, antennae dark brown with basal part of scape paler; all coxae and hind femora concolorous with thorax; basal three fourths of fore and mid femora dark coppery brown; tibiae and tarsi yellowish brown terminal tarsal segment brownish.

*Head* (Figs. 67, 68, 69): Viewed in front broadly rounded about 1.3x as wide as long; face rugosely punctate, in between face and inner orbital border, just below insertion of antennae transversely reticulate, mandibles tridentate; height of eyes 3x the malar space; POL 3.5x OOL. Antennae inserted at the middle of face; scape reaching front ocellus; pedicel longer than first funicular segment. All funicular segments quadrate, subequal; club as long as preceding three segments combined.

*Thorax*: Moderately convex. Closely reticulately sculptured; scutellum 3x as long as propodeum; propodeum with a distinct median carina. Forewing twice as long as broad, mv 1.8x that of pmv, the latter 1.3x that of stv.

*Gaster*: With sparse white pubescence, 1.4x that of thorax in profile; ovipositor exerted.

*Male*: Unknown.

*Host*: *Contarinia dalbergiae* making galls on *Dalbergia sisso*.

*Distribution*: India (Kerala, Delhi, UP).

*Plesiotype*: Female, INDIA, Kerala, C.U. Campus, Mini, 5.IV.1996 (DZCU).

#### *Discussion*

This species differs from its closest relative *Systasis dasyneurae* Mani in having

- 1) Pedicel much longer than first funicular segment (In *S. dasyneurae* pedicel slightly longer than first funicular segment).
- 2) All funicular segments quadrate (In *S. dasyneurae* all funicular segments not quadrate).
- 3) Both mandibles tridentate (In *S. dasyneurae* only the left mandible tridentate).

*Systasis vischnu* (Motschulsky)

(Figs. 71-75)

*Eulophus vischnu* Motschulsky, 1863. Bull. Soc. Imp. Natur. Moscou, 36: 65.

F. Srilanka: Mt. Nuara Eliya (ZMMS).

*Plesiotype*: Female: Length 1.7 mm.

*Colouration*: Dark metallic bluish green with a slight golden yellow reflection. Antennae brown, ocelli reddish brown; eyes dark cupreous; gaster with brownish bands on hinder part of tergites. Legs with coxae and femur concolorous with body, remainder brown, tegulae brown; wings hyaline; veins pale brown.

*Head* (Figs. 71, 72, 73): Uniformly and closely reticulate with scattered umbilicate punctures which are sparse on lower face; reticulation finer on lower face, but closer as vertex; in dorsal view head width 2.2x its length. In front view 1.4x as broad as high POL 3.3x OOL. Malar space little less than half of eye length (19:9); eye length in profile 1.3x its width. Antennae inserted in the middle of face. Scrobe deep; scape stout, reaching median ocellus. Anterior margin of clypeus straight; pedicel almost half that of scape. Anelli equal; pedicel 1.3x as long as F1, the latter 1.2x as long as F2. F1 longer than broad; F5 transverse, remaining segments quadrate. Flagellum slightly widening towards the tip.

*Thorax:* Stout, moderately convex, uniformly reticulate with scattered punctures, pronotal collar narrow, deeply emarginate posteriorly. Mesoscutum width 1.5x length. Scutellum moderately convex as broad as long. Propodeum with a very short median carina (Fig. 74) due to deep emargination posteriorly. Spiracle close to metanotum. Callus with few hairs. Forewing length 1.8x width, basal part almost bare except few setae on basal vein. Relative length of smv, mv, pmv and stv as 34:20:8:7. Metapleuron faintly reticulate. Hind coxae finely reticulate.

*Gaster:* Length 1.2x that of rest of the body. Dorsally collapsing. T1 the largest, T2 small, remaining tergites gradually decreasing in length.

*Male:* Body not as much stout as in female; pedicel a little longer than F1; antennae paler than female (Fig. 75), gaster thin; other characters same as that of female.

*Host:* Unknown.

*Distribution:* India (Kerala). Srilanka.

*Plesiotype:* Female, INDIA, Kerala, C.U. Campus, Mini, 24.II.1995 (DZCU).

*Other materials examined:* 1F, INDIA, Kerala, Painavu, Sureshan, 18.III.1996; 1F, INDIA, Kerala, Nirmalagiri, Mini, 3.XI.1996; 1F, INDIA, Kerala, Nirmalagiri, Mini, 3.XI.1996; 1F, INDIA, Kerala, Aaralam farm, Mini, 16.XII.1995; 1F, INDIA, Kerala, Aaralam Farm, Mini, 16.XII.1995; 1F, INDIA, Kerala, C.U. Campus, Sureshan, 6.VII.1988; 1F, INDIA, Kerala,

Malampuzha, Sureshan, 11.XII.1988; 1F, INDIA, Kerala, Padappai, S. Amutha, 23.VII.1992; 1M, INDIA, Kerala, Muthanga, Mini, 6.X.1995; 1M, INDIA, Kerala, C.U. Campus, Sureshan, 25.VI.1989 (All in DZCU).

#### *Discussion*

This species differs from all other known species in having a stout body. Comes closer to *Systasis dasyneurae* Mani but differs from it in having

- 1) Propodeum with a short median carina (In *Systasis dasyneurae* median carina well developed).
- 2) Forewing length 1.8x width (In *S. dasyneurae* forewing length 2.2x width).

#### *Variation*

Colour varies from metallic bluish green to metallic green.

#### *Systasis lepidus* sp. nov.

(Figs. 76-79)

*Holotype*: Female: Length 2.4 mm.

*Colouration*: Body metallic blue, brownish on ventral part of gaster; eyes cuperous; ocelli pear white; antennae brown with basal part of scape paler. Coxae and hind femora concolorous with body; fore and mid femora except tip, mid and hind tibiae except base and tip, and tips of tarsi brown,

other parts of legs testaceous. Tegula brown, wings hyaline, veins pale brown.

*Head* (Figs. 76,77, 79): Closely and moderately reticulate with scattered pubescence and punctures on lower face. In front view 1.2x as broad as long. Height of eyes 1.6x the malar space. Genae compressed. Mandibles tridentate. Clypeus straight anteriorly. Antennae inserted middle of face, formula 11253; scape reaching front ocellus; pedicel slightly longer than F1; ring segments transverse, second thicker than the other. Funicular segments unequal longer than broad; club as long as preceding two segments together, about twice as long as broad.

*Thorax*: Uniformly and moderately reticulate; pronotum very narrow; mesoscutum width 1.4x length. Scutellum moderately convex about 3.3x that of propodeum. Propodeum short with slightly indicated median carina. Forewing length 2.5x width space below marginal vein with ten long erect setae, mv long 3.1x that of pmv, the latter 1.1x that of stv.

*Gaster*: Elongate, dorsally collapsing, about 1.5x that of thorax in profile. T1 the largest, T2 smallest, following tergites gradually decreasing in length. Ovipositor sheaths and ovipositor strongly protruded out (Fig. 76).

*Male*: Unknown.

*Host*: Unknown.

*Distribution:* India (Kerala).

*Holotype:* Female, INDIA, Kerala, Chindaki, Sureshan, 13.XII.1987 (DZCU).

*Etymology:* The species name is taken from the latin word meaning elegant.

#### *Discussion*

This species comes close to *Systasis vischnu* Motschulsky but differs from it in having

- (1) Gaster elongated (In *Systasis vischnu* gaster not much elongate).
- (2) Club as long as preceding two segments together (In *Systasis vischnu* club as long as preceding three segments combined).
- (3) Ovipositor strongly protruded out (In *Systasis vischnu* ovipositor not protruded strongly).

#### *Systasis malabarensis* sp. nov.

(Figs. 80-83)

*Holotype:* Female: Length 1.8 mm.

*Colouration:* Body dark metallic blue with greenish reflection on face; eyes pale chocolate brown; ocelli pale yellowish brown. Scape pale brown with tips darker, remainder of antenna dark brown. Fore and hind coxae concolorous with thorax; middle coxa brown, femora dark brown with



bluish reflection on hind femora; tibiae brown with tips paler, tarsi testaceous with tips darker; tegulae and veins pale brown; wings hyaline.

*Head* (Figs. 80, 81, 82): Uniformly and closely reticulate with scattered umbilicate punctures; pubescence longer on lower face. In front view head width 1.2x length. POL 3.4x OOL. In dorsal view head width 1x length. Anterior margin of clypeus slightly emarginate, shiny. Malar space 0.36x as long as eye; eye length 1.3x width in profile; antennae inserted little below middle of face; scrobe deep; scape stout, reaching median ocellus, pedicel little less than half of scape, width equal. Pedicel 1.3x as long as F1; funicular segments gradually decreasing in length; F2 quadrate, F1, F3, F4 and F5 transverse.

*Thorax*: Highly convex in lateral view; uniformly reticulate with scattered umbilicate punctures; pronotal collar narrow; mesoscutum width 1.6x length; scutellum almost as long as broad; propodeum with median carina moderate (Fig. 83) plicae sharp. Forewing length 2.2x width; basal part almost bare except few setae on basal vein; mv 2.9x that of pmv the latter 1.1x that of stv.

*Gaster*: Length 1.5x that of rest of the body, dorsally collapsing. Ovipositor sheaths and ovipositor protruding out.

*Male*: Unknown.

*Host*: Unknown.

*Distribution*: India (Kerala).

*Holotype*: Female, INDIA, Kerala, Thalappara, T.C. Narendran, 31.VIII.1987 (DZCU).

*Etymology*: The species is named after its collection locality.

*Discussion*: This species comes close to *Systasis cenchrivora* Farooqi & Menon but differs in having

1. Pedicel not as long as F1 and F2 combined (In *S. cenchrivora* pedicel as long as F1 and F2 combined).
2. Antennae not shorter (In *S. cenchrivora* antennae shorter).
3. F2 quadrate (In *S. cenchrivora* all funicular segments transverse).

## Subfamily DIPARINAE

### Diagnosis

Antenna 13-segmented; hind coxa inserted unusually high, its outer face often with transverse sculpture; brachypterous or wingless females common, while the males usually fully winged; either vertex and/or thorax dorsally with paired dark bristles and gena posteriorly rounded. In some species bristles absent and gena carinate in lower part and antenna long.

### KEY TO THE INDIAN GENERA OF DIPARINAE

1. Notauli meet before reaching the middle of mesoscutum (Fig.100) ....  
..... *GRAHAMISIA* Delucchi
- Notauli do not meet in the middle of mesoscutum ..... 2
2. Gaster sessile or subsessile, rather short and broad; petiole transverse; scutellum much longer than scutum (Fig. 104).....  
..... *NETOMOCERA* Boucek
- Gastral petiole distinct, subquadrate upto about twice as long as broad, body of gaster rather slender, conically acuminate; scutellum not or hardly longer than scutum ..... 3
3. Notaular grooves arched and approaching each other on the usually shinier posterior part of scutum (Fig. 112) ..... *PARURIOS* Girault
- Notauli rather wide apart, almost straight scutum posteriorly pilose and dull (Fig. 94) ..... *DIPARA* Walker

## GENUS *DIPARA* Walker

*Dipara* Walker, 1833. Ent. Mag. 1: 371. Type species: *Dipara petiolata* Walker, by monotypy.

*Epilelaps* Girault, 1915 (232): 344. Type species *Epilelaps hyalinipennis* Girault: by original designation. Synonymy by Boucek, 1988: 334.

*Pseudiparella* Girault, 1927 (416): 334-335. Type species *Pseudiparella emersoni* Girault, by monotypy. Synonymy by Boucek, 1988: 334.

*Tricoryphus* Foerster, 1856. Hym. Stud., 2: 46, 47. Type species: *Tricoryphus fasciatus* Thomson, by subsequent reference of Thomson, 1876.

*Hispanolelaps* Mercet, 1927. EOS, Madrid, 3: 60. Type species: *Hispanolelaps coxalis* Mercet, by monotypy.

*Afrolelaps* Hedqvist, 1963. Stud. Forest. Suec., No. 11: 47. Type species: *Afrolelaps maculata*. Hedqvist by original designation. Synonymy by Graham 1969: 65.

### Diagnostic features

Head broader than thorax in dorsal view; malar sulcus distinct; frons reticulate; mandibles with 3 teeth; vertex and thorax dorsally dark bristles; gena posteriorly rounded. Antennae clavate, 13-jointed, 11173; inserted on or above a level with anterior margin of eyes; gena posteriorly rounded pronotum and anterior part of mesonotum reticulate; notauli complete; scutellum with frenum; propodeum with nucha, wings well developed or shortened with long bristles, gaster acuminate.

## Distribution

India (Kerala), Srilanka, North America, Europe, Africa, Australia.

## Biology

Unknown.

## Discussion

This genus is reported for the first time from India. In this work four species are recorded from Kerala and are new to science. The limits of the genus are not yet quite clear. *Dipara* was based on the male characters of the European *D. petiolata* Walker, whilst the female of that species was described as *Tricoryphus* and *Hispanolelaps*.

### KEY TO THE ORIENTAL SPECIES OF *DIPARA* WALKER

1. Wings reach to base of petiole ..... 2
- Wings not reaching the base of petiole (Fig. 92) ..... *nitigastrea* sp. nov.
2. Scutellum and propodeum with a pair of lateral black protrusion (Fig. 98) ..... *distincta* sp. nov.
- Scutellum and propodeum not as above ..... 3
3. Antenna distinctly clavate, gaster shagreened (Fig. 84) .....  
..... *keralensis* sp. nov.
- Antenna not well clavate, gaster smooth (Fig. 88) .....  
..... *ecarinata* sp. nov.

*Dipara keralensis* sp. nov

(Figs.84-87)

*Holotype*: Female: Length 2.47 mm.

*Colouration*: Head and thorax honey brown; eyes and ocelli whitish grey; F2, F3, F4, F5 and scape brownish black; pedicel and F1 yellowish brown, F6, F7 and club yellowish white; Fore coxa and hind leg pale yellowish brown, remaining part of the legs brownish black; gaster blackish brown; ovipositor brownish yellow with apex blackish brown.

*Head* (Figs.84, 85, 86): Broader than thorax in dorsal view (13:8) malar sulcus distinct; frons reticulate clypeus slightly longer than wide. Head in front view 1.5x as wide as long; genae posteriorly rounded; maximum diameter of eyes in profile 2.7x length of malar space; POL equal to OOL; face below antennal sockets punctated and with small setae; vertex with five bristles three directed backwards and two forwards. Antennal formula 11173; clavate, club 2.7x as long as broad; scrobe reaching front ocellus; antennae inserted above a level with anterior margin of eyes; scape not reaching front ocellus. Pedicel 1.3x as long as F1, the latter 1.2x as long as F2; the remaining six funicular segments are of equal length.

*Thorax*: Pronotum and anterior part of mesonotum reticulate; pronotum 2x as wide as long; mesoscutum with two pairs of bristles about 2x as long as scutellum in profile. Notauli complete. Scutellum with frenum. Propodeum constricted in to a short nucha; a little rugose, 1.5x as

long as scutellum; propodeum with a median raised carina and a pair of sublateral carina; the median and submedian carina not reaching posterior margin of propodeum as in (Fig. 87). Spur half as long as its basi tarsus the latter 1.7x shorter than rest of the distal segments together, wings brachypterous, reach to base of petiole with five long bristles on fore wings.

*Gaster*: Shagreened; setiferous with two pairs of long black setae on T6. Apical part of gaster covered with fine hairs. Petiole 1.5x as long as broad. Gaster including petiole 1.9x as long as thorax. T1 the largest 2.5x as long as T2, following tergites gradually decreasing in length.

*Male*: Unknown

*Host*: Unknown

*Distribution*: India (Kerala)

*Holotype*: Female, INDIA, Kerala, Parambikulam, Sureshan 2.IX.1995 (DZCU).

*Etymology*: The species is named after its region of collection, namely Kerala.

#### Discussion

This species comes to the fourth couplet of the key to world species of *Dipara* Walk by Hedqvist (1969) but it differs from *Dipara nigrofasciata* Hedqvist in having.

1. Clypeus slightly longer than wide (In *Dipara nigrofasciata* clypeus as long as wide).
2. Absence of a transverse band in front of scutellum (In *Dipara nigrofasciata*, a transverse band in front of scutellum present)
- 3) Petiole 1.5x as long as broad (In *D. nigrofasciata* petiole as long as wide).

It differs from *Dipara nigrita* in having antennae inserted above a level with anterior margin of eyes (In *D. nigrita* antennae inserted on a level with anterior margin of eyes).

***Dipara ecarinata* sp. nov.**

(Figs. 88-91)

*Holotype*: Female: length 1.9 mm.

*Colouration*: Head and thorax yellowish brown; eyes and ocelli whitish grey. Scape, pedicel, F1, F2, F3, F4, F7, club and legs pale yellowish brown, F5, F6 and gaster brownish yellow.

*Head* (Figs. 88, 89, 91): Broader than thorax in dorsal view (11:9), malar sulcus distinct; scrobe reaching front ocellus, frons striate; clypeus 1.4x as wide as long; head in front view 1.2x as wide as long; gena posteriorly rounded; maximum diameter of eyes in profile twice the length of malar space; POL twice to OOL; vertex with two pairs of bristles directed forwards. Antennae inserted above a level with anterior margin of eyes;



formula 11173. Scape not reaching front ocellus; pedicel twice as long as F1, club 3.6x as long as broad.

*Thorax:* Pronotum and anterior part of mesonotum transversely striated; mesoscutum with a pair of bristles, 1.5x as long as scutellum in profile; notauli complete; scutellum with frenum. Anterior median part of propodeum (Fig. 90) smooth with grooves having cross bands and with a pair of transverse carinae; propodeum constricted into a short nucha; hind tibiae with one spur half as long as its basitarsus; wings pubescent with fuscous clouds and with long blackish brown bristles (Fig. 88); mv long 3.4x as long as pmv, the latter twice as long as stigmal vein.

*Gaster.* Smooth with exerted ovipositor; petiole 1.5x as long as wide; gaster including petiole 1.8x as long as thorax; T1 the largest, 1.75x as long as following tergites combined; epipygium 2.1x as long as ovipositor sheath.

*Male:* Unknown.

*Host:* Unknown.

*Distribution:* India (Kerala).

*Holotype:* Female, INDIA, Kerala, Chindaki, T.C. Narendran, 13.XII.1987 (DZCU).

*Discussion*

This comes to first couplet of the key to world species of *Dipara* Walk. by Hedqvist (1969) but it differs from *Dipara canadensis* Hedqvist in the following features.

- 1) Median carina absent (In *Dipara canadensis* median carina present).

Differs from *Dipara keralensis* sp. nov. in having

- 1) Smooth gaster (In *Dipara keralensis* gaster shagreened.
- 2) Antennae not distinctly clavate (In *Dipara keralensis* antenna distinctly clavate).

***Dipara nitigastra* sp. nov.**

(Figs. 92-94)

*Holotype*: Female: Length 1.5 mm.

*Colouration*: Head and thorax honey brown; eyes and ocelli whitish grey. Legs, scape, pedicel, and F1, yellowish brown; F2, F3, F4, F5, F6 brown. F7 and club yellowish white. Gaster brown with epipygium and petiole brownish yellow.

*Head* (Figs. 92, 93, 94): Broader than thorax in dorsal view (36:20) malar sulcus distinct; maximum diameter of eyes in profile 2.2x length of malar space. Head in front view 1.2x as broad as long; scrobe not reaching median ocellus; frons reticulate; vertex with four pairs bristles, four directed forwards and four backwards. POL twice OOL, Antennae inserted

slightly above the level of lower margin of eyes; formula 11173; clavate, pedicel 1.2x as long as F1; F1, F2, F4, F7 of equal length, F3, F5 and F6 are of equal length. Club 2.3x as long as broad, slightly longer than preceding four segments combined.

*Thorax* (Fig. 94): Pronotum and anterior part of mesonotum reticulate; pronotum 1.2x as broad as long. Mesoscutum with two pairs of bristles; mesoscutum plus scutellum 1.7x as long as propodeum. Propodeum smooth with a pair of lateral carinae. Wings brachypterous, not reaching the base of petiole. Fore wing margin with five long bristles.

*Gaster*: Smooth, gaster including petiole 1.8x that of thorax in profile; petiole as long as wide; T1 2.6x that of T2; epipygium 1.5x ovipositor sheath.

*Male*: Unknown.

*Host*: Unknown.

*Distribution*: India (Kerala).

*Holotype*: Female INDIA, Kerala, Muthanga Mini, 6.X.1995 (DZCU).

*Etymology*: The species name due to shining gaster.

#### *Discussion*

This comes to the first couplet of the key to world species of *Dipara* Walk by Hedqvist (1969) but it differs from *Dipara petiolata* in having a smooth propodeum (In *Dipara petiolata* propodeum punctated).

It differs from *Dipara keralensis* sp. nova in the following features.

1. Propodeum without a distinct median carina (In *D. keralensis* sp. nova propodeum with a distinct median carina).
2. Gaster smooth (In *Dipara keralensis* gaster Shagreened).
3. Wings not reaching the base of petiole (In *D. keralensis* wings reach to base of petiole).

***Dipara distincta* sp. nov.**

(Figs. 95-98)

*Holotype*: Female: Length 1.7 mm.

*Colouration*: Head, thorax, antennae, ocelli, and petiole brownish yellow; eyes yellowish grey. Gaster yellowish brown with dark brown bands. Legs pale yellowish brown, wings hyaline with brownish infuscation. Veins pale brown.

*Head* (Figs. 95, 96, 97): In front view about as long as wide. In dorsal view twice as wide as long; malar sulcus distinct; maximum diameter of eyes twice that of malar space. POL twice OOL. Vertex with two pairs of bristles directed forwards. Scrobe reaching front ocellus. Clypeus 1.5x as wide as long. Antennae inserted above a level with the anterior margin of eyes; scape not reaching front ocellus; pedicel 1.6x as long as broad about as long as following two segments combined. F2 twice as long as F1; F2 to F7 almost equal in length. Club 2.2x as long as broad, about as long as preceding three segments combined.

*Thorax:* With pairs of bristles directed backwards, transversely striated with white pubescence. Notauli complete. Scutellum and propodeum with a pair of lateral black protrusions (Fig. 98). Propodeum twice as wide as long, constricted into a conspicuous nucha. Forewing with a tuft at parastigma, 2.7x as long as broad; marginal fringe conspicuous, mv long, 7.6x as long as pmv, the latter 0.7x as long as stv. Hind tibia with one long spur.

*Gaster:* Smooth, petiole short, about as long as wide. Gaster fully 1.4x as long as thorax in profile. T1 the largest, about 1.7x as long as following tergites combined.

*Male:* Unknown.

*Host:* Unknown.

*Distribution:* India (Kerala).

*Holotype:* Female, INDIA, Kerala, C.U. Campus, Sureshan, 3.IV.1989 (DZCU).

*Paratype:* 2 Females with same data as the holotype.

#### *Discussion*

This species differs from other known species in having a stout body. It resembles *Dipara ecarinata* sp. nov. in having well developed wings and smooth gaster. It differs from *Dipara ecarinata* in having

1. Propodeum and scutellum with lateral protrusions (In *Dipara ecarinata* lateral protrusions absent).
2. Forewing with a tuft at parastigma (In *D. ecarinata* forewing without tuft at parastigma but wing margin with long blackish bristles).
3. Petiole as long as wide (In *D. ecarinata* petiole 1.5x as long as wide).

## Genus *GRAHAMISIA* Delucchi

*Grahamisia* Delucchi, 1962. Ann. Mus. Roy. Afric. Centr. Zool., 110: 379.

Type species: *Grahamisia setosa* Delucchi, by monotypy and original designation.

### Diagnostic features

Antennae inserted just on a level or just above a level with anterior margin of eyes; formula 11173; malar sulcus distinct; gena posteriorly rounded. Clypeus with anterior margin straight; vertex with two black setae, between ocelli and inner orbits. Notauli meet in the middle of mesoscutum. Each of scapulae with a black smooth area; mesonotum and scutellum with two black setae each. Wings short, reach to petiole or longer. Gaster smooth.

### Distribution

India (Kerala) Srilanka.

### Biology

Unknown.

### Discussion

This genus is reported for the first time from India. In this work one species is dealt with and is new to science.

*Grahamisia kozhikodensis* sp. nov

(Figs. 99-101)

*Holotype*: Female: Length 1.5 mm.

*Colouration*: Head and thorax brownish yellow with brownish bands on face. Eyes and ocelli blackish grey. Pedicel and funicular segments except F7, brown; F7, club, scape and legs pale brownish yellow; gaster and ovipositor brown with epipygium yellowish brown; wings yellowish brown.

*Head* (Figs. 99, 100, 101): Broader than thorax in dorsal view (48:32); in front view 1.3x as broad as long; smooth except above antennae which is transversely striated. Face below antennal sockets finely punctate and with small setae; clypeus with anterior margin straight, slightly longer than wide. Malar sulcus distinct; genae posteriorly rounded; maximum diameter of eye in profile 2.5x length of malar space. Vertex with two black setae, between ocelli and inner orbites with two setae. POL equal to OOL; antennae inserted just above a level with anterior margin of eyes. Formula 11173. Pedicel 1.3x as long as F1; funicular segments longer than broad except last two which are quadrate. Club 2.9x as long as broad, slightly longer than three last funicular segments combined.

*Thorax* (Fig. 100): Pronotum with transverse striation; anterior part of median lobe of mesonotum with transverse striation but finer than on pronotum. A pair of black setae in the middle and anterior of mesonotum



and scutellum, notauli meet in the middle of mesonotum; each scapula with a black smooth area. Prepectus smooth and all pleurae with scattered striation. Mid and hind coxae with transverse striation. Propodeum smooth with a median carina; length of propodeum almost equal to that of scutellum; plica short. Wings short only reaching to base of petiole with one black setae at base, one in the middle, and one strong black setae at apex.

*Gaster* (Fig. 99): Smooth, apical part with scattered fine hairs. Gaster including petiole and ovipositor almost twice as long as thorax in profile. Petiole as long as wide with rugose puncturation; T1 the largest, about twice as long as preceding tergites combined. Ovipositor including its sheath equal to that of epipygium.

*Male*: Unknown.

*Host*: Unknown.

*Distribution*: India (Kerala).

*Holotype*: Female, INDIA, Kerala, C.U. Campus, Mini, 2.II.1997 (DZCU).

*Paratype*: 1F INDIA, Kerala, Tiruvannur, Mohana, 16.XI.1996 (DZCU).

*Etymology*: The species is named after its collection locality.

### *Discussion*

This species comes to the third couplet of the key to world species of *Grahamisia* Del by Hedqvist (1969) but differs from *Grahamisia maculata* Hedqv. in having

- 1) petiole as long as wide (In *G. maculata* Hedqv. petiole longer than wide).
- 2) wings short only reach to base of petiole (In *G. maculata* Hedqv. wings not short, reaches beyond petiole).
- 3) T1 twice as long as preceding tergites combined (In *G. maculata* T1 only 1.4x as long as following tergites combined).

It shows similarity with *G. maculata* in having each of scapulae with a black smooth area.

## Genus *NETOMOCERA* Boucek

*Netomocera* Boucek, 1954. Sbor. Ent. Odd. Nar. Mus. Praze, 29: 49. Type species: *Netomocera setifera* Boucek, by original designation.

### Diagnostic features

Colour often brownish black with various parts dark testaceous. Body rather robust. Large 3-toothed mandibles with strongly sickle shaped outer margin, the almost truncate or slightly produced shiny clypeus, the low insertion of the antennae in the female, rather long especially in the males; scrobe deep, sides striated, middle part smooth and shiny. Temples not strongly converging; strong bristles on the vertex and the thoracic dorsum; thorax finely reticulate; the pronotum with short collar and a high vertical collum; scutellum much longer than scutum, propodeum flat. Forewing almost uniformly pubescent. Gaster smooth, sessile or subsessile, rather short and broad; petiole transverse; first tergite the largest.

### Distribution

India (Kerala, Tamil Nadu), Srilanka, Africa, Australia and New Guinea.

### Biology

Not yet known.

## Remarks

Only one species of *Netomocera* viz. *Netomocera nigra* Sureshan & Narendran have so far been reported from India. In this work two species are dealt with of which one is new to science.

Hedqvist places this genus in a separate tribe Netomocerini.

## KEY TO THE ORIENTAL SPECIES OF NETOMOCERA BOUCEK

1. Antennal toruli at the level of lower margin of compound eye; posterior margin of T1 emarginate (Fig. 104).....  
..... *nigra* Sureshan and Narendran
- Antennal toruli little below the level of lower margin of compound eye; posterior margin of T1 straight (Fig. 110) ..... *Clavata* sp. nov.

### *Netomocera nigra* Sureshan & Narendran

(Figs. 102-106)

*Netomocera nigra* Sureshan and Narendran, 1990. Orient. Ins; 24: 219-227.

*Plesio*type: Female: length 3.1 mm .

*Colouration*: Body black with no metallic reflection. Gaster black with ventral part brown. Antenna with scape, pedicellus, first funicle segment testaceous, otherwise black. Coxae brownish black; femora brown; tibiae

and tarsi testaceous with tips of later brown. Tegulae brown; wings with uniform brown infumation, veins brown.

*Head* (Figs. 102, 103, 104): Only slightly wider than mesoscutum, in dorsal view 2.2x as broad as long with temples not strongly converging and 0.26x as long as eyes, vertex with four pairs of long black bristles directed forwards, POL 3.5x OOL. Head in front view 1.2x as wide as long; finely reticulate; clypeus smooth, without teeth anteriorly. Malar space length .17x compound eye height; malar groove distinct. Antennal toruli at level of lower margin of compound eyes; scrobe very deep, sides striated, middle part smooth and shiny; scape just reaching median ocellus, 5.2x as long as pedicel, anellus very short, indistinct in dried specimens, first funicle segment as long as pedicel, the following segments progressively broadening, club three jointed, broader than any other funicle segment, as long as four preceding segments combined.

*Thorax*: More than 3x as long as head dorsally, finely reticulate with sparse pubescence; pronotal collar width 5x length, anterior margin round, with a row of long backwardly directed bristles. Mesoscutum shorter than 3x as long as pronotal collar, with 2 pairs of backwardly directed bristles, frenum longitudinally striated. Scutellum 1.5x as long as middle lobe of mesoscutum. Metanotum anteriorly with close longitudinal carinae. Dorsellum not clearly marked off, smooth; propodeum flat, 1.9x as broad as long and half as long as scutellum, median part, with several small areas made by fine carinae, area just behind spiracle striated without carinae, spiracle round, well separated from metanotum; callus with scattered hairs;

nucha absent. Prepectus elongated, triangular, almost smooth, lower part deep with fine transverse carinae. Mesopleuron with mesepisternum rugulose, mesepimeron smooth and shiny. Metapleuron with fine carinae on the sides and smooth medially. Legs normal; hind coxae transversely striated on dorsolateral region; hind tibia with two spurs. Forewing (Fig. 102) almost uniformly pubescent, except a small speculum, pubescence small, marginal fringe small and inconspicuous. Veins with a row of bristles, mv 2x as long as pmv and 3x as long as the stv.

*Gaster* (Fig. 104): Petiole longitudinally rugulose, as long as broad and half as long as propodeum in dorsal view; tergite 1 covering more than half of gaster, posterior margin emarginate deeply; hind margin of following tergites almost straight. Ovipositor sheaths exerted.

*Male*; Length 1.3 mm. Similar to female but differing as follows: Body black, smaller than female. Propodeum (Fig. 106) more reticulate than in female. Antenna (Fig. 105) long and filiform, funicle segments elongate, anellus indistinct. Wings hyaline, with marginal fringe more clear, pubescence more sparse. Gaster with only T1 visible, others retracted.

*Host*: Unknown.

*Distribution*: India (Kerala).

*Plesiotype*: Female, INDIA, Kerala, Aralam W.L.S., Sureshan, 5.IV.1995 (DZCU).

*Other materials examined:* 1M, INDIA, Kerala, Kakkayam, Mini, 8.II.1996; 1M, INDIA, Kerala, Nirmalagiri, Mini, 10.XII.1996; 1M, INDIA, Kerala, Aaralam, Mini, 11.XII.1995 (All in DZCU).

### *Discussion*

This species closely resembles the European *Netomocera setifera* Boucek, differs from it in having body generally black, antennal club as long as four preceding segments combined and gaster (Fig. 102) with tergites following first not very short and not much retracted under the first. *N. setifera* has the body generally testaceous, club almost as long as three preceding segments combined and gaster with tergites following first very short and more or less retracted under the first.

It differs from the African species *N. africana* Hedqv. in having short, oval gaster with T1 exceeding well beyond the middle of gaster. In *N. africana* Hedqv. gaster long with T1 not reaching middle of gaster.

### *Netomocera clavata* sp. nov.

(Figs. 107-110)

*Holotype:* Female: Length 2.2 mm.

*Colouration:* Body black with no metallic reflection, antennae yellowish brown; coxae black, femora brown, tibiae and tarsi testaceous with tips of later brown. Tegulae brown, veins pale brown.

*Head* (Figs. 107, 108, 109): In front view 1.6x as broad as long, reticulate; clypeus smooth; vertex with six pairs of black bristles directed forwards. POL 2x OOL; temples not strongly converging; malar space 0.24x maximum diameter of eyes; antennal toruli below the level of lower margin of compound eyes; scrobe deep, sides striated, middle part smooth and shiny, scape not reaching median ocellus, 3.5x as long as pedicel. Antennae thirteen jointed, anellus very short, funicular segments are of equal length; pedicel twice as long as F1, club twice as long as broad, longer than preceding two segments combined.

*Thorax*: Finely reticulate; pronotum with a row of backwardly directed bristles; mesoscutum with two pairs of backwardly directed bristles; pronotum plus mesoscutum 1.5x longer than scutellum. Scutellum with three pairs of bristles directed backwards, one pair longer than the other two, frenum smooth; metanotum with median and lateral depressions. Propodeum flat, reticulate 2.3x as broad as long, median part with several small areas made by fine carinae; callus with scattered hairs, nucha absent. Mesopleuron with mesepisternum punctate; mesepimeron smooth and shiny. Hind coxae transversely striated on dorsolateral region (Fig. 107), hind tibiae with two spurs; forewing almost uniformly pubescent except a small speculum; marginal fringe conspicuous; veins with a row of bristles; mv 3x as long as pmv, latter about as long as stv.

*Gaster* (Figs. 107, 110): Petiole longitudinally striated, 1.3x as broad as long. T1 covering more than half of gaster, posterior margin straight. Gaster including petiole 1.4x as long as thorax in profile. Apex pointed.



*Male:* Unknown.

*Host:* Unknown.

*Distribution:* India (Kerala).

*Holotype:* Female: INDIA, Kerala, Nirmalagiri, Mini, 16.XII.1995 (DZCU).

*Paratype:* 1F, INDIA, Kerala, Aaralam, Mini, 17.X.1995, 1F, INDIA, Kerala, Tiruvannur, Mohana, 23.XI.1996 (DZCU).

#### *Discussion*

This species comes to the couplet three of the key to the oriental and African species of Netomocera by Sureshan and Narendran (1990). But it differs from *Netomocera nigra* Sureshan and Narendran in the following features:

1. Antennal toruli little below the level of lower margin of compound eye (In *N. nigra* antennal toruli at the level of lower margin of compound eye).
2. Posterior margin of T1 straight (In *N. nigra* posterior margin emarginate).
3. Club as long as preceding three segments combined (In *N. nigra* club as long as preceding four segments combined).

It differs from *Netomocera africana* Hedqv. in having T1 reaching well beyond the middle of gaster (In *N. africana* T1 not reaching middle of gaster).

### Genus *PARURIOS* Girault

*Parurios* Girault, 1913 (175): 84-85. Type species *Parurios australiana* Girault; by monotypy.

*Uriolelaps* Girault, 1915 (239): 201. Type species *Uriolelaps argenticoxae* Girault; by original designation. Synonymy by Boucek, 1988: 335.

*Emersonia* Girault, 1933 (441): (1). Type species *Emersonia atriscutum* Girault; by monotypy. Synonymy by Boucek, 1988: 335.

#### Diagnostic features

Antennae shorter than body, narrowly cylindrical without long hairs but usually with quite conspicuous longitudinal sensilla. Malar sulcus distinct; gena posteriorly rounded. Pronotum distinctly narrower than mesoscutum; notaular grooves arched and approaching each other on the usually shinier posterior part of scutum; Mesoscutal pair of bristles about twice as far from the transscutal suture as the anterior scutellar bristles. Gastral petiole always long. T1 the largest.

#### Distribution

India (Kerala) Newguinea, Australia.

### *Biology*

One Indian species was reared from the curculionid *Athesapeuta cyperi* Marshall feeding on roots of *Cyperus rotundatus* (Boucek, 1988).

### *Discussion*

In the present work only one species is recorded and is new to science.

### *Parurios malabarensis* sp. nov.

(Figs.111-113)

*Holotype*: Female: Length 2 mm.

*Colouration*: Head and thorax black; ocelli brown; scape brownish yellow; pedicel and funicular segments brownish black; coxae blackish brown, rest of the legs yellowish brown. Gaster blackish brown; veins testaceous.

*Head*: (Figs. 111, 112, 113) in front view 1.3x as broad as long, malar sulcus distinct; malar space smooth below malar groove. Gena reticulate, posteriorly rounded. Maximum diameter of eyes in profile 2.3x the length of malar space; POL 1.6x OOL; scrobe not reaching front ocellus; frons striate and depressed; vertex with three pairs of bristles directed forwards. Antennae inserted above a level with the anterior margin of eyes; Antennal formula 1173; club slightly longer than preceding two segments together (5:4) and 3.3x as long as broad. Fl 1.4x as long as the pedicel. Funicular segments are of equal length, club 2.7x as long as broad.

*Thorax* (Fig. 112) with pairs of bristles directed backwards; pronotum, mesoscutum and anterior part of scutellum reticulate; frenum longitudinally striated. Notauli complete. Scutellum 1.25x as long as propodeum. Propodeum rugoso reticulate and with a short postero median carina starting from transverse median line; constricted in to a short nucha. Wings with a row of bristles; mv twice that of pmv, the latter 1.2x that of stv.

*Gaster*. Smooth, gaster including petiole equal to that of thorax in profile. Petiole punctate, 2.5x as long as broad. T1 the largest, 3.5x that of T2; remaining tergites gradually decreasing in length forming a pointed apex.

*Male*: Length 2.1 mm. Similar to female in most of the features but differs in having much stronger bristles; antennae narrowly cylindric, without long hairs but usually with quite conspicuous longitudinal sensilla. Gastral petiole longer than in female; only T1 visible other tergites retracted.

*Host*: Unknown

*Distribution*: India (Kerala).

*Holotype*: Female; India, Kerala, Muthanga, Mini 6.X.1995 (DZCU).

*Paratype*: 1F, INDIA, Kerala, Moolamattom, Narendran & Party, 30.XI.1988; 1F, INDIA, Kerala, Malampuzha, sureshan, XI-XII.1987; 1M,

INDIA, Kerala, Muthanga, Mini, 6.X.1995; 1M, INDIA, Kerala Tiruvannur, Mohana, 23.XI.1996; 1M, INDIA, Kerala, Amalagiri, Narendran & Party, 28.XI.1988; 1M, INDIA, Kerala, Aaralam, Mini, 17.XII.1995 (All in DZCU).

### *Discussion*

This species resembles the Australian species *Parurios australiana* Girault in having.

1. Antennae without a ring joint, propodeum not punctate and with a median carina. It differs from *P. australiana* in the following features.
  1. Abdomen without a broad darker strip across base (In *Parurios australiana* abdomen with a broad darker strip across base).
  2. Wings well developed (In *P. australiana* wings very small).
  3. Abdominal petiole punctate (In *P. australiana* abdominal petiole longitudinally striate).

## Subfamily CEROCEPHALINAE

### Diagnosis

Head sub prognathous or globose, with large ridge or tooth between antennae, and with strong occipital carina; body and antennae shiny latter without anelli, thorax frequently smooth. Propodeum always heavily sculptured; wings with fine long marginal fringe, sometimes with a tuft at parastigma; marginal vein fairly long but postmarginal and stigmal veins short; gastral petiole sometimes long, sometimes strongly transverse; hind margin of first gastral tergite in females often emarginate or even deeply excised in the middle. Ovipositor sheaths subexserted or longer. Short winged forms common.

### KEY TO THE INDIAN GENERA OF CEROCEPHALINAE

1. Head dorsally depressed, at least slightly longer than broad and with nearly parallel sides; antennae shifted distinctly forwards, their toruli anterior to the ocular line. In female funicle with five or six segments (Fig. 120) ..... *Theocolax* Westwood
- Head stout, dorsally rather convex, with toruli at least partly touching the lower ocular line; in female funicle always six-segmented; (Fig. 115) ..... *Cerocephala* Westwood

## Genus CEROCEPHALA Westwood

*Cerocephala* Westwood, 1832. Mag. Zool. 2:Cl. IX, Pl.4. Type species:

*Cerocephala cornigera* Westwood, by monotypy.

*Epimacrus* Walker, 1833. Ent. Mag; 1:368. Type species: *Epimacrus rufus*

Walker, by monotypy.

*Sciatherus* Ratzeburg, 1948. Ich. Forstin. 2:209. Type-species: *Sciatherus*

*trichotus*. Ratzeburg, by monotypy. Synonymy by Forster, 1856: 41.

*Sciatherodes* Masi, 1917:189. Type species *Cerocephala eccoptogastri* Masi; here designated synonymy by Boucek, 1988: 338.

*Proamotura* Girault, 1920. Insec. Inscit. - Menstruus, 8:143. Type-species:

*Proamotura aquila* Girault, by monotypy. Synonymy by Gahan, 1946:358.

### Diagnostic features

Short convex head with short normal mandibles. Antennae inserted near the middle of face; scape long slender; funicle slightly swollen apically; club fused with funicle, shortly pointed. Mesonotum polished, parapsidal furrows complete, scutellum flat. Propodeum horizontal with relatively fine irregular rugulose sculpture, without coarse carinae or areolae. Forewing with distinct tuft of black hairs on parastigma. Abdomen shortly oval.

### Distribution

India (Kerala, KT.), Srilanka.

### *Biology*

Some species attack mainly scolytidae, others develop as parasites of Anobiidae, i.e, the latter always in dead wood (Boucek, 1988).

### *Remarks*

Only one species of *Cerocephala* viz. *Cerocephala dinoderi* Gahan have so far been reported from India. This species is represented in the collection of the present investigation.

### *Cerocephala dinoderi* Gahan

(Figs. 115-119)

*Cerocephala dinoderi* Gahan, 1925. Philippine J. Sci. 27:100.

*Plesiotype*: Female: Length 1.9 mm.

*Colouration*: Head and thorax brownish yellow; antennae, legs and petiole yellowish brown. Wings hyaline with veins pale brown. Gaster and tip of ovipositor brown, remaining part yellowish brown.

*Head* (Figs. 115, 116, 117): Stout, dorsally rather convex, rarely longer than wide anteriorly not wider than thorax. Eyes small oval slightly hairy. Head in dorsal view 1.2x as wide as long. Mandibles 4-dentate POL equal to OOL. Antennas separated by triangular protrusion bordered by 2-dentate ridges; inserted at level of lower margin of eyes 9-segmented, more or less expanded distally without annuli, club unsegmented slightly shorter than preceding three segments together. Face piliferous.



*Thorax:* Twice as long as wide; notauli complete, scutellum flat. Propodeum horizontal with fine irregular rugulose sculpture, (Fig. 118) without coarse carinae or areolae. Forewing narrow with distinct tuft of black bristles on an expansion of the parastigma; marginal fringe at apex long. Forewing 3.2x as long as broad; smv 1.2x as long as mv, the latter 6x as long as pmv, pmv almost as long as stv.

*Abdomen:* Petiole 1.6x as long as wide. Gaster fully 1.2x as long as thorax in dorsal view, elongatedly ovate. T2 1.1x as long as T1, the remaining tergites gradually decreasing in length. Ovipositor stout strongly protruding.

*Male:* Length 1.5 mm. Antennas slightly longer, thinner, 10-segmented (Fig. 119). Other characters same as in female.

*Host:* *Sitophilus oryzae*

*Distribution:* India (Kerala, Karnataka), Srilanka, Philippines.

*Plesiotype:* Female, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998 (DZCU).

*Other materials examined:* 1M, INDIA, Kerala, C.U. Campus, Mini, 6.III.1996; 1M, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998; 1M, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998; 1M, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998 (All in DZCU).

*Discussion*

This species differs from *C. trichotus* Ratz. in having.

1. antennas of female slightly expanded distally.
2. posterior margin of first abdominal tergite brown.

(In *C. trichotus* antennas of female extremely dilated distally, posterior margin of first abdominal tergite yellowish).

## Genus *THECOLAX* Westwood

*Theocolax* Westwood, 1832 b:127. Type species *Theocolax formiciformis* Westwood; by monotypy.

*Choetospila* Westwood, 1874: 137. Type species *Choetospila elegans* Westwood; by monotypy. Synonymy by Boucek, 1988: 339.

*Spalangiomorpha* Girault, 1913 (169): 333-334. Type species *Spalangiomorpha fasciatipennis* Girault; by original designation. Synonymy by Gahan, 1946:352.

### Diagnostic features

Head smooth, wider than thorax, longer than wide anteriorly, dorsally depressed; eyes small naked; genae longer than longitudinal axis of eye; lower margin of frons with 2 denticles; mandibles 4-dentate. antennae inserted below lower margin of eyes, separated by angular protrusion; in female funicle with 5 or 6 segments; club unsegmented. Thorax longer than wide; pronotum long, slightly conical; mesonotum wider than long, smooth, shiny; parapsidal furrows distinct, complete; scutellum transverse, axillae widely separated, medium segment long, very finely rugose transversely; wings well developed with fine long marginal fringe and with a tuft of black hairs at parastigma. Abdomen oval, slightly longer than thorax; third tergite long.

### *Distribution*

Cosmopolitan

### *Biology*

Parasites of small beetles associated with grain or of anobiid beetles (Boucek, 1988).

### *Discussion*

Gahan produced the first reasonable generic key in which he separated *Choetospila* from *Theocolax* on the number of the funicular segments especially in the females (5 or 6, respectively).

### *Theocolax elegans* (Westwood)

(Figs. 120-124)

*Choetospila elegans* Westwood, 1874: 157. Synonymy by Boucek 1988: 339

*Plesiotype*: Female: Length 1.6 mm.

*Colouration*: Head, thorax, and antenna yellowish brown with club little darker. Eyes black with sides grey; gaster brown; ovipositor sheath yellow with tip brown; wings hyaline; veins brown; legs pale brownish yellow.

*Head* (Figs. 120, 121, 122): Globose, dorsally depressed, at least slightly longer than broad and with nearly parallel sides; occipital carina well developed. POL equal to OOL. Mandibles 4-dentate. Clypeus as wide as long. Head in dorsal view 1.1x as broad as thorax. Antennae shifted distinctly forwards, their toruli anterior to the ocular line, separated by angular protrusion. Formula 1151; club unsegmented. Scape 2.3x that of pedicel, pedicel 1.7x that of F1, F2 1.3x that of F1. F2, F3, F4 and F5 of equal

length. Club twice as long as broad, as long as preceding two segments together.

*Thorax:* Longer than wide with large triangular collar, pronotum long slightly conical, mesonotum twice as broad as long, smooth, shiny; notanli distinct, complete. Scutellum transverse, axillae widely separated, median segment long very finely rugose transversely. Propodeum almost twice as long as broad, faintly striated and with a short nucha (Fig. 123). Wings well developed without conspicuous pilosity but with fine long marginal fringe and with a tuft of black hairs at parastigma, (Fig. 120) mv fairly long, 6.8x that of pmv the latter, 0.64x that of stv; legs not long and slender.

*Abdomen:* Oval, 1.4x as long as thorax in profile, petiole 1.5x as broad as long. F1 twice as long as F2, F3 1.4x as long as F2. Ovipositor sheath exerted.

*Male:* Length 1.5 mm. Antenna 9 segmented, (Fig. 124) slightly thinner; body less stouter than in female. Other characters similar.

*Host:* Parasites of small beetles associated with grain.

*Distribution:* India (Kerala) Africa.

*Plesiotype:* Female, INDIA, Kerala, C.U. Campus, Sheela S, 26.XI.1994 (DZCU).

*Other materials examined:* 1F, INDIA, Kerala, C.U. Campus, Mini, 3.VI.1995. 1F, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998. 1F, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998. 1M, INDIA, Kerala, Chevarambakam, Sureshan, 5.II.1998 (All in DZCU).

#### *Discussion*

This species can be easily distinguished with the European species *T. formiciformis* Westwood in having well developed wings and antennae with only eight segments.


## Subfamily CLEONYMINAE

### Diagnosis

Pronotum dorsally rounded or at least without transverse edge, medially often with smooth strip or raised longitudinal line. Hind margin only moderately emarginate; thorax usually punctured. In some species notaular grooves incomplete or posteriorly vague combined with asymmetric preclava in the female antenna and in some gaster sclerotized and with a longitudinal carina dorso-laterally.

### KEY TO THE INDIAN GENERA OF CLEONYMINAE

1. Gaster of female strongly sclerotised and punctured; tergites 5 and 6 apically produced in to a narrow tail with median keel (Fig. 139)  
..... *SOLENUM* Westwood  
- Gaster not as above ..... 2
2. Stigmal Vein fairly long, fully twice as long as distance of stigmal knob from post marginal vein; hind femur with a sub apical tooth on ventral margin ..... *CLEONYMUS* Latreille  
- Stigmal Vein short hind femur without sub apical tooth on ventral margin ..... 3
3. Fore femur greatly enlarged on ventral edge, outside with oblique strong black bristles and a comb of perpendicular pegs (Fig. 134)  
..... *OODERA* Westwood  
- Fore femur not as above ..... 4

4. Propodeum and pronotum short, thorax with distinct, close, deep pits, (Fig. 138) ..... *RIEKISURA* Boucek
- Propodeum and Pronotum not short. Thorax not as above ..... 5
5. Gaster elongate, scrobe deep with carinate outer margin and inter antennal ridge.  Hind tibia with two spurs (Fig. 125) ..... *GROOCA* Sureshan & Narendran
- Gaster not so elongate, Scrobe not as above. Hind tibia with one spur ..... *HEYDENIA* Forster



## Genus *GROOCA* Sureshan & Narendran

*Neopistenia* Sureshan and Narendran (1995), J. Bombay. nat. Hist. Soc. 92(1): 96-99.

*Grooca* Sureshan and Narendran, 1997, J. Bombay. nat. Hist. Soc. 94(1): 175.

### Diagnostic features

Body moderately large and stout. Head uniformly and moderately raised, reticulate, with Silvery White Pubescence. Occiput immargined; temples moderately converging, malar grooves distinct. Scrobe deep with carinate outer margin and inter antennal ridge. Antennae inserted slightly above lower margin of eyes. Thorax reticulate punctate with moderately dense pubescence. Pronotum large with a median keel. Hind tibia with two unequal spurs. Gaster elongate, acuminate, ovipositor sheaths and ovipositor strongly protruded out.

### *Distribution*

India (Karnataka).

### *Biology*

Probably a parasite of wood boring beetles.

### *Discussion*

Only one species of *Grooca* (*Grooca coorgensis*) have so far been reported from India. This extralimital species is included in the present study since the specimen was collected from an area near the Kerala state.

### *Grooca coorgensis* Sureshan & Narendran

(Fig. 125-130)

*Holotype*: Female: Length 7.6 mm

### **Redescription**

*Colouration*: Black with golden yellow reflection on mesoscutum and scutellum dorsally, metallic blue to violaceous reflections on propodeum, T1 and T4 of gaster dorsally. Eyes dirty brown. Antennae black with slight metallic blue tinge on scape. Coxae concolorous with thorax; all femora dark brown; tibiae brown except base and tips testaceous; tarsi yellow with tips brown. Tegulae brown; wings hyaline; veins brown.

*Head* (Figs.125, 128, 129): Uniformly and moderately raised reticulate, reticulation engraved on vertex and occiput with uniform silvery white pubescence. In dorsal view head width 2x length and in front view width 1.2x height; temples moderately converging, length 0.25x that of eye. POL 1.6x OOL. Ocelli large, occipital carina absent anterior margin of clypeus straight. Malar grooves distinct, malar space length 0.4x that of eye. Antennae inserted slightly above lower margin of eyes; toruli wide apart. Scrobe deep with carinate outer margin and distinct inter antennal ridge. Scape not reaching median ocellus, length .6x that of eye and 2.6x

pedicel. F1-F4 equal in length. F5 and F6 slightly shorter than F4 and equal in length. F7 and F8 slightly shorter than F6 and equal in length, club as long as preceding two segments combined; pubescence on antenna very small and dense.

*Thorax:* reticulate punctate with moderately dense pubescence. Pronotum width 2.5x length with distinct median keel becoming faint at posterior end. Collar not demarcated anteriorly. Mesoscutum width 1.4x length. Scutellum width almost equal to length. Propodeum medially raised with a sharp transverse ridge, the area behind it lies in a vertical plane forming a subtriangular cup which is subdivided medially (Fig. 130). Shiny anteriorly and with vertical rugae posteriorly. Median carina short, Mesepepimeron reticulate punctate with a triangular shiny area beneath tegulae; forewing length 2.8x width, with brown pubescence. Costal cell hairy only on upper half; basal cell hairy distinct speculum absent; marginal fringe small. Relative lengths of smv, mv, pmv and stv as 26.5, 12, 10.5, and 3.5. Fore and hind coxae reticulate laterally; mid coxae shagreened; hind tibia with two strong unequal spurs, with an outer row of scattered spines in addition to the thick hairs.

*Gaster* (Fig. 125): Elongate, acuminate; length 4.1x width in dorsal view and 1.7x that of head plus thorax combined; sides of T2-T5, anterior part of T3 dorsally, T4 and T5 completely reticulate punctate; engraved reticulate on sides of T1; pubescence dense on sides of T1-T5 and complete on remaining tergites. Ovipositor sheaths and ovipositor strongly

protruded out; hypopygium reaching beyond T3 up to one fourth length of T4.

*Male:* Unknown

*Host:* Wood boring beetles

*Distribution:* India (Karnataka)

*Holotype:* Female, INDIA, Karnataka, Nemanakolly (South coorg), Sureshan, 7.III. 1994.

#### *Discussion*

The above redescription is based on the original description of Sureshan & Narendran (1995).

*Grooca coorgensis* resembles *Paraepistenia* Dodd. in general structure of the body. *Paraepistenia* differs from it in having triangular spines on the dorsal edge of fore tibia, gaster with lateral keels dorsally epipygium short and ovipositor not produced.

*Grooca coorgensis* differs from *Reikisura* Boucek in the absence of occipital carina, in having longer pronotum and propodeum and in the shape of gaster.

## Genus *OODERA* Westwood

*Oodera westwood*, 1874. Thesaurus Ent. Oxon; 24: 125.

*Type species: Oodera gracilis* West wood, by designation of Ashmead, 1904.

*Stellophora Risbec*, 1951: 239. Type species *Stellophora magnifica* Risbec; by monotypy.

### Diagnostic features

Antennae with 13 segments. Club symmetric. Inner orbital border raised up with a row of short transverse carinae. Parascrobal areas crested. axillae advanced in front of scutellar base; thorax with grooved sutures arranged radically from almost one point. Fore femur greatly enlarged on ventral edge, outside with oblique strong black bristles and a comb of perpendicular pegs. Ovipositor long, exerted.

### Distribution

India (Assam). Srilanka, Australia, Africa.

### Biology

Some extra limital species, and the one from Papua New Guinea were found on logs or dead tree trunks or branches. Mostly the species are parasites of xylophagous beetles.

### Remarks

Only one species of *Oodera* (*Oodera ahoma*) West wood have so far been reported from India. This species is not so far collected from Kerala.

Since it is likely to collect this species from Kerala, this extralimital species is included in the present work.

*Oodera ahoma* (Mani & Kaul)

(Figs. 131-135)

*Lycisca ahoma* Mani & Kaul, 1973. Mem. School Ent. Agra, 2: 53.

*Female*: Length 8.50 mm.

*Colouration*: Head, thorax, fore coxae and femora black with some metallic - green reflections; face metallic-green; abdomen brownish-black; scape brown in ventral basal 0.50; flagellum brownish-black; fore tibia and tarsus brown; middle and hind legs dark reddish-brown; fore wings hyaline with faint obscuration in the middle, especially along the speculum; venation brown.

*Head* (Figs. 132, 135): Viewed above, width to length 100:60; ocellular space about 1.50x ocellar diameter; front ocellus situated within scrobe; vertex finely transversely rugose, with a shallow median sulcus extending from the front ocellus to occiput; occiput striolate; head viewed in front width almost equal to height; frons closely, deeply reticulately-punctate, punctate becoming conspicuously coarsely, transversely rugose between the inner orbital borders and scrobe above the middle of eyes; scrobes in the form of an inverted Y; gena about .40 of eye, genal carina present, malar space closely striolate, with a few scattered punctae; antennae inserted far below lower orbital borders; F1 equal to pedicel;

funicular segments 2-3 subequal and about 1.50<sup>^</sup>x the first segment; F4 almost 0.60 of the third; F5 about 0.80 of the fourth; F6 about 0.75 of the fifth; segments 7-8 subequal and about .80 of the width; club elongate-oval, about 1.80x the preceding segment.

*Thorax:* Large; pronotum, scutum and scutellum ratio 75:100:38; pronotum well developed, about 1.60x as long as wide in lateral view, with fine sculpture and longitudinally striate at the sides and behind. Scutum length to width 100:88, parapsidal furrows complete, reticulately punctate in front and transversely reticulate-striate behind; axilla reticulate in front and with fine microsculpture behind; scutellum more or less uniformly longitudinally reticulately striate, width to length 100:75; propodeum with a short median carina and coarsely longitudinally rugose at the sides; forewing about 3x as long as wide; mv 1.25x as long as pmv, the latter 2.6x as long as stv. Fore femur swollen, dentate about 2x as long as wide (Fig. 134) middle and hind tibiae slightly compressed.

*Male:* Unknown

*Host:* *Agrilus* sp.

*Distribution:* India (Assam), Ceylon, Pakistan, Srilanka.

*Remarks:* The above account is based on the original description of Mani & Kaul (1973).

## Genus *RIEKISURA* Boucek

*Riekisura* Boucek, 1988. Australasian chalcidoidea (Hymenoptera) C.A.B. International, Wallingford, oxon 247-248 Type species *Agamerionella Curculionis* Girault.

### Diagnostic features

Scrobe reaching to the median ocellus, with almost parallel and carinate sides. Clava in female undivided and at least twice as long as preclaval segment. Occipital carina conspicuous on sides pronotum relatively much shorter; anterior margin of scutellum arched forwards; propodeum in female very short, in middle usually raised in to a slight transverse crest without median carina. Gaster very broadly sessile, at base fully as broad as distance between propodeal spiracles, in female conical at apex with the post cercal part of epipygium not or hardly longer than the exposed part of the sixth tergite in the median line.

### Distribution

India (Kerala) Australia

### Biology

Reared from wood-boring larvae of the weevil genus *Euthyrrhinus*.

### Remarks

Only one species of *Riekisura* (*R. keralensis*) have so far been reported from India and is included in the present work.



*Riekisura keralensis* Narendran

(Figs. 136-138)

*Riekisura keralensis* Narendran, 1992. J. Adv. Zool. 13(1 & 2): 57-58.

Holotype : Female: Length 7.7 mm.

**Redescription**

*Colouration:* Body black, eyes blackish grey; ocelli yellow apices of all femora, bases and apices of all tibiae brown; tarsi pale brownish yellow. Wings hyaline without any infuscations, veins brown. Pubescence silvery, somewhat dense.

*Head* (Figs. 136, 137, 138): Width subequal to maximum width of thorax (excluding tegulae). In front view 2.2x (excluding mandibles) as broad as long. In dorsal view 1.9x as broad as long. POL 2.28x OOL; with close, large, deep pits, interstices narrow and carinate; malar groove distinct; malar area distinctly rugoso punctate, occipital carina not very distinct and not raised. Antenna (Fig. 136) with scape not at all reaching front ocellus, inserted a trifle below level of ventral margin of eye, clavate, formula 1173; club about as long as preceding two segments together.

*Thorax:* With distinct, close, deep pits, interstices narrow and carinate. 1.3x as long as wide; apex of scutellum rounded. Propodeum short, medially raised in to a slight transverse crest without median carina Forewing with relative lengths of Smv:mv:pmv:stv as 30:17:10:2.

*Gaster* (Figs.136, 138): Very broadly sessile, at base fully as broad as distance between propodeal spiracles gaster fully 2.2x as long as thorax in profile, conical at apex with epipygium distinctly longer than exposed part of sixth tergite in the median line. T4 the largest, .7x as long as preceding tergites combined.

*Male*: Unknown

*Host*: Unknown

*Distribution*: India (Kerala)

*Holotype*: Female, INDIA, Kerala, Konni Forest, Pathanamthitta District, T.C. Narendran, 26.XI. 1988 (DZCU).

*Discussion*:

This species differs from other known species in having the scrobe not reaching front ocellus, in having different proportion of lengths of gastral tergites and in having epipygium reaching sub apical part of ovipositor sheath.

The above description is taken from the original description by Narendran (1992).

## Genus SOLENURA Westwood

*Solenura* Westwood, 1868. Trans. Ent. Soc. London, 36: p.XXXVI. Type-species: *Solenura telescopica*.

### Diagnostic features

Gaster of female strongly sclerotised and punctured. Last two segment of abdomen greatly tubularly elongate in to a narrow tail. The tail with median keel.

### Distribution

India, Philippines, Indonesia.

### Biology

Parasites of the wood boring beetle larvae.

### Remarks

Only one species of *Solenura* viz. *solenura ania* have so far been reported from India. Though this species is not so far reported in Kerala, I have included the description of this in this work since it is likely to be collected from Kerala.

*Solenura ania* (Walker)

(Fig. 139)

*Epistenia ania* Walker, 1846. List. Hym. British Mus; 1:93.

*Solenura telescopica* Westwood, 1868. Trans. ent. Soc. London. 36: XXXVI.

*Female*: Length 17.00 mm

*Colouration*: Body dark blue partly with slightly green, violaceous reflections and sometimes appearing wholly green; abdomen style bluish-fuscous; frons below scrobe and clypeus golden coloured; mandibles and basal segments of palpi black; other palpal segments paler, but apically darker; legs more or less darkened; fore femora bluish-black, hind femora violaceous; wings pale yellow.

*Head*: As wide as thorax. Eyes large conspicuous, with short and sparse pubescence; scrobe deep, reaching almost to front ocellus above, below with a straight torulus margin and with an acute minute spine in a triangularly carinate space; clypeus semi-circular but distinct; head viewed from the side ovate, vertex rounded; eyes ovate; genal sulcus well developed; maxillary palpi with 4 segments; antennae stout; pedicel short, anellus as long as thick, funicular segments become thicker towards the antennal tip and thin basally; F1 not much longer than anellus; F6 as long as thick; club sub equal to the preceding segment and conically cylindrical.

*Thorax*: Reticulo-punctate; obliquely impressed above the fore coxae at the sides; pronotum dorsally slightly depressed in the middle in front; parapsidal furrows deep, complete, propodeum short, with median

longitudinal carina; mv 1.75x pmv the latter 2.5x stv; discal pubescence short, but dense hind femora elongate fusiform, subcompressed; hind tibia with 2 short spurs.

*Abdomen:* In front as wide as thorax, with the sides parallel; dorsally convex, posteriorly produced in to long compressed style, (Fig. 139) almost 5x as long as the rest of the abdomen, with fine stiff pubescence; first tergite almost rectangular; second tergite a little shorter than the first.

*Male:* Unknown.

*Host:* Unknown.

*Distribution:* India (Assam, Uttarpradesh) Srilanka. Indonesia: Philippines.

*Remarks:* The above description is based on the redescription by Mani (1989).

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## ***Check List***

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CHECKLIST OF PTEROMALID SPECIES OF INDIA BELONGING  
TO 20 GENERA OF THE SUBFAMILIES SPALANGIINAE,  
PANSTENONINAE, EUNOTINAE, ORMOCERINAE,  
DIPARINAE, CEROCEPHALINAE AND CLEONYMINAE

SUBFAMILY 1. SPALANGIINAE

Genus 1. *SPALANGIA* Latrielle

= *Prospalangia* Brethes, 1915

1. *Spalangia endius* Walker, 1839      India (Kerala, Delhi)
2. *Spalangia cameroni* Perkins, 1910      India (Kerala, Delhi,  
Karnataka), Malaysia,  
Cosmopolitan
3. *Spalangia gemina* Boucek, 1963      India (Kerala, Karnataka, Tamil  
Nadu, West Bengal), Malaysia
4. *Spalangia obscura* Boucek, 1963      India (Kerala, Karnataka),  
Malaysia, Philippines
5. *Spalangia nigroaenea* Curtis, 1839      India (Kerala, Karnataka,  
Delhi), Bangladesh, Pakistan

SUBFAMILY II. PANSTENONINAE

Genus 1. *PANSTENON* Walker

= *Caudonia* Walker, 1850

1. *Panstenon collaris* Boucek, 1976      India (Kerala), Africa

### SUBFAMILY III. EUNOTINAE

#### Genus 1. CEPHALETA Motschulsky

- = *Cardiogaster* Motschulsky, 1863
  - = *Anysis* Howard, 1896
  - = *Eurycephalus* Ashmead, 1903
  - = *Eurycranium* Ashmead, 1904
1. *Cephaleta nirupama* sp. nov.                      India (Kerala, Tamilnadu)
  2. *Cephaleta australiensis* (Howard) 1896    India (Andhra Pradesh,  
= *Anysis australiensis* Howard, 1896    Assam, Uttar Pradesh),  
Bangladesh, Srilanka
  3. *Cephaleta brunniventris*                      India (Kerala, Goa, Uttar  
Motschulsky, 1859                              Pradesh, Karnataka),  
= *Cephaleta purpureiventris*                Srilanka, Pakistan  
Motschulsky, 1859  
= *Pteromalus magniceps* Walker, 1860  
= *Encyrtus obstructus* Walker, 1860  
= *Cardiogaster fusciventris* Motschulsky, 1863  
= *Eurycephalus alcocki* Ashmead, 1903  
= *Eurycranium saissetiae* Ashmead, 1905
  4. *Cephaleta hayati* Farooqi, 1980            India (Tamilnadu, Madhya  
Pradesh)

#### Genus 2. MORANILA Cameron

- = *Tomocera* Howard, 1881
- = *Dilophogaster* Howard, 1886
- = *Eunotomyia* Masi, 1917
- = *Aphobetoideus* Ashmead, 1940
- = *Muscidea* Girault, 1915



= *Eurycraniella* Girault, 1916

= *Muscideoidea* Girault, 1916

1. *Moranila californica* (Howard), 1881 India (Karnataka, Kerala)

= *Tomocera californica* Howard, 1881

= *Moranila testaceiceps* Cameron, 1883

= *Tomocera ceroplastis* Perkins, 1906

= *Tomocera glabriventris*, 1915

= *Tomocera flaviceps*, 1915

### Genus 3. NEOCEPHALETA gen. nov.

1. *Neocephaleta malabarensis* sp. nov. India (Kerala)

### Genus 4. OPHELOSIA Riley

1. *Ophelosia indica* Farooqi, 1983 India (Maharashtra)

### Genus 5. SCUTELLISTA Motschulsky

= *Aspidocoris* Costa, 1863

= *Enargopelte* Foerster, 1878

= *Eugastropelte* Masi, 1931

1. *Scutellista cyanea* Motschulsky, 1859 India. Srilanka

## SUBFAMILY IV. ORMOCERINAE

### Genus 1. SYSTASIS Walker

= *Guieralia* Risbec, 1951

= *Paruriella* Girault, 1913

1. *Systasis cenchrivora* Farooqi & Menon, 1972 India (Kerala, Delhi)

2. *Systasis dasyneurae* Mani, 1939 India (Kerala, Uttar Pradesh, Maharashtra)

3. *Systasis vischnu* Motschulsky, 1863    India (Kerala), Srilanka  
= *Eulophus vischnu* Motschulsky, 1863
4. *Systasis dalbergiae* Mani, 1942            India (Kerala, Delhi, Uttar Pradesh)
5. *Systasis indicus* sp. nov.                    India (Kerala)
6. *Systasis curiosus* sp. nov.                India (Kerala)
7. *Systasis lepidus* sp. nov.                 India (Kerala)
8. *Systasis malabarensis* sp. nov.         India (Kerala)

#### SUBFAMILY V. DIPARINAE

##### Genus 1. *DIPARA* Walker

- = *Tricoryphus* Foerster, 1856
- = *Epilelaps* Girault, 1915
- = *Pseudiparella* Girault, 1927
- = *Hispanolelaps* Mercet, 1927
- = *Afrolelaps* Hedqvist, 1963

1. *Dipara keralensis* sp. nov.                India (Kerala)
2. *Dipara ecarinata* sp. nov.                India (Kerala)
3. *Dipara distincta* sp. nov.                India (Kerala)
4. *Dipara nitigastra* sp. nov.                India (Kerala)

##### Genus 2. *GRAHAMISIA* Delucchi

1. *Grahamisia kozhikodensis* sp. nov.    India (Kerala)

##### Genus 3. *NETOMOCERA* Boucek

1. *Netomocera nigra* Sureshan & Narayendran 1990            India (Kerala)

2. *Netomocera clavata* sp. nov. India (Kerala)

**Genus 4. PARURIOS Girault**

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

**SUBFAMILY VI. CEROCEPHALINAE**

**Genus 1. CEROCEPHALA Westwood**

- = *Epimacrus* walker, 1833
- = *Sciatherus* Ratzeburg, 1848
- = *Parasciatherus* Masi, 1917
- = *Sciatherodes* Masi, 1917
- = *Proamotura* Girault, 1920

1. *Cerocephala dinoderi* Gahan, 1925 India (Kerala, Karnataka),  
Srilanka, Philippines

**Genus 2. THEOCOLAX Westwood**

- = *Choetospila* Westwood, 1874
- = *Spalangiomorpha* Girault, 1913

1. *Theocolax elegans* (Westwood) India (Kerala, Delhi,  
= *Choetospila elegans* Karnataka, Tamilnadu),  
Westwood 1874 Cosmopolitan  
= *Spalangiomorpha*  
*fasciatipennis* Girault, 1913

**SUBFAMILY VII. CLEONYMINAE**

**Genus 1. CLEONYMUS Latrielle**

- = *Ptinobius* Ashmead, 1896
- = *Aplatygerrhus* Girault, 1913

= *Systolomorphella* Girault, 1915

= *Beharella* Risbec, 1952

1. *Cleonymus* spp. indet. Boucek  
*et al.*, 1978 India, Srilanka

**Genus 2. GROOCA Sureshan & Narendran**

1. *Grooca coorgensis* (Sureshan and Narendran) 1997 India (Karnataka)

**Genus 3. HEYDENIA Foerster**

= *Paraheydenia* Cameron, 1912

= *Pterooderella* Risbec, 1952

= *Risbecisca* Hedqvist, 1960

= *Heydenisca* Hedqvist, 1967

1. *Heydenia* spp. indet. Boucek  
*et al.*, 1978 India (Tamilnadu),  
Srilanka

**Genus 4. OODERA Westwood**

= *Stellophora* Risbec, 1951

1. *Oodera ahoma* (Mani & Kaul), 1973 India (Assam), Pakistan,  
= *Lycisca ahoma* Mani & Srilanka  
Kaul, 1973

**Genus 5. RIEKISURA Boucek**

1. *Riekisura keralensis* Narendran, 1992 India (Kerala)

**Genus 6. SOLENURA Westwood**

1. *Solenura ania* Walker, 1846 India (Assam, Uttar Pradesh),  
= *Epistenia ania* Walker, Srilanka  
1846  
= *Solenura telescopica* Westwood, 1868

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***Host-Parasite Index***

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## HOST- PARASITE INDEX

(ABBREVIATIONS : Col. = Coleoptera, Dipt. = Diptera, Hom. =  
Homoptera, Lep. = Lepidoptera)

ADISURA ATKINSONI Moore - Lep.: Noctuidae

*Spalangia gemina* Boucek

AGRILUS sp. Col. : Buprestidae

*Oodera ahoma* (Mani & Kaul)

ASTEROLECANIUM sp. - Hom. : Asterolecaniidae

*Cephaleta brunniventris* Motschulsky

ATHESAPEUTA CYPERI Marshall - Col.: Curculionidae

*Parurios* sp.

BOMBYX MORI Linn. - Lep.: Bombycidae

*Spalangia endius* Walker

CEROCOCCUS HIBISCI - Hom.: Cerococcidae

*Cephaleta brunniventris* Motschulsky

CEROCOCCUS INDICUS Hom.: Cerococcidae

*Cephaleta brunniventris* Motschulsky,

*Cephaleta australiensis* (Howard)

CEROCOCCUS Spp. Hom.: Cerococcidae

*Cephaleta australiensis* (Howard)

*Cephaleta hayati* Farooqi

CEROPLASTES ACTINIFORMIS Green. Hom.: Coccidae

*Cephaleta brunniventris* Motschulsky

CEROPLASTES PSEUDOCERIFERUS Green. Hom.: Coccidae

*Cephaleta brunniventris* Motschulsky

CEROPLASTES Sp.

*Cephaleta brunniventris* Motschulsky

CHLOROPULVINARIA PSIDII (Maskell) Hom.: Coccidae

*Cephaleta brunniventris* Motschulsky

'CHRY SOMYIA AENEA' - Dipt.: Calliphoridae

*Spalangia endius* Walker

*Spalangia cameroni* Perkins

*Spalangia nigroaenea* Curtis

COCCUS HESPERIDIUM Linnaeus - Hom.: Coccidae

*Scutellista cyanea* Motschulsky

CONTARINIA DALBERGIAE Mani - Dipt.: Cecidomyiidae

*Systasis dalbergiae* Mani

DASYNEURA LINI Barnes - Dipt.: Cecidomyiidae

*Systasis dasyneurae* Mani

EXORISTA SORBILLANS Weid. Dipt.: Tachinidae

*Spalangia endius* Walker

FERRISIA VIRGATA (Cockerell) - Hom.: Pseudococcidae

*Cephaleta australiensis* (Howard)

LECANIUM Sp. - Hom.: Coccidae

*Scutellista cyanea* Motschulsky

MUSCA DOMESTICA Linnaeus - Dipt.: Muscidae

*Spalangia nigroaenea* Curtis

MUSCA Sp. Dipt.: Muscidae

*Spalangia endius* Walker

PARAISSETIA NIGRA (Nietner) - Hom.: Coccidae

*Scutellista cyanea* Motschulsky

SAISSETIA COFFEAE (Walker) - Hom.: Coccidae

*Cephaleta brunniventris* Motschulsky

SAISSETIA OLEAE (Oliver) Hom.: Coccidae

*Scutellista cyanea* Motschulsky

SAISSETIA Sp. Hom.: Coccidae

*Moranila Californica* (Howard)

SITOPHILUS ORYZAE (Linnaeus) - Col.: Curculionidae

*Cerocephala dinoderi* Gahan.

*Theocolax elegans* (Westwood)

TIRATHABA MUNDELLA Walker - Lep.: Pyralidae

*Spalangia obscura* Boucek

#### INDETERMINED HOSTS

COCCOIDS - Hom.: Coccoidae

*Scutellista cyanea* Motschulsky

*Cephaleta australiensis* (Howard)

*Cephaleta brunniventris* Motschulsky

DIPTERA - PUPAE

*Spalangia endius* Walker

*Spalangia gemina* Boucek

PHYTOPHAGOUS INSECT

EGGS AND LARVAE

*Panstenon collaris* Boucek

SCALE INSECT

*Cephaleta* Sp.

#### PLANT HOSTS

ACACIA NILOTICA

*Cephaleta* sp.



ALTERNANTHIRA PHILOXEROIDES

*Cephaleta australiensis* (Howard)

CAJANUS INDICUS

*Cephaleta australiensis* (Howard)

CENCHRUS CILIARIS (Seeds)

*Systasis cenchrivora* Farooqi and Menon.

CENCHRUS SETIGEROUS (Seeds)

*Systasis cenchrivora* Farooqi and Menon

CEPHALANDRA INDICA

*Cephaleta* sp.

CYPERUS ROTUNDATUS

*Parurios* sp.

DALBERGIA SISSO (Galls)

*Systasis dalbergiae* Mani

GOSSYPIUM sp.

*Cephaleta australiensis* (Howard)

GRAMINAE sp.

*Panstenon* sp.

HIBISCUS ROSASINENSIS

*Cephaleta australiensis* (Howard)

JASMINIUM MULTIFLARUM

*Systasis vischnu* Motschulsky

LINSEED FLOWER BUDS

*Systasis dasyneurae* Mani

TEPHROSIA CANDIDA

*Cephaleta australiensis* (Howard).

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## ***Summary***

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## S U M M A R Y

The present systematic study deals with seven subfamilies of Pteromalidae viz. Spalangiinae, Panstenoninae, Eunotinae, Ormocerinae, Diparinae, Cerocephalinae and Cleonyminae. Specimens were collected from all over the districts of Kerala. They have been studied and analysed systematically. Almost all types of habitats like forests, grasslands, cultivated lands, coastal areas etc. have been covered. Various methods of collections like use of sweepnet, yellowpan or Moerick trap, Malaise trap, etc. have been employed. Emerging parasites were also collected from stored grains and other products infected with various pests.

The thesis altogether deals with 35 species belonging to 17 genera including five extralimital species. *Cephaleta hayati* Farooqi, *Scutellista cyanea* Motschulsky, *Solenura ania* Walker, *Oodera ahoma* (Mani & Kaul) and *Grooca coorgensis* (Sureshan and Narendran) are included as extralimital species because of their collection from an area adjacent to the region of present study. It is likely that these species may be found later in Kerala.

In the present investigation one genus and 13 species have been described as new to science. The important feature of the present study is the establishment of new genus *Neocephaleta*. The genus *Panstenon* Walker is reported for the first time from the oriental region. Genera *Dipara* Walker and *Grahamisia* Delucchi form first record for India. In addition to the description of new species, already known but poorly described species are redescribed in detail. A dichotomous key to subfamilies of Pteromalidae of

oriental region, keys to the genera and keys to the species under each genus are also given. In addition a checklist of Pteromalidae belonging to the 20 genera of the above mentioned seven subfamilies of Indian subcontinent and an host parasite index for the species have been given. All the type materials are kept in the collection of DZCU.

The systematic treatment of the genera and species of pteromalidae belonging to the subfamilies, Spalangiinae, Panstenoninae, Eunotinae, Ormocerinae, Diparinae, Cerocephalinae and Cleonyminae of Kerala is given below.

#### **SUBFAMILY I. SPALANGIINAE**

##### **1. Genus *Spalangia* Latrielle**

1. *Spalangia endius* Walker
2. *Spalangia cameroni* Perkins
3. *Spalangia gemina* Boucek
4. *Spalangia obscura* Boucek
5. *Spalangia nigroaenea* Curtis

#### **SUBFAMILY II. PANSTENONINAE**

##### **1. Genus *Panstenon* Walker**

1. *Panstenon collaris* Boucek

#### **SUBFAMILY III. EUNOTINAE**

##### **1. Genus *Cephaleta* Motschulsky**

1. *Cephaleta brunniventris* Motschulsky
2. *Cephaleta australiensis* (Howard)

3. *Cephaleta nirupama* sp. nov.

## 2. Genus *Moranila* Cameron

1. *Moranila californica* (Howard)

## 3. Genus *Neocephaleta* gen. nov.

1. *Neocephaleta malabarensis* sp. nov.

## SUBFAMILY IV. ORMOCERINAE

### 1. Genus *Systasis* Walker

1. *Systasis cenchrivora* Farooqi and Menon
2. *Systasis dasyneurae* Mani
3. *Systasis indicus* sp. nov.
4. *Systasis dalbergiae* Mani
5. *Systasis vischnu* Motschulsky
6. *Systasis curiosus* sp. nov.
7. *Systasis lepidus* sp. nov.
8. *Systasis malabarensis* sp. nov.

## SUBFAMILY V. DIPARINAE

### 1. Genus *Dipara* Walker

1. *Dipara keralensis* sp. nov.
2. *Dipara ecarinata* sp. nov.
3. *Dipara nitigastra* sp. nov.
4. *Dipara distincta* sp. nov.

**2. Genus *Grahamisia* Delucchi**

1. *Grahamisia kozhikodensis* sp. nov.

**3. Genus *Netomocera* Boucek**

1. *Netomocera nigra* Sureshan and Narendran
2. *Netomocera clavata* sp. nov.

**4. Genus *Parurios* Girault**

1. *Parurios keralensis* sp. nov.

**SUBFAMILY VI. CEROCEPHALINAE**

**1. Genus *Cerocephala* Westwood**

1. *Cerocephala dinoderi* Gahan

**2. Genus *Theocolax* Westwood**

1. *Theocolax elegans* (Westwood)

**SUBFAMILY VII. CLEONYMINAE**

**Genus *Riekisura* Boucek**

1. *Riekisura keralensis* Narendran

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***Plates and Figures***

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**PLATE I**

Yellow pan trap

**PLATE II**

Malaise trap



2020

**PLATE III**

Collection site - C.U. Campus

**PLATE IV**

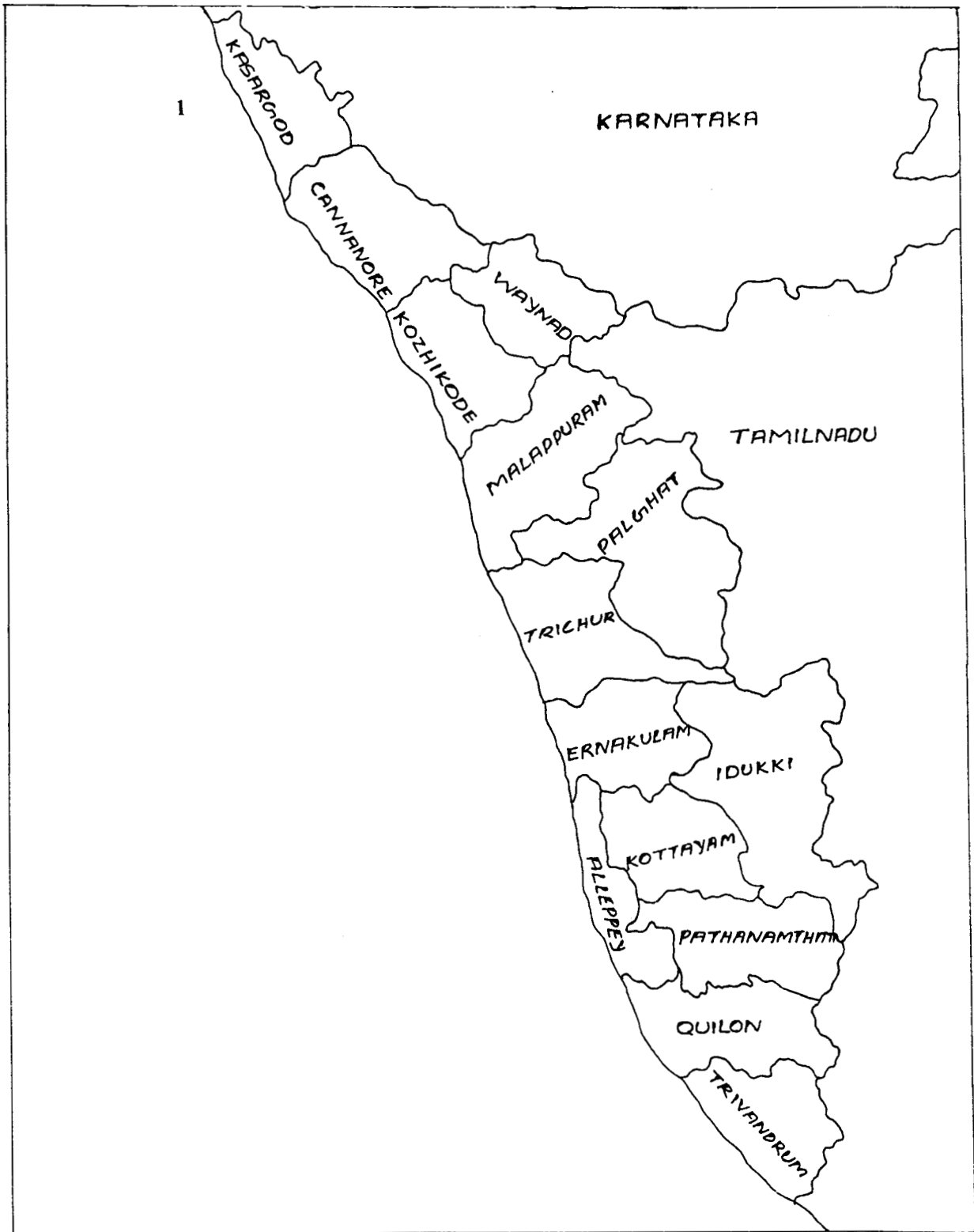
Collection site - Aaralam Wildlife Sanctuary



202E

**Fig. 1. Kerala : Districts**

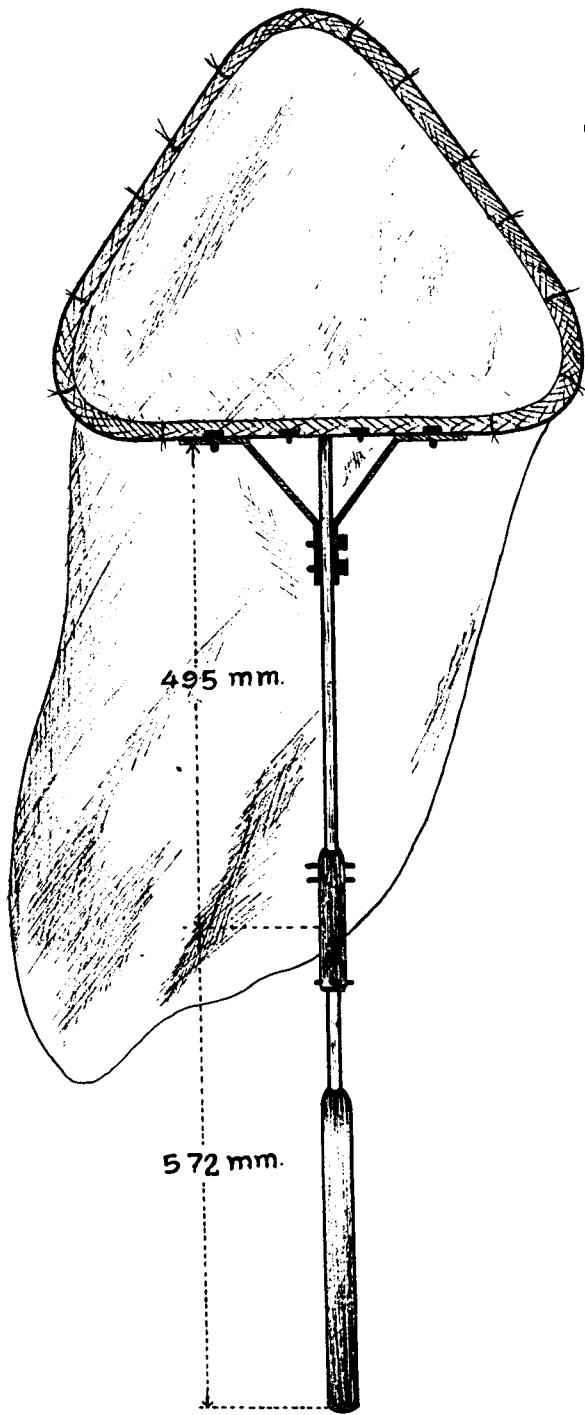




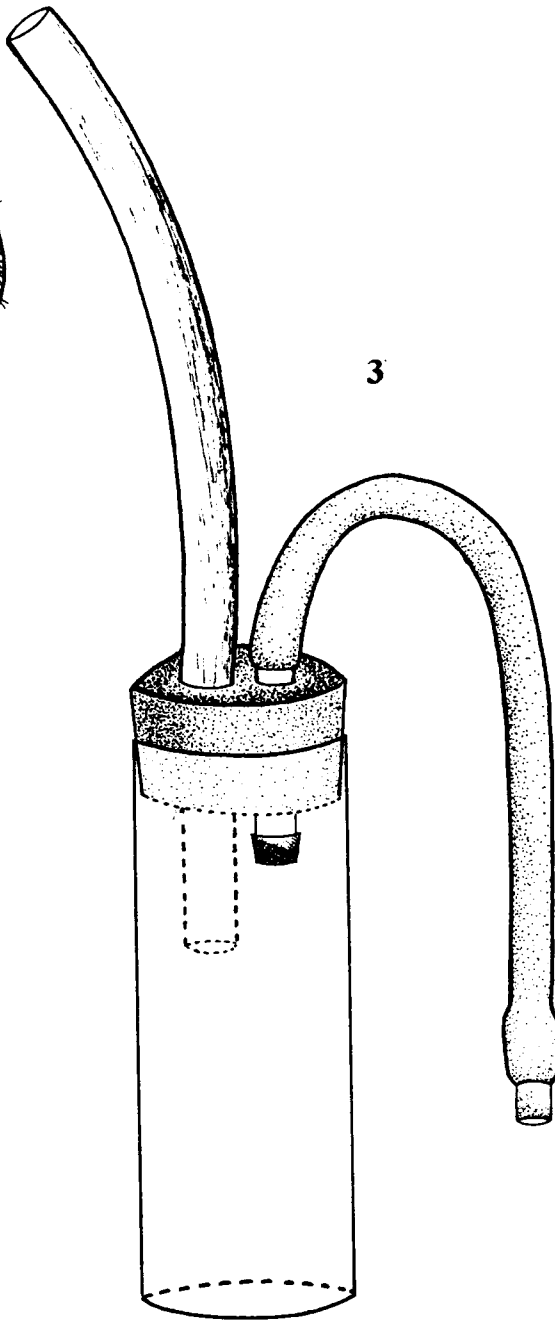
**Fig. 2.** Sweep net

**Fig. 3.** Aspirator

2



3



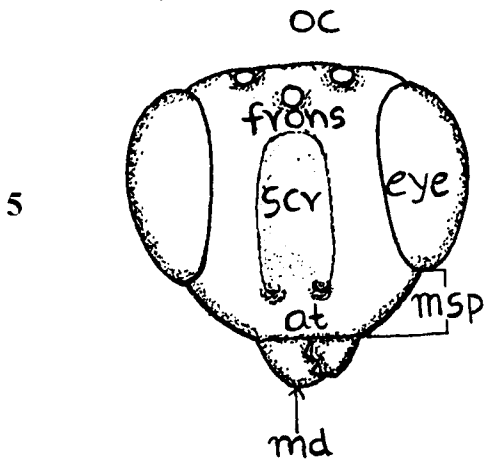
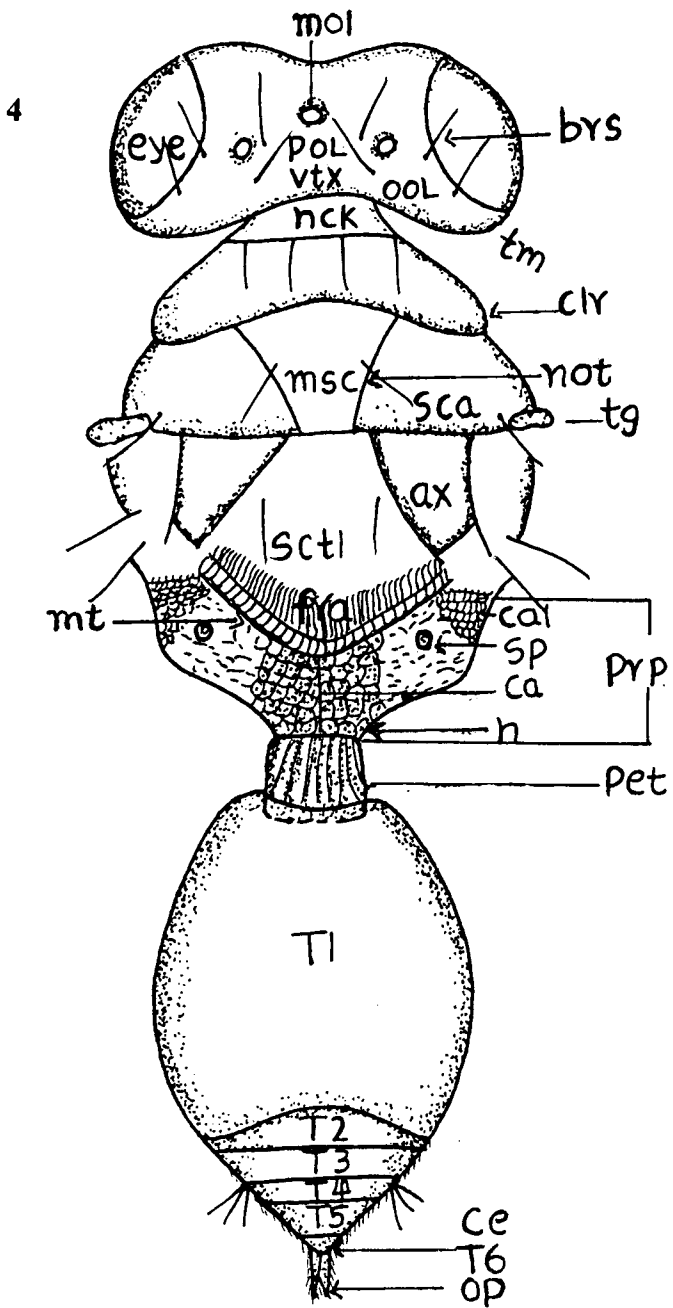
## **Figs. 4 & 5. General diagrams**

### **4. Body - dorsal view**

ax	axilla
brs	bristles
ca	carina
cal	callus
ce	cercus
clr	collar
fra	frenal area
mol	medium ocellus
msc	mesoscutum
mt	metanotum
n	nucha
nck	neck
not	notaulus
OOL	ocell-ocular distance
OP	ovipositor sheath
pet	petiole
pn	pronotum
POL	post-ocellar distance
prp	propodeum
sca	scapula
sctl	scutellum
sp	spiracle
T1-T6	gastral tergites
tg	tegula
tm	temple
vtx	vertex

### **5. head - frontal view**

at	antennal toruli
md	mandible
msh	malar space
oc	ocelli
scr	scrobes



## Figs. 6-8. General diagrams

### 6. Thorax - profile view

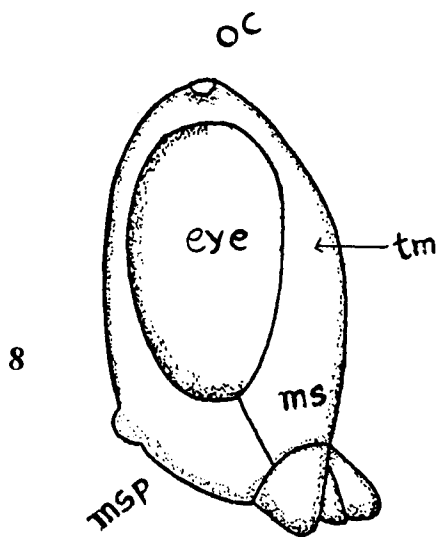
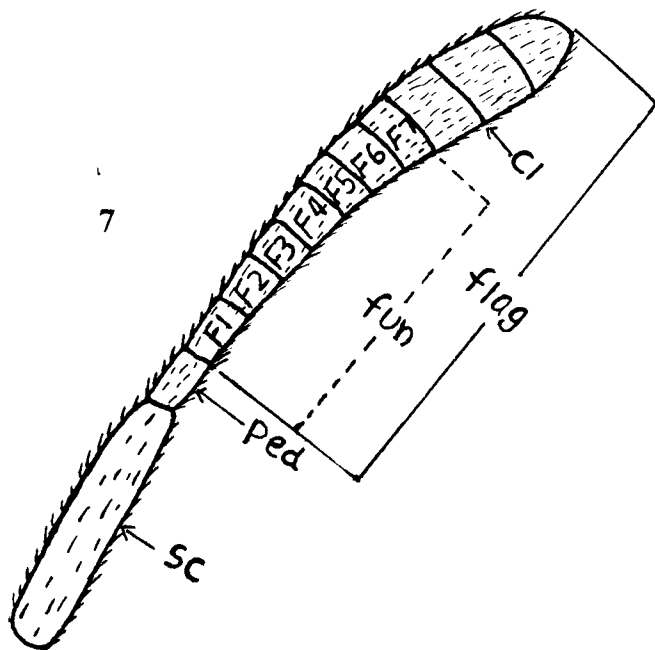
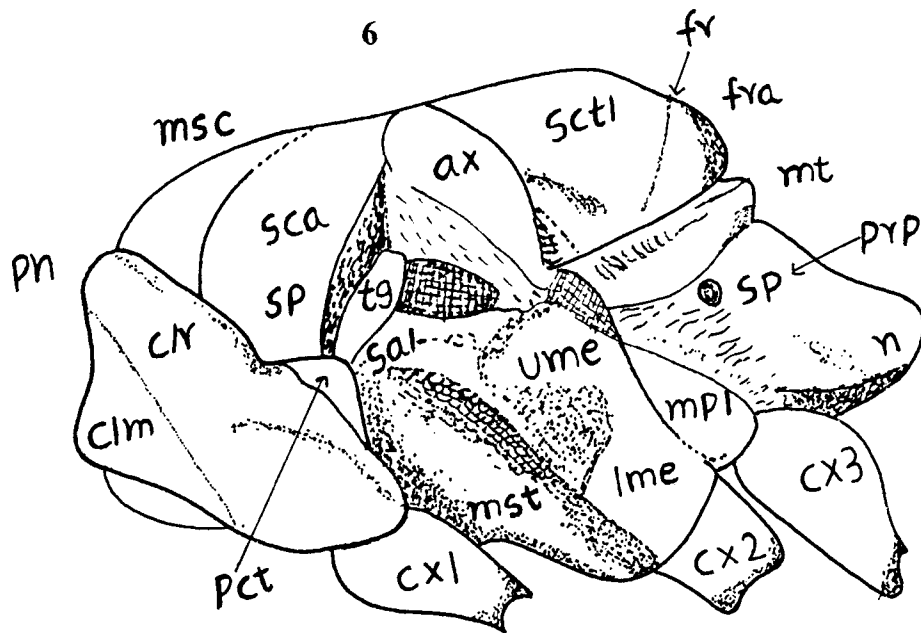
ax	axilla
clm	collum
clr	collar
cx1-3	fore, mid and hind coxa
fr	frenal line
fra	frenal area
lme	lower epimeron
mpl	mesopleuron
msc	mesoscutum
mst	mesepeisternum
mt	metanotum
n	nucha
pct	prepectus
pn	pronotum
prp	propodeum
sal	subalar area
sca	scapula
sctl	scutellum
sp	spiracle
tg	tegula
ume	upper mesepeimeron

### 7. antenna

cl	clava
flag	flagellum
fun	funicle
ped	pedicellus
sc	scape

### 8. Head - profile view

ms	malar sulcus
msh	malar space
oc	ocelli
tm	- temple



## **Figs. 9 & 10. General diagrams**

### **9. Forewing**

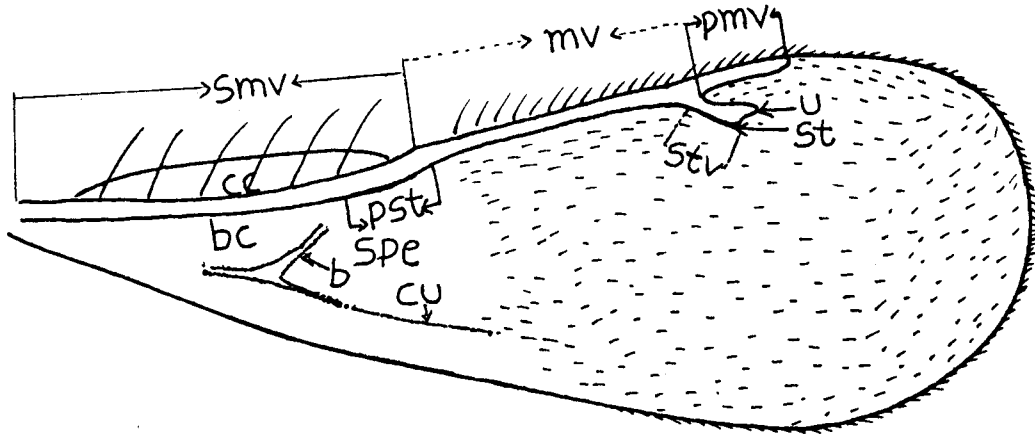
b	basal vein
bc	basal cell
cc	costal cell
cu	cubital vein
mf	marginal fringe
mv	marginal vein
pmv	post marginal vein
pst	parastigma
smv	submarginal vein
spe	speculum
st	stigma
stv	stigmatal vein
u	uncus

### **10. Hind leg**

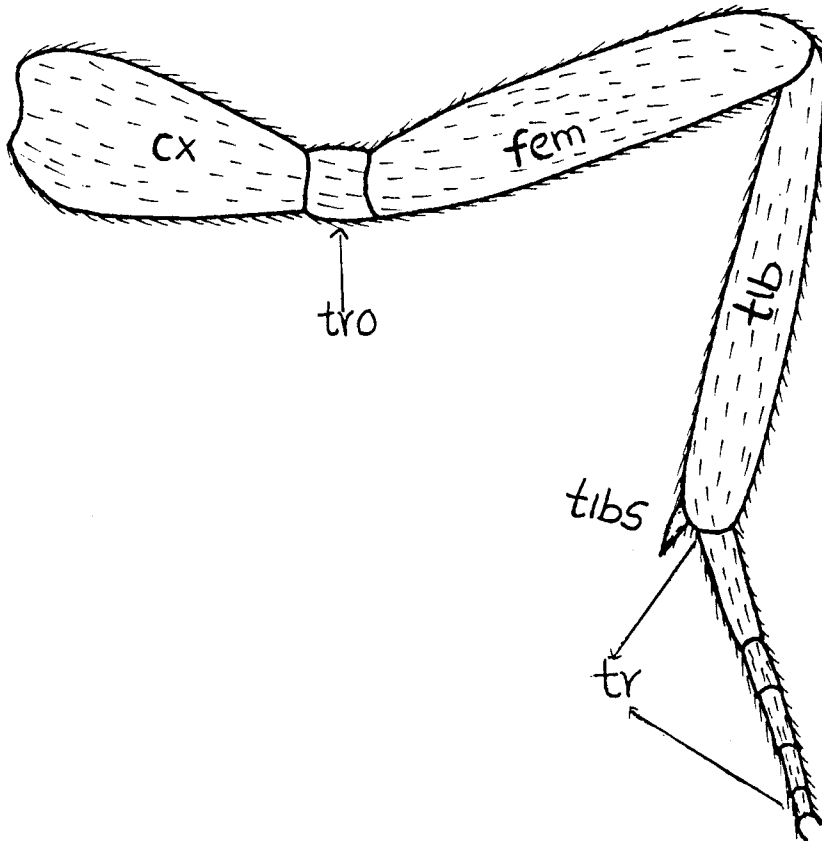
cx	coxa
fm	femur
tib	tibia
tibs	tibial spur
tr	tarsus
tro	trochanter



9

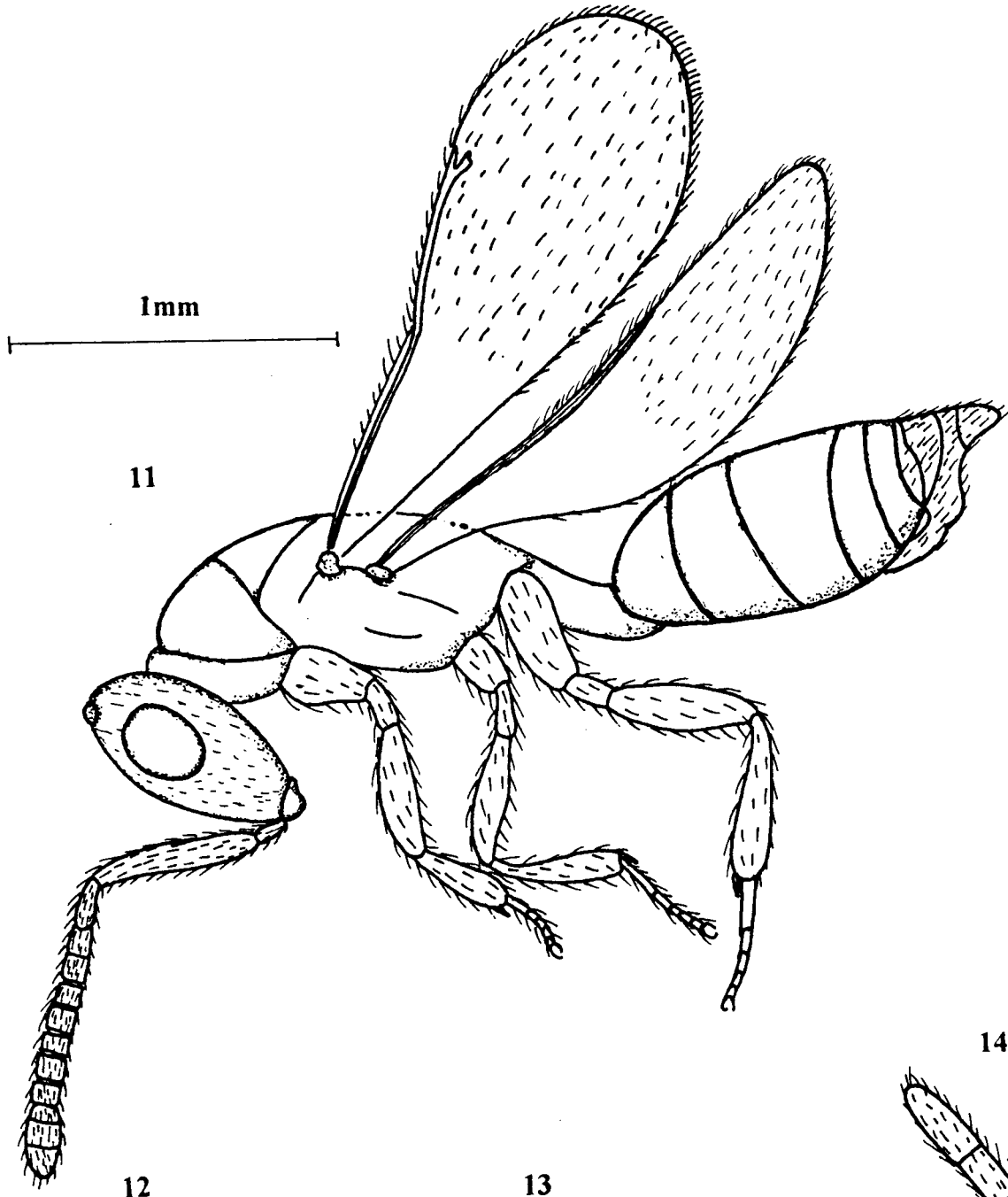


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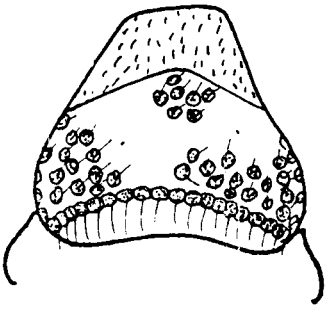


**Figs. 11-14.** *Spalangia endius* Walker

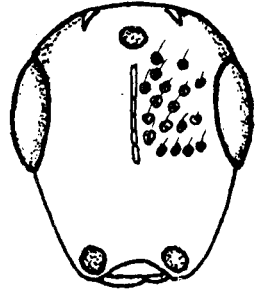
11. Female, body profile
12. Pronotum
13. Head, frontal view
14. Male antenna



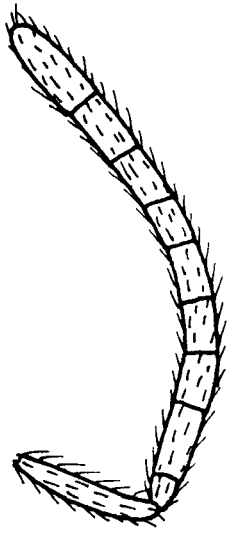
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13

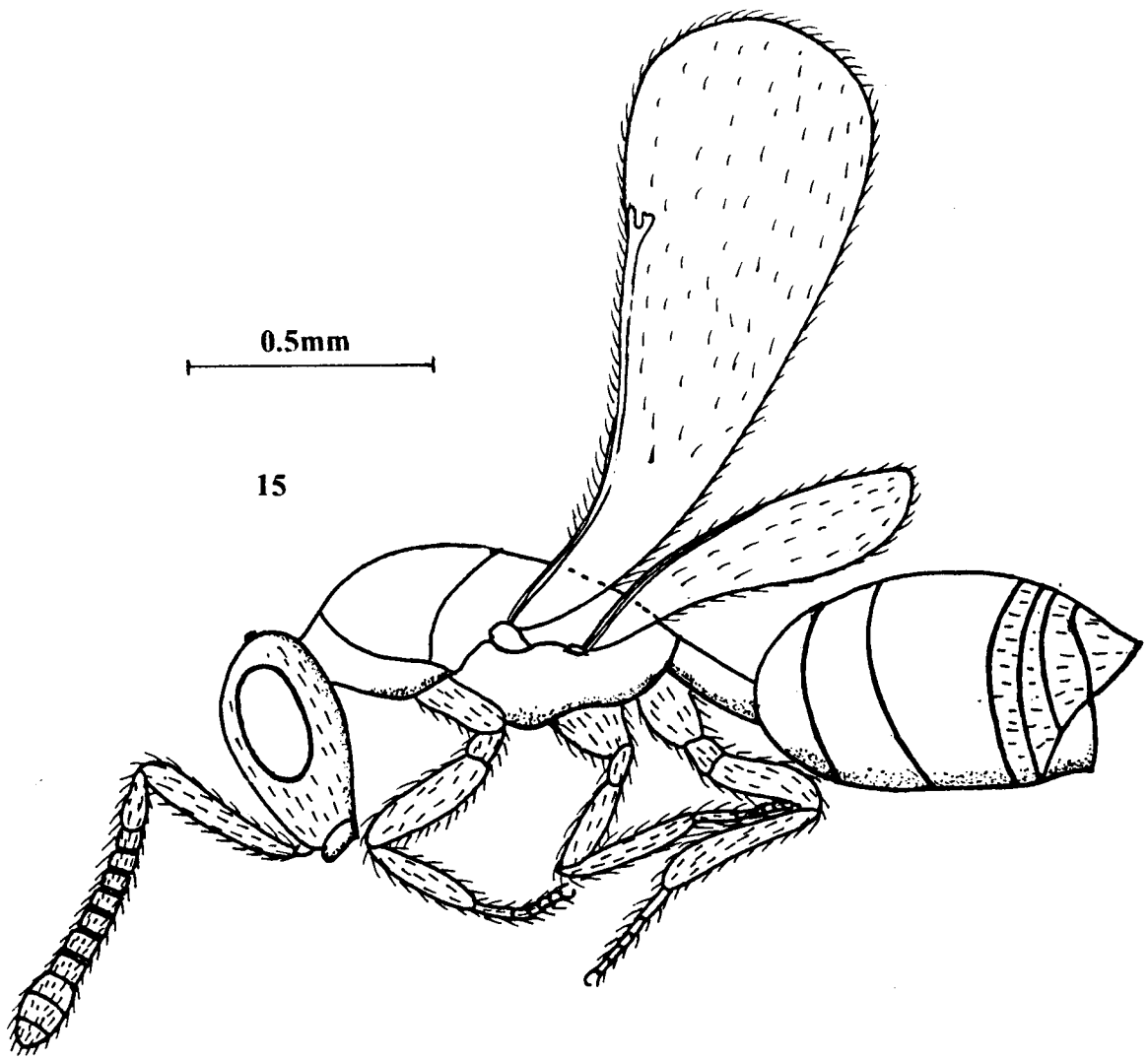


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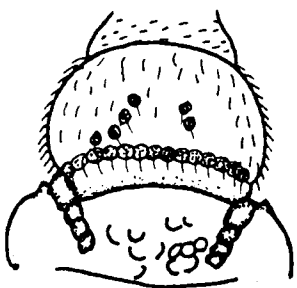


**Figs. 15-18.** *Spalangia cameroni* Perkins

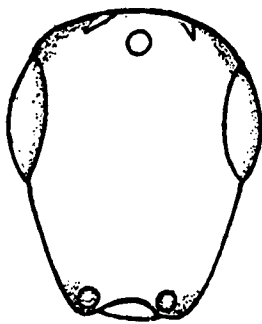
15. Female, body profile
16. Pronotum and mesoscutum
17. Head, frontal view
18. Male antenna



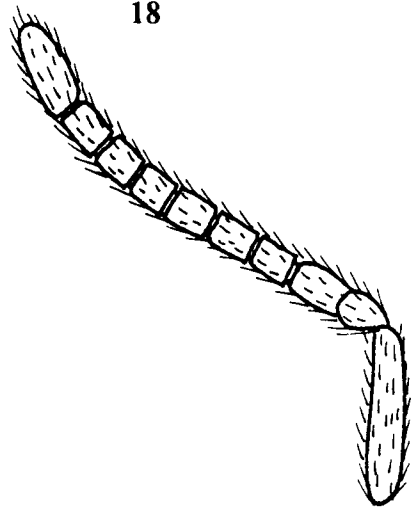
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17

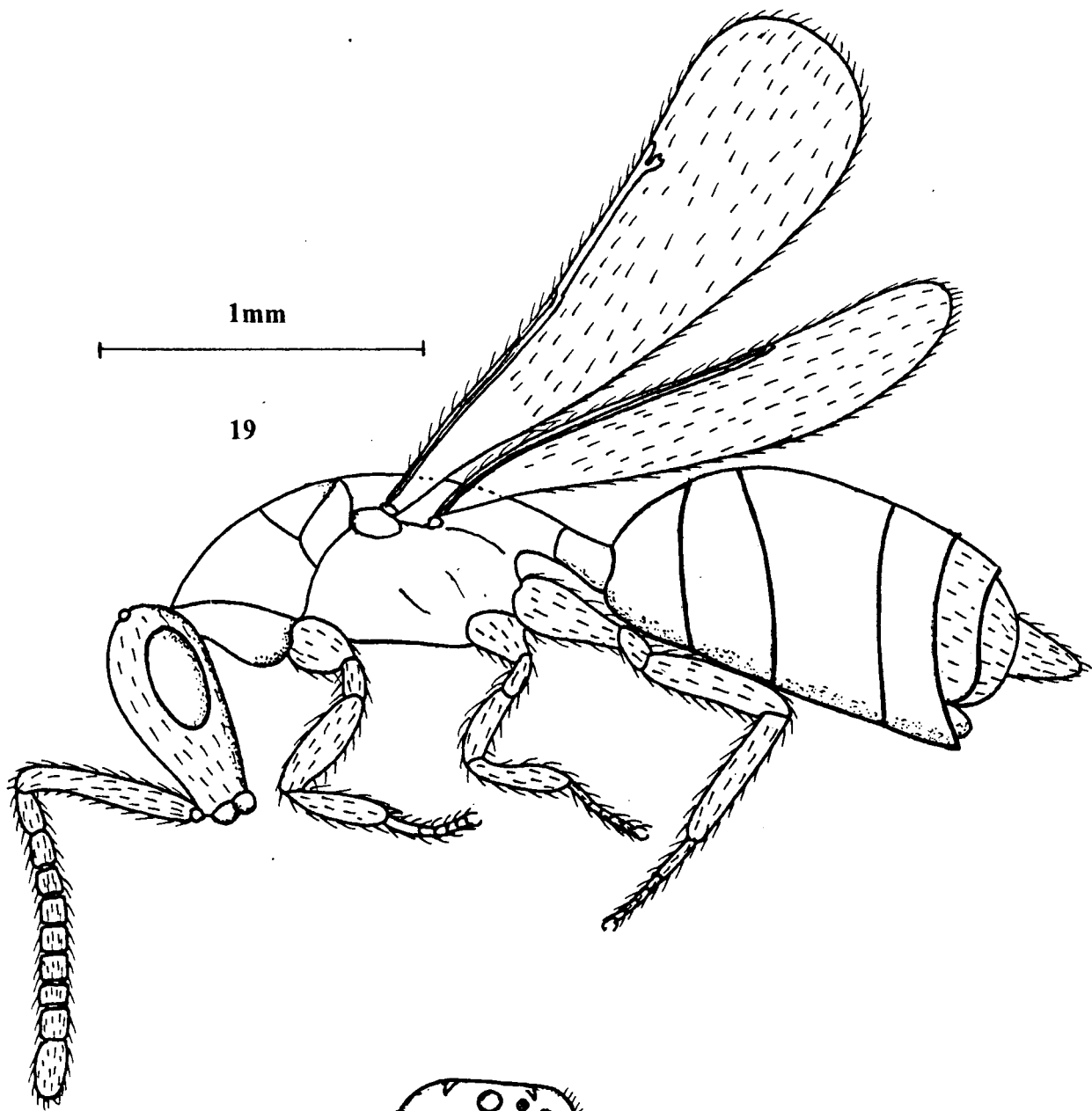


18



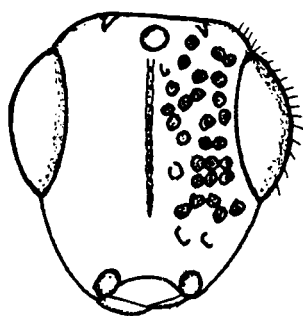
**Figs. 19 & 20. *Spalangia gemina* Boucek**

- 19. Female, body profile
- 20. Head, frontal view



19

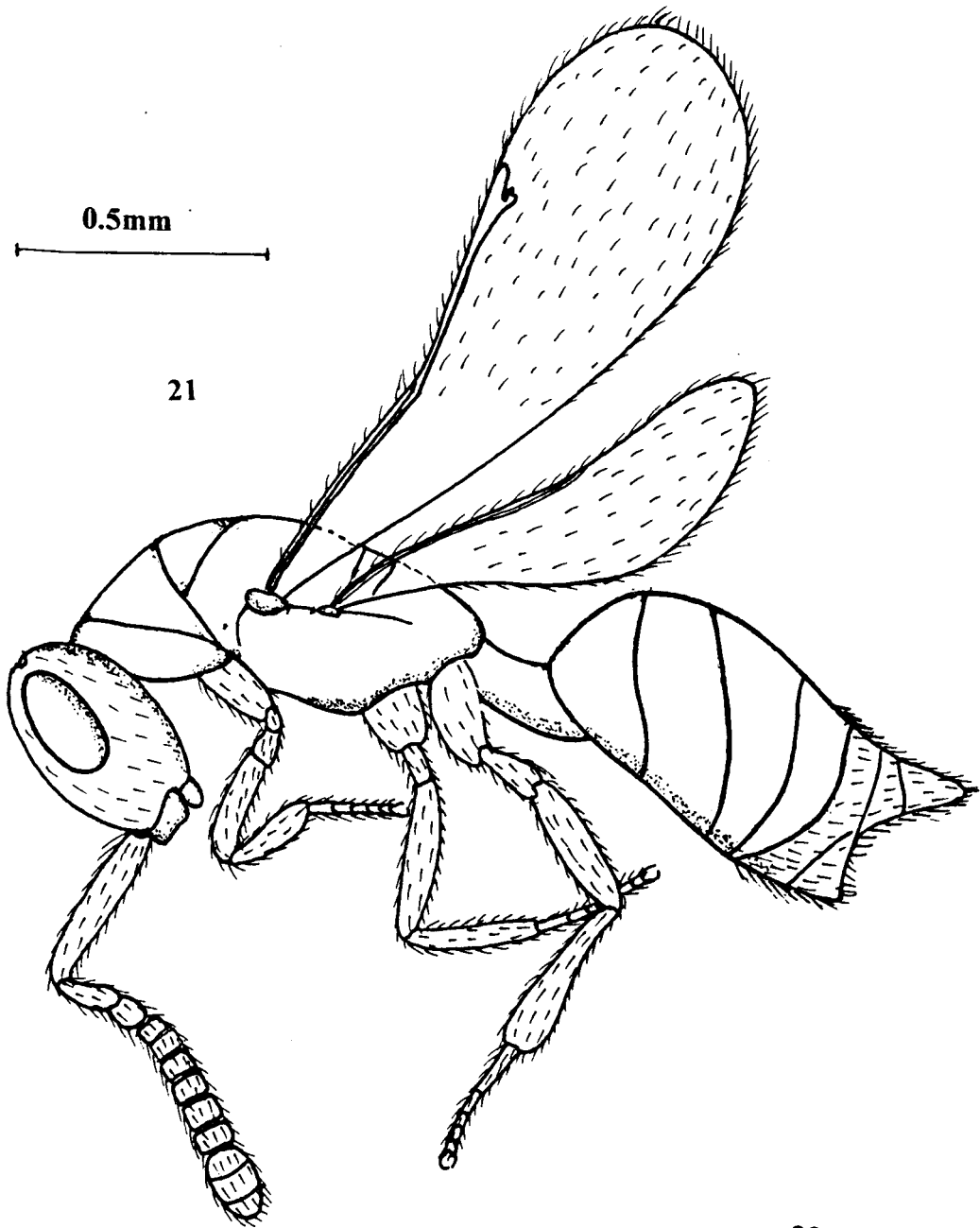
20



**Figs. 21-23.** *Spalangia obscura* Boucek

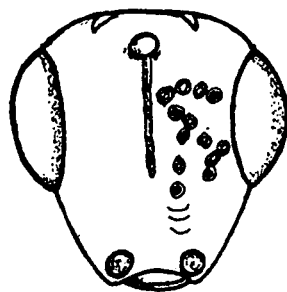
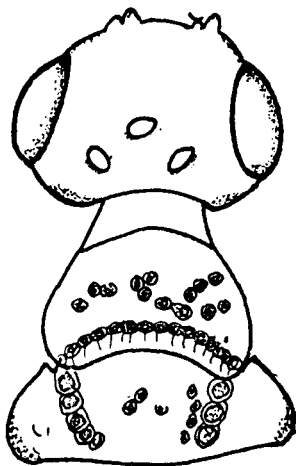
21. Female, body profile
22. Head, pronotum and mesoscutum
23. Head, frontal view





23

22

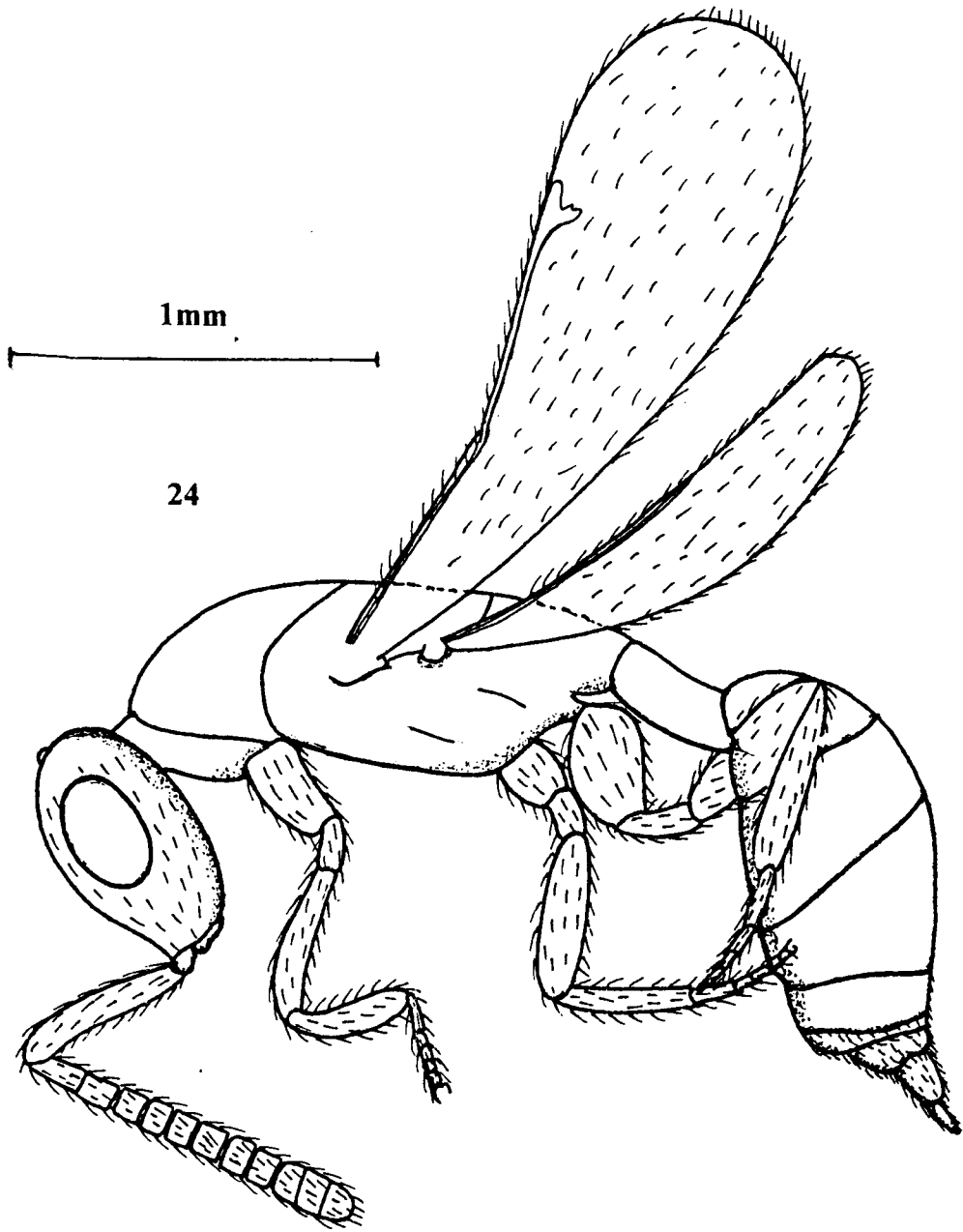


**Figs. 24-26.** *Spalangia nigroaenea* Curtis

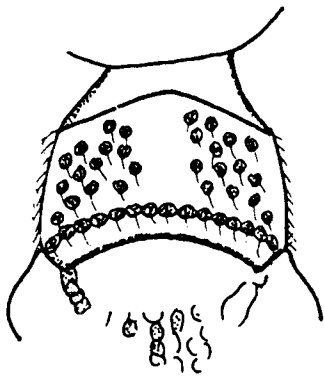
24. Female, body profile

25. Pronotum

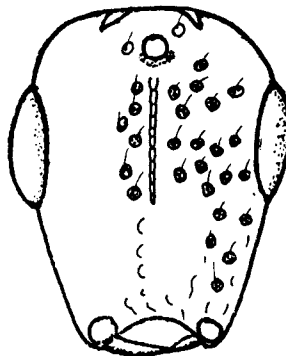
26. Head, frontal view



25



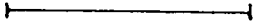
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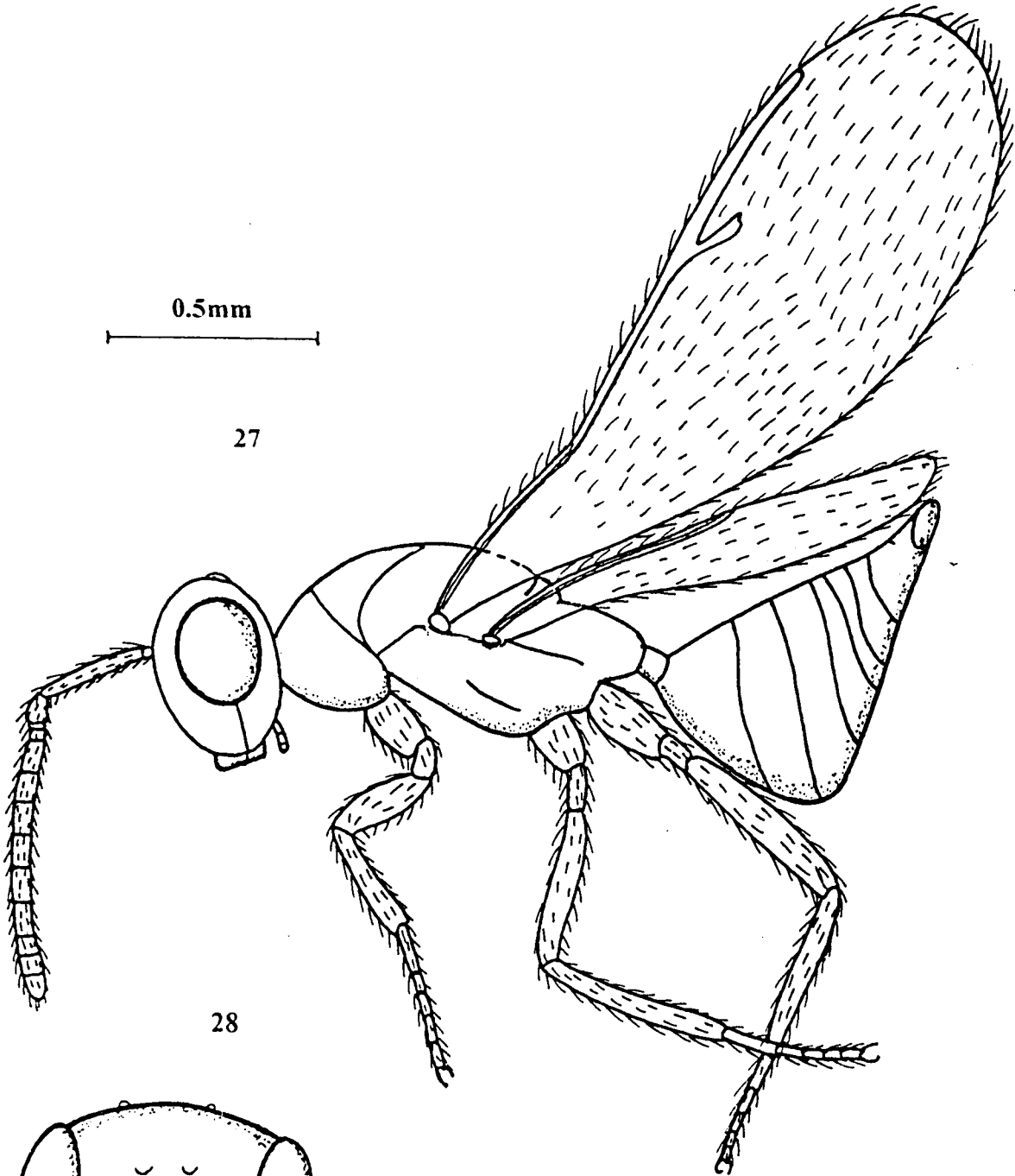
**Figs. 27-30.** *Panstenon collaris* Boucek

- 27. Female, body profile
- 28. Head, frontal view
- 29. Propodeum
- 30. Head, dorsal view

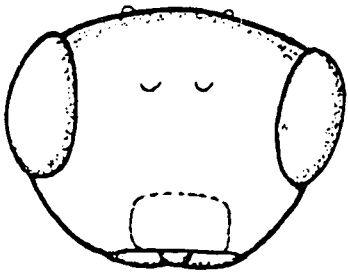
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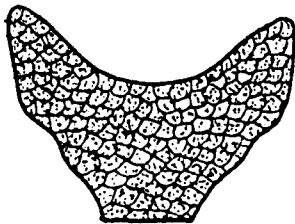
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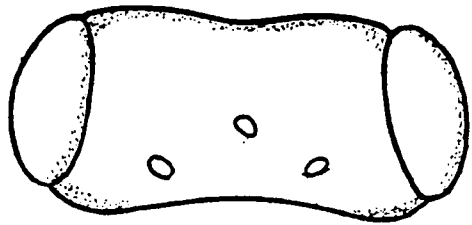
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29



30

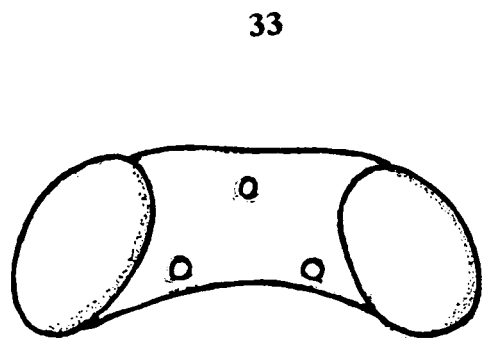
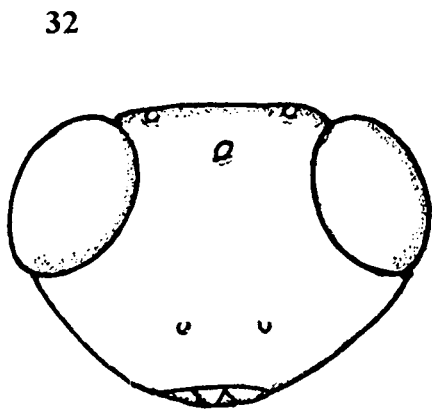
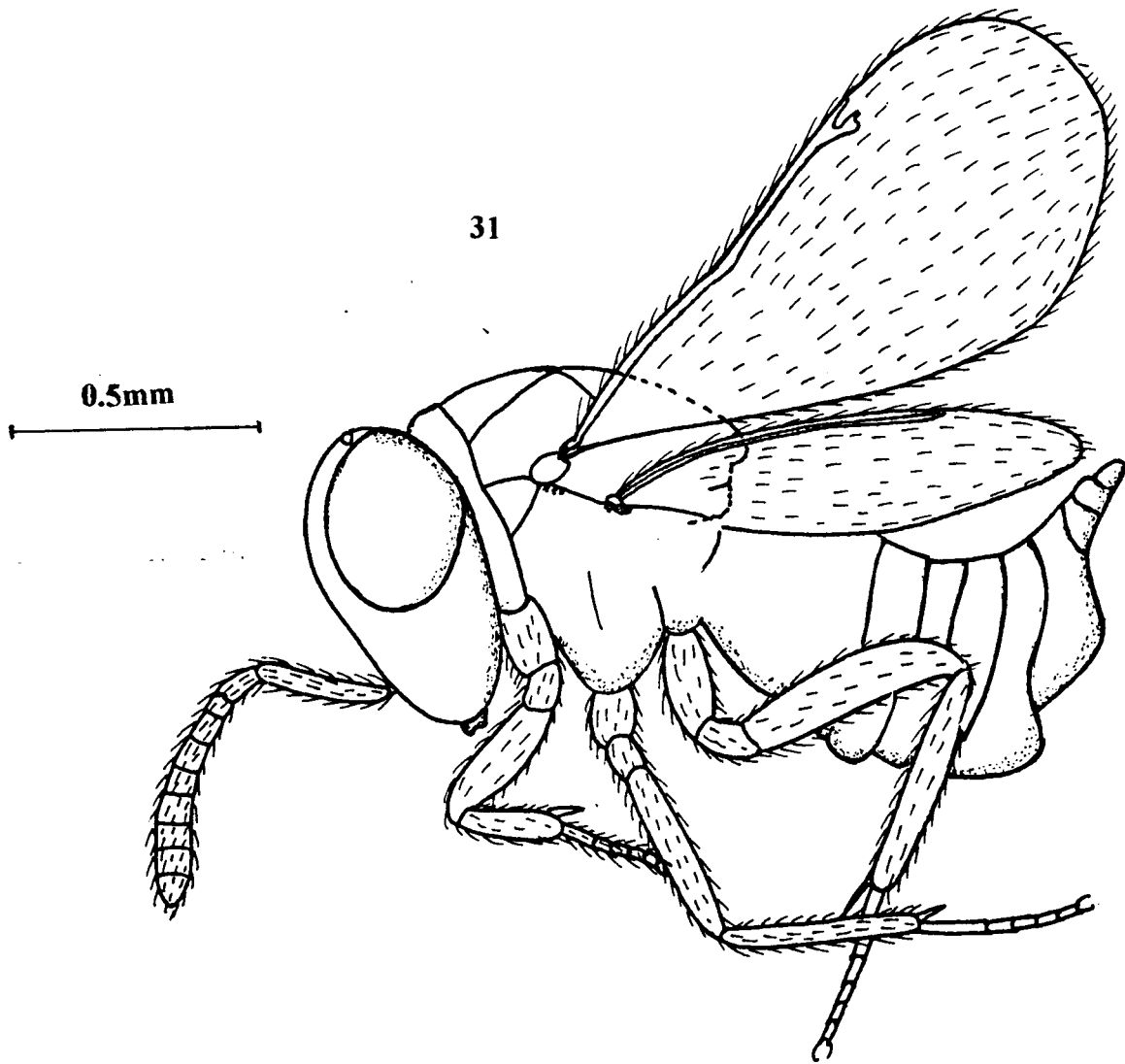


**Figs. 31-33.** *Cephaleta nirupama* sp.nov.

31. Female, body profile

32. Head, frontal view

33. Head, dorsal view



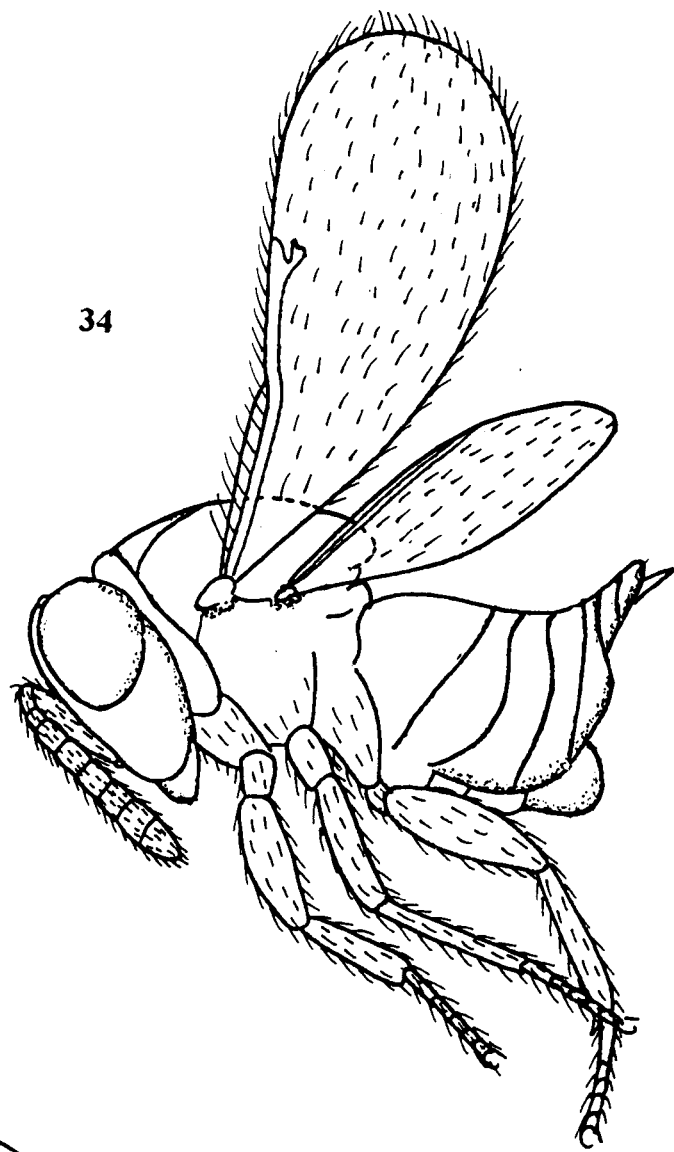
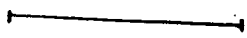
**Figs. 34-36.** *Cephaleta australiensis* (Howard)

- 34. Female, body profile
- 35. Male antenna
- 36. Head, dorsal view

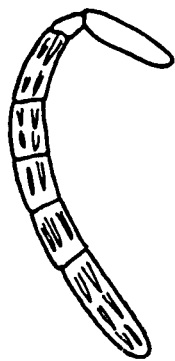


34

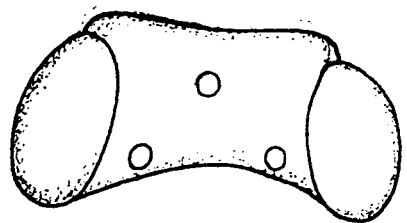
0.5mm



35



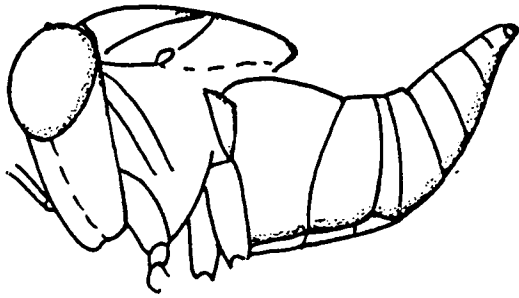
36



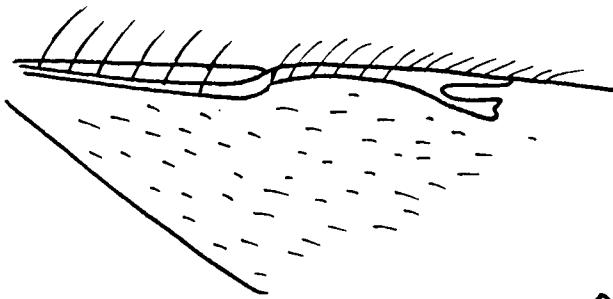
**Figs. 37-39.** *Cephaleta hayati* Farooqi

- 37. Female, body profile
- 38. Basal half of forewing
- 39a. Female antenna
- 39b. Male antenna

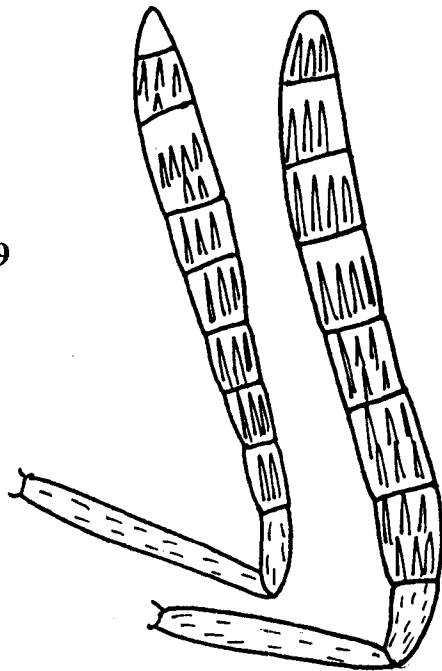
37



38



39

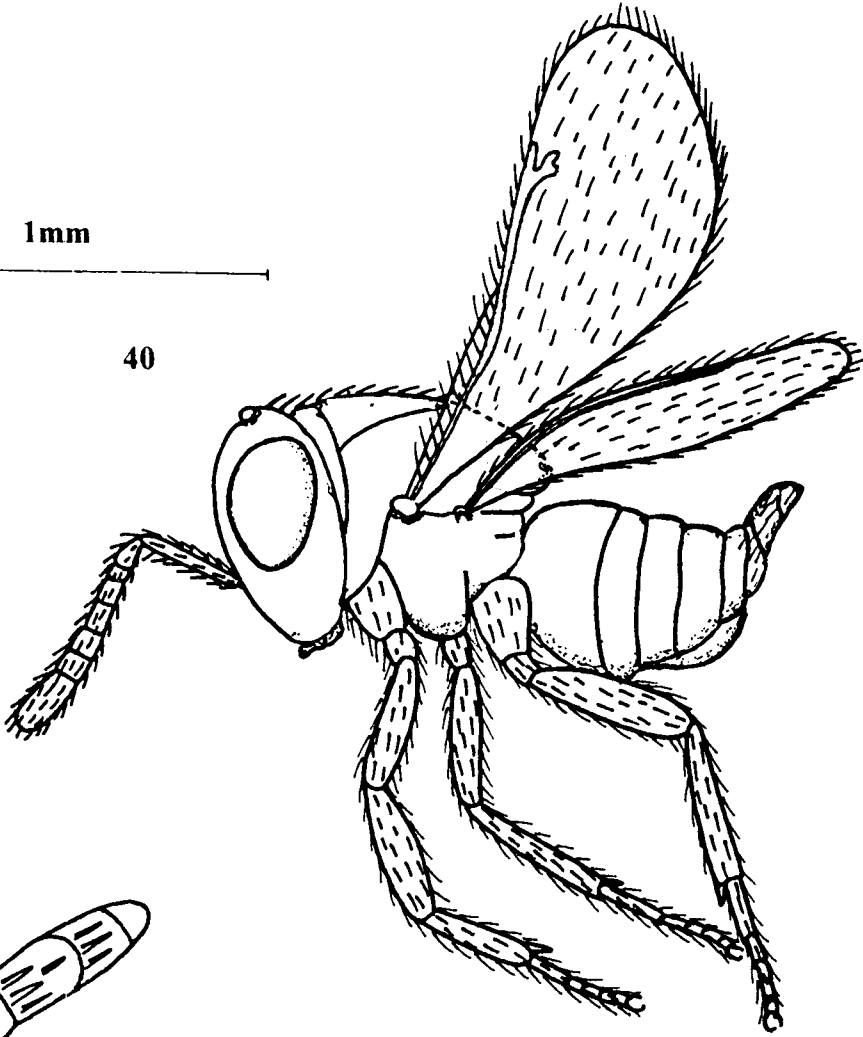


**Figs. 40-43.** *Cephaleta brunniventris* Motschulsky

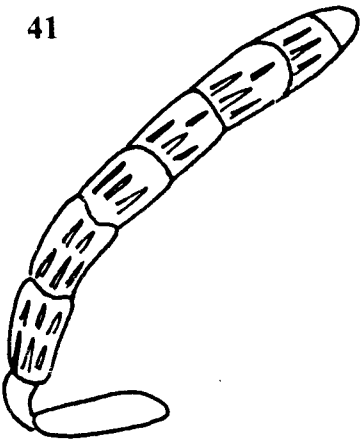
- 40. Female, body profile
- 41. Male antenna
- 42. Head, frontal view
- 43. Body, dorsal view.

1mm

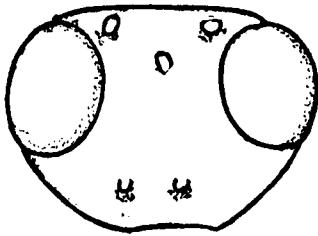
40



41

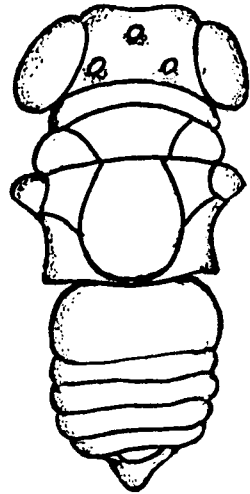


42



43

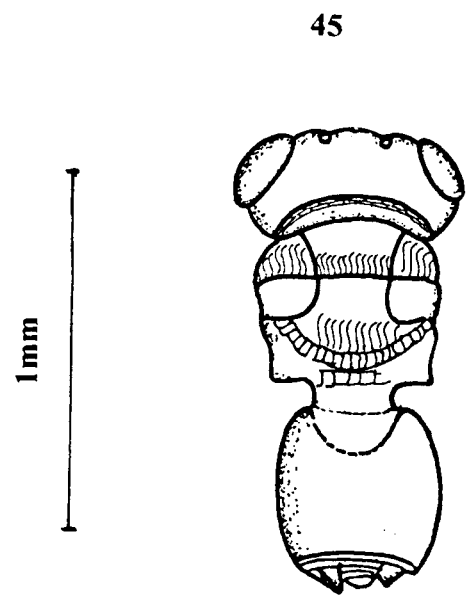
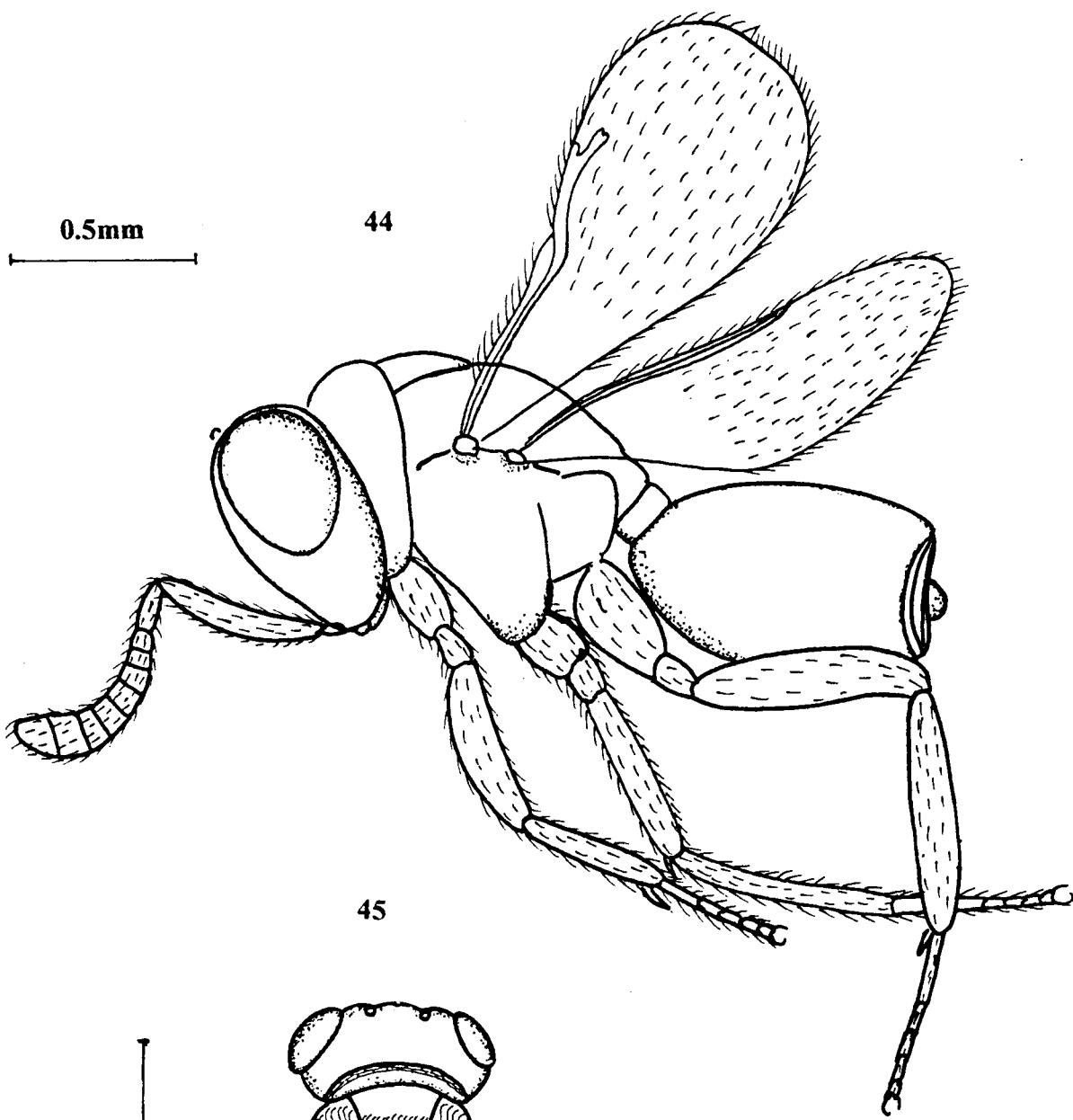
1mm



**Figs. 44 & 45. *Moranila californica* (Howard)**

44. Female, body profile

45. Body, dorsal view.



**Figs. 46-49.** *Neocephaleta malabarensis* sp. nov.

46. Female, body profile

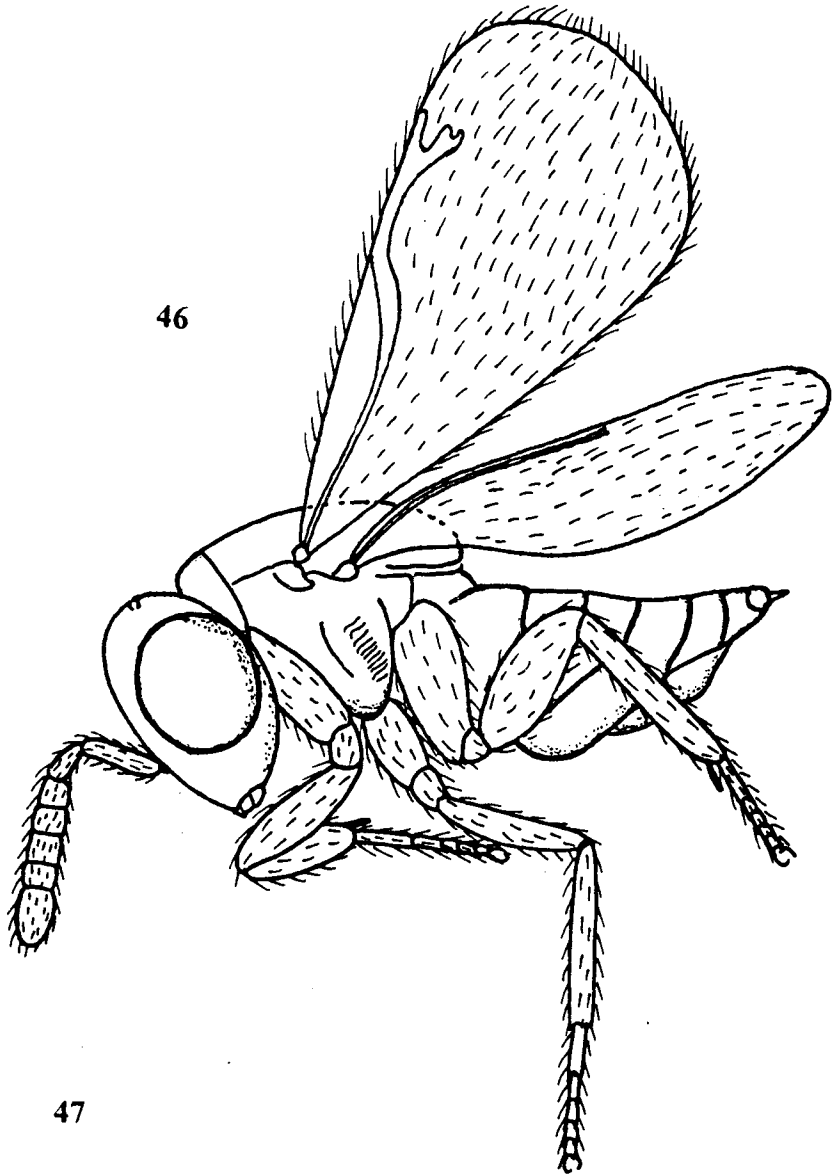
47. Head, frontal view

48. Gaster, dorsal view

49. Head, dorsal view.

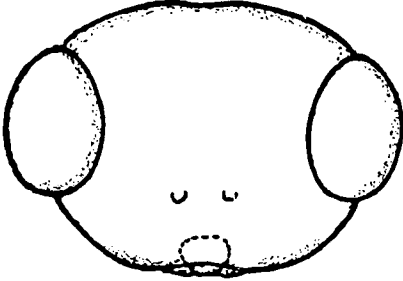


46

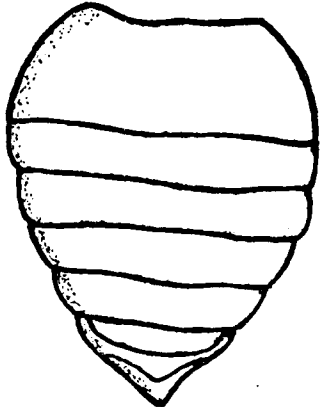


0.5mm

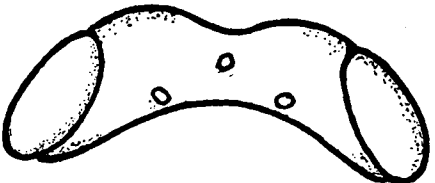
47



48

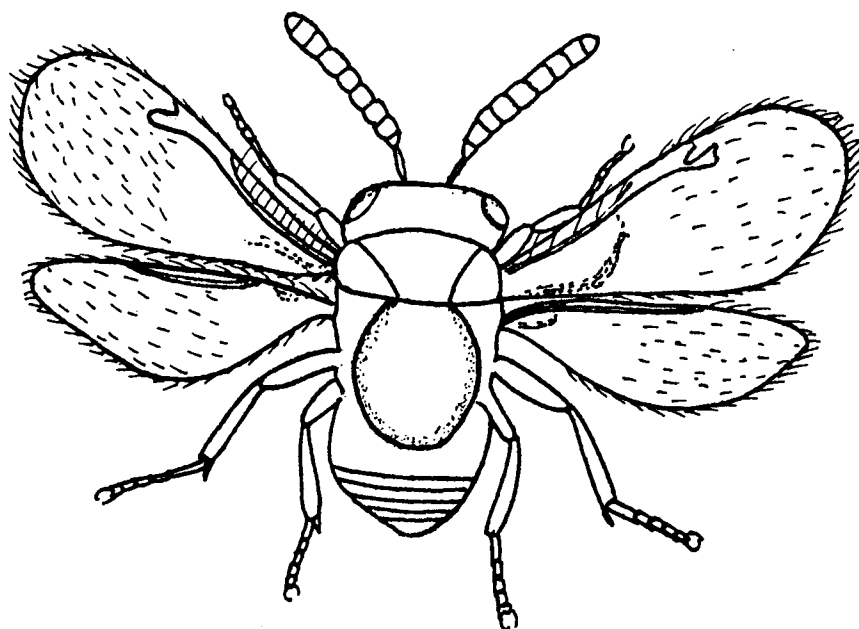


49



**Fig. 50.**      *Scutellista cyanea* Motschulsky

Male, body dorsal view

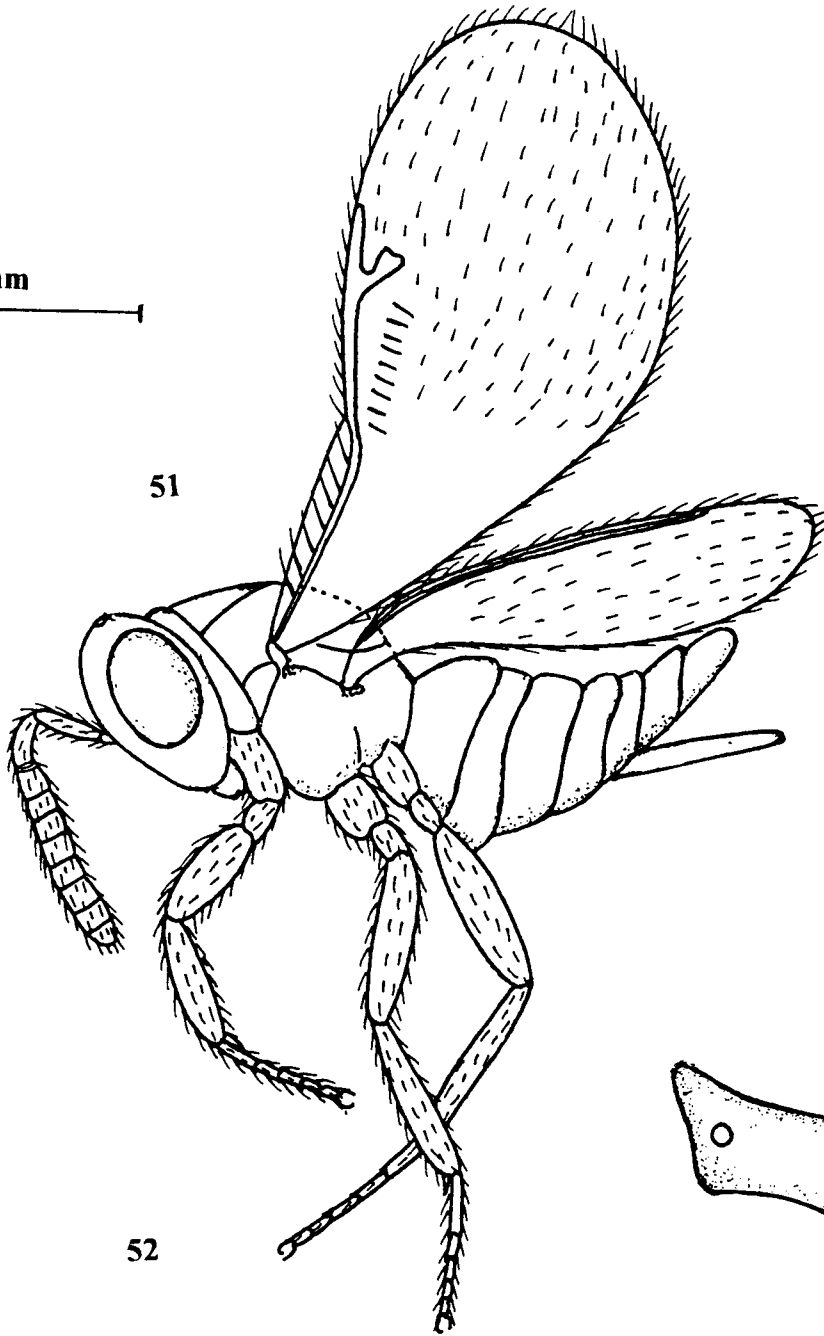


**Figs. 51-54.** *Systasis cenchrivora* Farooqi & Menon

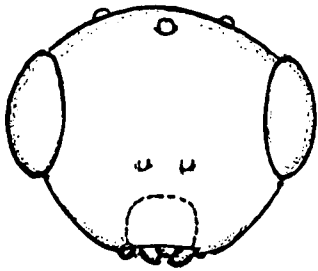
- 51. Female, body profile
- 52. Head, frontal view
- 53. Propodeum
- 54. Head, dorsal view

0.5mm

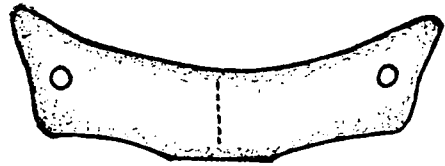
51



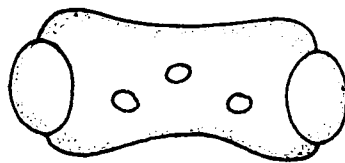
52



53

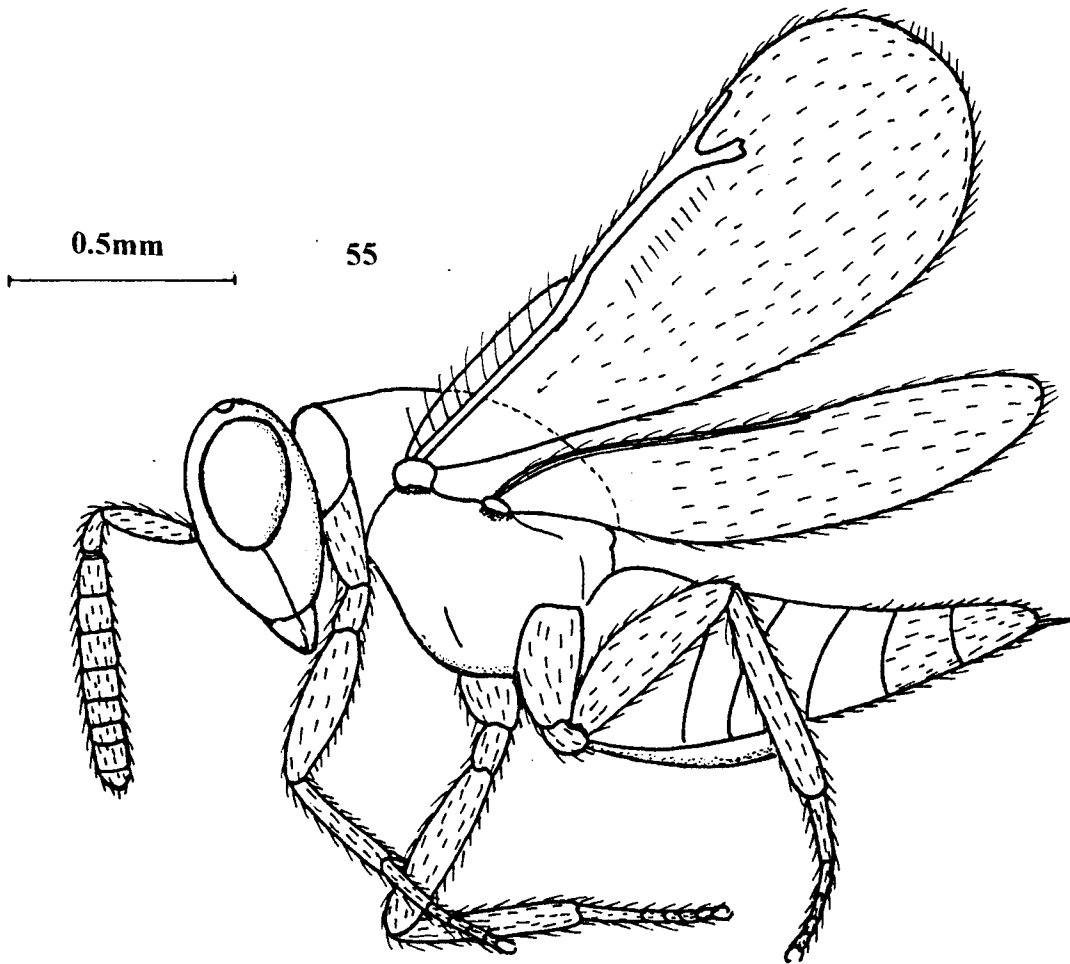


54

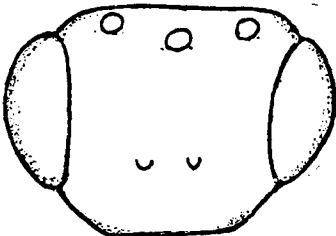


**Figs. 55-58.** *Systasis dasyneurae* Mani

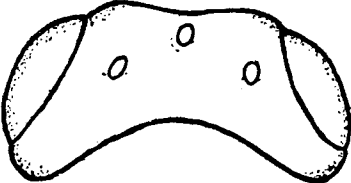
- 55. Female, body profile
- 56. Head, frontal view
- 57. Head, dorsal view
- 58. Propodeum



56



57



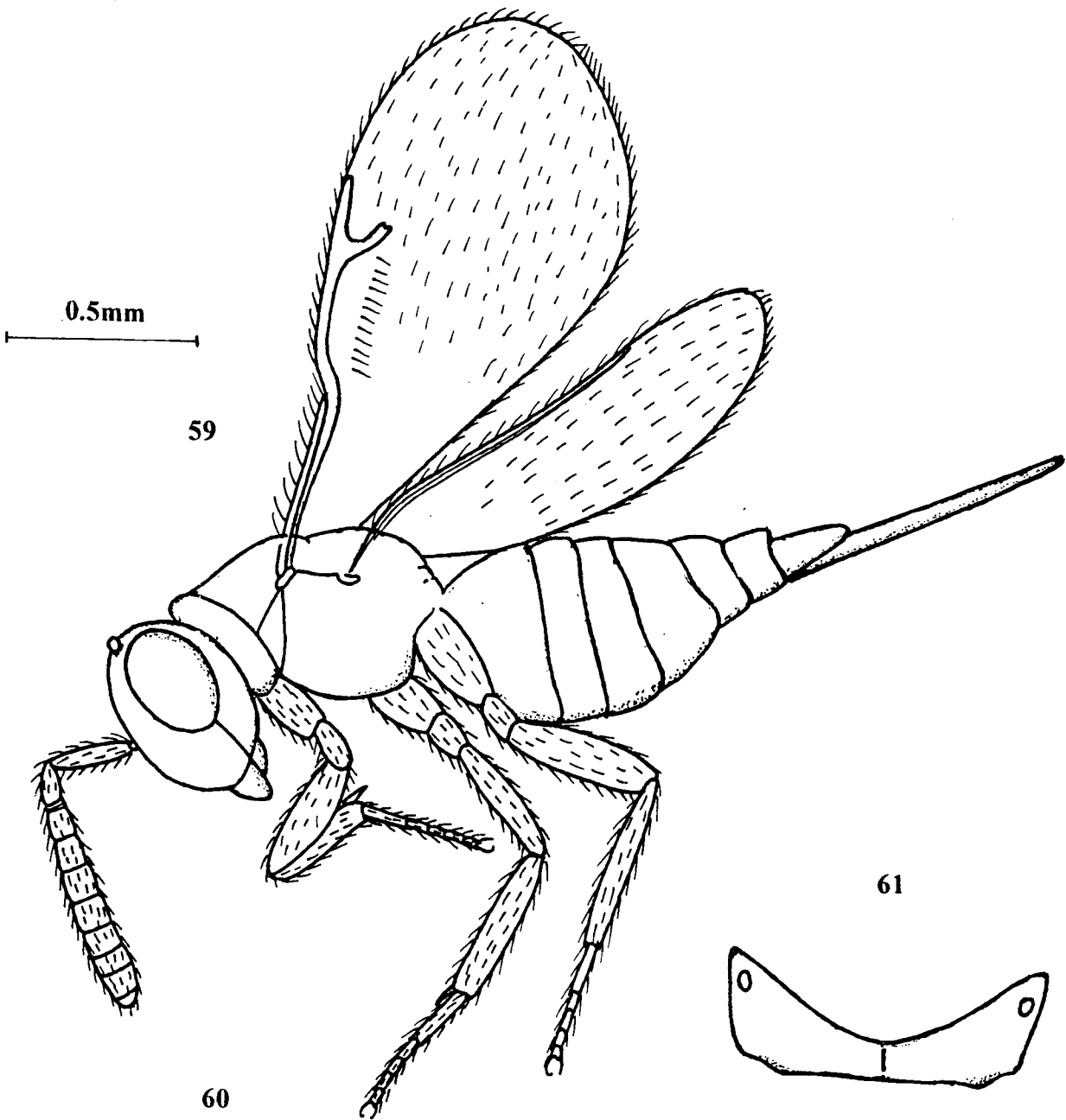
58



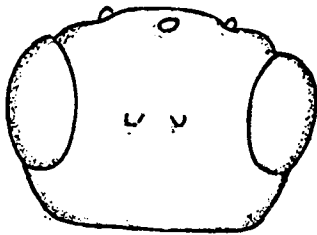
**Figs. 59-62.** *Systasis indicus* sp. nov.

- 59. Female, body profile
- 60. Head, frontal view
- 61. Propodeum
- 62. Head, dorsal view

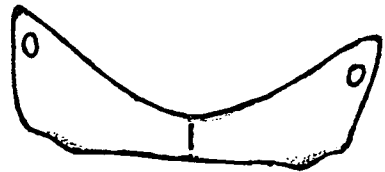




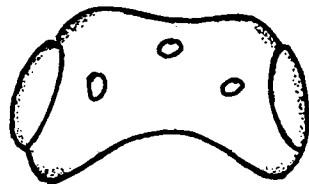
60



61

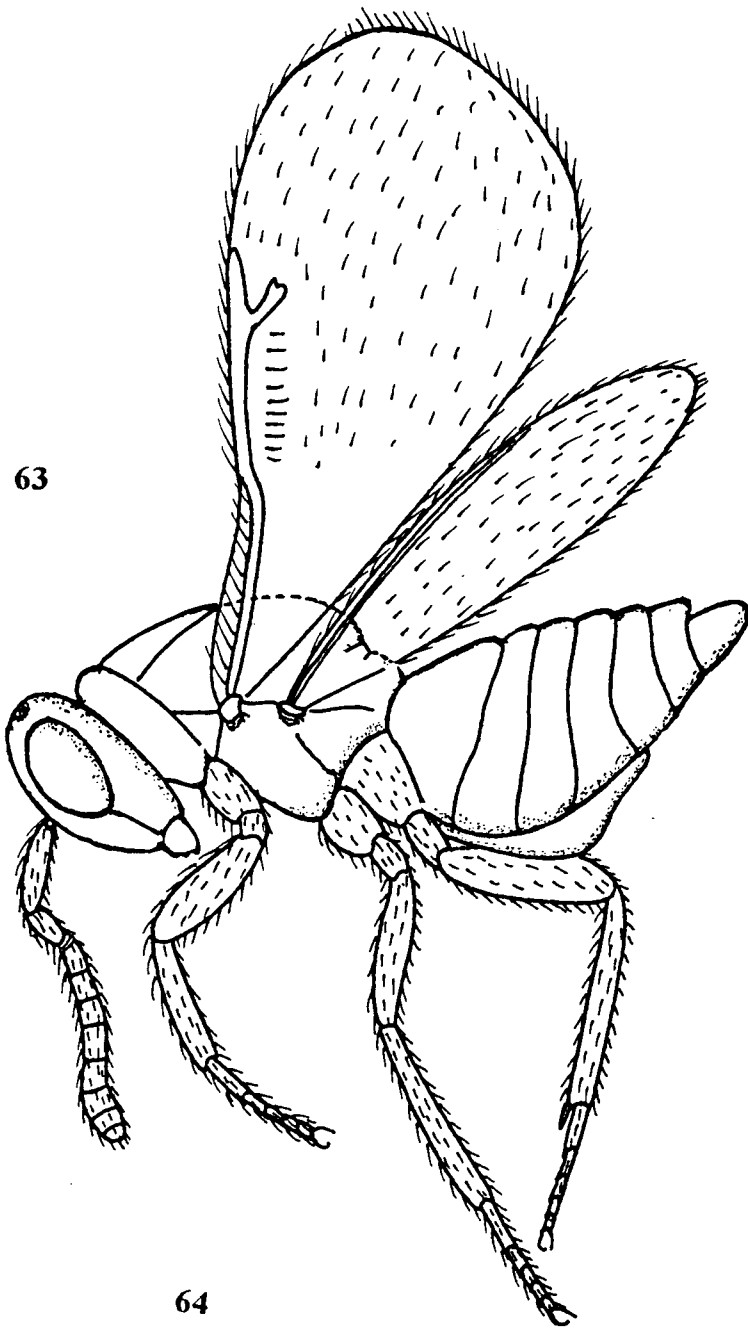


62

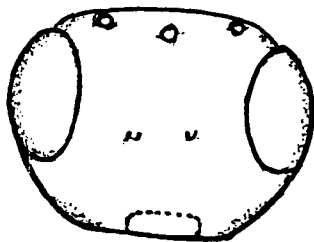


**Figs. 63-66.** *Systasis curiosus* sp. nov.

- 63. Female, body profile
- 64. Head, frontal view
- 65. Head, dorsal view
- 66. Propodeum



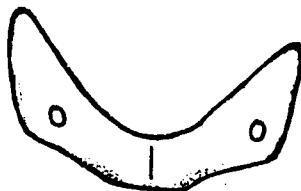
64



65



66

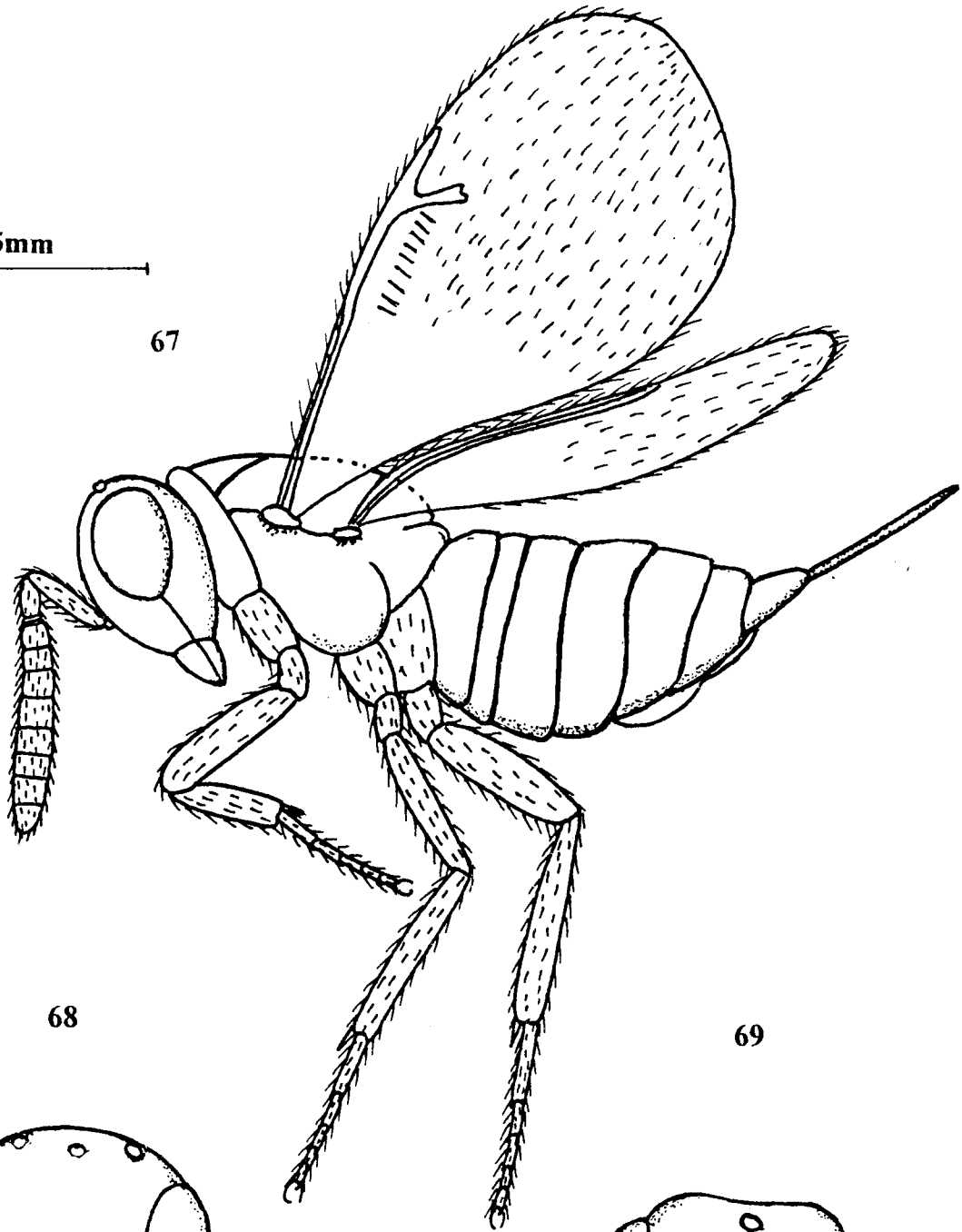


**Figs. 67-70.** *Systasis dalbergiae* Mani

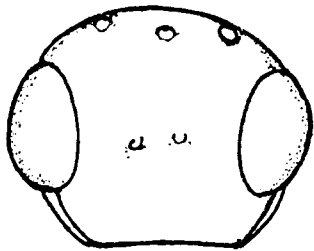
- 67. Female, body profile
- 68. Head, frontal view
- 69. Head, dorsal view
- 70. Propodeum

0.5mm

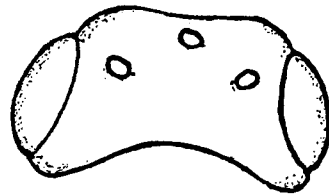
67



68



69



70

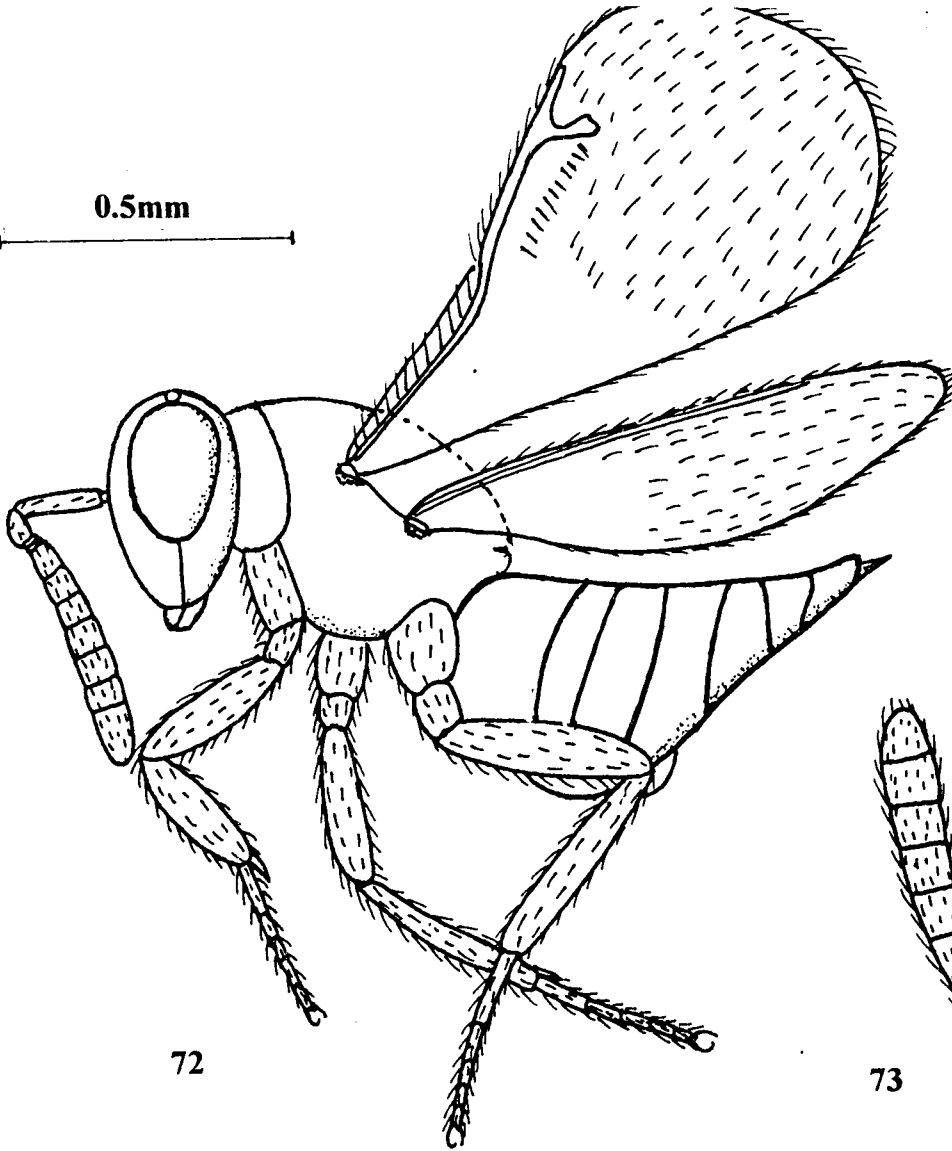


**Figs. 71-75.** *Systasis vischnu* Motschulsky

- 71. Female, body profile
- 72. Head, frontal view
- 73. Head, dorsal view
- 74. Propodeum
- 75. Male antenna

0.5mm

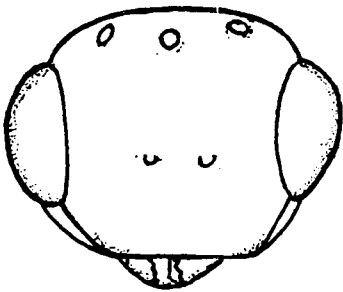
71



72

75

73



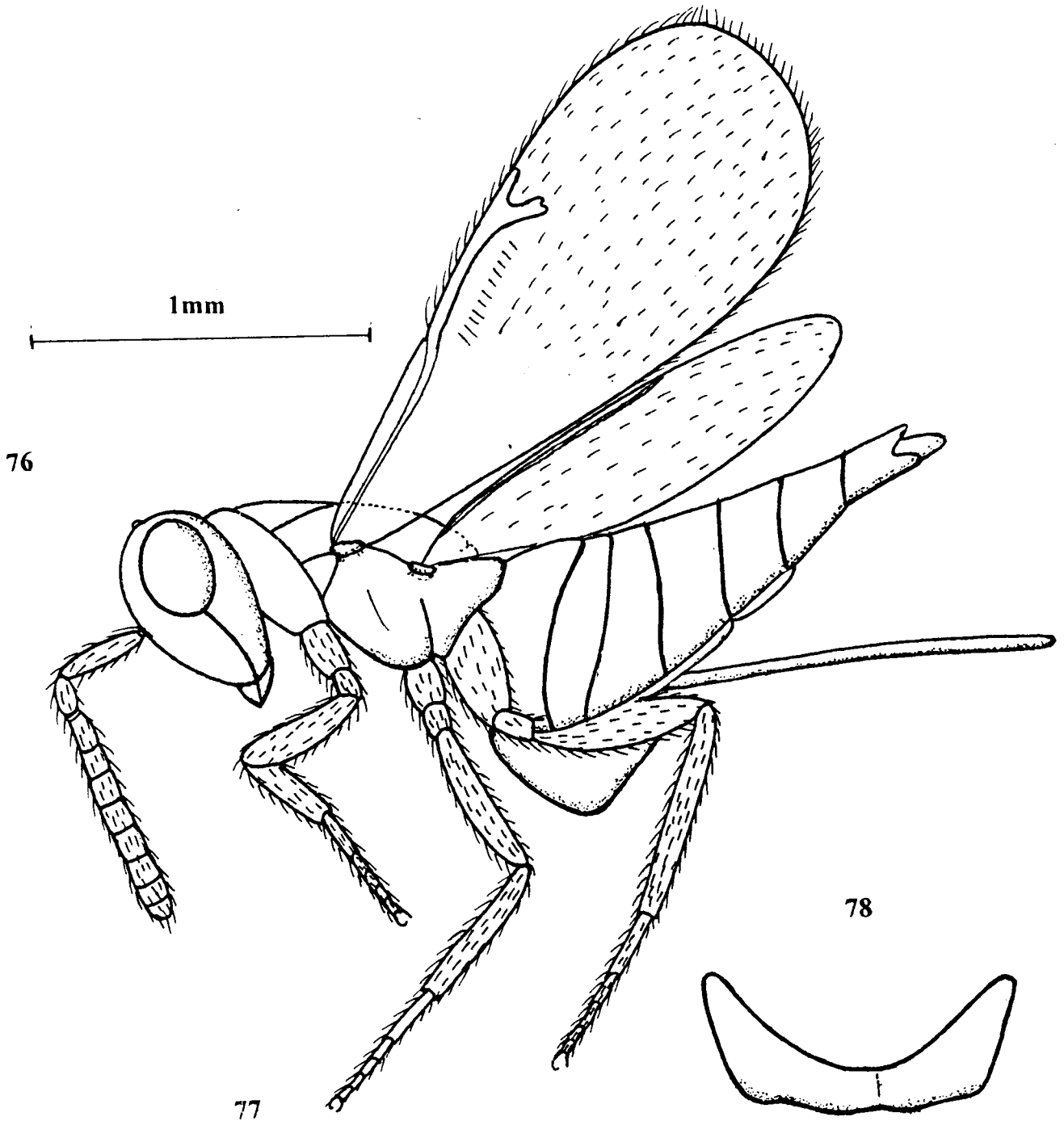
74



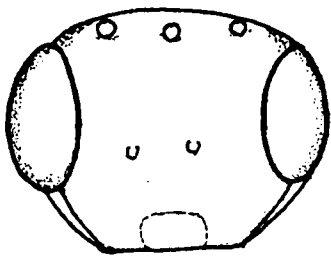
**Figs. 76-79.** *Systasis lepidus* sp. nov.

- 76. Female, body profile
- 77. Head, frontal view
- 78. Propodeum
- 79. Head, dorsal view

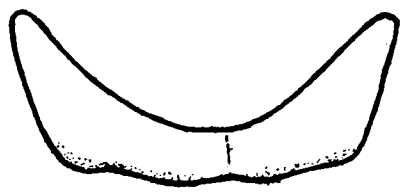




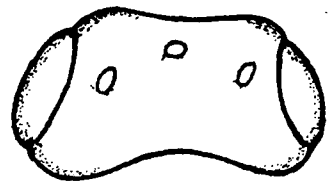
77



78

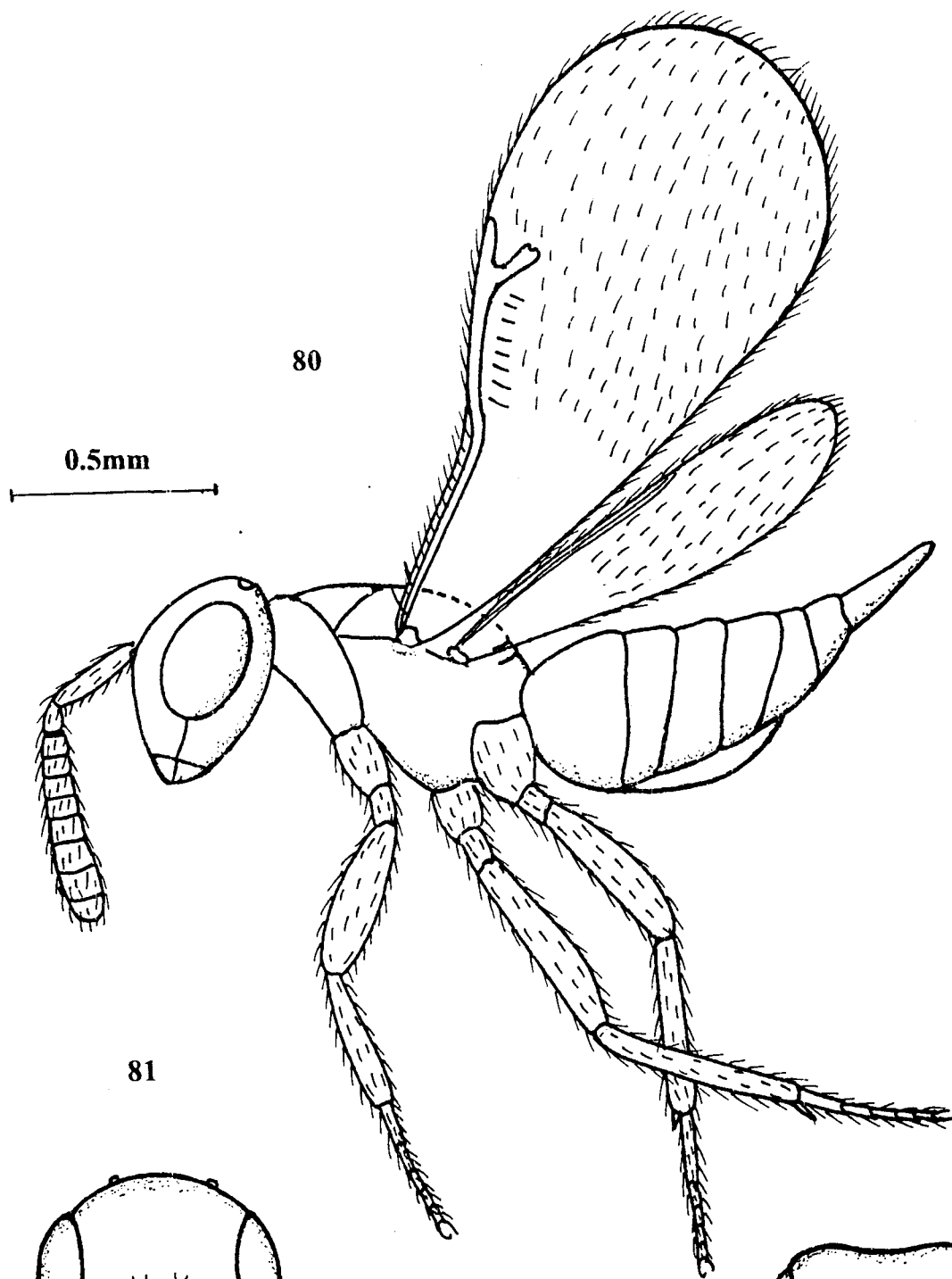


79

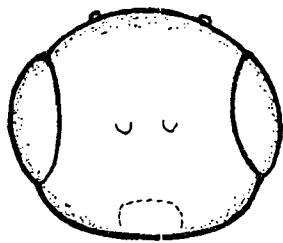


**Figs. 80-83.** *Systasis malabarensis* sp. nov.

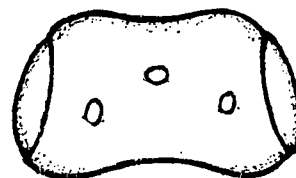
- 80. Female, body profile
- 81. Head, frontal view
- 82. Head, dorsal view
- 83. Propodeum



81



82



83



**Figs. 84-87.** *Dipara keralensis* sp. nov.

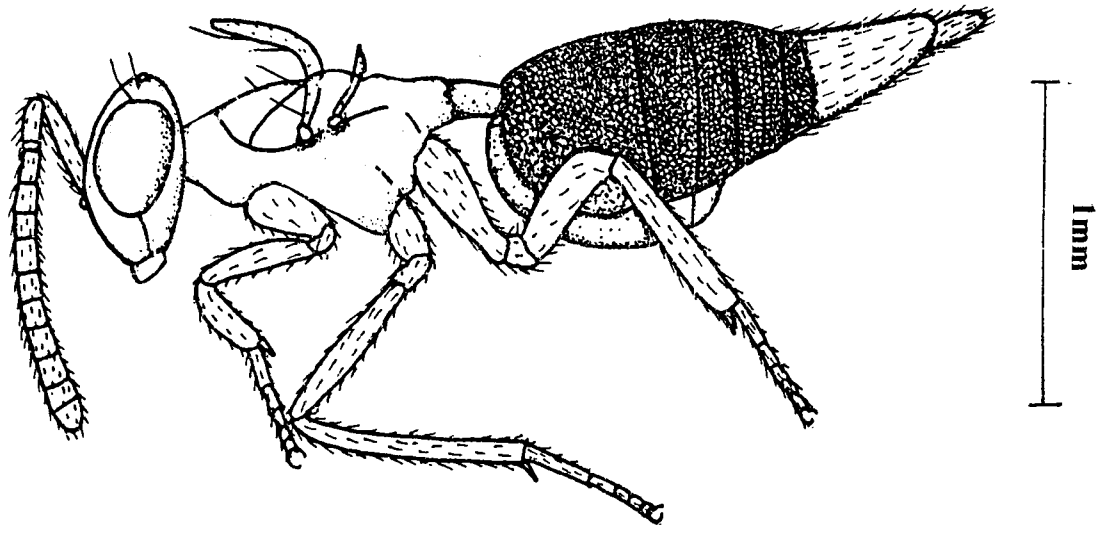
84. Female, body profile

85. Head, frontal view

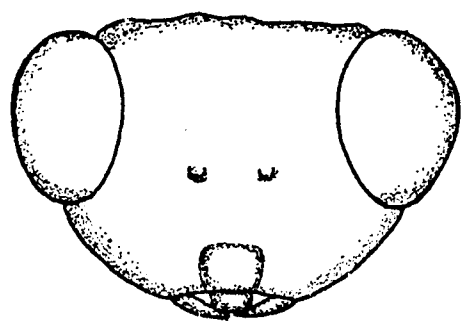
86. Head, dorsal view

87. Propodeum

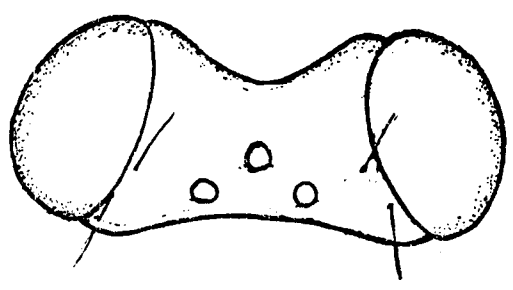
84



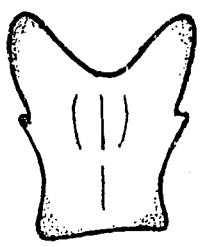
85



86



87



**Figs. 88-91.** *Dipara ecarinata* sp. nov.

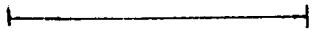
88. Female, body profile

89. Head, dorsal view

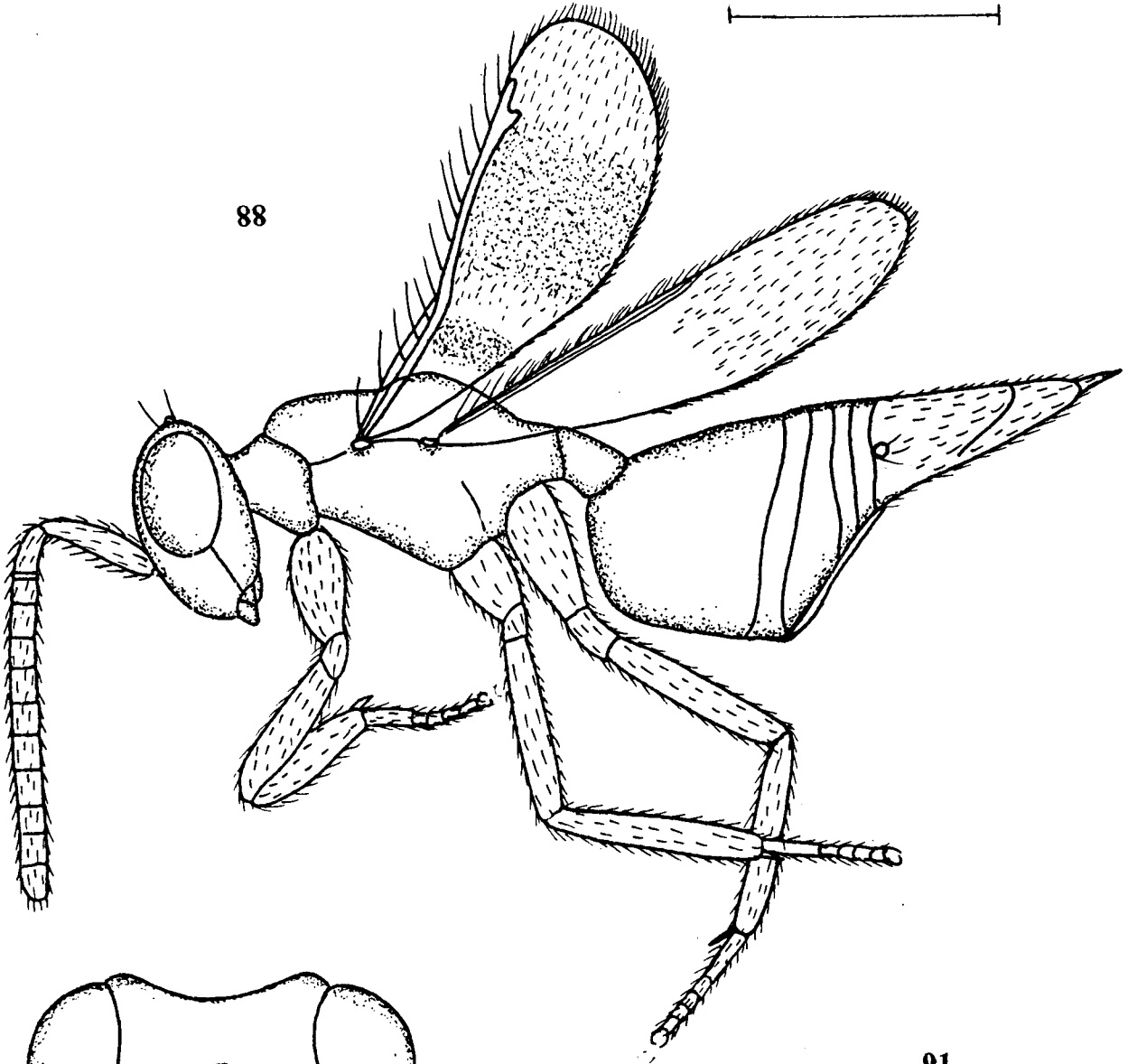
90. Propodeum

91. Head, frontal view

0.5mm



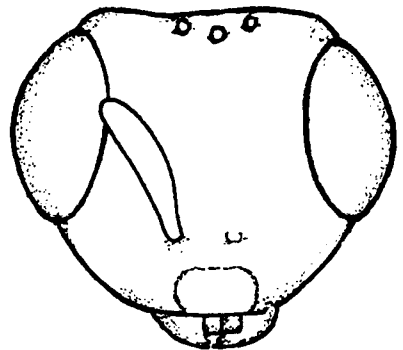
88



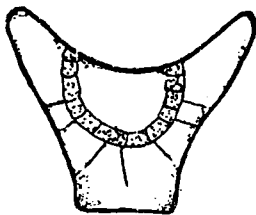
89



91



90



**Figs. 92-94.** *Dipara nitigastrea* sp. nov.

92. Female, body profile

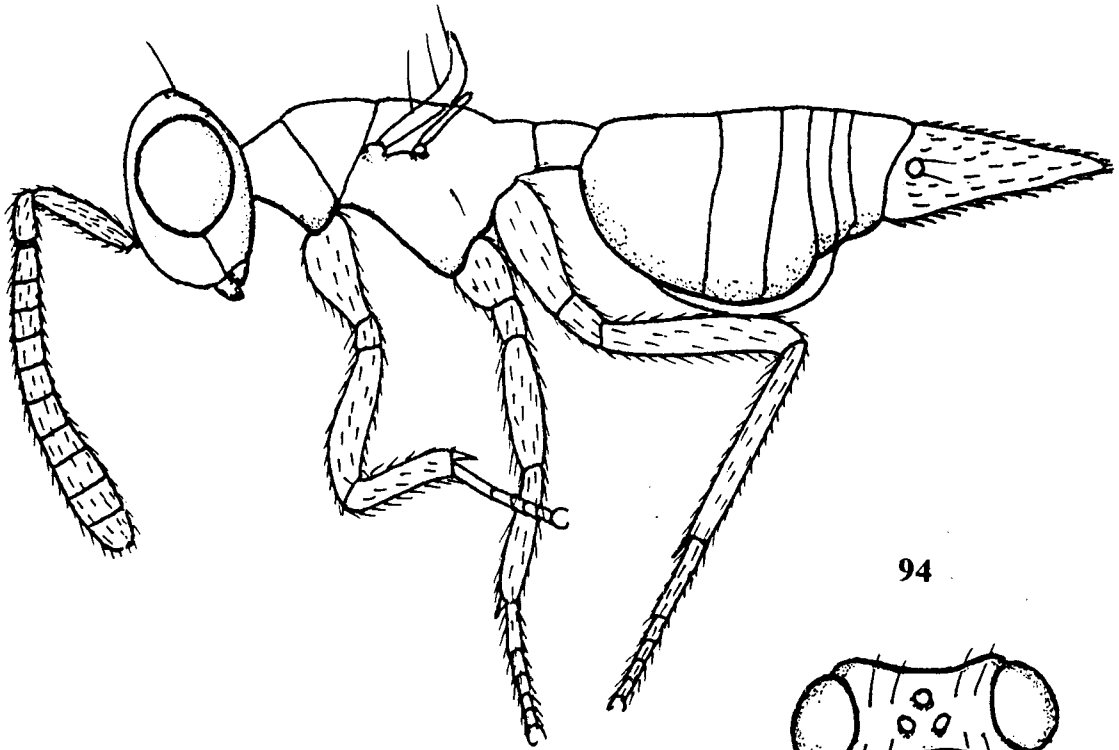
93. Head, frontal view

94. Body, dorsal view

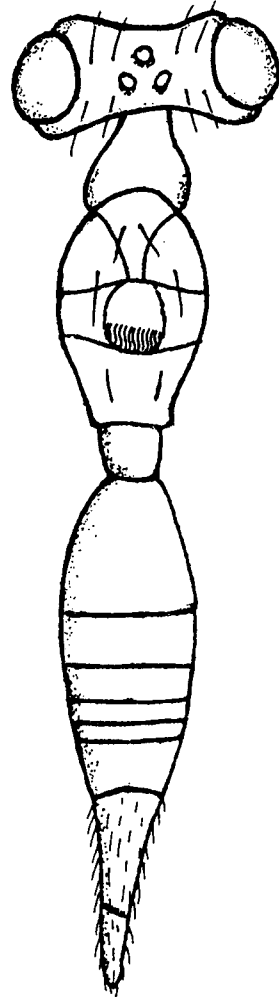


92

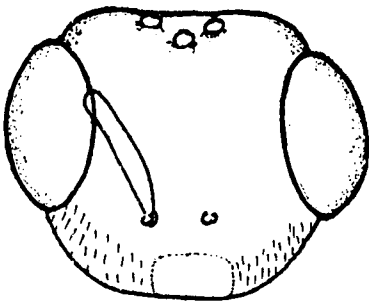
0.5mm



94



93



0.5mm

**Figs. 95-98.** *Dipara distincta* sp. nov.

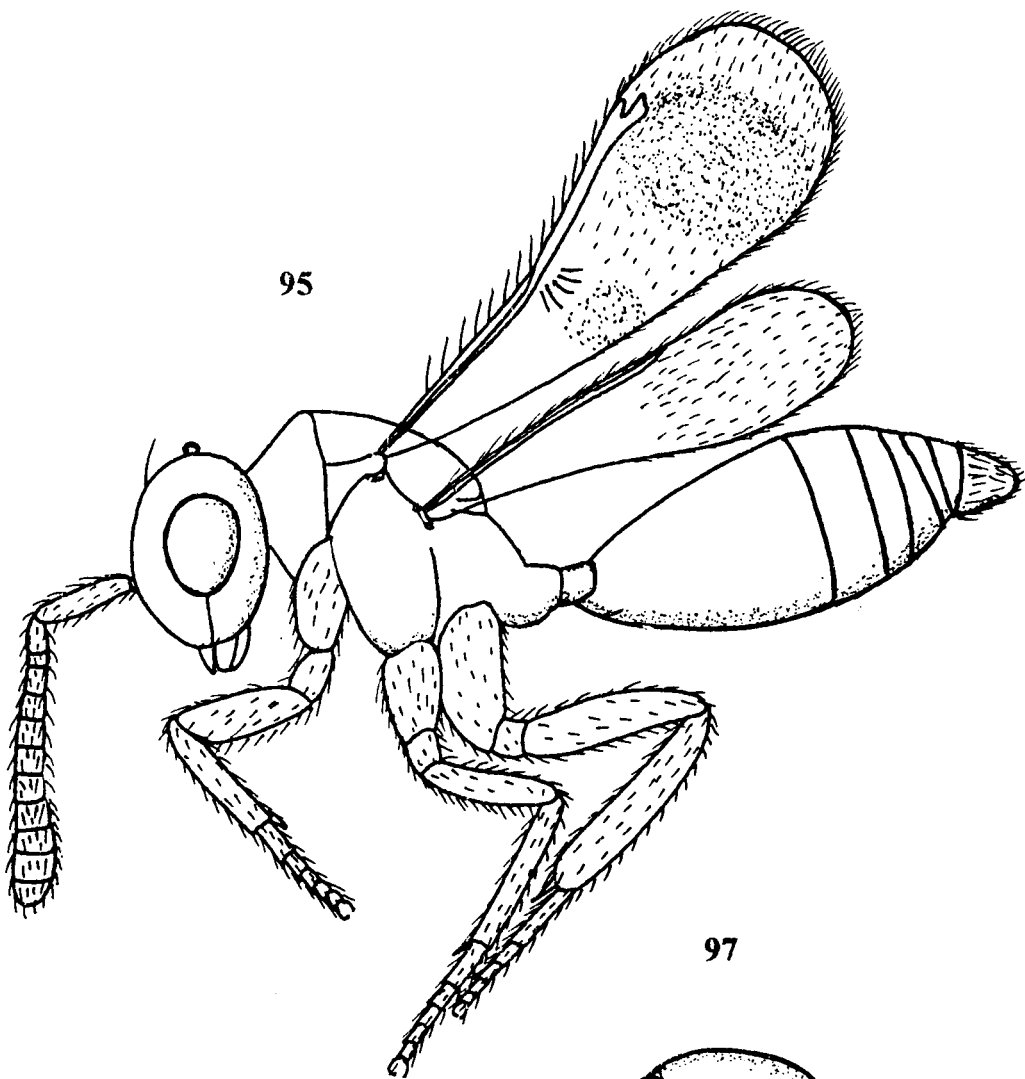
95. Female, body profile

96. Head, dorsal view

97. Head, frontal view

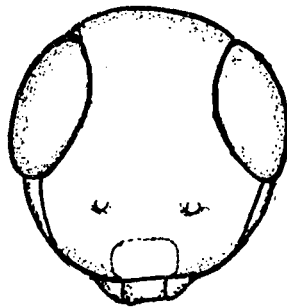
98. Propodeum

0.5mm

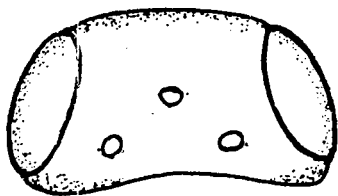


95

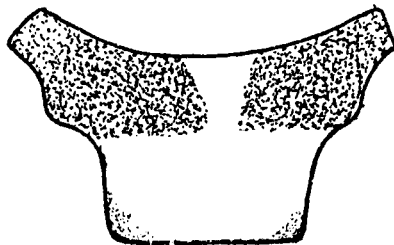
97



96

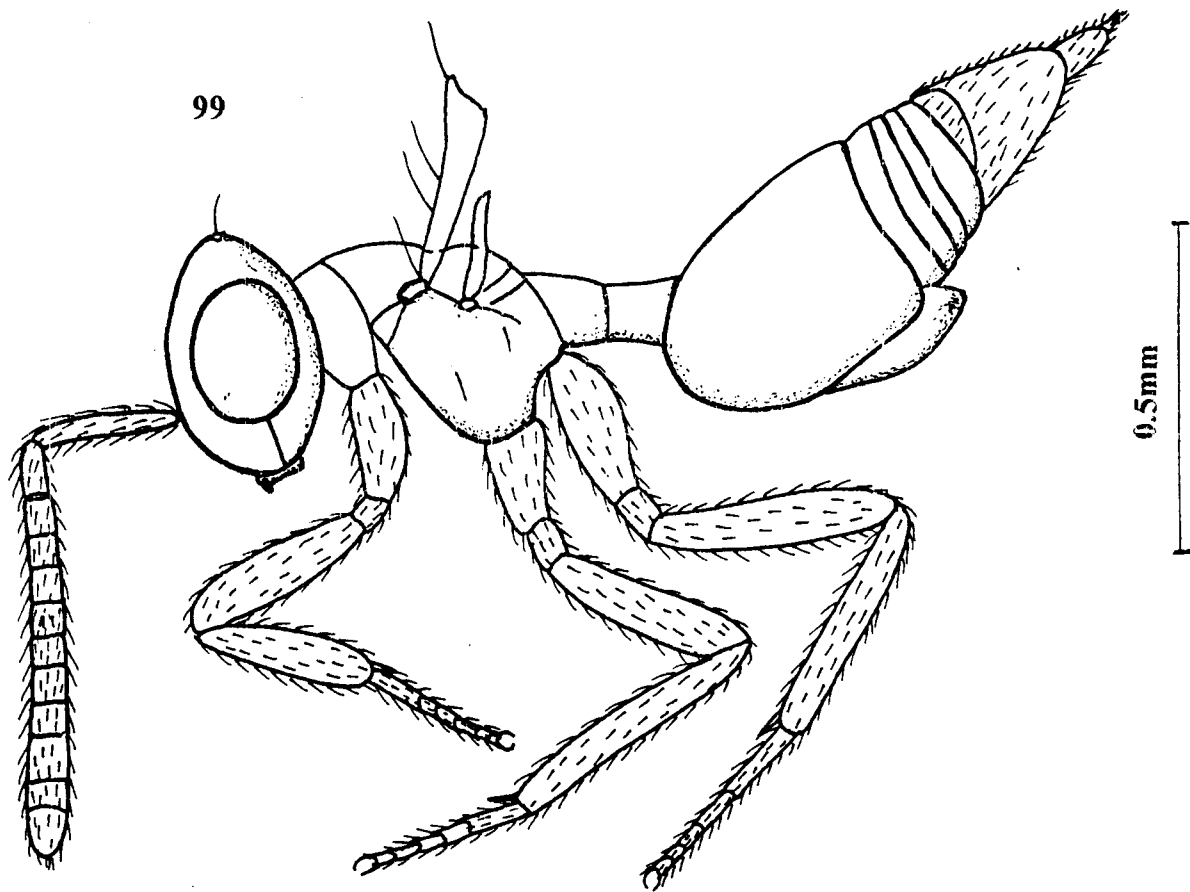


98

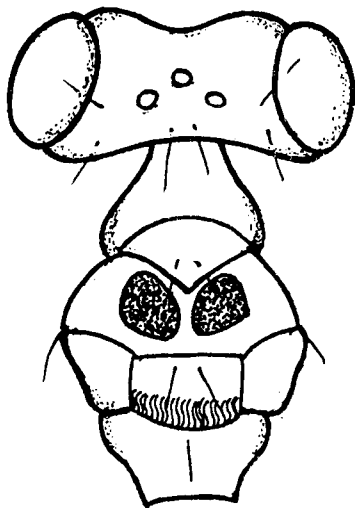


**Figs. 99-101.** *Grahamisia kozhikodensis* sp. nov.

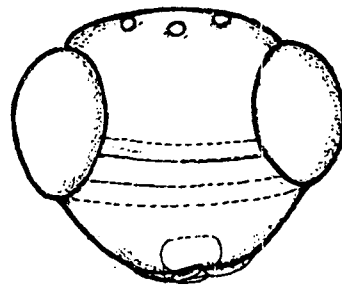
- 99. Female, body profile
- 100. Head and thorax, dorsal view
- 101. Head, frontal view



100



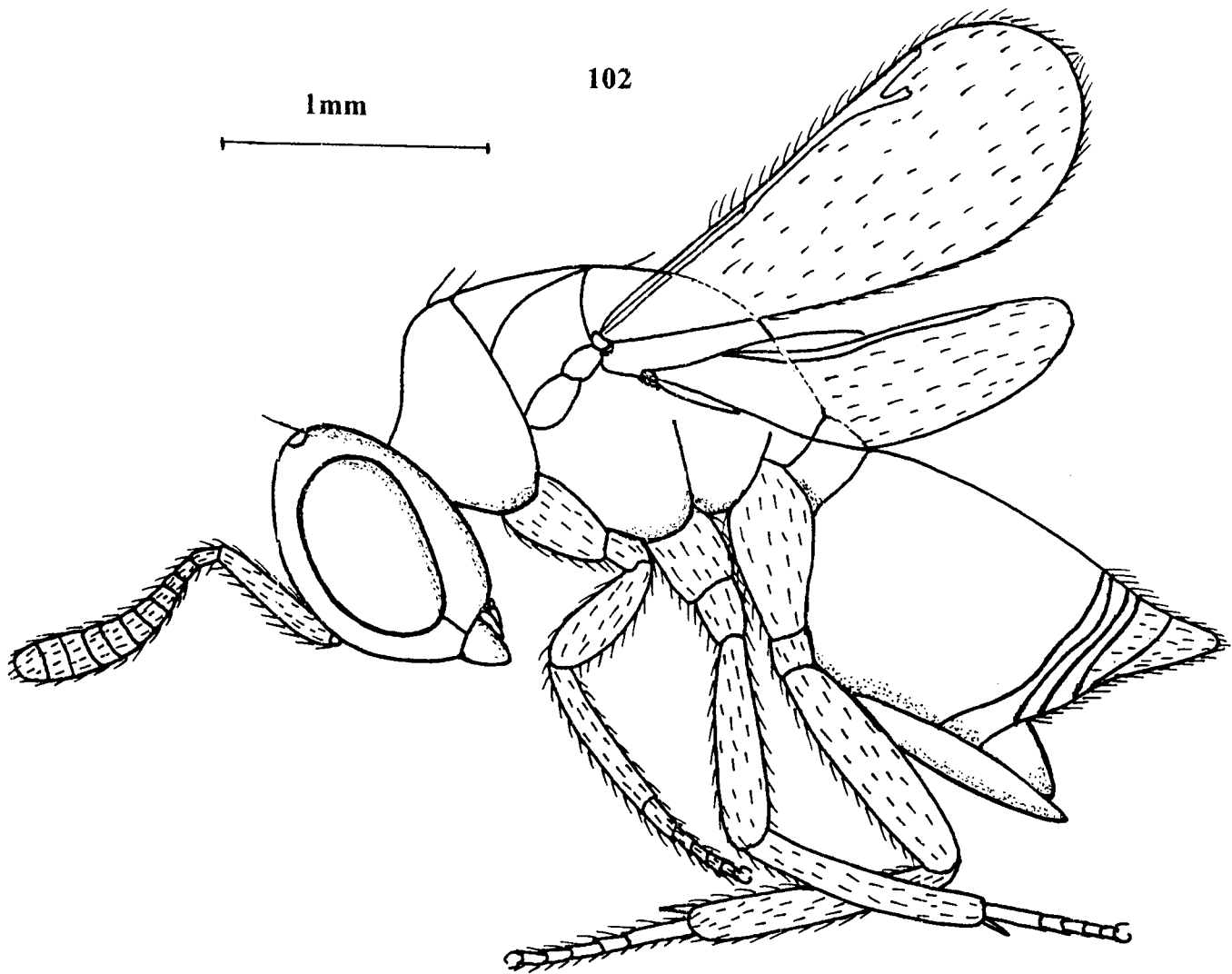
101



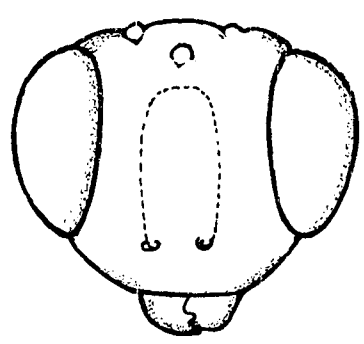
**Figs. 102-103.** *Netomocera nigra* Sureshan & Narendran

102. Female, body profile

103. Head, frontal view



103



**Figs. 104-106.** *Netomocera nigra* Sureshan & Narendran

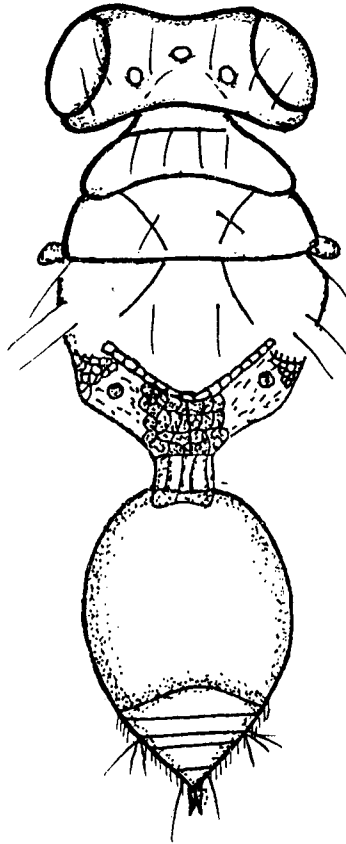
104. Body, dorsal view

105. Male antenna

106. Male propodeum



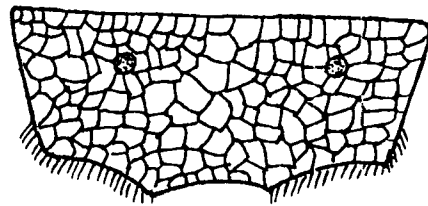
104



105



106

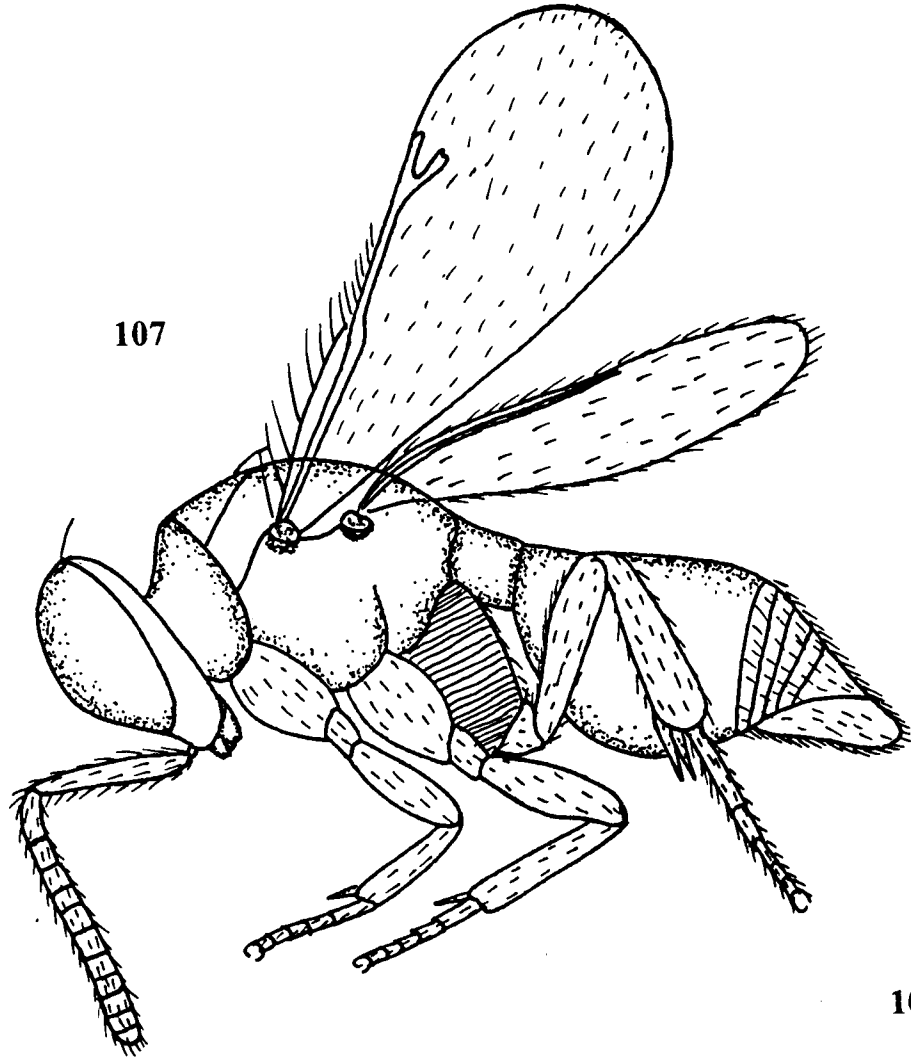


**Figs. 107-110.** *Netomocera clavata* sp. nov.

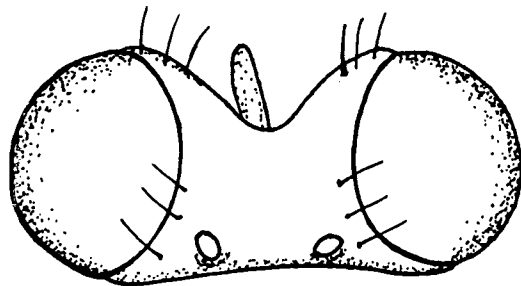
- 107. Female, body profile
- 108. Head, dorsal view
- 109. Head, frontal view
- 110. Gaster, dorsal view

1mm

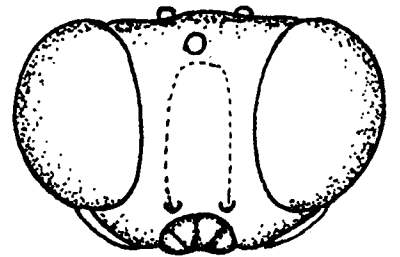
107



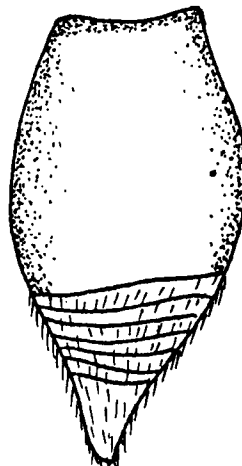
109



108



110



**Figs. 111-113.** *Parurios malabarensis* sp. nov.

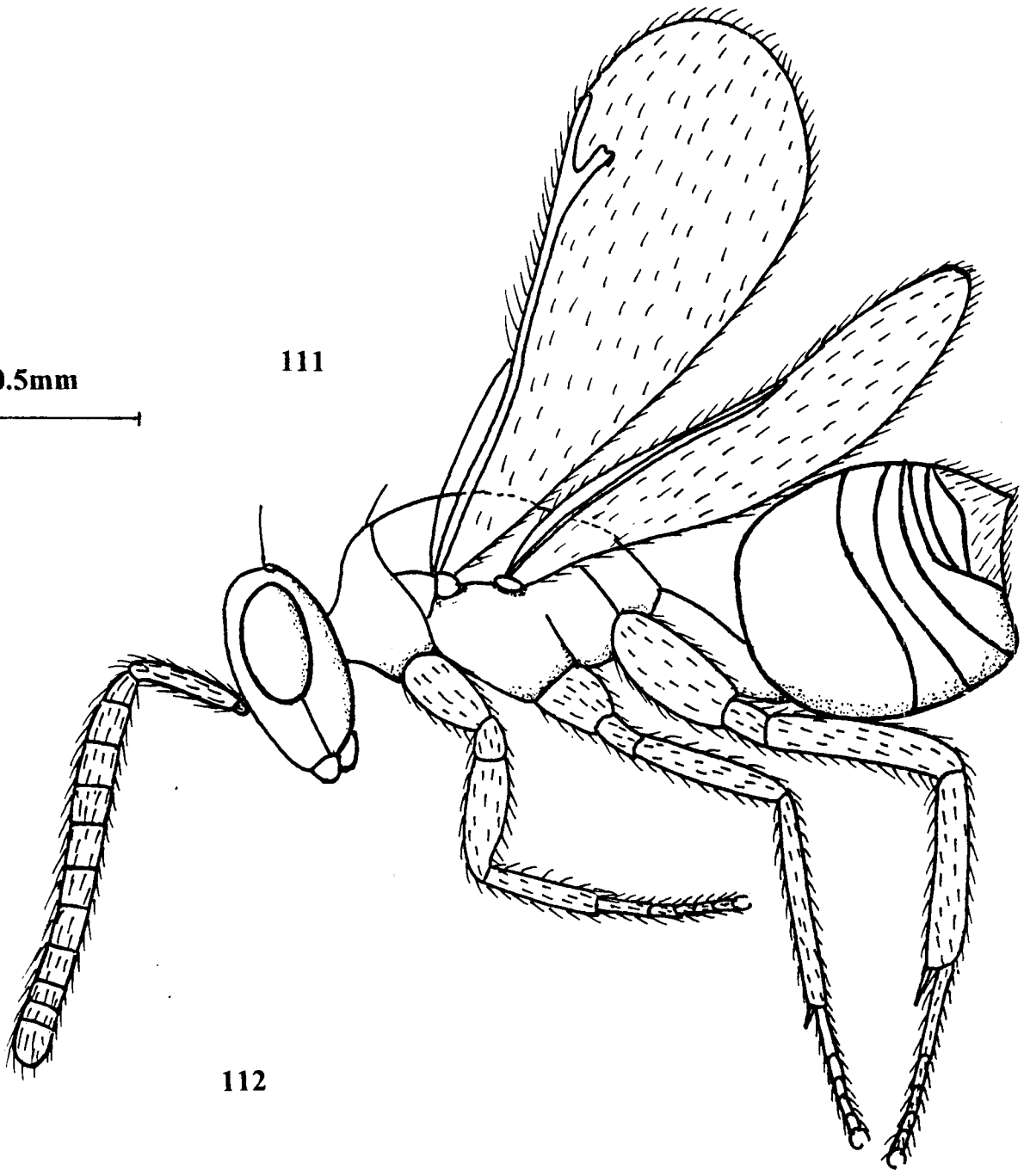
111. Female, body profile

112. Head and thorax, dorsal view

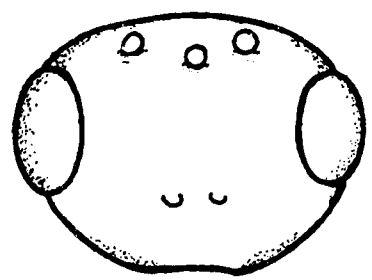
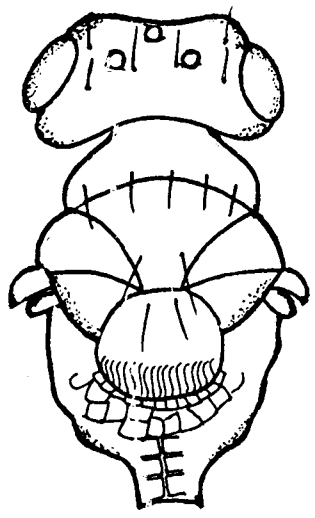
113. Head, frontal view

0.5mm

111



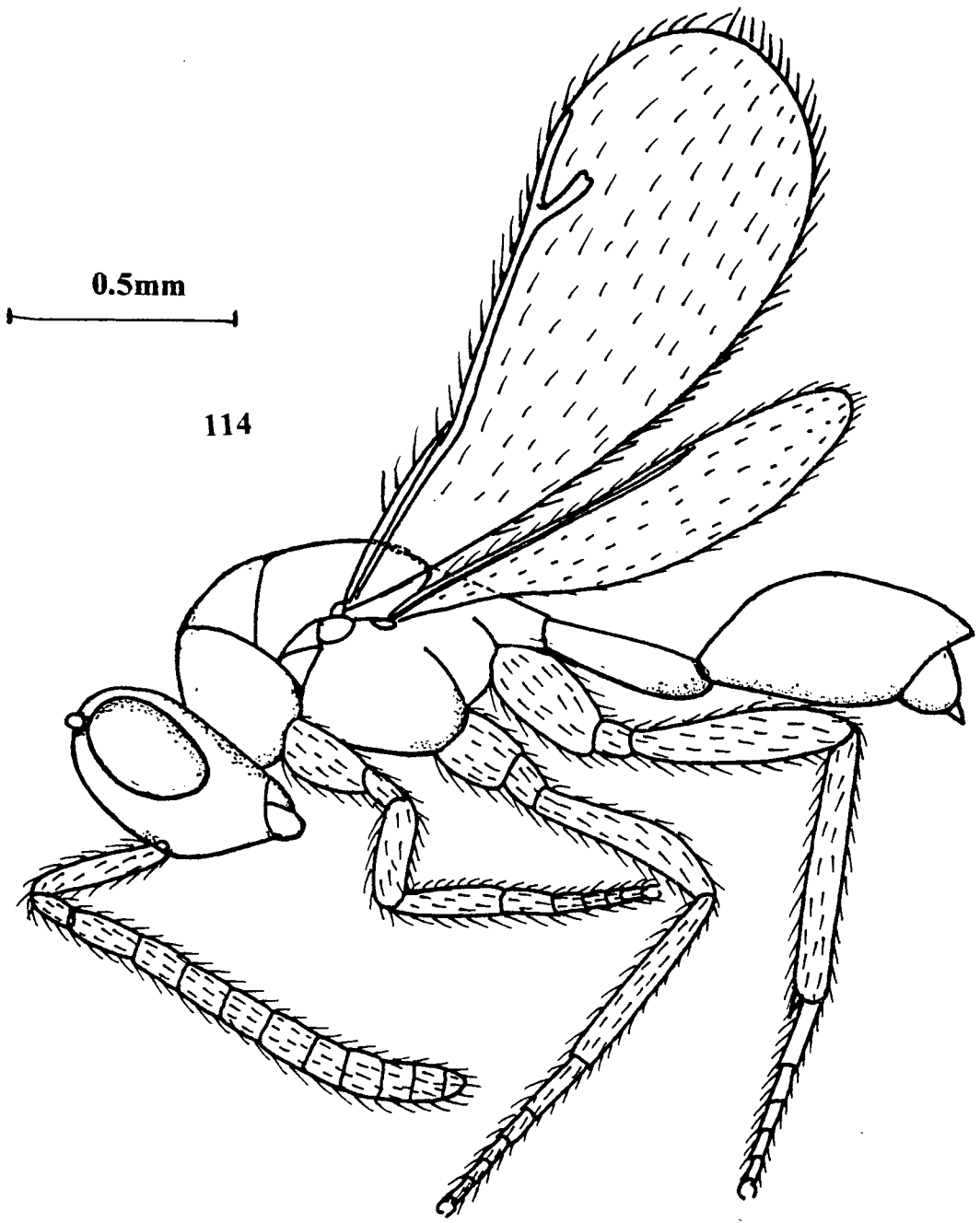
112



113

**Fig. 114.** *Parurios malabarensis* sp.nov.

Male, body profile



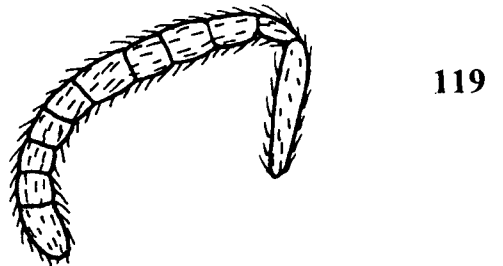
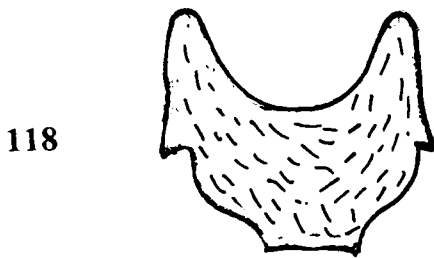
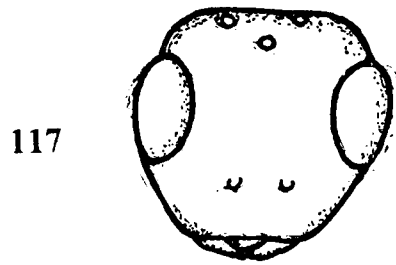
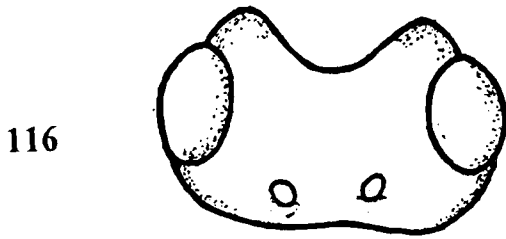
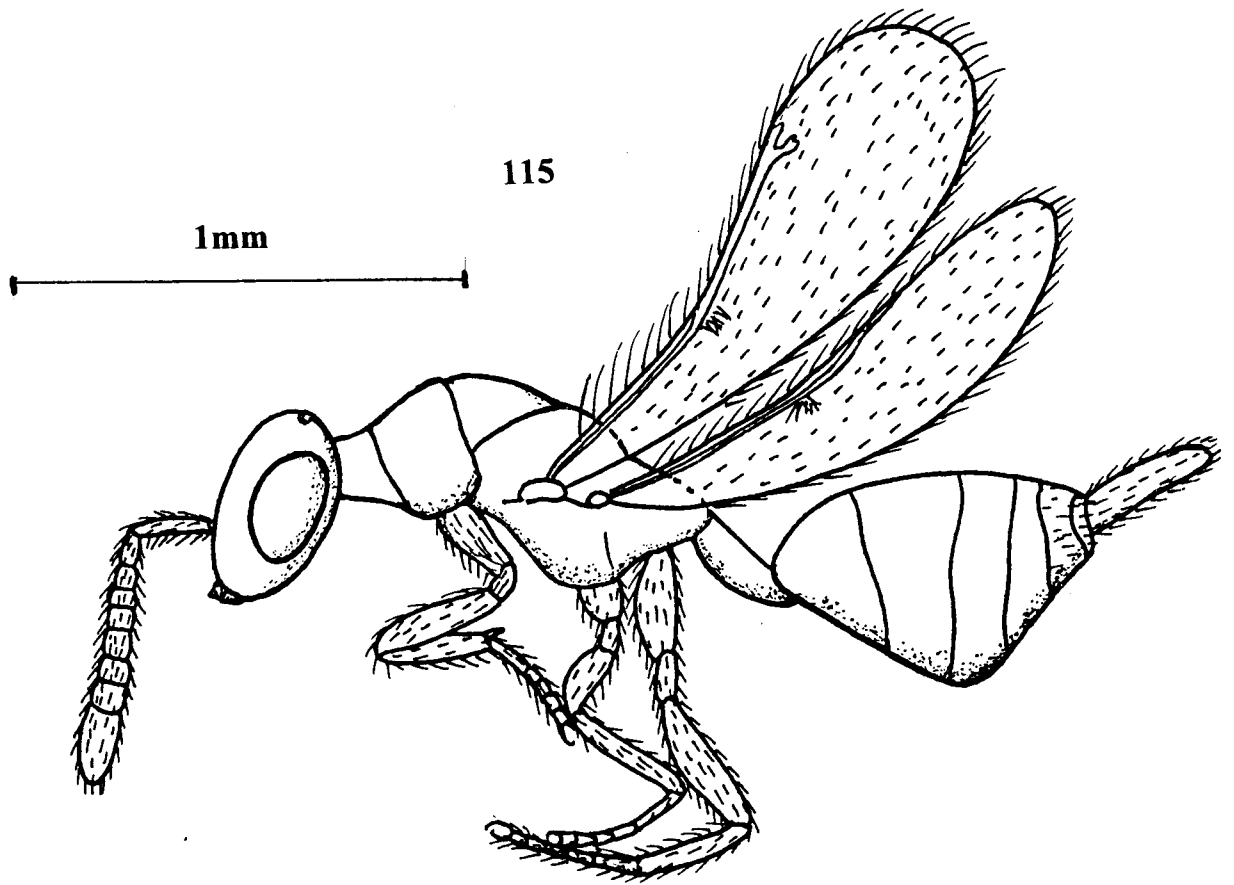
0.5mm

114

**Figs. 115-119.** *Cerocephala dinoderi* Gahan

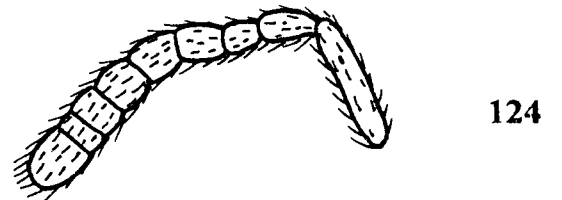
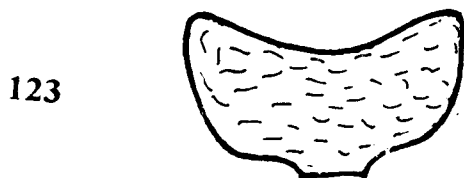
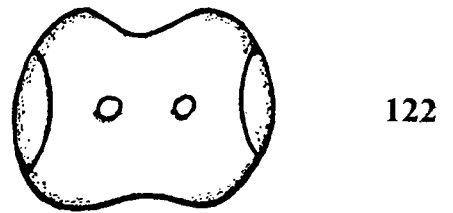
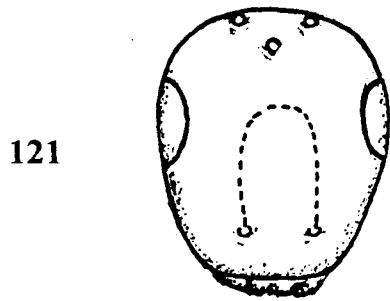
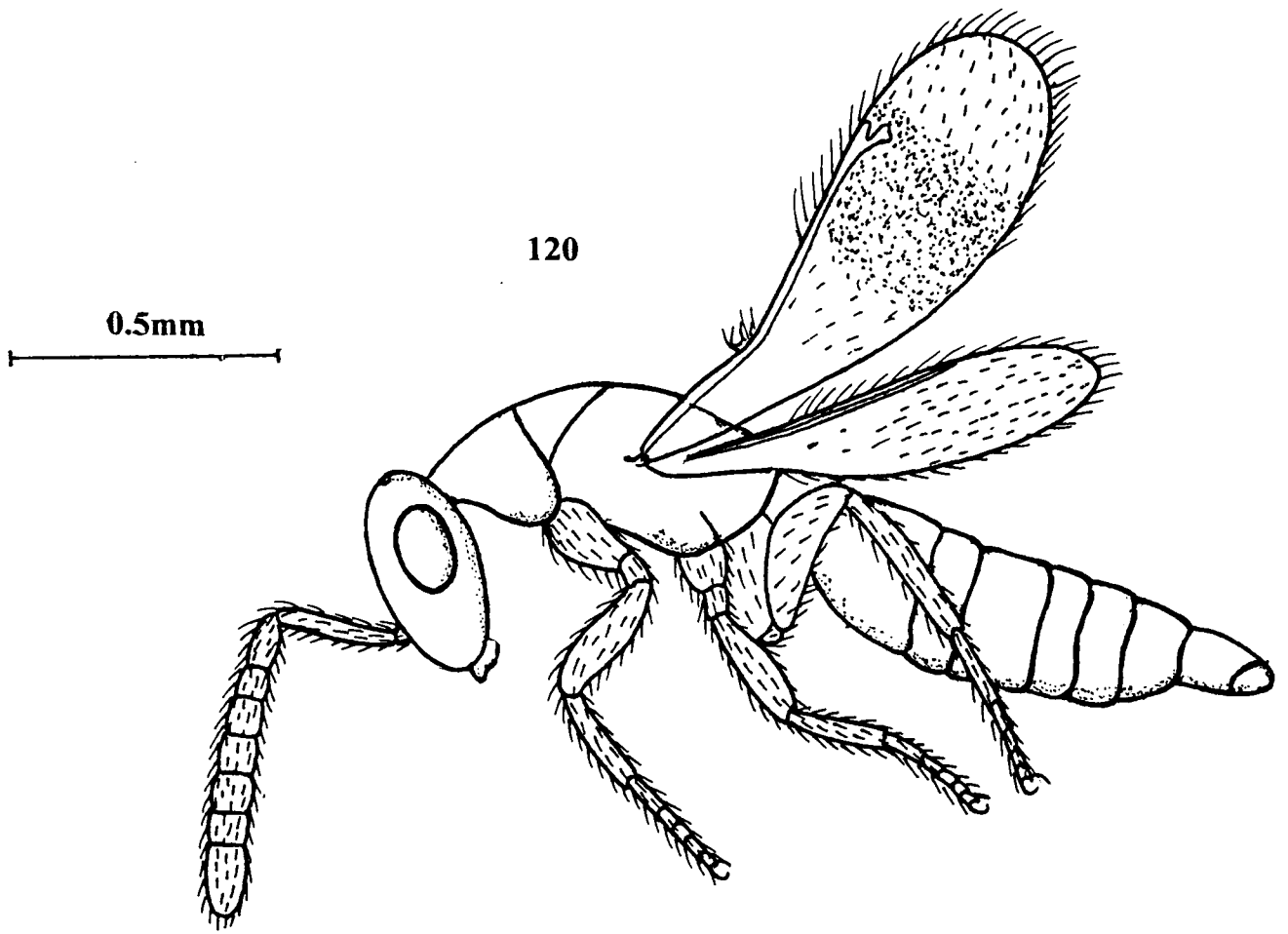
- 115. Female body profile
- 116. Head - dorsal view
- 117. Head - frontal view
- 118. Propodeum
- 119. Male antenna





**Figs. 120-124.** *Theocolax elegans* (Westwood)

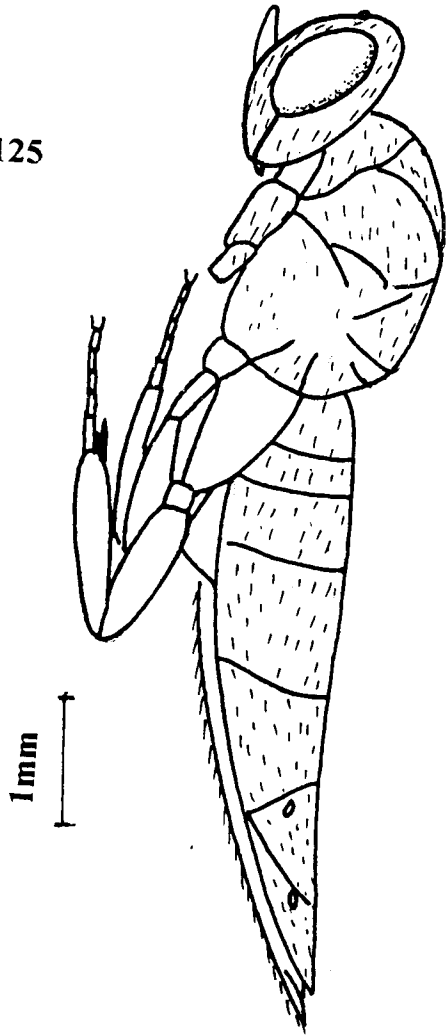
- 120. Female, body profile
- 121. Head, frontal view
- 122. Head, dorsal view
- 123. Propodeum
- 124. Male antenna



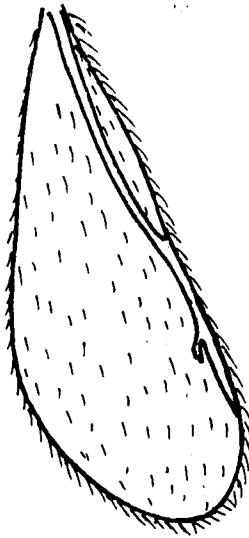
**Figs. 125-130.** *Grooca coorgensis* Sureshan & Narendran

- 125. Female, body profile
- 126. Forewing
- 127. Antenna
- 128. Head, frontal view
- 129. Head, dorsal view
- 130. Propodeum

125



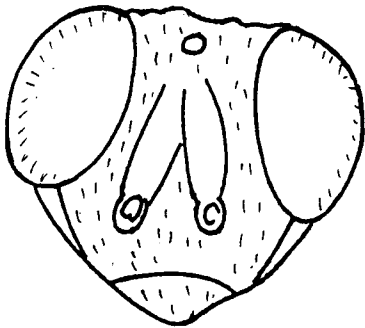
126



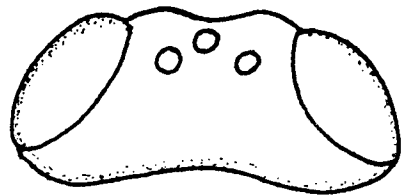
127



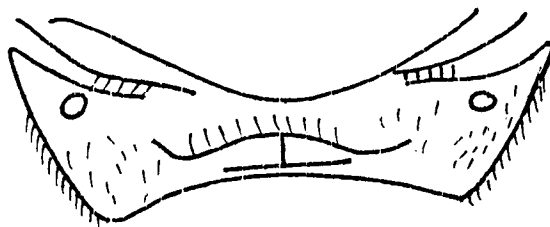
128



129



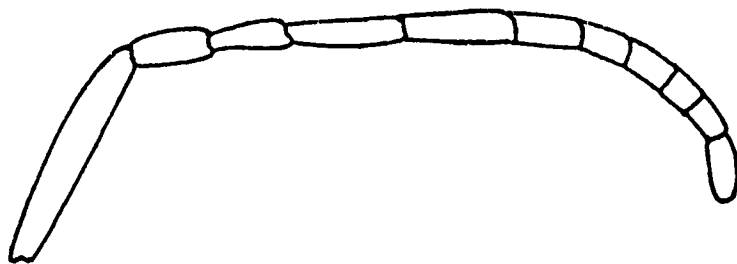
130



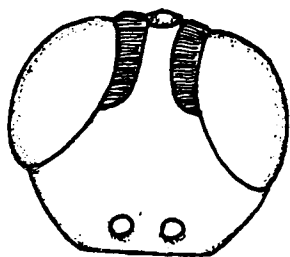
**Figs. 131-135.** *Oodera ahoma* (Mani & Kaul)

- 131. Antenna
- 132. Head, frontal view
- 133. Forewing
- 134. Fore leg
- 135. Head, dorsal view

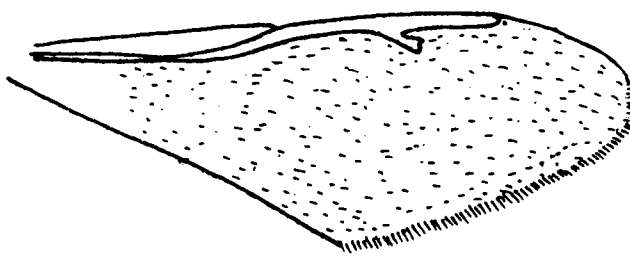
131



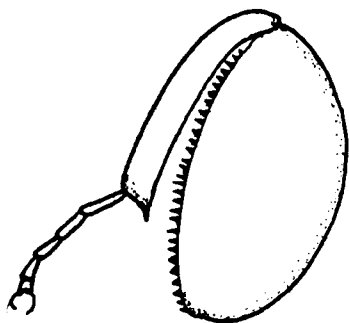
132



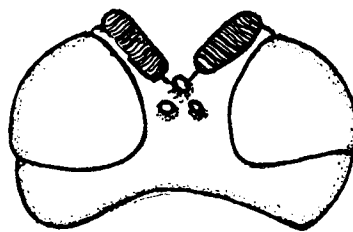
133



134



135



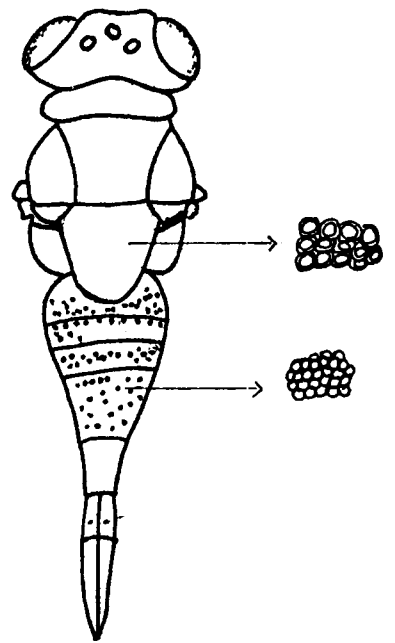
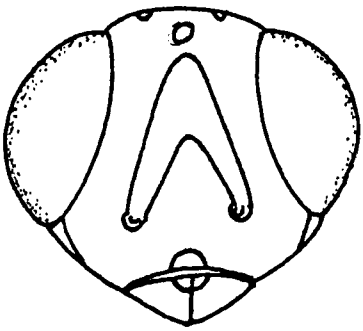
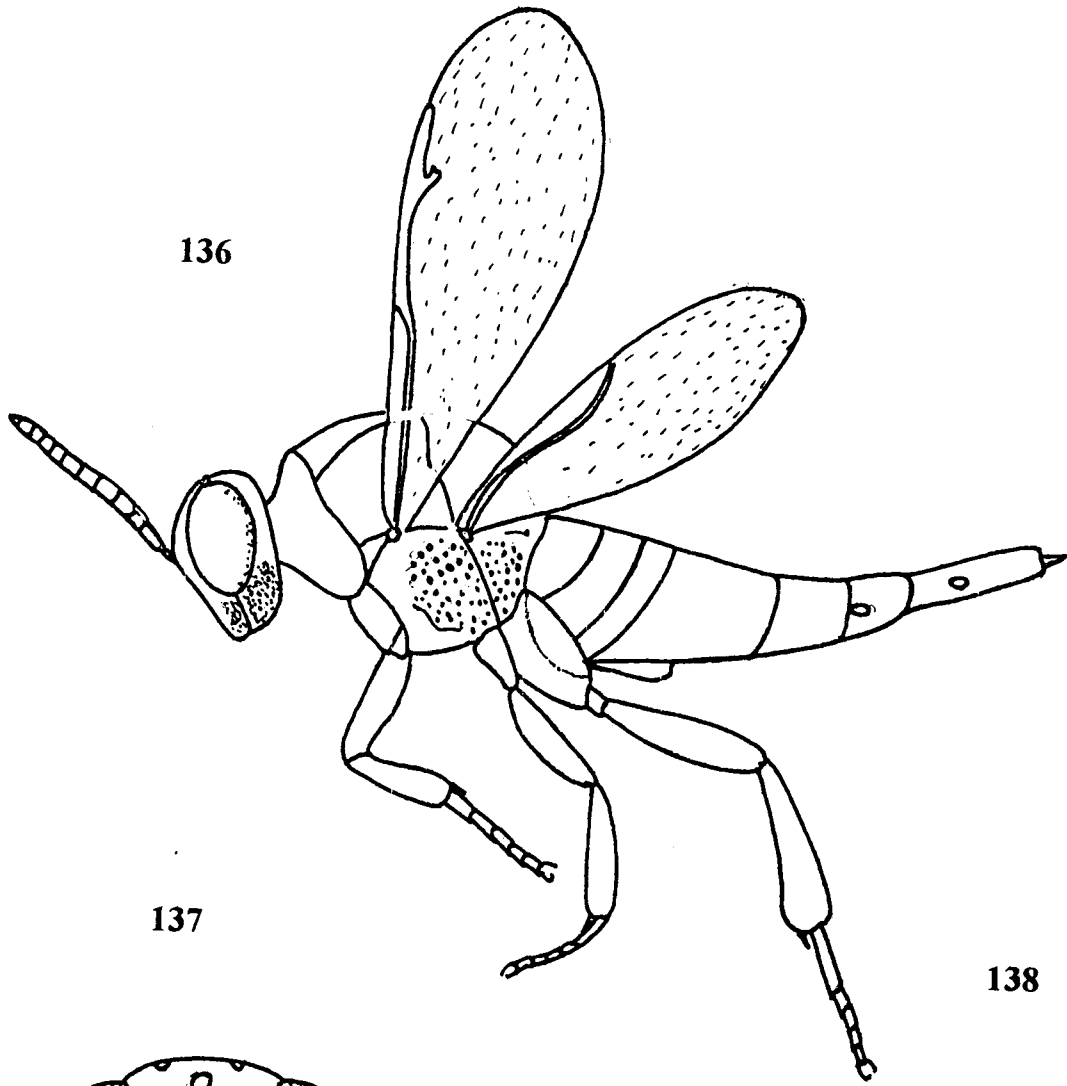
**Figs. 136-138.** *Riekisura keralensis* Narendran

136. Female, body profile

137. Head, frontal view

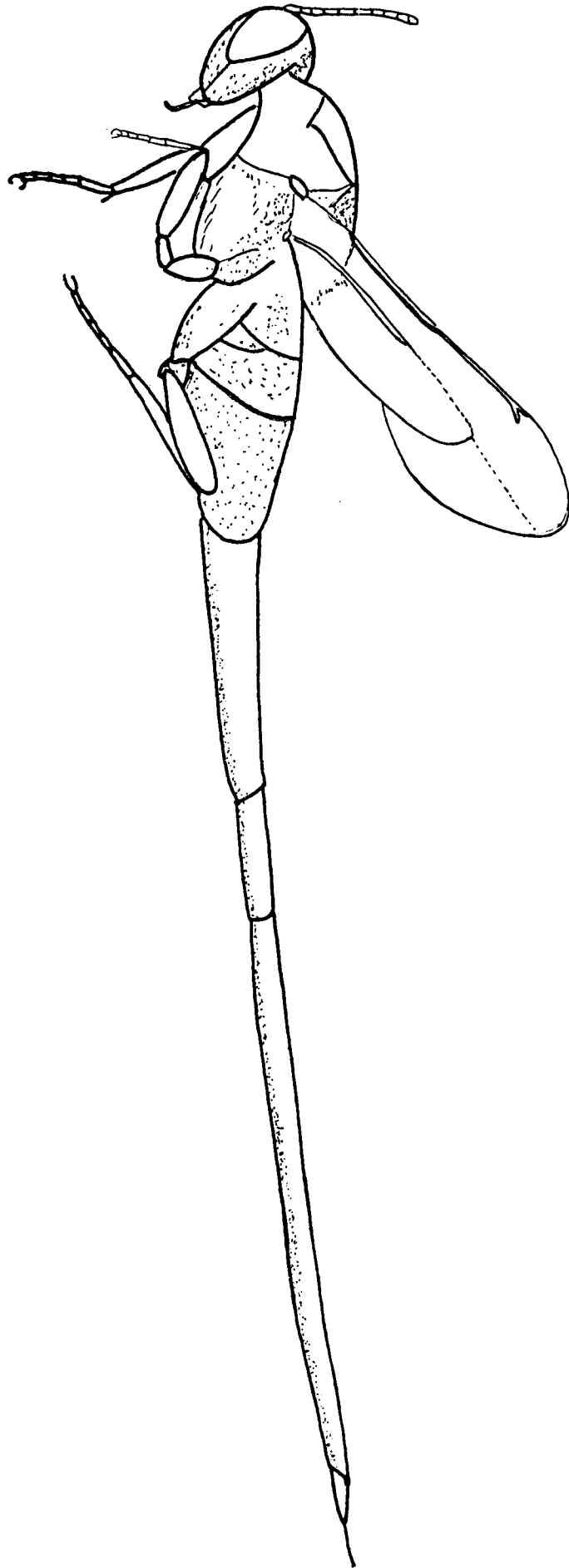
138. Body, dorsal view





Figs. 139.      *Solenura ania* (Walker)  
Female, body profile

139



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***Publication***

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**A NEW SPECIES OF *CLEONYMUS* LATREILLE (HYMENOPTERA :  
PTEROMALIDAE) FROM MALAYSIA**

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A new species of *Cleonymus* Latreille viz. *Cleonymus malaicus* sp. nov. from Malaysia is described and comparison with related species is made.

**INTRODUCTION**

While studying the arthropod community associated with bamboo in west Malaysia, Dr. Damir Kovac of Forschungsinstitut, Senckenberg, Frankfurt, Germany, found out several interesting species which included some remarkable new species of Chalcidoidea (Narendran & Kovac, 1995; Narendran *et al.*, 1995). Among these, an interesting new species of the genus *Cleonymus* is studied by the present authors and described below. It does not fit to the descriptions of any of the described species of *Cleonymus* by Walker (1837), Girault (1913, 1915, 1922, 1925, 1926 & 1927), Dodd (1924), Graham (1969), Boucek (1972 & 1988), Kamijo (1983 & 1996) and Zhongqi (1996).

*Cleonymus malaicus* sp. nov. (Figs. 1-3)

*Holotype female* : Length 4.5 mm.

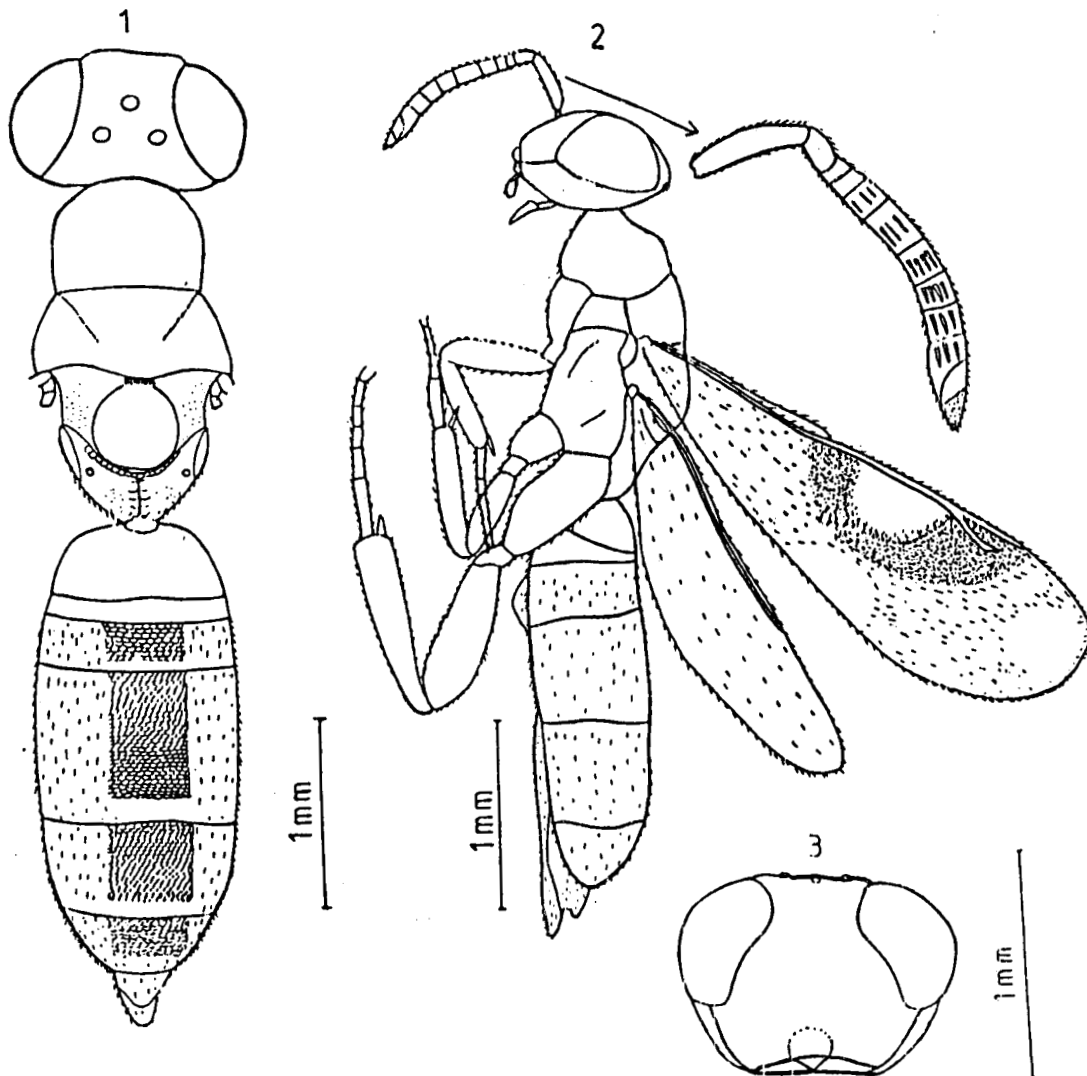
*Colouration* : Dark bluish green with coppery or bronzy reflections on head and thorax; gaster brownish green with slightly greenish smooth hind bands on T3 to T5. Scape, pedicel and F1 brown with rest of the flagellar segments yellowish brown. Legs brownish yellow except fore- and hind coxae which are concolorous with the thorax in greater part. Forewing subhyaline with fuscous clouds below parastigma and PMV, which are almost joined in the middle of the wing; hairs on disc just below MV pale, forming a hyaline patch, two other patches present below and beyond apical cloud (Fig. 2).

*Head* : Much broader than thorax (48:40) in dorsal view (Fig. 1) 1.8x as broad as long; POL nearly twice as long as OOL, which is 1.3x as long as lateral ocellus. Vertex irregularly and strongly reticulate. Head in front view 1.33x as broad as long. Clypeus broader than long (9:6.5); frons more weakly so, with area just in front of ocelli densely rugulose-reticulate. Malar space 0.35x as long as height of eye. Antennal formula 1173; scrobes shallow. Scape 3x as long as pedicel, pedicel 1.1x as long as following two segments combined. Flagellum with F1 and F2 distinctly transverse; F4 longer than broad, rest of the funicular segments quadrate; projection of eighth segment nearly reaching three quarters of club. Club 2.6x as long as broad, slightly shorter than preceding three segments combined.

*Thorax* : 1.9x as long as broad, pronotum medially 1.2x as broad as long weakly sloping anteriorly, densely and deeply reticulate, covered with hairs as in pronotum. Scutellum 1.1x as long as broad more weakly reticulate than mesoscutum. Dorsellum smooth propodeum medially

0.57x as long scutellum; median panels weakly but distinctly reticulate, becoming superficial anteriorly; besides depressions present along median carina which is rather weak; spiracular sulci shallow, broad; upper surface of costal cells anteriorly with a row of hairs, becoming double apically; MV fully 2.8x as long as STV relative lengths of SMV : PMV : STV as 45:31:16:11. hind femur serrated (Fig. 2).

*Gaster* : Length about 1.1x as long as head plus thorax in dorsal view, 1.4x as long as thorax, 2.6 as long as broad. T4 1.2x as broad as long, as long as preceding tergites combined; medially 1.6x as long as T5. T1 and T2 almost smooth and polished; T3-T5 rather uniformly and strongly reticulate with a smooth band posteriorly.



Figs. 1-3. *Cleonymus malaicus* sp. nov. Female : 1. Body in dorsal view, 2. Body profile; 3. Head in front view.

*Male* : Unknown

*Host* : Unknown

*Holotype* : Female. West Malaysia, Ulu Gombak, Coll. D. Kovav, ex. Bamboo, 2. Viii. 1994 (Department of Zoology, University of Calicut).

*Remarks* : This species comes close to *Cleonymus longinervus* Kamijo from Japan, in general appearance but differs from it in having:

1. T4 1.6x long as T5 (in *Cleonymus longinervus* T5 2.2x as long as T4),
2. T1 and T2 almost smooth and polished (in *Cleonymus longinervus* only T1 smooth and polished).
3. T1 3.1x as long as T2 (in *Cleonymus longinervus* T1 1.7x as long as T2).

It may be distinguished from *C. balcanicus* Boucek by the weaker sculpture of the frons in front of the ocelli, the relatively shorter OOL which is only 1.3x as long as lateral ocellus (more than 1.5x in *C. balcanicus*) and the long T4. It may also be distinguished from *C. trifasciatipennis* Girault from Australia in having serrated hind femur. In *C. trifasciatipennis* hind femur with only a sub apical tooth on ventral margin.

*Cleonymus malaicus* does not fit to the key to Japanese species of *Cleonymus* by Kamijo (1996) or to the key of European species by Boucek (1972).

#### ACKNOWLEDGEMENTS

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