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# BIOSYSTEMATIC STUDIES ON SOME EULOPHID PARASITOIDS (HYMENOPTERA: EULOPHIDAE) OF NORTHERN INDIA

*Thesis*

*Submitted to the*

Govind Ballabh Pant University of Agriculture & Technology,
PANTNAGAR-263 145 (U.S. Nagar), Uttarakhand, INDIA

***By***

*Sandeep Kumar*

*IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF*

# Doctor of Philosophy

**(ENTOMOLOGY)**

DECEMBER, 2008

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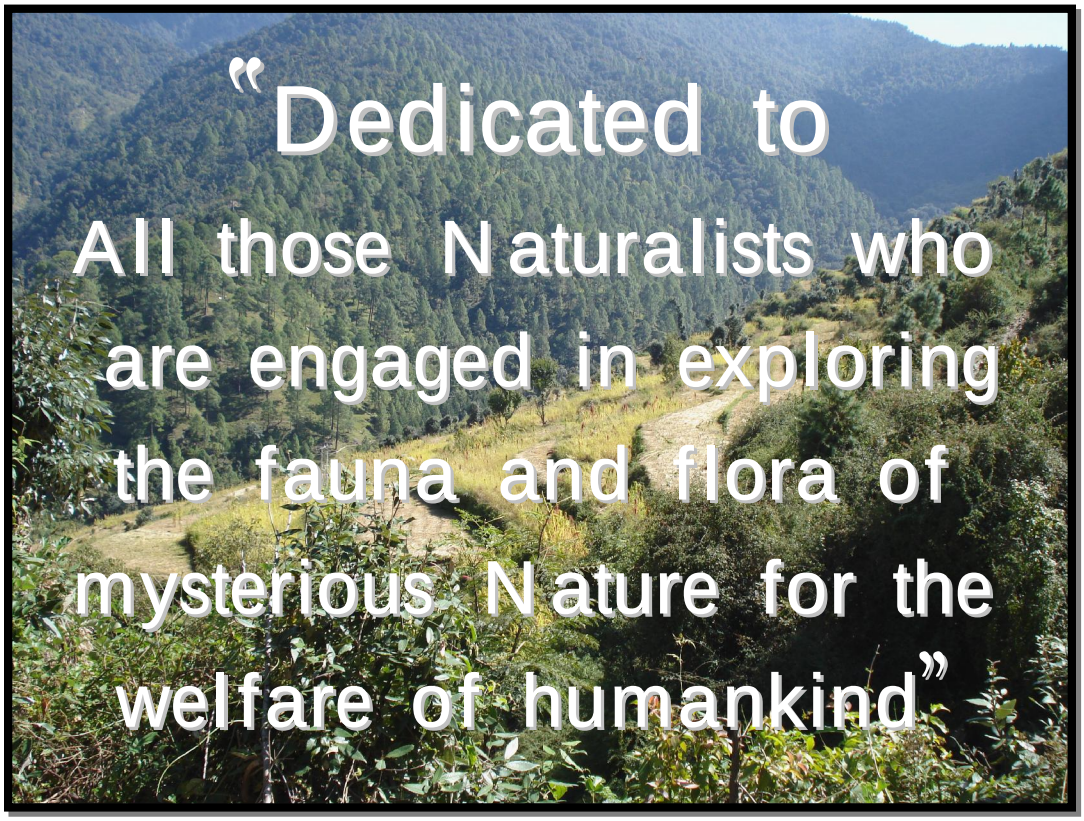

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# Acknowledgement

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*Pantnagar*
*December, 2008*

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# CERTIFICATE

This is to certify that the thesis entitled **"BIOSYSTEMATIC STUDIES ON SOME EULOPHID PARASITOIDS (HYMENOPTERA: EULOPHIDAE) OF NORTHERN INDIA"** submitted in partial fulfilment of the requirements for the degree of **DOCTOR OF PHILOSOPHY** with major in **ENTOMOLOGY** and minor in **PLANT PATHOLOGY** of the College of Post-Graduate Studies, G.B. Pant University of Agriculture and Technology, Pantnagar, is a record of *bona-fide* research carried out by **Mr. SANDEEP KUMAR, Id. No. 29726**, under my supervision and no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged.

**(M.A. Khan)**
Chairman
Advisory Committee

Pantnagar
December, 2008

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# CERTIFICATE

We, the undersigned, members of the Advisory Committee of **Mr. SANDEEP KUMAR, Id. No. 29726**, a candidate for the degree of **DOCTOR OF PHILOSOPHY** with major in **ENTOMOLOGY** and minor in **PLANT PATHOLOGY**, agree that the thesis entitled **"BIOSYSTEMATIC STUDIES ON SOME EULOPHID PARASITOIDS (HYMENOPTERA: EULOPHIDAE) OF NORTHERN INDIA"** may be submitted in partial fulfilment of the requirements for the degree.

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# CONTENTS


| S.NO. | CHAPTERS | PAGE |
|---|---|---|
| 1. | INTRODUCTION | |
| 2. | REVIEW OF LITERATURE | |
| 3. | MATERIALS AND METHODS | |
| 4. | RESULTS AND DISCUSSION | |
| | Family Eulophidae | |
| | An integrated key to the Subfamilies, tribes and Indian genera of Eulophidae | |
| 4.1 | Subfamily – Tetrastichinae | |
| 4.1.1 | Genus *Tetrastichus* Haliday | |
| | Key to the some Indian species of Genus *Tetrastichus* Haliday | |
| 4.1.1.1 | *Tetrastichus figensis* sp.n. | |
| 4.1.1.2 | *Tetrastichus clubensis* sp.n. | |
| 4.1.1.3 | *Tetrastichus minutus* sp.n. | |
| 4.1.1.4 | *Tetrastichus eggaevorus* sp.n. | |
| 4.1.1.5 | *Tetrastichus narendranii* sp.n. | |
| 4.1.1.6 | *Tetrastichus mallitalensis* sp.n. | |
| 4.1.1.7 | *Tetrastichus clavatus* Khan *et al.* | |
| 4.1.1.8 | *Tetrastichus hillensis* sp.n. | |
| 4.1.1.9 | *Tetrastichus taprobanensis* Ranweera | |
| 4.1.1.10 | *Tetrastichus bhimtali* sp.n. | |
| | Checklist for world fauna of Genus *Tetrastichus* Haliday | |
| 4.1.2 | Genus *Aprostocetus* Westwood | |
| | Key to the Indian species of Genus *Aprostocetus* Westwood | |
| 4.1.2.1 | *Aprostocetus hayatae sp.n.* | |
| 4.1.2.2 | *Aprostocetus silvestriae* sp.n. | |
| | Checklist for world fauna of Genus *Aprostocetus* Westwood | |

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PDF Complete

4.1.3 Genus *Neotrichoporoides* Girault
Key to the Indian species of Genus *Neotrichoporoides* Girault
4.1.3.1 *Neotrichoporoides mani* sp.n.
Checklist for world fauna of Genus *Neotrichoporoides* Girault
4.1.4 Genus *Mestocharella* Girault
Key to the some species of Genus *Mestocharella* Girault
4.1.4.1 *Mestocharella kausaniensis* sp.n.
4.1.4.2 *Mestocharella pauri* sp.n.
Checklist for world fauna of Genus *Mestocharella* Girault
4.1.5 Genus *Tamarixia* Mercet
4.1.5.1 *Tamarixia brassicae* sp.n.
4.1.5.2 *Tamarixia minerensis* sp.n.
Checklist for world fauna of Genus *Tamarixia* Mercet
4.2 Subfamily – Eulophinae
4.2.1 Genus *Bishtiella* gen.n.
4.2.1.1 *Bishtiella indica* sp.n.
4.2.2 Genus *Elachertus* Girault
Key to the some species of Genus *Elachertus* Girault
4.2.2.1 *Elachertus indica* sp.n.
Checklist for world fauna of Genus *Elachertus* Girault
4.2.3 Genus *Euplectrus* Westwood
Key to the some species of Genus *Euplectrus* Westwood
4.2.3.1 *Euplectrus scutellaris* sp.n.
4.2.3.2 *Euplectrus bristlis* Khan *et al.*
Checklist for world fauna of Genus *Euplectrus* Westwood
4.2.4 Genus *Diglyphus* Walker
Key to the some species of Genus *Diglyphus* Walker
4.2.4.1 *Diglyphus horticola* Khan
Checklist for world fauna of Genus *Diglyphus* Walker
4.3 Subfamily – Entedoninae
4.3.1 Genus *Entedon* Dalman
4.3.1.1 *Entedon erdosensis* sp.n.
4.3.1.2 *Entedon dubeyensis* sp.n.
Checklist for world fauna of Genus *Entedon* Dalman

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4.3.2 Genus *Chrysocharis* Foerster

Key to the some species of Genus *Chrysocharis* Foerster

4.3.2.1 *Chrysocharis malus* sp.n.

4.3.2.2 *Chrysocharis orientalis* sp.n.

4.3.2.3 *Chrysocharis longiclavatus* Khan *et al.*

Checklist for world fauna of Genus *Chrysocharis* Foerster

4.3.3 Genus *Neochrysocharis* Kurdjumov

Key to the some species of Genus *Neochrysocharis* Kurdjumov

4.3.3.1 *Neochrysocharis parthenicus* sp.n.

4.4 Subfamily - Euderinae

4.4.1 Genus *Euderus* Haliday

Key to the some species of Genus *Euderus* Haliday

4.4.1.1 *Euderus albitartarsus* Zett.

4.4.1.2 *Euderus agromyzae* Gangrade

4.4.1.3 *Euderus elongata* sp.n.

Checklist for world fauna of Genus *Euderus* Haliday

5. SUMMARY AND CONCLUSION

LITERATURE CITED

VITA

ABSTRACT

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# Introduction

*"Get good counsel before you begin and when you have decided act promptly"*

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# Chapter 1 Introduction

The Indian region is recognized as one of the major centers of biodiversity in the World. A sound biodiversity knowledge base is a prerequisite for effective conservation, environmental assessment, ecological research management and sustainable use of biological resources. In the current millennium, India will become a major economic power because of its biodiversity. Insects comprise of about 75 per cent of all organisms living on this Planet, some beneficial and others harmful which attain the status of a pest.

In spite of much information available on Entomofauna, even today massive amount of the species are either not known or improperly understood. Due to lack of this information, Economic Entomologists are unable to use the beneficial insects to the fullest. To overcome this problem, great attention must be laid on promoting basic studies like identification of various useful insect species.

The lack of knowledge of species diversity hampers the further research on the species within habitats and their interactions with other organisms. Taxonomy is the essential first step for all fields of scientific endeavor and a species name provides the international scientific community with an unambiguous mean of access to information concerning that species. Surveying species diversity is thus a prerequisite for other biological disciplines, for example, conservation biology and ecology.

Interest in Systematics can be traced back to 1737 with the first publication of *Systema Naturae* or "The Natural System" by Linnaeus**.** After that it was revised numerous times and finally published as the revised 10$^{th}$ edition of *Systema Naturae* in 1758. Traditionally, the order Hymenoptera has been divided into two suborders, “Symphyta” and “Apocrita”. The latter is divided into two sections or infraorders namely “Parasitica” and “Aculeata” (Gauld and Bolton,

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1988). The “Parasitica” hymenopterans constitute the most diverse group within the order, containing 50% or more of the total described species (LaSalle and Gauld, 1993).Among the parasitic Hymenoptera, wasps in the super family Chalcidoidea are ecologically and economically the most important insects for the control of other insect pest population (LaSalle, 1993).

The super family Chalcidoidea has small to minute wasps, ranging from 0.11 - 45 mm (rarely more than 10 mm) but usually on an average 0.2 - 4 mm in body length. It is also characterized by highly reduced forewing venation consisting of (at most) a single vein complex subdivided into submarginal, marginal, postmarginal and stigmal veins. Chalcidoids are the only apocritans possessing an independent, externally visible, mesopleural sclerite - the prepectus separates the mesopleuron from the pronotum, often resulting in the failure of the pronotum to contact the tegula. The mesothoracic spiracle, if evident, is located at the dorsal margin of the pronotum, near the pronotal / prepectal juncture. Most Chalcidoids possess multiporous plate sensilla on the flagellar segments that usually project above and beyond each segment. The species of Chalcidoidea were distributed in 20 families and 86 sub families and estimated the number of species have ranged between 60,000 and 1, 00,000 (Gibson *et al.*, 2000). Noyes (1998) regarded 2,040 genera and 21, 250 species as valid in the super family Chalcidoidea.

Among these families, the members of Eulophidae are very much promising agents for the control of insect pests of agricultural importance world wide. Eulophidae is large family of the superfamily chalcidoidea comprising of about 300 genera in the World, among these 150 genera are found in the Indo-Australian region and about 60 genera in the Indian subcontinent (Narendran and Fausi, 2002). There are 294 genera of Eulophidae in the world (Noyes, 2002) and Eulophidae comprises more than 3000 species all over the world and their number is constantly increasing.Eulophids are small to medium size chalcids which can be easily recognized at once by the four segmented tarsi, antennae with two to four

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(rarely five) funicular segments, short and straight tibial spur of the fore tibia, Axilla often produced forward of the scuto- scutellar suture and non-pedunculate wings.

For the proper and successful control of insect pests much awareness is being paid to their natural enemies as potential biological control agents. Despite the fact that eulophids are generally of minute size, they have a great repressive effect on pest population. The entomophagous eulophids include several species (*Arachnobius* and some *Pediobius*) emerging from egg-sacs of spiders, but the vast majority attack Insecta-Pterygota. Larval parasitoids predominate but some species are egg parasitoids and pupal parasitoids. Eulophids attack a wide range of hosts viz. Lepidoptera, Diptera (including leaf miners), Coleoptera, Hemiptera and gall makers, stem borers, coccids etc and the host spectrum will certainly expand with improved knowledge of regional fauna (Boucek, 1988).

The insect parasitoids are very efficient and often species specific in action, therefore, their correct identification is obligatory to their effective actions. An advancement of biosystematics knowledge is greatly needed in the area of basic studies in relation to fauna studies, host-parasitoid relations, ecological and ethological aspects etc, before going for an adventure in the biological control.

In order to provide more information on the basic studies of parasitoids, the present biosystematic studies on parasitoids have been initiated with following objectives:

1. To carry out extensive survey of Eulophid parasitoids and their hosts from various eco-climatic zones of Northern India.
2. Identification of various host insects and their Eulophid parasitoids.
3. To study and describe as many as possible in order to access the family Eulophidae in Northern India.
4. To study and evaluate taxonomic characters and develop keys for identification.

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5. To study the relationship of North Indian Eulophid parasitoids with the world Eulophid fauna.

The present investigation is a minor contribution to the vital and vast field of taxonomy of parasitic Hymenoptera. It comprises a comprehensive description of thirteen genera and thirty one species of Eulophidae out of which one genus and twenty four species are new to the Entomological and seven species have also been redescribed.

The Eulophid genera included in the present study are: *Aprostocetus* Westwood, *Bishtiella* gen. nov., *Chrysocharis* Forster, *Diglyphus* Walker, *Elachertus* Spinola*, *Entedon* Dalman, *Euderus* Haliday, *Euplectrus* Westwood, *Mestocharella* Girault, *Neochrysocharis* Kurdjumov, *Neotrichoporoides* Girault, *Tamarixia* Mercet and *Tetrastichus* Haliday.

The genus marked with an asterisk is reported for the first time from India.

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# Review of Literature

*"The past can not be changed,*
*the future is yet in your power"*

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# Chapter 2 Review of Literature

Taxonomic studies on the parasitic Hymenoptera belonging to superfamiliy Chalcidoidea were started in the 18th century. The earliest record on chalcid parasitoid has been made by Carolus Linnaeus under the name *Cynpis* in the year 1758. Since then a number of incredible taxonomic studies have been carried out by several workers and are being reported from different parts of the world. Every achievable endeavor has been made to review all their up-to-date contributions to the knowledge of Eulophidae family.

The family Eulophidae based on Olivier's genus *Eulophus* was described in 1791. Westwood in 1840 made some remarkable contributions in his work 'An introduction to modern classification of insects" and placed the eulophid parasitoids under the subfamily Eulophidea of the family Chalcididae. He attributed thirteen genera to it viz., *Stenomesius* Westwood, *Euplectrus* Westwood, *Hemiptarsenus* Westwood, *Dicladocerus* Westwood, *Elasmus* Westwood, *Aprostocetus* Westwood, *Omphale* Haliday and *Cirrospilus* Westwood.

Forster in 1856 made some valuable contributions in his work entitled "Hymenopterologische studies" and attributed to eulophid genera to his newly proposed families viz., **(1)** Elachistoidae for the genera *Euplectrus* Westwood, *Elachistus* Spinola, *Aulogymnus* Forster, *Olinx* Forster and *Teleogmus* Forster; **(2)** Eulophidae for the genera *Cirrospilus* Westwood, *Melittobia* Westwood, *Solenotus* Forster, *Eulophus* Olivier and *Sympiesis* Forster **(3)** Entedonoidae for the genera *Epiclerus* Haliday, *Omphale* Haliday, *Chrysocharis* Forster and *Derostenus* Westwood and **(4)** Tetrastichoidae for the genera *Triphasius* Forster, *Anozus* Forster; *Pterothrix* Westwood; *Trichaporus* Forster, *Ceranisus* Walker, *Baryscapus* Forster, *Hyperteles* Forster and *Tetrastichus* Haliday. Besides, he

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provided an identification key to various genera under each family. Walker in 1842 renamed the families Elachistoidae, Entedonoidae, Eulophoidae and Tetrastichoidae as Elachistidae, Entedonidae, Eulophidae and Tetrastichidae, respectively.

In 1878, Thomson in his "Hymenoptera Scandinaviae" degraded the families as proposed by Forster (1856) to the rank of tribes, Elachistina, Eulophina, Entedonina and Tetrastichina. Ashmead in 1894 recognized Elachistinae, Eulophinae, Entedoninae and Tetrastichinae as subfamilies of Chalcididae. Later in 1904 he accepted family status of Eulophidae and included Elachertinae (=Elachistoidae Forster), Eulophinae, Entedoninae, Tetrastichinae and Aphelininae as its subfamilies. Further, he divided the subfamilies into tribes viz., **1.** Elachertinae (Euplectrini, Ophelinini and Elachertinj), **2.** Eulophinae (Eulophini and Hemiptarsenini), **3.** Entedoninae (Tetracampini, Entedonini, Omphalini and Pediobini)**, 4.** Tetrastichinae (Tetrastichini and Ceratoneurini) and **5.** Aphelininae (Aphelinini and Pteroptricini). He proposed several new genera under the family Eulophidae. Vireck in 1916 raised the rank of subfamily Aphelininae to the family Aphelinidae.

Girault in 1913 followed the Ashmead's 1904 system of classification to classify family Eulophidae into subfamilies and tribes. He added some significant findings during 1911-1926 and proposed several genera under the family Eulophidae.

Walker in 19l5a described four new species under four genera of the family Eulophidae from Ceylon. In the following years -1915b, 1916, 1922, 1925, he described twenty two new species under seven genera of the family Eulophidae from African regions. Gahan and Fagan in 1923 proposed new names *Giraulta* and *Secodoidea* for the genera *Cirrospilopsis* Girault and *Secodes* Girault, respectively.Ferriere made some very excellent and important contributions to the knowledge of Eulophidae from Asiatic in 1930, 1931b, African in 1931a.

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Mani in 1938 adopted Ashmead's 1904 system of classifying eulophid into subfamilies and tribes in his "Catalogue of Indian insects, Part 23 Chalcidoidea". However, he suffixed to each tribe name as-ariae. Catalogue covered 67 species under 29 genera of the family Eulophidae. In 1976, he accepted the family status of Eulophidae, Tetrastichidae and Elachertidae.

Burks in 1943 in "The North American Parasitic wasps of the Genus *Tetrastichus*- a Contribution to Biological Control of Insect Pests" made very significant efforts on the understanding of its species and relationship. He described 23 new species under the genus *Tetrastichus* for the first time. Detailed description and list of synonymy of the genus *Tetrastichus* was also given. In 1965, he suppressed the family Elasmidae and accorded to it the rank of subfamily Elasminae under the family Eulophidae on the basis of four segmented tarsi, anteriorly extended conditions of axillae, three segmented funicle of female antennae and numerous denticles of mandible. His other important contributions are dated 1952, 1958, 1963, 1967 a, 1967b, 1968, 1975, and 1979.

Ghesquiere in 1946 proposed new names *Heteroscapiscus*, *Hyssopiscus*, *Metacriastnus*, *Microcaeticus*, *Thymiscus* and *Lopodytiscus* for the genera *Heteroscapus* Brethes, *Hyssopus* Girault, *Microcaetus* Meunier, *Thymus* Girault, *Lopodytes* Rond respectively. Gahan in 1946 transferred the genus *Paraspalangia* Ashmead from subfamily Spalangiinae to Tetrastichinae.

Muesebeck *et al.* (1951) followed Ashmead (1904) in classifying Eulophidae into five subfamilies viz., Elachertinae, Eulophinae, Entedontinae, Tetrastichinae and Aphe1ininae. They incorporated in catalogue about 613 species under 90 genera of Eulophidae from America and North of Mexico.

In 1951, Risbec recognized three subfamilies: Elachertinae, Entedoninae and Eulophinae under the family Eulophidae. The subfamily Entedoninae was divided into two tribes: Tetracampini and Omphalini, and the subfamilies Elacheritinae and Eulophinae remain undivided. He suppressed the subfamily

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Tetrastichinae and transferred its genera to the tribe Omphalini of the subfamily Entedoninae. In the following year, 1952, Risbec again demoted the subfamilies and tribes (excluding Aphelinids) as recognized by Ashmead (1904) under the family Eulophidae to the ranks of tribes and subtribes, respectively.

Nikol'skaya in 1952 made an outstanding contribution to the "Chalcid fauna of the USSR" and followed Forster 1856 and Walker 1872 in recognizing Elachertidae (=Elachistoidae Forster), Eulophidae, Entedontidae and Tetrastichidae as distinct families. Further, she gave a key to genera of USSR under each family and included Tetracampid genera viz., *Foresterella* Dalla Torre, *Platynochilus* Westwood and *Tetracampe* Forster in the family Entedontinae.

Domenichini in 1953 considered Elachertidae, Eulophidae, Entedonidae, Tetrastichidae and Tetracampidae as distinct families. He highlighted the taxonomic significance of morphological structures in the abdomen of some members of the above families. In 1965 he accepted Tetrastichinae as subfamily and divided it into two tribes, Melittobiini and Tetrastichini. Further, he studied comprehensively on the Palearctic species of the genus *Tetrastichus* Haliday. The family status of Tetracampidae was later recognized and accepted by all the recent workers Erdos (1953, 1956a); Boucek (1958), Peck (1963) and Peck *et al.* (1964). His other important contributions were made in 1957, 1966, 1966a, 1966b, 1967.

Erdos (1944) in his excellent work, "Species Hungaricae Generis *Entedon* Dalm" studied the genus *Entedon* in great detail by providing the valuable information on its morphology and dividing the genus *Entedon* into six subgenera viz., *Trochentedon* Erdos, *Pleuropachy* Westwood, *Nephelentedon* Erdos, *Chlorentedon* Erdos, *Megalentedon* Erdos and *Dolichentedon* Erdos. He facilitated the identification of different species by providing a key. His exhaustive studies of eulophid parasitoids culminated in recognition of four subfamilies viz., EIachertinae, Eulophinae, Entedontinae and Tetrastichinae

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under the family Eulophidae. His other important contributions were made in 1951, 1953, 1954, 1955, 1956a, 1956b, 1958, 1961, 1966. He followed Ashmead in dividing the subfamilies Elachertinae into three and Eulophinae into two tribes, respectively. He recognized only three tribes: Entedontinae Ashmead, Omphalini Ashmead and his new tribe Euderini under the subfamily Entedontinae and made no significant effort to classify the subfamily Tetrastichinae. Altogether he described 363 species under 58 genera of the family Eulophidae.

De Santis in 1949 a, 1949 b, 1961, 1964, 1966, 1972, 1977, 1979 made an exhaustive study of the parasitic fauna and agreed to family status as proposed earlier by Forster in 1856 (Eulophidae, Tetrastichidae, Elachertidae and Entedontidae) under each family genera and species (Based on Girault's Pvt. Publ.) was given.

Delucchi 1954a, 1954b, 1954c and 1962 made some important contributions to the family Eulophidae. He proposed new genera in 1954 a viz., *Enaysma*, *Epilampsis* under the subfamily Entedontinae and described many new species. In 1954 c he gave a comprehensive account of the various genera of the subfamily Entedontinae with special emphasis on *Chrysocharis* and also framed a key for the identification of various species of different genera.

Boucek (1958, 1959a, 1959b, 1961, 1963, 1964, 1965, 1966, 1970, 1974, 1976a, 1977a, 1977c, 1978, 1986, 1988) is well known for his remarkable contribution to the European eulophids. His outstanding contribution "Australasian Chalcidoidea" (1988) provided excellent knowledge about the Chalcidoidea biodiversity from the Australian region, in which he discussed the families viz., Chalcididae, Leucospidae, Eurytomidae, Torymidae, Ormyridae, Agaonidae, Pteromalidae, Perilampidae, Eucharitidae, Eupelmidae, Tanaostigmatidae, Rotoitidae, Tetracampidae and Eulophidae. He also proposed key to the genera of Australasian Eulophinae under subfamilies Eulophinae, Entedoninae, Tetrastichinae and Euderinae and subdivided these subfamilies into

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tribes viz., (1) Eulophinae, into tribe Anselmellini trib.n.; Keryini trib. n. Ophelimini, Eulophini, Euplectrini and Elachertini and listed out 55 genera including new and old under this subfamily (2) Tetrastichinae (Tribus, Tetrastichini and Gyrolasomyiini tribe, n.) which includes description of 28 genera (3) Entedoninae (tribus, Platytetracampini tribe n. and Entedonini consisting of 41 described genera. The genus *Awara* Boucek which was placed in the tribe Euplectrini of the Eulophinae (Boucek, 1988), later on transferred from the Eulophinae (Euplectrini) to the Tetrastichinae by the Boucek and LaSalle (1996).Recently Boucek (2002) also described a new species *Elachertus anthophilae* from Great Britain.

Graham in 1959 raised the tribe Euderini to the rank of subfamily Euderinae and also framed keys to the British genera and species of the subfamilies Elachertinae, Eulophinae, Entedontinae and Euderinae. In 1961 he studied the genus *Aprostocetus* Westwood in detail and provided notes on the synonymy of the European species.He incorporated some additions and corrections to the British list of Eulophidae and also described some new species. The British species of the genus *Entedon* were revised in 1971. His other important contributions are dated 1977, 1979, and 1985. The subfamily status of Euderinae was later accepted by Askew 1968, Boucek 1963, 1977a and Peck, Boucek *et al*. (1964).Graham (1987 and 1991) reclassified the European Tetrastichinae with a revision of certain genera. Kerrich (1960,1969, 1970a, 1970b, 1973, 1974, 1975) made valuable contribution on Eulophid fauna of Africa, South Asiatic and Australian regions and described two new genera viz., *Platocharis, Schizocharis* besides various new species.

Kamijo (1960, 1965, 1976, 1977a, 1977b, 1977c, 1978, 1979) made significant contribution to the eulophids fauna of Japan and provided information on Ashmead's and Crawford's types and Eulophidae from Japan. In 1979, he gave a comprehensive account of Eulophidae excluding Tetrastichinae from Korea and dealt with 54 species of which none were unnamed under 17 different

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genera of the subfamilies Elachertinae, Eulophinae, Euderinae and Entedontinae. His other important contributions were made in 1986a, 1986b, 1986c, 1987, 1990a, 1990b, 1992, 1994a, 1994b, 1996, 1997, and 2003.

Miller (1962, 1964a, 1964b, 1965) provided excellent illustrations on the male genitalia of eulophid parasitoids, but, he did not make any attempt to show their taxonomic significance. In 1970s, he made comprehensive studies on the Nearctic species of the eulophid genera *Pnigalio* and *Sympiesis.*

Peck (1963) in his "Catalogue of the Nearctic Chalcidoidea" upheld Erdos (l956a) in dividing the family Eulophidae into four subfamilies Eulophinae, Tetrastichinae, Entedontinae and Elachertinae. He catalogued 471 species grouped under 79 genera of the family Eulophidae. Peck *et al.* (1964) provided excellent work in "Keys to the Chalcidoidea of Czechoslovakia", in which they keyed out the genera of different families of Chalcidoidea and also recognized five subfamilies Elachertinae, Eulophinae, Entedontinae, Euderinae and Tetrastichinae under the family Eulophidae. Their key to the genera of family Eulophidae contained 71 genera from Czechoslovakia region.

Yoshimoto (1971) revised the genus *Euderus* Haliday in America, North of Mexico and divided the genus into five sub genera viz., *Secodelloidea* Girault, *Euderus* Haliday, *Euderoides* n. subgen., *Neoeuderus* n.subgen. and *Leipocrossus* n. subgen. and included 25 species out of which 13 species were described as new to Entomological science. He also provided key to sub genera and species distribution and host records were also included. In 1973b he studied the species of *Chrysocharis (Kratochviliana)* found in North America with special emphasis on the Canadian species. He proposed the division of the genus *Chrysocharis* Forster into two subgenera viz., *Kratochviliana* Malae and *Chrysocharis* s. str. and included 15 Nearctic species of *Kratochviliana* of which 10 species were described as new. In 1973c he made revision of the genus *Chrysocharis* Forster (subgenus *Chrysocharis* s. str.) of America, North of Mexico and included 18 species out of which 6 species were described as new. In

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addition to key to species, he also discussed the relationship of species groups of North America and Europe. In 1976, he made thorough revision of the genus *Dicladocerus* Westwood of America. North of Mexico and described 12 new species and provided a key to species. His other important contributions to the eulophid fauna are dated 1970a, 1970b, 1970c, 1973a, 1973b, 1976, 1977, 1978, 1980, 1983.

Hedquist (1976) proposed two new genera viz., *Sarasvatia* and *Visnuella* from Sri Lanka. He (1978) also proposed four new genera *of* the subfamily Euderinae viz., *Balinia, Durinia, Oinia* and *Gimlia* from Brazil.

Kostyukov (1977, 1978) has also made valuable contribution to the knowledge *of* eulophid fauna of European part *of* USSR by providing key to 11 genera of Tetrastichinae and under each genus key to species had also been given. Trjapitzin (1978) provided "Keys to the insects of the European part of the USSR" in which he keyed out to the 64 genera under the subfamilies Eulophinae, Elachertinae, Euderinae and Entedontinae.

Some other scattered contributions on the family Eulophidae have also been made by Gradewell (1957), Askew (1962, 1979, 1984), Askew and Ruse (1970, 1974), Askew and Coshan (1973), Askew and Shaw (1974), Askew and Viggiani (I978), Gijswist (1962, 1965, 1976, 1982). Sugonjaev (1971), Viggiani (1964, 1967, 1977), Okazaki (1973), Tachikawa (1977, 1983, 1984), Kostyukov (1917, 1978);Gordh (1977, 1978), Gordh and Hendrickson *Jr.* (1979), Storozheva (1979), Bryan (1980), Doganlar (l980, 1993, 1994, 2003), Grissell (1981), Ryabtschonsky (1983), Dahms (1984).

Schauff (l985a, 1985b, 1988), Schauff and LaSalle (1993) and Schauff *et al.* (1997, 1998) made excellent and exhaustive studies on eulophid fauna of the world. Schauff (1985a, 1985b) made some significant contribution to the Nearctic eulophid species of *Elachertus* and revised the species of *Hyssopus* Girault.Same author (1991) also made valuable contribution to the

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Holarctic genera of Entedoninae, where, twenty seven genera were recognized as valid, including two which had been imported into North America but did not occur in Holarctic region. Five genera previously assigned to the subfamily were removed to other subfamilies of Eulophidae or families of Chalcidoidea *(Bellerus* Walker, Euderinae), *Corlyeia* Girault (Eulophidae), *Enderomphale* Girault (Eulophinae), *Hubbardiella* Ashmead (Euderinae), *Hoplocrepis* Ashmead (Eulophinae), seven new generic synonymies were established (senior name listed last), *Ionymha* Graham = *Asecodes* Forster. *Exodontomphale* Boucek, *Moserina* Delucchi and *Pholema* Graham = *Omphale* Haliday, *Psephenivorus* Burks, and *Holcopeltoideus* Ashmead = *Horismenus* Walker, *Zaommomyia* Ashmead = *Chrysocharis* Forster, sixteen new combination were given. *Eprhopalotus* Girault was placed as *Insertae sedis.* A discussion of evolutionary relationship and an analysis of characters were presented along with an illustrated key to the genera. For each genus information was given on diagnosis, evolutionary relationship, biology and host distribution. Besides this Schauff and LaSalle (1993) provided exhaustive review of the systematic placement of the genera in subfamily Eulophinae and Euderinae of the family Eulophidae of North America and also described *Cristelacher* and *Dasyeulophus* as a new genus and placed thirty genera in the Eulophinae and five in the Euderinae and four new generic synonymies in the subfamily Eulophinae viz., *Notanisomorpha* Ashmead = *Hemiptarsenus* Thomson; *Mirolynx* Girault and *Pseudolynx* Girault = *Aulogymnus* Forster; *Cirrospiloideus* Ashmead= *Elachertus* and one new generic synonymy in the subfamily Entedoninae *Aabacharis* Schauff = *Eprhopalotus* Girault were also proposed. They enriched the literature on eulophid fauna of North America by reporting following nine genera viz., *Colpoclypeus* Lucchese, *Cristelacher* Schauff and LaSalle, *Dasyeulophus* Schauff and LaSalle, *Deutereulophus* Schulz, *Diglyphomorpha* Ashmead, *Euplectromorpha* Girault, *Notanisomorphella* Girault, *Platyplectrus* Ferriere and *Xanthellum* Erdos for the first time. They also proposed thirty two new combinations and a lectotype were designated for *Cirrospiloideus playnotae.* A table of the genera of North

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American Eulophinae, with their current placement was also given. Schauff *et al.* (1997) discussed and keyed out the genera of eulophids of superfamily Chalcidoidea known to occur in the Nearctic region. Recently Schauff and Janzen (2001) studied the taxonomy and ecology of Costa Rican *Euplectrus* parasitoids of Lepidopteran caterpillars.

LaSalle (1989, 1990a, l990b, 1994, 1999, 2004) has made valuable contribution to the knowledge of eulophid fauna of the world. In 1994, he provided exhaustive review on North American genera of Tetrastichinae in which, he recognized forty-two genera as valid, with the largest of these, A*prostocetus*, having four subgenera besides this he also described thirteen new genera viz., *Apterastichus, Careostrix,Chytrolestes, Comastichus, Cucarastichus, Dapsiothrix, Eriastichus, Exalarius, Exastichus, Hadrotrichodes, Mesofrons, Oxypracetus, Styotrichia* and a new subgenus *Quercastichus* in the genus *Aprostocetus* Westwood. LaSalle and Schauff (1990) gave new subfamily placement for some North American eulophids and they (1992) also made excellent preliminary studies on neotropical eulophid fauna based on Ashmead, Cameron, Howard and Walker species. The same author (1994) provided an exhaustive review on eulophid parasitoids of whiteflies, with comments on their systematic placement and gave a generic key. They placed all the eulophid whitefly parasitoids in the tribe Euderomphalini in the subfamily Entedoninae and described three new genera and rest of the seven genera were divided into two distinct generic groups viz., the Euderomphale group included *Baeoentedon* Girault, *Euderomphale* Girault, *Neopomphale* gen.n.; and *Pomphale* Husain *et al.* and the Entedononecremnus groups included *Aleuroctonus* gen.nov., *Dasyompale* gen.nov. and *Entedononecremnus* Girault. They also described *Dasyomphale chilensis* as a new species. In the same year, LaSalle and Delvare (1994) designated a lectotype for *Tetrastichus procerae* and transferred to *Aprostocetus* which was a senior synonym of *Aprostocetus pachydiplosisae.* LaSalle and Pena (1997) described *Galeopsomyia fausta* as a fortuitous

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parasitoids of the gracillariid *Phyllocnistis citrella* which is widely distributed in the Neotropics being known from Mexico and Puerto Rio to Argentina. Recently LaSalle and Wharton (2002) described African *Tetrastichus* species (Hymenoptera: Eulophidae) associated with fruit flies.

Hansson (1990, 1994a, 1996) made excellent studies on eulophid fauna of Palearctic and Nearctic region. He (1990) discussed taxonomic status and range of the eulophid genera *Chrysonotomyia* and *Neochrysocharis* in which he revised seven Palearctic species of *Chrysonotomyia* and twenty species of *Neochrysocharis* besides framing out a key to the species. He also described two new species and proposed six new synonyms including the *N. immaculate,* which was previously synonymized with *N. aratus* and later resurrected as *N. aratus.* Another good attempt was made by Hansson (1994b) where he discussed the taxonomic status and morphological range of the genus *Chrysonotomyia* and *Teleopterus.* Type species of *Chrysonotomyia* has also been redescribed.

Five species of the genus *Teleopterus* have been included besides framing out a key to the Holarctic species of the genus. One new species of the genus *Teleopterus* and two new combinations to *Teleopterus* have also been proposed.

In the same year Hansson (l994a) also described the taxonomic status and delimitation of the genus *Closterocerus* on the basis of new characters and synonymized *Achrysocharella, Cecidiophaga, Chrysocharidia, Halochariessa, Halocharis, Moserina, Pseudochrysocharis,* and *Wolffiella* genera with the *Closterocerus* and recognized *Chrysonotomyia* as a valid genus and most species previously recorded in this genus were transferred to *Closterocerus.* Besides this he revised and keyed out Nearctic species of *Closterocerus* and described twenty one species out of which eight were new. He proposed four new synonyms including *Closterocerus winnemanae* synonymized with *C. trifasciatus* and transferred seven Nearctic species to the genus *Closterocerus.* He also transferred eight Palearctic species including *Achrysocharis lyoneitae* from

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*Chrysonotomyia* to *Closterocerus* and framed out key to the Nearctic species of *Closterocerus.*

Hansson (1995) added another important contribution in which he described 18 species of the genus *Neochrysocharis* viz., *N. hirsute* sp. nov. from *Agromyza* sp. on *Salidago fistulosa; N. marginalis* sp. nov. from *Phytobia lateralis; Meromyza americana* and *N. pilosa* sp. nov. from *Phacelia* sp. and proposed five new synonyms, including *Achrysocharella aetii* as a junior synonym of *Neochrysocharis diastatae. Derostenus agromyzae* and *D. arizonensis* were removed from synonymy (Under *Chrysonotomyia punctiventris).* He also proposed four new combinations including *Neochrysocharis agromyzae* and *N. arizonensis* from *Derostenus* besides describing the genus *Rhicnopeltomyia* as a new synonym of *Neochrysocharis* Lactotypes were also designated for six species.

Hansson (1996) removed genus *Ionympha* Graham from the listed synonym of *Asecodes* Forster and placed *Teleopterus* Silvestri, *Metasecodes* Erdos and *Desmatocharis* Graham as synonymy with *Asecodes* on the basis of new characters. He transferred five species viz., *Desmatocharis reticulates* Kamijo, *Entedon erxias* Walker, *Eulophus turcicus* Ness, *Teleopterus delucchii* Boucek, *T. politus* Hansson from *Teleopterus* to *Asecodes.* The Nearctic species of *Asecodes* including one new species *A. orilatum,* two newly recorded species *A. mento* (Walker), *A. coronis* (Walker) hitherto known from Europe and two species previously in *Teleopterus* viz., *A. erxias, A. politum* were keyed out. *Ionympha* was represented by two species in the Nearctic viz., *I. carne* (Walker), *I. ochus* (Walker). In the same year, Hansson and LaSalle (1996) described two new species of Eulophidae, *Cirrospilus ambiguous* (subfamily Eulophinae) and *Quadrastichus liriomyzae* (subfamily Tetrastichinae) which were parasitoids of *Liriomyza trifolli* in Taiwan; C. *ambiguous* has a wide distribution in the old world tropics and *Q. liriomyzae* only reported from Taiwan. Recently Hansson and Nishida (2002) described very distinct species of genus *Pediobius* as a

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parasitoid of *Epilachna* beetle from Costa Rica and that *P.nishidai* was unique among New World species of Pediobius in having the propodeum elongated and extended backwards. Hansson and LaSalle (2003) revised the Neotropical species of the tribe Euderomphalini.

Excellent contributions have been made by Ikeda and Kamijo (1993a, 1993b) and Ikeda (1995, 1996a, 1996b, 1997a, 1997b, I999a, 1999b, 1999c) on the Eulophid fauna of Japan and more significant contributions made by Ikeda and Huber (1996) on the genus *Dimmockia* Ashmead where they had given an exhaustive review of the existing species of the genus *Dimmockia* till date, in which they redescribed and keyed out five species of *Dimmockia.* Member of the genus *Dimmockia* are mainly hyperparasitoids of Hymenoptera, Diptera and also recorded as primary parasitoids of Lepidoptera. The Nearctic species viz., *D. incongrua* and *D. pallipes* were redescribed and a lectotype was designated for *D. incongrua, D. marylandica* Girault was provisionally removed from the genus *Dimmockia* but its correct placement is still unknown. The Plaearctic species *D. brevicorni* Ikeda was newly recorded from North America. They also provided some additional taxonomic features for *D. exorientis* and *D. secunda.* Despite of this, two African species, previously placed in *Dimmockia* were transferred to *Sympiesis* as S. *polygoniae* (Risbec) comb. nov. and S. *copmopterygi* (Risbec) comb. nov. and a lectotype was also designated for a *polygoniae.* They made relationship and character analysis of *Dimmockia* spp. and 21 species of *Sympiesis.*

Ikeda (1996a, 1996b) for the first time reported three species, *Anaprostocetus acuminatus* (Ratzeburg), *Halchtetrastichus rhosaces* (Walker) and *Parachrysocharis javensis* Girault of the subfamily Tetrastichinae from Japan and in the same year he also proposed *Pasohstichus* as a new genus for a species, *P. konishii* sp. nov. from Malaysia and Japan. Very recently (1999) he made remarkable contribution by revising world species of *Sigmophora* Rondani and *Quadrastichodella* Girault. He described six new species of the genus

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*Sigmophora (S. aceris* sp. nov. and S. *divorsa* sp. nov. from East Asia;S. *papuana* sp. nov. from Papua New Guinea and *S. tumidifrons* sp.nov. S. *prolixa* sp.nov. and S. *lutea* sp.nov. from Africa) and four new species of the genus *Quadrastichodella* (*Q. neglectae* sp. nov. from Australia, *Q. pilosa* sp. *novo* from New Zealand, *Q. gracilis* sp.nov. from Japan and *Q. hirsute* sp.nov. from the Malaya Peninsula). Ikeda *et al.* (1996) described *Stipecarinata striata* as a new genus and species from Japan. In the same year Yefremova and Shrol revised to European eulophid wasps of the genus *Diglyphus* Walker. Recently Ikeda (2001) revised the world species of *Ceratoneura* Ashmead.

Gumovsky (2001) described the status of some genera allied to *Chrysonotomyia* and *Closterocerus* with description of a new species from Dominican amber and in 2003 the same author reviewed group of species allied to *Pediobius alcaeus* (Walker). Gumovsky and Boucek (2003) described a new genus *Podkova* from Brazil with its type species *P. hirsuta.*

Zhu *et al.* (1999, 2000a, 2000b, 2002) reviewed many species of *Aulogymnus*, *Hemiptarsenus*, *Diglyphus* and *twenty* valid species of *Cirrospilus* of China *and* framed key to the species of these genera.

Zhu and Huang (2000, 2001a, 2001b, 2001c, 2002a, 2002b and 2002c) made very excellent contribution where they reviewed nine valid species of *Euplectromorpha*, twenty three valid species of *Elachertus*, five species of *Eulophus*, thirty valid species of *Euplectrus* and twelve valid species of *Platyplectrus* from China and provided keys to the species for all above mentioned genera.Zhu and Haung (2001b) also provided an integrated key to the subfamilies, genera and species of the family Eulophidae.

Yang and Wei (2003) described two new species as *Tetrastichus shandongensis* and *T. nigricoxae* from china; both species were pupal endoparasites of *Hyphantria cunea.*Yang *et al.* (2003a, 2003b, 2005) described three new species as *Tetrastichus litoreas*, *Aprostocetus magniventer* on pupae of *Hyphantria cunea* and *Tetrastichus janusi* on larva of *Janus piri* respectively.

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Zang *et al.* (2007) recorded 73 species in 25 genera of Eulophidae along with details of hosts from South Gansu and Qinling mountains areas of China. In the same year Dognalar and Traptsyn (2007), reviewed *Ceranisus* of Turkey with description of a new species.

Taxonomic work on the family Eulophidae is rather poorly known from Sri Lanka and in this direction Wijesekara and Schauff has recently made a good attempt in 1994 and 1997. In the year 1994, Wijesekara and Schauff have revised the genera and species of the tribe Euplectrini (Eulophidae) from Sri Lanka and recognized the following genera *viz.; Euplectrus, Euplectromorpha, Metaplectrus* and *Platyplectrus.* They described eight *Euplectrus* species as new viz. *atrafacies, colliosivlvus, geethae, litoralis, mellocoxus, nibilis, peechansis,* and *xanthovultus.* Five species previously placed in *Euplectrus* were removed and transferred to other Euplectrini genera as follows: *E. flavescens* Crawford = *Aroplectrus flavescens* (Crawford); *E. nigromaculatus* Ashmead = *Euplectromorpha nigromaculatus*. (Ashmead) comb. nov., E. *philippinensis* Ashmead = *Platyplectrus philippinensis* (Ashmead) comb. nov., E. *rugosus* Crawford = *P. rugosus* (Crawford) comb. nov. and *E. japonicus* Ashmead = *Platyplectrus japonicus* (Ashmead) comb nov. They removed *E. ornatus* from Euplectrini and placed as *Cirrospilus ornatus* (Mukherjee), comb. nov. (in Eulophinae). They also described three new *Euplectromorpha* species *(formosus, jamburaliyaensis* and *laminum),* one new *Metaplectrus* species *(teresgaster)* and five new *Platyplectrus* species *(coracinus, flavus, gannoruwaensis, melinus* and *truncates).* They also recorded *P. viridiceps* (Ferriere) from Sri Lanka, which were previously known from India and Malaysia and designated lactotype for *Metaplectrus solitarius* Gadd. They also gave *Platyplectrus kuriani* Wijesekara as a new name to *Euplectromorpha natadae* Kurian.

Triapitsyn and Headrick (1995) made valuable contributions where they reviewed the thrips attacking Eulophidae (subfamily Entedoninae) from the Nearctic region and described one new species, *Ceranisus loomansi.* Besides

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this, they redescribed four other species of *Ceranisus* mainly based on a study of their type specimen as well as additional material from Arizona, California, Hawaii, Mississippi and Japan. They also designated lactotype for *Ceranisus americensis* (Girault), C. *nubilipensis* (Williams) and C. *russelli* (Crawford) and framed out a key. In the same year, Surekha and LaSalle (1995) added few important contributions to the eulophid fauna, where they described *Baryscapus megos* Forster as a new species of Tetrastichinae of family Eulophidae from North America. In 1996, Surekha *et al.* proposed *Oxycantha darwini* Surekha and Ubaidillah as a new genus and species of Eulophinae from Brunei. Delvare and LaSalle (2000) reported very unique genus of Eulophidae as *Trisecodes* gen.n., with its type agromyzae became first Eulophid as well as the first member of the Chalcidoidea outside of Trichogrammatidae having three tarsal segments in both sexes.

Ubaidillah and LaSalle (1996) described *Agmostigma* as a new genus, which included three species viz., *A. frontale* sp.nov.; *A. bruneiense* sp.nov. *A. ilhami* sp. nov. from Brunei and a key to species was also framed. Ubaidillah *et al.* (2000a, 2000b) reported a new species of *Zagrammosoma* from the indo-Australian region and in the same year the author has also described a peculiar new genus and species of Entedoninae from Southeast Asia. Recently Ubaidillah (2006) described two new species of *Trichospilus* as *T. politus* and *T.striatus* from Indonesia and also provided a key to its all species worldwide.

Other minor contributions on the taxonomic studies were made by Grissell and Schauff (I990), Mushtaque (1990), Paik (1991), Jansson and Lecrone (1991), Jansson and Lecrone (1991) reported *Eutetrastichus evonimellae* parasitizing a pest of Willow (*Salix spp.)* in Bulgaria, Doganlar (1993, 1994, 2003), Delvare and LaSalle (1993), Sheng and Wang (1992), Yang *et al.* (1994), Grout and Stephen (1995), Polaszek and LaSalle (1995), Headrick *et al.* (1995), Efremova (1996), Berry (2007), Yefremova (2003), Yefremova and Myartseva (2004), Cameron *et al.*(2004), Delvare *et al.*(2004), Edwards and LaSalle (2004), Kim *et*

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*al.* (2004), Tschudi *et al.* (2004), Kostjukov and Khomchenka (2005), Doganlar and Traptsyn (2007), Fisher and LaSalle(2005) .

Gauthier *et al.* (2000) studied the phylogeny of Eulophidae and reclassified to Eulophinae with merging of Elasmidae into Eulophinae. Gates *et al.* (2002) surveyed Hymenopteran parasitoids of leaf miners in California, USA and framed out a illustrated key to 44 genera (except those belonging Braconidae) and interestingly more than 80% of specimens reared belonging to Eulophidae. Gates and Schauff (2003) reported a new species *Cirrospilus infuscatus* reared from *Tischeria bifurcata* Braun (Lepidoptera:Tischeriidae). Recently Gates *et al.* (2005b) also described a new species *Baryscapus diorhabdivorus* reared from *Diorhabda elongata* and compared to closely related species. Gates *et al.* (2005a) reported *Pediobius chylizae* as new species reared from the puparia *Chyliza apicalis* Loew (Diptera: Psilidae) and compared with closely related species of *Pediobius* from Holarctic Region.

Noyes (2002, 2003) contributed incalculably an Interactive Catalogue for World Chalcidoidea and also provided a World Wide Web electronic publication "Universal Chalcidoidea Database".

Reina and LaSalle (2003 and 2004) provided a key to the World Genera of Eulophidae Parasitoids (Hymenoptera) of Leafmining Agromyzidae (Diptera) and in 2004 reported two new species of *Quadrastichus* Girault, as parasitoids of the leafminers *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) and *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae).

Myartseva (2003) described two species of *Euderomphale* along with a key to species of the genus *Euderomphale* of North and Central America. In (2004) the same author also described three species of the genus *Entedononecremnus* as *E. annellus, E. funiculatus* and *E. guamuchil* and provided a key to species of the genus *Entedononecremnus* from North and South America.

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The fauna of the Indian subcontinent is rather poorly known, There are several recent publications but most of these deal with a few species and there is so far virtually not comprehensive account of the family from the region have been made. First consolidated work on Indian chalcids was done by Mani in 1938, who published the catalogue on Chalcidoidea of India, Ceylon and Burma, in which he covered 67 species under 29 genera of the family; Eulophidae. He adopted the Ashmead's (1904) system of classification and suffixed to each tribe name as ariae. Besides Mani, the fauna of the Indian subcontinent was studied by Cameron (1913), Mahadihassan (1923), Cherian and Margabundhu (1942), Bhatnagar (1952), Kurian (1953, 1954), Narayanan (1960), Naryanan, and Subba Rao (1960), Subba Rao and Sharma (1966). Dubey (1974), Kaul and Saraswat (1974), Saraswat (1975, 1978), Khan and Shafee (l980a, 1980b, 1981a, 1981b, 1981c, 1982). Hayat (1985) has given an informative and working key to the genera of the family Eulophidae of India and adjacent countries. Hussain and Khan (1986) have elaborately 'contributed to our knowledge of Eulophidae of India, Pakistan, Nepal, Burma, Bangladesh and Sri Lanka, through a catalogue covering 46 genera. They have also cited a list of synonymy and erected a number of new combinations under each genus. Narendran and Krishna Kumar (1995), Singh and Khan (1994a, 1994b, 1995, 1996, 1997, 1998), Surekha and Narendran (1993), Surekha and LaSalle (1995) Surekha *et al.*(1996), Sushil and Khan (1997,1999), Khan (1982, 1985a, 1985b,1986, 1992, 1993, 1995, 1996), Khan and Singh (1994), Khan and Sushil (1992, 1998) and Narendran and Fausi (2002), Narendran and Sinu (2003), Narendran and Thomas (2003), Narendran (2004, 2005, 2006 and 2007) made remarkable contributions to the eulophid fauna of India.

Khan *et al.* (2005) have made excellent work and expressed in Monograph “Taxonomic studies of Eulophid Parasitoids (Hymenoptera: Chalcidoidea) of India” and studied the 29 genera and 56 species of Eulophidae and framed the key to genera and their concerned species.

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Narendran *et al.* (2001, 2002, 2003a, 2003b, 2003c 2004a, 2004b, 2005a, 2005b, 2005c, 2005d, 2005e, 2005f, 2006, 2007a and 2007b) made significant contribution to the knowledge of eulophid fauna of India. Narendran (2007) contributed a monograph on Indian Tetrastichinae and framed the key to genera and their concerned species.

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# Materials and Methods

*"Use all methods analytical bring every detail into play planning to the critical can cause the team to win their way"*

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# Chapter 3 Materials and Methods

## Collection, rearing and preservation

Extensive taxonomic task on a major group of little known insects can not be done properly without fresh material and really fresh specimens can be acquired only by collecting and rearing. Hence, fresh collections were made by surveying various important agricultural, horticultural and agro forestry areas of Kumaon hills, Garhawal hills, tarai belt of Uttar Pradesh, Rajasthan, Jammu and Himachal Pradesh during the course of investigation.

Parasitized eggs and different stages of host insects along with damaged material like pieces of barks, leaves, stems, twigs, pods or other plant parts were collected. At the same time few unparasitised host specimens, if available, were also collected individually from the same plant and allowed to emerge to facilitate their correct identification. However, sweep net collections were also made in order to acquire large amount and variety of microhymenoptera in the shortest time, in most types of vegetation. A complete record was maintained indicating the reference number, locality, date of collection, name of the host plant and host insect.

The collected material was brought into the Biological Control Laboratory, Department of Entomology for proper rearing. The selected pieces of barks, leaves, stems twigs, pods or other plant parts were cut into small pieces and put in rearing jars, the mouth being tightly closed with very fine muslin cloth held with a rubber band. As per necessity, the leaves and other plant parts were wrapped with cotton soaked in water to maintain proper turgid conditions. A slip was fixed to each jar indicating the reference number. Collections made during the month of March, April, May and October and November in the years of 2005 to 2007, were put in a constant temperature cabinet running at 70°F and with 70

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per cent RH to expedite the emergence of parasitoids, otherwise the parasitoids were reared under room temperature. The rearing jars were examined daily for the emerged parasitoids.

The emerged parasitoids were collected from jars and preserved in 75 per cent alcohol in glass vials. Whenever larger number of parasitoids emerged in plastic tubes, an empty tube of the same size was put in end to end portion over the tube containing parasitoids. Then the tube with parasitoids was wrapped with black paper, and the whole assembly was put near an over head light source. This technique enables the parasitoids to move to the empty tube in response to light. Thus all assembled parasitoids were preserved. The preserved specimens were then separated up to generic level under binocular microscope. Data on the number of specimens of each genus and species from each sample was also recorded.

**Preparation of permanent slides, measurements and illustrations**

Permanent slides were prepared to enable detailed study of important structure of the parasitoids. The normal process of dehydration was followed and clearing was made in the clove oil. The dissection was made in clove oil and the various dissected parts were placed on a micro slide in a drop of Canada balsam and thus mounting was made under 22 mm coverslip. The permanent slides were examined under trinocular microscope in order to make drawings and detailed study of each structure with the help of Camera Lucida. This approach has revealed some characters which otherwise are likely to be overlooked in tag dry mount specimens.

For description of eulophid parasitoids conventional terminology has been adopted which is abbreviated (Plate A, Fig. 1-5) and explained as follows:

In Chalcidoidea, as in all Apocrita, the first abdominal segment is fused with the 'thorax' and is called 'propodeum'. The posterior part, less the first abdominal segment (propodeum) is called the 'gaster' in Ichneumonidae, the

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abdomen in various aculeate wasps. But in Chalcidoidea the second abdominal segment is here always transformed into the 'petiole' (Fig. 1) and the first visible tergite corresponds to the original third abdominal one.

**A. Head (Fig. 1, 2):** The head is normally in a perpendicular position to the body axis, with the mouth directed ventrad-orthognathous position.

i. Face: Front part of the head and dorsally it merges with the vertex.

ii. Ocelli: Vertex bears three ocelli which are sometimes encompassed by a groove delimiting the ocellar area.

iii. Frons: The space between eyes, the ocelli above and the antennal sockets below is upper face or frons.

iv. Malar space: Below the eyes, the genae (malar space) with genal or malar sulcus, groove line.

v. Scrobis (pit): Usually the upper face part above each torulus is shallowed or depressed; this depression is called scrobis, two scrobis united into the scrobes. In Eulophidae the frons often bears grooves or line of weaker sclerotisation, in a symmetrical pattern. This consists of two grooves in the scrobal depressions, mostly converging upwards or uniting into one groove.

vi. Lower face: The part of the face below the antennae.

vii. Clypeal margin: The lower clypeal margin being straight, emarginate, sinuate, often bidentate or bilobed.

**B. Antenna (Fig. 3)**

i. Radicula: Basal part of antenna, not counted as antennal segment.

ii. Scape (Scapus): First antennal segment always longer than the second segment.

iii. Pedicel (Pedicellus): Second antennal segment followed by scape.

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iv. Flagellum: The part of the antenna distal to the pedicel, usually subsegmented or multiarticulate.

v. Ring segments: The proximal 1, 2 or more flagellar segments may be strongly shortened and distinguished from the following funicular segments not only by their small size but also by the lack of longitudinal sensilla.

vi. Funicle segments: Flagellar segments between ring segments and club.

vii. Club: The distal segments usually fused.

**Explanations to abbreviations**

**(Plate A)**

**Fig. 1: Body (Dorsal view)**

| | | | | | |
|---|---|---|---|---|---|
| POL | : | Postocellar line | AX | : | Axillae |
| OOL | : | Ocellocular line | SCTL | : | Scutellum |
| OCC | : | Occiput | PROP | : | Propodeum |
| CL | : | Colar | PT | : | Petiole |
| MSC | : | Mesoscutum | OVI | : | Ovipositor |
| PG | : | Parapsidal grooves | FE | : | Femur |
| TI | : | Tibia | TA | : | Tarsus |

**Fig. 2: Head in frontal view**

| | | | | | |
|---|---|---|---|---|---|
| OCE | : | Ocelli | AS | : | Antennal sockets |
| CLY | : | Clypeus | MD | : | Mandible |
| MS | : | Malar space | | | |

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**Fig. 3: Antenna**

| | | | | | |
|---|---|---|---|---|---|
| RA | : | Radicula | SC | : | Scape |
| PED | : | Pedicel | RS | : | Ring segment(s) |
| FU | : | Funicle | FS | : | Funicle segment(s) |
| CL | : | Club | CS | : | Club segment(s) |

**Fig. 4: Thorax**

| | | | | | |
|---|---|---|---|---|---|
| MSC | : | Mesoscutum | PG | : | Parapsidal groove |
| SCTL | : | Scutellum | MSCT | : | Metascutellum |
| PROP | : | Propodeum | CAL | : | Callus |
| PS | : | Propodeal spiracle | PLI | : | Plicha |
| MC | : | Median carinae | COST | : | Costula |
| PE | : | Petiolar emargination | SF | : | Supracoxal flange |

**Fig. 4A: Fore wing**

| | | | | | |
|---|---|---|---|---|---|
| CC | : | Costal cell | SM | : | Submarginal vein |
| MV | : | Marginal vein | PMV | : | Post marginal vein |
| STV | : | Stigmal vein | MF | : | Marginal fringe |
| BC | : | Basal cell | SPE | : | Speculum |
| Cu | : | Cubital vein | SCU | : | Subcubital vein |

**Fig. 4 B: Fore wing part**

| | | | | | |
|---|---|---|---|---|---|
| AH | : | Admarginal hairs | RC | : | Radial cell |
| PS | : | Parastigma | | | |

**Fig. 5 : Ovipositor**

| | | | | | |
|---|---|---|---|---|---|
| FV | : | First valvifers | SV | : | Second valvifers |
| TV | : | Third valvulae | OPO | : | Outer plates of ovipositor |

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**Fig. 6: Sculpture**

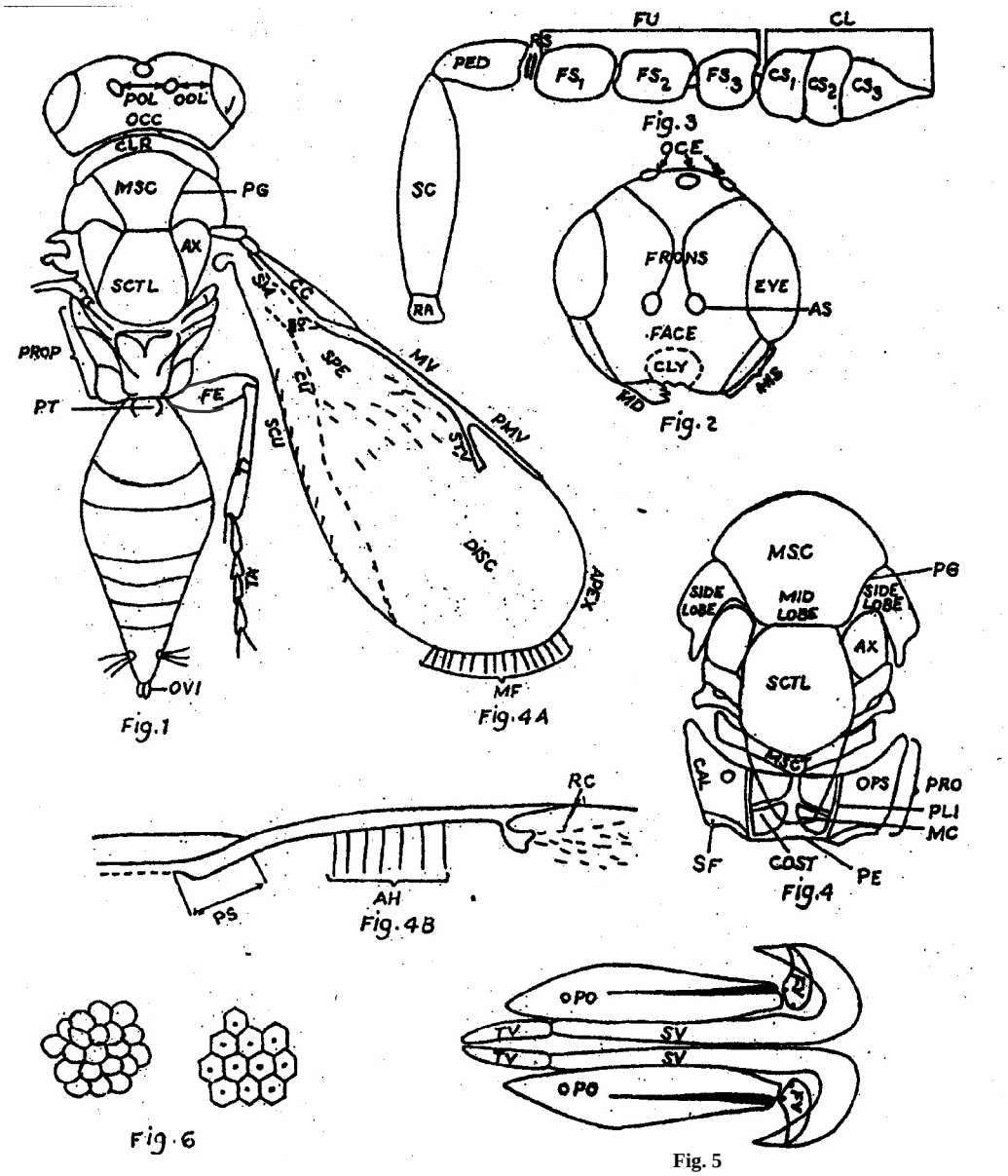


**Plate A**

## C. Thorax (Fig. 1, 4)

i. Pronotum: has a dorsal collar separated by an edge from the sloping anterior part, collum. The collar may be anteriorly carinate or rounded, often with a smooth strip behind the last row of setae, which are often bristly.

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ii. Mesoscutum: is a broad part of measonotum subdivided by notauli or parapsidal grooves into three lobes: the middle lobe and the side lobes (or scapulae).

iii. Axillae: Posterior to the transscutal line are.

iv. Scutellum: Posterior to the transscutal line. It is often subdivided longitudinally by submedian or sublaterial grooves, apical margin may be rounded or margined by an impressed admarginal grooves.

v. Propodeum: The first abdominal segment incorporated into the thorax.

Neck (or) nucha : Narrowed and constricted part before the apex medially.

Median carinae : Median longitudinal carinae.

Plicae : Sublateral longitudinal carinae.

Costula : A transverse carina about in the middle.

Callus : Side part convex and hairy

Petiolar emargination: Petiole attachment

Supracoxal flange : Post spiracular groove or sulcus, a deep fovea.

**D. Wings (Fig. 4A, 4B):** The wings yield a number of characters, especially the pilosity and the relatively reduced venation. The primitive pilosity seems to be spread down to the base of the wing, without differentiation in the length, thickness or position of hairs. Frequently the proximal (basal) third or half of the wing is more or less bare.

i. Costal cell: Mostly bare part above the submarginal vein.

ii. Submarginal vein: between the costal and basal cell.

iii. Speculum: basal cell and an area immediately beyond the basal cell.

iv. Parastigma: submarginal vein distally joins the parastigma, which is often produced downwards at its proximal end as a stub or a shaded basal vein.

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v. Cubital hair line: closes below the speculum and the basal cell.

vi. Subcubital line of hairs: It starts below or underside of the cubital hair line.

vii. Marginal vein: is followed by the post marginal vein, after the branching point of the stigmal vein.

viii. Uncus: stigmal vein often knobbed at the apex (stigma), sometimes sends off towards the postmarginal vein a little stub called the uncus, which may be continued by a hair line.

**E. Petiole and Gaster (Fig. 1, 5):** The petiole (petiolus) may be strongly transverse and completely concealed in dorsal view, but often it is conspicuous and then usually sculptured. The petiole is formed only by the tergal part of the originally second abdominal segment. The gastral body has usually the first tergite relatively large, the following ones often smaller but there are various exceptions. The seventh and eighth gastral tergites are often fused and then this syntergum is called 'epiphygium'.

The ovipositing apparatus is derived from the ventral parts of the sixth and seventh gastral ($8^{th}$ and $9^{th}$ abdominal) segments and is connected with 'epiphygium'. The subtriangular basal part is the 'Valvifer' and the narrow distal part is the 'Valvula' (Fig. 5). The ovipositor stylets are formed by the first and second valvulae, whilst the third valvulae constitute the sheaths.

**F. Sculpture (Fig. 6):** Generally the sculpture seems to be of two kinds: either derived from a 'Piliferous (hair-bearing) puncturation", or quite unconnected with pilosity. The puncturation of the probably primitive common type consists of more or less deep separate little 'alveolae' (pits, dots, puncta), each bearing a hair on the bottom. Very coarse puncturation may be called 'Punctation". If the alveolae are large, deep and more or less

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polygonal or round the sculpture may be called 'alveolation' or if coarser, 'foveolation'. If the dense punctures are polygonal the sculpture resembles a deep net work i.e. 'reticulate puncturation'.

Reticulation is formed by a raised net work of septa 'raised reticulation' and superficially resembles a network formed by engraved meshes "engraved reticulation". The engraved reticulation may be very fine, shallow, with meshes broad and often irregular; this sculpture is often called 'alutaceous'.

Some parts of the chalcid body may be weakly sclerotised and shrink after death. This tendency to collapse is termed "Collapsing".

**Explanations to abbreviations**

**Fig. 1: Head in facial view**

| | | | | | |
|---|---|---|---|---|---|
| LH | : | Length head | WH | : | Width head |
| LE | : | Length eye | LFR | : | Length frons |
| WRF | : | Width frons | ASE | : | Antennal socket from eye |
| DAS | : | Distance between antennal sockets | | | |

**Fig. 2: Head in dorsal view**

| | | | | | |
|---|---|---|---|---|---|
| MIM | : | Median length | POL | : | Posterior ocellus from eye rim |
| WH | : | Width head | | | |

**Fig. 3: Antenna**

| | | | | | |
|---|---|---|---|---|---|
| LS | : | Length scape | WS | : | Width scape |
| LF | : | Length pedicel | WP | : | Width pedicel |
| RS | : | Ring segment | LF | : | Length funicle |
| LC | : | Length club | WC | : | Width club |

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**Fig. 4: Thorax**

| | | | | | |
|---|---|---|---|---|---|
| LT | : | Length thorax | WT | : | Width thorax |
| LMS | : | Length mesoscutum | LSC | : | Length scutellum |
| WSC | : | Width scutellum | | | |

**Fig. 5: Wing venation**

| | | | | | |
|---|---|---|---|---|---|
| LSMW | : | Length submarginal veins | LMV | : | Length marginal veins |
| WMV | : | Width marginal veins | LPMV | : | Length postmarginal vein |
| LSTV | : | Length stigmal vein | | | |

**Fig. 6: Ovipositor**

| | | | | | |
|---|---|---|---|---|---|
| LSV | : | Length second valvifer | LTV | : | Length third valvulae |
| LOP | : | Length of outer plates ovipositor | | | |

Measurements, in millimeters (mm), of whole specimen as well as of different parts were taken with the help of an ocular micrometer and stage micrometer. Measurement levels for various parts are indicated in Plate B (Fig.1-5). Holotypes and paratypes are being deposited in Z.S.I., Calcutta, India.

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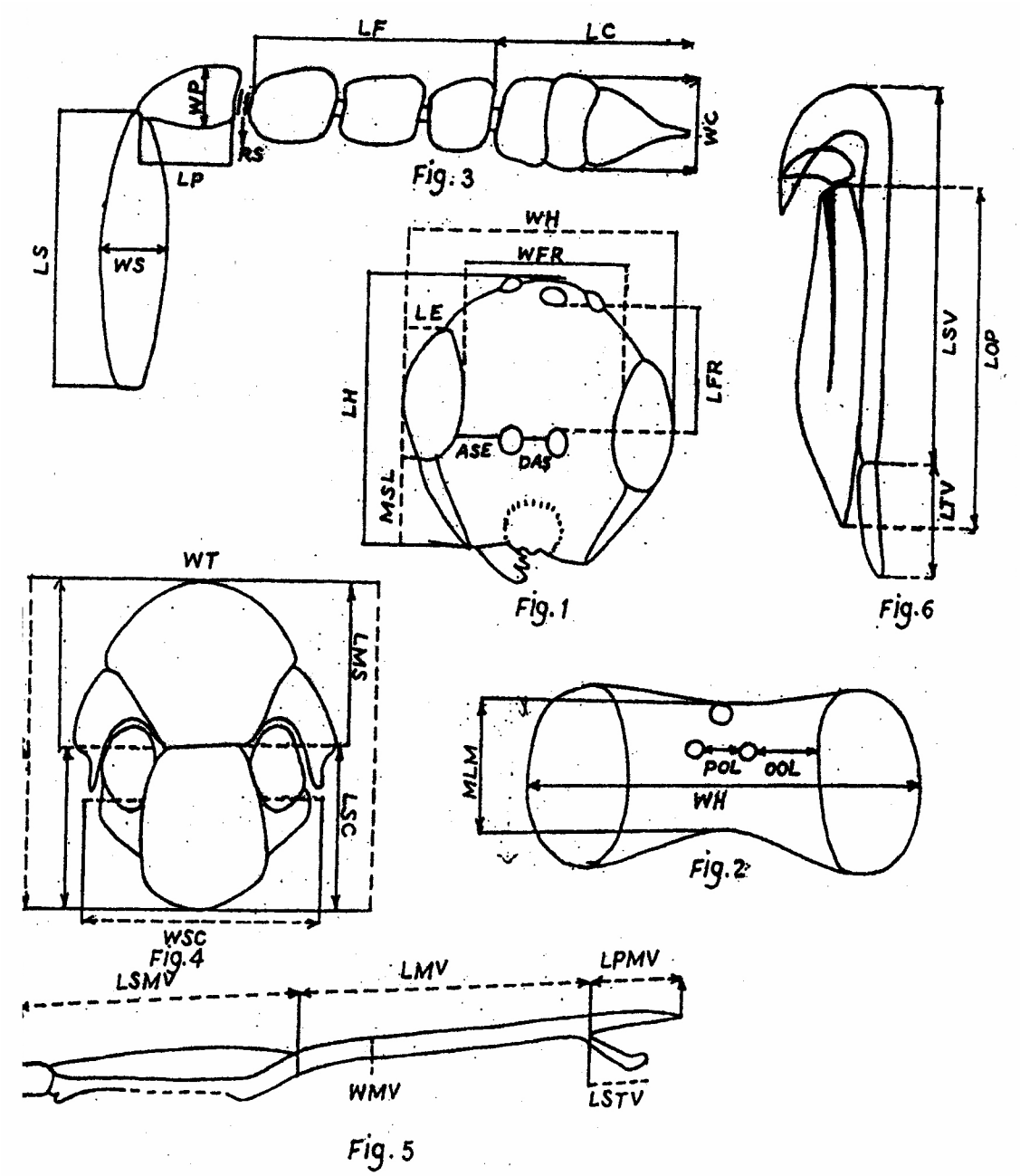


**Plate B**

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# Results and Discussion

*"Research is a very good word; and the meaning is certainly plain, when results are still quite absurd, it literally means search again"*

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# Chapter 4 Results and Discussion

The order Hymenoptera is especially rich in families exhibiting the entomophagous habit and most of the parasitic species utilized in biological control belong to this order. It is imperative to have good knowledge about the biology and taxonomy of the parasitic wasps. Among parasitic Hymenoptera, the members of family Eulophidae have promising role in the field of biological control. These are minute chalcids, exhibiting great potentiality in the control of pest populations and they play an important role in IPM. The majority of entomophagous eulophids include several species attacking insect pests of agricultural importance.

The proper identification of the pest and its natural enemies has become obviously fundamental since without scientific name previous references to the species could not be adequately examined. An attempt has been made to study all the existing species under different genera which were reared during present study. Apart from describing one genus and thirty one species, detailed morphological variations and structural differences in female genitalia have also been carefully studied and illustrated. Identification key to different subfamilies, tribes, genera and species have also been framed.

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# FAMILY - EULOPHIDAE

**Integrated key to the subfamilies, tribes and Indian genera of Eulophidae**

An endeavor has also been made to frame out a key to the eulophid genera of India and adjoining countries.

1. Fore wing with the submarginal vein smoothly joining parastigma. ……..2

— Fore wing with the venation more or less interrupted between Submarginal vein and parastigma ……..4

2. Mesoscutum with notaular lines (or grooves) complete, more or less deep throughout. Male antennal funicle not ramose **(subfamily Eulophinae)**. ……..3

— Notaular lines incomplete or absent. Male antennal funicle with rami **(subfamily Eulophinae)**. ……..6

3. Hind tibia with very long spurs, the longer one usually exceeding basitarsus, bristles on thorax long **(Tribe Euplectrini).** ……..18

— Hind tibia with spur(s) small, shorter than basitarsus **(Tribe Elachertini)**. ……..21

4. Notaular lines complete and axillae angularly produced forwards. ……..5

— Notaular line incomplete or absent or posteriorly indicated by broad impressions; if complete then strongly bent outward anteriorly and axillae with more or less rounded anterior margins **(Subfamily Entedontinae).** ……..28

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5. Scutellum usually with two longitudinal submedian grooved lines, postmarginal vein usually absent or reduced and stigmal vein longer **(Subfamily Tetrastichinae)**.

……..50

— Scutellum without such lines; postmarginal vein present and usually longer than stigmal, the latter short to very short (fore wings hyaline with plain hair lines, usually three, radiating from stigmal vein, propodeum with a median carina, otherwise nearly smooth; antennal formula 1, 1 ,4 ,3 antenna uniformly dark, in males without distinct hair whorls **(Subfamily Euderinae)**.

……..69

6. Funicle two segmented in both sexes; gaster with a short petiole; scutellum with two submedian grooves; pronotum much narrower and much shorter than mesoscutum; axillae distinctly advanced; mesoscutum midlobe only with two pairs of thin setae; frons without oblique grooves, propodeum without trace of plicae, adpetiolar strip weak.

……..***Diglyphus*** **Walker**

— Funicle at least three-segmented, male funicle 3-5 segmented.

……..7

7. Funicle three-segmented.

……..8

— Funicle four-segmented.

……..12

8. Basitarsus of at least the middle leg shorter than second segment.

……..9

— Basitarsus of the middle leg longer than second segment.

……..10

9. Mandibles stunted with the tips not meeting; length of malar space shorter than eye width; maxillary and labial palpi two and one

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segmented, respectively; mesoscutum with three pairs of setae; scutellum as long as wide; propodeum with median carina; first valvifer triangular.

……..***Eulophus*** **Goefroy**

— Mandibles normal with their tips meeting; length of malar space longer than eye width; maxillary and labial palpi one segmented each; mesoscutum with two pairs of setae; scutellum flattened, slightly less than two times as wide as long; propodeum without median carina; first valvifer semicircular.

……..***Rajiella*** **Agnihotri and Khan**

10. Scutellum, at least in female with submedian grooved lines; male antenna with two rami; flagellum always with three segmented funicle; head transverse-subtriangular; eyes ovate; pronotum, mesoscutum and scutellum densely sculpture with latter having a pair of sublateral longitudinal grooves; median carina of propodeum generally weak and complete in female; posterior margin of pronotum without submarginal ridge with a small protuberance on each side, gaster ovate to elongately lanceolate.

……..***Dicladocerus*** **Westwood**

— Scutellum without submedian grooved lines, or these very faint; male funicle four-segmented with three long thin rami.

……..11

11. Postmarginal vein nearly two times as long as stigmal vein or more; propodeum with median carina, sublateral plicae and transverse costula.

……..***Pnigalio*** **Schrank**

— Postmarginal vein shorter at most 1.7 times as long as stigmal vein; propodeum with median carina; funicle three segmented in female, first funicular segment in male usually distinctly longer than pedicel, body usually less stout, longer; antenna longer, scape about two times as long as distance between paired ocelli.

……..***Necremnus*** **Thomson**

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12. Mid femur with a characterstic strong seta at subapical part and antenna without trichoidal sensillae; scutellum smooth medially and reticulate on sides; petiole 2 segmented.

……..***Anumanniola*** **Narendran**

— Mid femur without characterstic strong setae at sub apical part; antenna with trichoidal sensillae; scutellum also different.

……..13

13. Costal cell of fore wing narrow; antennal toruli situated near middle of face; antennal scape extending well beyond front ocellus; funicle four segmented in male with three long rami; scutellum without sublateral grooves, propodeum with median area transversely convex or sloping from median line (or carina), without plicae or abrupt edge in their place; mesoscutum on median part frequently with reduced pilosity; postmarginal vein ending far from wing apex; scapes very distinctly exceeding vetex level.

……..***Hemiptarsenus*** **Westwood**

— Costal cell not narrow; toruli situated below middle of face.

……..14

14. Propodeum without sublateral plicae and transverse costula.

……..15

— Propodeum with sublateral plicae and transverse costula; postmarginal vein nearly two times as long as stigmal vein; sloping sides of scutellum often abruptyly smooth or much shinier than reticulate; mesoscutum even in median part with numerous hairs.

……..***Pnigalio*** **Schrank**

15. Postmarginal vein more than two times as long as stigmal vein.

……..16

— Postmarginal vein less than one and a half times as long as stigmal vein; mandibles with eight teeth; antennae inserted at lower level of eye

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margin; mesoscutum with fine reticulation and big scattered puncts throughout; scutellum with two sublateral grooves almost contiguous anteriorly and extending backside apart posteriorly; propodeum with slightly branched median carina.

……..***Arunus*** **Singh and Khan**

16. Propodeum with strong median carina.

……..17

— Propodeum without median carina or of moderate strength, plicae usually present; axillae distinctly advanced, notaulii posteriorly turning outwards to tops of axillae, area between them (mid lobe) with several paired setae only; notaulli shallow; gaster often very long, conically pointed much longer than head and thorax combined.

……..***Sympiesis*** **Forster**

17. Clypeus usually incised in middle, bilobed and depressed; mandibles with eight teeth; propodeum with almost complete and strong plicae.

……..***Dimmockia*** **Ashmead**

— Clypeus with apical margin straight; mandibles tridentate; propodeum without plicae; gaster petiolate, petiole very long, less than five times as long as wide and more than half the length of gaster.

……..***Mohaniella*** **Khan**

18. Scutellum without sublateral longitudinal furrows, eyes asetose; pronotum reduced dorsally, always with a transverse carina, mesosoma completely black.

……..***Euplectrus*** **Westwood**

— Scutellum always with sublateral furrows; eyes, pronotum and color of the mesosoma variable.

……..19

19. Hind tibia with single spur which is slightly longer than first tarsal segment; propodeum with well developed median carina.

……..***Metaplectrus*** **Ferriere**

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— Hind tibia usually with two spurs, longer spur reaching at least half the length of second tarsal segment; if only one spur present, then median carina on propodeum absent.

……..20

20. Median propodeal carina absent; two submedian carinae enclosing median area.

……..***Euplectromorpha*** **Girault**

— Propodeum with well developed median carina.

……..***Platyplectrus*** **Ferriere**

21. Funicle two-segmented; body usually weakly sclerotized.

……..22

— Funicle at least three-segmented.

……..26

22. Clypeal margin straight.

……..24

— Clypeal margin incised in the middle; antennae short and slender; thorax with long bristles; propodeum with a median carina and a small nucha, plicae indicated posteriorly, callus with several setae; petiole short; gaster more or less rounded, dorsally flat or of sublenticular shape; infuscated with hyaline patches and often two thick tufts of erect black setae.

……..23

23. Fore wing with tufts of dark or thickened setae, especially near parastigma and on base of marginal vein; or tufts of setae sometimes replaced by strongly darkened patches, merging with each other to make a single zig-zag patch; toruli unusually low, near mouth margin; fore bristles of mesoscutum short and not reaching to transscutal articulation; foraman magnum situated at centre or below the centre of head; normally gaster subsessile; tergite not much differing in length,

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ovipositor sheaths not visible from dorsal side of gaster.

……..***Trichospilus*** **Ferriere**

— Fore wing without tufts of dark or thickened setae, even tufts of setae not replaced by strongly darkened spots invenation; wing disc in fuscated with 2 separated blacksih patches; toruli situated at lower level of eyes, not near to mouth margin; fore bristles of mesoscutum midlobe long and reaching to transscutal articulation; foramen maganum situated well above the centre of head; ovipositor sheaths visible from dorsal surface of gaster.

……..***Bishtiella*** **gen.nov.**

24. Notauli posteriorly almost more or less converging straight, sometimes axillae more or less advanced.

……..25

— Notauli curving posteriorly outwards to meet the strongly advanced axillae, thorax dorsally flattened and with characteristics engraved sculpture.

……..***Pseudodiglyphus*** **Girault**

25. Axillae only slightly advanced; scutellum fairly convex faint or without sublateral grooves, thorax at scutellum about as high as broad.

……..***Aulogymnus*** **Forster**

— Axillae advanced; scutellum with sublateral grooves; thorax at scutellum broader than high; body mostly with yellow pattern or if thorax completely dark than propodeum distinctly reticulate.

……..***Cirrospilus*** **Westwood**

26. Occiput usually bordered by a distinct horse-shoe shaped ridge; propodeum with two high submedian carinae joined in middle, anterior area thus limited is deep and trapezoidal.

……..***Stenomesius*** **Westwood**

— Occiput and propodeum different.

……..27

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27. Scutellum with sublateral grooves.

……..28

— Scutellum without sublateral grooves; funicle four egmented, club two segmented; annellus indistinct; head transverse; vertex outlined; eyes bare; thorax flat above, pronotum narrowed anteriorly, scutellum smooth, apex outlined; marginal vein two times and postmarginal vein one and a half times longer than stigmal vein; gaster ovate.

……..***Miotropis*** **Thompson**

28. Mesoscutum with extensive pilosity or appearing bristly, eyes setose; antennae clavate; club segmented; gaster ovate.

……..***Elachertus*** **Spinola**

— Mesoscutum with four pairs of strong bristles; eyes bare; antennae not likewise; club unsegmented; propodeum with a pair of strong median carina fused throughout the length except at its two end.

……..***Guptaiella*** **Khan and Sushil**

29. Axillae relatively less produced; notaular lines usually at least anteriorly indicated.

……..30

— Nearly entire axillae situated anterior to base or scutellum; notaular lines absent; clava three segmented, funicle two-segmented with the first segment small; fore wing narrow with long marginal fringe.

……..***Euderomphale*** **Girault**

30. Body strongly sclerotized, head and gaster not shrunken, gaster often petiolate.

……..31

— Body weakly sclerotized, head and gaster at least partly shrunken, thorax frequently weakly sculpture; gaster usually sessile.

……..34

31. Propodeum and other characters mostly different.

……..32

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— Propodeum with complete plicae and two submedian carinae diverging posteriorly, the latter rarely vague and replaced by narrow basal elevation moderately sloping backwards; nucha well-developed; petiole distinct, rectangular and reticulate; pronotal collar carinate; postmarginal vein seldom more than a little longer than stigmal vein; antennal formula 1, 1, 3, 2 or 1, 1, 2, 3.

……..***Pediobius*** **Walker**

32. Propodeum with a strong median carina or an incomplete carina set in a groove; plicae forming outer border of furrow; occiput margined: pronotal collar sharply margined.

……..33

— Propodeum differently sculpture.

……..44

33. Postmarginal and stigmal vein very short, subequal in length; sessile or nearly subsessile; antennal formula 1, 1, 3, 2; median carina of propodeum always present and situated in a distinct groove or depression, with broad submedian areas flat or convex, mostly rather shiny, but with broad sinuate grooves in place of plicae; body with distinct metallic tinge and on scutum and scutellum with conspicuous raised reticulation; head non-collapsing, frons punctured or reticulate, without distinct scrobal grooves and mostly without furcal grooves; pronotum mostly reduced in median part often with protruding shoulder bosses.

……..***Entedon*** **Dalman**

— Postmarginal vein more than two times as long as stigmal vein; gaster petiolate, petiole bell-shaped or transverse; antennal formula 1, 1, 3, 1; male funicle segments strongly petiolate at apex; propodeum with plicae forming outer border of furrow, costula and nucha absent; legs stout, hind femora, coarsely and densely piliferous-punctate.

……..***Cotterellia*** **Waterston**

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34. Fore wings with two or three curved dark stripes, flagellum strongly compressed, fusiform, with segments transverse.

……..***Closterocerus*** **Westwood**

— Fore wings at most with a single faint fascia; either antenna not compressed or flagellar segments not transverse.

……..35

35. Funicle two-segmented or with one segment and club four-segmented.

……..36

— Funicle at least three-segmented.

……..44

36. Funicle (or flagellum) appearing bristly or provided with long, fine setae and trichoid setae and fore wing not oblate; thorax short and convex.

……..37

— Flagellum not bristly, without trichoid setae; thorax more elongate, subdepressed dorsally; if antennae as in the first alternate then fore wing strongly oblate.

……..41

37. Marginal fringe as long as or longer than width of wing.

……..38

— Marginal fringe normal.

……..39

38. Fore wing very narrow, slightly expanded before middle and at apex, narrowed in between; margin fringe longer than width of wing.

……..***Goetheana*** **Girault**

— Fore wing normally wedge-shaped; fringe at most about as long as width of wing.

……..***Thripobius*** **Ferriere**

39. Head with dense reticulation; postmarginal vein shorter or longer than stigmal vein.

……..40

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— Head without reticulation; postmarginal vein as long as stigmal vein; fore wing with densly pilose.

……..***Dubeyiella*** **Agnihotri and Khan**

40. Head and thorax dull dense reticulation; pedicel obconical almost two times as long as wide; mesoscutum convex with parapsidal furrow slightly converging but distinct only in posterior two third; fore wing not broad with sparse and short piloisity; postmarginal vein short but still longer than stigmal vein.

……..***Obesulus*** **Boucek**

— Head and thorax shining with dense reticulation; pedicel more or less rectangular; slightly longer than wide; mesoscutum convex with short, inconspicuous parapsidal furrow; fore wing broad with normal pilosity; postmarginal vein shorter than stigmal vein.

……..***Shardiella*** **Sushil and Khan**

41. Setae on marginal vein about as long as stigmal vein or longer; thorax smooth or alutaceous, never reticulate.

……..42

— Either setae on marginal vein not longer than stigmal vein or thorax distinctly finely reticulate.

……..43

42. Clava distinctly broader than funicle; gaster subsessile, petiole transverse.

……..***Ceranisus*** **Walker**

— Flagellum very thin, pointed at apex; petiole pyriform; fore wing with more or less distinct row setae extending distad from stigma, the radial cell bare.

……..***Sarasvatia*** **Hedqvist**

43. Fore wing usually with a distinct row of setae extending distad from stigmal vein, radial cell bare.

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……..***Chrysonotomyia*** **Ashmead**

— Fore wing without such line of setae and radial cell with setae submarginal vein with three dorsal setae; scutullem with three pairs of setae; mesoscutum with a median groove on posterior part and having a non-collapsible head.

……..***Neopediobopsis*** **Narendran**

44. Pronotal collar more or less sharply margined; gaster usually petiolate.

……..45

— Collar or pronotum not margined.

……..46

45. Scutellum with a median furrow; propodeum with plicae but without a median carina; notauli complete.

……..***Visnuella*** **Hedqvist**

— Scutellum without a median furrow; propodeum with median carina; notauli posteriorly incomplete.

……..***Chrysocharis*** **Forster**

46. Postmarginal vein at least 1.5 times as long as stigmal vein.

……..47

— Postmarginal vein about as long as stigmal vein or shorter.

……..48

47. Marginal vein moderately arched, anteriorly with weak and dense setae; disc densely setose; antenna uniformly hairy; propodeum with narrow emargination, embracing petiole, the latter sometimes very long; gaster usually broad; clypeal margin subtruncate.

……..***Chrysocharis*** **Forster**

— Marginal vein straight, with sparse, rather strong setae; disc sparsely setose; antenna with some whorls of setae; propodeum broadly emarginate, the petiole short; gaster more or less elongate; clypeal margin usually rounded protruding.

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……..***Omphale*** **Haliday**

48. Fore wing with a slight fuscous streak at stigmal vein; radial cell more or less bare.

……..49

— Fore wing hyaline; petiolar emargination of propodeum broad and triangular.

……..***Omphale*** **Haliday**

49. Funicle two segmented and club three segmented; antennal scape hardly reaching anterior ocellus; antennae inserted slightly above the lower level of eye margin; mesoscutum with two pairs of long setae; submarginal vein with two dorsal setae.

……..***Chrysonotomyia*** **Ashmead**

— Funicle three segmented and club two segmented; antennal scape very long, longer than all funicle segments combined and exceeding the vertex level, antennae inserted at the centre of face; mesoscutum with one pair of setae; submarginal vein with three dorsal setae.

……..***Maniella*** **Agnihotri and Khan**

50. Always scutellum with scutellar longitudinal submedian grooves or lines, number of setae on scutelum varies; body non-metallic and metallic both.

……..51

— Scutellum without longitudinal submedian grooves or lines; always 3 pairs of setae on scutellum; body metallic only.

……..***Kiggaella*** **Narendran**

51. Pronotum with cross-carina; funicle three-segmented in female.

……..52

— Pronotum without collar cross-carina.

…….55

52. Vertex raised flagellar segments very long with long hairs; scape

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exceeding vertex and stigmal vein linear.

……..***LaSalleola*** **Narendran**

— Vertex, flagellar, scape and stigmal vein different from above.

……..53

53. Female funicle three or four segmented, propodeum with inverted 'Y'shaped median carina, without aleveolar space; gaster sessile.

……..54

— Female funicle four segmented; propodeum with inverted 'Y' shaped median carina, with distinct aleveolae; gaster petiolated.

…….***Mestocharella*** **Girault**

54. Female antennal funicle three segmented.

…….***Neomestocharella*** **Narendran**

— Female antennal funicle four segmented.

……..***Farooqiella*** **Ahamad**

55. Malar sulcus with a triangular fovea below eye.

……..56

— Malar sulcus without a triangular fovea below eye.

……..57

56. Scutellum wider than long with 3 pairs of setae; prepectus large and raised; clypeal margin bilobed.

…….***Aprostoporoides*** **Narendran**

— Basically scutellum longer than wider generally with 2 pairs of setae, anterior pairs of scutellar setae at least slightly in front of middle and equidistant from submedian and sublateral lines or near the later occasionally; prepectus not large and raised; axillae not very advanced, sculpture on propodeum stronger than sculpture on scutellum; one of cercal setae longer than others, often sinuate.

……..***Neotrichoporoides*** **Girault**

57. Malar sulcus present, although sometimes fine.

……..58

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— Malar sulcus absent or indistinct.

……..67

58. Face with conspicuous striations radiating from clypeal margin.

……..59

— Not as in the first alternate.

……..60

59. Antennal sockets placed high on head, face convex; head rather strongly sclerotised; hind wing at hamuli usually distinctly knobbed, petiole usually conspicuous.

……..***Ceratoneura*** **Ashmead**

— Antennal sockets situated well above the lower level of eyes margin; head not sclerotised; hind wing not likewise; petiole not conspicuous.

……..***Neoaceratoneura*** **Agnihotri and Khan**

Malar sulcus deeply grooved and lower margin of clypeus with 3 teeth; submedian grooves of scutellum deep throughout; notali with 6 pairs adnotaular hairs; petiole absent; ovipositor sheaths distinctly and clearly well produced beyond apex of epipygium.

……..***Neogestrichus*** **Narendran**

— Malar sulcus not deeply grooved; lower margin of clypeus different and other character are also variable.

……..61

60. Mesoscutum (mid lobe) with numerous setae or bristles scattered all over the sclerite, without bare medina area or line.

……..62

— Mesoscutum entirely bared or with reduced number of setae and these confined to adnotaular areas.

……..63

61. Scutellum without submedian grooves and with anterior pair of bristles near to base; mesoscutum without median groove; frontovertex at ocelli without grooves or lines of weaker sclerotization, occiput edged right behind lateral ocelli; propodeum with a longitudinal swelling or ridge

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outside spiracles.

……..***Nesolynx* Ashmead**

— Scutellum with distinct submedian grooves; mesoscutum usually with a median groove.

……..63

62. Propodeum without such inverted Y-shaped paraspiracular carina or posteriorly indicated.

……..64

— Propodeum with inverted Y-shaped paraspiracular carina.

……..66

63. Mesoscutal mid lobe almost smooth with only 2 pairs of long semierect setae, one in anterior half and another in the posterior half; scutellum transverse and lower margin of clypeus truncate.

……..***Tamarixia* Mercet**

— Mesoscutal mid lobe not smooth, and generally with more than 2 pairs of setae and other characters are also variable.

……..65

64. Mesoscutal mid lobe with peculiar raised longitudinal striae which occupy most of the central part.

……..***Parachrysocharis* Girault**

— Mesoscutal mid lobe without peculiar raised longitudinal striae.

……..***Aprostocetus* Westwood**

65. Thorax depressed; relatively large pronotum laterally with conspicuous spiracular tubercle or tooth; scutellum without submedian grooves, only slightly longer or even shorter than subhoter than subhorizontal propodeum; thoracic bristles sparse, erect; antennae short with erect bristles; hypopygium in female often reaching apex of gaster.

……..***Aceratoneuromyia* Girault**

— Character mostly different; if thorax depressed and scutellum without grooves, than pronotum without protruding spiracles and female

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antennae without erect bristles.

……..***Tetrastichus*** **Haliday**

66. In alate specimens mid lobe of mesoscutum with much fewer setae, these often confined to adnotaular areas; if the setae are scattered, then scutellum without submedian grooves; males different.

……..68

— Mesoscutum in female with over twenty scattered setae and frons with linear rami of fork very close to each other, directed towards outer margin of median ocellus; toruli situated below ocular line, separated from each other by at most 1.5 times breadth of torulus; scutellum with submedian lines; males brachypterous, each eye reduced to one facet and antennae transformed inot grasping apparatus.

……..***Melittobia*** **Westwood**

67. Setae on mid lobe of mesoscutum reduced in number and confined to adnotaular areas; rami of frontal fork different.

……..69

— Setae on mesoscutum more or less scattered, semi-erect; scutellum without submedian lines; rami of frontal fork widely diverging towards outer side or lateral ocelli; marginal vein not thickened; males apterous, with strong legs, inflated scape and reduced small eyes.

……..***Tachinobia*** **Boucek**

68. Gaster elongate and pointed, longer than head and thorax combined; ovipositor hardly exerted.

……..***Euderus*** **Haliday**

— Gaster shortly, oval, not longer than thorax; ovipositor strongly exerted, as long as gaster.

……..***Pareuderus*** **Ferriere**

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## 4.1 Subfamily- Tetrastichinae

### 4.1.1 Genus: *Tetrastichus* Haliday

*Tetrastichus* Haliday, 1944; 297-298. Type species *Cirrospilus attalus* Walker, by monotypy not *Tetrastichus* Walker, 1942; 116 a name suppressed by opinion 720, ICZN.

*Pseudomphaloides* Girault, 1915: 258. Type Species *Pseudomphaloides acnellus* Girault; by original designation (Syn. by Boucek, 1988).

*Redinia* Girault, 1936: 4, type-species *Redinia hispidivertex* Girault; by monotype (Syn. by Boucek, 1988).

*Ceratoneuronomyia* Girault, 1913b: 252. Type-species *Ceratoneuronomyia arnoldi* Girault; by original designation (Syn. by Boucek, 1988).

*Tetrastichus* Thomson, 1978. *Hymenoptera scandinaviae*, 5: 278.

*Tetrastichus* Howard, 1886. *Ent. Amer.* 2: 100.

*Tetrastichus* Kurdjumov. 1913. *Russk. Ent. Obozr.* 13: 243.

*Tetrastichus* Gahan, 1914. *proc. U.S. Nat. Mus.* 48: 584.

*Tetrastichus* Crawford, 1915. *Proc. U.S. Nat. Mus.*, 48: 584.

*Tetrastichus* Rohwer, 1921. *Ann. Mag. Nat. Hist.*, 9(7): 128-133.

*Tetrastichus* Wasterston, 1922. *Indian Forest Rec.* 9: 39.

*Tetrastichus* Ferriere, 1930. *Bull. Ent. Res.*, 21: 253.

Ferriere, 1931b. *Bull. Ent. Res.*, 22: 290-291.

*Tetrastichus* Burks, 1943. *Proc. U.S. Natn. Mus.*, 93: 505-608.

*Tetrastichus* Ranaweera, 1947. *Indian J. Ent.*, 9: 7-13.

*Tetrastichus* Nikol'skaya, 1952. *Opred Faune U.S.S.R.* Moscow 44: 274.

*Tetrastichus* Bhatnagar, 1952. *Indian J. Agri. Sci.*, 21: 176.

*Tetrastichus* Kurian, 1953. *Indian J. Ent.* 15: 117.

*Tetrastichus* Delucchi, 1954b. *Mitt. Schweiz, Ent. Ges.*, 27: 99-108.

*Tetrastichus* Ferriere, 1960. *Acts Hymenop. Tokyo*, 1: 105-108.

*Tetrastichus* Peck *et al.* 1964. *Mem. Entomol. Soc. Canada.* 34: 99.

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*Tetrastichus* Domenichini, 1966a. *Bull. Zool. Agri. Bachic* (Ser. 2) 6: 61-205.

*Tetrastichus* Dzhanokmen, 1971. *Zoolog. Zhurn*, 59(12): 1883-1885.

*Tetrastichus* Kaul and Saraswat, 1974. *Oriental Ins.*, 8: 189.

*Tetrastichus* Saraswat. 1975. *Mem. School. Ent. Agra.* No. 4: 1-31.

*Tetrastichus* Saraswat. 1978. *Mem. School. Ent. Agra.* No. 5: 99-106.

*Tetrastichus* Boucek, 1977b. *Bull. Ent. Res.*, 67: 19, 21, 28-29.

*Tetrastichus* Kostyukov, 1978. *Opred Faune S.S.S.R.* 120: 430-467.

*Tetrastichus* Khan and Shafee, 1981a. *J. Bombay Nat. Hist. Soc.*, 78(2): 337-343.

*Tetrastichus* Khan, 1982. *J. Bombay Nat. Hist. Soc.* 79(2): 375-378.

*Tetrastichus* Khan, 1983. *J. Bombay Nat. Hist. Soc.*, 80(1): 185-188.

*Tetrastichus* Shafee *et al.*, 1983a. *J. Bombay Nat. Hist. Soc.*, 80(2): 393-398.

*Tetrastichus* Hayat, 1985. *Oriental Ins.*, 19: 252.

*Tetrastichus* Hussain and Khan. 1986. *Oriental Ins.*, 20: 234-244.

*Tetrastichus* Boucek, 1988. *Australasian Chalcidoidea* (Eulophid part). 693-694.

*Tetrastichus* Khan and sushil. 1992. *J. Bombay Nat. Hist. Soc.*, 89: 329-347.

*Tetrastichus* Narendran, 2006. *Entomon*, 31(4): 293-305.

**Diagnosis**

Genus *Tetrastichus* can be distinguished at once by the following key characters from all other members of the family Eulophidae; margin of clypeus with a pair of tooth like projectios; antennae never inserted at or immediately dorsal of clypeal margin; maxillary and labial palpi each composed of single segment, mandibles with three teeth; female antennae with three funicle segments, male with four, club in both sexes composed of three segments, terminal two often more or less fused, club always with a minute terminal style; eyes with sparse and short hairs; pronotum narrow, transverse; first and middle tibiae slender; all tarsi with four segments; propodeum mesad of spiracle with an inverted Y-shaped carina, i.e. with plica which behind middle sends off a branch towards the postero-lateral corner, and medially never very short; fore wing ventation more or less interrupted between submarginal vein and

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prestigma, later projecting basally to a narrow apex of submarginal vein, submarginal vein of fore wings with from one to several dorsal bristles, marginal vein always longer than stigmal vein, postmarginal vein usually reduced or wanting; axillae produced anteriorly advance of tegulae, scutellum with two longitudinal dorsal grooves; hind wings with three hamuli; gaster often with a rudimentary petiole but never distinctly petiolate; ovipositor may or may not markedly exerted.

**Discussion**

Genus *Tetrastichus* was first described by Haliday in 1833, with *Cirrospilus attaus* Walker as its type-species. Walker (1844) apparently accepted this generic segregation at once, as he published the description of a new species in *Tetrastichus* and during 1846-1848 he transferred many of his species earlier described under *Cirrospilus* to *Tetrastichus*. Walker also considered *Aprostocetus* Westwood as a synonym of *Tretrastichus* but according to them standard of taxonomic procedures, would be impossible, as *Aprostocetus* was the older of the two names. Based on the contributions of Haliday and Walker, Forster (1856) made a stupendous endeavour on the classification of chalcids. He, however, arranged the genera of chalcid flies among more than twenty families. Genus *Tetrastichus* was made the type genus for one of these families. He has stated in his discussion of the genus *Tetrastichus* "that he considered Walker to have been correct in combining *Aprostocetus* and *Tetrastichus* but that in the future if the species with an elongate ovipositor were segregated generically they should be placed under the *Aprostocetus* with *Lonchentedon* Ratzeburg as a generic synonym".

Walker (1871-72) in his classification of chalcid flies briefly dealt with the genera of the family Tetrastichidae, but his classification differs slightly from Forster's and continued to regard *Aprostocetus* as a synonym of *Tetrastichus*, although observance of the right of priority had become quite general by that time.

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Thomson (1878) while dealing with the Scandinavian species of *Tetrastichus* stated that *Aprostocetus* Westwood and *Lonchentedon* and *Geniocerus* Ratzeburg as generic synonyms, and transferred a number of species from *Eulophus* and *Entedon* to *Tetrastichus*.

A few years later, Howard in 1886, keyed out the genera of the chalcids without altering the basic concept of the genus *Tetrastichus* of the European authors. Ashmead (1887) published his classification of the supra generic categories of his superfamily Chalcidoidea, considered Forster's family Tetrastichoidea or Walker's Tetrastichinae of the Eulophidae. Further in 1904, he included thirteen genera in the Tetrastichinae. He treated *Tetrastichus* and *Aprostocetus* to be distinct genera and listed *Geniocerus* and *Trichoceras* Ratzeburg as synonyms of *Tetrastichus*. He cited *Eulophus miser* Nees as the genotype of *Tetrastichus*, apparently because of the fact that Dalla Torre (1898) had listed *Cirrospilus attalus* as a synonym of *Eulophus miser*.

Ashmead grouped *melittobia* Westwood, *Tetrastichodes* Ashmead, *Trichaporus* Forster, *Hyperteles* Forster, *Gyrolasia* Forster, *Syntomosphyrum* Forster, *Ceranisus* Walker, *Barycapus* Forster, *Aprostocetus* Westwood, *Crataepus* and *Pentastichus* Ashmead with *Tetrastichus* in the tribe Tetrastichini and making a tribe Ceratoneurini for the genus *Ceratoneura* Ashmead. He placed these two tribes in the sub-family Tetrastichinae.

Schmiedeknecht (1909) followed Ashmead's classification without much modification but pointed out the genus *Oomyzus* Rodani to be a synonym of *Tetrastichus*.

An excellent studies were carried out by Kurdjumov (1913) on the genus *Tetrastichus* and its allies, revealed that *Trichaporus* is a synonym of *Astichus* Forster (subfamily Entedontinae) and *Gyrolasia* is the same as *Pteroptrix* Westwood (a member of subfamily Aphelininae). He also considered *Syntomosphyrum*, *Ceranisus* and *Baryscapus* to be synonyms of *Tetrastichus*. He resurrected the genus *Geniocerus*, for those species formerly placed in

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*Tetrastichus*, which have more than one dorsal seta on the submarginal vein of the fore wings and restricted *Tetrastichus* to those species with one dorsal seta. He applied the name *Aprostocetus* for those species having a long exerted ovipositor. Further he also confirmed the fact that *Cirrospilus attalus* is a synonym of *Eulophus miser*.

Gahan (1914) followed Kurdjumov concept while dealing with Nearctic species of the genus *Tetrastichus*.Crawford (1915) was not satisfied with Kurdjumov's delimitations of *Tetrastichus* and *Geniocerus*, but no other information was available at that time except Kurdjumov's findings. Since that time of genus *Geniocerus* was used by few, but for the rest, Kurdjumov's contribution had been quite generally accepted and followed.

Girault (1913) followed Ashmead's system of classification and described unconsistently numerous genera and species of Tetrastichinae. For example, he described the genus *Aprostoceroloides* in his first account (1913) on the Eulophidae of Australia, but in the supplement (1915) to this work he pointed out this genus to be a synonym of his *Trichaporoidella*. Later (1917) he evidently marked that the two genera were not the same, as he placed on the his new species from USA in the genus *Aprostoceroloides*.

Burks (1943) studied the characters gives in the original descriptions of *Aprostoceroloides* and *Trichaporoidella* and in his opinion *Aprostoceroloides* is a synonym of *Tetrastichus*, while *Trichaporoidella* is more than likely the same as *Syntomosphyrum*. His conclusions in relation to he limitation of *Tetrastichus* and its allies slightly differ from those of Kurdjumov. He disagree with Kurdjumov finding that *Syntomosphyrum* is a synonym of *Tetrastichus*, as the two groups distinctly separate. Further, Burks stated "the use of the name *Geniocerus* seems unnecessary; the species referred to that genus may well be placed in *Tetrastichus*. The genus *Ceranisus*, as identified by Ashmead (and apparently by Kurdjumov as well), is not the same as Walker's genus as originally described. Ceranisus, Ashmead, not walker is undoubtedly the same as *Tetrastichus* but *Ceranisus* Walker, with two funicle segements is closed to

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*Pentastichus* Ashmead". Although he had transferred a number of species from *Ootetrastichus* Perkins to *Tetrastichus* but did not consider *Ootetrastichus* as a synonym of *Tetrastichus*. Further he concluded that the most of the Nearctic species described in *Hyperteles*, however, belong in *Tetrastichus*.

*Syntomosphyrum* Forster was synonymized with *Aprostocetus* Westwood by Graham (1961) and with *Tetrastichus* by Domenichini (1965). However, Ferriere (1938, 1940), Kurian (1954), Burks (1952, 1967), Risbec (1957), Peck (1963), Peck *et al.* (1964) Khan and Shafee (1981a) followed Burks (1943) opinion regarding *Syntomosphyrum* and *Tetrastichus* as distinct genera.

Kostyukov (1977) had studied in detail on the morphology of the genus *Tetrastichus* and the identification remarks made by him apply well on the species under study.

Recently, Boucek (1988) stated that most species of the genus with one dorsal seta on the submarginal vein, but in a group like *howardi*, the south Asiatic and Australian species with two bristles, whilst the very closely related African *T. atriclavus* Waterston and two other Australian species have only one. The group has the propodeum rather long and subhorizontal, with generally distinct irregular sculpture and very strong and straight plical carinae converging towards apex of the sclerite, as protruding corners of short nucha, whilst the outer branch (of inverted Y) is relatively weaker. *T. howardi* is extremely close to *T. inferens* Yoshimoto, which seems to differ by a slightly flattened dorsum of the thorax. In some specimens the differences (which include a dark or white fore coxa) seem to be inconspicuous, so that the Indo-Australian complex is united under *howardi* Graham (1987, 1991) and LaSalle (1994).

Khan and Sushil (1992) made valuable contributions to the genus and reported five new species viz., *Tetrastichus mohani*, *T. mangifera*, *T. obliqua*, *T. chakrataensis* and *T. partellus* from India. They also provided very informative and helpful key to some species based on females.

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**Biology**

These chalcid flies may be either primary parasitoids or hyperparasitoids and have wide host range consisting of cotton boll weevil, caterpillars of borers, beetles, leaf miners, midges, scale insects, gall makers which cause severe damage to agricultural crops, horticulture and forestry plantations. The parasitoids attack different stages of the host including eggs, larvae and pupae.

**Distribution**

All major regions (more than 100 spp.) including North America, Russia, New Guinea, Australia, Newzealand, India, Pakistan etc.

From India, a good number of species have been described so far. In the present investigation eight new species are being added to the current knowledge of the genus *Tetrastichus* Haliday. A key to some Indian species of the genus has been framed.

**Key to some Indian species of genus *Tetrastichus* Haliday**

1. Club unsegmented; PMV distinctly developed, POL slightly 2 times shorter than OOL, mandibles bidentate with 2 acute teeth and a truncation; antennae with 3 anelli, pedicel long more than ½ length of the FS1, FS1 to 3 gradually decreasing in length distad, FS1 much longer, more than 4 times as long as wide, FS2 slightly shorter than first, FS3 shorter than FS2, club much longer than the preceding funicle segment.

…….***Tetrastichus clavatus* Khan *et al.***

— Club 3-segmented and other characters variable.

…….2

2. PMV distinctly developed.

…….3

— PMV completely absent.

…….9

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3. Body yellow or yellowish brown.

…….5

— Body black.

…….4

4. Frontovertex and face with scattered shollow punctuations, eyes very sparsely pubescent; antennae brown, scape pale brown, only 1 anellus present, club almost as long as preceding two funicle segments combined; scutellum finely longitudinally reticulate.

……..***T. kishnaiahi*** **Kaul and Saraswat**

— Area of frons dorsal and lateral of scrobe cavity deeply punctured; eye bare; antennae brown except club white and scape whitish with infuscation on dorsal side, 3 anelli present, club longer than preceding funicle segment; scutellum with microreticulate sculpture.

….***T. chakrataensis*** **Khan**

5. Eyes silvery white, bare; scape slightly more than 4 times as long as wide, 3 ring segments present, FS1 to 3 subequal in length, each 1.5 times as long as wide; mesoscutum with 5 adnotaular setae; gaster with 5 transverse brown bands on dorsum.

….***T. flavidus*** **Khan and Shafee**

— Eyes black or dark red and other characters variable.

…….6

6. Antennal toruli situated well below the lower level of eye margin; mesosctutum with medium furrow.

…….7

— Antennal toruli situated well above the lower level of eye margin; mesoscutum without median furrow.

…….8

7. POL distinctly less than 2 times as long as OOL; pedicel short, much less than 2 times as long wide, FS1 longer than wide, FS2 shorter than

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FS1, quadrate, FS3 transverse, wider than long, club almost as long as funicle segments 1 to 3 combined; fore wings densely setose, speculum moderate, SMV with 4 strong setae, longer than MV; third valvulae moderate in size, less than 7 times as long as wide less than 1/3rd the length of second valvifers.

…. ***T. mohani* Khan and Sushil**

— POL distinctly more than 2 times as long as OOL; pedicel long slightly less than 2 times longer than wide, FS1 much longer than wide, FS2 shorter than FS1, 2 times longer than wide, FS3 shorter than FS2, longer than wide, club slightly shorter than preceding two funicle segments combined; fore wings sparsely setose, speculum large and broad, SMV without setae, shorter than MV; third valvulae long, more 1/4th the length of second valvifers.

**…. *T. sissoo* Khan *et al.***

8. Antennae with 2 anelli; pedicel 2 times as long as wide, as long as FS1, FS1 a trifle less than 2 times as long as wide, FS2 longer than FS1, less than 2 times as long as wide, FS3 shorter than FS2, less than 1.5 times as long as wide, club longer than preceding to funicle segment together; third valvulae long, more than 10 times as long as wide, distinctly less than 1/3rd length of second valvifers.

……***T. lotellae* Delucchi**

— Antennae with an anellus; pedicle distinctly less than 2 times longer than wide, much shorter than FS1, FS1 long, les than 3 times longer than wide, FS2 longer than FS1, slightly more than 3 times as long as wide, FS3 much longer than FS2, slightly less than 3 times as long as wide, club much shorter than preceding FS2 combined; third valuable very long, more than 12 times as long as wide more than 1/3rd the length of second valvifers.

……***T. tewari* Khan *et al.***

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9. Body colouration dark brown or metallic.

…….10

— Body colouration yellow or yellowish brown.

…….29

10. Antennae with only an anellus.

…….11

— Antennae with more than 1 anelli.

…….25

11. Frontovertex punctate.

…….12

— Frontovertex smooth, without punctations.

…….13

12. Malar sulcus distinct; antennae dark brown, scape testaceous, pedicle short, distinctly longer than wide, 2 anelli present, funicle segments 1 to 3 sebequal in size, club almost as long as preceding two funicle segments combined.

…***T. versicolor*** **Ranweera**

— Malar sulcus absent, antenne dark brown except club white, pedicel long; more than 2 times as long as wide, only an anellus present, FS1 elongated less than 2 times as long as wide, FS2 a trifle longer than wide, FS3 greatly transverse, club longer than preceding two funicle segments combined.

…***T. davidi*** **khan**

13. Lower margin of clypeus without dents medially.

…….. 14

— Lower margin of clypeus with 2 dents medially.

…….19

14. Scutum distinctly shorter than scutellum; scutellum not distinctly broader than long, gaster apical tip almost blunt and ovipositor sheaths not exerted.

…….15

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— Scutum slightly longer than scutellum; scutellum distinctly broader than long, gaster apical tip almost acuminate and ovipositor sheaths exerted

…….16

15. Midlobe of mesoscutum and scutellum each with 2 pairs of setae; compound eyes dull red; basal vein with 2 setae; malar sulcus slightly curved.POL less than 1.5 times as long as OOL,malar space more than 2 times longer than eye width,gaster sessile.

……***T. narendranii* sp.nov.**

— Mid lobe of mesoscutum and scutellum each with 3 pairs of setae; compound eyes dark brown; basal vein with 4 setae; malar sulcus straight.POL more than 1.5 times as long as OOL.malar space less than 2 times longer than eye width,gaster subsessile.

……..***T.bhimtali* sp.nov.**

16. Eyes red; prominence between antennal sockets almost 1/3$^{rd}$ the width of frons between eyes; spiracles contiguous with anterior margin of propodeum; scutellum with 3 pairs of setae.

……***T.indicus* Khan and Shafee**

— Eyes black; prominence between antennal sockets more than 1/3$^{rd}$ the width of frons between eyes.

…….17

17. Scape less than 5 times as long as wide; costal cell setose.

…….18

— Scape about 5 times as long as wide; costal cell bare, SV more than 1/4$^{th}$ the MV; ovipositor slightly exerted; mesoscutum with median longitudinal sulcus; basal vein with 5 setae, pronotum with transverse carina, mesoscutum with 7 pairs of adnotaular setae.

…….***T. mallitalensis* sp.nov.**

18. Prominence between antennal sockets more than 1/5$^{th}$ the width of frons between eyes; scape less than 5 times as long as wide; costal cell with 6

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setae; SV almost 1/4th the MV; gaster shorter than thorax; ovipositor almost concealed.

……***T. partellus*** **Khan and Sushil**

— Prominence between antennal sockets less than 1/5th the width of frons between eyes; scape less than 4 times as long as wide; costal cell with 3 setae; SV less than 1/4th the MV; gaster longer than thorax; ovipositor exerted.

……..***T. minutus*** **sp.nov.**

19. Mandibles bidentate.

…….20

— Mandibles tridentate.

…….21

20. POL almost 1.5 times as long as OOL; prominence between 2 antennal toruli 1/5th the distance between the frons and eyes; malar sulcus absent, pedicel distinctly less than 2 times as long as wide, FS1 long, 2 times as long as wide,FS2 short,shorter than FS1,FS3 slightly longer than FS2, mesoscutum without median furrow or groove, mesoprescutum bearing one row of 5 setae at each lateral margin; third valvulae long, almost seven times as long as wide, distinctly less than 1/3rd the length of second valvifers.

..…***T. pyrillae*** **Crawford**

— POL less than 2 times as long as OOL; prominence between 2 antennal toruli distinctly more than 1/6th the distance between the frons and eyes; malar sulcus distinctly present; pedicel 2 times as long as wide, all funicle segments almost subequal in size; mesoscutum with median furrow, mesoprescutum bearing one row of 4 setae at each lateral margin; third valvulae much long, less than 9 times as long as wide, distinctly more than 1/3rd the length of second valvifers.

…….***T. apanteles*** **Khan *et al.***

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21. Eyes reddish brown; prominence between antennal toruli 1/4th the width of frons between eyes, malar space about as long as eye width; third valvulae short, triangular, less than 2 times as long as wide, about 1/5th the length of second valvifers.

……..***T. aligarhensis*** **Khan and Shafee**

— Eyes dark brown and other characters variable.

…….22

22. Mesoscutum without a median furrow or groove; prominence between antennal toruli less than 1/3rd the width of frons; malar space distinctly longer than eye width; third valvulae long; lanceolate; almost 4 times as long as wide, more than one third the length of second valvifers.

…***T. mangifera*** **Khan and Sushil**

— Mesoscutum with a median furrow or groove and other characters variable.

…….23

23. Pedicel short, 2 times as long as wide,club shorter than preceding two funicle segments combined;posterior margin of pronotum with more than 1 pair of setae,costal cell setose.

…….24

— Pedicel long, more than 2 times as long as wide, club as long as preceding two funicle segments combined; posterior margin of pronotum with 1 pair of setae; costal cell bare.

…….. ***T. thoracicus*** **Khan *et al.***

24. Pedicel slightly more than 1.5 times as long as FS1, all funicle segments almost subequal in length, FS1 twice as long as wide; posterior margin of pronotum with 10 pairs of setae, PMV slightly developed.

……..***T. triozai*** **Khan *et al.***

— Pedicel slightly less than 1.5 times as long as FS1, all funicle segments different in length, FS1 more than 2.5 times as long as wide; posterior margin of pronotum with 7 pairs of setae, PMV rudimentary.

…….. ***T. hillensis*** **sp.nov.**

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25. Antennae with 4 anelli.

…….26

— Antennae with only 2 or 3 anelli.

…….27

26. Body very dark brown with metallic blue green reflections; head without punctations,antennae brown with scape yellow; legs pale yellow except fore coxae dark brown.

…… ***T. dhireni* Saraswat**

— Body nonmetallic brown; head with shallow scattered punctuations on vertex and face; antennae dark brown except scape yellowish brown; legs pale brown.

….***T. shencottensis* Saraswat**

27. Antenna with 2 anelli; scape and pedicel yellowish brown,funicle segments and club fuscous;legs pale cream except coxae and major part of femora dark.

…… ***T. taprobanensis* Ranweera**

— Antennae with 3 anelli; other characters also different.

…….28

28. Antennae dark brown with yellowish brown scape and pedicel; legs testaceous except coxae and femora dark brown.

……. ***T. niger* Ranweera**

— Antennae pale brown except scape yellow; legs yellow coxae with tarsal segments infuscated;malar sulcus grooved;lower face with longitudinal groove under each torulus;club two segmented.

……***T.clubensis* sp.nov.**

29. Pedicel distinctly shorter or ½ to 1/3$^{rd}$ the length of FS1.

…….30

— Pedicel as long as FS1 or longer.

…….40

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30. Antennae with 1 or 2 anelli.

…….31

— Antennae with 3 or 4 anelli.

…….33

31. Antennae with only 1 anellus, malar space shorter than eye width, mandibles with 2 teeth and a truncation, scape 3 times longer than wide; basal vein with 5 setae, speculum closed below; third valvulae very long almost 9 times as long as wide, distinctly less than 1/3rd the length of second valvifers.

……***T. pantnagarensis* Khan**

— Antennae with 2 anelli; malar space longer than eye width; basal vein with 3 setae.

…….32

32. Mandibles tridentate with acute teeth; scape more than 5 times as long as wide;speculum large and open below, third valvulae short, 5 times as long as wide, less than the 1/4th of the second valvifers.

……***T. misellus* Delucchi**

— Mandibles bidentate with acute teeth; scape more than 4 times as long as wide;speculum narrow and closed below, third valvulae long, 9 times as long as wide, less than the 1/3rd of the second valvifers.

…… ***T. eggaevorus* sp.nov.**

33. 4 anelli present.

…….34

— Only 3 anelli present.

…….35

34. Antennae about ½ the body, pedicel almost 1/3rd the length of FS1, FS1 very long almost 8 times as long as wide; 3 mesoscutal bristles present, median longitudinal groove on mesonotum faint.

…… ***T. tritrichia* Saraswat**

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— Antennae less than ½ the body, pedicel not likewise, distinctly shorter than FS1, FS1 almost 2.5 times as long as wide; 11 andotular setae present, median longitudinal groove on mesonotum distinct.

…***T. polyseta*** **Saraswat**

35. Antennae not uniformly yellow.

…….36

— Antennae uniformly yellow, eyes red with 6 dark patches, scape slightly less than 4 times as long wide, as long as basal 2 FS together, FS1 to 3 subequal in length; body completely yellow except apex of ovipositor infuscated; middle tibial spur as long as basitarsus; third valvulae 4 times as long as wide, one fourth the length of second valvifers, outer plates of ovipositor as long as second valvifers.

…***T. psyllidis*** **Khan and Shafee**

36. Lower margin of clypeus without dents medially, 2 dark spots below the front ocellus present; club 2 segmented; thorax light reddish brown, slightly broader than head; legs yellowish brown; SMV approximately equal to the MV; SV and about one fourth of the MV; ovipositor subexerted.

**…*T. lasiopterae* Bhatnagar**

— Lower margin of clypeus with 2 dents medially and other characters also variable.

…….37

37. Face or thorax with puntations.

…….38

— Face and thorax without any punctuations.

…….39

38. Frontovertex, mesoscutum and scutellum with punctations; eyes and ocelli brownish red to reddish brown; antennae dark brown; legs

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yellowish brownexcept middle coxae completed,hind coxae basally last tarsal segments of all the legs dark brown.

…….***T. mallabarensis*** **Saraswat**

— Only upper face having punctations; mesoscutum and scutellum without punctations; eyes and ocelli dark brown to dull red; legs pale yellow except fore and hind coxae completed, hind coxae dark brown.

……..***T. figensis*** **sp.nov.**

39. Head yellowish brown, vertex and bases of ocelli dark brown; eyes reddish brown; antennae black except scape yellowish brown; legs yellowish except last tarsal segment of all the legs dark brown, pedicel distinctly less than ½ the length of FS1.

……***T. bicolor*** **Saraswat**

— Head very dark brown, rest of the body yellowish brown; eyes red; antennae brown except scape and pedicel yellowish brown, pedicel not likewise but distinctly shorter than FS1; legs brownish yellow except hind coxae on basal half black.

…..***T. satpurensis*** **Saraswat**

40. Eyes silvery white; prominence between antennal toruli 1/6$^{th}$ the width of frons between eyes; antennae yellowish, scape 3.5 times as long as wide, pedicel 1.5 times as long as wide, 2 ring segments present, FS1 to 3 slightly longer than wide; third valuable 3.5 times as long as wide, 1/3$^{rd}$ the length of second valvifers; outer plates of ovipositor slightly longer than second valvifers.

…..***T. annulicornis*** **Khan and Shafee**

— Eyes red, prominence between antennal toruli distinctly more than 1/4$^{th}$ the width of frons between eyes; mesoprescutum bearing a single setae at each lateral margin, third valvulae less than 6 times as long as wide, slightly more than 1/3$^{rd}$ the length of second valvifers, outer plates of ovipositor distinctly shorter than second valvifers.

……***T. obliqua*** **Khan and Sushil**

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**4.1.1.1 *Tetrastichus figensis* sp.nov.** (Plate: 1, Figs.1-13)

**Female** : Body length about 1.95 mm; body colour blackish brown with raddish reflection; head dark brown,ocelli pale red and eyes dark brown; antennae pale brown except scape and pedicel yellow; thorax blackish brown with reddish reflection, wings hyaline; legs pale yellow except fore and hind coxae blackish brown; gaster blackish brown.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.54 : 0.44), small pits scattered on upper face, head frontal grooves present meeting to mid ocelli; frontovertex wide, width distinctly more than ½ the total head width (0.34 : 0.54); vertex setae shorter and sparse; ocelli arranged in obtuse angled triangle; POL 1.5 times as long as OOL; compound eyes bulged and smooth, eyes orbits round, facets uniform in shape and size; antennal toruli situated just above the lower level of eye margin, prominence between antennal toruli less than 1/8$^{th}$ the width of frons between eyes (0.04 : 0.306); malar sulcus straight and prominent; malar space smooth, longer than eye width (0.16 : 0.112); mandibles bidentate (Fig. 2); maxillary palp (Fig. 3) and labial palp (Fig. 4) each single segmented; lower margin of clypeus bilobed medially.

**Antennae (Fig. 5)** : 8 segmented excluding 3 anelli; antennae with long longitudinal sensilla, apical tip of antenna with very small spicule, antennal formula 1,1,3,3,3; scape cylindrical, more than 3.5 times as long as wide (0.18: 0.048); scape apex touching to mid ocelli; pedicel more than 1.5 times as long as wide (0.066: 0.04) and shorter than the length of the FS1; funicle 3 segmented, FS1 to FS3 gradually decreasing in length, FS1 less than 2 times as long as wide (0.105: 0.053), FS2 less than 2 times as long as wide (0.102 : 0.053), FS3 more than 1.5 times as long as wide (0.096 : 0.062); club 3 segmented, more than 3 times as long as wide (0.185 : 0.057),shorter than preceding two funicle segments combined.

**Thorax (Fig. 6)** : Pronotum blackish brown bearing 5 pairs of setae (Fig.7),

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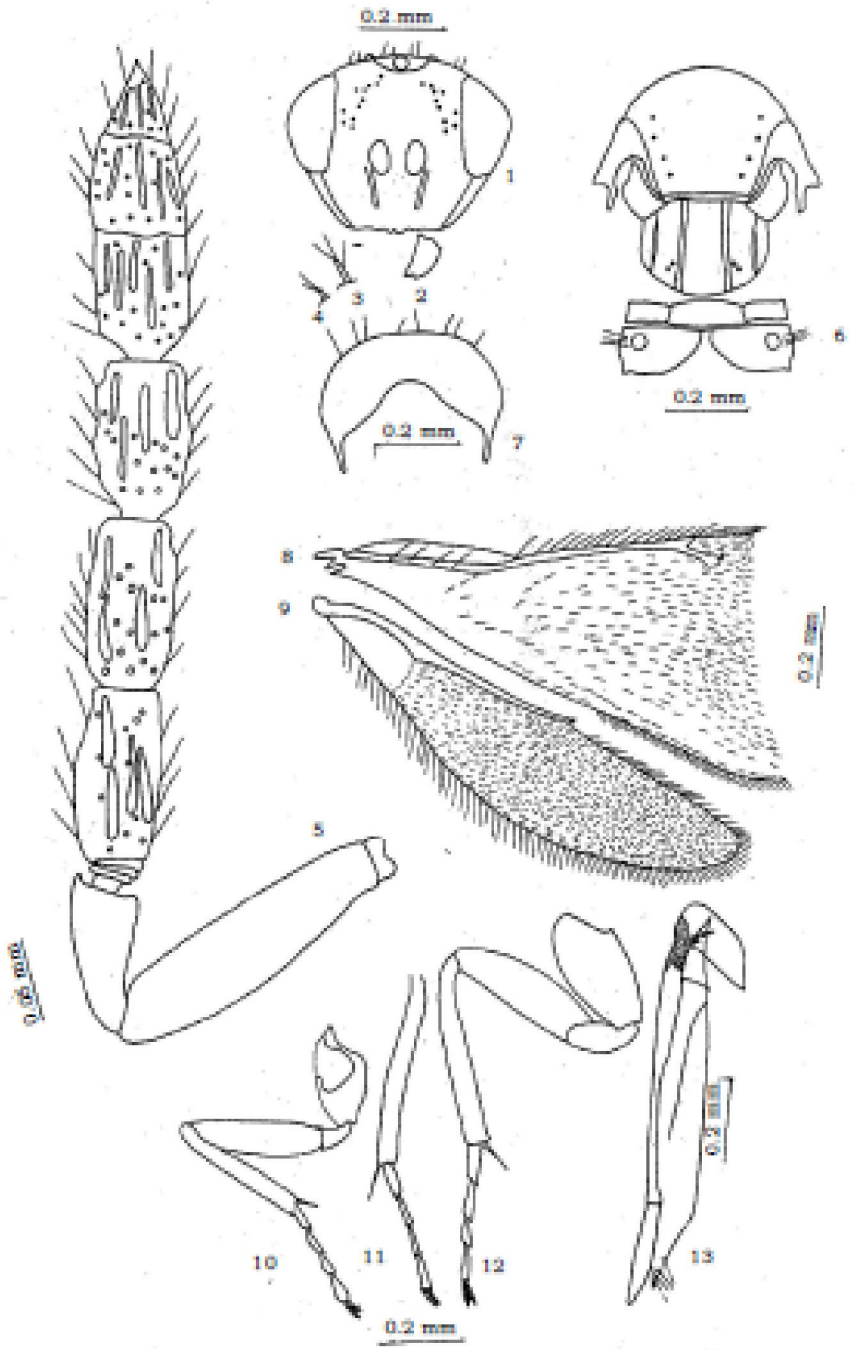


**Plate: 1-figs. 1-13:** ***Tetrastichus figensis*** **sp.nov.**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view;7.Pronotum;8.Forewing;9.Hindwing;10.Foreleg;11.part of middle leg;12.hind leg;13.Female genitalia

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**(A) Fig fruit with adults of Agaonid insect**

**(B) Infested fig fruit by larvae of Agaonid insect and these larvae were parasitized by *Tetrastichus figensis* sp.nov.**

**(C) Female adult of Agaonid insect**

**(D) Female adult of Agaonid insect**

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anterior margin concave in the middle; mesoscutum more than 1.5 times as wide as long (0.54 : 0.31); mesoscutum having 4 pairs of adnotaular setae, notauli complete and deep, median longitudinal sulcus present; axilla moderately advanced; scutellum slightly smooth and shorter than mesoscutum, slightly more than 2 times as wide as long (0.48 : 0.235) with submedian longitudinal grooves and 2 pairs of setae situated on scutellum, grooves deep and straight; dorsellum large; metanotum broad like a bend; propodeum with median carina and with paraspiracular carinae, propodeal spiracles round and large and well separated from the anterior margin of propodeum, spiracle rim fully exposed.

**Fore wings (Fig. 8)** : Long, slightly more than 3 times as long as wide (1.545: 0.490), less than 1.5 times longer than hind wing length, densely setose; costal cell long and broad with a row of 4 setae; SMV with 4 setae directed upwards, longer (0.45) than MV (0.425); MV bearing 14 long setae on front edge; PMV very short (0.02), SV (0.09) more than 4.5 times shorter than the length of MV (0.425); marginal fringe moderate in length; basal vein with 4 setae, basal cell bare; speculum moderate, closed below; cubital vein sinuate, subcubital line of hairs arising from the distance of 1/3$^{rd}$ the base.

**Hind wings (Fig. 9):** More than 4 times as long as wide (1.22: 0.285) with blunt apex; vein length (0.69) more than one half the length of wings; marginal fringe spaced by a distance equal to 1/5$^{th}$ of their length.

**Fore legs (Fig. 10):** Coxa less than 2 times as long as wide (0.25: 0.15); femur more than 3.5 times as long as wide (0.32: 0.085), shorter than tibia; fore tarsus shorter than length of tibia (0.23: 0.33).

**Mid legs (Fig. 11):** Coxa more than 2 times as long as wide (0.330: 0.150); shorter than 4.5 times as long as wide (0.350: 0.075); femur more than tibia; tarsus less than 1.5 times shorter than length of tibia (0.32: 0.47).

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**Hind legs (Fig. 12):** Hind coxa less than 2 times as long as wide (0.31: 0.16), femur less than 3.5 times as long as wide (0.375: 0.110); femur shorter than tibia, tarsus less than 1.5 times shorter than length of tibia (0.335: 0.480).

**Gaster :** Large and ovate, gaster surface smooth, gasteral apical tip acuminate; gaster sessile; metasoma more than 1.5 times longer than mesosoma (1.050 : 0.625); ovipositor sheaths slightly exerted; frist valvifers triangular (Fig.13); anterior margin of basal part of second valvifers curved; third vulvulae more than 5 times as long as wide (0.255: 0.050); less than 3 times the length of second valvifers (0.745); outer plates of ovipositor longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 13).

**Male:** Not known

**Holotype:** ♀, India, U.K., Ramnagar, Shankarpur, Host-larvae of Fig insect (Hymenoptera: Agaonidae), reared collection on Fig fruit, Hym. Eulo. Nr. 077 (Sandeep Kumar).

**Paratype:** 10 ♀♀, same data as holotype Hym. Eulo Nr. 077A (Sandeep Kumar).

**4.1.1.2 *Tetrastichus clubensis* sp.nov.** (Plate: 2, Figs.1-11)

**Female :** Body length about 1.52 mm; body moderately sclerotized; body colour black; head yellow, ocelli pale yellow and eyes black; antennae pale brown except scape yellow; thorax black; nonirridescent; wings hyaline with yellow venation;gaster black with basal half of gaster yellow.

**Head (Fig. 1)** : More than 1.5 times wider than long in frontal aspect (0.42 : 0.36), sparsely setose, head frontal grooves present; scrobes touching to frontal grooves; frontovertex wide, width distinctly more than ½ the total head width (0.290 : 0.420); vertex setae dense; ocelli arranged in obtuse angled triangle; POL less than 1.5 times as long as OOL; compound eyes bulged, moderate in size and pilose, eyes inner orbits almost parallel to each other; facets uniform in

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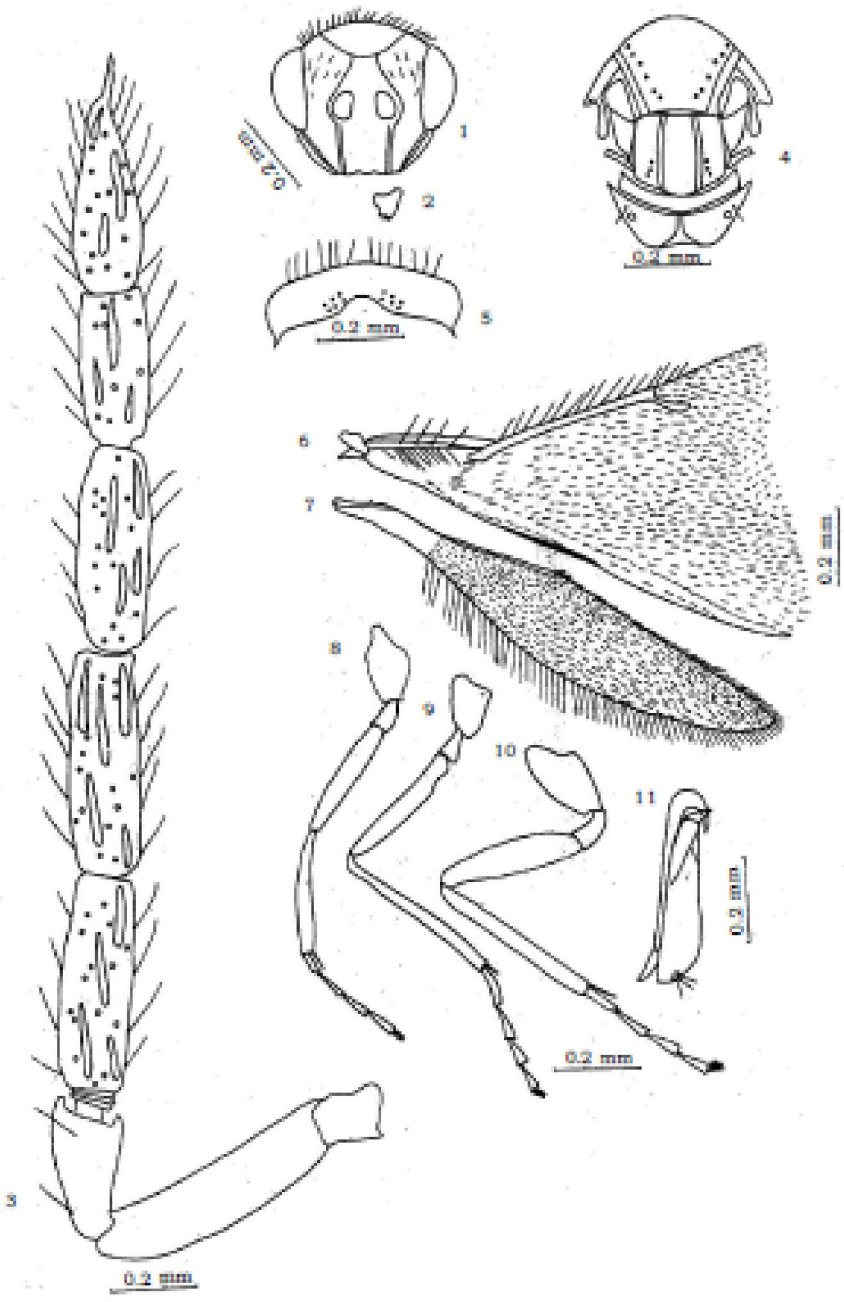


**Plate: 2-figs. 1-11:** ***Tetrastichus clubensis*** **sp.nov.**

1. Head in frontal view; 2. Mandible; 3. Antenna; 4.Thorax in dorsal view;5.Pronotum;6.Forewing;7.Hindwing;8.Foreleg;9.Middle leg;10.hind leg;11.Female genitalia

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shape and size; antennal toruli situated above the lower level of eye margin, prominence between antennal trouli less than 1/5$^{th}$ the width of frons between eyes (0.270 : 0.060); malar sulcus straight and grooved, below antennal toruli longitudinal grooves present; malar space smooth more than 1.5 times longer than eye width (0.125 : 0.075); mandibles tridentate (Fig. 2) with 2 acute teeth and a truncation; maxillary palp and labial palp each single segmented; lower margin of clypeus convexed medially.

**Antennae (Fig. 3)** : 7 segmented excluding 3 anelli, antennae with long longitudinal sensillae, apical tip of antenna with long spicule, antennal formula 1,1,3,3,2;radicula large; scape cylindrical slightly more than 4 times as long as wide (0.150 : 0.037), scape apex touching to mid ocelli; pedicel with 2 long seta, less than 1.5 times as long as wide (0.059 : 0.042) and shorter than the length of the FS1; funicle 3 segmented, FS1 more than 3 times as long as wide (0.128 : 0.041), FS2 more than 3 times as long as wide (0.13: 0.040), FS3 more than 2.5 times as long as wide (0.12 : 0.042); club 2 segmented, more than 5.5 times as long as wide (0.233 : 0.040), shorter than preceding two funicle segments combined.

**Thorax (Fig. 4)** : Pronotum brownish yellow and smooth bearing 8 pairs of setae at its posterior margin (Fig.5), postero-lateral margins round, anterior margin concave in the middle; mesoscutum less than 1.5 times as wide as long (0.225: 0.220); mesoscutum smooth having 6 pairs of adnotaular setae, notauli complete and deep, scapular flange broad; median longitudinal groove present; axilla trapezoidal in shape, strongly advanced; scutellum slightly smooth and shorter than mesoscutum, almost 2 times as wide as long (0.38 : 0.19) with submedian longitudinal grooves and 3 pairs of setae situated on scutellum, grooves almost straight and deep, dorsellum smooth; metanotum board; propodeum with inverted ‘Y’ shaped median carina and with paraspiracular carinae, propodeal spiracles round, small and well separated from the anterior margin of propodeum, spiracle rim fully exposed.

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**Fore wings (Fig. 6)** : Less than 3 times as long as wide (1.395 : 0.47), less than 1.5 times longer than wing length, densely setose; costal cell bare and moderate in size; SMV with 4 setae directed upwards, shorter (0.335) than MV (0.39); MV broad bearing 13 long setae on front edge; PMV rudimentary; SV long (0.085) less than 1/5$^{th}$ of the length of MV (0.39); marginal fringe moderately long, basal vein with 4 setae, basal cell bare; speculum narrow, closed below; cubital vein straight, subcubital line of hairs arising from the base of cubital vein and sinuate.

**Hind wings (Fig. 7)**: More than 6 times as long as wide (1.16: 0.19) with almost acute apex; vein length (0.56) slightly less than ½ the length of wing.

**Fore legs (Fig. 8)**: Slightly more than 2 times as long as wide (0.175; 0.085); femur 5.5 times as longer as wide (0.275: 0.050), less than 1.5 times shorter than tibia in length; tarsus yellow except TS4 brown.

**Mid legs (Fig. 9)** : Less than 1.5 times as long as wide (0.065 : 0.04); femur more than 6.5 times as long as wide (0.31 : 0.045), less than 1.5 times shorter than tibia in length; tarsus yellow; mid tibial spur much longer than fore and hind tibial spur.

**Hind legs (Fig. 10)** : Slightly less than 2 times as long as wide (0.21 : 0.11); femur more than 4 times as long as wide (0.33 : 0.08), less than 1.5 times shorter than tibia in length, tarsus yellow.

**Gaster** : Small and ovate, gaster surface hairy; gasteral apical tip blunt, gaster sessile; metasoma less than 1.5 times longer than mesosoma; ovipositor sheaths not visible from dorsal surface; first valvifers triangular (Fig. 11); anterior margin of basal part of second valvifers uniformly curved; third valvulae more than 4.5 times as long as wide (0.095 : 0.02), slightly less than 1/4$^{th}$ the length of second valvifers (0.375); outer plates of ovipositor slightly longer than second valvifers with a ridge along basal half of dorsal margin and another (Fig. 11) oblique ridge starting at the base of dorsal margin and running obliquely upto middle of plate; cercal setae small.

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**Male:** Not known

**Holotype:** ♀, India, U.K., Paurigarhwal, Host not known, sweepnet collection on natural plantation, 03/05/08, Hym. Eulo. Nr. 084 (Sandeep Kumar).

**Paratype:** 4 ♀♀, same data as holotype Hym. Eulo Nr. 084A (Sandeep Kumar).

**4.1.1.3** ***Tetrastichus minutus*** **sp.nov.** (Plate: 3, Figs.1-10)

**Female** : Body length about 1.75 mm; body colour dark brown; head brown with clypeal region pale brown,ocelli red and eyes black; antennae pale brown; thorax brown, nonirridescent; wings hyaline with yellowish brown venation; legs yellowish white except coxae and femora dark brown; gaster dark brown with out reflection.

**Head (Fig. 1)** : Wider than long in frontal aspect (0.395: 0.32), smooth and sparsely setose, head frontal grooves present 'Y' in shape; frontovertex wide; width more than ½ the total head width (0.25: 0.395); vertex setae short and sparse; ocelli arranged in obtuse angled triangle;compound eyes bulged,small and smooth, eyes orbits round; facets uniform in shape and size; antennal toruli situated distinctly above the lower level of eye margin, prominence between antennal toruli less than 1/4$^{th}$ the width of frons between eyes (0.06: 0.23); malar sulcus straight and prominent; malar space smooth, longer than eye weight (0.15:0.08);mandibles tridentate (Fig.1) with 2 acute teeth and a truncation; maxillary palp and labial palp each single segmented; lower margin of clypeus straight; foramen megnum situated at centre of head.

**Antennae (Fig. 2):** 8 segmented excluding an anellus, antennae with trichoidal sensilla, apical tip of antenna with long spicule, antennal formula 1,1,1,3,3; scape cylindrical slightly more than 4 times as long as wide (0.153:0.035); scape apex extending beyond mid ocelli; pedicel with 2 setae; more than 2 times as long as wide (0.078: 0.036) and longer than the length of the FS1; funicle 3 segmented, FS1 more than 1.5 times as long as wide (0.07:0.039), FS2

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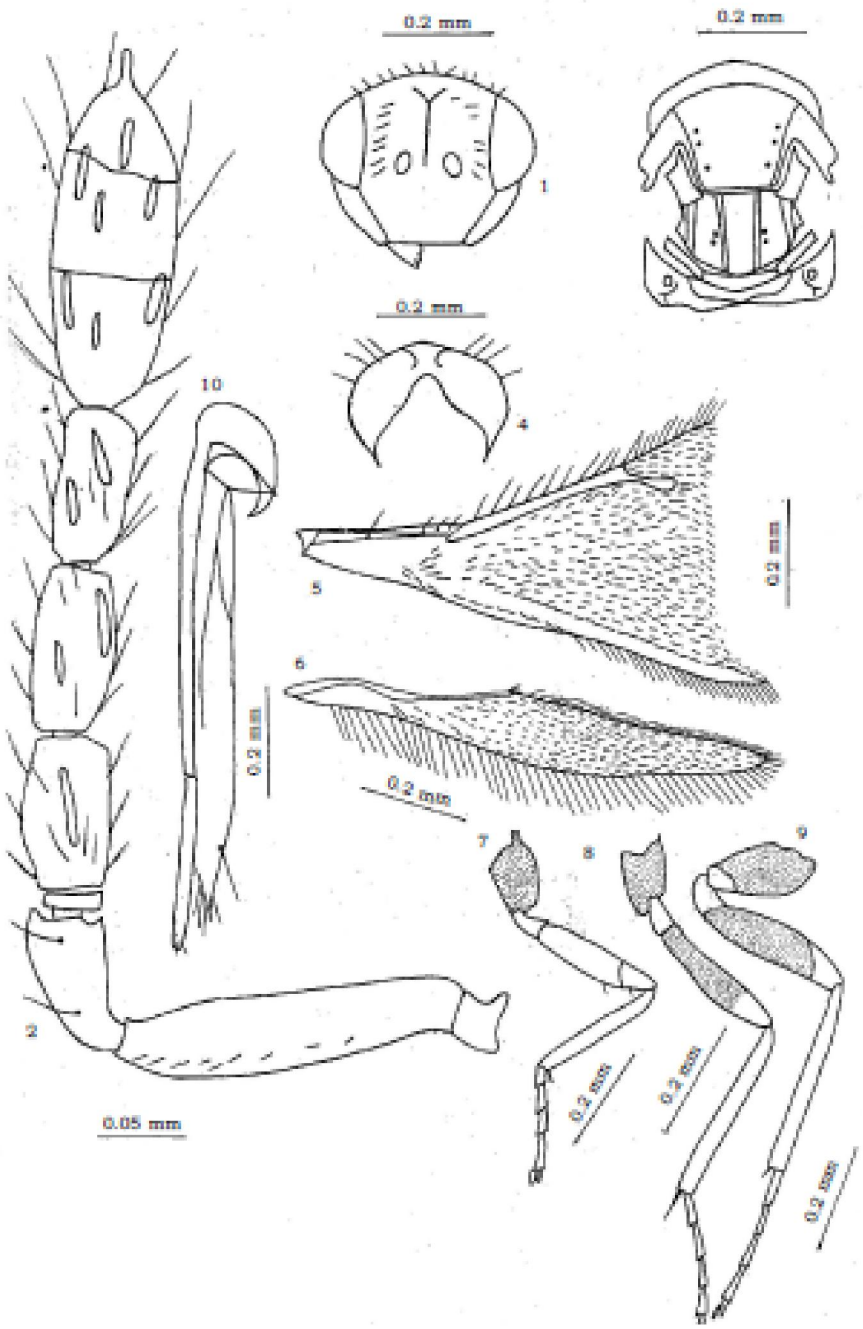


**Plate: 3-figs. 1-10:** ***Tetrastichus minutus*** **sp.nov.**
1. Head in frontal view; 2. Antenna; 3.Thorax in dorsal view;4.Pronotum;5.Forewing;6.Hindwing;7.Foreleg;8.Middle leg;9.hind leg;10.Female genitalia

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almost 2 times as long as wide (0.077:0.0385), FS3 more than 2 times as long as wide (0.071:0.0315); club 3 segmented, less than 3 times as long as wide (0.168:0.057), longer than preceding two funicle segments combined.

**Thorax (Fig. 3)** : Pale brown pronotum with two bends at mid of posterior margin bearing 4 pairs of setae (Fig. 4), antero-lateral angles acute and laterally directed, anterior margin deep concave in the middle; mesoscutum less than 2 times as wide as long (0.36: 0.19); mesoscutum having 3 pairs of adnotaular setae, notauli complete, deep and distinct, axilla angulately advanced; scutellum slightly convex ,smooth and shorter than mesoscutum, more than 2 times as wide as long (0.34:0.15) with submedian longitudinal grooves and 2 pairs of setae situated on scutellum, grooves deep and straight; dorsellum smooth and bulged; metanotum narrow; propodeum without median carina and with inverted 'Y' shaped paraspiracular carinae, propodeal spiracles round and large, spiracle rim fully exposed.

**Fore wings (Fig. 5)** : Round in shape at its apex, more than 2 times as long as wide (0.50:1.17), less than 2 times longer than hind wing length, sparsely setose; costal cell small and narrow with a row of 3 setae; SMV with 1 seta directed upwards,shorter (0.30) than MV (0.325), MV bearing 10 long setae on front edge; PMV rudimentary; SV (0.085) less than $1/4^{th}$ of the length of MV (0.325); marginal fringe short spaced by a distance more than $1/5^{th}$ of the length of fringe; basal vein with 2 setae, basal cell bare; speculum narrow, closed below cubital vein sinuate, subcubital line of hairs arising before the base of cubital vein.

**Hind wings (Fig.6):** More than 7 times as long as wide (0.92:0.12) with acute apex; vein length (0.43) less than one half the length of wing; marginal fringe spaced by a distance equal more than $1/4^{th}$ of their length.

**Legs (Fig. 7, 8 and 9):** Infuscated, mid tibial spur much longer than fore and hind tibial spur.

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**Gaster :** Large and elongate,gaster surface smooth,long hairs at the posterior end of the gaster,gasteral apical tip acuminate, sessile; metasoma more than 2 times longer than mesosoma; ovipositor sheaths exerted; first valvifers semicircular (Fig.10); anterior margin of basal part of second valvifers much curved; third valvulae movably articulated with second valvivers, more than 13 times as long as wide (0.33: 0.025); slightly more than 2 times the length of second valvifers (0.33: 0.71); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin and another (Fig. 10) oblique ridge starting at the base of dorsal margin and running obliquely upto middle of plate; cercal setae small.

**Male:** Not known

**Holotype:** ♀, India, U.K., Ramnagar, Sohara, Host not known, sweepnet collection in Sugarcane crop, 07-10-06, Hym. Eulo. Nr. 14 (Sandeep Kumar).

**Paratype:** 7 ♀♀ same data as holotype Hym. Eulo Nr. 14A (Sandeep Kumar).

#### 4.1.1.4 *Tetrastichus eggaevorus* sp.nov. (Plate: 4, Figs.1-13)

**Female** : Body length about 1.53 mm; body colour dark brown; head brown with clypeal region pale brown ocelli pale brown and eyes reddish black; antennae brown; thorax brown,pronotum brown, nonirridescent; wings hyaline; legs pale yellow; gaster grown without reflection.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.39: 0.35), sparsely setose, head frontal grooves present reaching to lower level of toruli; frontovertex width distinctly more than ½ the total head width (0.280: 0.390); vertex setae long and sparse; ocelli arranged in obtuse angled triangle; POL almost 2 times as long as OOL (Fig. 7); compound eyes bulged and smooth, eyes orbits round; antennal toruli situated at the lower level of eye margin, prominence between antennal toruli less than 1/5$^{th}$ the width of frons between eyes (0.050: 0.230); malar sulcus straight and malar space smooth, longer than eye width (0.105:0.08); mandibles (Fig. 2) with 2 blunt teeth;

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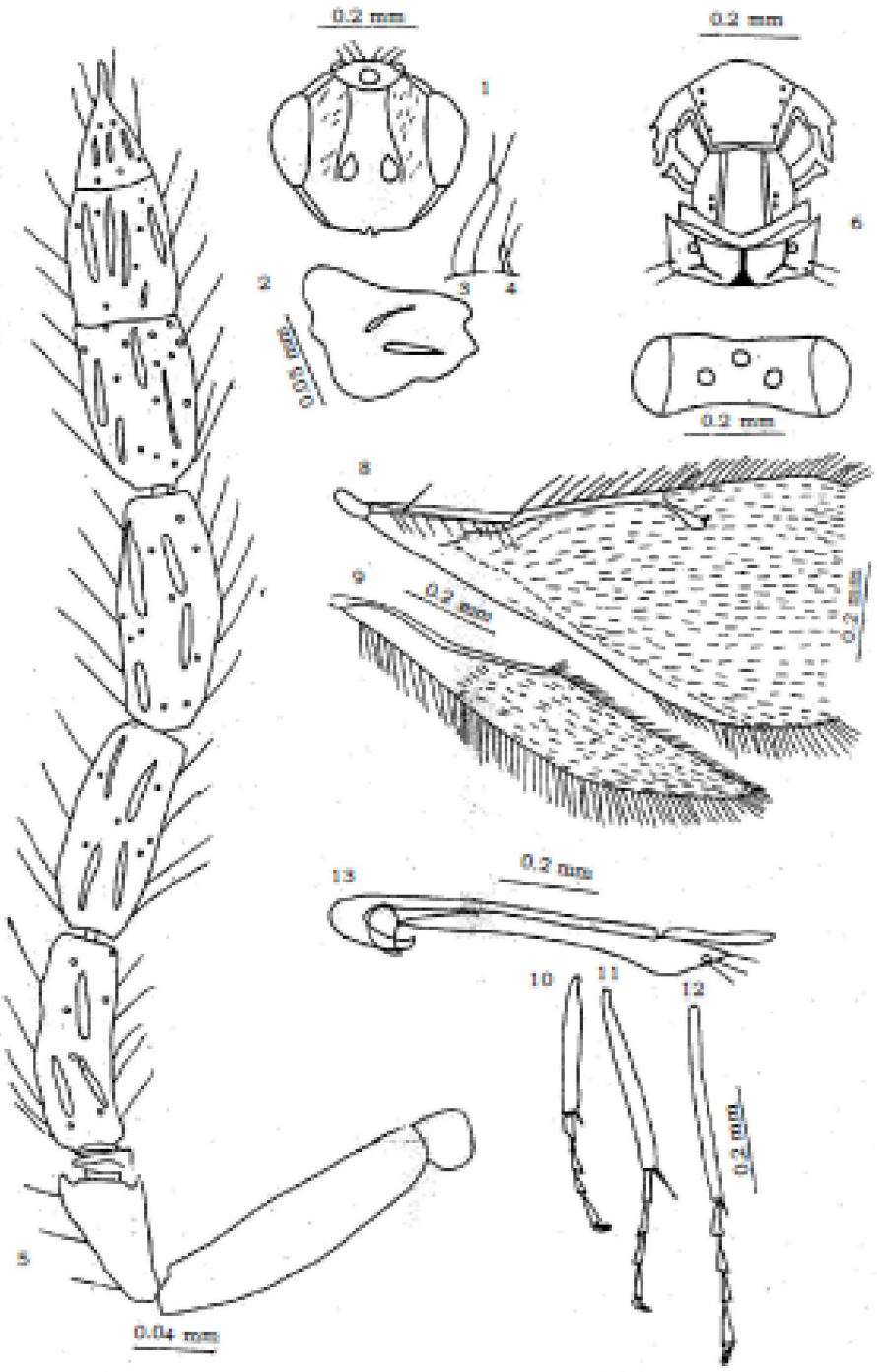


**Plate: 4-figs. 1-13:** ***Tetrastichus eggaevorus*** **sp.nov.**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.head in dorsal view; 8.Forewing; 9.Hindwing; 10. Part of Foreleg; 11.Part of Middle leg; 12. Part of hind leg; 13.Female genitalia

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maxillary palp (Fig. 3) and labial palp (Fig. 4) each single segmented; lower margin of clypeus bilobed medially; occipital carina absent.

**Antennae (Fig. 5)** : 8 segmented excluding 2 anelli, antennae with long longitudinal sensillae, apical tip of antenna with long spicule, antennal formula 1,1,2,3,3; scape cylindrical slightly less than 4 times as long as wide (0.15:0.038); scape apex touching to mid ocelli; pedicel with 3 long setose; more than 1.5 times as long as wide (0.063: 0.040) and shorter than length of the FS1; funicle 3 segmented, FS1 less than 4 times as long as wide (0.15:0.038), FS2 more than 3.5 times as long as wide (0.18:0.048), FS3 less than 2.5 times as long as wide (0.123:0.051); club 3 segmented, more than 3.5 times as long as wide (0.223:0.06), shorter than preceding two funicle segments combined.

**Thorax (Fig. 6)** : Pronotum conspicuous, posterior margin without setae, anterior margin concave in the middle; mesoscutum more than 2 times as wide as long (0.38: 0.17); mesoscutum having 3 pairs of adnotaular setae, notauli complete and deep, median longitudinal groove absent; axilla strongly advanced; scutellum with faintly sculptured and longer than mesoscutum, almost 2 times as wide as long (0.36:0.18) with submedian longitudinal grooves and 2 pairs of setae situated on scutellum,grooves deep and straight; dorsellum moderate in size; metanotum moderate in size; propodeum with median carina and with inverted ‘Y’ shaped paraspiracular carinae, propodeal spiracles round and large and well separated from the anterior margin of propodeum by a space more than ½ of its own diameter, spiracle rim fully exposed.

**Fore wings (Fig. 8)** : Round in shape at its apex, more than 2 times as long as wide (1.22:0.52),less than 1.5 times longer than hind wing length, sparsely setose; costal cell moderate in size and bare; SMV with 1 setae directed upwards, longer (0.330) than MV (0.295); MV bearing 11 long setae on front edge; PMV rudimentary; SV (0.085) more than 1/3$^{rd}$ of the length of MV

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(0.295); marginal fringe long spaced by a distance 1/7$^{th}$ of the length of fringe; basal vein with 3 setae, basal cell bare; speculum narrow, closed below ;cubital vein straight, subcubital line of hairs arising from the distance of 1/3$^{rd}$ the base.

**Hind wings (Fig. 9):** Almost 6 times as long as wide (0.96:0.16) with acute apex; vein length (0.495) less than ½ the length of wing.

**Fore legs (Fig. 10):** Coxa more than 2 times as long as wide (0.16:0.07); femur almost 4 times as long as wide (0.24: 0.06), less than 1.5 times shorter than tibia in length; fore tarsus shorter than length of tibia.

**Mid legs (Fig. 11)** : Coxa more than 1.5 times as long as wide (0.125: 0.075); femur more than 5 times as long as wide (0.265: 0.05) ,less than 1.5 times shorter than tibia in length; mid tarsus shorter than length of tibia; mid tibial spur much longer than fore and hind tibial spur.

**Hind legs (Fig. 12)** : Hind coxa less than 2 times as long as wide (0.20: 0.105); femur more than 5 times as long as wide ((0.29: 0.055); less than 1.5 times shorter than tibia in length.

**Gaster :** Elongate and sessile;gaster surface smooth, 1$^{st}$ gasteral tergum large in size, gasteral apical tip acuminate;metasoma more than 1.5 times longer than mesosoma; ovipositor sheaths exerted; first valvifers semicircular (Fig. 13); anterior margin of basal part of second valvifers much curved; third valvulae movably articulated with second valvivers, a trifle more than 9 times as long as wide (0.23: 0.025);almost 1\3$^{rd}$ the length of second valvifers (0.23: 0.69);outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 13).

**Male:** Not known

**Holotype:** ♀, India, U.K., Pantnagar, Host eggs of yellow stem borer, reared collection, rice crop, 10-08-07 Hym. Eulo. Nr. 06 (Sandeep Kumar).

**Paratype:** 7 ♀♀ same data as holotype Hym. Eulo Nr. 06A (Sandeep Kumar).

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#### 4.1.1.5 *Tetrastichus narendranii* sp.nov. (Plate: 5, Figs.1-12)

**Female** : Body length about 1.7 mm; body colour dark brown; head dark brown with clypeal region pale brown and eyes dark brown; antennae brown; thorax dark brown, nonirridescent; wings hyaline with pale brown venation; legs brown; gaster dark brown without any reflection.

**Head (Fig. 1)** : Much wider than long in frontal aspect (0.56 : 0.44); sparsely setose; frontovertex wide, distinctly more than half the total head width (0.37 : 0.56); ocelli arranged in obtuse angled triangle; POL less than 1.5 times as long as OOL (0.130 : 0.095); antennal toruli inserted at the lower level of eye margin, prominence between antennal trouli more than 1/4$^{th}$ the width of frons between eyes (0.33 : 0.07); malar sulcus prominent and slightly curved; another ridged sulcus parallel to MS; malar space longer than eye width (0.24 : 0.105); mandibles bidentate (Fig. 2); maxillary palp (Fig. 3) and labial palp (Fig. 4) each single segmented, dark brown; lower margin of clypeus straight.

**Antennae (Fig. 1)** : 8 segmented excluding an anellus; scape cylindrical more than 4 times as long as wide (0.2 : 0.045); pedicel a trifle less than 2 times as long as wide (0.097 : 0.05); almost equal to the length of the FS1; funicle 3 segmented, funicles subequal in size (0.09 : 0.07); all funicle segments longer than wide; club 3 segmented, almost 3 times as long as wide (0.215 : 0.07), longer than preceding two funicle segments combined.

**Thorax (Fig. 5)**: Entire thorax smooth; notauli complete; pronotum bearing 3 pairs of setae (Fig. 6), anterior margin concave in the middle; mesoscutum wider than longer, less than 1.5 times as wide as long (0.55: 0.48); mesoscutum bearing 2 pairs of setae; scutellum longer than wide, with submedian grooves and 2 pairs of setae; propodeum without median carina, spiracles well separated from the anterior margin.

**Fore wings (Fig. 7)**: More than 2 times as long as wide (1.63 : 0.71), densely setose;costal cell long and broad; SMV with 1 setae directed upwards, longer

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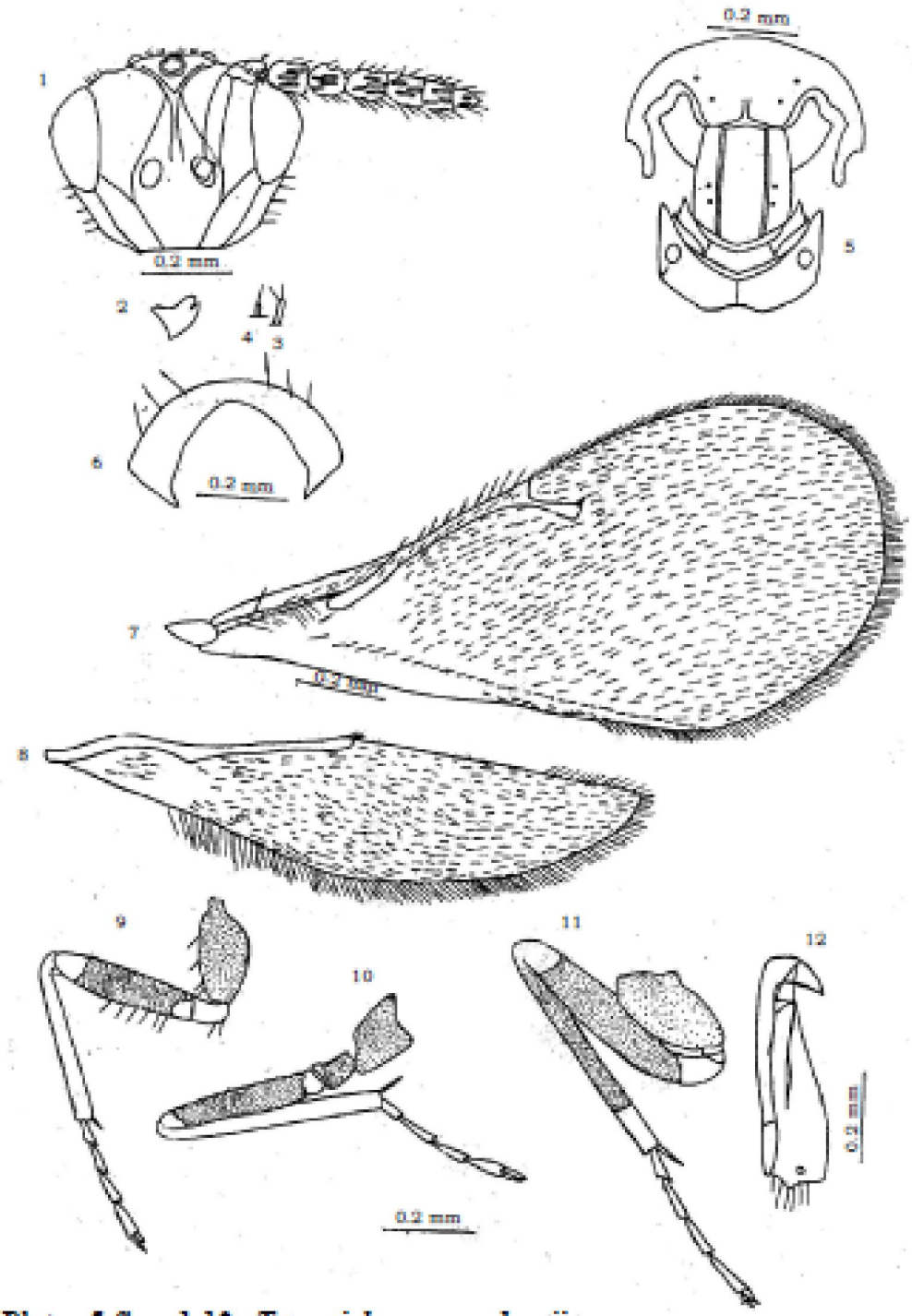


**Plate: 5-figs. 1-12:** ***Tetrastichus narendranii*** **sp.nov.**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5.Thorax in dorsal view; 6.Pronotum; 7.Forewing; 8.Hindwing; 9.Foreleg; 10. Middle leg; 11.hind leg; 12.Female genitalia

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(0.55) than MV (0.34); PMV rudimentary; SV (0.11) more than 1/3rd of the length of MV (0.34); marginal fringe short ; basal vein with 1 setae, basal cell bare; speculum broad, open below; cubital vein straight, subcubital line of hairs starting from a distance about one half distance from the base.

**Hind wings (Fig. 8)**: Hyaline, more than 4 times as long as wide (1.34 : 0.31) with blunt apex.

**Legs (Fig. 9, 10 and 11)**: Coxa, trochanter and femur brown, femur pale brown at apex; pro and mesotibia pale brown but metatibia infuscated; mid tibial spur shorter than hind tibial spur.

**Gaster**: Ovate and sessile, metasoma longer than mesosoma; ovipositor not exerted, first valvifers triangular (Fig. 12); anterior margin of basal part of second valvifers not much curved; second velvifer (0.365) more than 3 times as long as third vulvulae; third valuable not exerted beyond the apex of outer plate; hypopygium reaching beyond middle of gaster; outer plates of ovipositor much longer than second valvifers, with a oblique ridge (Fig.12) starting at the base of dorsal margin and running obliquely upto middle of plate.

**Male:** Not known

**Holotype:** ♀, India, U.K., Pantnagar, Host Mustard aphid?, Sweepnet collection in mustard crop ,15/09/07 ,Hym. Eulo. Nr. 076 (Sandeep Kumar).

**Paratype:** 15 ♀♀ same data as holotype Hym. Eulo Nr. 076A (Sandeep Kumar).

**4.1.1.6 *Tetrastichus mallitalensis* sp.nov.** (Plate: 6, Figs.1-13)

**Female:** Body length about 1.63 mm; body colour brownish black; head brownish black; ocelli pale brown and eyes reddish black; antennae brown except scape and pedicel brownish yellow; thorax brown, nonirridescent; wings hyaline with yellowish brown venation; legs coxa and femora brown, rest parts yellow; gaster blackish brown.

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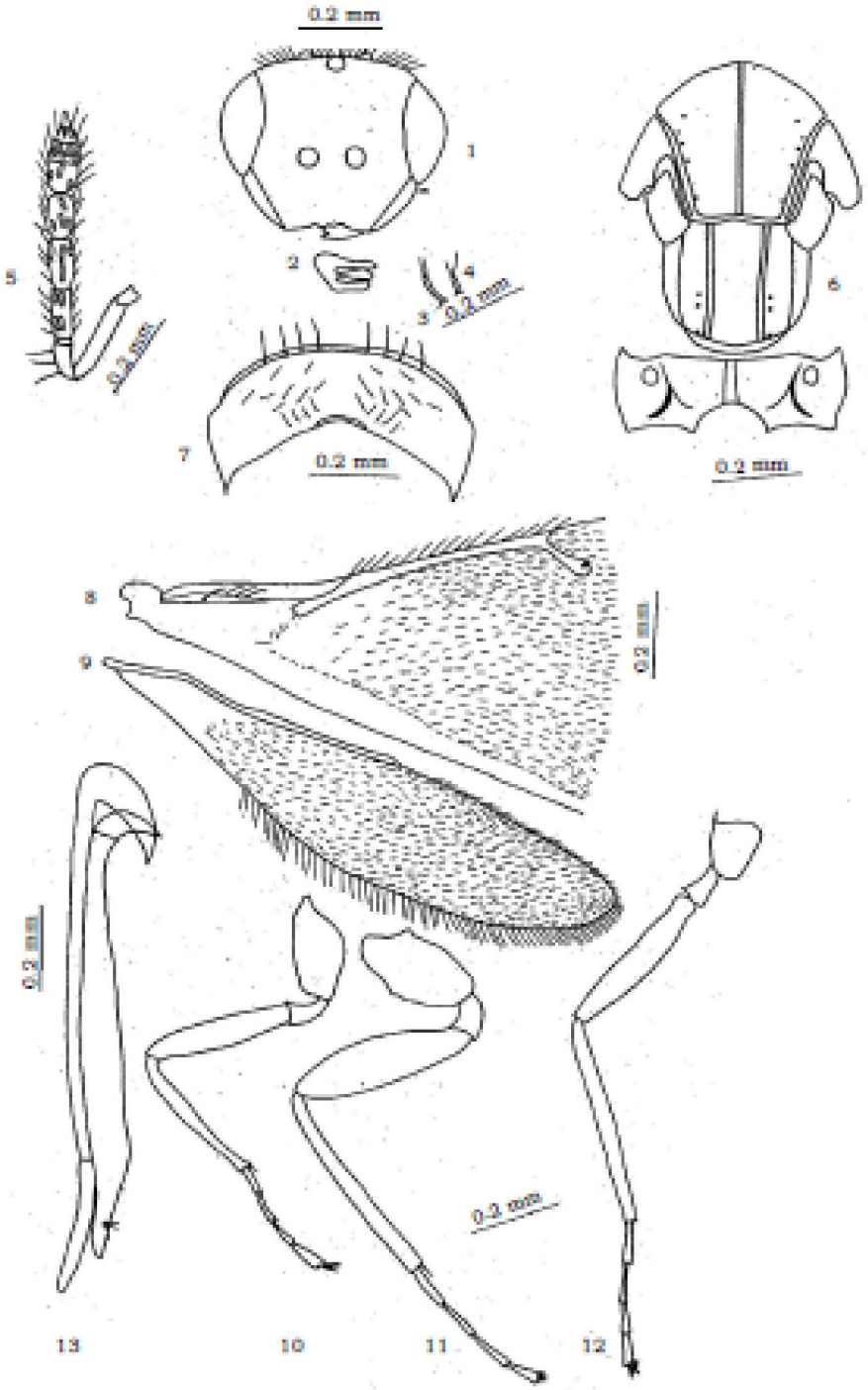


**Plate: 6-figs. 1-13:** ***Tetrastichus mallitalensis*** **sp.nov.**
1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view;7.Pronotum;8.Forewing;9.Hindwing;10.Foreleg;11.Middle leg;12.hind leg;13.Female genitalia

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**Head (Fig.1)** : Less than 1.5 times wider than long in frontal aspect (0.570: 0.450), smooth,head frontal grooves absent; frontovertex wide, width distinctly more than ½ the total head width (0.225: 0.570); vertex setae short and dense; ocelli arrnaged in obtuse angled triangle;compound eyes bulged,moderate and smooth, eyes orbits round, antennal toruli situated above the lower level of eye margin, prominence between antennal trouli 1/5$^{th}$ the width of frons between eyes (0.175: 0.035);malar sulcus straight and not prominent; malar space smooth, longer than eye width (0.16 : 0.11); mandibles bidentate (Fig. 2); maxillary palp (Fig. 3) and labial palp (Fig. 4) each single segmented; lower margin of clypeus bilobed medially; occipital carina absent.

**Antennae (Fig. 5)** : 8 segmented excluding an anellus, apical tip of antenna with small spicule, antennal formula 1,1,1,3,3; scape cylindrical 5 times as long as wide (0.20 : 0.04), scape apex touching to mid ocelli; pedicel with 3 long setae, more than 1.5 times as long as wide (0.065: 0.040) and shorter than the length of the FS1; funicle 3 segmented, FS1 to FS3 almost subequal in length, FS1 more than 2 times as long as wide (0.11 : 0.05), FS2 slightly less than 2 times as long as wide (0.11 : 0.06), FS3 more than 1.5 times as long as wide (0.10 : 0.06), club 3 segmented, more than 2.5 times as long as wide (0.19 : 0.07), shorter than preceding two funcle segments combined.

**Thorax (Fig. 6)**: Pronotum dorsal surface pubescent, bearing transverse carina at posterior margin (Fig. 7), having 5 pairs of setae at transverse carina, anterior margin concave in the middle; mesoscutum less than 1.5 times as wide as long (0.41 : 0.35); mesoscutum having 7 pairs of adnotaular setae, notauli complete and deep, median longitudinal sulcus present; axilla strongly advanced; scutellum slightly convex,smooth and shorter than mesoscutum, less than 1.5 times as wide as long (0.46 : 0.31) with submedian longitudinal grooves and 3 pairs of setae situated on scutellum, grooves deep and straight; metanotum narrow;spiracle rim fully exposed.

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**Fore wings (Fig. 8)** : More than 2 times as long as wide (1.62 : 0.72), less than 1.5 times longer than hind wing length, densely setose; costal cell long,broad and almost bare; SMV with 1 setae directed upwards,longer (0.465) than MV (0.45); MV bearing 15 long setae on front edge; PMV rudimentary; SV long (0.095), less than 1/5$^{th}$ of the length of MV;marginal fringe short; basal vein with 5 setae, basal cell bare; speculum narrow, closed below; cubital vein sinuate, subcubital line of hairs arising from the distance of 1/3$^{rd}$ the base.

**Hind wings (Fig. 9)**: More than 4.5 times as long as wide (1.275: 0.275) with blunt apex; vein length (0.7) more than ½ the length of wings; marginal fringe long.

**Legs (Fig. 10, 11 and 12)**: Mid tibial spur much longer than fore and hind tibial spur.

**Gaster** : Moderate,elongate and sessile;gaster surface hairy, gasteral apical tip acuminate; ovipositor issuing from almost base of gaster; metasoma longer than mesosoma; ovipositor sheaths slightly exerted; first valvifers semicircular (Fig. 13); anterior margin of basal part of second valvifers curved; third valvulae less than 9 times as long as wide (0.31 : 0.035), slightly less than 1/3$^{rd}$ the length of second valvifers (0.90); outer plates of ovipositor slightly longer than second valvifers; cercal setae small.

**Male:** Not known

Holotype: ♀, India, U.K., Mallital, Host not known, Sweepnet collection in Peach orchard, 08/04/08, Hym. Eulo. Nr. 89 (Sandeep Kumar).

**Paratype:** 3 ♀♀ same data as holotype Hym. Eulo Nr. 89A (Sandeep Kumar).

#### 4.1.1.7 *Tetrastichus clavatus* Khan *et al.* (Plate: 7, Figs.1-13)

**Female** : Body length about 2.16 mm, general body colour yellow with brown infuscations; head yellow with brown infuscatinos, clypeal region pale yellow, frontovertex with reticulate sculpture, ocelli red and eyes dark black. Antennae

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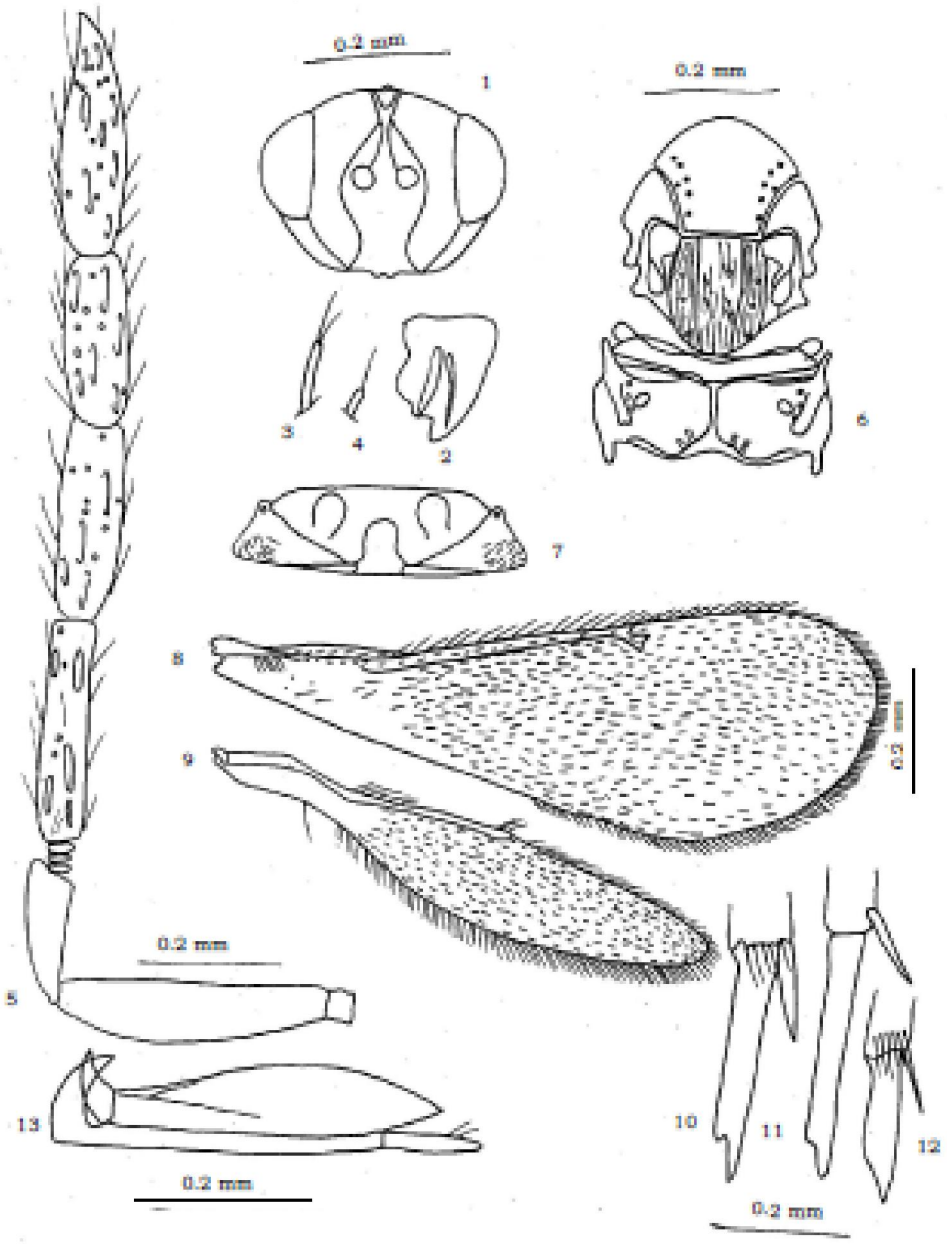


**Plate: 7-figs. 1-13:** ***Tetrastichus clavatus*** **Khan *et al.***
1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.Pronotum; 8.Forewing; 9.Hindwing; 10. Part of Foreleg; 11.Part of Middle leg; 12. Part of hind leg; 13.Female genitalia

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uniformly dark brown except scape and pedicel yellow with infuscations. Thorax yellow with dark patches on most of mesoscutum, axillae, margins of parapsidal grooves and sides of scutellum, mesoscutum and scutellum with fine longitudinally reticulate sculpture, sculpture more prominent in dark areas; pronotum yellow with dark patches on its greater part with fine hexagonal reticulate sculpture. Wings hyaline with yellow venation. Legs uniformly yellowish except the last tarsal segment brown. Abdomen yellowish with dark bands on tergites, nonirridescent, third valvulae dark.

**Head (Fig. 1)** : Wider than long in frontal view (0.58 : 0.44); frontovertex wider than long (0.33: 0.20), width of frons (0.33) between eyes slightly more than one half of the head width; ocelli arranged in obtuse angled triangle; postocellar line short, two times shorter than ocellocular line; antennae inserted in the middle, separated by a space more than one sixth the width of frons between eyes (0.33 : 0.05); lower level of clypeal margin with two dents medially; malar space more than three times as long as wide (0.15 : 0.04), slightly longer than eye width (0.12); malar suture distinct; mandibles bidentate (Fig. 2) with two teeth and a truncation; maxillary (Fig. 3) and labial palpi (Fig. 4) each one segmented.

**Antennae (Fig. 5)** : Apex of scape reaching well above the level of anterior ocellus; six segmented excluding three ring segments; scape more than four times as long as wide (0.22 : 0.05); pedicel more than two times as long as wide (0.10 : 0.04), more than one half length of the first funicle segment; funicle three segmented, segments one to three gradually decreasing in length distad, first funicle segment longest (0.175 : 0.04), a triffle more than four times as long as wide, second segment (0.16 : 0.05) distinctly longer than third (0.14 : 0.05); club unsegmented, four times as long as wide (0.20 : 0.05).

**Thorax (Fig. 6):** Posterior margin of pronotum with sub-marginal (Fig. 7) ridge bearing four pairs of setae at antero-lateral margins laterally directed; mesoscutum more than one and half times as wide as long (0.48 : 0.27);

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mesoprescutum bearing a row of six setae at its lateral margin; scutellum almost equal to the length of mesoscutum (0.28 : 0.27), less than one and a half times as long as wide (0.28 : 0.24) with submedian grooves and three pairs of strong setae; propodeum smooth, finely reticulate, medium carina distinctly present and branched anteriorly, paraspiracular carina present, propodeal spiracles well separated from the anterior margin by a space more than one half of its own diameter, mesal length of propodeum (0.17) almost equal to one third the length of mesoscutum.

**Fore wings (Fig. 8)** : More than three times as long as wide (1.62 : 0.52); costal cell much narrow, long with a row of thirteen setae; submarginal vein with four setae, shorter (0.44) than marginal vein (0.52); marginal vein with fifteen setae at its margin; postmarginal vein very short, more than one half the length of stigmal vein (0.04); marginal fringe short (0.04); spaced by a distance equal to one fourth length of the fringe; basal vein with two scattered setae, basal cell with six small setae; speculum narrow, open below; cubital vein straight.

**Hind wings (Fig. 9):** Sparsely setose with blunt apex, more than five times as long as wide (1.24 : 0.23); marginal fringe long (0.05) spaced by a distance less than one third of their length.

**Fore legs** : Coxae and femora with a row of six setae; apical rim of tibiae with more small peg and six strong bristles, basitarsus with an oblique row of fourteen small setae (Fig. 10 ); tibial spur short.

**Hind legs**: Tibial spur much longer; apical rim of tibiae with six strong setae (Fig. 12).

**Gaster**: Ovipositor very well exerted; first valvifers semicirucular (Fig.13), anterior margin of basal part of second valvifers not much curved; third valvulae dark, setose, movably articulated with second valvifers, seven times as long as wide (0.28: 0.04), less than one half the length of second valvifers; outer plates of ovipositor (Fig. 13) almost equal to the second valvifers, infuscated with dark brown patches.

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**Male**: Not known

**Material examined:** 2 ♀, India, U.P., Pantnagar (U.S.Nagar), sweepnet collection, Linseed crop, 27/04/07, Hym. Eulo. Nr. 112A (Sandeep Kumar).

**4.1.1.8** ***Tetrastichus hillensis*** **sp.nov.** (Plate: 8, Figs.1-11)

**Female** : Body length about 2.45 mm; body colour black with greenish reflection, head dark brown, eyes dull red; antennae dark brown; thorax black with greenish reflection; wings hyaline;legs yellow except coxae, trochanter and almost basal 1/7$^{th}$ of the femora dark brown; gaster black with greenish reflection.

**Head (Fig. 1)** : Slightly wider than long in frontal aspect (0.64 : 0.62); frontovertex wide,width distinctly more than ½ the total head width (0.44: 0.640); ocelli arranged in obtuse angled triangle; POL less than 1.5 times as long as OOL;antennal toruli situated just at the lower level of eye margin, prominence between antennal toruli more than 1/5$^{th}$ the width of frons between eyes (0.07: 0.36);malar sulcus prominent and curved; malar space more than 2 times longer than eye width (0.28 : 0.135); mandibles tridentate with 3 acute teeth; maxillary palp (Fig.2) and labial palp (Fig. 3) each single segmented; lower margin of clypeus with 2 dents medially.

**Antennae (Fig. 4)** : 8 segmented excluding an anellus; scape cylindrical slightly more than 4.5 times as long as wide (0.248: 0.05); pedicel with 3 setae, almost times 2 times as long as wide (0.11: 0.055); funicle 3 segmented, FS1 more than 2.5 times as long as wide (0.14 ; 0.05), FS2 2 times as long as wide, FS3 more than 1.5 times as long as wide, FS1 to FS3 gradually decreasing in length; club 3 segmented, more than 2 times as long as wide (0.21: 0.09), shorter than preceding 2 funicle segments combined.

**Thorax (Fig. 5)** : Pronotum with carina bearing 7 pairs of setae (Fig. 6) yellowish brown, sculptured, anterior margin concave in the middle; mesoscutum convex like hump in shape, mesoscutum about 2 times as wide as

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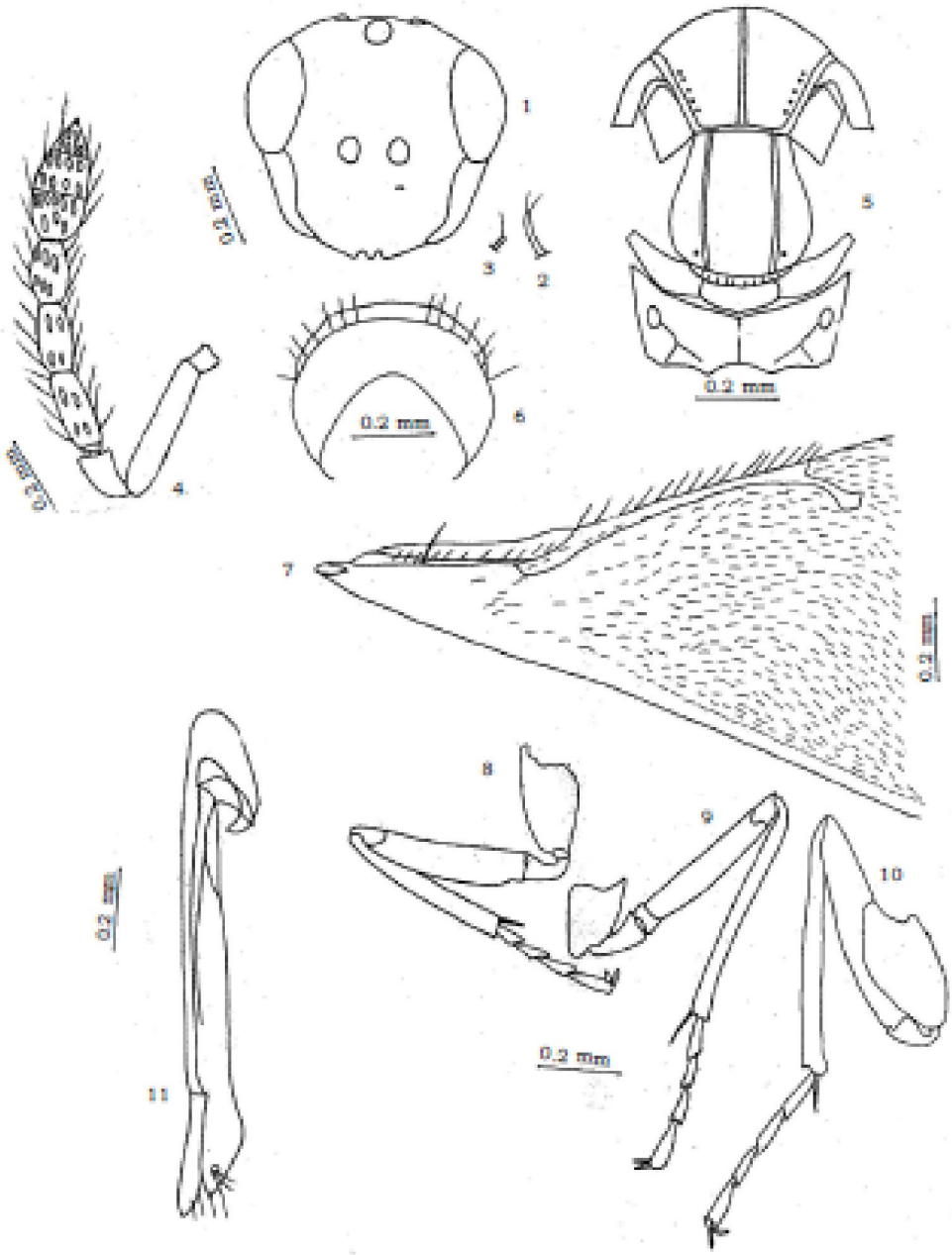


**Plate: 8-figs. 1-11: *Tetrastichus hillensis* sp.nov.**

1. Head in frontal view; 2. Maxillary Palp; 3. Labial palp; 4. Antenna; 5.Thorax in dorsal view; 6.Pronotum; 7.Forewing; 8.Foreleg; 9. Middle leg; 10.hind leg; 11.Female genitalia

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long (0.590: 0.295) with complete notauli,mesoscutum bearing as single row of 5 setae at each lateral margin, median longitudinal groove present; scutellum convex and longer than mesoscutum, 1.5 times as wide as long (0.54:0.36) with submedian grooves and one pair of setae grooves situated near lateral marginal of scutellum; propodeum with median carina and with inverted 'Y' shaped paraspiracular carinae, propodeal spiracles well separated from the anterior margin by a space of more than 1.5 times of its own diameter, propodeum with reticulated sculpture.

**Fore wings (Fig. 7)** : More than 2 times as long as wide (2.23 : 0.965), densely setose; costal cell long and broad with a row of setae; SMV with 1 setae directed upwards, shorter (0.575) than MV (0.59); MV broad; PMV redimentary; SV long (0.125) equal to 1/4$^{th}$ of the length of MV (0.59); marginal fringe short spaced by a distance more than 1/4$^{th}$ of the length of fringe; basal vein with 5 setae, basal cell bare; speculum narrow, closed below; cubital vein straight, subcubital line of hairs starting form a distance about one half from the base.

**Hind wings** : More than 4 times as long as wide (1.72: 0.40) with blunt apex; vein length (0.97) more than ½ the length of wing; spaced by a distance equal to 1/4$^{th}$ of their length.

**Legs (Fig.8, 9 and 10)**: Mid tibial spur much longer than fore and hind tibial spur.

**Gaster:** Elongate and sessile, metasoma 1.5 times longer than mesosoma, ovipositor slightly exerted, first valvifers semicircular (Fig. 11); anterior margin of basal part of second valvifers much curved; third valvulae movably articulated with second valvifers, more than 6 times as long as wide (0.31: 0.05); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin and another (Fig.11) oblique ridge starting at the base of dorsal margin and running obliquely upto middle of plate.

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**Male**: Not known.

**Holotype**: ♀, India, U.K., Bharsar, Host not known, Sweepnet collection, Apple orchard, 03/05/08, Hym. Eulo. Nr.88 (Sandeep Kumar).

**Paratype**: 4 ♀♀, same data as holotype Hym. Eulo. Nr. 88A (Sandeep Kumar).

**4.1.1.9 *Tetrastichus taprobanensis* Ranweera** (Plate: 9, Figs.1-12)

**Female**: Body uniformly blackish brown; abdomen greatly longer than head and thorax combined; ovipositor exerted; eyes reddish brown; antennae uniformly brown in colour.

**Head (Fig.1)** : Dark brown in colour; smooth without any reticulation, wider than long in facial view (0.40: 0.32); width of frontovertex a trifle more than one half of total head width (0.23 : 0.40); ocelli white arranged in an equilateral triangle; antenna inserted well above line drawn across lower margin of eyes; prominence between antennal sockets less than one fourth the width of frons between eyes (0.06: 0.23); malar space longer than eye width (0.15 : 0.09); mandiable tridentate; maxillary (Fig.2) and labial palpi (Fig.3)each one segmented.

**Antennae (Fig.4)** : Brown in colour except scape; two ring segments; funicle three segmented; longer than wide; scape light yellow; slightly more than six times longer than wide (0.19 : 0.03); pedicel light brown in colour, one and a half times longer than wide (0.06 : 0.035); first and second funicle segments three and a half times longer than wide (0.105 : 0.03); third funicle segment is elongate (0.12 : 0.03); club elongated, three segmented,slightly more than four times longer than wide (0.2 : 0.05).

**Thorax (Fig. 5)**: Pronotum (Fig.6) without posterior submarginal ridge bearing three pairs of fine setae; mesoscutum wider than long (0.43 : 0.31); parapsidal furrows well developed; mesoscutum without any setae at lateral margins; middle longitudinal groove absent; scutellum longer than wide (0.24 : 0.21),

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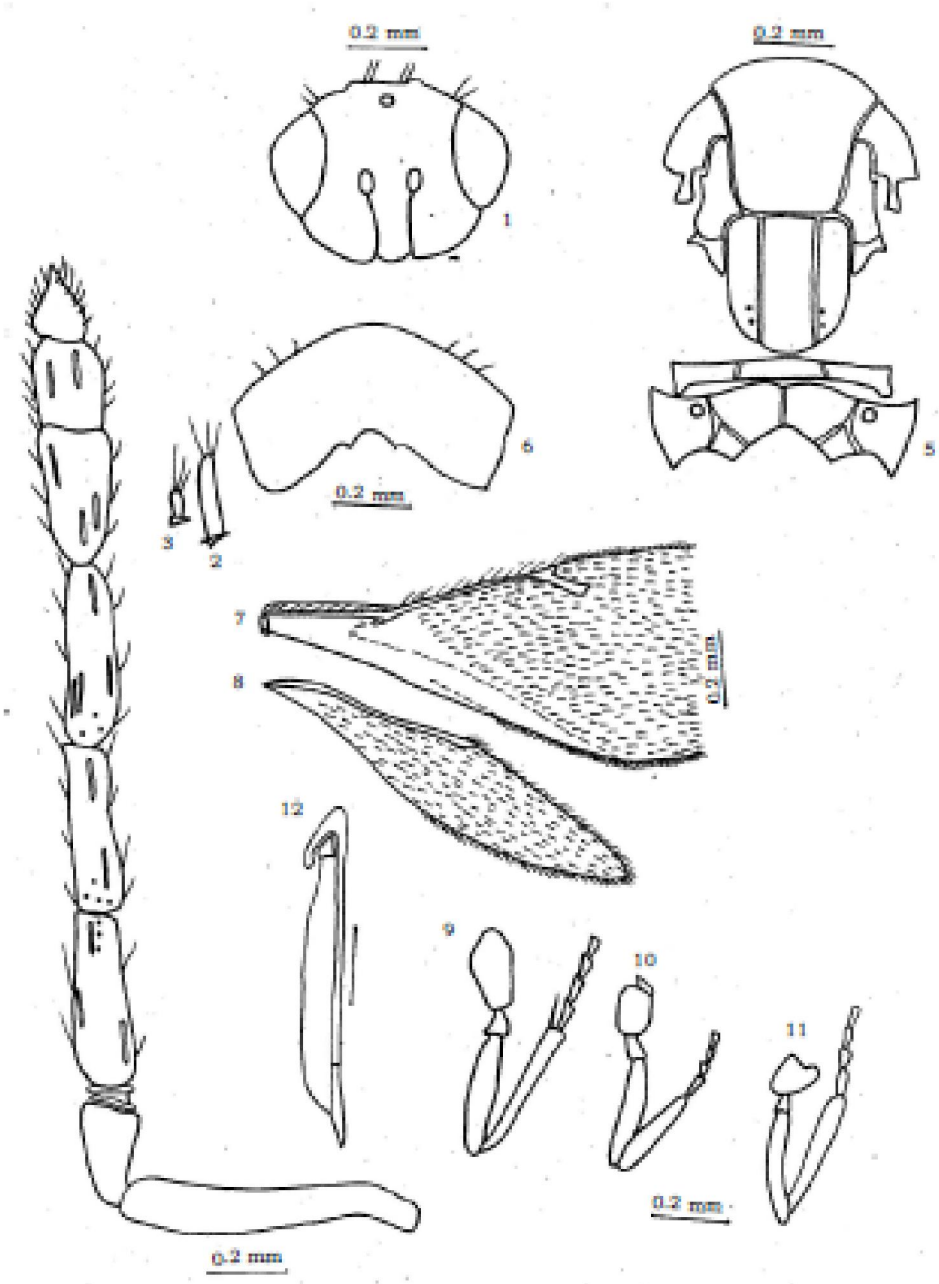


**Plate: 9-figs. 1-12:** ***Tetrastichus taprobanensis*** **Rauweera**

1. Head in frontal view; 2. Maxillary Palp; 3. Labial palp; 4. Antenna; 5.Thorax in dorsal view;6.Pronotum;7.Forewing;8.Hindwing;9.Foreleg;10.Middle leg;11.hind leg;12.Female genitalia

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with two submedian longitudinal grooves and two pairs of setae present; posterior margin rounded; propodeum with lateral and mesal carinae present; propodeal spiracles well separated from anterior margin of propodeum.

**Fore wings (Fig. 7)** : Hyaline; slightly less than two and a half times longer than wide (0.84 : 0.36); disc sparasly setose; apex broadly rounded; costal cell narrow, bare, basal vein with four setae; basal cell bare; speculum moderate and closed below; cubital vein straight; marginal vein longer than submarginal vein (0.27 : 0.24); post marginal vein almost rudimentary; stigmal vein (0.07) long, less than four times as long as marginal vein (0.27); marginal fringe short.

**Hind wings (Fig. 8):** Narrow at apex; disc with hyaline setae; less than five times as long as wide (0.69: 0.15).

**Legs (Fig.9, 10 and 11)**: Uniformly yellow, tibial spur small, coxa infuscated at top in hind leg; normal.

**Abdomen** : Greatly longer than head and thorax combined with tapering apex; blackish brown in colour; ovipositor exerted; first valvifer triangular; second valvifer of uniform width (0.7) long narrow; third valvulae long, lanceolate, a trifle more than one third the length of second valvifer (Fig.12).

**Male**: Not known

**Material examined**: 3 ♀, India, U.K., Pantnagar (U.S. Nagar) from unknown mass on leaf surface on Rice, *Oryza sativa*, 22/10/2007. Hym. Eulo. Nr. 22 (Sandeep Kumar).

**4.1.1.10 *Tetrastichus bhimtali* sp.nov.** (Plate: 10, Figs.1-11)

**Female** : Body length about 1.84 mm; body colour dark brown;head dark brown; ocelli, pale brown and eyes dark brown; antennae brown; thorax dark brown, pronotum brown, nonirridescent; wings hyaline with brown venation; legs dull dark brown; gaster dark brown without any reflection.

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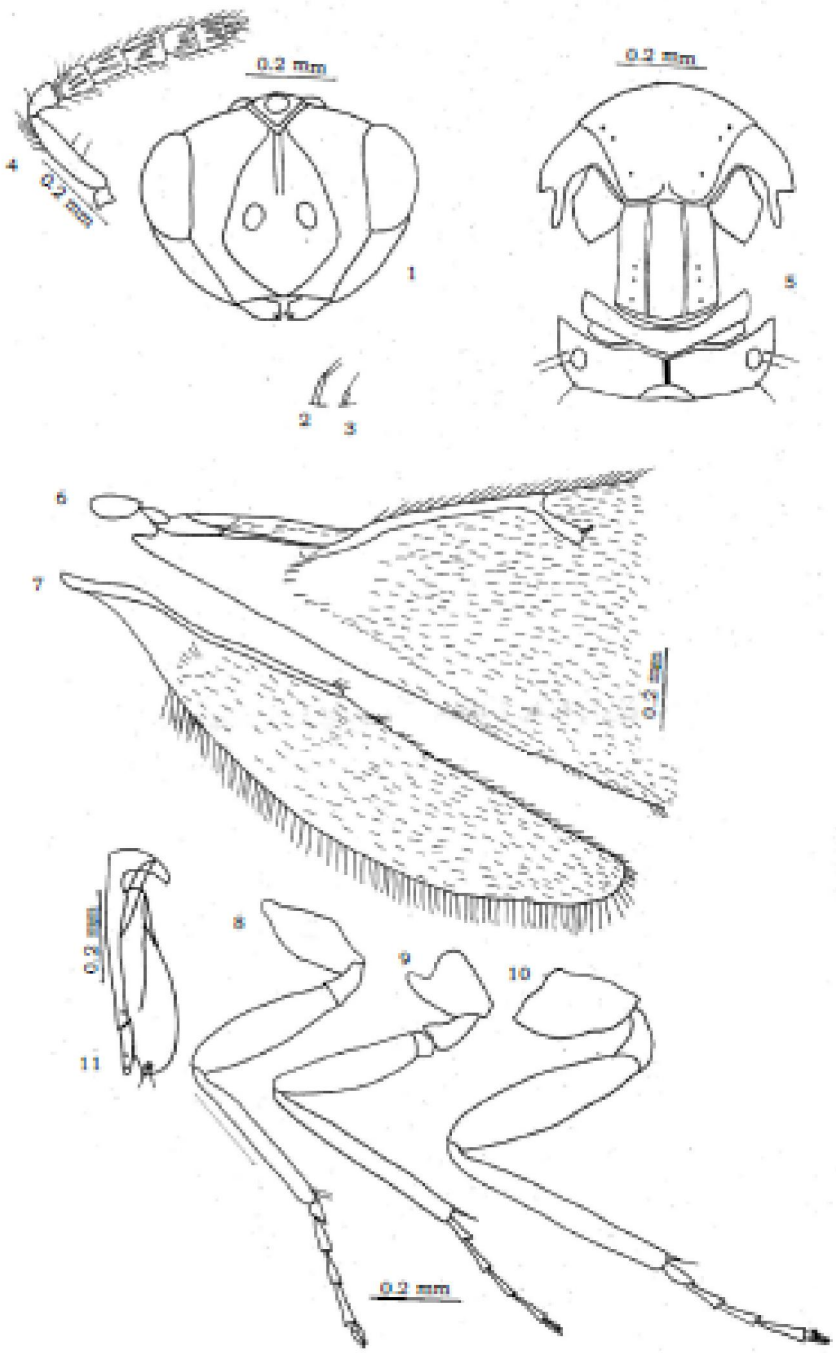


**Plate: 10-figs. 1-11: *Tetrastichus bhimtali* sp.nov.**

1. Head in frontal view; 2. Maxillary Palp; 3. Labial palp; 4. Antenna; 5.Thorax in dorsal view; 6.Forewing; 7.Hindwing; 8.Foreleg; 9.Middle leg;10.hind leg;11.Female genitalia

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**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.62 : 0.46); head frontal grooves 'Y' in shape; frontovertex wide, width distinctly more than 1/2 the total head width (0.46 : 0.62); ocelli arranged in obtuse angled triangle; POL more than 1.5 times as long as OOL; compound eyes bulged and smooth, eyes orbits round; antennal toruli situated at the lower level of eye margin, prominence between antennal toruli slightly less than 1/5$^{th}$ the width of frons between eyes (0.080: 0.386); malar sulcus straight and prominent, malar space smooth, longer than eye width (0.18 : 0.11); mandibles bidentate with 2 acute teeth and a truncation; maxillary palp (Fig. 2) and labial palp (Fig. 3) each single segmented, lower margin of clypeus straight.

**Antennae (Fig. 4)** : 8 segmented excluding an anellus, antennae with prominent trichoidal sensillae, apical tip of antenna without spicule, antennal formula 1,1,1,3,3; scape cylindrical, less than 5 times as long as wide (0.22 : 0.045); pedicel setose, less than 1.5 times as long as wide (0.065 : 0.050) and shorter than the length of the FS1; funicle 3 segmented, FS1 to FS3 gradually increasing in length, FS1 less than 1.5 time as long as wide (0.075 : 0.055), FS2 more than 1.5 times as long as wide (0.083 : 0.051), FS3 less than 1.5 times as long as wide (0.090 : 0.065), club 3 segmented, more than 3 times as long as wide (0.20 : 0.061), longer than preceding two funicle segments combined.

**Thorax (Fig. 5)** : Mesoscutum more than 2 times as wide as long (0.57 : 0.25); mesoscutum having 3 pairs of adnotaular setae, notauli complete and deep, medan longitudinal groove incomplete; axilla broad strongly advanced; scutellum slightly convex and longer than mesoscutum, more than 1.5 times as wide as long (0.50 : 0.288) with narrow submedian longitudinal grooves and 3 pairs of setae situated on scutellum; dorsellum smooth; metanotum broad; propodeum with median carina and without paraspiracular carinae, propodeal spiracles very large, round and well separated from the anterior margin of propodeum, spiracle rim fully exposed.

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**Fore wings (Fig. 6)** : Broad and round at its apex, more than 3 times as long as wide (1.76 : 0.56) less than 1.5 times longer than hind wing length, densely setose; costal cell broad,setose and moderate in length; SMV with 1 setae on front edge; PMV rudimentary; SV long (0.115) less than 1/4$^{th}$ of the length of MV (0.425); marginal fringe moderate in length; basal vein with 4 setae, basal cell bare; speculum broad, closed below; cubital vein straight; subcubital line of hairs arising from the distance of 1/2 the base.

**Hind wings (Fig. 7)**: More than 4.5 times as long as wide (1.325: 0.285) with blunt apex; vein length (0.685) more than one half the length of wing.

**Fore legs (Fig. 8)** : Coxa more than 2.5 times as long as wide (0.26 : 0.10); femur more than 3.5 times as long as wide (0.35 : 0.095), less than 1.5 times tibia in length, fore tarsus shorter than length of tibia ,tarsal segments pale brown.

**Mid legs (Fig. 9):** Coxa less than 1.5 times as long as wide (0.16: 0.14);femur more than 4 times as long as wide (0.365: 0.085), less than 1.5 times tibia; mid tarsus shorter than of tibia; TS1 shorter than next two tarsal segments, TS1 longer than mid tibial spur length, tarsal segments pale brown; mid tibial spur longer than fore and hind tibial spur.

**Hind legs (Fig. 10)** : Hind coxa more than 1.5 times as long as wide (0.25 : 0.15); femur more than 3.5 times as long as wide (0.41 : 0.115), less than 1.5 times shorter than tibia in length; hind tarsus shorter than length of tibia; TS1 shorter than next two tarsal segment, TS1 logner than hind tibial spur length, tarsal segment pale brown.

**Gaster** : Bulged,ovate and subsessile, less than 1.5 times as long as wide (0.87 : 0.625), gaster surface smooth; gasteral apical tip sub acuminate; metasoma less than 1.5 times longer than mesosoma; ovipositor sheaths not exerted; first valvifers triangular (Fig. 11); third vulvulae more than 3.5 times as long as wide (0.110 : 0.030); more than 3.5 times the length of second valvifers (0.395);

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outer plates of ovipositor almost equal to second valvifers with a ridge along basal half of dorsal margin (Fig. 11).

**Male:** Not known

**Holotype:** ♀, India,U.K.,Bhimtal, Host Unknown, Sweepnet collection on Natural vegetation,10/10/07, Hym. Eulo. Nr. 80 (Sandeep Kumar).

**Paratype:** 6 ♀♀ same data as holotype Hym. Eulo Nr. 80A (Sandeep Kumar).

## Checklist for world fauna of Genus *Tetrastichus* Haliday

1. *Tetrastichus abalosi* Blanchard, 1950
2. *Tetrastichus abatus* Narendran, 2005
3. *Tetrastichus abdominalis* Kostjukov, 1995
4. *Tetrastichus aberrans* Kostjukov, 1995
5. *Tetrastichus abiiarum* Kostjukov, 1978
6. *Tetrastichus abnormis* Kostjukov, 1995
7. *Tetrastichus absintium* Kostjukov, 1978
8. *Tetrastichus acuticlavus* Kostjukov, 1995
9. *Tetrastichus acutiusculus* Graham, 1991
10. *Tetrastichus acutus* Ashmead, 1886
11. *Tetrastichus aenellus* (Girault, 1915)
12. *Tetrastichus aeneoviridis* (Girault, 1912)
13. *Tetrastichus aeneus* Walker (unavailable name in Chalcicoidea)
14. *Tetrastichus aethognathi* Ghesquière, 1960
15. *Tetrastichus africanus* (Risbec, 1957)
16. *Tetrastichus agrili* Crawford, 1915
17. *Tetrastichus agrilocidus* Graham, 1991
18. *Tetrastichus ahmetcitiri* Doganlar, 1993
19. *Tetrastichus alaskensis* Ashmead, 1902
20. *Tetrastichus albipes* Crosby, 1909
21. *Tetrastichus albisensillis* Kostjukov, 1995
22. *Tetrastichus albitarsis* Kostjukov, 1995
23. *Tetrastichus amgun* Kostjukov, 1995
24. *Tetrastichus amurensis* Walker, 1874
25. *Tetrastichus amurzetus* Kostjukov, 1995
26. *Tetrastichus ancyferovi* Kostjukov, 1990
27. *Tetrastichus angeloni* Girault, 1926
28. *Tetrastichus anosibei* Risbec, 1958
29. *Tetrastichus apanteles* Khan, Agnihotri & Sushil, 2005
30. *Tetrastichus apantelicida* Brèthes, 1923

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31. *Tetrastichus aponiusi* Yang, 1996
32. *Tetrastichus archideus* (Walker, 1839)
33. *Tetrastichus ardisiae* Ishii, 1931
34. *Tetrastichus armandii* Yang, 1996
35. *Tetrastichus arnoldi* (Girault, 1913)
36. *Tetrastichus arsenjevi* Kostjukov, 1995
37. *Tetrastichus artem* Kostjukov, 1995
38. *Tetrastichus ascania* Kostjukov, 1978
39. *Tetrastichus assuetus* Kostjukov, 1978
40. *Tetrastichus atamiensis* Ashmead, 1904
41. *Tetrastichus atomelli* Khan, 1983
42. *Tetrastichus atratulus* (Nees, 1834)
43. *Tetrastichus atriclavus* Waterston, 1915
44. *Tetrastichus atrocoeruleus* (Nees, 1834)
45. *Tetrastichus auplopus* Burks, 1963
46. *Tetrastichus australasiae* Gahan, 1922
47. *Tetrastichus autonae* (Walker, 1839)
48. *Tetrastichus axia* Walker, 1848
49. *Tetrastichus axyllaris* Kostjukov, 1995
50. *Tetrastichus baccharidis* Kieffer, 1910
51. *Tetrastichus baeri* Kostjukov, 1978
52. *Tetrastichus balteatus* Waterston, 1915
53. *Tetrastichus bambeyi* Risbec, 1951
54. *Tetrastichus basilewskyi* Risbec, 1957
55. *Tetrastichus basinotatus* (unavailable name in Chalcicoidea)
56. *Tetrastichus basokoi* Risbec, 1958
57. *Tetrastichus beardsleyi* Fullaway, 1956
58. *Tetrastichus bekiliensis* Risbec, 1952
59. *Tetrastichus bellus* Narendran & Girish Kumar, 2006
60. *Tetrastichus belokobylskyi* Kostjukov, 1995
61. *Tetrastichus benoiti* Risbec, 1958
62. *Tetrastichus bicolor* (Ashmead, 1894)
63. *Tetrastichus boninensis* Yoshimoto & Ishii, 1965
64. *Tetrastichus brachyopae* Graham, 1991
65. *Tetrastichus brevicalcar* Graham, 1991
66. *Tetrastichus breviclava* Kostjukov, 1995
67. *Tetrastichus brevidorsellum* Kostjukov, 1995
68. *Tetrastichus brevimarginatus* Kostjukov, 1995
69. *Tetrastichus breviosus* Kostjukov, 1995
70. *Tetrastichus breviscapus* Kostjukov, 1977
71. *Tetrastichus breviscapus* Kostjukov, 1978 (junior homonym)
72. *Tetrastichus breviscapus* Kostjukov, 1995 (junior homonym)
73. *Tetrastichus brevitarsis* Kostjukov, 1995
74. *Tetrastichus breviventris* Kostjukov, 1995
75. *Tetrastichus bromi* Kostjukov, 1978

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76. *Tetrastichus brontispae* (Ferrière, 1933)
77. *Tetrastichus brunifuniculus* Kostjukov, 1995
78. *Tetrastichus bruninervis* Kostjukov, 1995
79. *Tetrastichus bruniscapus* Kostjukov, 195
80. *Tetrastichus brunistigma* Kostjukov, 1995
81. *Tetrastichus brunitibialis* Kostjukov, 1995
82. *Tetrastichus bruniventris* Kostjukov, 1995
83. *Tetrastichus bureja* Kostjukov, 1995
84. *Tetrastichus burrus* Yoshimoto & Ishii, 1965
85. *Tetrastichus byersi* Burks, 1963
86. *Tetrastichus canadensis* Ashmead (unavailable name in Chalcicoidea)
87. *Tetrastichus capitatus* (Ratzeburg, 1852)
88. *Tetrastichus capitonus* Kostjukov, 1978
89. *Tetrastichus capreae* Erdös, 1969
90. *Tetrastichus carbonelli* Blanchard, 1947
91. *Tetrastichus caridei* Brèthes, 1918
92. *Tetrastichus carinatus* Kostjukov, 1995
93. *Tetrastichus casuarinae* Ferrière, 1929
94. *Tetrastichus cecidivorus* MacGown, 1979
95. *Tetrastichus cecidomyiae* De Stefani, 1887
96. *Tetrastichus ceroplastidis* Brèthes, 1913
97. *Tetrastichus chakrataensis* Khan and Sushil, 1993
98. *Tetrastichus chara* Kostjukov, 1978
99. *Tetrastichus chvalynicus* Kostjukov, 1978
100. *Tetrastichus cimbiciphilus* Kostjukov, 1976
101. *Tetrastichus cincinnatus* (Girault, 1917)
102. *Tetrastichus cinerea* (unavailable name in Chalcicoidea)
103. *Tetrastichus circularis* Howard, 1897
104. *Tetrastichus citriscapus* Kostjukov, 1978
105. *Tetrastichus citritibialis* Kostjukov, 1978
106. *Tetrastichus claudii* (Brèthes, 1928)
107. *Tetrastichus clavatus* Kostjukov, 1995
108. *Tetrastichus clavatus* Yang, 1996 (junior homonym)
109. *Tetrastichus clavatus* Khan, Agnihotri & Sushil, 2005 (junior homonym)
110. *Tetrastichus clavicornis* Yang, 1996
111. *Tetrastichus clito* (Walker, 1840)
112. *Tetrastichus clypeatus* Gahan, 1925
113. *Tetrastichus coelarchus* Graham, 1991
114. *Tetrastichus coelioxydis* (Burks, 1967)
115. *Tetrastichus coeruleus* (Nees, 1834)
116. *Tetrastichus coeruleus* (Bingham, 1906) (junior homonym)
117. *Tetrastichus colemani* Crawford, 1912
118. *Tetrastichus compsivorus* Crawford, 1915

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Expanded Features
Unlimited Pages
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119. *Tetrastichus contiguus* Kostjukov, 1995
120. *Tetrastichus coorgensis* (Chandy Kurian, 1952)
121. *Tetrastichus crinicornis* (Perris, 1840)
122. *Tetrastichus crioceridis* Graham, 1983
123. *Tetrastichus cupressi* Yang, 1996
124. *Tetrastichus cuproideus* Howard, 1897
125. *Tetrastichus curtiscapus* Kostjukov, 1995
126. *Tetrastichus curtiventris* Kostjukov, 1978
127. *Tetrastichus cyaniventris* (Motschulsky, 1863)
128. *Tetrastichus cydoniae* Risbec, 1951
129. *Tetrastichus dasyops* Graham, 1991
130. *Tetrastichus decrescens* Graham, 191
131. *Tetrastichus defimbriatus* Kostjukov, 1978
132. *Tetrastichus denuntiativus* Kostjukov, 1995
133. *Tetrastichus desulcatus* Kostjukov, 1978
134. *Tetrastichus dhireni* Saraswat, 1978
135. *Tetrastichus dignitosus* Kostjukov, 1995
136. *Tetrastichus dignus* Kostjukov, 1995 (junior homonym)
137. *Tetrastichus dignus* Kostjukov, 1995
138. *Tetrastichus diospiri* Risbec, 1952
139. *Tetrastichus dipterae* (Risbec, 1956)
140. *Tetrastichus dispar* Masi, 1917
141. *Tetrastichus djuritschae* Kostjukov, 1979
142. *Tetrastichus echthrus* Crawford, 1911
143. *Tetrastichus elegans* Kostjukov, 1995
144. *Tetrastichus enchorius* Kostjukov, 1995
145. *Tetrastichus encyrti* (unavailable name in Chalcicoidea)
146. *Tetrastichus ennii* Girault, 1936
147. *Tetrastichus epilachnae* (Giard, 1896)
148. *Tetrastichus euplectrae* Risbec, 1951
149. *Tetrastichus euplectri* Gahan, 1914
150. *Tetrastichus eurinus* Kostjukov, 1995
151. *Tetrastichus evorymellae* (unavailable name in Chalcicoidea)
152. *Tetrastichus femoralis* Kostjukov, 1995
153. *Tetrastichus flagelatus* Kostjukov, 1995
154. *Tetrastichus flavifemoralis* Kostjukov, 1995
155. *Tetrastichus flavinervis* Kostjukov, 1995
156. *Tetrastichus flavipes* Ashmead, 1886
157. *Tetrastichus flavipes* Ashmead, 1886
158. *Tetrastichus flavirictus* Kostjukov, 1978
159. *Tetrastichus flaviscapus* Kostjukov, 1995
160. *Tetrastichus flavopictus* (Ashmead, 1887)
161. *Tetrastichus fuscipennis* Howard, 1897

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Expanded Features
Unlimited Pages
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162. *Tetrastichus gahani* Costa Lima & Guitton, 1962
163. *Tetrastichus gardneri* Ferrière, 1931
164. *Tetrastichus giffardianus* Silvestri, 1915
165. *Tetrastichus giffardii* Silvestri, 1913
166. *Tetrastichus giffardii* Silvestri, 1915
167. *Tetrastichus gozelae* Myartseva, 1989
168. *Tetrastichus graminicola* Risbec, 1957
169. *Tetrastichus graminum* Erdös, 1969
170. *Tetrastichus gressitti* Yoshimoto & Ishii, 1965
171. *Tetrastichus guamensis* Yoshimoto & Ishii, 1965
172. *Tetrastichus gyrolasiaeformis* Risbec, 1957
173. *Tetrastichus hakonensis* Ashmead, 1904
174. *Tetrastichus halidayi* (Graham, 1961)
175. *Tetrastichus hanka* Kostjukov, 1995
176. *Tetrastichus hasanicus* Kostjukov, 1995
177. *Tetrastichus haywardi* Blanchard (unavailable name in Chalcicoidea)
178. *Tetrastichus heeringi* Delucchi, 1954
179. *Tetrastichus hehcirus* Kostjukov, 1995
180. *Tetrastichus helianthemellae* Erdös, 1969
181. *Tetrastichus hellburgi* (Risbec, 1957)
182. *Tetrastichus helviscapus* Graham, 1991
183. *Tetrastichus heterus* Graham, 1991
184. *Tetrastichus hippasus* (Walker, 1839)
185. *Tetrastichus hispidivertex* (Girault, 1936)
186. *Tetrastichus howardi* (Olliff, 1893)
187. *Tetrastichus howardi* (Olliff, 1953)
188. *Tetrastichus hydrelliae* Sheng, 1995
189. *Tetrastichus hylotomarum* (Bouché, 1834)
190. *Tetrastichus ibseni* (Girault, 1916)
191. *Tetrastichus idothea* Walker, 1844
192. *Tetrastichus ilithyia* (Walker, 1839)
193. *Tetrastichus imitator* (Brèthes, 1916)
194. *Tetrastichus inaequalis* Graham, 1991
195. *Tetrastichus incongruus* Ashmead, 1904
196. *Tetrastichus inferens* Yoshimoto, 1970
197. *Tetrastichus ingratus* Howard (unavailable name in Chalcicoidea)
198. *Tetrastichus injuriosus* Compere, 1926
199. *Tetrastichus inopinus* Kostjukov, 1978
200. *Tetrastichus interjectus* Kostjukov, 1978
201. *Tetrastichus inunctus* (Nees, 1834)
202. *Tetrastichus invidus* Silvestri (unavailable name in Chalcicoidea)
203. *Tetrastichus isis* Brèthes, 1918
204. *Tetrastichus jantarae* (Risbec, 1958)
205. *Tetrastichus jinzhouicus* Liao, 1987

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Expanded Features
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206. *Tetrastichus johnsoni* Ashmead, 1896
207. *Tetrastichus juglansi* Yang, 1996
208. *Tetrastichus julis* (Walker, 1839)
209. *Tetrastichus kamenushka* Kostjukov, 1995
210. *Tetrastichus kievka* Kostjukov, 1995
211. *Tetrastichus kisenyensis* Risbec, 1957
212. *Tetrastichus kitegaensis* Risbec, 1957
213. *Tetrastichus kivuensis* Risbec, 1958
214. *Tetrastichus kodaikanalensis* Saraswat, 1975
215. *Tetrastichus komarovi* Kostjukov, 1995
216. *Tetrastichus kovalevi* Kostjukov, 1995
217. *Tetrastichus kraussi* Yoshimoto & Ishii, 1965
218. *Tetrastichus krishnaiahi* Saraswat, 1974
219. *Tetrastichus krishnieri* (Mani, 1941)
220. *Tetrastichus kukitamabae* Ishii, 1950
221. *Tetrastichus kumaonensis* Saraswat, 1975
222. *Tetrastichus kurandensis* (Girault, 1914)
223. *Tetrastichus laddi* Girault, 1913
224. *Tetrastichus laminatus* Kieffer, 1910
225. *Tetrastichus langiellae* Förster (unavailable name in Chalcicoidea)
226. *Tetrastichus lankicus* Narendran, 2005
227. *Tetrastichus largicapicus* Kostjukov, 1995
228. *Tetrastichus largiorisus* Kostjukov, 1995
229. *Tetrastichus largipterus* Kostjukov, 1995
230. *Tetrastichus largistigma* Kostjukov, 1995
231. *Tetrastichus largithorax* Kostjukov, 1995
232. *Tetrastichus lasiopterae* (Lindeman, 1881)
233. *Tetrastichus lasiopterinus* Domenichini, 1964
234. *Tetrastichus laudabilis* Kostjukov, 1995
235. *Tetrastichus ledrae* Viggiani, 1971
236. *Tetrastichus legionarius* Giraud, 1863
237. *Tetrastichus leionotus* Graham, 1991
238. *Tetrastichus lemae* Risbec, 1951
239. *Tetrastichus leocrates* (Walker, 1839)
240. *Tetrastichus lepidus* Walker, 1874
241. *Tetrastichus lepidus* Masi, 1940 (junior homonym)
242. *Tetrastichus leptosoma* Graham, 1991
243. *Tetrastichus lindemani* Kostjukov, 1978
244. *Tetrastichus litoreus* Yang, Qiao & Han, 2003
245. *Tetrastichus longicapus* Kostjukov, 1995
246. *Tetrastichus longicauda* Kostjukov, 1995
247. *Tetrastichus longiclava* Kostjukov, 1995

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248. *Tetrastichus longidorsellum* Kostjukov, 1995
249. *Tetrastichus longifimbriatus* Masi, 1917
250. *Tetrastichus longipronotum* Kostjukov, 1995
251. *Tetrastichus longiradius* Kostjukov, 1995
252. *Tetrastichus longiscaposus* Boucek, 1988
253. *Tetrastichus longiscutum* Kostjukov, 1995
254. *Tetrastichus longispinis* Kostjukov, 1995
255. *Tetrastichus longistigma* Kostjukov, 1995
256. *Tetrastichus longithorax* Kostjukov, 1995
257. *Tetrastichus lopezi* Blanchard, 1936 (junior homonym)
258. *Tetrastichus lopezi* Cristobal, 1936
259. *Tetrastichus lugubris* (De Santis, 1969)
260. *Tetrastichus luridiceps* Brèthes, 1918
261. *Tetrastichus luteorubidus* Yoshimoto & Ishii, 1965
262. *Tetrastichus lyridice* (Walker, 1839)
263. *Tetrastichus macrops* (Graham, 1961)
264. *Tetrastichus maculifer* Silvestri, 1914
265. *Tetrastichus madagascariensis* Risbec, 1952
266. *Tetrastichus magnicorpus* Khan & Shafee, 1988
267. *Tetrastichus magnus* Risbec, 1951
268. *Tetrastichus magnus* Risbec, 1958 (junior homonym)
269. *Tetrastichus magnus* Kostjukov, 1995 (junior homonym)
270. *Tetrastichus malabarensis* Saraswat, 1975
271. *Tetrastichus mangifera* Khan & Sushil, 1993
272. *Tetrastichus manilensis* (Ashmead, 1905)
273. *Tetrastichus maritimus* Kostjukov, 1995
274. *Tetrastichus mascalicornis* Kostjukov, 1995
275. *Tetrastichus mauripennis* Waterston, 1915
276. *Tetrastichus mediocris* Kostjukov, 1995
277. *Tetrastichus melasomae* Graham, 1991
278. *Tetrastichus metallicus* (Girault & Dodd, 1915)
279. *Tetrastichus micans* Howard, 1897
280. *Tetrastichus mimus* (Perkins, 1912)
281. *Tetrastichus minasensis* De Santis, 1969
282. *Tetrastichus minimus* Kostjukov, 1995
283. *Tetrastichus mirus* Kostjukov, 1978
284. *Tetrastichus miser* (Nees, 1834)
285. *Tetrastichus mittagongensis* Girault, 1913
286. *Tetrastichus mohani* Khan & Sushil, 1993
287. *Tetrastichus moldovicus* Kostjukov & Tuzlukova, 2000
288. *Tetrastichus momardicae* Domenichini, 1964

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Expanded Features
Unlimited Pages
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289. *Tetrastichus monstrabilis* Kostjukov, 1995
290. *Tetrastichus monsus* Kostjukov, 1995
291. *Tetrastichus muhavurae* Risbec, 1957
292. *Tetrastichus murakamii* Sugonjaev, 1983
293. *Tetrastichus murcia* (Walker, 1839)
294. *Tetrastichus muricolaris* Ghesquière, 1949
295. *Tetrastichus narendrani* LaSalle, 2004
296. *Tetrastichus nartshukae* Kostjukov, 1976
297. *Tetrastichus niger* Ranaweera, 1950
298. *Tetrastichus niger* Kostjukov, 1995 (junior homonym)
299. *Tetrastichus niger* Kostjukov, 1995 (junior homonym)
300. *Tetrastichus nigricitrinus* Kostjukov, 1978
301. *Tetrastichus nigricornis* Kostjukov, 1995
302. *Tetrastichus nigricoxa* Masi, 1917
303. *Tetrastichus nigricoxae* Yang, 2003
304. *Tetrastichus nigrinervis* Kostjukov, 1995
305. *Tetrastichus nigriocellus* Kostjukov, 1995
306. *Tetrastichus nigriscapus* (Howard, 1897)
307. *Tetrastichus nigriscapus* Kostjukov, 1995 (junior homonym)
308. *Tetrastichus nikolskajae* Kostjukov, 1995
309. *Tetrastichus nilamburensis* Saraswat, 1975
310. *Tetrastichus novoselische* Kostjukov, 1995
311. *Tetrastichus obliqua* Khan & Sushil, 1993
312. *Tetrastichus oeceticola* Brèthes, 1920
313. *Tetrastichus okawus* Rohwer, 1921
314. *Tetrastichus ooctonus* (Kawall, 1858)
315. *Tetrastichus ootyensis* Saraswat, 1975
316. *Tetrastichus ophiusae* Crawford, 1912
317. *Tetrastichus ordanus* Kostjukov, 1978
318. *Tetrastichus orgyae* Risbec, 1951
319. *Tetrastichus orientalis* Khan, Agnihotri & Sushil (junior homonym)
320. *Tetrastichus orientalis* Kostjukov, 1995
321. *Tetrastichus orissaensis* Husain & Khan, 1986
322. *Tetrastichus orthagae* Khan, Agnihotri & Sushil, 2005
323. *Tetrastichus oryzae* (Risbec, 1952)
324. *Tetrastichus ovicida* Risbec, 1951
325. *Tetrastichus ovipransus* Crosby & Leonard, 1917
326. *Tetrastichus ovivorus* Crawford, 1911
327. *Tetrastichus ovulorum* Giraud (unavailable name in Chalcicoidea)
328. *Tetrastichus oxyurus* Silvestri, 1913
329. *Tetrastichus pachycerus* Graham, 1991
330. *Tetrastichus pachylophusae* Risbec, 1956
331. *Tetrastichus palauensis* Yoshimoto & Ishii, 1965

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332. *Tetrastichus palgravei* Girault, 1919
333. *Tetrastichus pallidiventris* Kostjukov, 1978
334. *Tetrastichus pallipes* (Risbec, 1958)
335. *Tetrastichus paluster* Kostjukov, 1978
336. *Tetrastichus pantnagarensis* Khan, 1983
337. *Tetrastichus paracholus* Burks, 1943
338. *Tetrastichus partellus* Khan & Sushil, 1993
339. *Tetrastichus patannas* Motschulsky, 1863
340. *Tetrastichus pauliani* Risbec, 1952
341. *Tetrastichus paulisiensis* Risbec, 1958
342. *Tetrastichus paululus* Graham, 1991
343. *Tetrastichus pavinantoae* (Risbec, 1952)
344. *Tetrastichus peischula* Kostjukov, 1995
345. *Tetrastichus pellucidinervis* Kostjukov, 1995
346. *Tetrastichus perineti* Risbec, 1952
347. *Tetrastichus periplanetae* Crawford, 1910
348. *Tetrastichus perkinsorum* Graham, 1991
349. *Tetrastichus philippiae* Risbec, 1958
350. *Tetrastichus philippinensis* Ashmead, 1904
351. *Tetrastichus piceae* Yang, 1996
352. *Tetrastichus pilemostomae* Graham, 1991
353. *Tetrastichus planipectus* Kostjukov, 1978
354. *Tetrastichus planipectus* Kostjukov, 1995 (junior homonym)
355. *Tetrastichus planiscutellum* Kostjukov, 1995
356. *Tetrastichus platensis* Brèthes, 1905
357. *Tetrastichus plausibilis* Kostjukov, 1995
358. *Tetrastichus poincarei* Girault, 1913
359. *Tetrastichus polygonae* Risbec, 1952
360. *Tetrastichus polynemae* Ashmead, 1900
361. *Tetrastichus pompilicola* Graham, 1960
362. *Tetrastichus populi* (Kurdjumov, 1913)
363. *Tetrastichus porteri* Brèthes, 1918
364. *Tetrastichus productus* Riley, 1885
365. *Tetrastichus prospaltae* Ashmead, 1901
366. *Tetrastichus pseudoeceticola* Blanchard, 1936
367. *Tetrastichus pulvinariae* Risbec, 1951
368. *Tetrastichus punctatifacies* Girault, 1926
369. *Tetrastichus punctifrons* Kostjukov, 1995
370. *Tetrastichus punctipronotum* Kostjukov, 1995
371. *Tetrastichus punctivertex* Kostjukov, 1995
372. *Tetrastichus punjabensis* (Chandy Kurian, 1952)
373. *Tetrastichus pupivorus* Risbec, 1952
374. *Tetrastichus pyrrhalti* Myartseva, 1995

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375. *Tetrastichus quadriseta* Saraswat, 1975
376. *Tetrastichus raphnusae* Risbec, 1958
377. *Tetrastichus rasnitsyni* Kostjukov, 2001
378. *Tetrastichus rebezae* Kostjukov, 1978
379. *Tetrastichus regionibus* Kostjukov, 1995
380. *Tetrastichus rhinocori* Risbec, 1951
381. *Tetrastichus rivalis* Brèthes, 1918
382. *Tetrastichus rjazanovka* Kostjukov, 1995
383. *Tetrastichus rotundus* Delucchi, 1962
384. *Tetrastichus ruandensis* Risbec, 1957
385. *Tetrastichus rufiventris* Risbec, 1958
386. *Tetrastichus rugosus* Risbec, 1958
387. *Tetrastichus ruskini* (Girault, 1915)
388. *Tetrastichus rwankwiensis* Risbec, 1958
389. *Tetrastichus sahalinicus* Kostjukov, 1995
390. *Tetrastichus sapari* Myartseva, 1989
391. *Tetrastichus satpurensis* Saraswat, 1978
392. *Tetrastichus saundersii* (Packard, 1881)
393. *Tetrastichus sceliphroni* Risbec, 1958
394. *Tetrastichus schoenobii* Ferrière, 1931
395. *Tetrastichus schuvachinae* Kostjukov, 1995
396. *Tetrastichus scolyti* Ashmead, 1894
397. *Tetrastichus scriptus* Burks, 1943
398. *Tetrastichus sculpturatus* Waterston, 1915
399. *Tetrastichus sedanka* Kostjukov, 1995
400. *Tetrastichus semideae* (Packard, 1881)
401. *Tetrastichus semidesertus* Kostjukov, 1978
402. *Tetrastichus seorsus* Kostjukov, 1995
403. *Tetrastichus septentrionalis* Yang, 2001
404. *Tetrastichus serenus* Kostjukov, 1995
405. *Tetrastichus sesamiae* Risbec, 1951
406. *Tetrastichus setifer* Thomson, 1878
407. *Tetrastichus seychellensis* Masi, 1940
408. *Tetrastichus seyrigi* Risbec, 1952
409. *Tetrastichus shandongensis* Yang, 2003
410. *Tetrastichus shaxianensis* Liao, 1987
411. *Tetrastichus shencottensis* Saraswat, 1975
412. *Tetrastichus silvestrinus* Kostjukov, 1995
413. *Tetrastichus* simplex Kostjukov, 1995
414. *Tetrastichus sinope* (Walker, 1839)
415. *Tetrastichus sissoo* Khan, Agnihotri & Sushil, 2005
416. *Tetrastichus sodalis* Graham, 1991
417. *Tetrastichus solvae* Graham, 1991
418. *Tetrastichus soudanensis* Steffan (unavailable name in Chalcicoidea)
419. *Tetrastichus spassk* Kostjukov, 1995

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420. *Tetrastichus spirabilis* Waterston, 1922
421. *Tetrastichus storozhevae* Kostjukov, 1995
422. *Tetrastichus stylatus* (Girault, 1915)
423. *Tetrastichus subviridis* Kostjukov, 1995
424. *Tetrastichus sugitamabae* Yasumatsu & Yoshii, 1959
425. *Tetrastichus sutschanus* Kostjukov, 1995
426. *Tetrastichus swaedicola* Kieffer, 1910
427. *Tetrastichus tachos* (Walker, 1839)
428. *Tetrastichus taibaishanensis* Yang, 1996
429. *Tetrastichus taiga* Kostjukov, 1995
430. *Tetrastichus tamaricicola* Kostjukov, 1978
431. *Tetrastichus tanjorensis* Husain & Khan, 1986
432. *Tetrastichus taprobanensis* Ranaweera, 1950
433. *Tetrastichus tauricus* Kostjukov, 1989
434. *Tetrastichus taylori* Ferrière, 1933
435. *Tetrastichus tchegdomyn* Kostjukov, 1995
436. *Tetrastichus telon* (Graham, 1961)
437. *Tetrastichus temporalis* (Graham, 1961)
438. *Tetrastichus terney* Kostjukov, 1995
439. *Tetrastichus tertius* Kostjukov, 1978
440. *Tetrastichus testaceus* Masi, 1940
441. *Tetrastichus tewarii* Khan, Agnihotri & Sushil (unavailable name in Chalcicoidea)
442. *Tetrastichus thekmenevae* Kostjukov, 1986
443. *Tetrastichus theoi* Graham, 1991
444. *Tetrastichus thoracicus* Yang, 1996
445. *Tetrastichus thoracicus* Khan, Agnihotri & Sushil, 2005 (junior homonym)
446. *Tetrastichus tibialis* (Ashmead, 1894)
447. *Tetrastichus tibialis* Kostjukov, 1995 (junior homonym)
448. *Tetrastichus tipicus* Kostjukov, 1995
449. *Tetrastichus tonkoui* Risbec, 1954
450. *Tetrastichus tortricis* Kostjukov & Seregina, 1989
451. *Tetrastichus translaticius* Kostjukov, 1995
452. *Tetrastichus travancorensis* Saraswat, 1975
453. *Tetrastichus triozai* Khan, Agnihotri & Sushil, 2005
454. *Tetrastichus trisetae* Risbec, 1958
455. *Tetrastichus trisulcatus* Provancher, 1887
456. *Tetrastichus tritrichia* Saraswat, 1975
457. *Tetrastichus trjapitzini* Kostjukov, 1995
458. *Tetrastichus turanicus* Kostjukov, 1976
459. *Tetrastichus tyrtaeus* (Walker, 1839)
460. *Tetrastichus ulmi* Erdös, 1954
461. *Tetrastichus uniarticulata* Saraswat, 1975
462. *Tetrastichus unicolor* Girault & Dodd, 1915

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463. *Tetrastichus urgal* Kostjukov, 1995

464. *Tetrastichus urkaltus* Kostjukov, 1995

465. *Tetrastichus urundiensis* Risbec, 1957

466. *Tetrastichus urvilleae* (De Santis, 1957)

467. *Tetrastichus ussuriensis* Kostjukov, 1995

468. *Tetrastichus vadanatus* Narendran, 2004

469. *Tetrastichus varius* Kostjukov, 1978

470. *Tetrastichus violaceus* Kurdjumov, 1913

471. *Tetrastichus voalokae* Risbec, 1958

472. *Tetrastichus xania* Kostjukov, 1978

473. *Tetrastichus xylebororum* Domenichini, 1960

474. *Tetrastichus yapensis* Yoshimoto & Ishii, 1965

475. *Tetrastichus zalae* Risbec, 1958

476. *Tetrastichus zekioezeri* Doganlar, 1993

477. *Tetrastichus zygophylli* Myartseva, 1995

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### 4.1.2 Genus *Aprostocetus* Westwood

*Aprostocetus* Westwood, 1833b: 144. Type-species *Aprostocetus caudatus* Westwood; (monotypy).

*Tetrastichus*, Walker, 1942. 116 (neo Holiday, 1844). Type species *Cirrospilus iycidas* Walker (Subsequent designation) Peck. 1951: 443). Placed on the official index of rejected and invalid generic names in zoology (ICZN, 1965).

*Exurus* Philippi. 1873. 296. Type species (*Exurus colliguayae* Philippi (monotopy) (Syn. by LaSalle, 1994).

*Syntomosphyrum* Forster, 1887. 60: Type-species *Syntomosphyrum fulvipes.* Forster (monotopy).

*Tetrastichodes* Ashmead, 1887; 203. Type-species *Tetrastichodes floridanus* Ashmead; (monotypy).

*Ootetrastichus* Perkins, 1906; 263. Type-species *Ootetrastichus beatus* Perkins; (monotypy).

*Neomphaloides* Girault, 1913: 103-104. Type-species *Neomphaloides cinctiventris* Girault, by original designation (Syn. by Boucek, 1988).

*Selitrichodes* Girault, 1913: 104-105. Type-species *Selitrichodes fasciativentris* Girault; by original designation (Syn. by Boucek, 1988).

*Zagrammosomoides* Girault, 1913b: 177. Type species *Zagrammosomoides fasciatus* Girault; by original designation (Syn. by Boucek, 1988).

*Epomphaloides* Girault, 1913a: 49. Type-species *Epomphaloides flavus* Girault; by original designation (Syn. by Boucek, 1988).

*Aprostocerella* Girault, 1913: 71. Type-species *Aprostocerella kelloggi* Girault; by original designation (Syn. by Boucek, 1988).

*Asyntomosphyrum* Girault, 1913b: 71 also 249-250. Type-species *Asyntomosphyrum pax* Girault; by original designation (Syn. by Boucek, 1988).

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*Ootetrastichella* Girault, 1913b: 223. Type-species *Ootetrastichella longiventris* Girault; by original designation (Syn. by Boucek, 1988).

*Neotetrastichodes* Girault, 1913b: 228, 250 (*Neotetrastichodes*) and 1913a: 44. Type-speices *Neotetrastichodes flavus* Girault; by original designation (Syn. by Boucek, 1988).

*Epitetrastichus* Girault, 1913b: 229, and 1913a: 45. Type-species *Tetrastichus speciosissimuss* Girault, by original designation (Syn. by Boucek, 1988).

*Quadrastichus* Girault, 1913b: 232 and 1913c: 67. Type-species, *Quadrastichus nigrinotatus* Girault; by original designation (Syn. by Boucek, 1988).

*Neomphaloidella* Girault, 1913b: 234 and 1913c: 69. Type-species *Neomphaloidella fasciativentris* Girault; by original designation (Syn. by Boucek, 1988).

*Tetrastichella* Girault, 1913b: 237, and 1913 c: 108. Type-species *Tetrastichella fuscipennis* Girault; by original designation (Syn. by Boucek, 1988).

*Epentastichus* Girault, 1913b: 241. Type-species *Epentastichus nugatorius* Girault; by original designation (Syn. by Boucek, 1988).

*Syntomosphyrella* Girault, 1913b: 244. Type-species *Syntomosphyrella fuscipennis* Girault; by original designation (Syn. by Boucek, 1988).

*Selitrichodelia* Girault, 1913b: 24. Type-speices *Selitrichodelia aenea* Girault; by original designation (Syn. by Boucek, 1988).

*Trichoporoides* Girault, 1913: 104. Type-species *Trichaporoides fasciativentris* Girault; by original designation. Syn. n. The type species transferred to *Ootetrastichus* by Girault, 1913b: 217, i.e., before actual publication of the description of *Trichaporoides*.

*Duotetrastichus* Dodd, in Girault, 1915: 257. Type-species *Duotetrastichus monticola* Dodd; by original designation (Syn. by Boucek, 1988).

*Proceratoneura* Girault, 1915. 262. Type species *Ootetrastichus lustris* Girault; by original designation (Syn. by Boucek, 1988).

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*Paromphaloidomyiia* Girault. 1917. (309): 1. Type species *Paromphaloidomyiia homeri* Girault (original designation) (Syn. by LaSalle, 1994).

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

*Blattotetrastichus* Girault, 1917 (309): 257. Type species *Entedon hagenowii* Ratzeburg (Original designation).

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

*Neomphaloidomyia* Girault, 1917 (338): 118. Type species *Hyperteles polynemae* Ashmead (Original designation).

*Aprostocetus* Mani, 1941. *Indian J. Ent.*, 3: 25-36.

*Aprostocetus* Mani and Kurian, 1953. *Indian J. Ent.* 15: 1-21.

*Aprostocetus* Graham, 1961a. *Entomol. Month. Mag.*, 97: 34-36.

*Aprostocetus* Peck, 1963. *Cand. Ent. Suppl.* 30: 1092.

*Aprostocetus* Peck, Boucek and Hoffer, 1964. *Mem. Ent. Soc. Canad.*, 34: 99.

*Aprostocetus* Burks, 1967b. Syn. Cat; Second supplement USDA Monogr., 2: 213-282.

*Aprostocetus* 1967a. *Ann. Ent. Soc. Amer.* 60(4) : 756-760.

*Aprostocetus* Boucek, 1977b. *Bull. Ent. Res.*, 67: 1-15.

*Aprostocetus* Shafee and Rizvi, 1984. *Mitt. Schweiz Ent. Ges.*, 57: 377-378.

*Aprostocetus* Boucek, 1988. *Australasian chalcidoidea* 'Eulophid part', 676-686.

*Chrysotetrastichus* Kostjukov. 1977: 189 (as subgenus of *Tetrastichus).* Type species *Tetrastichus oveophilus* Forster (Original designation).

*Aprostocetus* LaSalle, 1994. *African Entomol.*, 2(2) : 107-109.

**Diagnosis**

The genus can be very well identified by the following generic characters viz., head collapsing or not, in later case antennae atleast slightly below centre of face; anelli less distinct often fewer and if four discernible in dry specimens then

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thorax not strongly convex, mid lobe of mesoscutum without unusual area of striation; scutellum mostly with submedian grooves usually without admarginal groove, propodeum without Inverted Y-shaped carina or if these very slightly indicated posteriorly, then clypeus truncate otherwise also often different; female funicle normal (not short), its FS2 atleast as long as the FS3, club very rarely enlarged, SMV with 1 to 3 or more dorsal setae, MV mostly shorter and not unusually widened, SV longer and at less acute angle, PMV atleast slightly shorter than the SV, if approaching that length then female antennae much shorter; gaster elongate, ovipositor long; mandible without apical strong tooth and without inner serrate border.

**Discussion**

Mani (1941) studied Indian parasitic Hymenoptera and gave full note of morphological descriptions on the *Aprostocetus krishnieri.* Further, in 1953, he gave the descriptions and records of the genus from India. Burks (1943) listed *Tetrastichodes*, *Epitetrastichus*, *Epomphaloides*, *Neomphaloidella* and *Neotetrastichodes* genera under the genus *Tetrastichus* Haliday. From the names listed above *Tetrastichodes* was formally synonymized with *Aprostocetus* by Graham (1961a), although the later genus was used in its broadest sense for which the name *Tetrastichus* was later used. Peck (1963) published an exhaustive catalogue of the literature of Nearctic species of *Aprostocetus.* A few additional references that have appeared since Peck's catalogue was published are included in Burks (1967b). The genus *Ootetrastichus* was also listed under the *Tetrastichus* by Domenichini (1966b). Boucek (1977b) regarded *Tetrastichodes* as a valid genus with its type species, *A. hagenowii* is rather distinctive, but a closely related Indian species (*asthenogonus* Waterston) has already a hairless median strip on the measoscutum, as in all *Approstoceltus* species. Graham now regards *Tetrastichodes* as a subgenus of *Aprostocetus* (Boucek, 1988). Graham (1987) made a significant distinction by correcting the list of synonyms placed

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under *Tetrastichus.* The type-species of *Aprostocerella, Neotetrastichodes* and *Neomphaloidella* seem to belong close to the lycidas group of *Aprostocetus.*

Boucek (1988) in his most comprehensive account on Australian Chalcidoidea listed new synonyms, among them *Neomphaloides* based on a species probably close to the type species of *Aprostocetus.* Other relatively clearly related species were described under *Ootetrastichus, Epomphaloides, Ootetrastichella, Epitetrastichus* and *Proceratoneura* and also very similar to them are the type-species of *Selitrichodella, Tetrastichella, Trichaporoides* and *Selitrichodelia.* He further stated that "many Australian forms show reduction of dorsal bristles on the submarginal vein to one. Therefore they can be easily misidentified in keys to the genera of other regions where the character apparently have greater significance (e.g. Europe). A further difficultly in attempting to understand Girault's genera arises from the wide variety of species which he eventually placed under one generic name. They often belong now to different genera and certainly more misplacement will be found in future".

Boucek (1988) declared *Terebratella indica* Shafee and Rizvi, as junior synonyms of the wide spread Mediterranean *Aprostocetus percaudatus* (Silvestri) from India. This species is close to some of those found in Australia and which earlier placed in *Neomphaloides.* European species have recently been revised by Graham (1987), in which he recognized five subgenera within *Aprostocetus; Aprostocetus, Ootetrastichus, Tetrastichodes, Chrysotetrastichus* and *Coriophagus* and provided a key to separate these subgenera. The subgenra *Chrysotetrastichus* and *Cosiophagus* is not known from the New World, LaSalle, 1994) added an additional subgroup *Quercastichus.*

LaSalle (1990b) transferred three New World species viz., into *Aprostocetus* and LaSalle and Schauff (1992) transferred 26 New World species into this genus. Recently LaSalle (1994) endorsed the view given by Graham (1987) and in addition to that LaSalle added on new subgenus *Auercastichus* to the given by Graham.

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**Biology**

Mostly being associated with galls caused by other insects, mainly Cecidomyiidae. They seem to be mostly primarily parasitoids attacking eggs or various larval instars of their hosts.

**Distribution**: All continents.

**Key to Indian species of the genus *Aprostocetus* Westwood**

1. Metasoma more than 3 times longer than mesosoma; ovipositor sheaths slightly longer than gaster; pronotum conspicuous and bell shaped; anelli 3; funicle segments highly longer than its width; gaster cylindrical; cerci long and eyes large.

……..***Aprostocetus silvestriae* sp.nov.**

— Metasoma not much longer than mesosoma; ovipositor sheaths concealed or highly shorter than gaster; pronotum and other characters also different.

……2

2. Antennae with unsegmented club and an anellus; body pale yellow; thorax with fine micro reticulations, pronotum smooth, mesoscutum without median longitudinal groove, slightly more than 1.5 times as long as scutellum; costal cell broad and long, SMV much longer than MV, PMV slightly developed, SV very long nearly ½ the length MV; legs uniformly yellow.

…. ***A. bouceki* Singh and khan**

— Antennae with 3 segmented club and other characters different.

……3

3. Antennae inserted slightly below the lower level of eyes, thorax blackish brown or dark brown, mesoscutum with median longitudinal grooves, PMV present

……4

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— Antennae inserted below the middle of face on an imaginary line joining the lower orbital border or slightly above the eye margin; PMV absent or rudimentary.

……5

4. Antennae with 2 anelli ;thorax dark brown with dark patches on scutellum and axillae; pronotum coarsely reticulated; propodeum without mid carina.

**…….. *A. lasalle* Singh**

— Antennae with an anellus; thorax blackish brown without any dark patch on scutellum and axillae; pronotum smooth; propodeum with mid carina.

…….. ***A. hayatae* sp.nov.**

5. Scrobes moderately deep, complete and united, not reaching the median ocellus; body metallic green; vertex wider than long, minutely punctate, cheek subequal to orbital height; thorax smooth with a few scattered minute puncts on side lobe of mesoscutum, scutellum with 4 longitudinal grooves, propodeum finely rugose with indistinct median carina. lateral carinae more prominent; gaster about 1.5 times the thorax.

…..***A. krishnieri* Mani**

— Scrobes shallow or slightly developed not united and reaching the median ocellus.

……6

6. Body metallic blue or dark metallic greenish; vertex narrow, emarginated with leathery sculpture and reddish brown pubescence; pedicel slightly more than one half the length of FS1, funicle segments gradually decreasing in length, club 4/5$^{th}$ as long as the preceding to funicle segments; thorax rugose and punctate, scutellum highly convex, propodeum rugoso reticulate with a longitudinal carinae in the middle; fore wing 2 times as long as wide; gaster longer than thorax.

….***A. asphondyliae* Mani**

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— Body dark brown, nonirridescent; vertex wide, smooth without any sculpture; pedicel as long as the FS1, funicle segments gradually increasing in length distad, club slightly longer than preceding two funcile segements combined, thorax smooth, scutellum slightly convex, propodeum faintly reticulated, median carina absent and with paraspiracular carina; fore wing more than 2 times as long as wide; gaster longer than head and thorax combined.

…..***A. yoshimotoi* Singh**

**4.1.2.1** ***Aprostocetus hayatae* sp.nov.** (Plate: 11, Figs.1-10)

**Female:** Body length about 1.655 mm; body colour blackish brown; head blackish brown, ocelli red and eyes black; antennae brown ; thorax blackish brown ,pronotum brown, nonirridescent; wings hyaline; legs dark brown with yellowish white; gaster dark brown without any reflection.

**Head (Fig. 1 ):** Wider than long in frontal aspect (0.472:0.395), smooth, head frontal grooves 'Y' in shape;frontovertex width distinctly more than 1/2 the total head width (0.350:0.472);ocelli arranged in obtuse angled triangle; OOL less than 1.5 times as long as POL; compound eyes flat, small and smooth ,eyes orbits round; antennal toruli situated below the lower level of eye margin, prominence between antennal toruli more than 1/3$^{rd}$ the width of frons between eyes (0.06:0.21), malar sulcus straight and grooved; malar space smooth, longer than eye width (0.16:0.14); mandibles tridentate (Fig.2 ) ; maxillary palp (Fig. 3) and labial palp (Fig. 4) each single segmented; clypeus semiarched;lower margin of clypeus straight.

**Antennae (Fig. 5):** 8 segmented excluding an anellus ,apical tip of antenna without spicule,antennal formula 1,1,1,3,3; scape coarsely sculptured ,cylindrical slightly more than 3 times as long as wide (0.172:0.052),scape apex not touching to mid ocelli; pedicel setose, more than 1.5 times as long as wide ( 0.068:0.040 )

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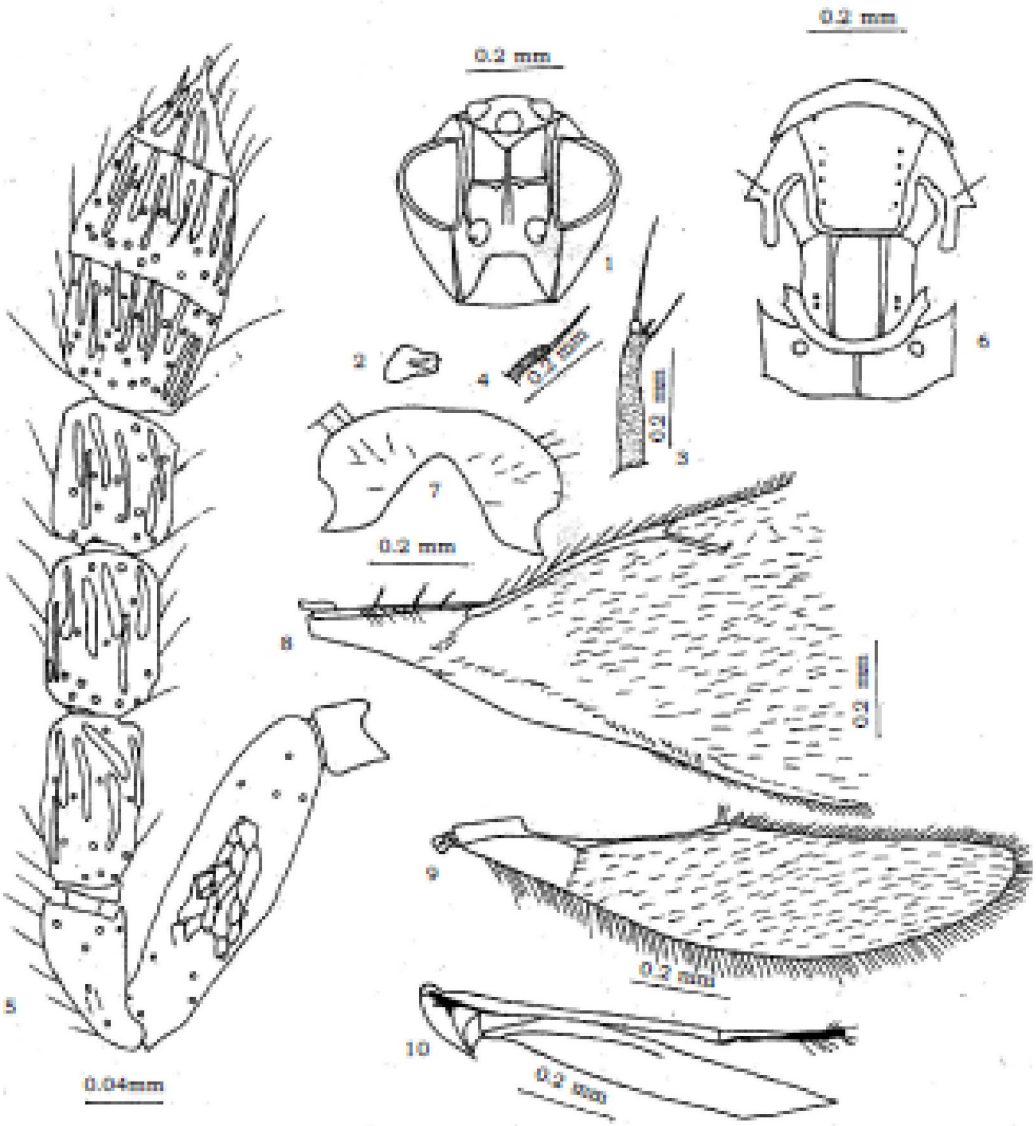


**Plate 11: Figs. 1-10:** ***Aprostocetus hayatae*** **sp.nov.**
1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.Pronotum; 8.Forewing; 9.Hindwing; 10.Female genitalia

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and longer than the length of the FS1; funicle 3 segmented, FS1 to FS3 gradually decreasing in length,FS1 less than 2 times as long as wide (0.09 :0.051 ),FS2 less than 1.5 times as long as wide (0.085:0.057),FS3 less than 1.5 times as long as wide (0.076:0.061 ); club 3 segmented, more than 2 times as long as wide (0.187:0.077), slightly longer than preceding two funicle segments combined.

**Thorax (Fig. 6):** Pronotum brown bearing 3 pairs of setae at its posterior margin (Fig. 7), antero-lateral angles acute , anterior margin concave in the middle;mesoscutum less than 2 times as wide as long (0.45 :0.263 ); mesoscutum faintly sculptured , having 5 pairs of adnotaular setae,notauli complete , median longitudinal sulcus present;axilla highly advanced;scutellum slightly convex and faintly sculptured and shorter than mesoscutum, less than 2 times as wide as long (0.396 :0.225) with submedian longitudinal grooves and 1 pair of setae situated on scutellum,grooves deep and straight;dorsellum smooth;metanotum narrow; propodeum with simple median carina and without paraspiracular carinae,propodeal spiracles round,large and well separated from the anterior margin of propodeum by a space more than 1/2 of its own diameter, spiracle rim fully exposed ;mesopostphragma notched at its apical margin and its apical margin touching to lower margin of propodeum.

**Fore wings (Fig.** 8) more than 2 times as long as wide (1.465:0.71),less than 2 times longer than hind wing length, densely setose; costal cell long; SMV with 3 Setae directed upwards, longer (0.455) than MV (0.29); PMV shorter than SV (0.043:0.11); SV long (0.11) more than 1/2 of the length of MV (0.29); marginal fringe short spaced by a distance equal to 1/5 of the length of fringe; basal vein with 7 setae, basal cell bare; speculum broad, closed below; cubital vein almost straight, subcubital line of hairs absent.

**Hind wings (Fig. 9):** more than 4 times as long as wide (1.155:0.255) with blunt apex; vein length (0.56) less than one half the length of wing; marginal fringe spaced by a distance equal to 1/9th of their length.

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**Legs:** coxae, trochanter and more than basal half of femora dark brown rest parts yellowish white in colour;coxae sculptured;mid tibial spur much longer than fore and hind tibial spur.

**Gaster:** large and elongate, more than 2 times as long as wide (0.905:0.415), gaster surface smooth, gasteral apical tip acuminate; gaster sessile; metasoma 1.3 x longer than mesosoma; ovipositor sheaths not exerted; first valvifers semicircular, (Fig. 10); third valvulae more than 12 times as long as wide (0.27: 0.022), slightly less than 1/2 the length of second valvifers (0.63); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig.10);cercal setae small and length of setae same at both sides of gaster.

**Male:** Not known

**Holotype:** ♀**,** India, U.K., Rudrapur, Host *Pieris brassicae* larvae, reared collection, Mustard crop, 12/02/06 Hym. Eulo. Nr 07 (Sandeep Kumar).

**Paratype:** 4♀♀, same data as holotype Hym. Eulo Nr 07A (Sandeep Kumar).

**4.1.2.2** ***Aprostocetus silvestriae* sp.nov.** (Plate: 12, Figs.1-7)

**Female** : Body length about 2.1 mm; body colour brown; head yellow, ocelli violet and eyes black; antennae pedicel and scape brownish yellow, rest brown; thorax yellowish brown, nonirridescent; wing hyaline with pale yellow vanation; legs yellow, except hind leg coxa dark brown; gaster brown without any reflection.

**Head (Fig. 1):** Less than 1.5 times wider than long in frontal aspect (0.32: 0.26), with faint sculpture, head frontal grooves absent; frontovertex width distinctly more than ½ the total head width (0.22: 0.26); vertex smooth; ocelli arranged in obtuse angled triangle; POL less than 1.5 times as long as OOL; compound eyes distinctly large mid of eyes inner orbits convex; antennal toruli just below the

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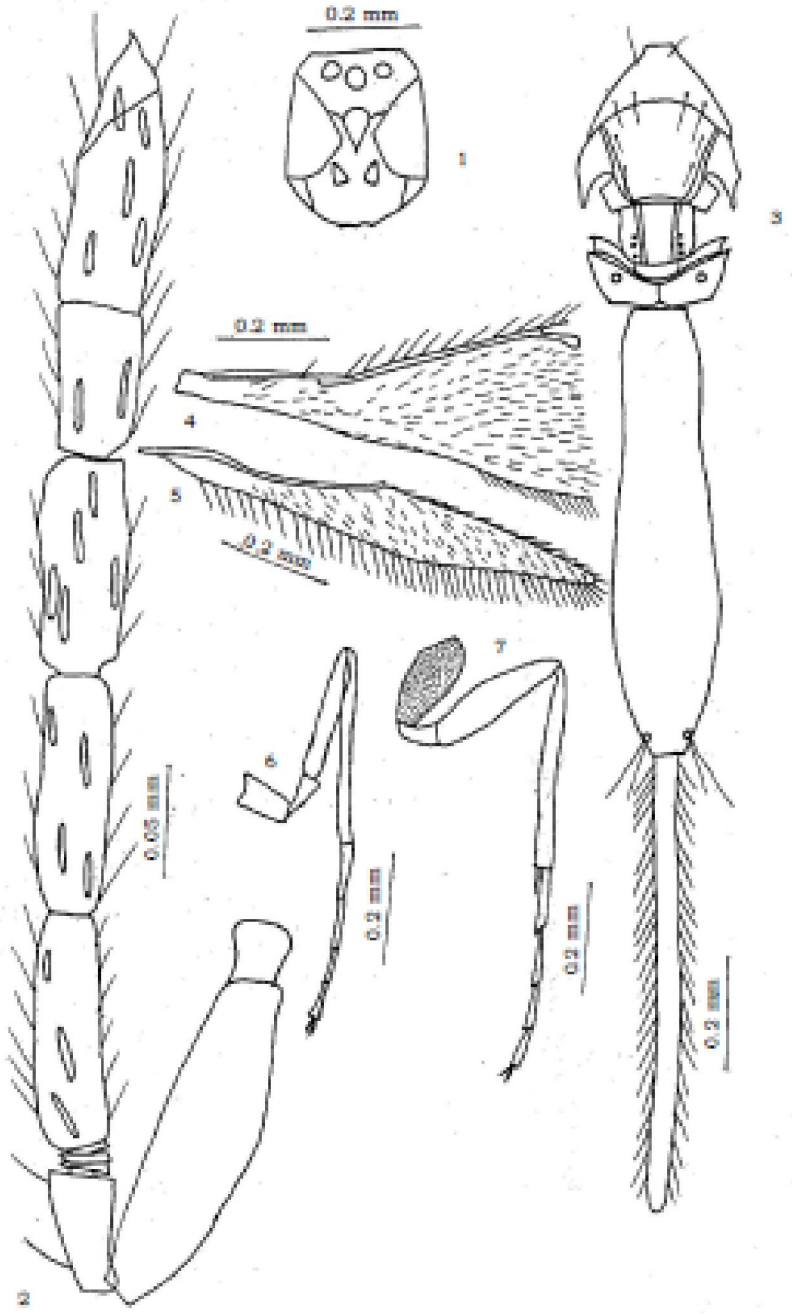


**Plate 12: Figs. 1-7:** ***Aprostocetus silvestriae*** **sp.nov.**
1. Head in frontal view; 2. Antenna; 3.dorsal view of body; 4.Forewing; 5.Hindwing; 6.Middle leg; 7.hind leg

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lower level of eye margin, prominence between antennal trouli less than 1/2 the width of frons between eyes (0.04:0.06);malar sulcus short; malar space smooth, longer than eye width (0.125:0.100);maxillary palp and labial palp each single segmented; lower margin of clypeus swelled medially.

**Antennae (Fig. 2)** : 8 segmented excluding 3 anelli, antennae with long longitudinal sensilla, apical tip of antenna with small spicule, antennal formula 1,1,3,3,3; scape cylindrical slightly more than 3.5 times as long as wide (0.160: 0.042), scape apex not touching to mid ocelli; pedicel with 2 long setae almost 1.5 times as long as wide (0.045:0.030) and more than 3.5 times shorter than the length of the FS1; funicle 3 segmented, FS1 more than 5.5 times as long as wide (0.17: 0.03), FS2 more than 3.5 times as long as wide (0.109 : 0.031), FS3 less than 2.5 times as long as wide (0.100: 0.041); club 3 segmented, less than 5 times as long as wide (0.198: 0.041), shorter than preceding two funicle segments combined.

**Thorax (Fig. 3)** : Pronotum bell shaped,deep reticulated sculpture bearing 3 pairs of setae; mesoscutum more than 1.5 times as wide as long (0.290: 0.185); mesoscutum having 2 pairs of adnotaular setae, notauli complete and deep, median longitudinal sulcus absent; axilla moderately advanced; scutellum slightly convex, faintly sculptured and more than 1.5 times shorter than mesoscutum, less than 2.5 times as wide as long (0.29: 0.11) with submedian longitudinal grooves and 3 pairs of setae situated on scutellum, grooves deep and straight; dorsellum bulged; metanotum narrow; propodeum with simple median carina and without paraspiracular carinae, propodeal spiracles round,small and well separated from the anterior margin of propodeum by a space almost 2 times of its own diameter, spiracle rim fully exposed.

**Fore wings (Fig. 4)** : Slightly less than 4 times as long as wide (1.15 : 0.29), less than 1.5 times longer than hind wing length, moderately setose; costal cell narrow and bare; SMV with one setae directed upwards, longer (0.34) than MV

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(0.315); MV bearing 7 long setae on front edge; PMV rudimentary; SV long (0.06) less than 1/6$^{th}$ of the length of MV (0.35); marginal fringe short spaced by a distance equal to 1/5$^{th}$ of the length of fringe; basal vein with 2 setae, basal cell setose; speculum narrow, closed below; cubital vein almost straight, subcubital line of hairs arising from the base of cubital vein.

**Hind wings (Fig. 5)**: More than 7.5 times as long as wide (0.865: 0.110) with acute apex; vein length (0.41) less than one half the length of wings; marginal fringe spaced by a distance equal to 1/6$^{th}$ of their length.

**Legs**: Tarsal segment 3 and 4 infuscated, mid tibial spur much longer than fore and hind tibial spur.

**Gaster (Fig. 3)**: Long, more or less cylindrical with a highly long ovipositor sheaths, longer than rest gaster, gaster surface smooth; sessile; metasoma more than 3 times longer than mesosoma (1.58: 0.48); ovipositor sheaths highly exerted.

**Male**: Not known

Holotype: ♀, India, U.K., Sitarganj, HRC, Host not known,Sweepnet in Rice, 14/09/06, Hym. Eulo. Nr. 100 (Sandeep Kumar)

**Paratype**: No paratype.

**Checklist for world fauna of Genus *Aprostocetus* Westwood**

1. *Aprostocetus burksi* LaSalle, 1994
2. *Aprostocetus burmeisteri* (Girault, 1915)
3. *Aprostocetus cacus* (Walker, 1839)
4. *Aprostocetus calamarius* Graham, 1961
5. *Aprostocetus calvus* (Domenichini, 1965)
6. *Aprostocetus camerounensis* (Risbec, 1955)
7. *Aprostocetus capitigenae* Graham, 1987
8. *Aprostocetus capnopterus* Graham, 1987
9. *Aprostocetus cassidis* (Burks, 1943)
10. *Aprostocetus cassidocida* Risbec, 1951

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11. *Aprostocetus catius* (Walker, 1839)
12. *Aprostocetus caudatus* Westwood, 1833
13. *Aprostocetus cebennicus* Graham, 1987
14. *Aprostocetus cecidomyiarum* (Bouché, 1834)
15. *Aprostocetus celtidis* (Erdös, 1954)
16. *Aprostocetus ceroplastae* (Girault, 1916)
17. *Aprostocetus ceroplastae* (Girault, 1916)
18. *Aprostocetus cerricola* (Erdös, 1954)
19. *Aprostocetus chakassicus* (Dolgin & Kostjukov, 1987)
20. *Aprostocetus chapadae* (Ashmead, 1904)
21. *Aprostocetus ciliatus* (Nees, 1834)
22. *Aprostocetus cinctiventer* Boucek, 1988
23. *Aprostocetus cinctiventris* (Girault, 1913)
24. *Aprostocetus citrinus* (Förster, 1841)
25. *Aprostocetus citripes* (Thomson, 1878)
26. *Aprostocetus clavicornis* (Zetterstedt, 1838)
27. *Aprostocetus claviger* (Thomson, 1878)
28. *Aprostocetus cleonica* (Walker, 1839)
29. *Aprostocetus cobdeni* (Girault, 1913)
30. *Aprostocetus coccidiphagus* Graham, 1987
31. *Aprostocetus coimbatorensis* (Rohwer, 1921)
32. *Aprostocetus collega* (Ratzeburg, 1844)
33. *Aprostocetus colliguayae* (Philippi, 1873)
34. *Aprostocetus consimilis* (Girault, 1913)
35. *Aprostocetus consobrinus* (Girault, 1913)
36. *Aprostocetus constrictus* Graham, 1987
37. *Aprostocetus coxalis* (Howard, 1897)
38. *Aprostocetus cracens* Graham, 1987
39. *Aprostocetus craneiobiae* Graham, 1987
40. *Aprostocetus crassiceps* Graham, 1987
41. *Aprostocetus cressoni* (Girault, 1915)
42. *Aprostocetus crino* (Walker, 1838)
43. *Aprostocetus crypturgus* Yang, 1996
44. *Aprostocetus csokakoensis* (Erdös, 1969)
45. *Aprostocetus culex* (Girault, 1915)
46. *Aprostocetus culminis* Graham, 1987
47. *Aprostocetus cultratus* Graham, 1987
48. *Aprostocetus cupreus* (Ashmead, 1894)
49. *Aprostocetus curtivena* Graham, 1991
50. *Aprostocetus cycladum* Graham, 1987
51. *Aprostocetus cyniphidum* (Ratzeburg, 1848)
52. *Aprostocetus daimachus* (Walker, 1839)
53. *Aprostocetus darwini* (Girault, 1913)

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54. *Aprostocetus darwinianus* Boucek, 1988
55. *Aprostocetus dauci* Graham, 1987
56. *Aprostocetus debilitatus* Graham, 1987
57. *Aprostocetus deceptor* Graham, 1991
58. *Aprostocetus decii* (Girault, 1928)
59. *Aprostocetus dei* (Girault, 1928)
60. *Aprostocetus dendroctoni* Yang, 1996
61. *Aprostocetus denticularis* Ranjit, Misra, Mohendro & Prasad (unavailable name in Chalcicoidea)
62. *Aprostocetus deobensis* Graham, 1987
63. *Aprostocetus dezhnevi* (Kostjukov, 1990)
64. *Aprostocetus dineuri* (Risbec, 1958)
65. *Aprostocetus diplosidis* Crawford, 1907
66. *Aprostocetus distichus* Graham, 1961
67. *Aprostocetus distinguendus* (Perkins, 1912)
68. *Aprostocetus distinguendus* (Masi, 1917) (junior homonym)
69. *Aprostocetus diversus* (Förster, 1841)
70. *Aprostocetus doksyensis* Graham, 1987
71. *Aprostocetus dolichocerus* (Masi, 1917)
72. *Aprostocetus domenichinii* (Erdös, 1969)
73. *Aprostocetus domenichinii* (Erdös, 1969) (unavailable name in Chalcicoidea)
74. *Aprostocetus dotus* (Walker, 1839)
75. *Aprostocetus dryocosmi* Wu & Xu, 2001
76. *Aprostocetus dubius* (Waterston, 1929)
77. *Aprostocetus durmitorensis* Graham, 1987
78. *Aprostocetus dymas* (Walker, 1839)
79. *Aprostocetus elegantulus* Graham, 1987
80. *Aprostocetus eleuchia* (Walker, 1839)
81. *Aprostocetus elevatus* (Howard, 1897)
82. *Aprostocetus elongatus* (Förster, 1841)
83. *Aprostocetus elongatus* (Doutt, 1961) (junior homonym)
84. *Aprostocetus emesa* (Walker, 1839)
85. *Aprostocetus epicharmus* (Walker, 1839)
86. *Aprostocetus epilobiellus* Graham, 1987
87. *Aprostocetus epilobii* Graham, 1987
88. *Aprostocetus eratus* (Walker, 1839)
89. *Aprostocetus ericae* (Dufour, 1837)
90. *Aprostocetus eriophyes* (Taylor, 1909)
91. *Aprostocetus ermaki* (Kostjukov, 1990)
92. *Aprostocetus escherichi* (Szelényi, 1941)
93. *Aprostocetus esherensis* Graham, 1987
94. *Aprostocetus esurus* (Riley, 1879)
95. *Aprostocetus euagoras* (Walker, 1839)

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Expanded Features
Unlimited Pages
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96. *Aprostocetus eucalypti* (Girault, 1929)
97. *Aprostocetus eupatorii* Kurdjumov, 1913
98. *Aprostocetus eupolis* (Walker, 1839)
99. *Aprostocetus eurystoma* Graham, 1961
100. *Aprostocetus eurytomae* (Nees, 1834)
101. *Aprostocetus eurytus* (Walker, 1839)
102. *Aprostocetus extensus* Graham, 1987
103. *Aprostocetus fabicola* (Rondani, 1877)
104. *Aprostocetus facetus* (Trjapitzin & Kostjukov, 1986)
105. *Aprostocetus fannius* (Walker, 1839)
106. *Aprostocetus fasciativenter* Boucek, 1988
107. *Aprostocetus fasciativentris* (Girault, 1913)
108. *Aprostocetus fasciativentrosus* Boucek, 1988
109. *Aprostocetus fasciatus* (Ashmead, 1894)
110. *Aprostocetus faustus* (Burks, 1943)
111. *Aprostocetus februus* (Walker, 1839)
112. *Aprostocetus femoralis* (Sundby, 1957)
113. *Aprostocetus femoratus* (Ashmead, 1894)
114. *Aprostocetus ferganicus* Kostjukov & Khomchenko, 2005
115. *Aprostocetus fidius* Girault, 1917
116. *Aprostocetus filiformis* (Girault, 1915)
117. *Aprostocetus flavellinus* Boucek, 1988
118. *Aprostocetus flavellus* (Girault & Dodd, 1915)
119. *Aprostocetus flavicapitus* Kostjukov, 1995
120. *Aprostocetus flavicaput* Girault, 1913
121. *Aprostocetus flavicollis* (Girault, 1937)
122. *Aprostocetus flavicornis* (Dodd, 1915)
123. *Aprostocetus flavidus* (Khan & Shafee, 1981)
124. *Aprostocetus flavifrons* (Walker, 1849)
125. *Aprostocetus flavimetanotum* Yefremova & Yegorenkova, 2005
126. *Aprostocetus flavios* (Girault, 1913)
127. *Aprostocetus flavipostscutellum* (Girault, 1913)
128. *Aprostocetus flaviscapus* (Dodd, 1915)
129. *Aprostocetus flaviscutellum* (Girault, 1913)
130. *Aprostocetus flavobasalis* Girault, 1915
131. *Aprostocetus flavovarius* (Nees, 1834)
132. *Aprostocetus flavus* (Girault, 1913) (junior homonym)
133. *Aprostocetus flavus* (Girault, 1913) (junior homonym)
134. *Aprostocetus flavus* Girault, 1913 (junior homonym)
135. *Aprostocetus flavus* (Girault, 1913) (junior homonym)
136. *Aprostocetus flavus* (Girault, 1913)
137. *Aprostocetus florida* (Girault, 1917)

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PDF Complete

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139. *Aprostocetus fonscolombei* Graham, 1987
140. *Aprostocetus foraminifer* Graham, 1987
141. *Aprostocetus formosanus* (Timberlake, 1921)
142. *Aprostocetus forsteri* (Walker, 1847)
143. *Aprostocetus froggatti* (Ashmead, 1900)
144. *Aprostocetus fukutai* Miwa & Sonan, 1935
145. *Aprostocetus fulgens* (Girault, 1915)
146. *Aprostocetus fulvipes* (Förster, 1878)
147. *Aprostocetus fulvipostscutellum* (Girault, 1913)
148. *Aprostocetus fuscipennatus* Boucek, 1988
149. *Aprostocetus fuscipennis* (Girault, 1913)
150. *Aprostocetus fuscitibiae* (Girault, 1929)
151. *Aprostocetus fuscosus* Boucek, 1988
152. *Aprostocetus fuscus* (Girault, 1913)
153. *Aprostocetus fusificola* Graham, 1987
154. *Aprostocetus gala (*Walker, 1847)
155. *Aprostocetus gallicola* (Ferrière, 1924)
156. *Aprostocetus garganensis* Graham, 1987
157. *Aprostocetus garryana* (Burks, 1963)
158. *Aprostocetus gaus* (Walker, 1839)
159. *Aprostocetus gelastus* (Burks, 1943)
160. *Aprostocetus ghananensis* (Doganlar, 1993)
161. *Aprostocetus gibboni* (Girault, 1917)
162. *Aprostocetus glandic*ola Graham, 1987
163. *Aprostocetus gloriosus* (Girault & Dodd, 1915)
164. *Aprostocetus glycon* (Walker, 1839)
165. *Aprostocetus gnomus* Graham, 1987
166. *Aprostocetus gobius* Girault, 1913
167. *Aprostocetus gowdeyi* (Crawford, 1912)
168. *Aprostocetus graciliclava* Graham, 1987
169. *Aprostocetus grahami* Kostjukov & Tuzlikova, 2002
170. *Aprostocetus grandicauda* Kostjukov, 1995
171. *Aprostocetus grandii* (Domenichini, 1965)
172. *Aprostocetus gratus* (Giraud, 1863)
173. *Aprostocetus gravans* (Silvestri, 1915)
174. *Aprostocetus gregi* (Girault, 1913)
175. *Aprostocetus grotiusi* (Girault, 1913)
176. *Aprostocetus grylli* (Erdös, 1954)
177. *Aprostocetus guttatus* (Girault, 1913)
178. *Aprostocetus habarovi* (Kostjukov, 1990)
179. *Aprostocetus haeckeli* (Girault, 1913)
180. *Aprostocetus hagenowii* (Ratzeburg, 1852)
181. *Aprostocetus hanangensis* (Delucchi, 1962)
182. *Aprostocetus handeli* Girault, 1926
183. *Aprostocetus hanka* Kostjukov, 1995

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Unlimited Pages
PDF Complete

184. *Aprostocetus harongae* (Risbec, 1952)
185. *Aprostocetus hedqvisti* Graham, 1987
186. *Aprostocetus hesperius* (Burks, 1947)
187. *Aprostocetus hetaericos* (Girault, 1915)
188. *Aprostocetus hexguttativentris* (Girault, 1915)
189. *Aprostocetus hians* Graham, 1983
190. *Aprostocetus hibus* (Burks, 1943)
191. *Aprostocetus hillmeadia* (Girault, 1917)
192. *Aprostocetus hofferi* (Kostjukov, 1989)
193. *Aprostocetus holochlorus* (Perkins, 1912)
194. *Aprostocetus holomelas* Graham, 1987
195. *Aprostocetus holoxanthus* Graham, 1991
196. *Aprostocetus homeri* (Girault, 1917)
197. *Aprostocetus homochromus* (Perkins, 1912)
198. *Aprostocetus humilis* Graham, 1961
199. *Aprostocetus hyalinipennis* (Girault, 1911)
200. *Aprostocetus hyalinipennis* (Girault, 1914) (junior homonym)
201. *Aprostocetus hyalinus* (Girault, 1913)
202. *Aprostocetus hyperfuniculus* Kostjukov, 1995
203. *Aprostocetus ibericus* Graham, 1987
204. *Aprostocetus ignigenus* De Santis, 1988
205. *Aprostocetus ilexi* Sheng & Zhao, 1995
206. *Aprostocetus imago* Girault, 1915
207. *Aprostocetus imperialis* Girault, 1913
208. *Aprostocetus impexus* (Girault, 1917)
209. *Aprostocetus impurus* (Förster, 1861)
210. *Aprostocetus incrassatus* Graham, 1961
211. *Aprostocetus indigenus* (Girault, 1932)
212. *Aprostocetus infulatus* (De Santis, 1957)
213. *Aprostocetus inghamensis* (Girault, 1913)
214. *Aprostocetus intentatus* (Girault & Dodd, 1915)
215. *Aprostocetus invidus* (Domenichini, 1965)
216. *Aprostocetus io* (Girault, 1913)
217. *Aprostocetus ion* Boucek, 1988
218. *Aprostocetus ione* (Walker, 1839)
219. *Aprostocetus irvingi* (Girault, 1917)
220. *Aprostocetus ischnopterae* (Girault, 1917)
221. *Aprostocetus java* (Girault, 1917)
222. *Aprostocetus juniperi* (Crawford, 1915)
223. *Aprostocetus kansasia* Girault, 1917
224. *Aprostocetus kelloggi* (Girault, 1913)
225. *Aprostocetus krusenschterni* Kostjukov, 1995
226. *Aprostocetus kuriani* (Husain & Khan, 1986)
227. *Aprostocetus lacaena* (Walker, 1839)
228. *Aprostocetus lachares* (Walker, 1839)

Click Here & Upgrade
Expanded Features
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229. *Aprostocetus lacunatus* Graham, 1987
230. *Aprostocetus lamiicidus* Kerrich, 1963
231. *Aprostocetus larzacensis* Graham, 1987
232. *Aprostocetus LaSallei* Khan, Agnihotri & Sushil, 2005
233. *Aprostocetus lasius* (Burks, 1943)
234. *Aprostocetus laticeps* Graham, 1987
235. *Aprostocetus latithorax* (Girault, 1913)
236. *Aprostocetus lecanii* (Girault, 1916)
237. *Aprostocetus lelaps* (Walker, 1839)
238. *Aprostocetus lenini* (Girault, 1928)
239. *Aprostocetus leptocerus* Graham, 1987
240. *Aprostocetus leptoneuros* (Ratzeburg, 1844)
241. *Aprostocetus leroyi* (Risbec, 1958)
242. *Aprostocetus leucone* (Walker, 1839)
243. *Aprostocetus leucopterae* (Ferrière, 1936)
244. *Aprostocetus levadiensis* Graham, 1987
245. *Aprostocetus ligus* (Walker, 1839)
246. *Aprostocetus limbus* (Girault, 1929)
247. *Aprostocetus lineatus* (Girault, 1913)
248. *Aprostocetus lituratus* Graham, 1987
249. *Aprostocetus longicauda* (Thomson, 1878)
250. *Aprostocetus longicauda* (Kieffer, 1905) (junior homonym)
251. *Aprostocetus longiclava* Kostjukov, 1995
252. *Aprostocetus longiclavus* (Dodd, 1915)
253. *Aprostocetus longicornis* (Ashmead, 1894)
254. *Aprostocetus longicorpus* (Girault, 1916)
255. *Aprostocetus longipectus* (Kostjukov, 1978)
256. *Aprostocetus longipennis* (Dodd, 1915)
257. *Aprostocetus longiscapus* (Thomson, 1878)
258. *Aprostocetus longiscutulum* (Delucchi, 1962)
259. *Aprostocetus longispinis* Kostjukov, 1995
260. *Aprostocetus longistigma* Kostjukov, 1995
261. *Aprostocetus longiventris* (Girault, 1913)
262. *Aprostocetus longiventris* (Masi, 1917) (junior homonym)
263. *Aprostocetus longulus* (Erdös, 1954)
264. *Aprostocetus lustris* (Girault, 1913)
265. *Aprostocetus lutescens* Askew, 1997
266. *Aprostocetus luteus* (Ratzeburg, 1848)
267. *Aprostocetus lycidas* (Walker, 1839)
268. *Aprostocetus lycidoides* Graham, 1987
269. *Aprostocetus lysippe* (Walker, 1839)
270. *Aprostocetus maculatus* (Khan & Shafee, 1988)
271. *Aprostocetus magniventer* Yang, 2003
272. *Aprostocetus mahometi* (Girault, 1936)

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Unlimited Pages
PDF Complete

273. *Aprostocetus malagensis* Graham, 1987
274. *Aprostocetus mandanis* (Walker, 1839)
275. *Aprostocetus marcovitchi* (Crawford, 1915)
276. *Aprostocetus marginatus* (Girault, 1913)
277. *Aprostocetus margiscutellum* (Girault, 1915)
278. *Aprostocetus margiscutum* (Girault, 1913)
279. *Aprostocetus margiventris* (Girault, 1913)
280. *Aprostocetus margiventrosus* Boucek, 1988
281. *Aprostocetus marilandia* (Girault, 1917)
282. *Aprostocetus marinikius* (Kostjukov, 1989)
283. *Aprostocetus marylandensis* (Girault, 1916)
284. *Aprostocetus masculinus* Graham, 1987
285. *Aprostocetus massonianae* Yang, 1996
286. *Aprostocetus mauripennis* (Waterston, 1915)
287. *Aprostocetus maurus* Graham, 1991
288. *Aprostocetus maximus* (Dodd & Girault, 1915)
289. *Aprostocetus mazaeus* (Walker, 1839)
290. *Aprostocetus megameli* (Fullaway, 1940)
291. *Aprostocetus melichlorus* (Waterston, 1915)
292. *Aprostocetus melleus* (Ashmead, 1904)
293. *Aprostocetus meltoftei* Buhl, 1997
294. *Aprostocetus menius* (Walker, 1839)
295. *Aprostocetus meridialis* (Dodd, 1915)
296. *Aprostocetus meridianus* (Girault, 1915)
297. *Aprostocetus meridionalis* Graham, 1987
298. *Aprostocetus meroe* Graham, 1987
299. *Aprostocetus mesmeri* (Girault, 1915)
300. *Aprostocetus metallicus* (Perkins, 1912)
301. *Aprostocetus metra* (Walker, 1839)
302. *Aprostocetus micantulus* (Thomson, 1878)
303. *Aprostocetus microcosmus* (Girault, 1917)
304. *Aprostocetus microfuniculus* (Kostjukov, 1989)
305. *Aprostocetus microocellus* Kostjukov, 1995
306. *Aprostocetus microscopicus* (Rondani, 1877)
307. *Aprostocetus milleri* (Burks, 1963)
308. *Aprostocetus mimulus* Graham, 1987
309. *Aprostocetus minimus* (Ratzeburg, 1848)
310. *Aprostocetus minutissimus* (Girault, 1915)
311. *Aprostocetus minutus* (Howard, 1881)
312. *Aprostocetus miridivorus* (Domenichini, 1967)
313. *Aprostocetus mirus* (Girault, 1913)

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314. *Aprostocetus misericordia (*Girault, 1913)
315. *Aprostocetus moldavicus* Kostjukov, 1989
316. *Aprostocetus montanus* Girault, 1913
317. *Aprostocetus monticola* (Girault, 1915)
318. *Aprostocetus morairensis* Graham, 1987
319. *Aprostocetus morum* (Girault, 1913)
320. *Aprostocetus muiri* (Perkins, 1912)
321. *Aprostocetus multifasciatus* (Girault, 1915)
322. *Aprostocetus mycerinus* (Walker, 1839)
323. *Aprostocetus mymaridis* (Girault, 1916)
324. *Aprostocetus myrsus* (Walker, 1839)
325. *Aprostocetus nainitalensis* (Khan & Shafee, 1988)
326. *Aprostocetus narcaeus* (Walker, 1843)
327. *Aprostocetus natans* (Kostjukov & Fursov, 1987)
328. *Aprostocetus naucles* (Walker, 1843)
329. *Aprostocetus nebraskensis* (Girault, 1916)
330. *Aprostocetus necopinatus* Girault, 1915
331. *Aprostocetus negetae* Risbec, 1951
332. *Aprostocetus neglectus* (Domenichini, 1957)
333. *Aprostocetus neis* (Walker, 1839)
334. *Aprostocetus nelsonensis* (Girault, 1913)
335. *Aprostocetus neuroteri* (Ashmead, 1887)
336. *Aprostocetus niger* (Girault, 1913)
337. *Aprostocetus nigriceps* (Masi, 1917)
338. *Aprostocetus nigriclava* (Girault, 1915)
339. *Aprostocetus nigricornis* (Khan & Shafee, 1988)
340. *Aprostocetus nigrithorax* Girault, 1913
341. *Aprostocetus nigriventris* Kostjukov, 1995
342. *Aprostocetus nomadis* (Girault, 1915)
343. *Aprostocetus norax* (Walker, 1843)
344. *Aprostocetus novatus* (Walker, 1839)
345. *Aprostocetus novifasciatus* (Girault, 1913)
346. *Aprostocetus novus* (Girault, 1917)
347. *Aprostocetus nubigenus* Graham, 1986
348. *Aprostocetus nubilipennis* (Girault, 1915)
349. *Aprostocetus nugatorius* (Girault, 1913)
350. *Aprostocetus nympha* (Girault, 1913)
351. *Aprostocetus nymphis* (Walker, 1839)
352. *Aprostocetus obliquus* Graham, 1987
353. *Aprostocetus obscurus* Girault, 1913
354. *Aprostocetus obtusae* Narendran & David, 2005
355. *Aprostocetus occidentalis* Graham, 1987
356. *Aprostocetus occultus* (Girault, 1913)
357. *Aprostocetus octoguttatus* Girault, 1915

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Expanded Features
Unlimited Pages
PDF Complete

358. *Aprostocetus oculisetatus* Kostjukov, 1995
359. *Aprostocetus oklahoma (*Girault, 1917)
360. *Aprostocetus oncideridis (*Gahan, 1932*)*
361. *Aprostocetus orbitalis (*Ashmead, 1895)
362. *Aprostocetus oreophilus (*Förster, 1861)
363. *Aprostocetus orestes* Graham, 1987
364. *Aprostocetus orithyia* (Walker, 1839)
365. *Aprostocetus oropus (*Walker, 1839)
366. *Aprostocetus oviductus* (Girault, 1917*)*
367. *Aprostocetus ovivorax* (Silvestri, 1920)
368. *Aprostocetus pachyneuros* (Ratzeburg, 1844)
369. *Aprostocetus pallidicaput* (Girault, 1915)
370. *Aprostocetus pallidipedes* Kostjukov, 1995
371. *Aprostocetus pallidipes* (Ashmead, 1904)
372. *Aprostocetus pallidipes* (Perkins, 1912) (junior homonym)
373. *Aprostocetus pallidiventris* (Girault, 1915)
374. *Aprostocetus pallipes* (Dalman, 1820)
375. *Aprostocetus palustris* Graham, 1987
376. *Aprostocetus pandora* (Burks, 1943)
377. *Aprostocetus pantshenkoi* (Kostjukov, 1978)
378. *Aprostocetus paralus* (Walker, 1839)
379. *Aprostocetus parvulus* (Dodd, 1915)
380. *Aprostocetus pattersonae* (Fullaway, 1912)
381. *Aprostocetus pauliani* (Risbec, 1952) (junior homonym)
382. *Aprostocetus pauliani* Risbec, 1952
383. *Aprostocetus pauliani* Risbec, 1958
384. *Aprostocetus pausiris* (Walker, 1839)
385. *Aprostocetus pax* (Girault, 1913*)*
386. *Aprostocetus peischula* Kurdjumov, 1995
387. *Aprostocetus percaudatus* (Silvestri, 1920)
388. *Aprostocetus perfulvescens* Graham, 1987
389. *Aprostocetus perkinsi* (Girault, 1915)
390. *Aprostocetus perobscurus* (Girault, 1929)
391. *Aprostocetus perone* Graham, 1987
392. *Aprostocetus perpulcher* (Girault, 1915)
393. *Aprostocetus phillyreae* (Domenichini, 1965)
394. *Aprostocetus phineus* (Walker, 1839)
395. *Aprostocetus phloeophthori* Graham, 1983
396. *Aprostocetus phragmiticola* Graham, 1987
397. *Aprostocetus phragmitinus* (Erdös, 1954)
398. *Aprostocetus phryno* (Walker, 1839)
399. *Aprostocetus phytolymae* Risbec, 1947
400. *Aprostocetus ping* Graham, 1987
401. *Aprostocetus plagioderae* Kostjukov, 1995

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Expanded Features
Unlimited Pages
PDF Complete

402. *Aprostocetus plangon* (Walker, 1839)
403. *Aprostocetus planiusculus* (Thomson, 1878)
404. *Aprostocetus platoni* Girault, 1915
405. *Aprostocetus plesispae* (Ferrière, 1933)
406. *Aprostocetus politi* (Burks, 1963)
407. *Aprostocetus polybaea* (Walker, 1843)
408. *Aprostocetus polychromus* (Dodd, 1917)
409. *Aprostocetus polygoni* (Erdös, 1954)
410. *Aprostocetus polynemae* (Ashmead, 1900)
411. *Aprostocetus pomosus* Girault, 1913
412. *Aprostocetus pontiac* (Girault, 1929)
413. *Aprostocetus popovi* Kostjukov, 1995
414. *Aprostocetus postscutellatus* (Girault & Dodd, 1915)
415. *Aprostocetus problematicus* (Erdös, 1969)
416. *Aprostocetus procerae* (Risbec, 1951)
417. *Aprostocetus productus* Graham, 1987
418. *Aprostocetus prolidice* Graham, 1987
419. *Aprostocetus prolixus* LaSalle & Huang, 1994
420. *Aprostocetus prosymna* (Walker, 1839)
421. *Aprostocetus proto* (Walker, 1839)
422. *Aprostocetus pseudopodiellus* (Bakkendorf, 1953)
423. *Aprostocetus psyllaephagus* (Burks, 1963)
424. *Aprostocetus psyllidis* (Khan & Shafee, 1981)
425. *Aprostocetus ptarmicae* Graham, 1987
426. *Aprostocetus pulcher* (Girault & Dodd, 1915)
427. *Aprostocetus pulchrinotatus* (Girault, 1915)
428. *Aprostocetus pullus* (Girault, 1913)
429. *Aprostocetus punctatifrons* (Girault, 1916)
430. *Aprostocetus punctifrons* (Ashmead, 1894)
431. *Aprostocetus purpureicorpus* (Girault, 1915)
432. *Aprostocetus purpureithorax* (Girault, 1915)
433. *Aprostocetus purpureivarius* Girault, 1915
434. *Aprostocetus purpureus* Girault, 1913 (junior homonym)
435. *Aprostocetus purpureus* (Cameron, 1913)
436. *Aprostocetus pygmaeus* (Zetterstedt, 1838)
437. *Aprostocetus quadrifasciatus* (Girault, 1915)
438. *Aprostocetus quadriguttativentris* (Girault, 1915)
439. *Aprostocetus quadrimaculae* (Girault, 1915)
440. *Aprostocetus quadrimaculatus* (Girault, 1913)
441. *Aprostocetus queenslandensis* (Girault, 1913)
442. *Aprostocetus quinqnigrimaculae* (Girault, 1915)

Click Here & Upgrade
Expanded Features
Unlimited Pages
PDF Complete

443. *Aprostocetus regnieri* (Risbec, 1955)
444. *Aprostocetus rhacius* (Walker, 1839)
445. *Aprostocetus rhipheus* (Walker, 1839)
446. *Aprostocetus rhode* (Walker, 1840)
447. *Aprostocetus rieki* (De Santis, 1979)
448. *Aprostocetus rimskykorsakovi* (Kostjukov & Fursov, 1987)
449. *Aprostocetus riverai* (Brèthes, 1926)
450. *Aprostocetus roesellae* (Nees, 1834)
451. *Aprostocetus rosae* (Ashmead, 1886)
452. *Aprostocetus roseveari* Ferrière, 1931
453. *Aprostocetus rotundiventris* (Girault, 1915)
454. *Aprostocetus rubi* Graham, 1987
455. *Aprostocetus rubicola* Graham, 1987
456. *Aprostocetus rufescens* Graham, 1987
457. *Aprostocetus rufiscapus* Graham, 1987
458. *Aprostocetus rufiscutellum* (Girault, 1913)
459. *Aprostocetus rufus* (Bakkendorf, 1953)
460. *Aprostocetus rumicis* Graham, 1987
461. *Aprostocetus saintpierrei* (Girault, 1913)
462. *Aprostocetus salebrosus* Robinson, 1962
463. *Aprostocetus salictorum* Graham, 1987
464. *Aprostocetus saltensis* Girault, 1915
465. *Aprostocetus salto* Boucek, 1988
466. *Aprostocetus saltus* Boucek, 1988
467. *Aprostocetus sankarani* Boucek, 1986
468. *Aprostocetus sannio* (Girault, 1913)
469. *Aprostocetus sannion* Boucek, 1988
470. *Aprostocetus santalinus* Narendran, 2003
471. *Aprostocetus schambala* Kostjukov, 2000
472. *Aprostocetus schilleri* (Girault, 1915)
473. *Aprostocetus scoticus* Graham, 1987
474. *Aprostocetus scutellaris* (Delucchi, 1962)
475. *Aprostocetus secus* (Girault, 1915)
476. *Aprostocetus semiauraticeps* (Girault, 1916)
477. *Aprostocetus semiflaviceps* (Girault, 1915)
478. *Aprostocetus senegalensis* (Risbec, 1951) (junior homonym)
479. *Aprostocetus senegalensis* (Risbec, 1951)
480. *Aprostocetus sensuna* Baur, 1994
481. *Aprostocetus septemguttatus* (Girault, 1915)
482. *Aprostocetus serratularum* Graham, 1987
483. *Aprostocetus setosulus* Graham, 1987
484. *Aprostocetus sexguttatus* (Girault, 1913)
485. *Aprostocetus seymourensis* (Girault, 1915)
486. *Aprostocetus sibiricus* (Kostjukov, 1976)
487. *Aprostocetus sicarius* (Silvestri, 1915)

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Expanded Features
Unlimited Pages
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488. *Aprostocetus silaceus* Graham, 1987
489. *Aprostocetus silvarum* Boucek, 1988
490. *Aprostocetus silvaticus (*Gahan, 1937)
491. *Aprostocetus silvensis* (Girault, 1913*)*
492. *Aprostocetus silvestris* Kostjukov, 1995
493. *Aprostocetus similis* (Howard, 1897)
494. *Aprostocetus sobrius* (Gahan, 1919)
495. *Aprostocetus socialis* (Kieffer & Herbst, 1911)
496. *Aprostocetus spassk* Kostjukov, 1995
497. *Aprostocetus speciosissimus* (Girault, 1913)
498. *Aprostocetus speciosus* (Girault, 1913)
499. *Aprostocetus specularis* Graham, 1987
500. *Aprostocetus spinicornis* (Risbec, 1957)
501. *Aprostocetus spissigradus* (Girault, 1915)
502. *Aprostocetus stenus* Graham, 1987
503. *Aprostocetus stictococci* (Silvestri, 1915)
504. *Aprostocetus stigmaticalis* Graham, 1987
505. *Aprostocetus strobilanae* (Ratzeburg, 1844)
506. *Aprostocetus strobilus* (Burks, 1943)
507. *Aprostocetus subanellatus* Graham, 1961
508. *Aprostocetus subcylindricus* Graham, 1987
509. *Aprostocetus subfasciativentris* (Girault, 1915)
510. *Aprostocetus sublustris* (Girault, 1913)
511. *Aprostocetus subplanus* Graham, 1987
512. *Aprostocetus subterraneus* (Szelényi, 1973)
513. *Aprostocetus suevius* (Walker, 1839)
514. *Aprostocetus sulcatus* (Girault & Dodd, 1915)
515. *Aprostocetus sulfureiventris* (Girault, 1915)
516. *Aprostocetus susurrus* (Girault, 1915)
517. *Aprostocetus taiga* Kostjukov, 1995
518. *Aprostocetus tanaceticola* Graham, 1987
519. *Aprostocetus tarsalis* (Perkins, 1912)
520. *Aprostocetus tarsatus* Boucek, 1988
521. *Aprostocetus taxi* Graham, 1987
522. *Aprostocetus teiae* (Girault, 1924)
523. *Aprostocetus tenuiradialis* Graham, 1987
524. *Aprostocetus tenuis* Girault, 1915
525. *Aprostocetus terebrans* Erdös, 1954
526. *Aprostocetus tesserus* (Burks, 1943)
527. *Aprostocetus thalesi* Girault, 1936
528. *Aprostocetus theioneurus* (Masi, 1917)
529. *Aprostocetus thomasi* Brèthes, 1921
530. *Aprostocetus tiliaceae* Graham, 1987
531. *Aprostocetus tilicola* Graham, 1987
532. *Aprostocetus toddaliae* (Risbec, 1958)
533. *Aprostocetus tompanus* (Erdös, 1954)

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Unlimited Pages
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534. *Aprostocetus torquentis* Graham, 1987
535. *Aprostocetus totis* (Walker, 1839)
536. *Aprostocetus transversifasciatus* (Girault, 1915)
537. *Aprostocetus trichionotus* Robinson, 1962
538. *Aprostocetus tricolor* (Girault, 1915)
539. *Aprostocetus trifasciatus* (Girault, 1913)
540. *Aprostocetus trimaculosus* (Girault, 1913)
541. *Aprostocetus trjapitzini* (Kostjukov, 1976)
542. *Aprostocetus truncatulus* Graham, 1987
543. *Aprostocetus tymber* (Walker, 1839)
544. *Aprostocetus ugandaensis* (Girault, 1917)
545. *Aprostocetus unfasciativentris* (Girault, 1915)
546. *Aprostocetus vaccus* (Walker, 1839)
547. *Aprostocetus valens* (Walker, 1839)
548. *Aprostocetus vaquitarum* (Wolcott, 1924)
549. *Aprostocetus varicolor* (Dodd, 1915)
550. *Aprostocetus varicornis* (Girault, 1917)
551. *Aprostocetus variegatus* (Girault, 1915)
552. *Aprostocetus varigatus* (Girault, 1913)
553. *Aprostocetus vassolensis* Graham, 1987
554. *Aprostocetus venustus* (Gahan, 1914)
555. *Aprostocetus veronicae* Graham, 1987
556. *Aprostocetus verrucarii* (Balduf, 1929)
557. *Aprostocetus versicolor* (Ranaweera, 1950)
558. *Aprostocetus verticalis* Graham, 1987
559. *Aprostocetus verus* (Girault, 1928)
560. *Aprostocetus verutus* Graham, 1961
561. *Aprostocetus viatorum* (Graham, 1981)
562. *Aprostocetus vicinus* Kostjukov, 1995
563. *Aprostocetus victoriensis* (Girault, 1913)
564. *Aprostocetus viridescens* (Förster, 1981)
565. *Aprostocetus viridicyaneus* (Girault, 1915)
566. *Aprostocetus viridiflavus* Girault, 1913
567. *Aprostocetus viridinitens* Graham, 1987
568. *Aprostocetus viridis* (Dalla Torre, 1898)
569. *Aprostocetus viridiscapus* (Girault, 1915)
570. *Aprostocetus viridithorax* (Girault, 1913)
571. *Aprostocetus vivatus* (Girault, 1913)
572. *Aprostocetus volgodonicus* (Kostjukov, 1978)
573. *Aprostocetus voranus* (Walker, 1839)
574. *Aprostocetus vulgaris* (Ashmead, 1894)
575. *Aprostocetus wallacei* (Girault, 1915)

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576. *Aprostocetus walsinghami* (Girault, 1928)
577. *Aprostocetus westwoodii* (Fonscolombe, 1840)
578. *Aprostocetus wrangeli* (Kostjukov, 1990)
579. *Aprostocetus xanther* (Girault, 1913)
580. *Aprostocetus xanthicolor* (Girault, 1913)
581. *Aprostocetus xanthomelas* Graham, 1987
582. *Aprostocetus xanthopus* (Nees, 1834)
583. *Aprostocetus xenares* (Walker, 1839)
584. *Aprostocetus xenocles* (Walker, 1839)
585. *Aprostocetus xeuxes* (Walker, 1839)
586. *Aprostocetus yoshimotoi* Khan, Agnihotri & Sushil, 2005
587. *Aprostocetus zaleucus* (Walker, 1839)
588. *Aprostocetus zemani* (Brèthes, 1920)
589. *Aprostocetus zerovae* (Kostjukov & Fursov, 1987)
590. *Aprostocetus zoilus* (Walker, 1839)
591. *Aprostocetus zosimus* (Walker, 1839)

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### 4.1.3 Genus *Neotrichoporoides* Girault

*Neotrichoporoides* Girault, 1913a: 50. Type species *Neotrichoporoides uniguttatus* Girault; by original designation.

*Neotrichoporoides* Girault, 1913b: 241, 250. Unnecessary emendation.

*Trichoporoidella* Girault, 1913 (167). 223 and 1913 (171): 105. Type species *Trichoporoidella aenea* Girault; by original designation.

*Aprostoceroloides* Girault, 1913 (167) : 243. Type species *Aprostoceroloides speciosus* Girault; by original designation.

*Paraprostocetus* Girault, 1915 (230): 257. Type species *Paraprostocetus purpureithorax* Girault; by original designation.

*Epiquadrastichus* Girault, 1915: 258. Type species *Epiquadrastichus emersoni* Girault; by monotypy.

*Burksia* Fullaway. 1955: 409. Type species *Burksia viridimaculata* Fullaway; by original designation.

*Neotrichoporoides* Narendran *et.al* 2006.*Oriental Insects*, 40: 1-21.

The generic synonymy is fully discussed by Boucek (1988) in his revision of the Australian Chalcidoidea.

**Diagnosis**

Length 1.7-3.3 mm; fore wing with MV 6-9.5x longer than STV; axillae not very strongly advanced; malar sulcus usually foveate below eye; sculpture on propodeum stronger than sculpture on scutellum; anterior pair of scutellar setae at least slightly in front of middle and equidistant from submedian and sublateral lines or near the latter occasionally; propodeum with the raised lobe of callus partially cover the outer rim of spiracle; one of the cercal setae longer tan others, often sinuate.

**Discussion**

This genus comes very near to *Aprostocetus* Westwood in having one of the cercal setae longer than others; rim of callus partially covering propodeal

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spiracle and SMV with 4 or more dorsal setae. It differs from *Aprostocetus* in the combination of characters given above under diagnosis, mainly in the long MV and in having relatively stronger sculpture on propodeum than on the scutellum.

**Distribution**

Mainly old world tropics and subtropics with one wide spread species *Neotrichoporoides viridimaculatus* (Fullaway) also known from North and South America (LaSalle, 1994).

**Biology and Hosts**

Parasitoids of Diptera (e.g., Diposidae, Lanchaeidae and Muscidae) in stems of grasses (Boucek, 1988; LaSalle, 1994).

**Key to the species of *Neotrichoporoides* Girault from India (Based on females)**

1. First funicular segment at least twice as long as pedicellus ;speculum closed below;malar sulcus with fovea below eye not reaching half length of malar sulcus .

…..…….2

— First funicular segment generally less than twice as long as pedicellus; other characters partly or completely different.

…..…….3

2. Body yellow with characteristics patterns of metallic green or black markings which tend to form broken longitudinal stripes; scape as long as or longer than eye;marginal vein 8-9.5x length of stigmal vein;submedian line scutellum absent or faintly indicated in part,gaster slightly longer than head +mesosoma,2.6-3x as long as broad.

….. ***Neotrichoporoides viridimaculatus* (Fullaway)**

— Body brownish black without any marking;scape distinctly longer than eye;marginal vein almost 5.7x length of stigmal vein ;sub median line of

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scutellum prominent;gaster shorter than head + mesosoma;slightly more than 2x as long as broad.

……..***N. mani*** **sp.nov.**

3. Midlobe of mesoscutum with at least two longitudinal rows of adnotaular setae on either side; fore wing with speculum open behind.

…..……4

— Midlobe of mesoscutum with a single longitudinal row of adnotaular setae on either side; fore wing with speculum closed below by cubital line of setae.

…..……8

4. Gaster black with base yellow; body not wholly dark metallic green; fore wing about 3.7x as long as wide.

…… ***N. beonus*** **Narendran**

— Gaster not as above; body mostly dark metallic green; fore wing 3.5x or less than 3.5x as long as broad.

…..……5

5. Scape not exceeding level of vertex; first funicular segment 1.7 xs or less than 1.7x length of pedicel; head dark metallic green.

…..……6

— Scape exceeding level of vertex; first funicular segment 2x or more than 2x length of pedicle; head may or may not be with dark metallic green all over, often with yellow or brown colour on ventral half.

…..……7

6. Head width equal to mesoscutum, 2.43x as broad as long in dorsal view; POL 1.8x OOL, 2.5x OD; eye length 1.22x its width in profile; pedicellus 3x as long as its width; pronotum 0.85x length of mesoscutum; maximum width of midlobe of mesoscutum about 1.5x its length; hind femur 4x as

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long as borad; fore wing 3.14x as long as broad; MV 6.8-7 as long as STV.

…… ***N. crinius*** **Narendran**

— Head slightly broader than mesoscutum, 2.1-2.2x as broad as long; POL equal to or slightly greater than OOL, about 2x OD; eye length about 1.3x as long as broad in profile; pedicellus 2.2-2.6x as long as its width; pronotum about 0.5x length of mesoscutum; maximum width of midlobe mesoscutum about 2x its length; hind femur 3.3-3.5x as long as broad; fore wing 2.6-2.85x as long as broad; MV 8-9.3x as long as STV.

…… ***N. mediterraneus*** **Graham**

7. Pedicellus + flagellum1.6x width of mesoscutum; fore wing 3.47x as logn as broad; lower forns and gena metallic green; tip of hypopygium situated 0.5x length of gaster.

…… ***N. galia*** **Narendran**

— Pedicellus + flagellum 1.7-1.75x width of mesoscutum; fore wing 3x as long as broad; lower frons and gena yellow or yellowish brown; tip of hypopygium situated 0.35-0.40x length of gaster.

…… ***N. nyemitawus*** **(Rohwer)**

8. Head mostly or at least partly yellow; mesoscutum with a single row of 4 adnotaular setae; triangular fovea below eyes not reaching half length of malar sulcus; F1 1.42-1.5x as pedicel.

……9

— Head dark metallic green or pale brown with metallic green refringence; mesoscutum with a single row of 3 adnotaular setae on either side; triangular fovea below eyes reaching half length of mesoscutum; F1 equal to or 1.13x as long as pedicel.

……10

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9. Clava as long as F1; F1 1.43x as long as pedicel; fore wing less than 3x as long as wide; SMV with 7 and MV with 16 setae respectively on dorsal side.

…… ***N. delhiensis*** **(Shafee, Fatma and Kishore)**

— Clava distinctly longer than F1 (20:15) ; F1 1.5x as long as pedicel; fore wing a little more than 3x as long as wide; SMV with 4 and MV with 18-20 setae respectively on dorsal side.

…… ***N. tonimus*** **Narendran**

10. Anterior pair of scutellar setae placed a little after middle of scutellum; eye length 1.35x its maximum width in profile; F1 as long as pedicellus; pedicellus + flagellum about 1.5x breadth of mesoscutum; hind coxa 1.4x as long as broad; costal cell little longer than MV; head pale brown with metallic green refringenece.

…… ***N. stom*** **Narendran**

— Anterior pair of scutellar setae placed as little before middle of scutellum; eye length 1.06x its maximum width in profile; F1 nearly 2x as long as pedicellus; pedicellus + flagellum about 1.8x breadth of mesoscutum; hind Coxa 2x as long as broad; costal cell 0.74x as long as MV; head dark metallic green with mouth slightly pale.

…… ***N. curiosus*** **Narendran**

**4.1.3.1** ***Neotrichoporoides mani*** **sp.nov.** (Plate: 13, Figs.1-6)

**Female:** Body length about 1.9 mm; body colour brownish black; head black and eyes reddish black;antennae brown ; thorax brownish black ,nonirridescent; wings hyaline; legs pale brown except coxae dark brown ; gaster black with reddish brown apical tip.

**Head (Fig. 1):** Wider than long in frontal aspect (0.46:0.40), smooth and sparsely setose,head frontal grooves absent;frontovertex wide , width more than

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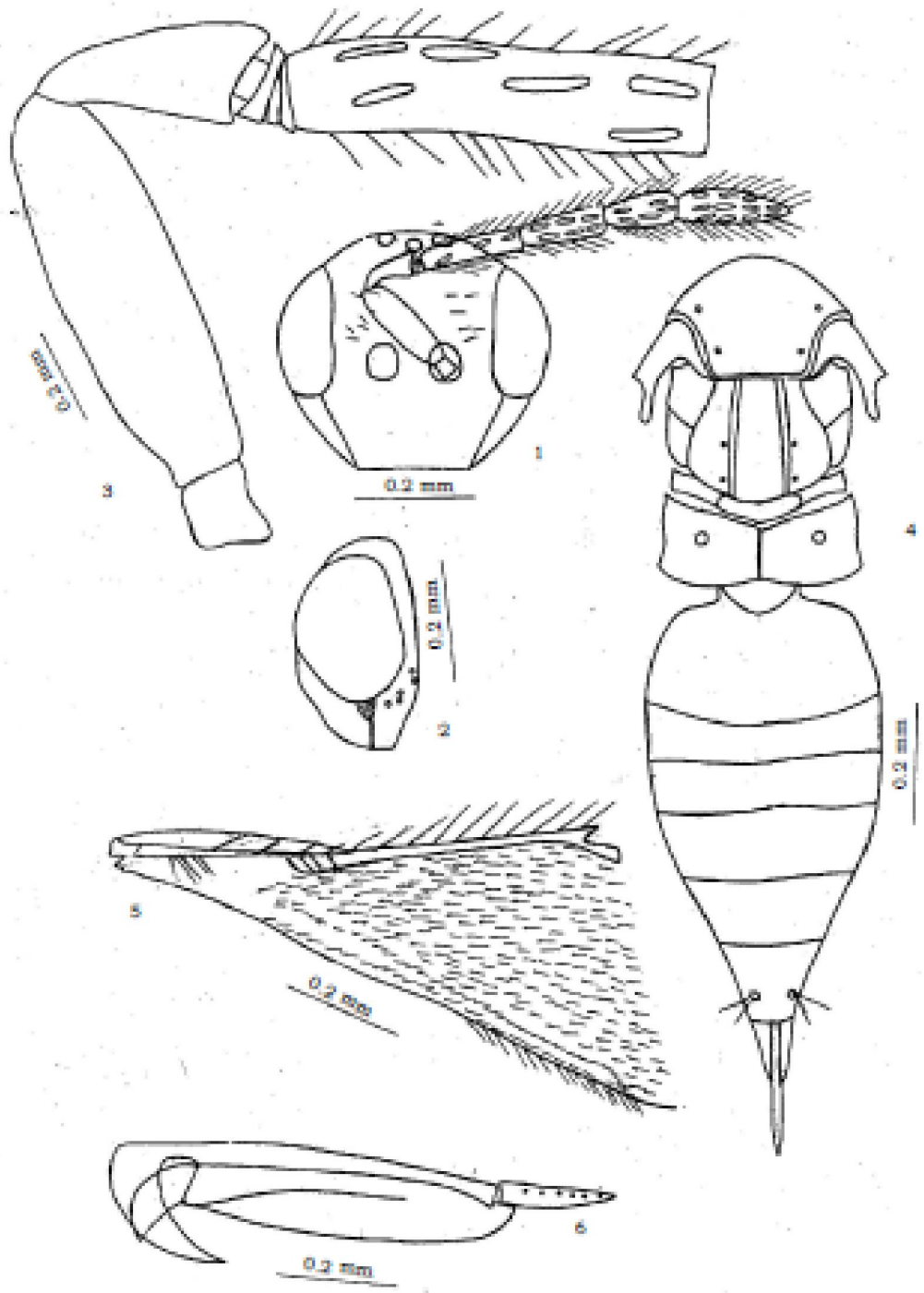


**Plate 13: Figs. 1-6: *Neotrichoporoides mani* sp.nov.**
1. Head in frontal view; 2. Head in lateral view 3. Part of Antenna; 4.body in dorsal view; 5.Forewing 6.Female genitalia

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1/2 the total head width (0.30:0.46);vertex setae short and sparse;ocelli arranged in obtuse angled triangle; POL slightly more than 1.5 times shorter than OOL(0.06:0.10); compound eyes bulged and smooth,eyes orbits round, facets uniform in shape and size; antennal toruli situated well above the lower level of eye margin, prominence between antennal toruli more than 1/5$^{th}$ the width of frons between eyes (0.05:0.266) malar sulcus straight; malar space distinctly foveated just below the lower level of eye (Fig. 2), longer than eye width (0.14:0.95);lower margin of clypeus straight; occipital carina absent.

**Antennae (Fig. 1 and 3 ):**hairy,8 segmented excluding 3 anelli,antennae with trichoidal sensilla,apical tip of antenna with small spicule,antennal formula 1,1,3,3,1 ; scape cylindrical slightly more than 3 times as long as wide (0.183:0.053), pedicel with 4 long setae, more than 1.5 times as long as wide (0.067 : 0.041 )and distinctly more than 2.5 times shorter than FS1(0.175:0.067); funicle 3 segmented, FS1 to FS3 gradually decreasing in length,FS1 more than 4 times as long as wide (0.175 :0.041 ),FS2 a trifle less than 3 times as long as wide(0.145 :0.050),FS3 more than almost 2 times as long as wide (0.12 :0.06 ); club unsegmented, more than 3 times as long as wide (0.19:0.06),shorter than preceding two funicle segments combined.

**Thorax (Fig. 4):** Pronotum with reticulated sculpture, its posterior margin with 3 pairs of setae, antero-lateral arms moderately long,anterior margin concave in the middle;mesoscutum with fine sculpture and more than 1.5 times as wide as long (0.340 :0.205); mesoscutum having 2 pairs of adnotaular setae,notauli complete ,deep and grooved, median longitudinal groove absent; axilla moderately advanced;scutellum slightly convex with fine sculpture and longer than mesoscutum, less than 2 times as wide as long (0.400 :0.225) with submedian longitudinal grooves and 1 pairs of setae situated outside of grooves at mid of scutellum, grooves deep and straight;dorsellum smooth;metanotum narrow;

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propodeum with median carina and without paraspiracular carinae,propodeal spiracles round and moderate in size, spiracle rim fully exposed .

**Fore wings (Fig. 5)** Elongate in shape, more than 3 times as long as wide (1.425:0.425 ),less than 1.5 times longer than hind wing length, densely setose; costal cell moderate in size and bare; SMV with 2 Setae directed upwards; MV bearing 10 long setae on front edge; PMV more than 2 times shorter than SV(0.03:0.07); SV long ( 0.07) more than 1/5$^{th}$ of the length of MV (0.40 );basal vein with 3 setae, basal cell bare; speculum absent; cubital vein straight, subcubital line of hairs arising from the base of cubital vein.

**Hind wings:** slightly more than 7 times as long as wide (1.135:0.160) with acute apex; vein length (0.54) more than one half the length of wing.

**Gaster:** Elongate and compressed, more than 2 times as long as wide (0.85:0.40), gaster surface smooth, 1st gasteral tergum large in size,gasteral apical tip reddish brown and tapering;gaster sessile;metasoma 1.5 times longer than mesosoma;ovipositor originated from the above mid of gaster,ovipositor sheaths moderately exerted; first valvifers semicircular, (Fig.6); anterior margin of basal part of second valvifers curved; third valvulae not movably articulated with second valvifers, a trifle less than 5 times as long as wide (0.20 :0.042 ), TV more than 1/3rd times the length of SV (0.66 ); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 6);cercal setae small.

**Male:** Not known

**Holotype:** ♀**,** India ,U.K.,Paurigarhwal,Host Natural vegitation , Sweepnet collection,15.05.07 , Hym. Eulo. Nr 101 (Sandeep Kumar).

**Paratype:** 8 ♀♀**,**same data as holotype Hym. Eulo Nr (Sandeep Kumar).

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## Checklist for world fauna of Genus *Neotrichoporoides* Girault

1. *Neotrichoporoides aeneicorpus* (Girault & Dodd, 1915)
2. *Neotrichoporoides aeneus* (Girault, 1913)
3. *Neotrichoporoides algericus* Kostjukov, 2004
4. *Neotrichoporoides beonus* Narendran, 2006
5. *Neotrichoporoides beyarslani* Doganlar, 1993
6. *Neotrichoporoides biogradensis* Graham, 1987
7. *Neotrichoporoides brevicosta* Graham, 1987
8. *Neotrichoporoides bulgaricus* Graham, 1987
9. *Neotrichoporoides cavigena* Graham, 1987
10. *Neotrichoporoides confusus* (Schulten & Feijen, 1984)
11. *Neotrichoporoides crassianulus* (Delucchi, 1962)
12. *Neotrichoporoides crinius* Narendran, 2006
13. *Neotrichoporoides curiosus* Narendran & Girish Kumar, 2006
14. *Neotrichoporoides cynodontis* (Domenichini, 1967)
15. *Neotrichoporoides delhiensis* (Shafee, Fatma & Kishore, 1984)
16. *Neotrichoporoides diopsisi* (Risbec, 1956)
17. *Neotrichoporoides dispersus* Graham, 1986
18. *Neotrichoporoides dubiosus* Graham, 1987
19. *Neotrichoporoides dubius* (Girault, 1913)
20. *Neotrichoporoides elegantus* (Girault, 1913)
21. *Neotrichoporoides emersoni* (Girault, 1915)
22. *Neotrichoporoides erroneus* Graham, 1987
23. *Neotrichoporoides fittkaui* Doganlar, 1993
24. *Neotrichoporoides flavipronotum* Girault, 1915
25. *Neotrichoporoides flavobrunneus* (Schulten & Feijen, 1984)
26. *Neotrichoporoides frater* Girault, 1915
27. *Neotrichoporoides galia* Narendran & Santhosh, 2006
28. *Neotrichoporoides gordensis* Graham,1987
29. *Neotrichoporoides hizireisi* Doganlar, 1993
30. *Neotrichoporoides hofferi* Kostjukov 2004
31. *Neotrichoporoides horaki* Kostjukov, 2004
32. *Neotrichoporoides intaminatus* (Walker, 1872)
33. *Neotrichoporoides leopardinus* (De Santis, 1957)
34. *Neotrichoporoides magribicus* Kostjukov, 2004
35. *Neotrichoporoides maupaussanti* (Girault, 1915)
36. *Neotrichoporoides mediterraneus* Graham, 1986

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37. *Neotrichoporoides microstigma* (Delucchi, 1962)
38. *Neotrichoporoides nyemitawus* (Rohwer, 1921)
39. *Neotrichoporoides orucreisi* Doganlar, 1993
40. *Neotrichoporoides pallidipes* (Girault & Dodd, 1915)
41. *Neotrichoporoides particolor* (Girault, 1915)
42. *Neotrichoporoides partiscutellum* (Girault, 1913)
43. *Neotrichoporoides pessulus* (Girault, 1915)
44. *Neotrichoporoides proserpinensis* (Girault, 1913
45. *Neotrichoporoides purpureithoracis* (Boucek, 1988)
46. *Neotrichoporoides radius* (Girault, 1915)
47. *Neotrichoporoides risbeci* (Schulten & Feijen, 1984)
48. *Neotrichoporoides rossilliensis* Graham, 1987
49. *Neotrichoporoides semiflaviceps* (Girault & Dodd, 1915)
50. *Neotrichoporoides speciosus* (Girault, 1913)
51. *Neotrichoporoides stom Narendran* & Jilcy, 2006
52. *Neotrichoporoides subaeneus* (Girault, 1913)
53. *Neotrichoporoides szelenyii* (Erdös, 1951)
54. *Neotrichoporoides tobiasi* Kostjukov, 2004
55. *Neotrichoporoides tokatensis* Doganlar, 1993
56. *Neotrichoporoides tonimus* Narendran, 2006
57. *Neotrichoporoides trjapitzini* Kostjukov, 2004
58. *Neotrichoporoides turgutreisi* Doganlar, 1993
59. *Neotrichoporoides turkm*enicus Kostjukov, 2004
60. *Neotrichoporoides uniguttatus* Girault, 1913
61. *Neotrichoporoides varia*bilis (Schulten & Feijen, 1984)
62. *Neotrichoporoides viridimaculatus* (Fullaway, 1955)

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### 4.1.4 Genus *Mestocharella* Girault

*Mestocharella* Girault, 1913b: 269 and 41. Type species *Mestocharella feralis* Girault; by original designation.

*Mestocharella* Gahan, 1922. *Treubia*, 3: 47-52.

*Mestocharella* Risbec, 1957. *Annis Mus. R. Congobelge Ser*. 8 Vol. (Zool.), 58, 148-231.

*Mestocharella* Boucek, 1977b. *Bull. Ent. Res.* 67: 17-30.

*Mestocharella* Hussain and Khan, 1986. *Oriental Ins.*, 20: 225.

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

*Mestocharella* Boucek, 1988. *Australasian Chalcidoidea* (Eulophid part). 672.

*Mestocharella* Kamijo, 1994. *J.J. Ent.*, 62(4): 747-762.

*Mestocharella* Singh and Khan, 1994. *J. Bomb. Nat. Hist. Soc.*, 92: 85-95.

*Mestocharella* Singh and Khan, 1995. *Shashpa.* 2(1): 23-26.

**Diagnosis**

The genus *Mestocharella* was proposed by Girault in 1913b with the type species *feralis.* Boucek (1988) proposed some key characters by which the genus can easily be identified, which are as follows: very distinct sculpture on propodeum, an areolation with more or less pronounced median carina forking anteriorly; antennae not inserted high above the centre of face ,scape and pedicel without any rough sculpture, only pedicel with slightly raised reticulation, but the antennae with three fairly conspicuous anelli, female antennae with four funicle segments and two segmented club; malar groove always present or replaced by groove or ridge; axillae relatively little advanced, their interior corners obtuse angular, petiole distinct, coarsely sculptured.

**Discussion**

The genus *Mestocharella* Girault belong to the subfamily Tetrastichinae, is the only known genus with a carinate or subcarinate collar on the pronotum. It

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was keyed out and commented on by Boucek (1977). *Mestocharella* has a very distinctive sculpture on the propodeum, an areolation with more or less pronounced median carina forking anteriorly. The pronotal and propodeal characters suggest a similarity to certain Eulophinae genera, but the male antennae and the arrangement of sclerites on thoracic dorsum are clearly Tetrastichinae, although the axillae are relatively weakly advanced.

Kamijo (1994) revised the genus *Mestocharella* and described 6 new species from Eastern and South Eastern Asia. He also recognized 3 species group and framed out key to the species. Singh and Khan (1995) reported *Mestocharella indica* as a new species, which was reared from the eggs of pentatomid bug collected from the Arjun leaves.

**Biology**

In India, Pakistan and Java *M. gahan* attacks Lepidopterous leaf miners, mainly of the Gracillariid genus *Caloptilia*, in Java a leaf miner on tea (Gahan, 1922c: 48). In Solomons another species, *M. feralis* was reared from *Pilocrocis* sp., Pyralidae.

**Distribution**

South East Asia, East to Java, Solomon (Boucek, 1988). Islands and Australia.

In the present study two new species has been described.

**Key to some Indian species of genus *Mestocharella* Girault**

1. Gaster shorter than thorax; first valvifers circular; SMV longer than MV and antennae inserted at the middle of the face.

……***Mestocharella indica* Singh and Khan**

— Gaster longer than thorax; first valvifers triangular; SMV shorter than MV and antennae inserted below the center of the face.

…….2

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2. Anelli 4; SMV with 3 dorsal setae, PMV equal to 1/4th the length of SV;FS1 and FS3 equal in size,FS2 longest and FS4 shortest.

…….***M. deltoids*** **Agnihotri**

— Anelli less than 4; SMV with 6 dorsal setae, PMV almost rudimentry; FS1 and FS3 equal in size, FS2 longest and FS4 shortest.

…….3

3. Anelli 2; SMV with 6 dorsal setae; PMV almost wanting; FS1 to FS4 gradually decreasing in length,petiole broader than long.

……..***M. kausaniensis*** **sp.nov.**

— Anelli 1; SMV with 5 dorsal setae; PMV more than 1/3rd the SV and FS1 to FS4 gradually decreasing in length, petiole longer than broad.

…….. ***M. pauri*** **sp.nov.**

**4.1.4.1** ***Mestocharella kausaniensis*** **sp.nov.** (Plate: 14, Figs.1-10)

**Female:** Body length about 1.645 mm; body colour black; head black;ocelli reddish brown and eyes reddish black, antennae brown except scape pale yellow, thorax brownish black and nonirridescent; wings hyaline with brown venation; legs yellowish white except coxae brownish yellow and TS4 dark brown with almost hexagonal yellow spot from base to second segments of gaster.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.470: 0.380), smooth and sparsely setose, head frontal grooves absent; frontovertex wide width distinctly more than ½ the total head width (0.320: 0.470); vertex setae short and sparse; ocelli arranged in obtuse angled triangle; POL less than 1.5 times as long as OOL; compound eyes bulged, moderate in size and smooth, eyes orbits round; antennal toruli situated above the lower level of eye margin, prominence between antennal toruli more than 1/4th the width of frons between eyes (0.07: 0.30) mallar sulcus absent; malar space smooth almost 2 times longer than eye width (0.16: 0.08); tentorial pits distinct and large; maxillary palp and labial palp each single segmented; lower margin of clypeus with a lobe medially.

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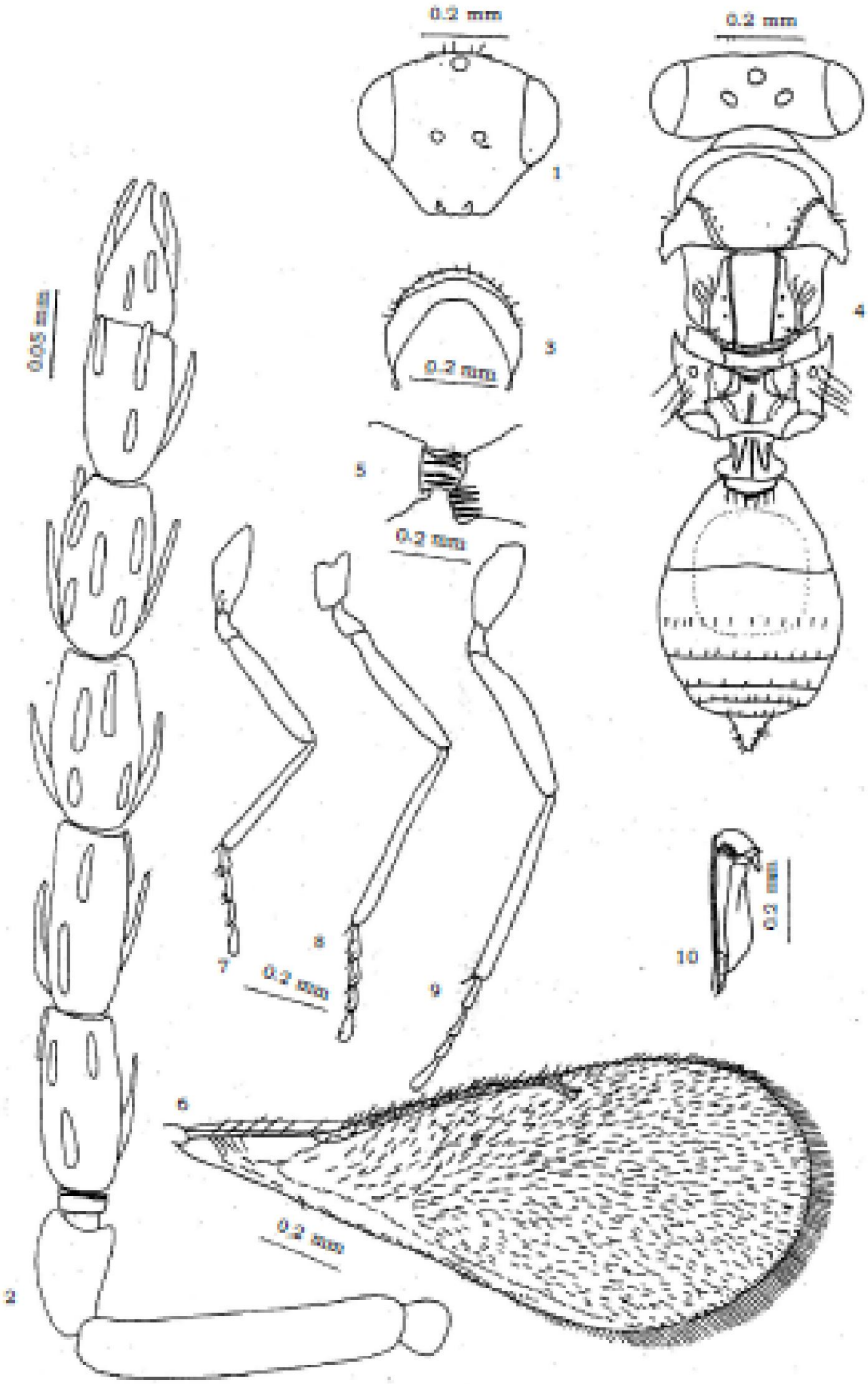


**Plate 14: Figs. 1-10:** ***Mestocharella kausaniensis*** **sp.nov.**
1. Head in frontal view; 2. Antenna; 3. Pronotum 4.Dorsal view of body; 5.Petiole 6.Forewing; 7.Foreleg; 8.Middle leg; 9.hind leg; 10.Female genitalia

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**Antennae (Fig. 2)** :8 segmented excluding 2 anelli, first anellus distinctly large; apical tip of antenna with moderate spicule, antennal formula 1,1,2,4,2; scape cylindrical slightly more than 4.5 times as long as wide (0.190: 0.039), scape apex touching to mid ocelli; pedicel less than 1.5 times as long as wide (0.057: 0.043) and less than 2 times longer than the length of the FS1; funicle 4 segmented, FS1 more than 2 times as long as wide (0.105: 0.048), FS2 less than 2.5 times as long as wide (0.112: 0.045), FS3 slightly less than 2 times as long as wide (0.103: 0.052), FS4 less than 2 times as long as wide (0.10: 0.055); club 2 segmented, more than 3 times as long as wide (0.173:0.052), shorter than preceding two funicle segments combined.

**Thorax (Fig. 4)**: Pronotum with prominent transverse carina at its posterior margin, bearing 8 pairs of setae (Fig. 3), anterior margin concave in the middle; mesoscutum less than 2 times as wide as long (0.425: 0.222); mesoscutum having 3 pairs of adnotaular setae, notauli complete and deep, median longitudinal groove absent; axilla almost not advanced; scutellum smooth and longer than mesoscutum, less than 2 times as wide as long (0.425: 0.255) with submedian longitudinal grooves and 3 pairs of setae situated on scutellum, grooves deep,broad and almost straight; propodeum almost smooth, with carinae delimiting subpentagonal area, strong median carina and without paraspiracular carinae, propodeal spiracles round and moderate in size and well separated from the anterior margin of propodeum spiracle rim fully exposed,callus with 4 long setae; plicae high and sharp.

**Fore wings (Fig. 6)** : A trifle more than 2 times as long as wide (1.49: 0.595), densely setose; costal cell long,broad and bare; SMV with 6 setae directed upwards, shorter (0.44) than MV (0.47); MV bearing short setae on front edge; PMV very short; SV long (0.05) slightly more than $1/9^{th}$ of the length of MV (0.470); marginal fringe short; basal vein with 7 setae, basal cell bare; speculum narrow, closed below ;cubital vein sinuate, subcubital line of hairs arising almost from the base.

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**Hind wings**: Blunt at its apex; marginal fringe moderate in length.

**Fore Legs (Fig. 7)**: Coxa more than 2.5 times as long as wide (0.21: 0.08); femur more than 6 times as long as wide (0.305: 0.05), more than 1.5 times longer than tibia in length; fore tarsus shorter than length of tibia.

**Mid legs (Fig. 8)** : Coxa less than 1.5 times as long as wide (0.105: 0.075); femur more than 6.5 times as long as wide (0.345 : 0.05);less than 1.5 times shorter than tibia in length, mid tarsus shorter than length of tibia, mid tibial spur much longer than fore and hind tibial spur.

**Hind legs (Fig.9):** Hind coxa slightly more than 2 times as long as wide (0.21: 0.10); femur more than 6 times as long as wide (0.37: 0.06).

**Gaster (Fig. 4)**: Bulged,elongate and smooth,densely setose at the posterior end , 1 gasteral tergite large, basal area foveated with 6 longitudinal carinae; gasteral apical tip acuminate; petiole having knob at each pestero-lateral margin ,petiole broader than long, carinated with 5 longitudinal strong carinae (Fig. 5); metasoma less than 1.5 times longer than mesosoma; ovipositor sheaths not exerted; first valvifers triangular (Fig. 10); anterior margin of basal part of second valvifers much curved; third valvulae movably articulated with second valvifers, almost 5 times as long as wide (0.10 : 0.02), almost 1/3$^{rd}$ the length of second valvifers (0.30); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 10); cercal setae small.

**Male:** Not examined.

**Holotype:** ♀, India, U.K., Kausani, Host unknown, Sweepnet collection in tea garden, 10/10/07 Hym. Eulo. Nr. 128A (Sandeep Kumar).

**Paratype:** 5 ♀♀ same data as holotype Hym. Eulo Nr. 128A (Sandeep Kumar).

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**4.1.4.2** ***Mestocharella pauri*** **sp.nov.** (Plate: 15, Figs.1-10)

**Female:** Body length about 2.13mm;head black with clypeal region pale brown, eyes reddish black; antennae brown; thorax black,pronotum blackish brown, nonirridescent; wings hyaline with pale brown venation; legs yellow except mid and hind legs coxae pale brown; gaster dark brown with a pale yellow circular spot from basal to mid area of gaster.

**Head (Fig. 1 ):** Wider than long in frontal aspect (0.576:0.46),coarsely sculptured, upper face slightly protrude,head frontal grooves absent; frontovertex width distinctly more than 1/2 the total head width (0.42:0.576);ocelli arranged in obtuse angled triangle; POL less than 1.5 times as long as OOL (0.11:0.8); compound eyes bulged and small,eyes orbits round, facets uniform in shape and size; antennal toruli situated above the lower level of eye margin, prominence between antennal toruli less than 1/6$^{th}$ the width of frons between eyes (0.06:0.35), malar sulcus absent; malar space sculptured, longer than eye width (0.198:0.110);mandibles bidentate with 2 acute teeth; maxillary palp and labial palp each single segmented; lower margin of clypeus with single lobe medially.

**Antennae (Fig. 2):** 8 segmented excluding an anellus,antennae,apical tip of antenna with small spicule,antennal formula 1,1,1,4,2; scape cylindrical almost 5 times as long as wide (0.245:0.049); pedicel setose, more than 1.5 times as long as wide (0.088:0.05)and distinctly shorter than the length of the FS1; funicle 4 segmented, FS1 to FS4 gradually decreasing in length,FS1 less than 3 times as long as wide (0.13:0.045),FS2 almost 2 times as long as wide( 0.120.06),FS3 less than 2 times as long as wide (0.11:0.06 ),FS4 almost 2 times as long as wide(0.10:0.05); club 2 segmented, more than 3 times as long as wide (0.190:0.050), shorter than preceding two funicle segments combined.

**Thorax (Fig. 3):** Pronotum with prominent transverse carina bearing 4 pairs of setae at its posterior margin (Fig. 4),anterior margin concave in the

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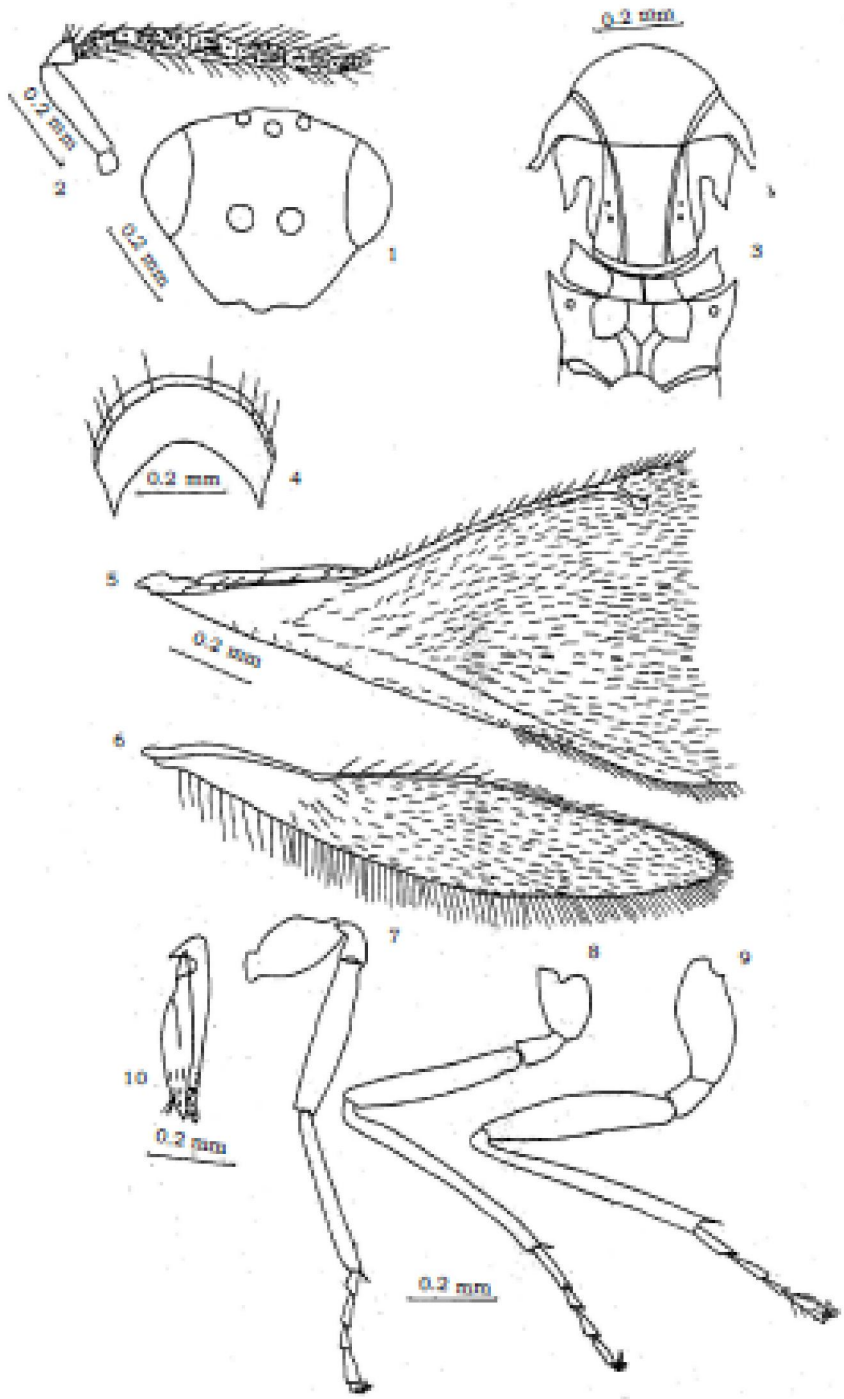


**Plate 15: Figs. 1-10:** ***Mestocharella pauri*** **sp.nov.**
1. Head in frontal view; 2. Antenna; 3.Thorax in dorsal view;4.Pronotum;5.Forewing;6.Hindwing;7.Foreleg;8.Middle leg;9.hind leg;10.Female genitalia

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middle; mesoscutum having reticulated sculpture, more than 1.5 times as wide as long (0.46:0.24 ); mesoscutum without adnotaular setae,notauli complete distinctly grooved, median longitudinal sulcus absent;axillae slightly advanced and well developed;scutellum convex and consculptured with mesoscutum and longer than mesoscutum (0.290:0.240), more than 1.5 times as wide as long (0.496:0.290) with submedian longitudinal grooves, anterior halves of scutellar grooves diverging exteriorly from mid of scutellum and obliquely meeting to notauli and 2 pairs of setae situated almost at mid on scutellum,grooves deep and curved;dorsellum smooth and more than 3 times as long as wide(0.16:0.05);metanotum broad; propodeum with distinct, broad median carina forked at its mid, each branch of fork touching to a lobe, propodeum without paraspiracular carinae,propodeal spiracles small and well separated from the anterior margin of propodeum by a space less than 1.5 times of its own diameter, spiracle rim fully exposed.

**Fore wings (Fig. 5):** More than 2 times as long as wide (1.73:0.70),less than 1.5 times longer than hind wing length (1.730:1.340),densely setose; costal cell moderate in size with a row of setae; SMV with 5 Setae directed upwards, shorter (0.50) than MV ( 0.61); MV bearing 18 long setae on front edge; PMV almost 3.5 times shorter than SV(0.02:0.07); MV more than 8.5 times longer than the length of SV; marginal fringe short spaced by a distance equal to 1/5$^{th}$ of the length of fringe; basal vein with 6 setae, basal cell bare; speculum narrow, closed below; cubital vein sinuate, subcubital line of hairs arising before the base of cubital vein.

**Hind wings (Fig. 6):** more than 5 times as long as wide (1.34:0.255) with blunt apex; vein length (0.775) more than one half the length of hind wing; marginal fringe spaced by a distance equal to 1/4$^{th}$ of their length.

**Legs (Fig. 7, 8 and 9):** legs yellow except mid and hind legs coxae pale brown, mid tibial spur much longer than fore and hind tibial spur.

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**Gaster:**large,elongate and ovate, more than 2 times as long as wide (1.20:0.56), gaster surface smooth ,1st gasteral tergum smaller than second tergum in size,gasteral apical tip lanceolate, petiolate; petiole longer than broader (0.13:0.10),dorsally and ventrally having ridged longitudinal carinae and postero-lateral portion of petiole having knob like projection; metasoma much longer than mesosoma (2.10:0.77); ovipositor sheaths not exerted; first valvifers triangular (Fig. 10); anterior margin of basal part of second valvifers much curved; third valvulae movably articulated with second valvifers, more than 3.5 times as long as wide (0.075:0.021 ), slightly more than 1/4$^{th}$ the length of second valvifers ( 0.345); outer plates of ovipositor almost equal to length of second valvifers, with a oblique ridge (Fig. 10) starting at the base of dorsal margin and running obliquely up to middle of plate; cercal setae small and length of setae same at both sides of gaster.

**Male:** Not known

**Holotype:** ♀**,** India, Host unknown, Sweepnet collection on Natural vegetation, 08/03/08, Hym. Eulo. Nr (sandeep kumar).

**Paratype:** 1♀♀**,** same data as holotype Hym. Eulo Nr (sandeep kumar).

**Checklist for world fauna of Genus *Mestocharella* Girault**

1. *Mestocharella camerounensis* Risbec, 1955
2. *Mestocharella congoensis* Risbec, 1957
3. *Mestocharella costulata* Kamijo, 1994
4. *Mestocharella deltoids* Khan, Agnihotri & Sushil, 2005
5. *Mestocharella feralis* Girault, 1913
6. *Mestocharella formosana* Kamijo, 1994
7. *Mestocharella indica* Jaikishan Singh & Khan, 1995
8. *Mestocharella javensis* Gahan, 1922
9. *Mestocharella kumatai* Kamijo, 1994
10. *Mestocharella latistriata* Kamijo, 1994
11. *Mestocharella rhois* Kamijo, 1994
12. *Mestocharella tenuicornis* Kamijo, 1994

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### 4.1.5 Genus *Tamarixia* Mercet

*Tamarixia* Mercet, 1924. 57-58. Type species *Tamarixia bicolour* Mercet (Original designation).

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

*Tamarixia* Boucek, 1988a. *Australasian chalcidoidea* (Eulophid part) 695-696.

*Tamarixia* Boucek, 1988b. *Bull. Ent. Res.*, 78: 543-547.

*Tamarixia* Graham, 1991. *Mem. Amer. Ent. Inst.*, 49: 1-322.

*Tamarixia* LaSalle, 1994. *J. Nat. Hist.* 28: 196-197.

**Diagnosis**

Fore wings with a single seta on the dorsal surface of the SMV, Propodeum with out of Y-shaped paraspiracular carina, midlobe of mesoscutum with 2 pairs of long, semi erect setae which are about equal in length, one in the anterior half and another in the posterior half; anterior margin of clypeus truncate slightly convex or with 2 minute lobes; relatively short and squat, body without metallic coloration, thorax black, gaster black to yellow, male genitalia is quite large and usually extended in dried specimen, the digitus 4-6 times as long as broad, with a distinct apical hook or spine (LaSalle, 1994).

**Discussion**

The genus *Tamarixia* is based on a species found in Spain on *Tamarixia* (Mrcet, 1924) and has been regarded as a synonym of *Tetrastichus* Haliday. Graham (1961b) and Domenichini (1966a and 1967) treated the genus *Tamarixia* in the pubescens group. Kostjukov (1977) treated *Tamarixia* as a subgenus of *Tetrastichus.* Graham (1987, 1991) and Boucek (1988) treated it as a valid genus. Boucek (1988b) described a new species *Tamarixia leucaenae* from the Carribean and transferred *Tetrastichus triozae* Burks to *Tamarixia triozae* (Burks, 1943). Graham (1991) revised the European species of the genus *Tamarixia.* LaSalle (1994) also treated *Tamarixia* as a valid genus and gave the

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diagnostic character. So far only one species *T. radiata* (Waterston) is known from India.

**Biology** : Parasitoids of Psylloidea, especially Triozidae.

**Distribution** : All continents

**4.1.5.1 *Tamarixia brassicae* sp.nov.** (Plate: 16, Figs.1-9)

**Female** : Body length about 1.40 mm; delicate body; body colour pale yellow; head pale yellow, ocelli violet and eyes black; antennae pale brown; thorax pale yellow; pronotum yellow with dark brown spot, nonirridescent; wings hyaline with yellowish venation; legs pale yellow; gaster pale yellow with dark brown patch at its mid, faintly sculptured.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.410 : 0.290), faintly sculptured and sparsely setose structure near to eyes raised than central portion of head, head frontal grooves absent; frontovertex width distinctly more than ½ the total head width (0.270 : 0.410); vertex setae short and sparse; ocelli arranged in obtuse angled triangle; OOL less than 1.5 times as long as POL; compound eyes bulged and smooth, eyes orbits almost round, antennal toruli situated well above the lower level of eye margin, prominence between antennal toruli more than 1/4$^{th}$ the width of frons between eyes (0.062 : 0.26); malar sulcus almost straight; malar space smooth, longer than eye width (0.105 : 0.072); mandibles bidentate (Fig. 1) with 2 acute teeth and a truncation; maxillary palp and labial palp each single segmented; lower margin of clypeus semiarched medially.

**Antennae (Fig. 2)** : 8 segmented excluding an anellus, apical tip of antenna with small spicule, antennal formula 1,1,1,3,3; scape cylindrical slightly more than 3 times as long as wide (0.152: 0.045), scape apex touching to mid ocelli; pedicel with 3 long setae,almost 2 times as long as wide (0.06 : 0.03) and shorter than the length of the FS1; funicle 3 segmented, FS1 to FS3 gradually decreasing in

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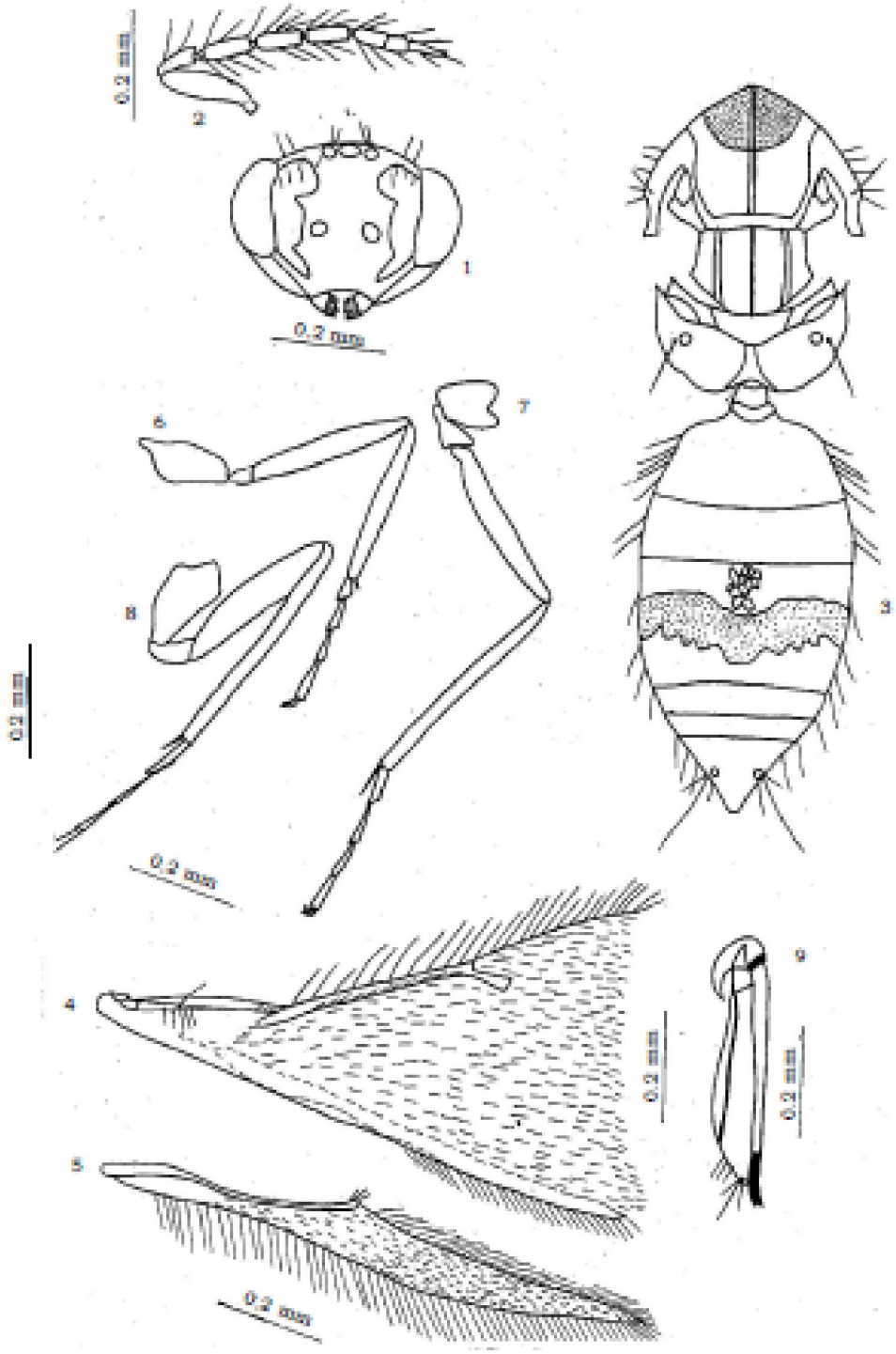


**Plate 16: Figs. 1-9:** ***Tamarixia brassicae*** **sp.nov.**
1. Head in frontal view; 2. Antenna; 3. Dorsal view of body; 4.Forewing; 5.Hindwing; 6.Foreleg; 7.Middle leg; 8.hind leg; 9.Female genitalia

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length, FS1 slightly less than 3 times as long as wide (0.09 : 0.031), FS2 more than 2.5 times as long as wide (0.08 : 0.31), FS3 almost 2.5 times as long as wide (0.075: 0.03); club 3 segmented, more than 5.5 times as long as wide (0.175: 0.03), shorter than preceding two funicle segments combined.

**Thorax (Fig. 3):** Pronotum yellow with dark brown patch bearing 3 pairs of setae at its posterior margin, anterior margin concave in the middle; mesoscutum more than 1.5 times as wide as long (0.40: 0.24); mesoscutum having 2 pairs of adnotaular setae, notauli complete and deep, median longitudinal sulcus present; axilla strongly advanced; scutellum convex and smooth and 1.5 times shorter than mesoscutum, less than 2 times as wide as long (0.295: 0.165) with sublateral longitudinal grooves and 2 pairs of setae situated on scutellum, grooves deep and straight; dorsellum smooth and bulged; metanotum moderate in size; propodeum with inverted 'Y' shaped median carina and without paraspiracular carinae, propodeal spiracles round and well separated from the anterior margin of propodeum, spiracle rim fully exposed.

**Fore wings (Fig. 4):** Round in shape at its apex, more than 3 times as long as wide (1.295 : 0.39), less than 1.5 times longer than hind wing length, moderately setose; costal cell small,narrow and bare; SMV with 1 setae directed upwards, shorter (0.325) than MV (0.345); MV bearing 10 long setae on front edge; PMV rudimentary; SV (0.075) more than 1/4$^{th}$ the length of MV (0.345); marginal fringe long spaced by a distance equal to 1/5$^{th}$ of the length of fringe; basal vein with 4 setae, basal cell setose; speculum narrow, closed below; cubital vein straight, subcubital line of hairs arising from the base of cubital vein, sinuate, merging with base of cubital vein.

**Hind wings (Fig. 5):** More than 9 times as long as wide (1.03 : 0.11) with very acute apex; vein length (0.475) less than ½ the length of wing; marginal fringe highly long spaced by a distance 1/6$^{th}$ of their length.

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**Fore legs (Fig. 6):** Coxa more than 2 times as long as wide (0.165 : 0.07); femur more than 6 times as long as wide (0.30 : 0.045); almost equal to tibia in length; fore tarsus shorter than length of tibia; tarsus yellow.

**Mid legs (Fig. 7)** : Coxa less than 1.5 times as long as wide (0.105 : 0.080); femur slightly more than 8 times as long as wide (0.325 : 0.04),less than 1.5 times shorter than tibia in length; mid tarsus shorter than length of tibia, tarsus yellow; mid tibial spur much longer than fore and hind tibial spur.

**Hind legs (Fig. 8)**: Hind coxa less than 2 times as long as wide (0.180: 0.095); femur slightly more than 5 times as long as wide, less than 1.5 times shorter than tibia in length; hind tarsus shorter than length of tibia, tarsus yellow.

**Gaster (Fig. 3)** : Ovate, slightly more than 2 times as long as wide (0.78 : 0.365), gaster surface faintly sculptured at mid of the gaster, 1$^{st}$ gasteral tergum large in size, gasteral apical tip acuminate;gaster with transverse petiole, petiole broader than longer; metasoma slightly 2 times longer than mesosoma; ovipositor sheaths slightly exerted; first valvifers triangular (Fig. 9); anterior margin of basal part of second valvifers much curved; third vulvulae more than 5.5 times as long as wide (0.10 : 0.018), 1/4$^{th}$ the length of second valvifers (0.4); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 9); cercal setae long.

**Male:** Not known

**Holotype:** ♀, India, U.K., Pantnagar, Host pupae of leaf miner, reared collection, *Brassica* sp.,07/03/07, Hym. Eulo. Nr. 071 (Sandeep Kumar).

**Paratype:** 1 ♀♀, same data as holotype Hym. Eulo Nr. 071 (Sandeep Kumar).

**4.1.5.2 *Tamarixia minerensis* sp.nov.** (Plate: 17, Figs.1-13)

**Female** : Body length about 1.33 mm; body colour pale yellow; head pale yellow; ocelli violet and eyes raddish black; antennae dark brown; thorax pale

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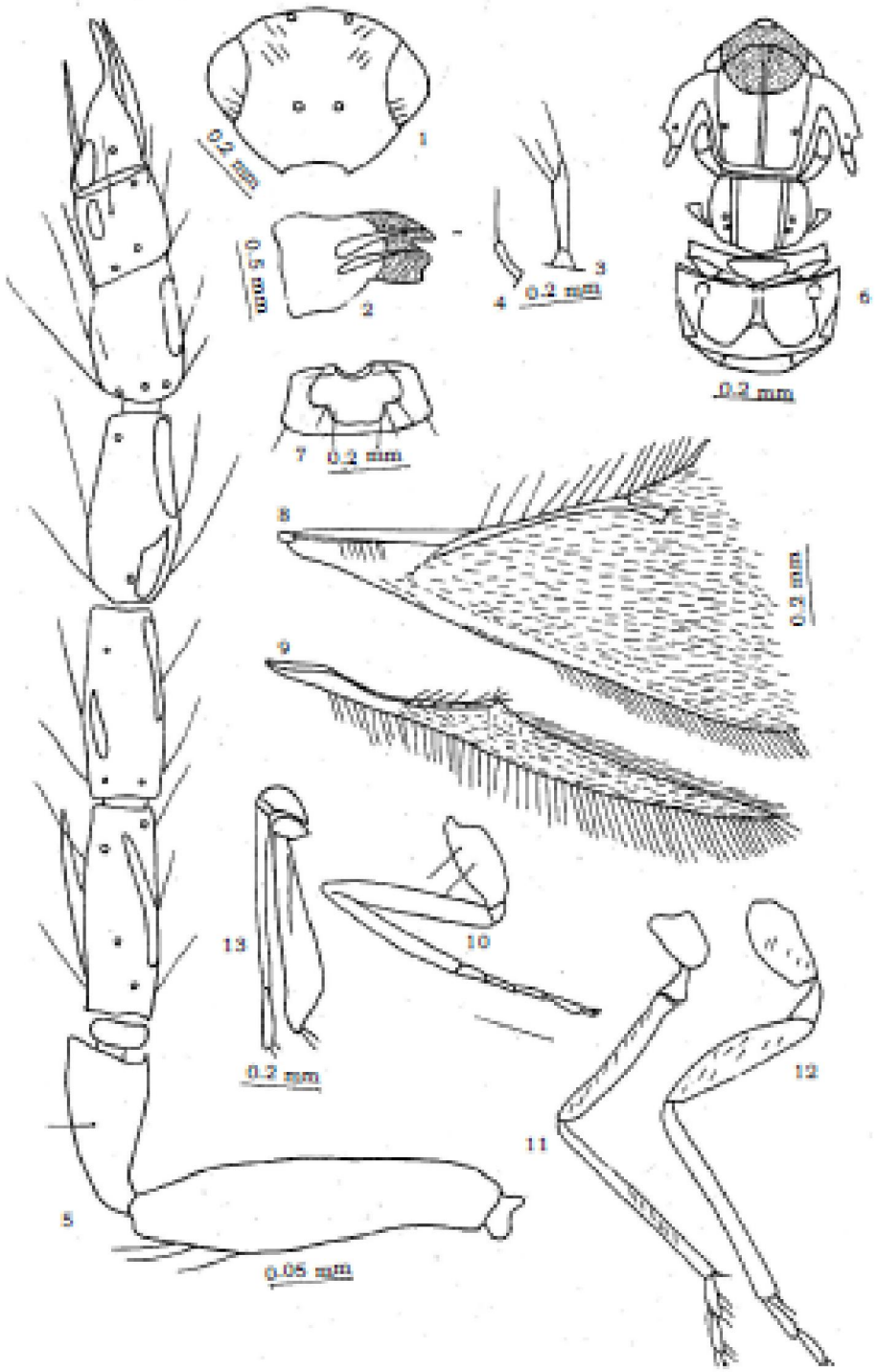


**Plate 17 : Figs. 1-13:** ***Tamarixia mineresis*** **sp.nov.**
1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view;7.Pronotum;8.Forewing;9.Hindwing;10.Foreleg;11.Middle leg;12.hind leg;13.Female genitalia

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yellow; nonirridescent; wings hyaline with yellowish venation; legs pale yellow; gaster yellowish with dark brown band below mid of gaster.

**Head (Fig. 1)** : Slightly less than 1.5 times wider than long in frontal aspect (0.40 : 0.27), smooth and sparsely setose, head frontal grooves absent; frontovertex wide, width distinctly more than ½ the total head width (0.30: 0.40); vertex almost smooth; ocelli arranged in obtuse angled triangle; OOL less than 1.5 times as long as POL; compound eyes bulged, small and smooth, eyes orbits round, facets uniform in shape and size; antennal trouli small, situated above the lower level of eye margin, prominence between antennal trouli more than 1/4$^{th}$ the width of frons between eyes (0.056: 0.24);malar sulcus almost straight and not prominent; malar space smooth; longer than eye width (0.125: 0.072); mandibles bidentate (Fig.2) with 2 acute teeth and a truncation; maxillary palp (Fig. 3) and labial palp (Fig. 4) each single segmented; lower margin of clypeus cancave.

**Antennae (Fig. 5)** : 8 segmented excluding a large anellus, antennae without visible longitudinal sensilla, apical tip of antenna with awl like spicule, antennal formula 1,1,1,3,3; flagellum with long hairs; scape cylindrical slightly more than 4 times as long as wide (0.155: 0.038), scape apex above mid ocelli; pedicel more than 1.5 times as long as wide (0.06: 0.036) and shorter than the length of the FS1; funicle 3 segmented, FS1 less than 3 times as long as wide (0.091: 0.031), FS2 less than 2.5 times as long as wide (0.082 : 0.033), FS3 slightly more than 2 times as long as wide (0.083: 0.041); club 3 segmented, more than 4.5 times as long as wide (0.173: 0.038), less than 1.5 times longer than preceding two funicle segments combined.

**Thorax (Fig. 6)** : Pronotum narrow, anterior mid part of mesoscutum and central part of pronotum with almost round dark brown spot, central part of pronotum sculptured (Fig.7); mesoscutum almost 1.5 times as wide as long (0.36 : 0.24); mesoscutum having 1 pairs of adnotaular setae well above the hind margin,

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natauli complete, median longitudinal sulcus present; axilla narrow, anterior part dark brown and strongly advanced; scutellum slightly convex and smooth and more than 1.5 times shorter than mesoscutum, less than 2.5 times as wide as long (0.34 : 0.138) with submedian longitudinal groves and 2 pairs of setae situated on scutellum, grooves deep and straight; metanotum broad; propodeum with inverted 'Y' shaped median carina and with paraspiracular carinae, propodeal spiracles round and large, contigious with margin of propodeum; spiracle rim fully exposed; mesopostphragma notched at its apical margin and its apical margin touching to lower margin of propodeum.

**Fore wings (Fig. 8)** : Less than 2.5 times as long as wide (1.205: 0.495), less than 1.5 times longer than hind wing length, moderately setose; costal cell moderate and bare; SMV with 7 setae directed down wards, longer (0.32) than MV (0.305); MV bearing 10 long setae on front edge; PMV rudimentary; SV long (0.07) more than ¼ of the length of MV; marginal fringe long; basal vein with 3 setae, basal cell bare; cubital vein almost straight, subcutital line of hairs arising from the base of cubital vein.

**Hind wings (Fig. 9)**: Narrow, more than 10 times as long as wide (0.953: 0.095) with acute apex; vein length (0.42) more than one half the length of wing; marginal fringe long.

**Legs (Fig. 10,11and 12)**: Pale yellow, slender, weak and hairy mid tibial spur much longer than fore and hind tibial spur.

**Gaster** : Moderate, delicate and ovate, 2 times as long as wide (0.64 : 0.32), gaster surface smooth, gasteral apical tip subacuminate, gaster subsessile; metasoma less than 1.5 times longer than mesosoma; ovipositor sheaths not seen from dorsal surface of gaster; first valvifers semicircular (Fig. 13); third valvulae movably articulated with second valvifers, almost 5 times as long as wide (0.10 : 0.02), slightly less than 1/4$^{th}$ the length of second valvifers (0.37); outer plates of

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ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 13).

**Male:** Not known

**Holotype:** ♀, India, U.K., Pantnagar, Sanjay Van, Host Pupae of leaf miner, reared collection, Marigold, 07-03-07 ,Hym. Eulo. Nr. 61 (Sandeep Kumar).

**Paratype:** 6 ♀♀, same data as holotype Hym. Eulo Nr. 61A (Sandeep Kumar).

**Checklist for world fauna of Genus *Tamarixia* Mercet**

1. *Tamarixia actis* (Walker, 1839)
2. *Tamarixia akkumica* (Kostjukov, 1978)
3. *Tamarixia arboreae* (Graham, 1979)
4. *Tamarixia asiatica* Kostjukov, 1996
5. *Tamarixia bicolor* Mercet, 1924
6. *Tamarixia brovni* Kostjukov, 2000
7. *Tamarixia caillardiae* (Kostjukov, 1978)
8. *Tamarixia cometes* (Girault, 1915)
9. *Tamarixia dhetysaicus* Kostjukov, 1996
10. *Tamarixia dryi* (Waterston, 1922)
11. *Tamarixia dyra* (Burks, 1943)
12. *Tamarixia erytreae* (unavailable name in Chalcicoidea)
13. *Tamarixia flavicoxae* Kostjukov, 2000
14. *Tamarixia flavigaster* (Brothers & Moran, 1969)
15. *Tamarixia flaviventris* (Kostjukov, 1978)
16. *Tamarixia hanca* Kostjukov, 2000
17. *Tamarixia klarisae* Kostjukov, 1996
18. *Tamarixia krascheninnikovi* (Kostjukov, 1990)
19. *Tamarixia leptothrix* Graham, 1991
20. *Tamarixia leucaenae* Boucek, 1988
21. *Tamarixia meteora* (Girault, 1915)
22. *Tamarixia monesus* (Walker, 1839)
23. *Tamarixia newelskoyi* (Kostjukov, 1990)
24. *Tamarixia nocturna* Kostjukov, 2000
25. *Tamarixia orientalis* Khan, Agnihotri & Sushil, 2005
26. *Tamarixia pallicornis* (Walker, 1872)

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27. *Tamarixia poddubnyi* (Kostjukov, 1978)
28. *Tamarixia pojarkovi* (Kostjukov, 1990)
29. *Tamarixia pronomus* (Walker, 1839)
30. *Tamarixia przewalskii* (Kostjukov, 1990)
31. *Tamarixia pubescens* (Nees, 1834)
32. *Tamarixia pygmaeola* (Erdös, 1958)
33. *Tamarixia radiata* (Waterston, 1922)
34. *Tamarixia rudolfae* (Kostjukov, 1978)
35. *Tamarixia schina* Zuparko (unavailable name in Chalcicoidea)
36. *Tamarixia sheebae* Narendran, 2005
37. *Tamarixia stelleri* (Kostjukov, 1990)
38. *Tamarixia tremblayi* (Domenichini, 1965)
39. *Tamarixia triozae* (Burks, 1943)
40. *Tamarixia tschirikovi* (Kostjukov, 1990)
41. *Tamarixia turundaevskayae* (Kostjukov, 1978)
42. *Tamarixia upis* (Walker, 1839)
43. *Tamarixia vinokurovi* Kostjukov, 1995

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## 4.2 Subfamily – Eulophinae

### 4.2.1 Genus *Bishtiella* gen. nov. (Plate: 18, Figs.1-11)

The present new genus belongs to subfamily Eulophinae, tribe Elachertini runs closed to *Trichospilus* Ferriere and also has some affinity with *Cirrospilus* Westwood in the keys to genera by Hayat (1985), Boucek (1988), and Khan *et al.* (2005). The genus distinctly differs from *Trichospilus* Ferriere and *Cirrospilus* Westwood. A key has been framed and given below for separating to these allied genera.

1. Anelli mostly concealed; antennal club segment 3 not much tapering; eyes not densely setose; toruli situated above the lower level of compound eyes; malar sulcus complete; scrobal cavity not deep; axillae slightly to strongly advanced, mesoscutum and scutellum having more or less same sculpture; thorax bristles not very long; scutellum with sublateral grooves; hind pair of scutellar bristles almost near to hind margin of Scutellum; gaster elongate or not round.

   …… ***Cirrospilus* Westwood**

— Anelli not concealed; antennal club segment 3 much tapering; eyes densely setose; toruli situated below the lower level of compound eyes; malar sulcus incomplete and oblique; scrobal cavity deep; axillae slightly advanced, mesoscutum and scutellum having different sculpture from each other; thorax bristles comparatively very long; scutellum without sublateral grooves; hind pair of scutellar bristles comparatively above hind margin of Scutellum; gaster bulged and round.

   ……. 2

2. Fore wing with tufts of dark or thickened setae**,** especially near parastigma and base of marginal vein; or tufts of setae sometimes replaced by strongly darkened spots in venation (as in fig. 6,Boucek,1976); wing disc infuscated with blackish patches merging with each other to make a single zigzag spot ((as in fig.1,3and 6,Boucek,1976); toruli unusually low**,** near

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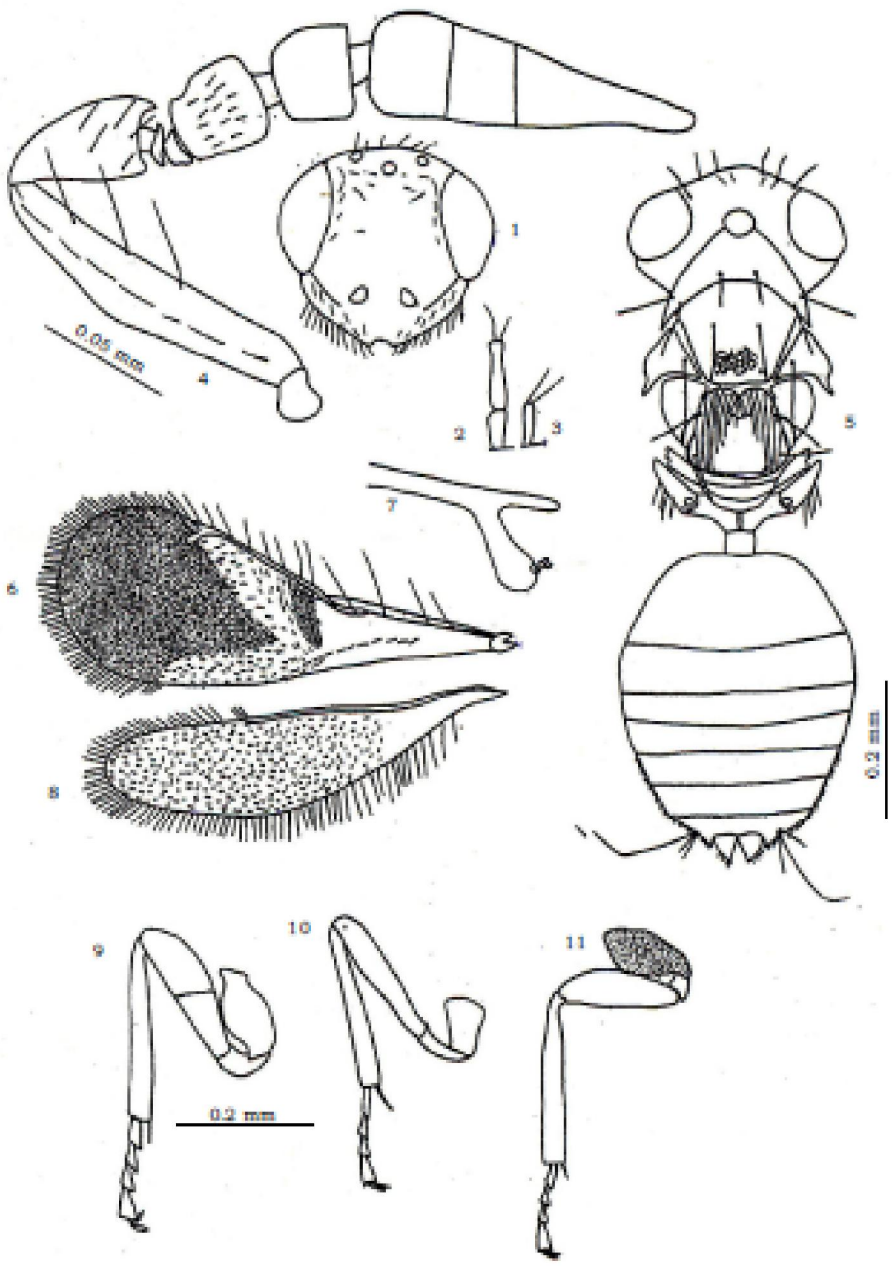


**Plate: 18-figs. 1-11:** ***Bishniella indica*** **sp.nov.**
1. Head in frontal view; 2. Maxillary Palp; 3. Labial palp; 4. Antenna; 5.body in dorsal view; 6.Forewing; 7. Vein 8.Hindwing; 9.Foreleg; 10.Middle leg; 11.hind leg

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**Completely skeletonized leaves caused by the larvae of *Eutectona machaeralis* Walker**

**Pupae of *Eutectona machaeralis* inside the silken web on leaf**

**Pupae of *Eutectona machaeralis* inside the silken web on leaf**

**Female *Bishtiella indica***
**(Dorsal view)**

**Female *Bishtiella indica***
**(Lateral view)**

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mouth margin; fore bristles of mesoscutum short and not reaching to transscutal articulation; foramen magnum situated at center or below the center of head; normally gaster subsessile;tergites not much differing in length; ovipositor sheaths not visible from dorsal side of gaster.

……..***Trichospilus*** **Ferriere**

— Fore wing without tufts of dark or thickened setae; even tufts of setae not replaced by strongly darkened spots in venation; wing disc infuscated with two separated blackish patches; toruli situated at lower level of eyes**,** not near to mouth margin; fore bristles of mesoscutum long and reaching to transscutal articulation; foramen magnum situated well above the center of head; basically gaster petiolated,1st tergite much differing in length than others on gaster; ovipositor sheaths visible from dorsal side of gaster.

……..***Bishtiella*** **gen.nov.**

The Genus is characterized as follows.

**Female:** Body length 1.22 mm, body delicate yellowish; Head wider than long in facial view, malar space longer than eye width, malar sulcus obliquely reaching near to lower level of torulus, maxillary and labial palpi two and one segmented respectively; antennae 7 segmented excluding 2 anelli,toruli inserted well below the lower level of eyes; funicle 2 segmented; club 3 segmented, tapering,CS3 lanceolate shaped; no carina on vertex or occiput,subposterior margin with transverse carina; mesoscutum with complete, straight and grooved notauli, with reticulate sculpture; scutellum slightly convex and carinated with longitudinal ridged lines of different length except at mid to apical area of scutellum making almost a smooth triangular area, longer than mesoscutum; Pronotum, mesoscutum and scutellum with long bristles; scutellum without sublateral or submedian grooves; axillae slightly advanced; propodeum smooth with simple median carina and paraspicular carina; fore wing infuscated with long

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fringes, SMV with 3 long setae; PMV shorter than SV; parastigma white with 2 long setae; SMV longer than MV; cubital vein short; Hind wing blunt at its apex; gaster petiolated; foramen magnum well above the centre of head; apical tip of gaster blunt.

**Type Species: *Bishtiella indica* sp.nov.**

**4.2.1.1 *Bishtiella indica* sp.nov.** (Plate: 18, Figs.1-11)

**Female:** Body length about 1.22 mm; body delicate; body colour yellow; head yellow with clypeal region red and eyes black; antennae whitish yellow; thorax brownish yellow, pronotum pale yellow, nonirridescent; wings infuscated with two blackish patches, venation blackish, parastigma white; legs yellow except hind coxa dark brown; gaster yellow with dull blackish scars at its mid extending up to last abdominal segment.

**Head (Fig. 1):**Less than 1.5 times wider than long in frontal aspect (0.380:0.345),facial area above mid eyes almost smooth and sparsely setose, head frontal grooves absent; frontovertex width distinctly more than 1/2 the total head width (0.24:0.38);vertex setae short and sparse; ocelli arranged in obtuse angled triangle; POL less than 2 times as long as OOL; compound eyes pilose, eyes inner orbits round, facets uniform in shape and size; antennal toruli situated below the lower level of eye margin, prominence between antennal toruli more than 1/3$^{rd}$ the width of frons between eyes (0.06:0.20); malar sulcus distinctly prominent ,black, not complete and obliquely reaching near to lower level of toruli; malar space hairy with reticulated sculpture, less than 2 times longer than eye width (0.17:0.09); genae slightly swelled at its lateral sides; maxillary palp (Fig. 2) and labial palp (Fig.3) two and one segmented respectively; lower margin of clypeus concave medially; occipital carina absent; foramen magnum situated at well above the center of face.

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**Antennae (Fig. 4):** 7 segmented excluding 2 anelli,antennae without conspicuous longitudinal sensilla, antennal formula 1,1,2,2,3 ; scape having 3 long hairs and a median line of hairs ,almost cylindrical except slightly swelled at mid of its dorsum, slightly more than 5 times as long as wide (0.150:0.028),scape apex not touching to mid ocelli; pedicel with 5 long setae, a trifle more than 1.5 times as long as wide ( 0.055:0.035 )and distinctly longer than the length of the FS1; funicle 2 segmented,FS1 less than 1.5 times as long as wide (0.041:0.036), FS2 less than 1.5 times as wide as long (0.040:0.035 ); club 3 segmented, more than 3 times as long as wide (0.145:0.045), slightly less than 2 times longer than preceding two funicle segments combined, CS3 lanceolate shaped and longer than preceding two club segments combined.

**Thorax (Fig. 5):** Pronotum conspicuously bell shaped bearing 3 pairs of long setae at its posterior margin, anterior margin deeply concave in the middle; mesoscutum with reticulate sculpture, less than 2 times as wide as long (0.34:0.18), mesoscutum having 2 pairs of long bristles at its submedian area, fore mesoscutal bristle touching to transscutal articulation, notauli complete and groove like, median longitudinal sulcus absent; axilla slightly advanced and triangular in shape; scutellum slightly convex having longitudinal ridged lines of different length except at its mid to apical area, making almost a smooth triangular aspect, not consculptured with mesoscutum and shorter than mesoscutum, scutellum more than 2 times as wide as long (0.34:0.16) without sublateral longitudinal grooves, 2 pairs of long bristles situated on scutellum and distance between fore and hind bristles more than distance between transscutal articulation and fore bristle on scutellum; dorsellum smooth; metanotum narrow; propodeum with weak median carina and with inverted ‘Y’ shaped paraspiracular carinae, propodeal spiracles round and spiracle rim fully exposed.

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**Fore wings (Fig. 6)** : Less than 3 times as long as wide (0.83:0.29), less than 1.5 times longer than hind wing length, densely setose; costal cell long, narrow and bare; SMV with 3 long setae directed upwards, longer (0.345) than MV (0.245); parastigma white having 2 long setae; MV bearing 8 long setae on front edge; PMV more than 1.5 times shorter than SV (0.023:0.040) (Fig. 7); SV more than 1/6$^{th}$ of the length of MV (0.040:0.245); marginal fringe moderately long ; basal vein wanting; speculum moderate, opened below; cubital vein sinuate and short, subcubital line of hairs wanting.

**Hind wings (Fig. 8):** More than 4 times as long as wide (0.73:0.165) with highly blunt apex; vein length (0.475) more than one half the length of wing; marginal fringe moderately long.

**Fore Legs (Fig. 9):** coxa more than 2 times as long as wide(0.16:0.075),more than 1.5 times longer than fore trochanter (0.16:0.095)**;**femur more than 3.5 times as long as wide (0.25:0.070),tibia less than 1.5 times longer than femur in length; fore tarsus more than 1.5 times shorter than length of tibia(0.31:0.18).

**Mid Legs (Fig. 10):** coxa less than 1.5 times as long as wide (0.085:0.065), more than 1.5 times shorter than mid trochanter**;** femur more than 3 times as long as wide (0.095:0.030), less than 1.5 times shorter than tibia in length; mid tarsus more than 1.5 times shorter than length of tibia (0.17:0.28); TS1 shorter than next two tarsal segments combined, TS1 equal to mid tibial spur length, mid tibial spur much longer than fore and hind tibial spur.

**Hind Legs (Fig. 11):** coxa reticulated, more than 2 times as long as wide (0.165:0.078), almost 4.5 times longer than hind trochanter (0.036)**;** femur more than 3 times as long as wide (0.19:0.06), more than 1.5 times shorter than tibia in length; hind tarsus almost one half the length of tibia; TS1 shorter than next two tarsal segments combined, TS1 shorter than hind tibial spur length.

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**Gaster (Fig. 5):** bulged and almost round, gaster surface smooth, densely setose at the posterior end,1st gasteral tergum large in size, gasteral apical blunt; gaster petiolated, petiole less than 1.5 times broader than longer (0.06:0.45),without carina; metasoma less than 1.5 times longer than mesosoma (0.585:0.505);ovipositor issuing from above the mid of gaster, ovipositor sheaths slightly exerted; first valvifers semicircular; anterior margin of basal part of second valvifers not much curved; third valvulae not movably articulated with second valvifers; length of a left seta longer than right cercal seta of gaster.

**Male:** Not known

**Holotype:** ♀**,**desected and mounted on slide, India, U. K., Ramnagar, Host pupa of teak leaf skeletonizer *Eutectona machaeralis*, reared collection, Teak forest,17-09- 08 , Hym. Eulo. Nr 1001 (Sandeep Kumar).

**Paratype:** 10 ♀♀**,** same data as holotype Hym. Eulo Nr 1001A (Sandeep Kumar).

**Etymology:** The genus is named in the honour of Dr. B. S. Bisht, Vice Chancellor, G. B. Pant Univ. of Agri. & Tech., Pantnagar, for his immense contributions in the field of Agricultural Sciences.

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### 4.2.2 Genus *Elachertus* Spinola

*Elachertus* Spinola, 1811: 151.

Type species – *Diplolepis lateralis* Spinola Desig. by Gahan and Fagan, 1923.

*Microterus* Spinola. 1811: 151.

Type species – *Diplolepis petiolata* Spinola. Desig. by Gahan and Fagan, 1923.

*Elachestus* Nees. 1934: 135. Emend.

*Elachistus* Forster, 1956: Emend.

*Epardalus* Girault, 1917: 5.

Type species – *Elachistus cidariae* Ashmead. Orig. Desig.

*Peteenus* Erdos. 1961: 471.

Type species – *Peteenu pulcher* Erdos. Orig. Desig.

*Elachertus* Zhu and Huang 2001.Zoological Studies, 40(4): 317-354.

*Elachertus* Boucek, Z. 2002.*Entomologist'-s-Gazette*, 53(2): 131-133.

*Elachertus* Yefremova and Myartseva 2004.*Entomologist'-s-Monthly-Magazine*, 140(1679/1681): 113-122.

**Diagnosis**

This genus can be differentiated from other genera of Eulophidae by the following combination of characters; antennal funicle with four articles; toruli at or above ventral margin of eye; notauli complete; scutellum with lateral grooves; curving inwards posteriorly, delimiting a narrow band of scutellum at the posterior margin, with two pairs of setae; midlobe of mesoscutum with 3 or more pairs of setae; postmarginal vein longer than stigmal. Males with sensory pores of scape limited to upper third, separated by less than their own diameter.

**Discussion**

Species of *Elachertus* are most similar to the genus *Hyssopus* Girault. Females can be differentiated by the following 3 or more pairs of setae on the midlobe of the mesoscutum (2 pairs only in *Hyssopus*); toruli inserted at or above

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ventral margin of eye (below ventral margin in *Hyssopus*). Males can also be separated by the pattern of pores on the scape, although this requires clearing and mounting of the antennae.

Other related genera (e.g. *Miotropis* and *Stenomesius*) either do not have scutellar grooves or the grooves, when present, do not extend the full length of the scutellum and do not meet medially and set off a narrow band of scutellum at the posterior margin. In addition, related genera often have the median propodeal carina split into two parallel carinae for most of its length or otherwise elaborated as in *Stenomesius* (median carina single and complete in *Elachertus* and only rarely with a small dorsal V-shaped opening); the head and thorax are often extensively marked with yellow as in some species of *Miotropis*, *Stonomesius* and *Cirrospiloideus* (head and throrax generally wholly black or dark metallic in *Elachertus*) and the occiput may possess a distinct semicircular carina as in *Ardalus* and at least some *Stenomesius* (no occipital carina in *Elachertus*).

This genus is one of a complex of closely related taxa which have been placed by various authors either in the subfamily Elachertinae (e.g. Askew, 1968; Peck, 1963) or in the tribe Elachertini (e.g. Burks, 1979). The monophyly of these groups has not been established. The monophyly of *Elchertus* itself has been questioned and various groups of species have been assigned and later removed from it (e.g. the species included in *Hyssopus* Girault).Most of the characters that have been used to set apart species either vary among the taxa or can not be interpreted as being uniquely shared among the species. For example, the longitudinal grooves of the scutellum occur in a number of different genera and the expressed in a variety of ways. In species of *Hyssopus*, they are identical to *Elachertus* (grooves curving inward posteriorly and meeting, leaving a narrow band of scutellum at the posterior and lateral margins). The same is true of the number of antennal segments, denticles of the mandibles, wing venation and so on. The male genitalia also provide no unique structural differences for *Elachertus*. The same basic male genitalic structure is present in males of

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*Hyssopus*, *Miotropis*, *Ardalus*, *Cirrospiloideus* and others. Since no comprehensive revision of most of these genera has been undertaken, the limits and monophyly of most of these related groups also remains in doubt. However, another character unique to males does indicate that the species of *Elachertus* are a monophyletic group. The inner lateral surface of the scape of males of *Elachertus* and related genera possess an array of small sensory pores. In all of the species of *Elachertus* in which have been able to examine the male antennae, the area of the pores is restricted to thedistal one third of the scape and the pores form a small tight group in which the individual pores are contiguous or separated by less than their own diameter. In some species, this area is clearly marked and can be seen in point mounted specimens, although the pores themselves cannot generally be seen with a dissecting microscope. In others, this area can only be discerned in cleared and slidemounted antennae. In *Hyssopus* these pores are scattered over nearly the entire surface of the scape and are set off from one another by one or two diameters. In other genera, the size of the area may be reduced, but again, the pores are seldom in contact with one another and the lower pores usually reach at least half way down the scape.

Many of the North American species placed in *Elachertus* were described one or two at a time by various authors from single specimens or short series. Most of the differences between these species cited by the original authors were small differences in coloration. After studying larger series and specimens from wider geographic areas, attribute most of these color differences to intraspecific variations.

**Key to the some species of *Elachertus* Spinola**

1. Anterior margin of scutellum and axillae forming a straight line. ……2

— Axillae protruding cephalad of the anterior margin of the scutellum. ……4

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2. Malar suture present; petiole as long as wide

……..3

— Malar suture absent; POL less than 1.5 x OOL; gaster subsessile;petiole not visible from dorsal surface; mesoscutum and scutellum each with three pairs of long setae; SMV with five setae ,lower margin of clypeus straight; mandibles hexadentate with 2 acute teeth.

…….***Elachertus indica*** **sp.nov.**

3. Malar suture in females straight; POL 2 × OOL; male head with vertex and occiput lightly sculptured; male antennae densely setose.

…… ***E. argissa*** **(Walker)**

— Malar suture in females curved; POL 1.5 × OOL, male head rugose except for scrobes; male antennae with only a few sparse setae.

…… ***E. atus*** **Schauff**

4. Scutellum smooth; mandibles with 2 large and 3-4 smaller teeth.

……5

— Scutellum alutaceous or coriaceous; mandible blunted, without obvious teeth.

……6

5. Face below toruli evenly rugose; midlobe of mesoscutum with 3 pairs of setae; male antennae with sparse white hairs, pores on scape.

…… ***E. loh*** **Schauff**

— Face below toruli lightly sculptured medially; smooth laterally; midlobe of mesoscutum with more than 3 pairs of setae; male antennae with numerous white hairs; pores on scape.

…… ***E. cacoeciae*** **(Howard)**

6. Propodeum lateral of carina sunken and with some sculpture;cubital and basal vein absent, submarginal with 3 or 4 setae.

…… ***E. louisiana*** **(Girault)**

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— Propodeum laterad of carina not sunken smooth; fore wing with cubital and basal vein present, submarginal vein with 7 setae.

…… ***E. cidariae*** **(Ashmead)**

**4.2.2.1** ***Elachertus indica*** **sp.nov.** (Plate: 19, Figs.1-8)

**Female** : Body length about 2.05 mm; body colour metallic brown; head brown,ocelli yellowish and eyes black; antennae brownish yellow; thorax metallic brown, wings hyaline with pale yellow venation; legs yellow; gaster yellow without any reflection.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.54 : 0.42), smooth and sparsely setose, head frontal grooves absent; forntovertex wide and width distinctly more than 1/2 the total head width (0.40: 0.52); vertex setae short and sparse; ocelli arranged in obtuse angled triangle; OOL less than 1.5 times as long as POL; compound eyes bulged, large and pilose, eyes orbits round, facets uniform in shape and size; antennal toruli situated well above the lower level of eye margin, prominence between antennal trouli more than 1/5$^{th}$ the width of frons between eyes (0.06 : 0.310); malar sulcus; malar space smooth, less than 1.5 times shorter than eye width (0.09: 0.11); mandibles hexadentate (Fig.2) with 2 acute teeth; maxillary palp (Fig.3) and labial palp (Fig.4) two and single segmented respectively; lower margin of clypeus straight; occipital carina absent.

**Antennae (Fig. 5)** : 9 segmented excluding two anelli, antennae with long longitudinal sensilla, apical tip of antenna with small spicule, antennal formula 1,1,2,4,3; scape cylindrical slightly more than 6.5 times as long as wide (0.22 : 0.032), scape apex touching to mid ocelli; pedicel with 4 setae, less than 1.5 times as long as wide (0.055 : 0.046) and more than two times shorter than length of the FS1; funicle 4 segmented, FS1 more than 3 times as long as wide (0.125: 0.04), FS2 more than 2 times as long as wide (0.150 : 0.045), FS3 less than 2.5

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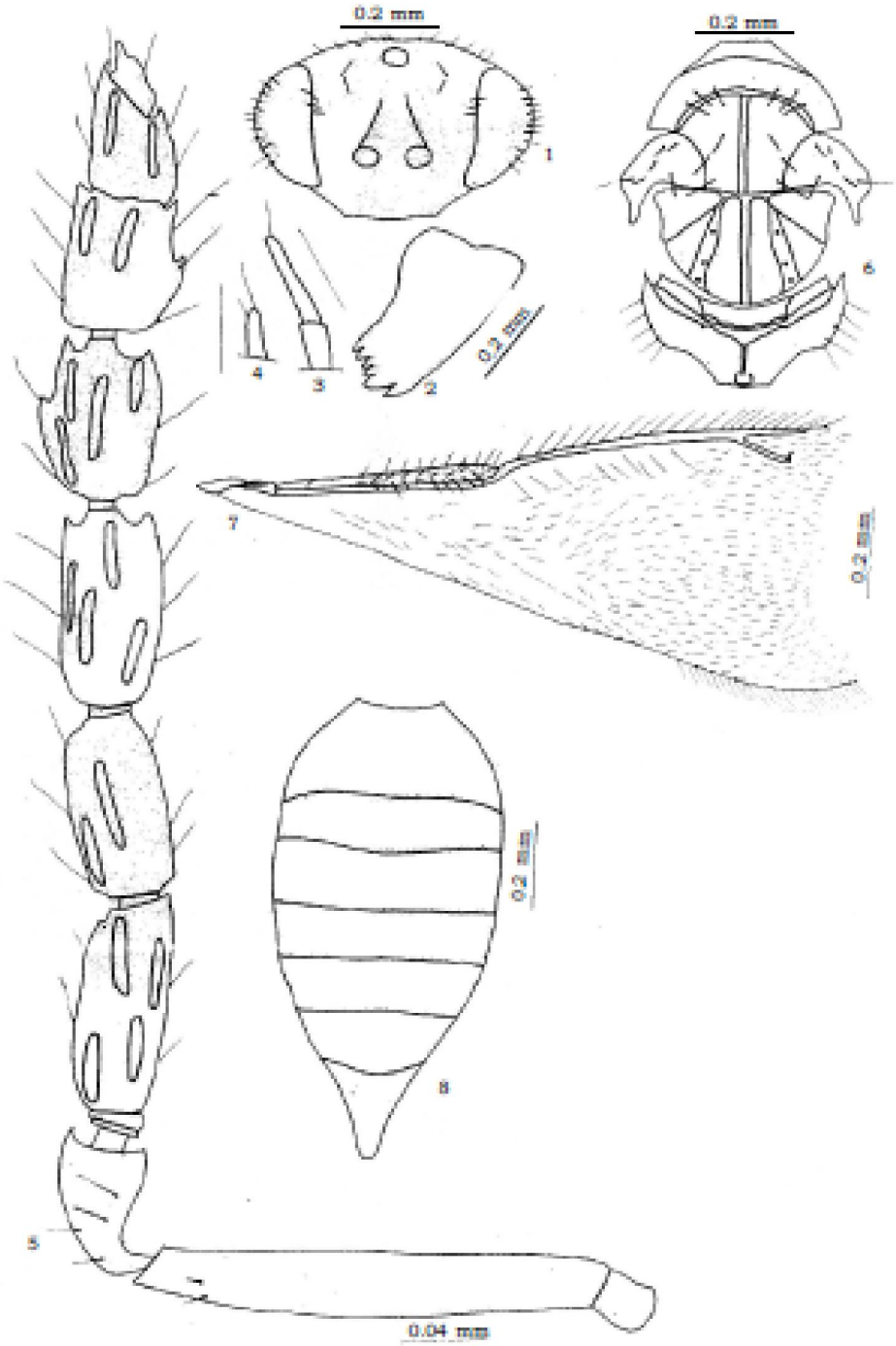


**Plate: 19-figs. 1-8: *Elachertus indica* sp.nov.**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.Forewing; 8.gaster

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times as long as wide (0.118 : 0.05), FS4 less than 1.5 times as long as wide (0.099: 0.055); club 3 segmented, less than 3.5 times as long as wide (0.165 : 0.05), shorter than preceding two funicle segments combined.

**Thorax (Fig. 6)**: Pronotum conspicuous, bell shaped with transverse carina bearing 3 pairs of setae at its posterior margin; mesoscutum with faint sculpture, longer than 2 times as wide as long (0.48 : 0.225); mesoscutum having 3 pairs of adnotaular setae, notauli complete and deep, median longitudinal groove present; axilla slightly advanced; scutellum with faintly sculpture and longer than mesoscutum, more than 1.5 times as wide as long (0.42 : 0.26) with curved grooves meeting at hind margin to each other and 3 pairs of setae situated on scutellum, grooves narrow, deep and curved; metanotum broad; propodeum with simple median carina and without paraspiracular carinae, propodeal spiracles round,large and well separated from the anterior margin of propodeum by a space ½ of its own diameter, spiracle rim fully exposed.

**Fore wings (Fig.7)** : More than 2.5 times as long as wide (1.575 : 0.575), densely setose; costal cell long, broad densely setose; SMV with 5 setae directed downwards, longer (0.49) than MV (0.475); 9 admarginal hairs below marginal vein;PMV less than 1.5 times longer than SV (0.115: 0.095); SV long equal to $1/5^{th}$ of the length of MV (0.475); marginal fringe long spaced by a distance equal to $1/7^{th}$ of the length of fringe; basal vein with 3 setae, basal cell bare; speculum narrow, opened below ; cubital vein sinuate, subcubital line of hairs arising from the base of vein.

**Hind wings:** Hind wing with blunt apex; marginal fringe long.

**Legs:** Fore femur with 8 long setae at its ventral surface; mid tibial spur much longer than fore and hind tibial spur.

**Gaster (Fig. 8)** : Elongate and sessile, more than 2.5 times as long as wide, gaster surface smooth, $1^{st}$ gasteral tergum large,gasteral apical tip acuminate;

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metasoma less than 1.5 times longer than mesosoma; ovipositor sheaths not exerted; ovipositor issuing highly above from the mid of gaster.

**Male:** Not known

Holotype: ♀, India, Uttarakhand, Bhimtal, Host not known, Sweepnet collection, bean crop, 08/04/07, Hym. Eulo. Nr. 95 (Sandeep Kumar).

**Paratype:** No paratype.

## Checklist for world fauna of *Elachertus* Spinola

1. *Elachertus abditus* Szelényi, 1977
2. *Elachertus abdominalis* Spinola (unavailable name in Chalcicoidea)
3. *Elachertus acaciae* (Risbec, 1951)
4. *Elachertus advena* Timberlake, 1926
5. *Elachertus aequalis* Förster, 1841
6. *Elachertus aeruginosus* Förster, 1841
7. *Elachertus affinis* Masi, 1911
8. *Elachertus agonoxenae* Kerrich, 1961
9. *Elachertus albipes* Spinola (unavailable name in Chalcicoidea)
10. *Elachertus anthophilae* Boucek, 2002
11. *Elachertus antillarum* (Gahan, 1922)
12. *Elachertus arenarius* Erdös, 1966
13. *Elachertus artaeus* (Walker, 1839)
14. *Elachertus atamiensis* Ashmead, 1904
15. *Elachertus ater* Zhu & Huang, 2001
16. *Elachertus atus* Schauff, 1985
17. *Elachertus auripes* (Girault, 1913)
18. *Elachertus australis* (Girault, 1913)
19. *Elachertus azerbaidzhanicus* (Boucek, 1971)
20. *Elachertus basilaris* Ashmead, 1904
21. *Elachertus bisurmanus* Erdös, 1966
22. *Elachertus breviclavus* Chishti & Shafee, 1988
23. *Elachertus brevicornis* (Masi, 1917)
24. *Elachertus cacoeciae* Howard, 1885
25. *Elachertus cardiospermi* Schrottky, 1911
26. *Elachertus catta* (Walker, 1839)
27. *Elachertus caudatus* Howard, 1894
28. *Elachertus ceramidiae* Burks, 1962
29. *Elachertus charondas* (Walker, 1839)
30. *Elachertus cicatricosus* (Girault, 1915)
31. *Elachertus cidariae* Ashmead, 1898
32. *Elachertus coerulescens* Nees, 1834
33. *Elachertus cyaneus* Förster, 1841
34. *Elachertus decemdentatus* (Girault, 1915)

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35. *Elachertus delirus* (Girault, 1913)
36. *Elachertus deplanatus* (Ratzeburg, 1852)
37. *Elachertus ditissimus* Förster, 1841
38. *Elachertus divergens* Zhu & Huang, 2001
39. *Elachertus edisoni* (Girault, 1915)
40. *Elachertus erse* (Walker, 1839)
41. *Elachertus eublemmae* Risbec, 1951
42. *Elachertus europs* (Walker, 1839)
43. *Elachertus facialis* Förster, 1841
44. *Elachertus fenestratus* Nees, 1834
45. *Elachertus flavifuniculus* Zhu & Huang, 2001
46. *Elachertus flavimaculatus* Zhu & Huang, 2001
47. *Elachertus fraterculus* (Girault, 1915)
48. *Elachertus fullawayi* (Yoshimoto & Ishii, 1965)
49. *Elachertus gallicus* Erdös, 1958
50. *Elachertus giffardi* Timberlake, 1927
51. *Elachertus guamensis* (Fullaway, 1913)
52. *Elachertus gyes* (Walker, 1839)
53. *Elachertus harrisinae* (Ashmead, 1887)
54. *Elachertus howardii* (Ashmead,1904)
55. *Elachertus idomene* Walker, 1846
56. *Elachertus insuetus* (Gahan, 1914)
57. *Elachertus insularis* (Risbec, 1957)
58. *Elachertus inunctus* Nees, 1834
59. *Elachertus inventrix* (Girault, 1915)
60. *Elachertus isadas* (Walker, 1839)
61. *Elachertus kopetdagensis* Efremova & Myartseva, 1994
62. *Elachertus kraussi* (Yoshimoto & Ishii, 1965)
63. *Elachertus laevis* (Förster, 1841)
64. *Elachertus lapponicus* Thomson, 1878
65. *Elachertus lasiodermae* Hedqvist, 1977
66. *Elachertus lateralis* (Spinola, 1808)
67. *Elachertus latifasciatus* (De Santis, 1988)
68. *Elachertus leroyi* Risbec, 1958
69. *Elachertus levigatus* (Howard, 1897)
70. *Elachertus loh* Schauff, 1985
71. *Elachertus longipetiolus* Boucek, 1971
72. *Elachertus longiramulus* Zhu & Huang, 2001
73. *Elachertus louisiana* (Girault, 1917)
74. *Elachertus lunatus* Förster, 1841
75. *Elachertus marginalis* (Wollaston, 1858)
76. *Elachertus marmoraticeps* (Girault, 1926)
77. *Elachertus melleus* (Brèthes, 1920)
78. *Elachertus metallicus* Howard, 1897
79. *Elachertus minoculatus* Szelényi, 1980
80. *Elachertus multidentatus* (Girault, 1917)
81. *Elachertus nigricoxatus* Yoshimoto & Ishii, 1965

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82. *Elachertus nigrithorax* (Girault, 1913)
83. *Elachertus nigromaculatus* (Risbec, 1951)
84. *Elachertus niveicornis* (Girault, 1915)
85. *Elachertus obliquus* Zhu & Huang, 2001
86. *Elachertus oligiramus* Zhu & Huang, 2001
87. *Elachertus parallelus* Zhu & Huang, 2001
88. *Elachertus paucifasciatus* (Girault, 1915)
89. *Elachertus pellucidus* Förster, 1861
90. *Elachertus petiolifuniculus* Zhu & Huang, 2001
91. *Elachertus pilicornis Spinola* (unavailable name in Chalcicoidea)
92. *Elachertus pilifer* Zhu & Huang, 2001
93. *Elachertus pilosiscuta* Boucek, 1971
94. *Elachertus plagiatus* Förster, 1841
95. *Elachertus platynotae* (Howard, 1885)
96. *Elachertus polygoni* Erdös, 1958
97. *Elachertus ponapensis* Yoshimoto & Ishii, 1965
98. *Elachertus pulcher* (Erdös, 1961)
99. *Elachertus ramosus* Zhu & Huang, 2001
100. *Elachertus reticulatus* Ratzeburg, 1852
101. *Elachertus scobiciae* Erdös, 1958
102. *Elachertus scutellaris* Zhu & Huang, 2001
103. *Elachertus scutellatus* Howard, 1894
104. *Elachertus semiflavus* (De Santis, 1955)
105. *Elachertus silvensis* (Girault, 1913)
106. *Elachertus similis* (Girault & Dodd, 1915)
107. *Elachertus simithorax* (Girault, 1915)
108. *Elachertus sinui* Narendran, 2004
109. *Elachertus sobrinus* (Girault & Dodd, 1915)
110. *Elachertus sobrius* (Walker, 1872)
111. *Elachertus spilosomatis* Howard, 1891
112. *Elachertus suada* (Walker, 1839)
113. *Elachertus sulcatus* Zhu & Huang, 2001
114. *Elachertus suttneri* (Girault, 1913)
115. *Elachertus sylvarum* Graham, 1983
116. *Elachertus thoreauini* (Girault, 1915)
117. *Elachertus timidus* Förster, 1841
118. *Elachertus trisulcus* (Girault, 1916)
119. *Elachertus tumidiscapus* Askew, 1982
120. *Elachertus varicapitulum* Zhu & Huang, 2001
121. *Elachertus viridulus* Spinola (unavailable name in Chalcicoidea)
122. *Elachertus walkeri* (Ratzeburg, 1848)

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### 4.2.3 Genus *Euplectrus* Westwood

*Euplectrus* Westwood, 1932b. 1: 128. Type species *Euplectrus maculiventris* Westwood, by monotypy.

*Diplectron* Dahlbom 1857: 292. Type species *Pteromalus bicolor* Swederus, by designation of Gahan and Fagan, 1923.

*Pachyscapha* Howard, 1897: Type species *Pachyscapha insularis* Howard, by monotypy.

*Rekabia* Cameron, 1904: 65. Type species *Rekabia testaceipes* Cameron, by monotypy.

*Heteroscapus* Brethes, 1918: 9. Type species *Heteroscapus ronnai* Brethes, by monotypy.

*Euplectrus* Crawford, 1909. *Proc. U.S. Natn. Mus.*, 41: 279.

*Euplectrus* Crawford, 1914, *Philipp. J. Sci.* 1(9) : 463.

*Euplectrus* Rohwer, 1921. *Ann. Mag. Nat. Hist.*, 7: 135.

*Euplectrus* Mani, 1941. *Indian J. Ent.*, 3: 25-36.

*Euplectrus* Ferriere, 1941. *Bull. Ent. Res.*, 32: 33.

*Euplectrus* Bhatnagar, 1952. *Indian J. Agr. Sci.*, 21: 173.

*Euplectrus* Mukherjee, 1975. *Mem. School Ent. Agra*, No. 4: 60.

*Euplectrus* Hussain and Khan. 1986. *Orient. Ins.*, 20: 221-223.

*Euplectrus* Boucek, 1988. *Australasian Chalcidoidea.* 633-634.

*Euplectrus* Wijesekara and Schauff, 1994. *Orient. Ins.*, 28: 1-48.

*Euplectrus* Wijesekara and Schauff, 1997. *Proc. Ent. Soc. Wash.* 99(11): 101-109.

*Euplectrus* Zhu and Huang 2002.*Raffles-Bulletin-of-Zoology*, 50(1): 129-136.

*Euplectrus* Kamijo 2003.*Nishi 2 Minami 6, Bibai, Hokkaido* 072-0025, Japan.

*Euplectrus* Schauff and Janzen 2001.*J. Hym. Res.*,10 (2): 181-230.

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**Diagnosis**

The genus *Euplectrus* was proposed by Westwood (1932) with the type species *E. maculiventris.* The genus can be easily distinguished from other allied genera by the following combination of characters: scutellum without longitudinal grooves, which has mostly rather fine sculpture or is almost smooth; pronotum rather short, dorsally with a fine transverse carina; hind tibia with atleast one transverse carina; hind tibia with atleast one spur distinctly longer than basitarsus, thorax mostly with outstanding long bristles, funicle always segmented in female (Boucek, 1988).

**Discussion**

The *Euplectrus* belongs to tribe euplectrini, subfamily Eulophinae. It stands close to the *Euplectromorpha* Girault but differs from it with above mentioned diagnostic characters. The structure of propodeum in *Euplectromorpha* with two strong submedian carinae behind a distinct basal cup or, if latter is extended with H-shaped carinae further separate the two genera. All recent workers have considered the genera *Diplectron* Dahlbom, *Pachyscapha* Howard, *Reckabia* Cameron and *Heteroscapus* Brethes to be synonyms of *Euplectrus* Westwood. Kerrich (1974) synonymized the genus *Rekabia* Cameron with *Euplectus* Westwood. The distinguishing characters of the genus as proposed by Nikol'skaya (1952), Peck *et al.* (1964) and additional generic characters of pronotum, female genitalia and subgenital plate as proposed by Khan and Shafee (1980a) apply well on the present species.

Recently Wijesekara and Schauff (1994) revised the genera and species of the tribe Euplectrini (Eulophidae) and described eight *Euplectrus* spices as new viz., *E. atrafacies, E. colliosilvus, E. geethae, E. litoralis, E. mellocoxus, E. nibilis, E. peechansis* and *E. xanthovulatus.* They transferred five species previously placed in this genus to other euplectrine genera as follows: *E. flavescens* Crawford = *Aroplectrus flavescens* (Carwford), comb. nov.;

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*E. pillippinensis* Ashmead = *Platyplectrus phillippinensis* (Ashmead); comb nov.; *E. rugosus* Crawford = *P. rugosus* (Crawford), comb. nov.; and *E. japonicus* Ashmead = *P. japonicus* (Ashmead), comb. nov. They also removed *E. ornatus* from Euplectrini and placed as *Cirrospilus ornatus* (Mukherjee), comb. nov. (in Eulophinae).

**Biology**

Primary gregarious ectoparasitoids of caterpillars.

**Distribution**

Occurs in all biogeographical regions. Boucek (1988) estimated the number of species to be about 100. Most species are probably in the tropics. There are 12 species each in Australia and North America while 16 species are recorded from India.

**Key to some Indian species of the Genus *Euplectrus* Westwood**

1. All legs, including their coxae uniformly coloured yellow or white. ……..……2

   Legs with differential colour black, brown, reddish brown, light brown or a combination of these. ……..……10

2. Pedicel armed with bristles. ……..……3

   Pedicel without any bristles. ……..……7

3. Pedicel not more than 2 stout bristles. ……..……4

   Pedicel with 5 long strong bristles, entire face dark brown, antennae light brown, scape about 7 times longer than wide, pedicel dark brown, club 2 segmented.

   ..... ***Euplectrus bristlis* Khan *et al.***

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4. Pedicel with 2 stout bristles.

……..……15

Pedicel with only 1 bristle.

……..……6

5. Vertex shallowly and closely punctate face very finely and obscurely punctate; POL more than 3 times as long as OOL; prominence between antennal toruli distinctly more than one-third the width of frons between eyes; antennal scape pale white, rest of the antennal segments hyaline light brown; only one very narrow anellus present; scape 3 times as long as wide, funicle segments subequal about 2 times as long as broad; club unsegmented, distinctly shorter than preceding 2 funicle segments combined, mesoscutum strongly, rugulosely puncatate anteriorly, the punctures not very well defined and virtually coalescent; scutellum and axillae minutely and shallow punctate; gaster mostly white except for a discontinuous centrally interrupted pale brown band apically, laterally and at the extreme base brown.

…***E. maternus* Bhatnagar**

– Vertex and face smooth, without punctuation; POL and OOL almost equal in length, prominence between antennal toruli slightly less than one-third the width of frons between eyes; scape uniformly white, pedicel, anelli and first 2 funicle segments yellow, rest of the flagellum infuscated; only two anelli present; scape 5 times as long as wide; FS1 longest, almost 1.5 times as long as wide, funicle segments 2-4 subequal in size; distinctly longer than wide; club 2 segmented longer than preceding 2 funicle segments together; thorax smooth without punctuation; gaster dark brown except a white patch on middle of dorsum.

……***E. longiscapus* Khan *et al.***

6. Scutellum uniformly punctate; or punctate in the middle.

……..……7

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– Scutellum not likewise, smooth

……..……8

7. Gaster yellow above, with only the sides and a more or less complete transverse band before the end brown, antennae slightly brown at tip; ocelli very large; the lateral ocelli closed to the eye margins than to the front ocellus, pubescence, whitish, funicle segments not sub-equal in length; scutellum uniformly, finely and longitudinally striate; propodeum smooth; petiole slightly broader than long.

…. ***E. leucostomus*** **Rohwer**

– Gaster black with a large yellow spot, without any transverse band; antennae uniformly yellowish white without infuscation at tip; ocelli small, widely separated from the eye margins; the OOL two-third as long as the POL; pubescence brown; funicle segments sub-equal in length; scutellum finely reticulate medially, reticulate lineate laterally; Propodeum shining median furrow distinct, complete, petiole granular, longer than wide.

……***E.euplexiane*** **Rohwer**

8. Pedicel 2 times or about 2 times as long as wide and other character different.

……..……9

– Pedicel slightly longer than broad; gaster yellow with a transverse strip before the end, line on the sides of the second segment and the petiole brown; vertex almost smooth, cilia very scattered; antennae with scape rather short, not reaching to the median ocellus; funicle thicker, the four joints subequal in length.

..…***E. parvulus*** **Ferriere**

9. Gaster black with a rounded yellow spot; antennae brown, scape and pedicel yellow; vertex smooth; ocelli rather large, the lateral ocelli at

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about the same distance from the median ocellus as from the eye margins; scape narrow and elongate, but not reaching to the level of median ocellus; mesoscutum finely reticulate, without median carina, scutellum smooth; MV a little longer than the SMV; the longest hind tibial spur not quite as long as the first 2 tarsal joints together, petiole smooth, elongate, almost 3 times as long as broad.

....***E. petiolatus*** **Ferriere**

– Gaster yellow above, slightly more orange-yellow at tip, only 2 lines on the sides at base and the petiole black; antennae orange-yellow, brown towards tip, scape light yellow; pronotum very short, mesoscutum with irregular transverse striate; scutellum finely reticulate.

...***E. coimbatorensis*** **Ferriere**

10. Pedicel distinctly longer than FS1.

……..……12

– Pedicel not like wise, as long as or shorter than FS1.

……..……11

11. Gaster reddish brown in the middle; ocelli dark reddish brown; POL almost equal in length to OOL; antennal dark brown except scape, pedicel and the anellus joint reddish brown, scape about 4 times as long as wide; funicle segments subequal in size; club unsegmented, equal to ½ of the preceding 2 funicle segments; mesoscutum and scutellum shallowly and closely punctate; longer hind tibial spur distinctly longer than the length of basal 2 tarsal joint together.

….***E. spodoptera*** **Bhatnagar**

– Gaster dark brown with metallic bluish reflections on the dorsum; ocelli white; POL: OOL 0.12: 0.07; antennae yellow with slight infuscation except scape uniformly whitish, 3 anelli present; scape slightly more than 5 times as long as wide; funicle segments gradually increasing in width distad; club 3 segmented, slightly more than 2 times as long as wide;

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mesoscutum longest, tibial spur shorter than the length of basal two tarsal joints together.

……. ***E. viggianii*** **Khan**

12. Pedicel shorter than FS1.

……..……13

– Pedicel as long as FS1.

……..……14

13. Scape white, segment of funicle unequal; hind coxae completely black

…… ***E. bussyi*** **Crawford**

– Scape brown, segments of funicle subequal; hind coxae black basally and reddish brown apically; body black except below antennae light brown and gaster with a light brown patch in the middle; vertex and face very finely and closely punctate, in low power appears to be met with fine grains; antennae brown except scape yellowish white; 2 anelli present.

….. ***E. mathuri*** **Bhatnagar**

14. Mesoscutum coarsely reticulate medioposteriorly, finely and lineately shagreened latero-anteriorly, without a median line or furrow; head without punctures; scutellum faintly longitudinally striate; funicle segements gradually increasing in length, the FS4 somewheat shorter than FS3, club entire.

…….. ***E. utethesiae*** **Mani and Kurian**

– Midlobe of measoscutum reticulately rugose, at reat medially with 1 or 2 longitudinal rugae, which extend forward about one-thrid thelenght of measoscutum; scutellum basally indistinctly reticulate.

…. ***E. nyctemerae*** **Crawford**

15. Antennae light brown with white scape, and pedicle; gaster light yellow except tip, sides and petiole black; petiole rather long, 2 times as long as broad or little less.

……***E. ceyloanensis*** **Howard**

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— Antennae yellowish brown, gaster dark except with a broad yellow patch on mid dorsum before apex.

……..……16

16. Antennae scape white with infuscation, petiole short as long as wide; scutellum with 2 pairs of setae, PMV shorter than SV.

……***E. prashanti* Khan *et al.***

— Antennae pale yellow, petiole 1.5 times longer than wide; scutellum with 3 pairs of setae and PMV longer than SV.

……..***E. scutellaris* sp.nov.**

**4.2.3.1 *Euplectrus scutellaris* sp.nov.** (Plate: 20, Figs.1-8)

**Female** : Body length about 1.740 mm; body colour black; head dark brown and eyes raddish brown; antennae pale yellow; thorax shined black; wings hyaline; legs pale yellow; gaster with yellow circular area covering almost whole dorsal surface of gaster.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.530: 0.45), smooth, head frontal grooves absent; frontovertex wide, width more than ½ the total head width (0.32: 0.53); vertex setae long and sparse, vertexal suture present with 4 setae, ocelli arranged in obtuse angled triangle; POL slightly more than 2 times as long as OOL; compound eyes bulged,large and smooth, eyes orbits round, antennal toruli situated just at the lower level of eye margin, prominence between antennal trouli almost 1/6$^{th}$ the width of frons between eyes (0.04: 0.24); malar sulcus straight; malar space smooth, shorter than eye width (0.14: 0.155); mandibles bidentate,maxillary and labial palp two and one segmented respectively; lower margin of clypeus narrow and straight.

**Antennae (Fig. 2)** : 8 segmented excluding a broad anellus, apical tip of antenna without spicule, antennal formula 1,1,1,4,2; scape cylindrical slightly more than 5.5 times as long as wide (0.25: 0.045), scape apex not touching to mid ocelli;

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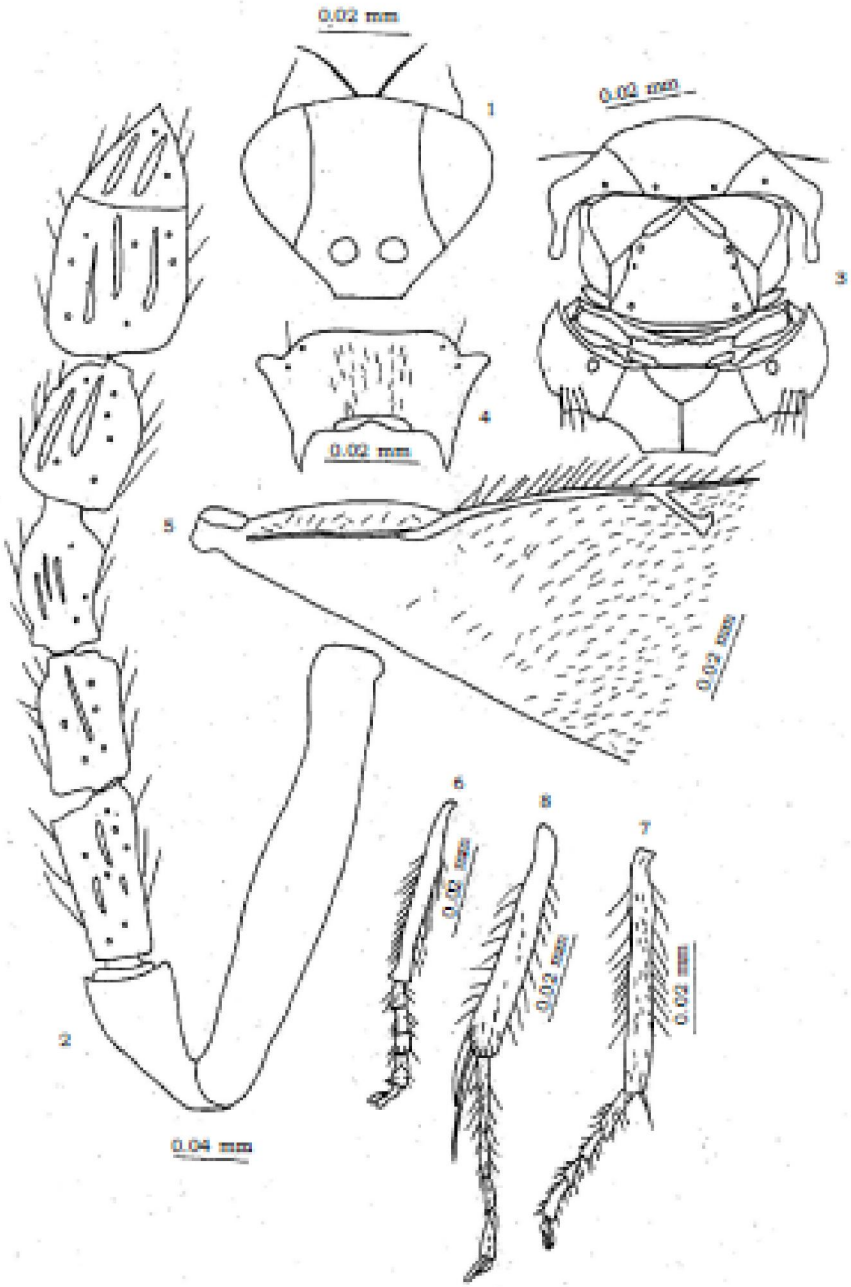


**Plate: 20-figs. 1-8: *Euplectrus scutellaris* sp.nov.**

1. Head in frontal view; 2. Antenna; 3.Thorax in dorsal view; 4.Pronotum; 5.Forewing; 6. Part of foreleg; 7.Part of middle leg; 8. Part of hind leg

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pedicel less than 1.5 times as long as wide (0.063: 0.05) and shorter than the length of the FS1; funicle 4 segmented, FS1 more than 1.5 times as long as wide (0.081: 0.048), FS2 more than 1.5 times as long as wide (0.074 : 0.045), FS3 more than 1.5 times as long as wide (0.077: 0.045), FS4 less than 1.5 times as long as (0.085: 0.075); club 2 segmented, less than 2 times as long as wide (0.141 : 0.075), shorter than preceding two funicle segments combined.

**Thorax (Fig. 3)** : Pronotum brown with setose dorsum, bearing 6 pairs of setae at its posterior margin (Fig. 4), transverse carina at sub posterior margin, anterior margin concave in the middle, postero-lateral margins with projected corners; mesoscutum less than 3.5 times as wide as long (0.305 : 0.180); mesoscutum weakly reticulated having 6 pairs of setae, notauli complete and shallow, median longitudinal sulcus absent; axilla slightly advanced, weakly reticulate and triangular; axillae meeting to each other at mid of transscutal articulation; scutellum with striated type sculpture and highly longer than mesoscutum, less than 2 times as wide as long (0.60: 0.31) with sublateral longitudinal grooves and 3 pairs of setae situated on scutellum; metanotum broad; propodeum with 'Y' shaped median carina and without paraspiracular carinae; propodeal spiracles small and well separated from the anterior margin of propodeum, spiracle rim fully exposed; 4 long setae present on callus.

**Fore wings (Fig. 5)** : More than 2 times as long as wide (1.67 : 0.70); less than 1.5 times longer than hind wing length, densely setose; costal cell long, broad and setose; SMV with 5 setae directed upwards, longer (0.50) than MV (0.49); MV bearing long setae on front edge; PMV more than 1.5 times longer than SV; marginal fringe short; basal vein absent; speculum broad, completely open below; cubital vein wanting, subcubital line of hairs also wanting.

**Hind wings:** Less than 4.5 times as long as wide (1.21: 0.27) with blunt apex; vein length (0.71) less than one half the length of wing.

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**Fore Legs (Fig. 6)**: legs hairy, tibial spur much shorter;

**Mid legs (Fig. 7)**: Tibial spur long; spur shorter than basitarsi.

**Hind legs (Fig. 8)**: Two long tibial spurs, longest tibial spur equal to length of basal 2 tarsal segments together, shortest tibial spur sub equal in length to the first basal segment.

**Gaster:** Subcircular and small; less than 1.5 times as wide as long, gaster surface smooth, 2$^{nd}$ gasteral tergum large, gasteral apical tip blunt, gaster petiolated, petiole longer than broader with knobs at lateral sides; metasoma shorter than mesosoma (0.706: 0.840); ovipositor sheaths not exerted; first valvifers triangular; anterior margin of basal part of second valvifers not much curved; third valvulae rudimentary; cercal setae very long.

**Male:** Not known

**Holotype:** ♀, India, U.P., Saharanpur, Hasanpur, Host not known, sweepnet collection, Arhar, 10-11-07, Hym. Eulo. Nr. 60 (Sandeep Kumar).

**Paratype:** 5 ♀♀, same data as holotype Hym. Eulo Nr. 60A (Sandeep Kumar).

**4.2.3.2 *Euplectrus bristlis* Khan *et al.*** (Plate: 21, Figs.1-11)

**Female**

Dark brown; head ilustrous dark brown, eyes reddish brown; antennae light brown; thorax dark brown with purplish reflections; wings hyaline; legs yellow; gaster dark brown.

**Head (Fig. 1):** Smooth except upper part of the frons very finely reticulate; wider than long in facial view (0.58: 0.43), frontovertex less than 3 times wider than long (036: 0.19), ocelli arranged in obtuse angled triangle; POL: OOL 0.10: 0.11; apex of scape reaching upto the median ocellus; antennal toruli situated (0.08) more than 1/4$^{th}$ the width of frons; malar sulcus absent, length of malar space (0.19) much more than the eye width (0.11); maxillary palp (Fig.2) and

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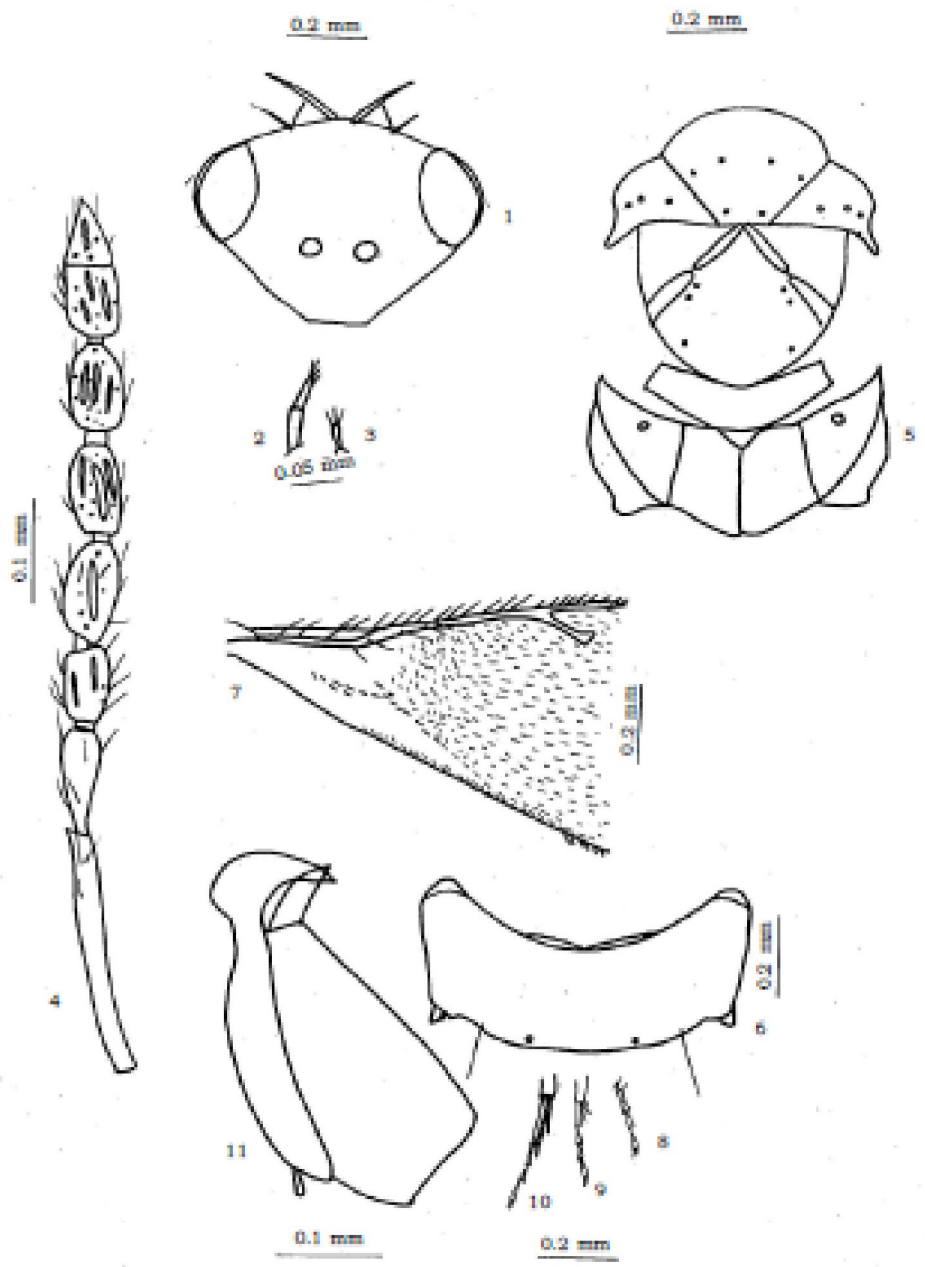


**Plate: 21-figs. 1-11:** ***Euplectrus bristlis*** **Khan** ***et al.***

1. Head in frontal view; 2. Maxillary Palp; 3. Labial palp; 4. Antenna; 5.Thorax in dorsal view; 6.Pronotum; 7.Forewing; 8. Part of foreleg; 9.Part of Middle leg; 10.Part of hind leg; 11.Female genitalia

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labial palp (Fig.3) two and one segmented respectively.

**Antennae(Fig. 4):** scape cylindrical, about 7 times longer than wide (0.25: 0.035), pedicel dark brown, short more than 2 times longer than wide (0.09: 0.035), 2 anelli present; funicle 4 segmented, subequal in size except the FS1 short (0.13: 0.55), numerous sensilla and hairs present.

**Thorax(Fig. 5)** Pronotum reticulate and deeply notched as the anterior margin, posterior margin convex with 2 pairs of long setae, mesoscutum more than 2 times wider than long (0.59 : 0.28) with 6 pairs of setae, midlobe coarsely and strongly reticulate, scutellum propodeum.

**Fore wings (Fig.7):** Hyaline, 2.68 times as long as wide, disc densly setose with a hyaline strip running obliquely parallel to the wing, almost in the middle; costal cell long and broad, disc densly setose; basal vein with a row of 8 setae; basal cell bare; speculum broad and closed below; cubital vein slightly sinuate; subcubital line of hairs starting from the base of cubital vein; SMV with 9 setae directed downward, apical one fourth of the SMV with 4 setae; SMV longer than MV, MV densly setose; PMV very long, 3.3 times as long as SV; marginal fringes short.

**Hind wings:** Broad with blunt apex, nearly 4 times as long as wide.

**Fore Legs (Fig. 8)**: legs hairy, tibial spur much shorter;

**Mid legs (Fig. 9)**: Tibial spur long; spur shorter than basitarsi.

**Hind legs (Fig. 10)**: Two long tibial spurs, longest tibial spur equal to length of basal 2 tarsal segments together, shortest tibial spur sub equal in length to the first basal segment.

**Gaster (Fig. 11):** Distinctly longer, more than 6 times as long as broad, more than 1.5 times the length of the head and thorax combined; ovipositor highly exerted; first valvifer triangular; second valvifer of uniform width, 6.52 times

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longer than third valvlae; third valvulae lanceolate, densly setose; outer plate of ovipositor narrow, tapering at the apex and densly setose.

**Male**: Not know.

**Material examined:** 2 ♀♀, India, U.K., Pantnagar (U.S. Nagar), sweepnet Collection in pigeon pea field, 15/09/2007, Hym. Eulo. Nr. 10 A (Sandeep Kumar).

## Checklist for world fauna of Genus *Euplectrus Westwood*

1. *Euplectrus aburiensis* Ferrière, 1941
2. *Euplectrus acutigaster* Zhu & Huang, 2003
3. *Euplectrus agaristae* Crawford, 1911
4. *Euplectrus albitrophis* Howard (unavailable name in Chalcicoidea)
5. *Euplectrus anae* Schauff, 2001
6. *Euplectrus atrafacies* Wijesekara & Schauff, 1994
7. *Euplectrus australiensis* Ashmead, 1900
8. *Euplectrus bebourensis* Risbec, 1957
9. *Euplectrus bicolor* (Swederus, 1795)
10. *Euplectrus brasiliensis* Ashmead, 1904
11. *Euplectrus brevicarinatus* Zhu & Huang, 2003
12. *Euplectrus brevisetulosus* Zhu & Huang, 2003
13. *Euplectrus brevitarsis* Ferrière, 1941
14. *Euplectrus bristlis* Khan, Agnihotri & Sushil, 2005
15. *Euplectrus cairnsensis* Girault, 1913
16. *Euplectrus cariniscutum* Girault, 1915
17. *Euplectrus carlowae* Schauff, 2001
18. *Euplectrus castaneus* Risbec, 1957
19. *Euplectrus catocalae* Howard, 1885
20. *Euplectrus ceresensis* Ferrière, 1941
21. *Euplectrus ceylonensis* Howard, 1896
22. *Euplectrus chapadae* Ashmead, 1904
23. *Euplectrus cinctiventris* Ferrière, 1941
24. *Euplectrus coimbatorensis* Ferrière, 1941
25. *Euplectrus colliosilvus* Wijesekara & Schauff, 1994
26. *Euplectrus comstockii* Howard, 1880
27. *Euplectrus edithae* Schauff, 2001
28. *Euplectrus epiplemae* Ferrière, 1941
29. *Euplectrus euplexiae* Rohwer, 1921
30. *Euplectrus flavigaster* Zhu & Huang, 2003
31. *Euplectrus flavipes* (Fonscolombe, 1832)
32. *Euplectrus floryae* Schauff, 2001
33. *Euplectrus frontalis* Howard, 1885
34. *Euplectrus fukaii* Crawford, 1911

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35. *Euplectrus fulvicoxis* Ferrière, 1941
36. *Euplectrus furnius* Walker, 1843
37. *Euplectrus fuscicoxalis* Zhu & Huang, 2003
38. *Euplectrus fuscipes* Ferrière, 1941
39. *Euplectrus geethae* Wijesekara & Schauff, 1994
40. *Euplectrus gopimohani* Mani, 1941
41. *Euplectrus hansoni* Schauff, 2001
42. *Euplectrus hargreavesi* Ferrière, 1941
43. *Euplectrus himalayensis* Mani, 1935
44. *Euplectrus hircinus* (Say, 1836)
45. *Euplectrus immargiventris* Girault, 1915
46. *Euplectrus indicus* Ferrière, 1941
47. *Euplectrus ireneae* Schauff, 2001
48. *Euplectrus ivonae* Schauff, 2001
49. *Euplectrus josei* Schauff, 2001
50. *Euplectrus junctus* Gahan, 1927
51. *Euplectrus koebelei* Crawford, 1911
52. *Euplectrus kuboi* Kamijo, 2003
53. *Euplectrus kurandaensis* Girault, 1913
54. *Euplectrus kuwanae* Crawford, 1911
55. *Euplectrus laeviscutellum* Zhu & Huang, 2003
56. *Euplectrus laphygmae* Ferrière, 1941
57. *Euplectrus latifrons* Shafee, Fatma, Khan & Shujauddin, 1984
58. *Euplectrus lenocos* (unavailable name in Chalcicoidea)
59. *Euplectrus leonae* Risbec, 1951
60. *Euplectrus leucostomus* Rohwer, 1921
61. *Euplectrus leucotrophis* Howard, 1885
62. *Euplectrus liparidis* Ferrière, 1941
63. *Euplectrus litoralis* Wijesekara, 1994
64. *Euplectrus longigaster* Zhu & Huang, 2003
65. *Euplectrus longipetiolatus* Zhu & Huang, 2003
66. *Euplectrus longiscapus* Khan, Agnohitri & Sushil, 2005
67. *Euplectrus lutheri* Girault, 1924
68. *Euplectrus maculiventris* Westwood, 1832
69. *Euplectrus magdae* Schauff, 2001
70. *Euplectrus manilae* Ashmead, 1904
71. *Euplectrus marginatus* Ashmead, 1885
72. *Euplectrus mariae* Schauff, 2001
73. *Euplectrus maternus* Bhatnagar, 1952
74. *Euplectrus mathuri* Bhatnagar, 1952
75. *Euplectrus medanensis* Crawford, 1911
76. *Euplectrus melanocephalus* Girault, 1913
77. *Euplectrus mellipes* Provancher, 1887
78. *Euplectrus mellocoxus* Wijesekara & Schauff, 1994
79. *Euplectrus migneti* Girault, 1936
80. *Euplectrus milii* Risbec, 1951
81. *Euplectrus narariae* (Chandy Kurian, 1954)
82. *Euplectrus nibilis* Wijesekara & Schauff, 1994

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83. *Euplectrus nigrescens* Ferrière, 1941
84. *Euplectrus nigroclypeatus* Ferrière, 1941
85. *Euplectrus noctuidiphagus* Yasumatsu, 1953
86. *Euplectrus nuperus* Narendran, 2003
87. *Euplectrus nyctemerae* Crawford, 1912
88. *Euplectrus orias* Schauff, 2001
89. *Euplectrus pachyscapha* Girault, 1917
90. *Euplectrus paribus* Zhu & Huang, 2003
91. *Euplectrus parvulus* Ferrière, 1941
92. *Euplectrus peechansis* Wijesekara & Schauff, 1994
93. *Euplectrus petiolatus* Ferrière, 1941
94. *Euplectrus phthorimaeae* Ferrière, 1941
95. *Euplectrus phytometrae* Risbec, 1951
96. *Euplectrus platyhypenae* Howard, 1885
97. *Euplectrus prashanti* Khan, Agnohitri & Sushil, 2005
98. *Euplectrus primus* Blanchard (unavailable name in Chalcicoidea)
99. *Euplectrus pullipes* Girault, 1915
100. *Euplectrus puttleri* Gordh, 1980

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### 4.2.4 Genus *Diglyphus* Walker

*Diglyphus* Walker, 1848; 145, 235. Type-species *Diglyphus poppoea* Walker, designated by Ashmead, 1904a.

*Diaulus* Ashmead, 1904. 1:356. Type-species. *Diaulus begini* Ashmead, by monotypy. Preoccupied by Mueller, 1879.

*Diaulinus* Schulz, 1906. Replacement name for *Diaulus* Ashmead, not Mueller.

*Cycloscapus* Erdos and Novicky, 1951. 2: 200. Type-species *Cycloscapus puszelensis* Erdos and Novicky, by original designation.

*Diglyphus* Peck, Boucek and Hoffer, 1964. *Mem. Ent. Soc. Can.*, 34: 1-120.

*Diglyphus* Kamijo, 1978. *Kontyu, Tokyo.* 46(3) : 455-469.

*Diglyphus* Gordh and Hendrikson Jr. 1979. *Proc. Entomol. Soc. Wash.*, 81(4): 666-684.

*Diglyphus* Khan, 1985a. *J. Bombay Nat. Hist. Soc.*, 82(1): 149-159.

*Diglyphus* Hussain and Khan, 1986. *Oriental Ins.*, 217.

*Diglyphus* Boucek, 1988. *Australasian Chalcidoidea* (Eulbphid Part) 617.

*Diglyphus* Arifa and Khan. 1991. *J. Bombay Nat. Hist. Soc.* 88(3): 428-438.

*Diglyphus* Yefremova and Shrol 1996.Entomologicheskoe Obozrenie, 75: 426-437.

*Diglyphus* Zhu *et al.* 2000b. *Oriental Ins.*, 34: 263-288.

**Diagnosis**

Body narrow, dark coloured, with a slight metallic glossy and very delicate sculpture, pilosity not conspicuous; funicle 2 segmented in both sexes; notauli incomplete or very shallow and then posteriorly curving outwards to meet the advanced axillae; scutellum with 2 subparallel grooves placed submedially (as in Terastichinae): gaster sessile, elongate (Boucek, 1988).

Few additional generic characters are suggested viz; mandibles quadridentate to pentadentate; maxillary palp and labial palp two and one

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segmented respectively; subgenital plate deeply concave, middle of anterior margin connected with the central notch of posterior margin by longitudinal grooves; first valvifers triangular; outer plates of ovipositor narrow at base gradually widening posteriorly with a submarginal ridge along one half length of dorsal margin; third valvulae short, conical. These characters apply well on the species under study (Khan, 1985a).

**Discussion**

The genus *Diglyphus* Walker, can be easily recognized from other eulophid genera by the distinguishing characters given in detail by Peck *et al.* (1964) and Gordh and Hendrickson Jr. (1979), Kamijo (1978) has dealt elaborately with the genus by giving descriptions of 4 species of *Diglyphus isaea* Walker, *D. minoeus* Walker, *D. pusztensis* Erdos and Novicky and *D. albiscapus* Erdos which were reared from Agromyzid leaf miners such as *Agromyza albipennis, A. oryzae, Chromatomyia horticola* and *Chromatomyia ranunculi*.

Khan (1985a) has done remarkable contribution to the first time from India. He has described 3 new species in detail and provided key to species of the genus. Arifa and Khan (1991) described two species of the genus *Diglyphus* viz. *D. indicus* Arifa and Khan and *D. frontolatus* Arifa and Khan from *Pseudonapomyza asiaticus* and *Liriomyza taraia* respectively.

**Biology**

Parasitoids of dipterous leaf miners, mainly on herbaceous plants, including some crops and ornamental plants.

**Distribution**

Originally northern hemisphere, especially the temperate zone (10 spp.), but several species have been introduced as bio-control agents to various African and Neotropical countries (Boucek, 1988).

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**Key to the Indian species of the genus *Diglyphus* Walker based on females**

1. Fore wings hyaline.

……2

— Fore wings infuscated.

……4

2. Antennae uniformly dark brown.

……3

— Antennae dark brown with funicle segments and club white; body dark brown with golden reflections.

…… ***Diglyphus horticola* Khan**

3. Body iridescent bluish-green with very fine reticulate sculpture; frontovertex with big punctures, wider than long, width about one-half the total head width; POL almost 2 times as long as OOL; prominence between antennal toruli slightly more than one fourth the width of frons between eyes; FS1 less than 3 times as long as wide.

……***D. indicus* Arifa and Khan**

— Body dark brown with very faint iridescent reflections except clypeal region which is yellowish brown, very finely sculputured; forntovertex smooth withut puncture; frontovertex more than 2 times as wide as long, width distinctly more than half the total head width; POL less than one half times as long as OOL; prominence between antennal toruli less than one fourth the width of frons between eyes; pedicel almost 1.5 times as long as wide; 3 anelli present; FS1 distinctly less than 2 times as long as wide.

……***D. frontolatus* Arifa and Khan**

4. Entire club white, funicle segments quadrate, subequal in size; SV longer than PMV.

……***D. mandibularis* Khan**

— Entire club uniformly brown except apex white, funicle segments longer than wide; PMV longer than SV.

……***D. funicularis* Khan**

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**4.2.4.1 *Diglyphus horticola* Khan** (Plate: 22, Figs.1-11)

*Diglyphus horticola* Khan 1985. *J. Bombay Nat. Hist. Soc.*, 82(1): 149-159.

**Female**: Body length about 1.65 mm, general body colour dark brown with golden reflections, and head dark brown with golden reflections; Antennae dark brown with funicle segments and club white; Thorax dark brown with golden reflections with fine reticulate sculpture; Wings hyaline.

**Head** (Fig. 1) : Wider than long in facial view (0.44 : 0.35), width of frons between eyes more than one half of the head width; frontovertex wide, wider than long; ocelli arranged in obtuse angled triangle; distance between two antennal sockets less than their distance from eye rim (0.06 : 0.08); mandibles (Fig.2) pentadentate, the three outer teeth well developed, long with sharp apices, the inner two short and saw-like; maxillary (Fig. 3) and labial palp (Fig.4) two and one segmented, respectively.

**Antennae (Fig. 5)** : Scape cylindrical, six times longer than wide (0.21 : 0.035); pedicel long, almost two times as long as wide (0.07 : 0.030), shorter than first funicle segment, two anelli intervening between pedicel and first funicle segment; funicle two segmented, first funicle segment (0.08: 0.55) distinctly longer than second segment (0.065 : 0.058); club three segmented, three times longer than wide (0.21 : 0.068), longer than funicle segments combined.

**Thorax (Fig. 6)** : Posterior margin of pronotum with eight setae; mesoscutum wider than long (0.26 : 0.25) with four long, strong bristles; parapsidal furrows weak; scutellum (0.25 : 0.21) shorter than mesoscutum with six long, strong bristles; propodeum carinated.

**Fore wings (Fig. 7)** : Densely setose, more than two and a half times longer than wide; submarginal vein long (0.5), with a six strong setae, marginal vein (0.31) distinctly longer than postmarginal vein (0.20), stigmal vein (0.12) less than one half the length of postmarginal vein; costal cell narrow, with ten setae; marginal fringe short.

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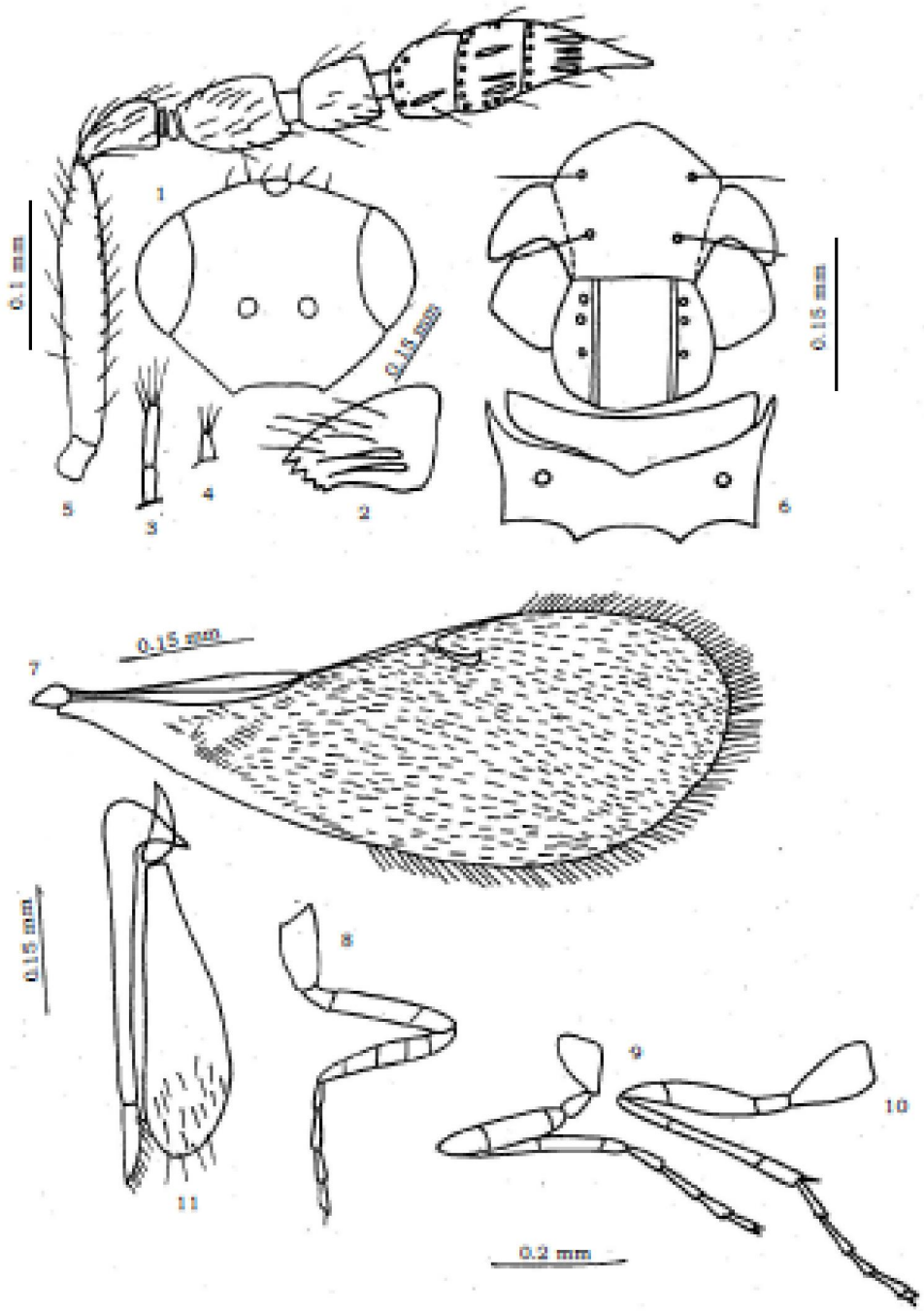


**Plate: 22-figs. 1-11: *Diglyphus horticola* Khan**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.Forewing; 8.Foreleg; 9. Middle leg; 10.hind leg; 11.Female genitalia

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**Hind wings:** Less than five times longer than wide; apex of marginal vein with three curved hooklets; marginal fringe long.

**Fore legs(Fig. 8)** : Coxa, trochanter and femora except apical one to fourth dark brown, apical one foruth of femora and basal tip of tibiae whitish, rest of the tibiae yellowish brown with faint brown patches on basal half and an apical half; tarsal segments yellowish brown.

**Middle legs (Fig.9)** : Coxa, trochanter and femora except basal tip and apical one-fourth dark brown, rest of the leg yellowish with dark brown bands on basal half and on apical half of tibiae; last tarsal segments brownish.

**Hind legs (Fig. 10)**: Coloration same as of middle legs.

**Abdomen**: Longer than thorax; first valvifer triangular (Fig. 11) with articular knobs prominent; second valvifer long with thickened dorsal margin throughout; third valvulae short (Fig.11) movably articulated with second valvifer; outer plates of ovipositor (Fig. 11) narrow at base, broad at apex, basal three fourth with thickened dorsal margin and a ridge in the middle, ovipositor slightly exerted.

**Male**: Not known

**Material examined**: 16 ♀♀, India, U.K., Almora (VPKAS), ex Pea leaf miner, *Chromatomyia horticola* (Diptera: Agromyzidae) on field peas, *Pisum sativum* L. 23/02/08, Hym. Eulo. Nr. 74A (Sandeep Kumar).

**Checklist for world fauna of Genus *Diglyphus* Walker**

1. *Diglyphus agrophlomicum* Kurashev, 1990
2. *Diglyphus albinervis* Zhu, LaSalle & Huang, 2000
3. *Diglyphus albiscapus* Erdös, 1951
4. *Diglyphus albitibiae* Zhu, LaSalle & Huang, 2000
5. *Diglyphus anadolucus* Doganlar, 1982
6. *Diglyphus begini* (Ashmead, 1904)
7. *Diglyphus bimaculatus* Zhu, LaSalle & Huang, 2000
8. *Diglyphus bulbus* Ubaidillah & Yefremova, 2001

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9. *Diglyphus carlylei* (Girault, 1917)
10. *Diglyphus chabrias* (Walker, 1838)
11. *Diglyphus crassinervis* Erdös, 1958
12. *Diglyphus eleanorae* Graham, 1981
13. *Diglyphus frontolatus* Arifa & Khan, 1992
14. *Diglyphus funicularis* Khan, 1985
15. *Diglyphus gibbus* Zhu, LaSalle & Huang, 2000
16. *Diglyphus guptai* (Subba Rao, 1957)
17. *Diglyphus horticola* Khan, 1985
18. *Diglyphus indicus* Arifa & Khan, 1992
19. *Diglyphus inflatus* Zhu, LaSalle & Huang, 2000
20. *Diglyphus insularis* (Gahan, 1914)
21. *Diglyphus intermedius* (Girault, 1916)
22. *Diglyphus isaea* (Walker, 1838)
23. *Diglyphus mandibularis* Khan, 1985
24. *Diglyphus metallicus* Zhu, LaSalle & Huang, 2000
25. *Diglyphus minoeus* (Walker, 1838)
26. *Diglyphus pachyneurus* Graham, 1963
27. *Diglyphus pedicellus* Gordh & Hendrickson, 1979
28. *Diglyphus phytomyzae* (Ruschka, 1912)
29. *Diglyphus poppoea* Walker, 1848
30. *Diglyphus propodealis* Szelényi, 1978
31. *Diglyphus pulchripes* (Crawford, 1912)
32. *Diglyphus pulchripes* (Crawford, 1912) (unavailable name in Chalcicoidea)
33. *Diglyphus pusztensis* (Erdös & Novicky, 1951)
34. *Diglyphus sabulosus* Erdös, 1951
35. *Diglyphus turcomanica* Kurashev, 1990
36. *Diglyphus websteri* (Crawford, 1912)

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## 4.3 Subfamiliy – Entedoninae

### 4.3.1 Genus *Entedon* Dalman

*Entedon* Dalman, 136-137.Type species *Entedon cyanellus* Dalman;designated by Ashmead,1904a.

*Metacrias* Girault, 1913(145):106-108, and (167):151.Type species *Metacrias australiansis* Girault;by Original designation. Syn. n. preoccupied by *Metacrias* Meyrick, 1886.

*Pelorotelopsella* Girault, 1913(167):148.Type species *Pelorotelopsella genu* Girault; by Original designation. Syn. n.

*Entedonella* Girault, 1913(167):154. Type species *Entedonella magnifica* Girault and Dodd; by Original designation.

*Uracrias* Girault, 1993(167):156. Type species *Uracrias excelsus* Girault. by Original designation. Syn. n.

*Acanthentedon* Dodd, 1977:363. Type species *Acanthentedon laticeps* Dodd;By monotypy.

*Metacriasinus* Ghesquiere, 1946:371.Replacement name for *Metacrias* Girault.Syn. n.

*Entedon* Dalman: Erdös, 1944, Species hungaricae generis *Entedon* Dalm. Kalocsa pp.1-64.

*Entedon* Graham 1971.*Trans. R. Ent. Soc. London*, 123: 313-358.

*Entedon* Gumovsky and Boyadzhiev 2003.*Acta Zoologica Bulgarica*,55(3): 3-32.

**Diagnosis**

The genus *Entedon* Dalman can easily be recognized among those of other entedoninae genera by the following characters: The head and thorax in all the *Entedon* species are strongly sclerotised and conspicuously reticulate , but the pilosity is reduced to very few setae ;these are conspicuous ,strong ,but only two pairs of them on the midlobe of mesoscutum.the antennae long in both the sexes

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the flagellum with only one anellus and 5 conspicuous segments, the terminal 2 often especially, in all females, closely united into clava.The tentorial pits are not distinct; the clypeus is transverse, and broad, its lower margin often more or less produced and almost margined by a shallow groove. The upper margin of occiput forms a rectangular edge which is often sharply carinate. The pronotum is medially reduced, non carinate, but laterally forming bristle-bearing subconical projection. The notauli are not well defined in posterior half, the axillae are not distinctly advanced. The scutellum is convex, without any grooves, also at apex without admarginal grooves. The Propodeum is also characteristic with distinct median carina set in a elevated area which bears a lateral subconical projection behind the spiracles, and the elevation is delimited laterally and anteriorly by deep curving groove which may continue inside by a depression where normally a plica would be; the depression is posteriorly connected by a grooved supracoxal flange with a groove outside of the median carina. The female gaster is often sessile or shortly petiolate, in males the petiole is distinctly longer, often distinctly elongate.

**Biology**

Extralimital species are mostly parasites of curculionid or other beetle larvae burrowing in plant stems, or in galls; rarely of some other insects.

**Distribution**

Europe and North America (together perhaps over 100 spp.), tropical countries of Africa and Asia (probably at least 10 spp.but little known) Australasia (at least 12 spp.).

**4.3.1.1** ***Entedon erdosensis*** **sp.nov.** (Plate: 23, Figs.1-12)

**Female** : Body length about 2.18 mm, body sclerotized; body colour black with greenish reflection; head brownish black with clypeal region yellowish brown and eyes reddish black; antennae dark brown except basal half white; thorax

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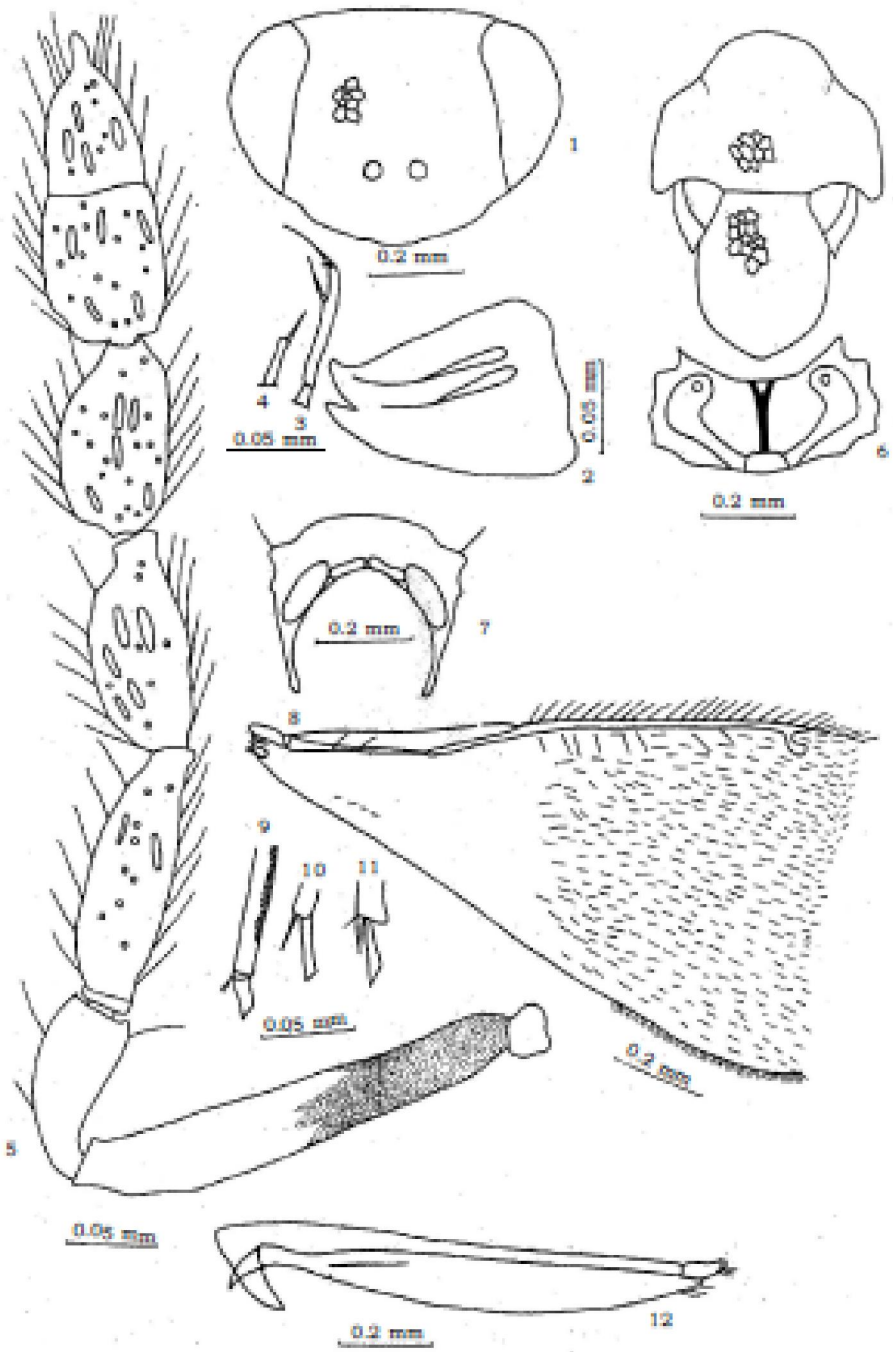


**Plate: 23-figs. 1-12:** ***Entedon erdosensis*** **sp.nov.**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.Pronotum; 8.Forewing; 9. Part of foreleg; 10.Part of Middle leg; 11.Part of hind leg; 12.Female genitalia

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black with greenish shine; wings hyaline with yellowish venation; gaster black with bluish and reddish reflection, iridescent.

**Head (Fig. 1)** : With coarse hexagonal sculpture, wider than long in frontal aspect (0.72: 0.52), head frontal grooves absent; frontovertex wide, width distinctly more than ½ the total head width (0.46 : 0.72); ocelli arranged in obtuse angled triangle; compound eyes bulged, large and smooth, eyes orbits round; antennal toruli situated above the lower level of eye margin, prominence between antennal trouli more than 1/5 the width of frons between eyes (0.08 : 0.44); malar space with raised reticulate sculpture, longer than eye width (0.52 : 0.14); mandibles bidentate (Fig. 2) with 2 acute teeth; maxillary palp (Fig. 3) and labial palp (Fig.4) each single segmented; lower margin of clypeus convexed medially; occipital carina absent.

**Antennae (Fig. 5)** : 7 segmented excluding an anellus, antennae with small longitudinal sensilla, apical tip of antenna with moderate spicule, antennal formula 1,1,1,3,2; scape cylindrical slightly more than 6 times as long as wide (0.235 : 0.038), scape apex not touching to mid ocelli; pedicel with 2 long setae, more than 2 times as long as wide (0.098 : 0.045) and shorter than the length of FS1; funicle 3 segmented, FS1 to FS3 gradually decreasing in length, FS1 slightly more than 3 times as long wide (0.136 : 0.045), FS2 more than 2 times as long as wide (0.118 : 0.052), FS3 less than 2 times as long as wide (0.110 : 0.061); club 2 segmented, more than 2 times as long as wide (0.152 : 0.065), shorter than preceding two funicle segments combined.

**Thorax (Fig. 6)**: Pronotum black with a projection at each postero-lateral margin, bearing a pair of long setae at posterior margin (Fig. 7), anterior margin concave in the middle; mesoscutum less than 1.5 times as wide as long (0.48 : 0.35); mesoscutum coasrsely and strongly reticulate, notauli absent or only as a shallow depression, median longitudinal sulcus absent; axilla almost triangular and advanced; scutellum convex with hexagonally raised reticulate sculpture and

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longer than mesoscutum, less than 1.5 times as wide as long (0.44 : 0.37) without longitudinal grooves and 1 pairs of setae situated near to hind margin of scutellum; metanotum narrow; propodeum with median area smooth and shining; median carina narrow and sharp and with paraspiracular carinae; propodeal spiracles round,small and well separated from the anterior margin of propodeum,spiracle rim not fully exposed, nucha well developed and nearly smooth; supra coxal flange well developed.

**Fore wings (Fig. 8)** : More than 2 times as long as wide (1.651 : 0.750), less than 1.5 times longer than hind wing length, densely setose; costal cell long,broad and bare; SMV with 1 setae directed upwards,slightly shorter (0.565) than MV (0.575); MV narrow bearing small setae on front edge; PMV slightly longer than SV (0.049 : 0.04); marginal fringe short; basal vein absent; speculum broad, completely open below; cubital vein wanting, subcubital line of hairs also wanting.

**Hind wings:** More than 3.5 times as long wide (1.335: 0.35) with acute apex; vein length (0.81) more than ½ the length of wing.

**Legs (Fig. 9,10and 11)** : Fore, mid and hind coxae and femora dark brown rest parts white; fore tibia white with dark brown longitudinal stripe; hind tibia with a pale brown band basally.

**Gaster:** Elongate less than 2.5 times as long as wide (1.2: 0.5), gaster surface smooth; gasteral apical tip acuminate; gaster subsessile, petiole broader than longer; metasoma less than 1.5 times longer than mesosoma (1.2: 0.85); anterior margin of basal part of second valvifers curved; third valvivers more than 2 times as long as wide (0.098 : 0.04), slightly more than 1/10$^{th}$ the length of second valvifers (1.035); outer plates of oviposiotor slightly longer than second valvifers (Fig. 12).

**Male** : Not known

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**Holotype:** ♀, India, U.K., Paurigarhwal, Bharsar, Host not known, sweepnet collection in apple orchard, 02/05/08, Hym. Eulo. Nr. 079 (Sandeep Kumar).

**Paratype:** 2 ♀♀ same data as holotype Hym. Eulo Nr. 079A (Sandeep Kumar).

**4.3.1.2** ***Entedon dubeyensis*** **sp.nov.** (Plate: 24, Figs.1-12)

**Female:** Body length about 2.30 mm; body colour dark brownish black with greenish reflection,eye black; antennae maxillary palpi white, labial palpi dark brown; thorax dark brownish black; wings hyaline; legs with dark brown and white colour combination;gaster brownish black with greenish reflection, irridescent.

**Head (Fig. 1)** : Less than 1.5 times wider than long in frontal aspect (0.712: 0.515), faintly sculptured, head frontal grooves inverted 'U' in shape; back side of head well sculptured; frontovetex wide, width distinctly more than ½ the total head width (0.44: 0.712); vertex setae long and sparse; ocelli arranged in obtuse angled triangle;compound eyes bulged,large and smooth, eyes orbits round, facets uniform in shape and size; antennal toruli situated at the lower level of eye margin, prominence between antennal toruli less than 1/4$^{th}$ the width of frons between eyes (0.04: 0.152),malar sulcus absent; malar space with hexagonally raised reticulate sculpture, less than 1.5 times longer than eye width (0.22: 0.152); mandibles bidentate (Fig.2), inner teeth having serration; maxillary palp (Fig.3) and labial palp (Fig. 4) two and one segmented respectively; lower margin of clypeus straight; occipital carina absent.

**Antennae (Fig. 5)** : 7 segmented excluding an anellus, antennae with small longitudinal sensillae, apical tip of antenna with moderate size spicule, antennal formula 1,1,1,3,2; scape cylindrical slightly more than 5.5 times as long as wide (0.187: 0.032), scape apex not touching to mid ocelli; pedicel with 2 long setae, more than 1.5 times as long as wide (0.067: 0.042) and shorter than the length of the FS1; funicle 3 segmented, FS1 more than 1.5 times as long as wide (0.093:

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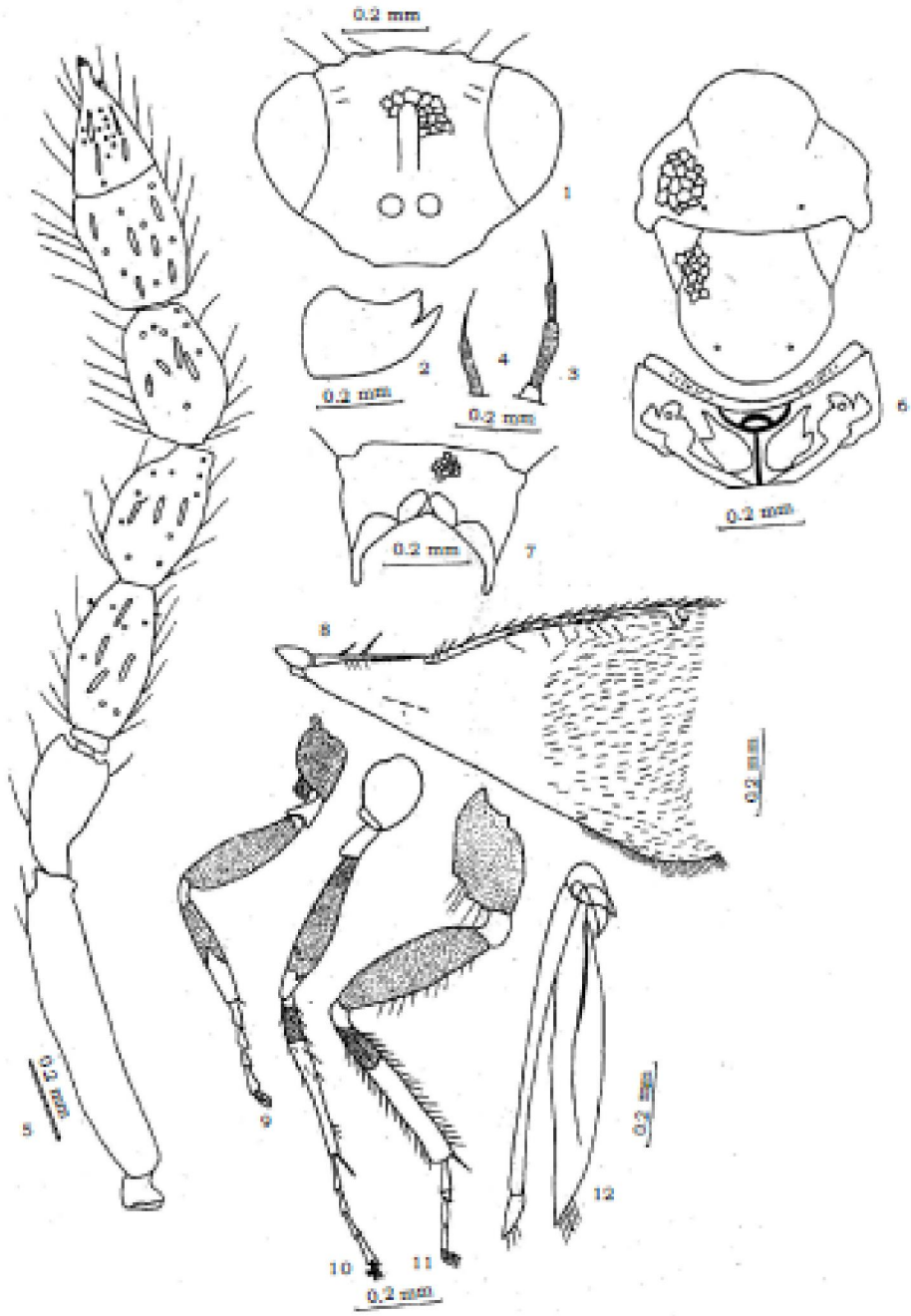


**Plate: 24-figs. 1-12:** ***Entedon dubeyensis*** **sp.nov.**
1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view;7.Pronotum;8.Forewing;9.Foreleg;10.Middle leg;11.hind leg;12.Female genitalia

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0.049), FS2 more than 1.5 times as long as wide (0.086 : 0.05), FS3 almost 1.5 times as long as wide (0.081: 0.054); club 2 segmented,shorter than preceding two funicle segments combined.

**Thorax (Fig. 6)**: Pronotum with hexagonal reticulate sculpture bearing 1 pairs of long setae (Fig. 7) at each postero-lateral margin, antero-lateral arms long, postero-lateral margin with projection at both sides; mesoscutum less than 1.5 times as wide as long (0.504 : 0.354); mesoscutum with hexagonal raised reticulated sculpture,1 pair of adnotaular setae, notauli incomplete and shallow, median longitudinal groove absent; axilla slightly advanced; scutellum slightly convex with hexagonal raised reticulate sculpture and less than 1.5 times than mesoscutum, less than 1.5 times as wide as long (0.50: 0.355) without longitudinal grooves and one pair of setae situated above the hind margin of scutellum; metanotum narrow; propodeum with distinct strong median carina and with distinct paraspiracular carinae, propodeal spiracles round,small and well separated from the anterior margin of propodeum,spiracle rim not fully exposed.

**Fore wings (Fig. 8)** : Round in shape at its apical side, more than 2 times as long as wide (1.34: 0.61), less than 1.5 times longer than hind wing length, densely setose; costal cell short,broad and bare; SMV with 2 setae directed upwards, less than 1.5 times shorter (0.39) than MV (0.535); MV bearing short setae on front edge; PMV slightly longer than SV (0.0425: 0.0390); marginal fringe short spaced by a distance equal to $1/4^{th}$ of the length of fringe; basal vein absent; speculum broad and opened below; cubital vein not well developed with only 3 setae at its base, subcubital line of hairs absent.

**Hind wings**: More than 4 times as long as wide (1.04: 0.24) with blunt apex; vein length (0.66) more than one half the length of wing; marginal fringe spaced by a distance equal to $1/7^{th}$ of their length.

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**Fore legs (Fig. 9)**: Coxa less than 1.5 times as long as wide (0.115: 0.11), less than 2.5 times longer than fore trochanter; femur more than 3.0 times as long as wide (0.305: 0.09); less than 1.5 time longer than tibia in length; fore tarsus shorter than length of tibia (0.23: 0.30); TS1 shorter, longer than next two tarsal segments combined, TS1 longer than tibial spur length, tarsus white except TS4 dark brown.

**Mid legs (Fig.10)** : Coxa less than 1.5 times as long as wide (0.185 : 0.135), almost 2 times longer than mid trochanter; femur less than 4.5 times as long as wide (0.375: 0.085),less than 1.5 times longer than tibia in length; mid tarsus shorter than length of tibia (0.29 : 0.395); TS1 shorter than next two tarsal segment combined, TS1 longer than tibial spur length, tarsus white except TS4 dull dark brown; mid tibial spur much longer than fore and hind tibial spur.

**Hind legs (Fig. 11)**: Hind coxa less than 2 times as long as wide (0.29 : 0.16), almost 3.5 times longer than hind trochanter; femur more than 3 times as long as wide (0.385: 0.115); less than 1.5 times shorter than tibia in length; hind tarsus shorter than length of tibia (0.39: 0.45), TS1 longer than next two tarsal segments combined (0.13 : 0.12), TS1 shorter than hind tibial spur length, tarsus white except TS4 dark brown.

**Gaster** : Large and elongate, more than 1.5 times as long as wide (1.17 : 0.68), gaster surface sparsely setose, 1$^{st}$ gasteral tergum large,gasteral apical tip acuminate, gaster sessile; metasoma more than 1.5 times longer than mesosoma (1.17 : 0.68); ovipositor sheaths exerted; first valvifers semicircular (Fig.12); anterior margin of basal part of second valvifers much curved touching to outer plates of ovipositor, third vulvulae more than 3 times as long as wide (0.11: 0.035), more than 1/7$^{th}$ the length of second valvifers (0.11 : 0.81); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig.12) running beyond the middle of plate.

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**Male:** Not known

**Holotype**: ♀, India, Uttarakhand, Pantnagar, Nagla, Sweepnet collection in castor crop, 18/11/07, Hym. Eulo. Nr. 55 (Sandeep Kumar).

**Paratype:** 8 ♀♀, same data as holotype Hym. Eulo. Nr. 55A (Sandeep Kumar).

**Checklist for world fauna of Genus *Entedon* Dalman**

1. *Entedon abdera* Walker, 1839
2. *Entedon adjunctus* Förster, 1861
3. *Entedon aequilongus* Ratzeburg, 1852
4. *Entedon aereiscapus* (Girault, 1927)
5. *Entedon aerias* (Walker, 1839) (unavailable name in Chalcicoidea)
6. *Entedon aestivalis* Erdös, 1966
7. *Entedon albicrus* Erdös, 1944
8. *Entedon albifemur* Kamijo, 1988
9. *Entedon albigenu* (Dodd, 1915)
10. *Entedon albiscapus* Askew, 1991
11. *Entedon albiziarum* Rasplus, 1990
12. *Entedon alveolatus* Gumovsky, 1996
13. *Entedon amadocus* Walker, 1848
14. *Entedon amethysteus* Gumovsky, 1996
15. *Entedon angorensis* Gumovsky, 1999
16. *Entedon anthonomi* Schauff, 1988
17. *Entedon apionidis* Ferrière, 1938
18. *Entedon apionis* Erdös, 1951
19. *Entedon armigerae* Graham, 1971
20. *Entedon arrabonicus* Erdös, 1954
21. *Entedon ashmeadi* Schauff, 1988
22. *Entedon atrocyanea* (Silvestri, 1914)
23. *Entedon auratus* (Masi, 1924)
24. *Entedon australiansis* (Girault, 1913)
25. *Entedon australiensis* (Girault, 1927)
26. *Entedon axia* Walker, 1848
27. *Entedon betulae* Yang, 1996
28. *Entedon bicolor* Dalman, 1820
29. *Entedon bifasciatus* Dalman (unavailable name in Chalcicoidea)
30. *Entedon bigeloviae* Ashmead, 1894
31. *Entedon biroi* Erdös, 1944
32. *Entedon bouceki* Rasplus, 1990
33. *Entedon broussonetiae* Yang, 1996
34. *Entedon bruchivorus* Rasplus, 1990

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35. *Entedon calcicola* Graham, 1971
36. *Entedon calvescentitus* Szelényi, 1977
37. *Entedon canaliculatus* (Förster, 1841)
38. *Entedon cardui* Askew, 2001
39. *Entedon caudatus* Ratzeburg, 1848
40. *Entedon cavicornis* Ratzeburg, 1852
41. *Entedon chalybaeus* Ratzeburg, 1852
42. *Entedon charino* Walker, 1839
43. *Entedon cioni* Thomson, 1878
44. *Entedon cionobius* Thomson, 1878
45. *Entedon columbianus* Ashmead, 1888
46. *Entedon confinis* Ratzeburg, 1848
47. *Entedon connexus* Ratzeburg, 1852
48. *Entedon coponices* Goureau, 1851
49. *Entedon coquillettii* Riley, 1889
50. *Entedon costalis* Dalman, 1820
51. *Entedon crassiscapus* Erdös, 1944
52. *Entedon cyanellus* Dalman, 1820
53. *Entedon danielssoni* Gumovsky, 1997
54. *Entedon darleneae* Schauff, 1988
55. *Entedon daurises* Walker, 1842
56. *Entedon delvarei* Rasplus, 1990
57. *Entedon diabolus* Rasplus, 1990
58. *Entedon diotimus* Walker, 1839
59. *Entedon ductus* Szelényi, 1977
60. *Entedon epicharis* Huang, 1991
61. *Entedon ergias* Walker, 1839
62. *Entedon ernobii* Schauff, 1988
63. *Entedon excelsus* (Girault, 1913)
64. *Entedon fufius* Walker, 1846
65. *Entedon fursovi* Gumovsky, 1996
66. *Entedon fuscitarsis* Thomson, 1878
67. *Entedon genei* Schauff, 1988
68. *Entedon genu* (Girault, 1913)
69. *Entedon glabrio* Walker, 1846
70. *Entedon gracilior* Graham, 1971
71. *Entedon gunturensis* (Shafee & Rizvi, 1985)
72. *Entedon halli* Gumovsky, 1997
73. *Entedon hercyna* Walker, 1839
74. *Entedon hestia* (Walker, 1839)
75. *Entedon heyeri* (Ratzeburg, 1848)
76. *Entedon hylotomarum* (Ratzeburg, 1844)
77. *Entedon inconspicuus* Ratzeburg, 1852
78. *Entedon incultus* Askew, 1991
79. *Entedon intumescens* Szelényi, 1977
80. *Entedon isander* Walker, 1848
81. *Entedon jozsefi* Gumovsky, 1999
82. *Entedon kerteszi* Erdös, 1944
83. *Entedon lanceolatus* Erdös, 1944

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84. *Entedon laticeps* (Dodd, 1917)
85. *Entedon leucocnemis* Erdös, 1944
86. *Entedon leucopus* Dalman, 1820
87. *Entedon leucopus* (Ashmead, 1888) (junior homonym)
88. *Entedon levadae* Gumovsky, 1999
89. *Entedon longicorpus* (Khan & Shafee, 1983)
90. *Entedon longiventris* Ratzeburg, 1848
91. *Entedon longus* Boucek, 1968
92. *Entedon lucasi* Gumovsky, 2007
93. *Entedon luteipes* Ratzeburg, 1848
94. *Entedon magnificus* (Girault & Dodd, 1913)
95. *Entedon magnus* Crawford, 1915
96. *Entedon manilensis* Crawford, 1915
97. *Entedon marci* Askew, 1992
98. *Entedon marginalis* Askew, 2001
99. *Entedon marusiki* Gumovsky, 1999
100. *Entedon mera* Walker, 1839
101. *Entedon metatarsalis* Thomson, 1878
102. *Entedon methion* Walker, 1839
103. *Entedon nigrini* Boucek, 1974
104. *Entedon nomizonis* Kamijo, 1988
105. *Entedon occidentalis* Girault, 1916
106. *Entedon ocyalus* Walker, 1839
107. *Entedon omnivorus* Rasplus, 1990
108. *Entedon oxys* Askew, 1991
109. *Entedon pallicrus* Erdös, 1944
110. *Entedon pannonicus* Erdös, 1944
111. *Entedon parvicalcar* Thomson, 1878
112. *Entedon pecki* Schauff, 1988
113. *Entedon pempheridis* Ferrière, 1939
114. *Entedon perturbatus* Walker, 1862
115. *Entedon pharnus* Walker, 1839
116. *Entedon philiscus* Walker, 1851
117. *Entedon pinetorum* Ratzeburg, 1852
118. *Entedon pini* Yang, 1996
119. *Entedon procerus* Schauff, 1988
120. *Entedon procioni* Erdös, 1944
121. *Entedon pseudonigritarsis* Erdös, 1944
122. *Entedon pterocarpi* Rasplus, 1990
123. *Entedon pumilae* Yang, 1996
124. *Entedon punctiscapus* Thomson, 1878
125. *Entedon reticulatus* Erdös, 1944
126. *Entedon rex* (Girault, 1929)
127. *Entedon robustus* (Crawford, 1907)
128. *Entedon rumicis* Graham, 1971
129. *Entedon scapus* Efremova & Kriskovich, 1995
130. *Entedon secundarius* (Masi, 1929)
131. *Entedon secundus* (Girault, 1913)

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132. *Entedon senegalensis* Rasplus, 1990
133. *Entedon setifrons* Askew, 1991
134. *Entedon sparetus* Walker, 1839
135. *Entedon squamosus* Thomson, 1878
136. *Entedon stennos* Walker, 1848
137. *Entedon stephanopachi* Heqvist, 1959
138. *Entedon subfumatus* Erdös, 1944
139. *Entedon subpunctatus* Erdös (unavailable name in Chalcicoidea)
140. *Entedon syleptae* Benoit, 1949
141. *Entedon sylvestris* Szelényi, 1981
142. *Entedon tachypterelli* Gahan, 1931
143. *Entedon teedoe* Schauff, 1988
144. *Entedon tenuitarsis* Thomson, 1878
145. *Entedon thestius* (Walker, 1839)
146. *Entedon thomsonianus* Erdös, 1944
147. *Entedon thonis* Walker, 1839
148. *Entedon thoubalensis* (Chishti & Shafee, 1988)
149. *Entedon tibialis* (Nees, 1834)
150. *Entedon tibialis* Szelényi, 1978 (junior homonym)
151. *Entedon tobiasi* Gumovsky, 2003
152. *Entedon transparens* Ratzeburg, 1848
153. *Entedon triangulatus* Szelényi, 1977
154. *Entedon tumiditempli* Yang, 1996
155. *Entedon typographi* Sietner (unavailable name in Chalcicoidea)
156. *Entedon ukrainicus* Gumovsky, 1999
157. *Entedon ulicis* (Perris, 1840)
158. *Entedon ulmi* Erdös, 1954
159. *Entedon unicostatus* Ratzeburg, 1848
160. *Entedon vaginulae* Ratzeburg, 1852
161. *Entedon victoriensis* (Girault, 1928)
162. *Entedon viridis* (Silvestri, 1914)
163. *Entedon vuattouxi* Rasplus, 1990
164. *Entedon washingtoni* Girault, 1917
165. *Entedon wilsonii* Yang, 1996
166. *Entedon xanthostoma* (Ratzeburg, 1844)
167. *Entedon yichunicus* Yang, 1996
168. *Entedon zairensis* Rasplus, 1990
169. *Entedon zanara* Walker, 1839
170. *Entedon zerovae* Gumovsky, 1995

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### 4.3.2 Genus *Chrysocharis* Forster

*Chrysocharis* Forster, 1856, 2: 79. Type-species *Chrysocharis femoralis* Forster, 1861, *Progr. Real. Aachen*, p. 38, by designation of Ashmead, 1904.

*Nesomyia* Ashmead, 1904. 1: 344. Type species *Nesomyia albipes* Ashmead, by monotypy and original designation.

*Omphalchrysocharis* Girault, 1917. V: 3. type species *Omphalchrysocharis orientalis* Girault, by monotypy and original designation.

*Euparacrias* Brethes, 1923. 22: 157. Type species *Paracrias phytomyzae* Brethes, by monotypy.

*Kratochyiliana* Malac, 1943. 6:1. Type species *Kratochyiliana moravica* Malac, by monotypy.

*Epilampsis* Delucchi, 1954a. 3. Type species *Chrysocharis boops* Thomson, by original designation.

*Trichocharis* Delucchi, 1954c. 27: 286. Type species *Chrysocharis pilosa* Delucchi, by original designation (syn. by Boucek and Askew, 1968).

*Oxycharis* Delucchi, 1954c. 27: 286. Type species *Chrysocharis punctifrons* Thomson, by original designation (syn. by Boucek and Askew, 1968).

*Xenocharis* Delucchi, 1954c. 27: 286. Type species *Chrysocharis syma* Walker, by original designation (syn. by Boucek and Askew, 1968).

*Chrysocharis* Peck. 1951. *Agriculture Monogr.*, 2: 1420 pp.

*Chrysocharis* Subba Rao, 1957. *Indian J. Ent.*, 19: 52.

*Chrysocharis* Boucek, 1961. Trudy Moldav. Nauchnoisslled. *Inst. Sadov, Vinogr. Vinod.*, 7: 5-30.

*Chrysocharis* Graham, 1963. *Trans. Soc. Br. Ent.*, 15: 167-225.

*Chrysocharis* Burks, 1967b. Synoptic catalog. Agriculture *Monogr.*, 2 (Suppl. 2): p. 232.

*Chrysocharis* Yoshimoto, 1973b. The *Canadian Entomologist*, 105(11) : 1377-1404.

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*Chrysocharis* Dubey, 1974. *Oriental Ins.*, 8: 417.

*Chrysocharis* Kamijo, 1976. *Kontyu, Tokyo,* 44(4) : 482-495.

*Chrysocharis* Kamijo, 1976. *AKITU*N. Ser. 13: 1-6.

*Chrysocharis* Kamijo, 1979. *Ann. Hist. Nat. Mus. Nat. Hung.*, 71: 251-264.

*Chrysocharis* Szelenyi, 1979. *Acta zoologica Academicae Scientiarum Hungaricae,* XXV. 1-2: 177-181.

*Chrysocharis* Khan, 1985b. *J. Bombay Nat. Hist. Soc.*, 82(2) : 376-380.

*Chrysocharis* Hansson, 1985. *Ent. Scand. Suppl.* 26: 1-130, 1985b. Ent. Scand. 16: 217-226.

*Chrysocharis* Hansson, 1986. *Proc. Ent. Soc. Wash.*, 88: 244-252.

*Chrysocharis* Hussain and Khan, 1986. *Oriental Ins.*, 20: 213-214.

*Chrysocharis* Hansson, 1986. *Proc. Ent. Soc. Wash.*, 88: 244-252.

*Chrysocharis* Hansson, 1987. *Ent. Scand. Suppl.* 3: 1-86.

*Chrysocharis* Boucek, 1988. *Australasian Chalcidoidea* (Eulophid part), p. 719.

*Chrysocharis* Ikeda, 1995. Revision of the Japanese species of *Chrysocharis* (Hymenoptera: Eulophidae). I. *Jpn. J. Ent.* 63(2) : 261-274.

*Chrysocharis* Ikeda, 1996. Revision of hte Japanese species of *Chrysocharis* (Hymenoptera: Eulophidae). II. *Jpn. J. Ent.* 64(2) : 275-287.

*Chrysocharis* Ideka, 1996. Revision of the Japanese species of *Chrysocharis* Hymenoptera: Eulophidae). III. *Jpn. J. Ent.* 64(3) : 551-569.

*Chrysocharis* Ikeda, 1997. Revision of the Japanese species of *Chrysocharis* (Hymenoptera: Eulophidae). IV. *Jpn. J. Ent.* 65(2) : 370-403.

*Chrysocharis* Schauff, 1991. *Contr. Amer. Inst.*, 26(4) : 1-109.

*Chrysocharis* LaSalle, and Schauff, 1992. *Contr. Amer. Ent. Inst.*, 27(1): 1-47.

**Diagnosis**

The genus *Chrysocharis* Forster belongs to the subfamily Entedontinae and is separated from other closely related genra by the following combination of characters viz., member of this group generally small (0.5-2.5 mm long) and

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usually bright metallic green to dark, bluish green; postmarginal vein of the fore wing much longer than the stigmal vein (except in few species, where the postmarginal vein subequal to or shorter than the stigmal vein); antennae 10 segemented with 3 anelli (third anellus largest and most conspicuous in female), the funicle 3 segmented, the club 2 segmented; surface of the eyes densely pubescent, the inner orbits of the eyes broadly emerginate medially, the frontal groove form Y-shaped (except in few species which have a T-shaped arm); petiolar emargination of propodeum generally narrow, semicircular to trapeziform; the petiole genrally conical, or spatulate to elongate, either smooth or with variable sculpture.

**Discussion**

Delucchi (1954a) divided *Chrysocharis* into three genera, *Enaysma* Delucchi, *Epilampsis* Delucchi and *Chrysocharis* s. str, he (1954a) added key to the subgenera and species of *Chrysocharis.*

Subba Rao (1957) reported the genus for the first time from India and described a new species, *Chrysocharis johnsoni* parasitic on *Epilachna 24-punctata.* Dubey (1974) described new species *Chrysocharis ajugus* reared from leaf mining Agromyzidae.

Graham (1959) followed Delucchi's classification and presented key to British species of the genus *Chrysocharis.* Boucek (1961) recognized *Epilampsis* of Delucchi as being the same as *Kratochviliana* Malac. Graham again in 1963 studied the two subgenera viz., *Kratochviliana* and *Chrysocharis* s.str. in detail and indicated that the only character that differentiates *Kratochviliana* from *Chrysocharis* s.str. is the presence (in the former) or absence (in the later) of the marginal collar of the pronotum. Burks (1967) considered the genus *Epilampsis* a synonym of *Kratochvilians.* Malac. based on Boucek revision (1961). Boucek and Askew (1968) synonymized Delucchi's subengeric names, *Trichocharis*, *Oxycharis* and *Xenocharis* in *Epilampsis* under *Chrysocharis*.

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Yoshimoto (1973) followed the subgeneric classification of Graham (1963) and Boucek and Askew (1968) and proposed a key to the subgenera of *Chrysocharis* Forster on the basis of pronotal collar character.

Kamijo (1976) examined the genus *Nesomyia* erected by Ashmead (1904) with it species *albips* and concluded that the genus *nesomyia* should be united with *Chrysocharis* Forster. *N. albines* which has a sharply margined collar belongs to the subgenus *Kratochviliana*. However, as *Nesomyia* had priority over *Kratochviliana* the name *Nesomyia* shout be applied to this subgenus.

The same author in 1977 had described *Chrysocharis ujiyei* Kamijo in detail from Japan, which were reared from various leaf-miners of Lepidoptera, Coleoptera and Diptera.

Kamijo (1979) descriebd in detail the *Chrysocaris pektusana* Kamijo from Korea, along with distinguishing characters of this species which can be well applied to separate this species from allied ones. The characters are the occipital margin conspicuously raised behind the ocelli, the propodeum with basal tongue like projection like in *Mesocharis* and the wings strongly infuscate throughout. Szelenyi (1979) described four new species of the genus *Chrysocharis* Forster viz., *C. aslpiodeae, C. atripes, C. viridula* and *C. duriceps* which were collected from Poland and Switzerland.

Khan (1985b) male significant contribution to the knowledge of the genus by describing the two new species viz., *C. indicus* and *C. funicularis* which were reared from pupae of *Chromatomyia* sp. (Diptera: Agromyzidae) from high altitude of India. He suggested some new generic characters which help in the separation of this genus more accurately from closely allied ones. The characters viz. first valvifer triangular with articular knobs well prominent, thrid valvulae short, lanceolate movably articulated with second valvifer, outer plates of ovipositor with broad apex and a ridge along dorsal margin. Further he also provided a useful key to some Asiatic species of the genus based on females. In

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recent years excellent piece of work has been done by Ikeda. He has made revision of Japanese species of the genus *Chrysocharis* and recognized in total 36 species including 3 new species, and classified into nine groups. His revisionary work on *Chrysocharis* was divided into four parts (1995, 1996a, 1996b, 1997). In the first part he treated 11 species of five species groups the procide, assis, nigrierus, illustris and purpurea groups. In the second part (1996a, 1996b) he treated 10 species of two species groups, the penthens and mediana groups and in third part (1996b) he treated 15 species and classified into two species groups the pubicornis and ainsliei groups, with a key to the Japanes species of the genus. In the fourth part (1997), he disscused the relation among all species groups of *Chrysocharis* based on the following three point view: 1. morphological similarities based on canonical discriminant analysis; II. Morphoclines for 10 characters; III. Parasite-host associations and he concluded that species groups associated with a lepidopterous genus, *Stigmella,* represent primitive forms of *Chrysocharis,* from which the Diptera-feeding groups have evolved through intermediate forms such as species groups associated with multiple hosts.

**Key to subgenera of *Chrysocharis* Forster as proposed by Yoshimoto**

1. Pronotum without a raised or margined collar, area behind collar reticulate with posterolateral corner shiny or sometimes with narrow, shiny, and smooth strip behind middle of margin.

….. *Chrsocharis* s.str.

— Pronotum with a strong raised or margined collar which extends from one side to the other, hind margin usually with wide, smooth, shiny strip which extends from side to side.

….. ***Kratochviliana* Malac**

**Biology**

Primary parasitoids of lepidopterous and dipterous and hymenopterous leaf miners.

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In the present work parasitoids of this genus reared from leaf miner of wild plants (unidentified) and collected by sweepnet in the apple orchards. Presently two new species are described and a revised key to some Asiatic species of genus has also been framed.

**Distribution**

Mainly Northern Hemisphere; Holarctic region (over 100 spp.), Neotropical region (about 10 spp.), Africa (about 2 spp.), Oriental region (about 6 spp.). In Australia and Newzealand 2 spp. introduced probably from Europe (Boucek, 1988).

**Key to some Indian species of the genus *Chrysocharis* based on females**

1. Flagellum with 3 funicle segments.

……..…3

— Flagellum with 4 funicle segments.

……..…2

2. Antennae with 2 anelli,Club 2 segmented, antennal scape greatly flattened with a yellow strip at its ventral side.

……***Chrysocharis funicularis*** **Khan**

— Antennae with 3 anelli, Club unsegmented, antennal scape not flattened and without any yellow strip at its ventral side.

……***C. orientalis*** **sp.nov.**

3. Legs (except coxae) pale.

……..…4

— Legs beyond coxae pale except femora and tarsal segments brown.

……..…6

4. Coxae uniformly brown; head with coarse sculpture; tentorial pits distinct; spiracle very small in size; toruli just above the lower level of eye margin.

…….***C. malus*** **sp.nov.**

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— Petiole not likewise; coxae pale except bases slightly influscated; ocelli arranged in obtuse angled triangle, head with very poor reticulations; pronotum with anterior margin deeply concave in the middle, posterior margin almost straight with 6 long setae.

……..…5

5. POL longer than OOL; antennae just above the lower level of eye margins, prominence between two antennal toruli almost same their distance between eye rim, scape slightly more than 6 times longer than wide, FS1 3 times as along as wide, FS2 and FS3 decreasing in length distad; mesoscutum slightly more than 2 times wider than long without any setae, scutellum sparsely setose; PMV of fore wing more than 3 times the length of SV.

…….***C. indicus*** **Khan**

— POL as long as OOL; antennae inserted well above the lower eye margins, prominence between two antennal touruli 1/4$^{th}$ the distance from eye rim, scape 8 times longer than wide, FS1 and FS2 almost subequal in size, slightly less than 2 times as long as wide, FS3 longer than FS1 and FS2 separately; mesoscutum slightly less than 1.5 times wider than long with 4 long strong bristles, scutellum with ony 4 bristles; PMV of fore wing more than 2 times the length of SV.

……***C. longiscapus*** **Khan *et al.***

6. Head nearly as wide as thorax; antennae with one minute, narrow anellus, scape slender, almost 7 times as long as wide, FS1 about three fourth the pedicel; fore wing hyaline except for a conspicuous and short brown infumation from the stigma backwards across the width of a short distance and gradually disappearing before the middle of wing.

……..***C. horticola*** **Mani**

— Head wider than thorax; antennae with 3 anelli, third anellus very large

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and conspicuous scape cylindrical, 5 time as long as wide, FS1 more than one half the pedicel; fore wing hyaline without any infumation from stigma.

…. ***C. longiclavatus* Khan *et al.***

**4.3.2.1 *Chrysocharis malus* sp.nov.** (Plate: 25, Figs.1-9)

**Female** : Body length about 2.27 mm; body colour metallic greenish brown; head brown with greenish reflection,clypeal region yellowish brown,ocelli pale yellow and eyes brownish yellow; antennae brown except more than half basal area of scape; thorax brown with greenish reflection; wings hyaline with yellowish venation; legs yellowish white except coxae dark brown; gaster dark brown with reddish reflection, irridescent.

**Head (Fig. 1):** Distinctly wider than long in frontal aspect (0.610: 0.480),coarse sculptured,head 'Y' shaped frontal grooves present at centre of head; frontovertex narrow, width more than ½ the total head width (0.350: 0.610); vertex setae long and sparse; ocelli arranged in obtuse angled triangle; POL less than 2 times as long as OOL (0.11: 0.095); compound eyes bulged,large and smooth,eyes orbits emarginated; antennal toruli situated above the lower level of eye margin, prominence between antennal toruli less than 1/5$^{th}$ the width of frons between eyes (0.064: 0.32); malar sulcus absent; malar space smooth, longer than eye width (0.16: 0.145); tentorial pits distinct; mandibles bidentate (Fig. 1) with 2 acute teeth; maxillary palp and labial palp each single segmented; lower margin of clypeus convex medially.

**Antennae (Fig. 2)** : 7 segmented excluding 3 anelli, apical tip of antenna with long spicule, antennal formula 1,1,3,3,2; scape cylindrical,slightly more than 5 times as long as wide (0.222: 0.039); pedicel setose with 4 long setae, more than 2 times as long as wide (0.087: 0.039); third anellus large, almost subequal in size and quadrangular; funicle 3 segmented, FS1 to FS3 gradually decreasing in

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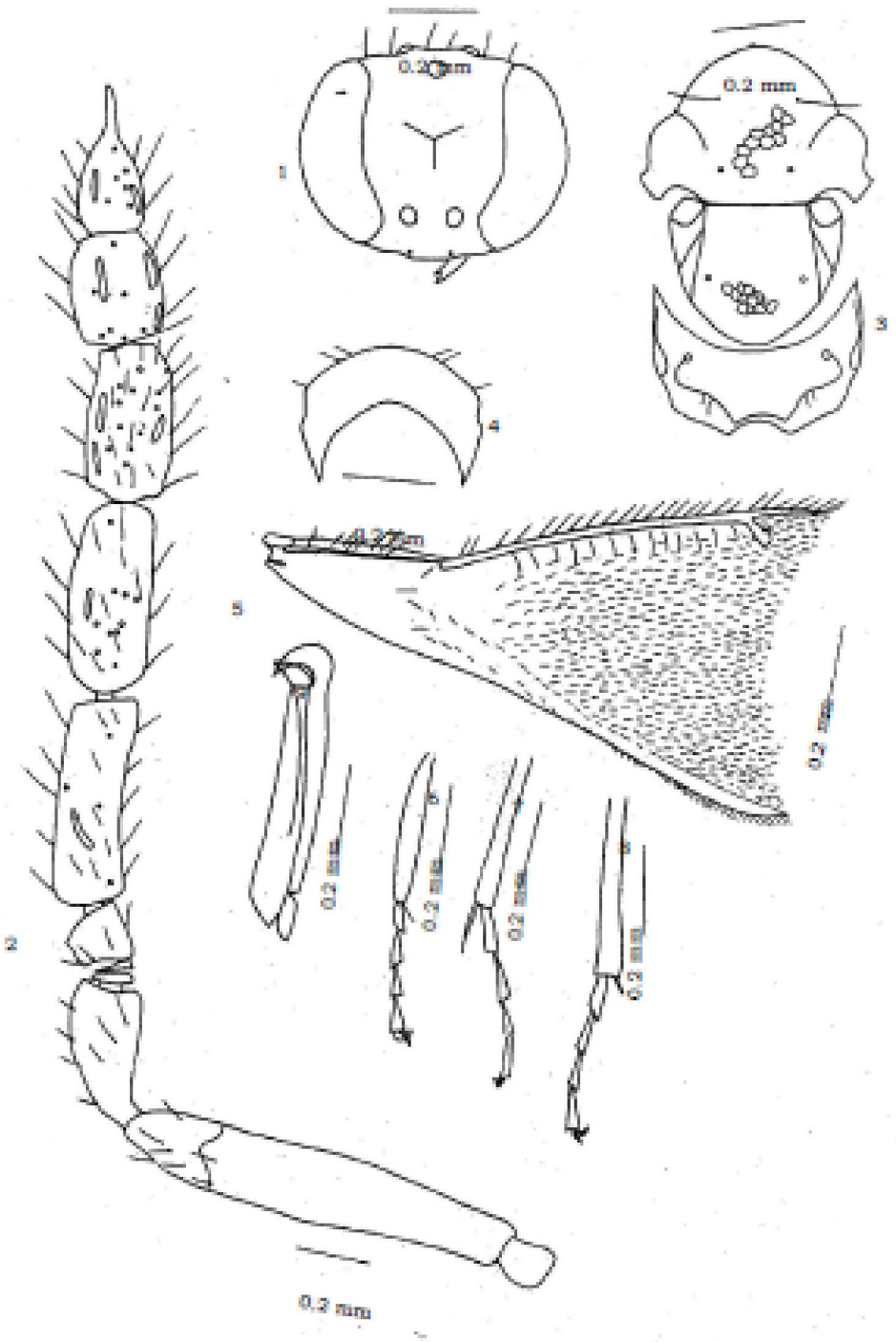


**Plate: 25-figs. 1-9: *Chrysocharis malus* sp.nov.**
1. Head in frontal view; 2. Antenna; 3.Thorax in dorsal view;4.Pronotum;5.Forewing;6.Part of foreleg;7.Part of middle leg;8.Part of hind leg;9.Female genitalia

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length, FS1 more than 3 times as long as wide (0.117: 0.036), FS2 more than 2.5 times as long as wide (0.109: 0.042), FS3 more than 1.5 times as long as wide (0.09 : 0.048); club 2 segmented, more than 2.5 times as long as wide (0.148: 0.052), shorter than preceding two funicle segments combined.

**Thorax (Fig. 3)**: Pronotum brown deep with reticulated sculpture bearing 3 pairs of setae (Fig.4), antero-lateral angles acute; anterior margin concave in the middle; mesoscutum less than 1.5 times as wide as long (0.48: 0.36); mesoscutum having 2 pairs of setae, notauli incomplete and shallow; axilla not advanced,eye shaped;scutellum slightly convex with hexagonal reticulated sculpture and shorter than mesoscutum, less than 2 times as wide and long (0.44: 0.325) without median longitudinal grooves and one pairs of setae situated on scutellum; metanotum narrow; propodeum without median carina and with paraspiracular carinae, propodeal spiracles round,small and well separated from the anterior margin of propodeum by a space more than of its own diameter, spiracle rim not fully exposed.

**Fore wings (Fig. 5)** : Round in shape at its apex, more than 2 times as long as wide (1.530: 0.70), less than one and half times longer than hind wing length, densely setose; costal cell narrow and bare; SMV with 2 setae directed upwards, shorter (0.435) than MV 0.655); MV bearing 17 long setae on front edge; PMV four times longer than SV;basal vein with 3 setae, basal cell bare; speculum narrow, closed below;marginal fringe short; cubital vein straight, subcubital line of hairs arising from the base of cubital vein.

**Hind wings**: More than 3.5 times as long as wide (1.205: 0.31) with blunt apex; vein length (0.75) ,more than ½ the length of wing.

**Legs (6, 7 and 8)** : Mid tibial spur much longer than fore and hind tibial spur.

**Gaster** : Large and ovate, less than 2 times as long as wide (0.925: 0.525), gaster surface smooth,densely setose at the posterior end of the gaster, 1$^{st}$ gasteral

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tergum large in size, gasteral apical tip acuminate;gaster petiolated, petiole broader than longer; metasoma almost equal to mesosoma in length, ovipositor sheaths not exerted; first valvifers semicircular (Fig. 9); anterior margin of basal part of second valvifers curved; third valvulae not movably articulated with second valvifers,third vulvulae more than 2.5 times as long as wide (0.10 : 0.04), more than 1/5$^{th}$ of the length of second valvifers (0.565); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin (Fig. 9).

**Male**: Not known.

**Holotype**: ♀, India, U.K., Bharsar, Host not known, Sweepnet collection in Apple orchard, 03/05/08, Hym. Eulo. Nr. 93 (Sandeep Kumar).

**Paratype**: 2 ♀♀, same data as holotype Hym. Eulo. Nr. 93 A (Sandeep Kumar).

**4.3.2.2 *Chrysocharis orientalis* sp.nov.** (Plate: 26, Figs.1-13)

**Female:** Body length about 1.65 mm; body colour blackish brown with metallic greenish reflection; head brown with reddish reflection; eyes pale yellow; antennae dark brown except scape pale yellow with dark brown basal tip; thorax metallic blackish brown with greenish reflection; wings hyaline; legs pale yellow except base of coxae slightly infuscated and sculptured; gaster blackish brown.

**Head (Fig.1 ):**Less than 1.5 times wider than long in frontal aspect (0.54:0.45) with reticulated sculpture, sparsely setose; frontovertex wide with reticulated sculpture, width more than one half the total head width (0.30:0.54); frontal fork 'Y' shaped; ocelli arranged in obtuse triangle; POL slightly less than 1.5 times as long as OOL; antennal toruli inserted just above the lower level of eye margin, prominence between antennal toruli almost 1/5$^{th}$ the width of frons between eyes (0.060: 0.30); malar sulcus not prominent; malar space longer than eye width (0.15:0.105); mandibles bidentate with 2 acute teeth; maxillary palp (Fig.2 ) and labial palp (Fig. 3 ) each single segmented and dark brown; lower margin of clypeus convex medially.

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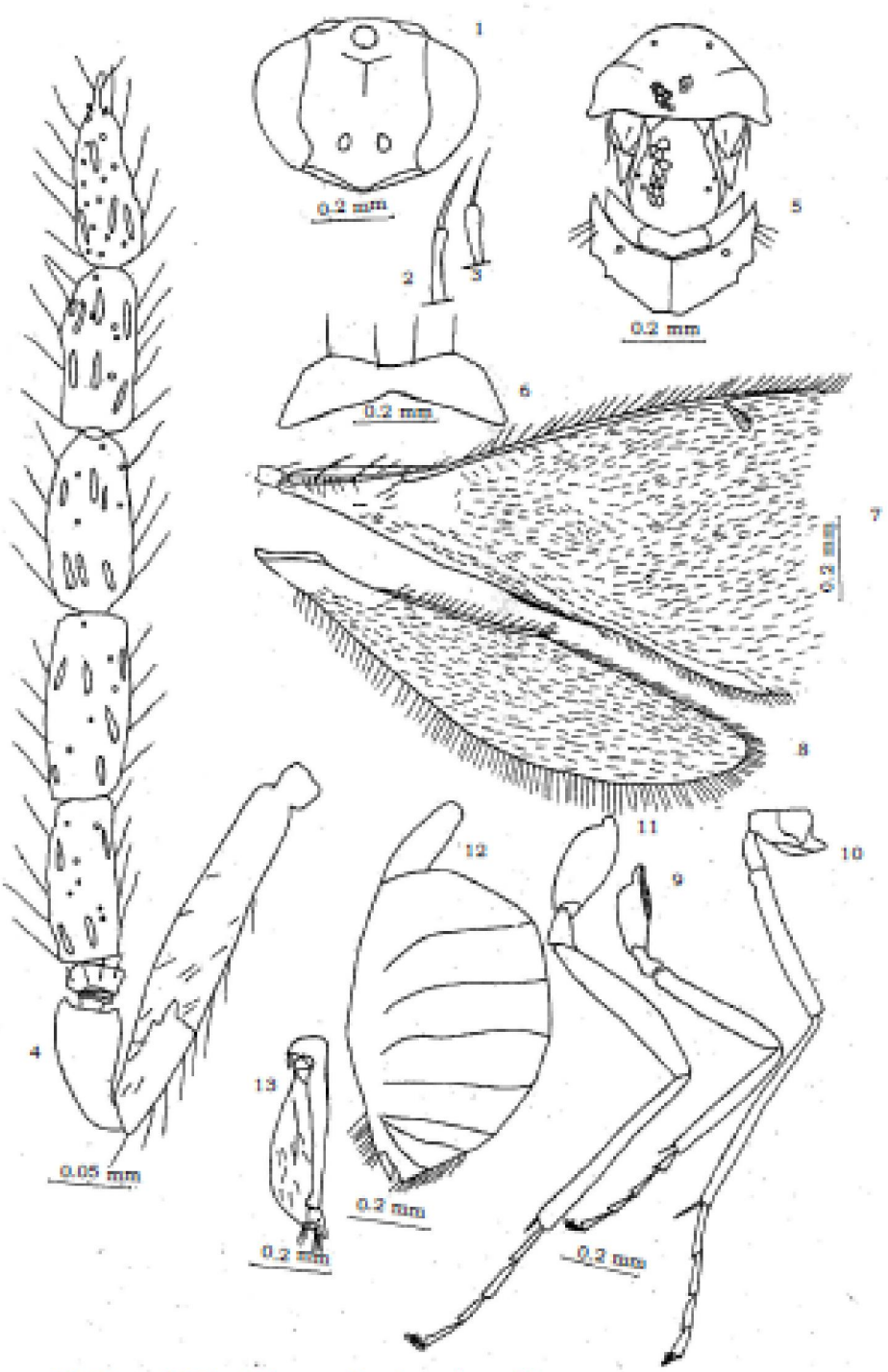


**Plate: 26-figs. 1-13: *Chrysocharis orientalis* sp.nov.**

1. Head in frontal view; 2. Maxillary Palp; 3. Labial palp; 4. Antenna; 5.Thorax in dorsal view; 6.Pronotum; 7.Forewing; 8.Hindwing; 9.Foreleg; 10. Middle leg; 11.hind leg; 12.Gaster; 13.Female genitalia

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**Antennae (Fig. 4 ):** moderately setose;7 segmented excluding 3 anelli,third anellus almost quadrate and large (0.03:0.025); scape cylindrical,slightly more than 5.5 times as long as wide (0.225:0.04); pedicel slightly more than 1.5 times as long as wide (0.062:0.04); almost equal to the length of the FS1; funicle 4 segmented, FS1 and FS4 almost subequal in size (0.10:0.42), FS2 and FS3 almost subequal in size (0.11:0.052); club unsegmented, more than 3 times as long as wide (0.12:0.038), much shorter than preceding two funicle segments combined.

**Thorax (Fig. 5):** having reticulated sculpture; Pronotum with 3 pairs of setae (Fig. 6), postero-lateral margins angled, anterior margin deeply concave in the middle; mesoscutum more than 1.5 times as wide as long (0.45:0.24); mesoscutum bearing two setae at each lateral margin, notuli incomplete, axillae more or less not advanced, widely separated from each other,mesoscutum and scutellum with reticulated sculpture; scutellum slightly convex and longer than mesoscutum, less than 1.5 times as wide as long (0.32:0.29) without submedian grooves and two pairs of setae; propodeum with median carina, spiracles well separated from the anterior margin of propodeum by a space equal to two times of its own diameter, surface of the propodeum smooth.

**Fore wings (Fig. 7)** broad and round at apex, more than 2 times as long as wide (1.70:0.75), densely setose;costal cell moderate in size; SMV with 2 setae directed upwards, shorter (0.43) than MV (0.71);SV short (0.09) a trifle more than ½ of the length of PMV (0.19); marginal fringe moderately long; basal vein with 4 setae, basal cell bare; speculum moderate, closed below; cubital vein sinuate, subcubital line of hairs starting from the base of cubital vein.

**Hind wings (Fig. 8):** Marginal vein yellow; more than 4 times as long as wide (1.32:0.3) with blunt apex; marginal fringe long.

**Legs (Fig. 9, 10 and 11):** Fore, mid and hind coxae infuscated having reticulated sculpture; mid tibial spur much longer than fore and hind tibial spur.

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**Gaster (Fig. 12):** metasoma longer than mesosoma; gaster bulged and ovate, petiole long (0.17), anterior portion yellowish brown and posterior portion of petiole black, having reticulated sculpture, slightly more than 1/4$^{th}$ the length of gaster excluding petiole length (0.17:0.70); apex of gaster pointed; gaster petiolated, sparsely setose at the posterior end of the gaster, ovipositor not exerted, first valvifers triangular with prominent articular knobs; (Fig. 13);anterior margin of basal part of second valvifers much curved; third valvulae 1/6$^{th}$ the length of second valvifers (0.07:0.42); outer plates of ovipositor round at its apex with a ridge along basal half of dorsal margin running obliquely up to middle of plate.

**Male:** Not known

**Holotype:** ♀, India, U.K., Bharsar, Host not known, Sweepnet collection in Apple orchard, 0.02.11.91. Hym. Eulo. Nr.82 (Sandeep Kumar).

**Paratype:** 6 ♀♀,same data as holotype Hym. Eulo Nr.82A (Sandeep Kumar).

**4.3.2.3** ***Chrysocharis longiclavatus*** **Khan** ***et.al*** (Plate: 27, Figs.1-10)

**Female** : Length about 1.26 mm (holotype), general body colour yellowish brown;head yellowish brown throughout; antennae uniformly dark brown except scape with very slight infuscations on basal part;thorax yellowish brown throughout smooth except with white longitudinal band extending from mesoscutum to posterior end of scutellum; wings hyaline with yellow venation; Fore legs uniformly yellowish except coxae, basal two third of femora and all tarsal segments brown,middle legs uniformly yellowish except last tarsal segment brownish, hind legs yellowish except coxae, basal half of femora and last two tarsal segment brownish.

**Head** (Fig.1) : Wider than long in frontal aspect (0.33: 0.25); width of frons between eyes less than one half the head width (0.15: 0.33); frontovertex wide, frontal fork ‘Y’ shaped; ocelli arranged in obtuse angle triangle; malar space

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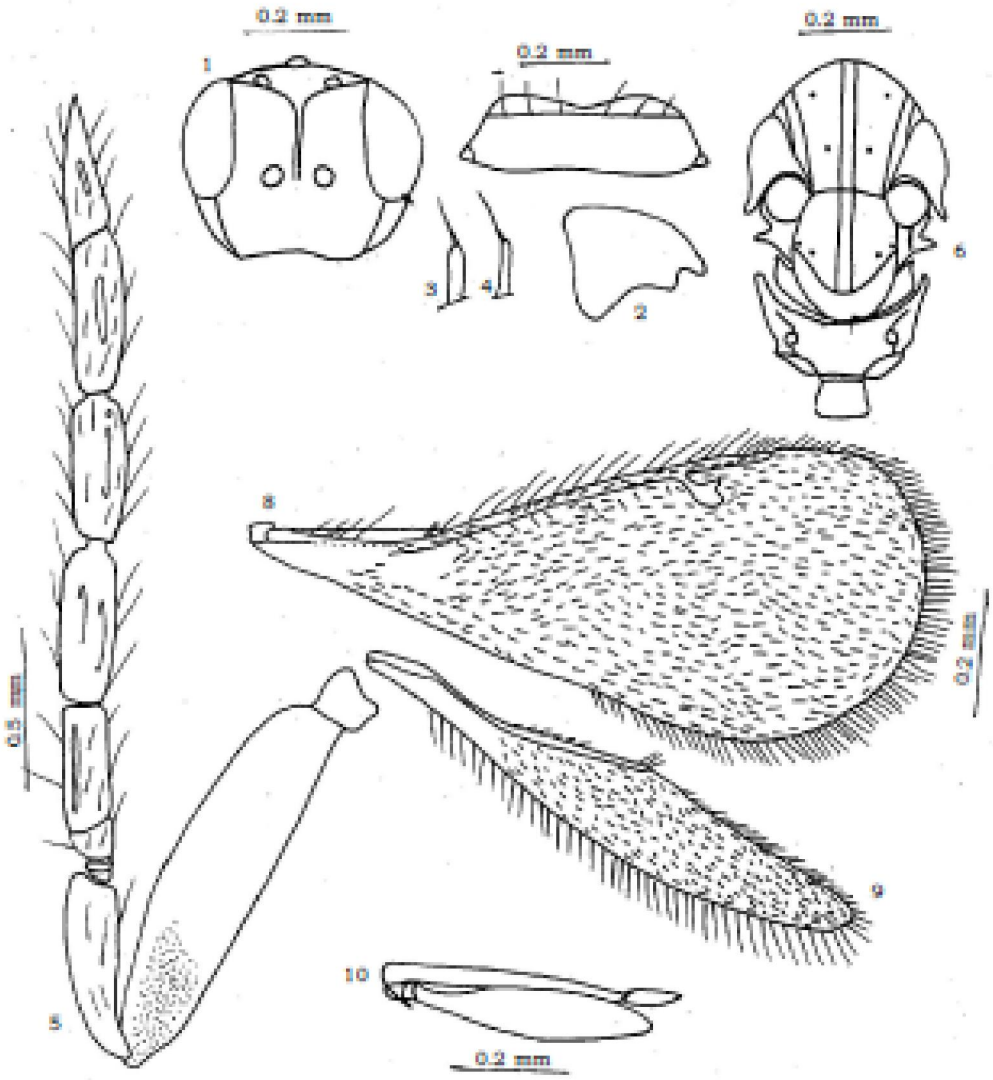


**Plate: 27-figs. 1-10:** ***Chrysocharis longiclavatus*** **Khan** ***et.al***

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view; 7.Pronotum; 8.Forewing; 9.Hindwing; 10.Female genitalia

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almost equal to transverse diameter of eyes (0.08: 0.08) and also equal to one half the length of the eye (0.16); antennae inserted just above the lower level of eye margins, distance between two antennal sockets less than two times their distance between eye rim (0.05: 0.03); apex of scape not reaching level of anterior ocellus; mandibles bidentate (Fig.2) with sharp apices; maxillary (Fig.3) and labial palpi (Fig.4) each one segmented.

**Antennae (Fig.5)** : Seven segmented excluding three anelli; scape cylindrical, five times as long as wide (0.15: 0.03); pedicel more than two times as long as wide (0.06: 0.025), much longer than first funicle segment; third anellus very large and conspicuous; funicle three segmented, first funicle segment longer than wide (0.035: 0.025), second and third funicle segment slightly decreasing in length distad, combined length of pedicel and first two funicle segments almost equal to the length of scape; club two segmented with a long spicule, a trifle longer than preceding two funicle segments combined.

**Thorax (Fig.6)** : Pronotum smooth, feebly reticulate, posterior margin with three pairs of setae, antero-lateral arms obtuse and laterally directed (Figg.7); mesoscutum one and a half times wider than long (0.24: 0.16) with two pairs of bristles; axillae widely separated from each other; scutellum longer than wide (0.17 : 0.13), slightly longer than mesoscutum; propodeum smooth, mesal length (0.06) more than one third length of scutellum, paraspiracular carinae present, propodeal spiracle separated from anterior margin by a space equal to diameter of a spiracle; mesopostphragma not reaching beyond the propodeum.

**Fore wings (Fig. 8)** : Less than three times longer than wide (0.91: 0.37), round at apex; costal cell long, narrow and almost asetose; marginal vein long (0.34),slightly less than three times longer than post marginal vein (0.12); stigmal vein (0.06) equal to one half the length of post marginal vein; basal vein with four setae; basal cell bare; speculum moderate, closed below; cubital vein sinuate; subcubital line of hairs starting from the base of cubital vein; marginal fringe short and spaced by a distance equal to the one fourth their length.

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**Hind wings (Fig. 9):** Slightly more than six times longer than wide (0.73: 0.12); apex of marginal vein with three hooklets; marginal fringe long, spaced by a distance more than one fourth their length.

**Legs**: Femora of fore leg with long setae at apical end; one small peg on each tarsal segment.

**Gaster** : Longer than thorax excluding length of petiole; petiole long; ovipositor slightly concealed; first valvifer triangular (Fig.10) with articular knobs prominent; second valvifer of uniform width; third valulae short lanceolate (Fig.10); movably articulated with second valvifer; outer plates of ovipositor with broad apex.

**Male**: Not known

**Material examined**: 3 ♀♀, India, U.K., Ranikhet, Chaubatia, host unknown, sweepnet collection in apple orchards, 16/08/07, Hym. Eulo. Nr. 110 (Sandeep Kumar).

**Checklist for world fauna of Genus *Chrysocharis* Forster**

1. *Chrysocharis absentia* Hansson, 1997
2. *Chrysocharis acoris* (Walker, 1839)
3. *Chrysocharis acutigaster* Hansson, 1985
4. *Chrysocharis aegyptiensis* Hansson, 1985
5. *Chrysocharis ainsliei* Crawford, 1912
6. *Chrysocharis ajugus* Dubey, 1974
7. *Chrysocharis albicoxis* Erdös, 1958
8. *Chrysocharis albipes* (unavailable name in Chalcicoidea)
9. *Chrysocharis albipes* (Ashmead, 1904)
10. *Chrysocharis alpinus* Yefremova, 2001
11. *Chrysocharis aluta* Yoshimoto, 1973
12. *Chrysocharis amanus* (Walker, 1839)
13. *Chrysocharis amasis* (Walker, 1839)
14. *Chrysocharis amyite* (Walker, 1839)
15. *Chrysocharis antoni* Hansson, 1985
16. *Chrysocharis arctica* (Erdös, 1950)
17. *Chrysocharis argyropezae* Graham, 1963
18. *Chrysocharis assis* (Walker, 1839)
19. *Chrysocharis auratus* (Ashmead, 1887)

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20. *Chrysocharis avia* Hansson, 1985
21. *Chrysocharis bambeyi* Risbec, 1951
22. *Chrysocharis beckeri* Yoshimoto, 1973
23. *Chrysocharis bedius* (Walker, 1842)
24. *Chrysocharis bestiola* Hansson, 1985
25. *Chrysocharis boriquenensis* Hansson, 1987
26. *Chrysocharis caribea* Boucek, 1977
27. *Chrysocharis cerodonthae* Hansson, 1987
28. *Chrysocharis cerris* Erdös, 1961
29. *Chrysocharis chlorus* Graham, 1963
30. *Chrysocharis chromatomyiae* Hansson, 1987
31. *Chrysocharis cimbicis* (Brues, 1909)
32. *Chrysocharis clarkae* Yoshimoto, 1973
33. *Chrysocharis collaris* Graham, 1963
34. *Chrysocharis compressicornis* Ashmead, 1895
35. *Chrysocharis coptodiscae* Yoshimoto, 1973
36. *Chrysocharis cornigera* Hansson, 1995
37. *Chrysocharis costalimai* (Guimaraes, 1957)
38. *Chrysocharis crassiscapus* (Thomson, 1878)
39. *Chrysocharis debussyi* Hansson, 1985
40. *Chrysocharis discalis* Graham, 1975
41. *Chrysocharis echinata* (Mani, 1989)
42. *Chrysocharis elongata* (Thomson, 1878)
43. *Chrysocharis entedonoides* (Walker, 1872)
44. *Chrysocharis equiseti* Hansson, 1985
45. *Chrysocharis eurynota* Graham, 1963
46. *Chrysocharis euterpe* Hansson, 1985
47. *Chrysocharis flacilla* (Walker, 1842)
48. *Chrysocharis flaviclypeus* Hansson, 1987
49. *Chrysocharis foliincolarum* (Christ, 1791)
50. *Chrysocharis frigida* Baur & Hansson, 1997
51. *Chrysocharis fulviscapus* Hansson, 1987
52. *Chrysocharis funicularis* Khan, 1985
53. *Chrysocharis gallicola* (Costa Lima, 1930)
54. *Chrysocharis gemina* Hansson, 1987
55. *Chrysocharis gemma* (Walker, 1839)
56. *Chrysocharis gibsoni* Hansson, 1987
57. *Chrysocharis giraulti* Yoshimoto, 1973
58. *Chrysocharis griffithsi* Hansson, 1987
59. *Chrysocharis horticola* Mani, 1971
60. *Chrysocharis idyia* (Walker, 1839)
61. *Chrysocharis ignota* Hansson, 1987
62. *Chrysocharis illustris* Graham, 1963
63. *Chrysocharis imbrasus* (Walker, 1847)

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64. *Chrysocharis imphalensis* (Chishti & Shafee, 1988)
65. *Chrysocharis indicus* Khan, 1985
66. *Chrysocharis johnsoni* Subba Rao, 1957
67. *Chrysocharis kimamaensis* Hansson, 1987
68. *Chrysocharis lankensis* Hansson, 1985
69. *Chrysocharis laomedon* (Walker, 1839)
70. *Chrysocharis laricinellae* (Ratzeburg, 1848)
71. *Chrysocharis latifossa* Hansson, 1985
72. *Chrysocharis lepelleyi* Ferrière, 1936
73. *Chrysocharis liriomyzae* Delucchi, 1954
74. *Chrysocharis longiclavatus* Khan, Agnihotri & Sushil, 2005
75. *Chrysocharis longicoxa* Hansson, 1987
76. *Chrysocharis longigaster* Hansson, 1987
77. *Chrysocharis longinerva* Hansson, 1997
78. *Chrysocharis longiscapus* Khan, Agnihotri & Sushil, 2005
79. *Chrysocharis longitarsus* Hansson, 1985
80. *Chrysocharis loranthellae* Erdös, 1954
81. *Chrysocharis lubrica* Ikeda, 1996
82. *Chrysocharis maculipennis* (Brèthes, 1922)
83. *Chrysocharis maya* Hansson, 1997
84. *Chrysocharis mediana* Förster, 1861
85. *Chrysocharis minuta* (Hansson, 1986)
86. *Chrysocharis miranda* Graham, 1983
87. *Chrysocharis moravica* (Malac, 1943)
88. *Chrysocharis nautius* (Walker, 1846)
89. *Chrysocharis nephereus* (Walker, 1839)
90. *Chrysocharis nephereus* (Walker, 1839)
91. *Chrysocharis nephereus* (Walker, 1839) (unavailable name in Chalcicoidea)
92. *Chrysocharis nigra* Ikeda, 1996
93. *Chrysocharis nigricrus* (Thomson, 1878)
94. *Chrysocharis nitetis* (Walker, 1839)
95. *Chrysocharis nitida* Hansson, 1985
96. *Chrysocharis nitidifrons* Graham, 1963
97. *Chrysocharis occidentalis* (Girault, 1916)
98. *Chrysocharis omari* (Girault, 1917)
99. *Chrysocharis orbicularis* (Nees, 1834)
100. *Chrysocharis oscinidis* Ashmead, 1888

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### 4.3.3 Genus *Neochrysocharis* Kurdjumov

*Neochrysocharis* Kurdjumov, 1912. Type species; *N. immaculate* Kurdjumov, 1912: 234 (*Cirrospilus aratus* Walker, 1838: 453) by original designation.

*Rhicnopeltimyia* Girault, 1913: 174. Type species; *Rhicnopeltimyia washingtoni* Girault, 1913:174; by original designation. Syn. by Hansson 1995.

*Heterocharis* Erdos, 1954: 343. Type species *Neochrysocharis alipes* Kurdjumov, 1912: 235, by original designation. Syn. by Boucek, 1957 (subgenus of *Neochrysocharis*).

*Fereceranisus* Szelenyi, 1977: 241. Type species *Fereceranisus hartigi* Szelenyi, 1977: 241, by monotypy and original designation. Syn. by Hansson, 1995.

*Neochrysocharis* Khan and Shafee. 1980b. *J. Bombay Nat. Hist. Soc.*, 76(3): 486-490.

*Neochrysocharis* Hansson, 1990. *Ent. Scand.*, 20: 29-52.

*Neochrysocharis* Hansson, 1995. *Ent. Scand.*, 26(1) : 29-52.

*Neochrysocharis* Fisher and LaSalle 2005.*Zootaxa*, 1044: 27-34.

**Diagnosis**

Antenna with 3-segmented clava, flagellum with sensilla ampullavea shaped, sphere like on a short stout stem; 3 small and discoid anelli, the distal anellus sometimes large; mandible tridentate; scrobal groove joining at frontal groove; occipital margin rounded; midlobe of mesoscutum with 2 pairs setae; transepimeral sulcus weakly curved or straight; propodeum short, transverse and usually smooth and shiny; propodeal callus with 2 setae; petiole small with raised surface only as a narrow transverse stripe; costal cell of fore wing narrow; postmarginal vein 0.24-1.6x as long as stigmal vein (usually 0.6-0.7x) (Hansson, 1995).

**Discussion**

The genus *Neochroscharis* was proposed by Kurdjumov 91912) for *Neochrysocharis immaculatus* Kurdjumov. Kerrich (1969) synonymised the genus *Proccrias*. However, on the basis of having carinae on propodeum

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Yoshomoto (1978) treated the Neartic species of *Neochrysocharis* in the subgenus *Achrysocharella* Girault of the genus *Chrysonotomyia* Ashmead. Yoshimoto described eight species, three of which were described as new.

Boucek (1988) synonymized *Neochrysocharis* with *Chrysonotomyia*, and Schauff accepted this synonymy. Hansson (1990, 1993) recognized *Neochrysocharis* (= *Achrysocharella sensu* Yoshimoto) as a separate genus not closely related to *Chrysonotomyia* and revised the Neartic species of *Neochrysocharis.*

Khan and Shafee (1980) reported the genus *Neochrysocharis* for the first time and described three species viz., *N. hyalinipennis; N. pubipennis* and *N. metallicus* from India.

**Biology**

Parasitoids of Coleoptera (Chrysomelidae); Diptera (Cecidomyiidae, Agromyziadae, Chloropidae, Anthomyiidae); Hymenoptera (Diprionidae, Tenthredinidae) and Lepidoptera (Chloropidae, Gelechidae, Gracillariidae, Lasiocampidae, Lyonetiidae, Nepticulidae, Tischeriidae, Yponomeutidae) (Hansson, 1995).

**Distribution**

All Zoogeographical regions including India.

**Key to the Indian species of the genus *Neochrysocharis* Kurdjumov based on the female**

**1.** Disc of fore wings with coarse setae; costal cell of fore wings slightly shorter than marginal vein; post marginal vein as long as stigmal vein.

… ***N. pubipennis* Khan and Shafee**

— Disc of fore wings with hyaline setae; costal cell of fore wings much shorter than marginal vein; postmarginal vein shorter than stimgal vein.

……2

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2. Axillae without transverse sutures.

…. ***N. hyalinipennis*** **Khan and Shafee**

— Axillae with transverse sutures.

……3

3. Side lobes with a transverse suture; scape 4 times as long as wide; pedicel slightly longer than wide.

…. ***N. metallicus*** **Khan and Shafee**

— Side lobes without transverse suture; scape more than 4 times as long as wide, pedicel more than 1.5 times longer than wide.

……4

4. Malar sulcus distinct, fore wings with infumation at stigmal vein, antennae with an anellus.

…… ***N. indica*** **Agnihotri**

— Malar sulcus indistinct; antennae with more than 2 anelli.

……5

5. Pedicel shorter than FS1, prominence between antennal toruli 1/5$^{th}$ the width of frons between eyes; costal cells setose.

…….. ***N. horticola*** **Agnihotri**

— Pedicel longer than FS1; costal cell bare and other characters also different.

……6

6. Pedicel a trifle more than 1.5 times as long as wide, prominence between antennal toruli more than 1/5$^{th}$ the width of frons between eyes;scape more than 6 times as long as wide; antennae with two anelli; fore wing slight less than two times as long as wide .

……..***N.liriomyzae*** **Agnihotri**

— Pedicel hairy, less than 1.5 times as long as wide, prominence between antennal toruli almost 1/5$^{th}$ the width of frons between eyes;scape slightly

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more than 4.5 times as long as wide; antennae with three anelli; fore wing more than 2.5 times as long as wide .

……..***N. parthenicus* sp.nov.**

**4.3.3.1 *Neochrysocharis parthenicus* sp.nov.** (Plate: 28, Figs.1-10)

**Female** : Body length about 1.325 mm; body colour metallic green; head metallic green and eyes black; antennae brown with basal half white; thorax metallic green, pronotum yellowish brown; wings hyaline with whitish venation; legs brown except trochanter and tarsi white; gaster dark brown with greenish reflection, iridescent.

**Head (Fig.1 )** : Wider than long in frontal aspect (0.44 : 0.315), fine reticulate sculpture, head frontal grooves touching to scrobes of antennae, frontovertex width more than 1/2 the total head width (0.29 : 0.44); vertex setae short and sparse; ocelli arranged in obtuse angled triangle; compound eyes bulged,large and smooth, eyes orbits round, antennal toruli situated at the lower level of eye margin, prominence between antennal toruli almost 1/5th the width of frons between eyes (0.04 : 0.20);malar sulcus absent; malar space reticulate, shorter than eye width (0.07 : 0.115); mandibles bidentate (Fig. 1); maxillary palp and labial palp two and one segmented respectively; lower margin of clypeus straight.

**Antennae (Fig. 2)** : 7 segmented excluding 3 anelli, antennae with long longitudinal sensillae, apical tip of antenna with long spicule, antennal formula 1,1,3,2,3; scape cylindrical slightly more than 4.5 time as long as wide (0.142 : 0.030), scape apex not touching to mid ocelli; pedicel setose, less than 1.5 times as long as wide (0.053 : 0.036) and almost equal to the length of FS1; funicle 2 segmented, FS1 less than 1.5 times as long as wide (0.050 : 0.041), FS2 less than 1.5 times as long as wide (0.058 : 0.04); club 3 segmented, more than 3 times as long as wide (0.163 : 0.05), shorter than preceding two funicle segments combined.

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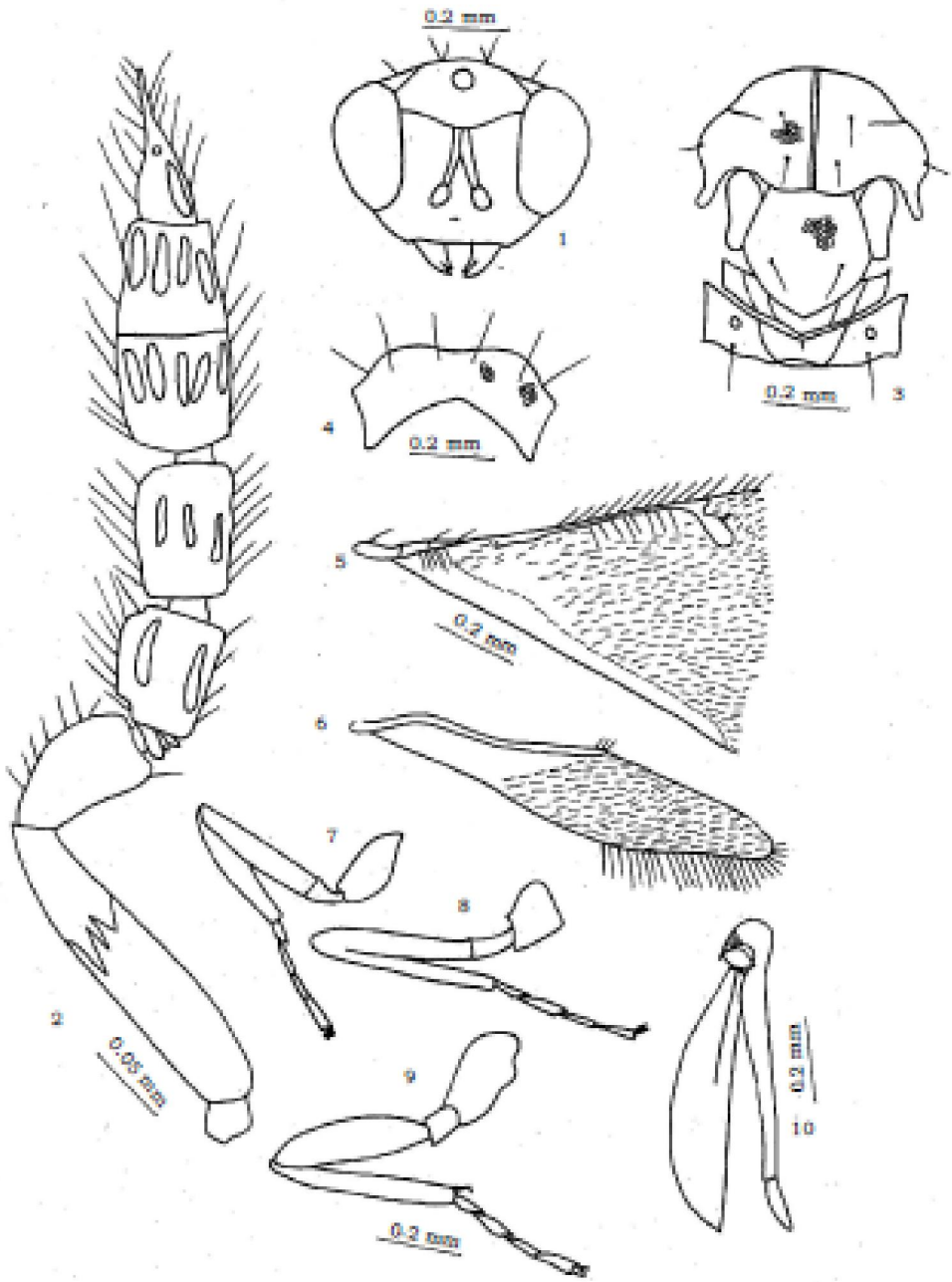


**Plate: 28 -figs. 1-10:** ***Neochysocharis parthenicus*** **sp.nov.**
1. Head in frontal view; 2. Antenna; 3.Thorax in dorsal view;4.Pronotum;5.Forewing;6.Hindwing;7.Foreleg;8.middle leg;9.hind leg;10.Female genitalia

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**Thorax (Fig. 3)** : Pronotum with sculpture bearing 3 pairs of setae (Fig. 4), anterior margin deep concave in the middle; mesoscutum less than 2 times as wide as long (0.38 : 0.20); mesoscutum having 2 pairs of adnotaular setae, notauli complete, indistinct and shallow, median longitudinal sulcus absent; axilla slightly advanced; scutellum slightly convex with reticulate sculpture and longer than mesoscutum, less than 1.5 times as wide as long (0.032 : 0.22) without longitudinal grooves, 1 pairs of setae situated on scutellum, metanotum broad; propodeum with incomplete median carina and without paraspiracular carinae, propodeal spiracles round, small and well separated from the anterior margin of propodeum by a more than 3 times of its own diameter, spiracle rim fully exposed; mesopostpharagma notched at its apical margin and its apical margin touching to lower margin of propodeum.

**Fore wing (Fig.5)** : Round at its apex in shape, more than 2.5 times as long as wide (0.935 : 0.36), less than 1.5 times longer than hind wing length, densely setose; costal cell small, narrow and bare; SMV with 2 setae directed upwards, shorter (0.29) than MV (0.31); MV bearing 13 long setae on front edge; PMV 8 times shorter than SV, SV long (0.08) slightly less than $1/4^{th}$ of the length of MV (0.31); basal cell bare; speculum narrow, closed below; 8 admarginal hairs present; cubital vein sinuate, subcubital line of hairs wanting.

**Hind wings (Fig. 6):** More than 5 times as long as wide (0.735: 0.145) with blunt apex; vein length (0.425) more than one half the length of wing.

**Fore legs (Fig.7)** : Coxa more than 2 times as long as wide (0.145 : 0.071), almost 2.5 times longer than fore trochanter; femur more than 5.5 times as long as wide (0.235: 0.040),1.5 times longer than tibia in length; fore tarsus shorter than length of tibia; TS1 shorter than next two tarsal segment combined.

**Mid legs (Fig.8)** : Coxa less than 1.5 times as long as wide (0.095 : 0.09); femur more than 7 times as long as wide (0.265 : 0.036), shorter than tibia in length;

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mid tarsus shorter than length of tibia; TS1 longer than mid tibial spur, tarsus white; mid tibial spur much longer than fore and hind tibial spur.

**Hind legs (Fig.9):** Hind coxa less than 2 times as long as wide (0.165: 0.095); femur more than 3.5 times as long as wide (0.265: 0.070) shorter than tibia in length; hind tarsus shorter than length of tibia.

**Gaster :** Large and ovate, more than 1.5 times as long as wide, gaster surface smooth; gasteral apical tip acuminate, gaster with transverse petiole, metasoma less than 1.5 times longer than mesosoma; ovipositor sheaths slightly exerted; first valvifers semicircular (Fig. 10); anterior margin of basal part of second valvifers curved;third valvulae slightly more than 4 times as long as wide (0.09 : 0.022),a trifle more than 1/5$^{th}$ the length of second valvifers (0.47); outer plates of ovipositor slightly longer than second valvifers, with a ridge along basal half of dorsal margin.

**Male:** Not known

**Holotype:** ♀**,** India, U.K., Pantnagar, Host Agromyzid leaf miner on *Parthenium hysterophorus*, Reared collection, 31/03/07 Hym. Eulo. Nr. 62 (Sandeep Kumar).

**Paratype:** 2 ♀♀, same data as holotype Hym. Eulo Nr. 62A (Sandeep Kumar).

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## 4.4 Subfamily Euderinae

### 4.4.1 Genus *Euderus* Haliday

*Euderus* Haliday, 1944. 3: 298. Type species *E. amphis* Walker, by monotypy.

*Secodella* Girault, 1913d, 79A(6): 48. Type species *Secodella lineata* Girault by monotypy and original designation.

*Omphalomorpha* Girault, 1913e. 79A(6): 103. Type species *Omphalomorpha viridis* Girault, by monotypy.

*Allomphale* Silvestri, 1915. 9: 217. Type species *Allomphale cavasolae* Silvestri; by monotypy and original designation.

*Secodelloidea* Girault, 1917a. 2: Type species *Secodella rugosus* Crawford, by monotypy and original designation.

*Euderoides* Yoshimoto, 1971. 103: 550. Type-species *Euderus purpureus* Yoshimoto, by original designation (As sub genus).

*Neoeuderus* Yoshimoto, 1971. 103. 552. Type species *Euderus viridilineatus* Yoshimoto by original designation.

*Leipocrossus* Yoshimoto, 1971. 103: 555. Type species *Euderus herillus* Walker by original designation.

*Euderus* Ashmead, 1894b. *J. Linn. Soc.* London (Zod.), 25: 175.

*Euderus* Ferriere, 1931a. *Bull. Ent. Res.*, 22: 132.

*Euderus* Peck, 1951. Synoptic catalog. *Agriculture Monog.*, 2: 462.

*Euderus* Kurian, 1954. *Agra Univ. J. Res.* (Sci.), 3: 126.

*Euderus* Graham, 1959. *Trans. Soc. Br. Ent.*, 13: 169-204.

*Euderus* Gangrade, 1960. *Indian J. Ent.*, 22: 80.

*Euderus* Boucek, 1963. *Beitr. Ent.*, 13(h. 3/4): 257-281.

*Euderus* Peck, 1963. *Can. Ent. Suppl.*, 30: 147-201.

*Euderus* Burks, 1967b. synoptic catalog. *Agriculture Monogr.* (Suppl. 2): 231-232.

*Euderus* Yoshimoto, 1971. *Can. Ent.* 103: 541-578.

*Euderus* Khan, 1985a. *J. Bombay Nat. Hist. Soc.*, 82(1) : 149-159.

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*Euderus* Hussain and Khan, 1986. *Oriental Ins.*, 20: 211-220.

*Euderus* Boucek, 1988. *Australasian Chalcidoidea* (Eulophid part). pp. 654-661.

*Euderus* Jansson and Lecrone ,1991. *Florida Entomologist.* 74(4) : 596-598.

*Euderus* LaSalle and Schauff ,1992. *Contrib. Amer. Ent. Inst.*, 27(1) : 1-44.

*Euderus* Singh ,2005.*Entomon* ,30(4):321-326.

**Diagnosis**

Genus *Euderus* was erected by Haliday (1844) with the type species *E. amphis.* The genus can be recognized at once on the basis of characters like three hair lines radiating from the base of stigmal vein, postmarginal vein in the fore wing and by the complete notauli. Khan (1985a) suggested additional new generic characters which are useful in separating *Euderus* from allied genera viz. (i) first valvifer semicircular with base little concave (ii) second valvifer with dorsal margin thickened (iii) outer plates of ovipositor narrow at base, gradually widening posteriorly with a submarginal ridge running ¾ length of dorsal margin.

**Discussion**

Genus *Euderus* Haliday is a small group belonging to the subfamily Euderinae, placed between the subfamilies Tetrastichinae and Entedontinae (Graham, 1959; Boucek, 1963). The members of this genus constitute a discrete and a homogenous group within the subfamily euderinae. There are two schools of thought regarding the placement of the related genera of the *Euderus.* Boucek (1963) separated *Secodelloidea* Girault and regarded these groups as valid genera. Peck (1951, 1963) and Burks (1967) placed *Secodelloidea* in synonymy with *Euderus.* Yoshimoto (1971) while making a revision of the *Euderus* had a modification of both opinions and re-evaluated the characters of the groups and proposed a new classification and also proposed a key to the subgenera of the genus *Euderus* as follows:

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**Key to subgenera of the genus *Euderus* Haliday as proposed by Yoshimoto (1971)**

1. Propodeum ½ to 2/3 as long as scutellum, with strong median and lateral carina, areas between carinae irregularly regulose to rugose; entire propodeum strongly developed, antennae clavate, club thick and without apical spicule.

……. ***Secodelloidea* Girault**

— Propodeum much shorter, lateral carina absent or weakly developed, surface alutaceous or reticulate; antennae weakly clavate, club with a spicule or male funicular segments pedicellate.

……2

2. MV 2 times the length of SMV; parastigma about as long SMV; PMV short, about 1/3rd length of SV.

……***Euderoides* Yoshimoto**

— MV less than 1.5 times length of SMV; parastigma about 1/4th to 1/3rd length of SMV; PMV long, 1.5 to more than 2.5 times length of SV.

……3

3. Fore wing without marginal ciliae, surface smooth, whitish, hyaline with scattered inconspicuous, colourless micropubescence (as seen under high magnification).

……..…***Leipocrossus* Yoshimoto**

— Fore wing with marginal ciliae, surface hyaline, with dark pubescence.

……4

4. Apical margin of fore wing with five hairlines; female antennae inserted at level of lower margin of eye; male flagellum with whorls of long hairs.

……..…***Neoeuderus* Yoshimoto**

— Apical margin of fore wing with three to four hair lines; antennae of male and female inserted slightly above level of lower margin of eye, antennae similar in both sexes.

……..…***Euderus* Haliday**

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**Distribution**

Cosmopolitan, about 100 spp. have been reported from India about six species have been reported (Hussain and Khan, 1986).

**Key to some species of the genus *Euderus* Haliday**

1. Fore wing without marginal fringe, wing surface smooth, whitish, and hyaline with pubescent.

.....***Euderus elongata*** **sp.nov.**

— For wing with marginal fringe, wing surface not smooth and normally pubescent; other characters also different.

……2

2. Female ovipositor sheath 1.5 to 2.0 times length of head and thorax combined; middle and hind tibiae whitish apically, radial and costal cells bare.

…***Euderus saperdae*** **Miller**

— Female ovipositor sheath shorter than head and thorax combined.

……3

3. Legs reddish to testaceous, middle of fore and hind femora and tibiae dark brown to black, fore and mid coxae bluish purple, basal half of hind coxa greenish yellow and apical half purplish blue; marginal ciliae of fore wing thick and distinct.

……***E. vockerothi*** **Yoshimoto**

— Legs concolourous with body, 3 basal tarsal segments pale to yellow or apices of tibiae whitish to pale yellowish; marginal ciliae of fore wing minute to long but not thickened.

……4

4. Tibiae uniformly or apices of tibiae whitish or pale.

……5

— Tibiae entirely metallic or dark brown.

……12

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5. Antennae uniformly fuscous or black with metallic luster.

……6

— Antennae not likewise.

……10

6. Female gaster narrow very long and apex slightly pointed, 1.5 times length of head and thorax combined.

……7

— Female gaster broad, elongate oval, slightly longer, less than 1.5 times length of head and thorax combined.

……8

7. Body bluish green, face dark purplish, median lobe of mesoscutum greenish yellow, antennae with flagellum fuscous, pedicel and FS1 subequal in length, funicle segments subequal in length, funicle segments longer than wide, 1 to 3 subequal in size, FS4 short, a trifle longer than wide; club shorter than preceding three funicle segments together; costal cell with 1 or 2 minute hairs near apex; 5 to 8 admarginal hairs present, PMV 1.5 times the length of SV.

…… ***E. fuscedinellae* Yoshimoto**

— Body very dark green, almost black, sometimes more or less bluish or with a purple shine on the vertex; antennal flagellum brown, pedicel distinctly longer than wide, FS2 as long as wide than long; club as long as preceding two funicle segments together, costal cell bare, 14 admarginal hairs present, PMV a little longer than SV.

……***E. gossypi* Ferriere**

8. Body metallic blue black; PMV subequal or slightly longer than SV, posterolateral margin of fore wing with 3 distinct hair lines.

……9

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— Body bright metallic green with brassy luster; PMV 1.5 times length of SV, posterolateral margin of fore wing with 2 distinct hair lines.

…… ***E. pecki* Yoshimoto**

9. SMV of fore wing with 6 dorsal setae, 7 to 8 admarginal hairs present; anterior half of median carina short and broad, 2 to 3 times wider than long; FS2 2 times the length of FS1.

……***E. glaucus* Yoshimoto**

— SMV of fore wing with 7 dorsal setae, 4 to 5 admarginal hairs present; anterior half of median carina narrow and long, 5 to 6 times longer than broad; FS1 and FS2 subequal in length.

……***E. solidaginis* Yoshimoto**

10. Antennae uniformly yellow except club brown, scape slightly flattened, more than 3 times as long as FS1, 2 anelli present.

…….***E. testualis* Khan**

— Only antennal scape yellow or yellowish orange.

……11

11. Female gaster narrow, very long and apex slenderly pointed, 1.5 times length of head and thorax combined, apex of hind wing rounded.

……***E. chillocotti* Yoshimoto**

— Female gaster broad, elongate oval, slightly longer, less than 1.5 times length of head and thorax combined, apex of hind wing subacute.

……***E. masoni* Yoshimoto**

12. Female gaster narrow, very long, and apex very slenderly pointed 1.5 times length of head and thorax combined; anterior half of median carina short and broad, slightly longer than broad.

……***E. lividus* Ashmead**

— Female gaster elongate-ovate, slightly larger or shorter than head and thorax combined.

……13

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13. Fore wing sparsely pubescent; funicle segments short, as long as broad or slightly not distinctly longer.

……14

— Fore wing normally pubescent; funicle segments usually longer than broad.

……15

14. Fore wing with irregular hair lines radiating from the SV, SMV with 3 to 4 dorsal setae, the admarginal hair ranging from 2 to 4; antennae with 2 anelli, FS1 very short, FS2 to FS4 subequal in size, club very long distinctly longer than preceding 3 FSs together.

……***E. acropasis* Crawford**

— Fore wing with regular hairs line radiating from the SV, SMV with 7 dorsal setae, 7 admarginal hairs present; antennae with only 1 anellus, FS1 a trifle shorter than FS2, FS2 and FS3 subequal, fourth segment shortest, quadrate, club longer than preceding two funicle segments together.

…..***E. agromyzae* Gangrade**

15. Costal cell with row of 6 hairs above SMV; 7 to 8 admarginal hairs present.

……***E. alaskensis* Yoshimoto**

— Costal cell bare or with 1 to 3 hairs above SMV, sometimes two additional hair at distal end, 3 to 6 admarginal hairs present.

……16

16. Ovipositor sheath barely exerted, as seen in dorsal view; SV with 3 to 5 hairs, generally 3 to 5 admarginal hairs present, marginal ciliae generally sparse and weak, costal cell usually with 1 to 2 hairs above distal end of SMV, SMV with 5 to 6 dorsal bristles; colour dull bluish green without luster or with slight purplish luster, callus with 4 setae.

……***E. subopasus* Gahan**

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— Ovipositor sheath distinctly exerted, longer than last tergite, marginal ciliae of fore wing close together, short.

……17

17. Costal cell with 2 setae, SMV with 6 dorsal setae, 3 to 5 admarginal hairs present; callus with row of 3 setae, colour blackish green.

……***E. albitarsis* (Zett.)**

— Costal cell with 3 to 5 setae, SMV with 6 to 8 dorsal setae, 6 to 7 admarginal hairs present.

……18

18. Body metallic green with brassy luster, FS1 as long as pedicel; SV with 5 to 6 setae, SMV with 5 to 6 dorsal setae, costal cell with 2 to 3 setae near apex.

…… ***E. cushmani* Crawford**

— Body and legs deep metallic purplish blue with greenish luster; SV of fore wing with about 9 to 11 hairs, SMV with 8 to 9 setae, costal cell with 4 to 5 setae near apex; FS1 longer than pedicel.

…… ***E. argyresthiae* Crawford**

**4.4.1.1** ***Euderus albitarsis (*Zetterstedt*)*** (Plate: 29, Figs.1-10)

**Female** : Length 2.37 mm, body dark brown; head dark brown with metallic reflections; vertex dark brown, antennae dark brown except scape with ventral side yellow; thorax dark brown with metallic reflections; fore and hind wings hyaline; legs uniformly brown except the first three tarsal segments almost white; gaster dark brown.

**Head (Fig. 1):** Much wider than (0.66: 0.46) in facial view, frontvertex with reticulate sculpture, wider than long, more than 1/2 the head width; eyes large (0.32) more than 1/2 length of the head in frontal view, more than twice longer than wide; ocelli arranged in obtuse angled triangle; POL much longer than

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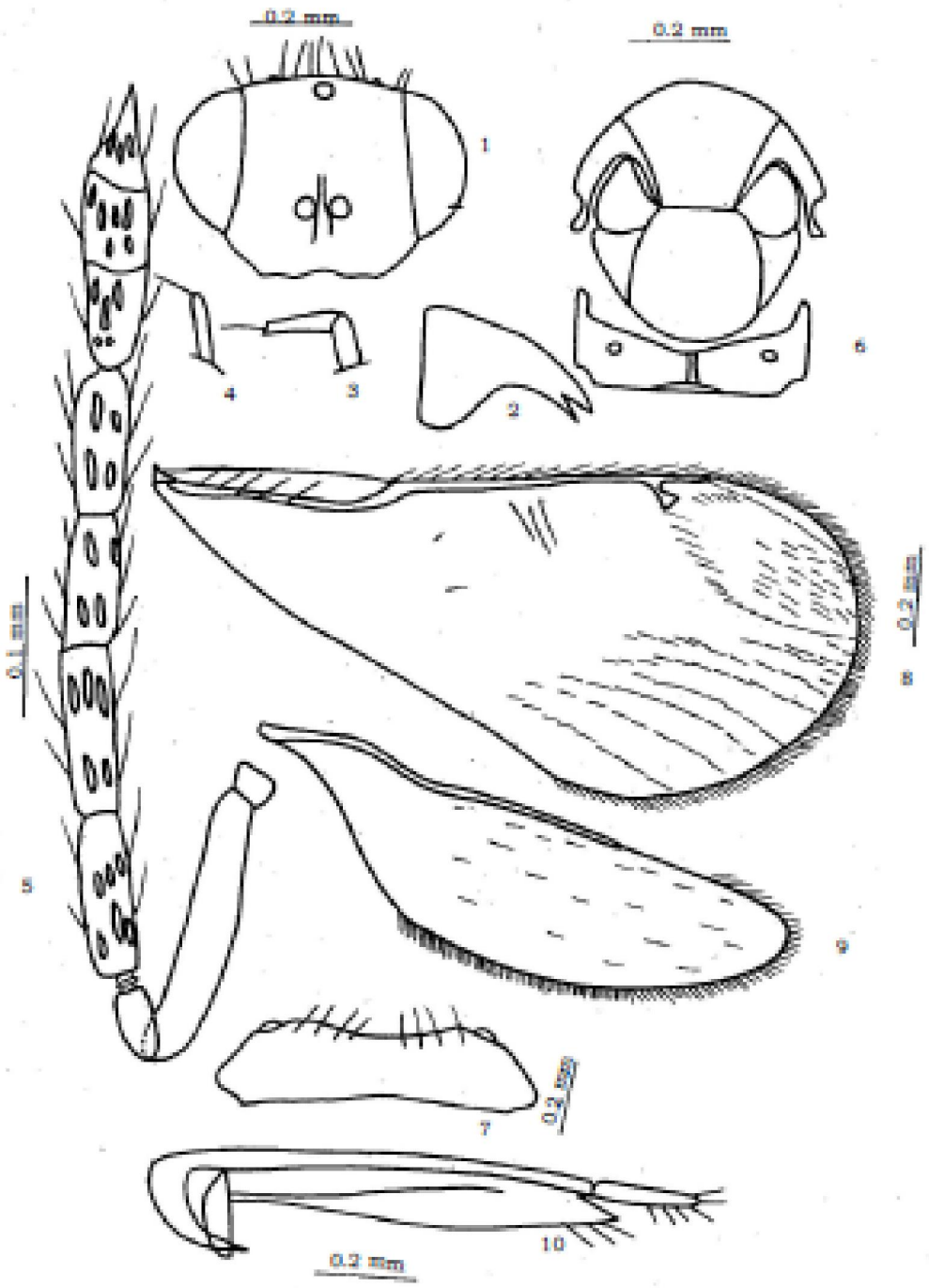


**Plate: 29-figs. 1-10: *Euderus albitarsis* (Zett.)**

1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view;7.Pronotum;8.Forewing;9.Hindwing;10.Female genitalia

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OOL; antennal toruli well above the imaginary line joining the orbital border; mandibles bidentate (Fig. 2); maxillary palp (Fig. 3) and labial palp (Fig. 4) 2 and 1 segmented respectively.

**Antennae (Fig. 5)** : Apex of scape reaching the level of median ocellus; antennae 9 segmented excluding 2 anelli; scape subcylindrical, more than 5 times longer than wide (0.22 : 0.04); pedicel small, 1.5 times longer than wide (0.06 : 0.045), much shorter than FS1 (0.125); funcile 4 segmented, FS1 and FS2 subequal in size (0.125: 0.05), FS3 (0.10 : 0.06) and FS4 (0.11 : 0.06) each less than 2 times as long as wide, club 3 segmented, less than 3 times longer than wide (0.22 : 0.08), longer than preceding two funicle segments combined, first to last club segmentes with 6, 5, 8, 7, 5, 7 and 4 sensoria, respectively.

**Thorax (Fig. 6)**: Reticulate; pronotum with smooth surface, posterior margin bearing 4 pairs of setae (Fig. 7); scutum less than 2 times wider than long (0.30 : 0.56), notauli deeply and sharply defined, scutellum as long as wide (0.30 : 0.30), larger than scutum, rounded at apex; propodeum reticulate with distinct short median carina;

**Fore wings (Fig.8):** hyaline, sparsely setose, more than 2 times longer than wide (1.69: 0.80); costal cell broad, asetose; SMV with 5 dorsal setae directed upwards; basal cell bare; MV much longer than SMV (0.58: 0.52); PMV with single minute hair longer than the SV (0.11: 0.06), 3 admarginal hairs present; posterior and apical margin with 6 hairs lines; marginal fringe short.

**Hind wings (Fig. 9):** Hyaline, sparsely setose, more than 3 times as long as wide (1.26 : 0.37), apex rounded; apex of marginal vein with a strong and 2 curved hooklets; marginal fringe short.

**Fore legs**: Apical rim with 5 strong setae; basitarsus with an oblique row of small 13 hairs/setae; tibial spur short.

**Middle legs**: Femora with long setae on outer face of apical end, tibial spur short.

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**Hind legs**: Apical rim of tibiae with 5 strong setae; tibial spur long.

**Gaster:** Longer than thorax, petiolate, tapering at apex; ovipositor concealed, first valvifer semicircular (Fig.10) with base little concave, anterior lobes prominent, second valvifer long with dorsal margin slightly thickened, third valvulae narrow, movably articulated with second valvifers; outer plates of ovipositor (Fig.10) narrow at the base, gradually widening posteriorly with submarginal ridge running 2/3$^{rd}$ length of dorsal margin.

**Material examined:** 2 ♀♀, India, U.T.; Pantnagar, Host *Melanogramyza* sp. (Diptera: Agromyzidae) in the pods of wild plant (unidentified). 10.10.2007 Hym. Eulo. Nr. 11A (Sandeep Kumar).

**4.4.1.2 *Euderus agromyzae* Gangrade** (Plate: 30, Figs.1-6)

**Female** : Body length about 2.27 mm; body colour brown with golden reflections; head brown, slightly reticulated, eyes red and ocelli white to pale yellow; antennae uniformly brown except the scape yellow; thorax brown with golden reflections shallowly and densely reticulate, wings hyaline; legs uniformly dark brown except the first 3 tarsal segments yellow; gaster brownish yellow.

**Head (Fig. 1)** : Wider than long in facial view (0.60 : 0.040); frontovertex wide (0.31), wide than long, 1/2 of head width; eyes large, bare, almost 2 times longer than wide (0.29 : 0.15); ocelli arranged in obtuse angled triangle; POL almost 4 times longer than OOL (0.20 : 0.05); antennal toruli placed well above the lower level of eye margin, distance between antennal toruli (0.03) more than 3 times their distance from eye margin (0.11); mandibles tridentate with acute teeth; maxillary palp and labial palp two segmented each.

**Antennae (Fig. 2) :** Scape more than 4 times as long as wide (0.18 : 0.04); pedicel distinctly less than 2 times longer than wide (0.07 : 0.04), longer than FS1 (0.05); one anellus; 4 funicle segments almost quadrate and subequal in size

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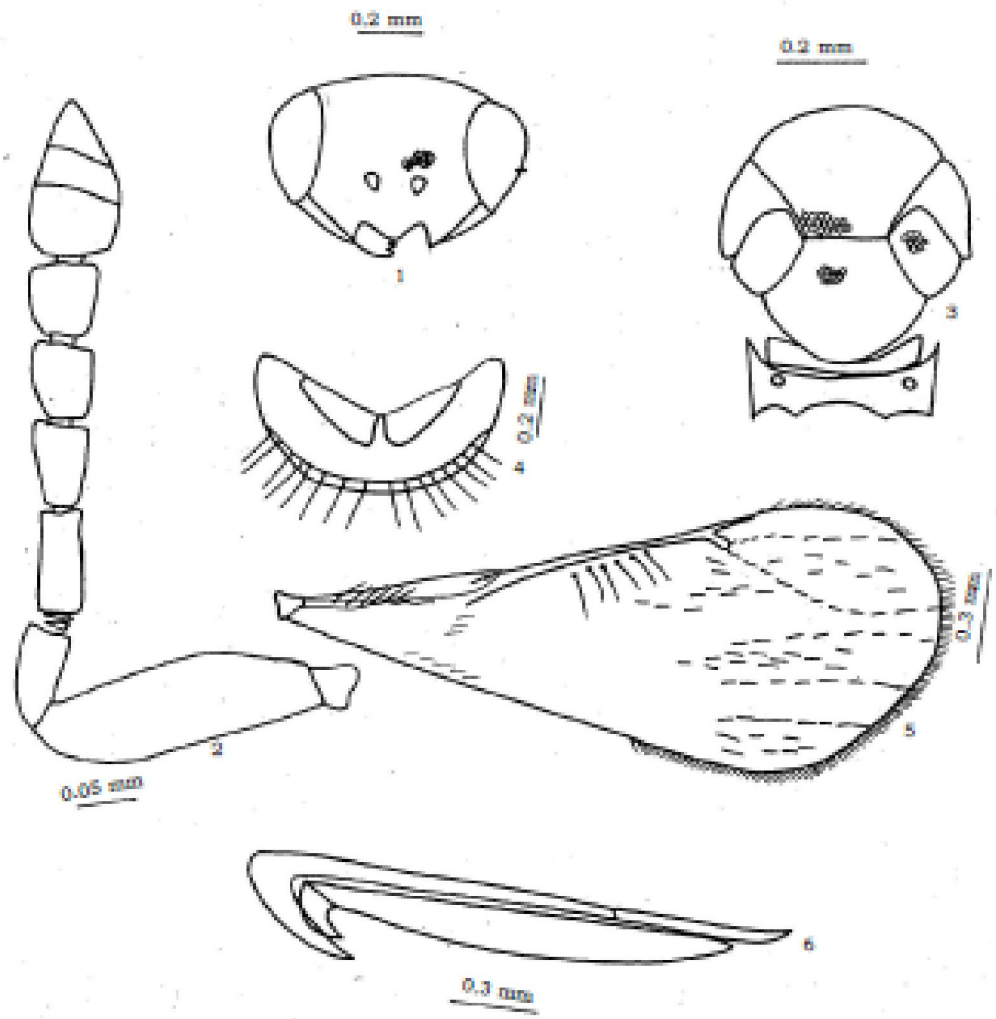


**Plate: 30-figs. 1-6: *Euderus agromyzae* Gangrade**

1. Head in frontal view; 2. Antenna; 3.Thorax in dorsal view; 4.Pronotum; 5.Forewing; 6.Female genitalia

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(0.05 : 0.05); club 3 segmented, 2 times longer than wide (0.16 : 0.08) subequal to the combined length of preceding three funicle segments combined; FS1 to last club segments with 3, 3, 3, 3, 5, 4 and 4 sensoria, respectively.

**Thorax (Fig. 3)**: Pronotum subrectangular (Fig. 4) with 2 setae on each lateral side of posterior margin and deeply concave anterior margin mesoscutum wider than long (0.47: 0.34); notauli deeply and sharply defined, with 4 small setae in a row at each margin; scutellum as long as wide (0.28: 0.28), shorter than mesoscutum, rounded at apex; propodeum faintly reticulate with median carina very short.

**Fore wings (Fig. 5) :** Sparsely pubescent, almost 2 times longer than wide (1.35 : 0.65); posterior and apical margin with 5 hair lines, 2 admarginal hairs present; costal cell asetose, broad and long; SMV (0.41) slightly shorter than MV (0.43) with four dorsal setae; PMV (0.06) slightly shorter than SV (0.07); radial cell bare, marginal fringe short.

**Hind wings:** More than 4 times as long as wide (1.12: 0.25), apex of marginal vein with a strong and 2 curved hooklets, marginal fringe very short.

**Legs**: Femora of fore leg broadened; apical rim of fore tibiae with 3 small pegs, basitarsus of fore leg with an oblique row of small setae.

**Gaster:** Longer than thorax, petiolate, tapering at apex ovipositor concealed; first valvifer semicircular (Fig.6) with base little concave, articular knobs prominent; second valvifer long with dorsal margin slightly thickened, third valvulae narrow, movably articulated with second valvifers, outer plates of ovipositor narrow, movably articulated with second valvifers, outer plates of ovipositor narrow at the base (Fig. 6) posteriorly broadened with a submarginal ridge.

**Material examined:** 3 ♀♀, one dissected and mounted on a slide India, U.K.; Pantnagar, Host *Melanogramyza obtusa* Malloch (Diptera: Agromyzidae) on *Cajanus cajan.* 10/11/2007. Hym. Eulo. Nr.11 and 11A (Sandeep Kumar).

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**4.4.1.3** ***Euderus elongata*** **sp.nov.** (Plate: 31, Figs.1-12)

**Female:** Robust, body length about 3.09 mm; body colour black with reddish and greenish reflection; head dark black with clypeal region yellowish brown and eyes black; antennae dark brown with scape pale brown, pronotum brownish black, thorax black, wings hyaline with reddish brown venation; legs dark brown except first three tarsal segments; gaster black with reddish and greenish reflection, iridescent.

**Head (Fig. 1)** : Almost 1.5 times wider than long in frontal aspect (0.840: 0.555), sculptured and sparsely setose, head frontal groove present just below mid occelli, head with facial carina just below mid ocelli; frontovertex wide, width more than ½ the total head width (0.46: 0.84); vertex setae short and sparse; ocelli arranged in obtuse angled triangle; POL almost 10 times as long as OOL; compound eyes bulged and large smooth, eyes orbits round, facets uniform in shape and size; antennal toruli situated well above the lower level of eye margin, prominence between antennal trouli less than 1/8$^{th}$ the width of frons between eyes (0.06: 0.47); malar sulcus straight and prominent; malar space reticulate sculptured, shorter than eye width (0.15 : 0.185); mandibles tridentate (Fig. 2) with 3 acute teeth; maxillary palp (Fig. 3) and labial palp (Fig. 4) each two segmented; clypeus arched at lower margin of clypeus.

**Antennae (Fig. 5)** : 9 segmented excluding 2 anelli,apical tip of antenna with small spicule, antennal formula 1,1,2,4,3; scape cylindrical ,slightly more than 4.5 times as long as wide (0.24 : 0.05), scape apex not touching to mid ocelli; pedicel with 3 long setae less than 1.5 times as long as wide (0.07: 0.0485) and shorter than length of the FS1; funicle 4 segmented, FS1 to FS4 not equal in length, FS1 more than 1.5 times as long as wide (0.098: 0.06), FS2 more than 1.5 times as long as wide (0.10 : 0.06), FS3 less than 1.5 times as long as wide (0.095: 0.07), FS4 less than 1.5 times as long as wide (0.092: 0.075); club 3

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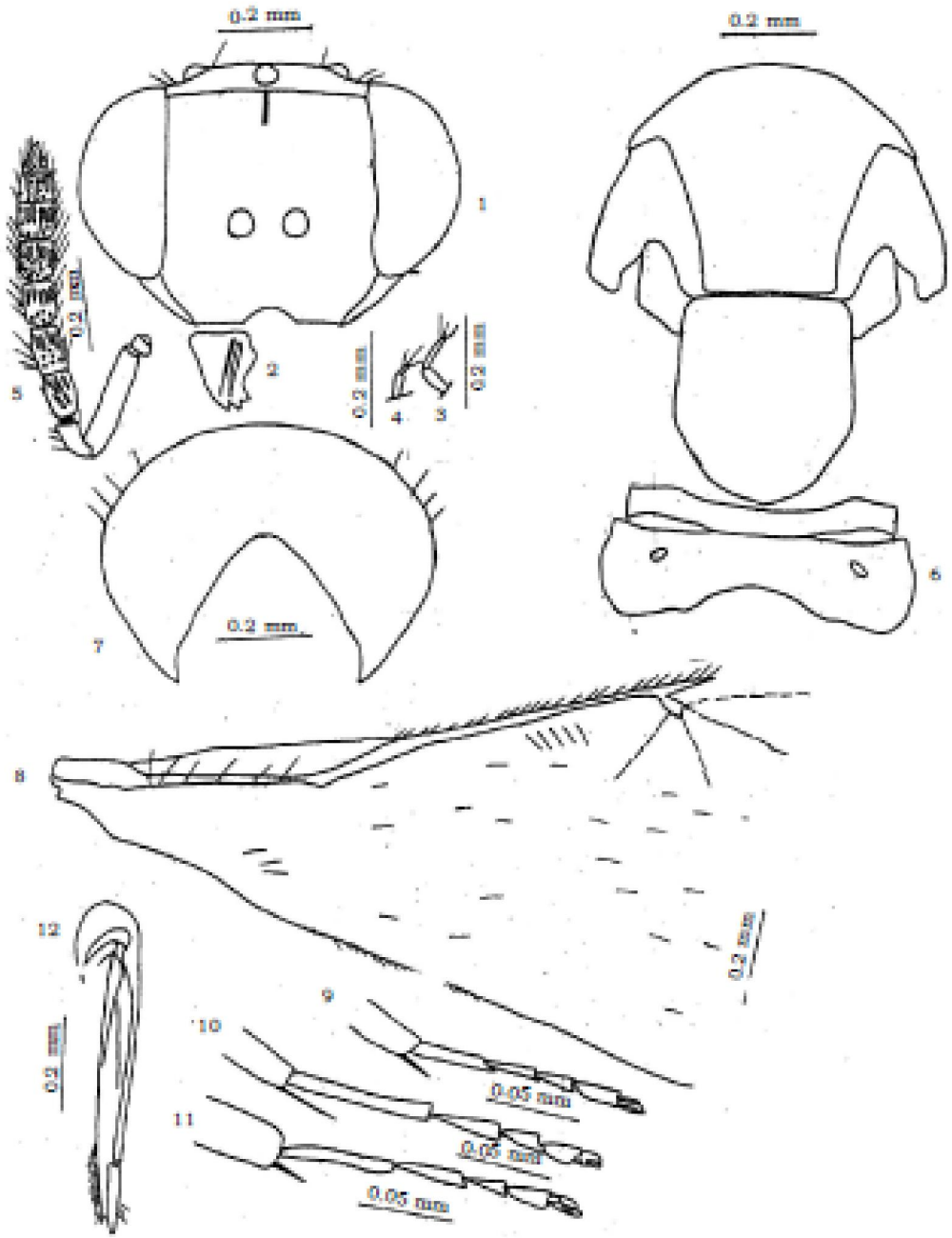


**Plate: 31-figs. 1-12: *Euderus elongata* sp.nov.**
1. Head in frontal view; 2. Mandible; 3. Maxillary Palp; 4. Labial palp; 5. Antenna; 6.Thorax in dorsal view;7.Pronotum;8.Forewing;9.Part of foreleg;10.Part of middle leg;11.Part of hind leg;12.Female genitalia

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segmented, more than 2.5 times as long as wide (0.21: 0.075), longer than preceding two funicle segments combined.

**Thorax (Fig. 6)** : Pronotum with reticulate sculpture bearing 4 pairs of setae (Fig. 7), anterior margin concave in the middle; mesoscutum having raised reticulated sculpture, less than 1.5 times as wide as long (0.74: 0.495); mesoscutum without any adnotaular setae, notauli and distinctly curved near to base of mesoscutum, median longitudinal sulcus absent; axilla moderately advanced; scutellum convex with fine raised reticulated sculpture and shorter than mesoscutum, slightly more than 1.5 times as wide as long (0.70: 0.46) without median longitudinal grooves and setae on scutellum; metanotum broad; propodeum without median carina and without paraspiracular carinae, propodeal spiracles not round and small and well separated from the anterior margin of propodeum by a space almost 2 times of its own diameter, spiracle rim fully exposed.

**Fore wings (Fig. 8)** : Round in shape at its apex, slightly more than 2 times as long as wide (1.97: 0.90), less than 1.5 times longer than hind wing length, sparsely setose; costal cell highly broad and bare; SMV with 5 setae directed upwards, longer (0.75) than MV (0.57); 5 admarginal hairs presents; MV bearing 19 short setae on front edge; PMV more than 2.5 times longer than SV (0.12: 0.045); SV long (0.045) more than $1/12^{th}$ of the length of MV (0.57), SV having 4 radiating lines of hairs; state of wing disk highly sparsed, marginal fringe short spaced by a distance eual to of the length of fringe; basal vein absent; speculum broad, cutibal vein more or less rudimentary having only 3 hairs, subcubital line of hairs absent; marginal fringe more or less absent.

**Hind wings**: More than 3.5 times as long as wide (1.55: 0.43) with highly blunt apex; vein length more than one half the length of wing.

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**Fore legs (Fig. 9)** : Fore coxa almost 2 times longer than fore trochanter, femur almost equal to tibia in length, tarsi longer than length of tibia (0.45 : 0.44), TS1 shorter than next two tarsal legs combined (0.17: 0.19), tarsus white except tarsal segment 4 dark brown.

**Mid legs (Fig. 10)** : Coxa less than 1.5 times than trochanter, tibia less than 1.5 times longer than femur, tibia longer than tarsus; TS1 distinctly longer than next two tarsal segments combined (0.305: 0.240); spur white in colour, tarsus white except TS4 dark brown.

**Hind legs (Fig. 11)**: Coxa more than 2.5 times longer than trochanter, tibia longer than femur (0.65: 0.55), tibia slightly longer than tarsus length (0.65: 0.59), TS4 dark brown rest tarsal segments ($TS_1$ to $TS_3$) white.

**Gaster** : Large and elongate almost 2.5 times as long as wide, gaster surface smooth, densely setose as the posterior end of the gaster, 1$^{st}$ gasteral tergum large in size and smooth, gasteral apical tip lanceolate, gaster sessile; metasoma slightly longer than mesosoma (1.176: 1.175); ovipositor sheaths slightly exerted; first valvifers cylindrical in shape, articular knobs prominent (Fig. 12); anterior margin of basal part of second valvifers uniformly curved; third valvulae not movably articulated with second valvifers slightly more than 6.5 times as long as wide (0.4: 0.06); SV (1.4) almost 3.5 times longer than the length of TV (0.4); outer plates of ovipositor narrow at its apex,highly longer than second valvifers, with a ridge along basal half of dorsal margin and another oblique ridge starting at the base of dorsal margin and running obliquely upto middle of plate; cercal setae not prominent.

**Male:** Not known

Holotype: ♀, India, U.K., Roorkee, Narsan Khurd, Host not known, sweepnet collection on castor, 04/03/07, Hym. Eulo. Nr. 085 (Sandeep Kumar).

**Paratype:** 5 ♀♀, same data as holotype Hym. Eulo Nr. 085A (Sandeep Kumar).

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## Checklist for world fauna of Genus *Euderus* Haliday

1. *Euderus acrobasis* (Crawford, 1915)
2. *Euderus acuminatus* (Girault, 1915)
3. *Euderus aemula* (Masi, 1917)
4. *Euderus aeneus* (Girault & Dodd, 1915)
5. *Euderus agrili* Boucek, 1963
6. *Euderus agromyzae* Gangrade, 1960
7. *Euderus agromyzae* Gangrade, 1961
8. *Euderus alaskensis* Yoshimoto, 1971
9. *Euderus albitarsis* (Zetterstedt, 1838)
10. *Euderus alcidodes* Singh, 2005
11. *Euderus alvarengai* De Santis & Diaz, 1975
12. *Euderus andropogonae* Risbec, 1956
13. *Euderus arenarius* Erdös, 1951
14. *Euderus argyresthiae* (Crawford, 1915)
15. *Euderus beardsleyi* Yoshimoto, 1965
16. *Euderus beijingensis* (Luo & Liao, 1985)
17. *Euderus brasiliensis* (Ashmead, 1904)
18. *Euderus brevicornis* Boucek, 1963
19. *Euderus californicus* Yoshimoto, 1971
20. *Euderus canadensis* Yoshimoto, 1971
21. *Euderus capensis* (Girault, 1913)
22. *Euderus carpomyiae* Bhatnagar, 1950
23. *Euderus caudatus* Thomson, 1878
24. *Euderus cavasolae* (Silvestri, 1914)
25. *Euderus chillcotti* Yoshimoto, 1971
26. *Euderus crawfordi* Peck, 1951
27. *Euderus cushmani* (Crawford, 1915)
28. *Euderus diversipennis* (Girault, 1915)
29. *Euderus elongatus* Ashmead, 1887
30. *Euderus fasciatus* Askew, 2001
31. *Euderus frater* (Girault, 1915)
32. *Euderus fuscedinellae* Yoshimoto, 1971
33. *Euderus fuscitarsis* De Santis, 1957
34. *Euderus glaucus* Yoshimoto, 1971
35. *Euderus gossypii* Ferrière, 1931
36. *Euderus gracilis* Graham, 1984
37. *Euderus grangeri* (Boucek, 1963)
38. *Euderus herillus* (Walker, 1847)
39. *Euderus io* (Girault, 1929)
40. *Euderus jezoensis* Ishii, 1938
41. *Euderus lindemani* Fursov, 1997
42. *Euderus lineatus* (Girault, 1913)
43. *Euderus lividus* (Ashmead, 1886)
44. *Euderus magnificus* Yoshimoto, 1971
45. *Euderus malayensis* Ferrière, 1930
46. *Euderus marilandicus* Girault, 1917
47. *Euderus masoni* Yoshimoto, 1971
48. *Euderus mestor* (Walker, 1839)

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49. *Euderus metallicus* (Ashmead, 1901)
50. *Euderus multilineatus* (Girault, 1917)
51. *Euderus ovativentris* (Girault, 1924)
52. *Euderus pallidiscapus* (Gahan, 1934)
53. *Euderus palustris* Erdös, 1951
54. *Euderus pecki* Yoshimoto, 1971
55. *Euderus pempheriphila* Ayyar & Mani, 1937
56. *Euderus petulans* (Girault, 1913)
57. *Euderus pulcher* (Girault, 1913)
58. *Euderus purpureus* Yoshimoto, 1971
59. *Euderus regiae* Yang, 1996
60. *Euderus repercussus* (Girault, 1913)
61. *Euderus rubriscapus* (Girault, 1916)
62. *Euderus rufiscapis* (Girault, 1913)
63. *Euderus rugosus* (Crawford, 1915)
64. *Euderus salinus* Erdös, 1951
65. *Euderus saperdae* Miller, 1965
66. *Euderus solidaginis* Yoshimoto, 1971
67. *Euderus striata* (Howard, 1897)
68. *Euderus subopacus* (Gahan, 1927)
69. *Euderus sumneri* (Girault, 1913)
70. *Euderus testualis* Khan
71. *Euderus tibialis* (unavailable name in Chalcicoidea)
72. *Euderus torymoides* (Ferrière, 1931)
73. *Euderus ussuriensis* (Storozheva, 1987)
74. *Euderus varicolor* (Ashmead, 1894)
75. *Euderus verticillatus* (Ashmead, 1888)
76. *Euderus viridilineatus* Yoshimoto, 1971
77. *Euderus viridis* Thomson, 1878
78. *Euderus viridulus* Boucek, 1988
79. *Euderus vockerothi* Yoshimoto, 1971
80. *Euderus yapensis* Yoshimoto & Ishii, 1965

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# Summary and Conclusion

*"Summing of the results provides further leads to prosperity"*

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# Chapter 5 Summary and Conclusion

India is blessed with a rich beneficial insect fauna, it is one among 12 “mega diversity” countries and accounts of 6.2% of Hymenopteran fauna which has a large percentage of parasitoids of crops pests. Despite of rich biodiversity of natural enemies fauna, our country’s economic entomologists are not much aware about their basic study including, identification of who’s who of natural enemies associated with various insect pests of agricultural importance which can offer a great promise in the BIPM Programme so- considering the taxonomy in Agricultural Entomology, there is an ample scope for its exploitation in biological control.

The insects biodiversity of Hymenoptera as compared to world fauna is very poorly known and is the lowest among the 27 insects orders known from India, it comprises approx 5000 (4,264 species out of 1 lakh recorded from the world). Thus comprising only 5% of the hymenoptera fauna recorded in India (Ghosh, 1996).

Among these insects, the members of the family Eulophidae is ecologically and economically most important parasitoids from controlling crop pests. Eulophidae is large family of super family chalcidoidea consisting of about 350 genera and more than 3,000 species (Noyes, 2002).

This is an extensive family of small chalcids. These are small to medium sized chalcids which can be recognized at a glance by medium to weakly sclerotised body, tarsi always 4 segmented, tibial spur of fore legs straight, funicle at the most 4 segmented in female, the frequently interiorly extended axillae, and non-pedunculate wings. Despite of the fact that eulophids are usually of minute in size but have a great repressive effect on pest population. Majority of entomophagous eulophids include several species attacking Insecta-Pterygota, larval parasitoids predominant but some others are egg, larval and pupal

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parasitoids, few members of subfamily Eulophinae and Tetrastichinae exhibit the phenomenon of ectoparasitism. Species of euplectrini are exclusively gregarious ectroparasitoids on caterpillars. The host spectrum of eulophid parasitoids is constantly increasing day by day, which includes orders of Lepidoptera, Diptera, Coleoptera and Hemiptera.

In fact these parasitoids have rarely been encouraged for pest control in India. The lack of proper information on their basic studies and improper identification many a times did not give the desired results of the major control projects. An improvement of systematic knowledge is greatly needed especially for projects connected with control of injurious insects.

With a view to furnish more information on the basic studies of parasitoids, the present work on Biosystematic studies on Eulophid parasitoids has been initiated.The present investigation, although is a very minor contribution to the vast field of the taxonomy of parasitic hymenoptera.

In the family Eulophidae an attempt has been made to give elaborative account of 13 genera, which include 31 species out of which 1 genus *Bishtiella* and 24 species viz. *Tetrastichus figensis, T. clubensis, T. minutus, T. eggaevorus, T. narendranii, T. mallitalensis, T. hillensis, T. bhimtali, Aprostocetus hayatae, A. silvestriae, Neotrichoporoides mani, Mestocharella kausaniensis, M. pauri, Tamarixia brassicae, T. minerensis, Bishtiella indica, Elachertus indica, Euplectrus scutellaris, Entedon erdosensis, E. dubeyensis, Chrysocharis malus, C.orientalis, Neochrysocharis parthenicus and Euderus elongata are* new to entomological science. Seven species namely *Tetrastichus clavatus* Khan *et al., T. taprobanensis* Ranweera, *Euplectrus bristlis* Khan *et al., Diglyphus horticola* Khan, *Chrysocharis longiclavatus* Khan *et al., Euderus albitarsis* (Zett.) and *E. agromyzae* Gangrade have been redescribed.

An attempt has also been made to utilize the characters of female genitalia for the separation of different species.

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# Literature Cited

*"When you achieve the goal, lets remember the former's role"*

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# ABSTRACT

The present investigation was carried out at Biological control laboratory of G.B. Pant Univ. of Agri. & Tech, Pantnagar, Distt.Udham Singh Nagar (Uttarakhand) to study the biosystematics of some Eulophid parasitoids (Hymenoptera : Eulophidae) from Northern India. As we know that India is blessed with a rich beneficial insect fauna. It is one among 12 "mega diversity" countries and accounts 6.2% of Hymenoptera fauna which has a large percentage of parasitoids of crop pests. Considering the biosystematics in Agricultural Entomology there is an ample scope for its exploitation in biological control. Among the insects, the members of family Eulophidae is ecologically and economically most important parasitoids for controlling crop pests.

The present study contain a detailed account of family Eulophidae and in family Eulophidae an attempt has been made to give a detailed account of 13 genera, amongst which one genus *Bishtiella* is new to Entomological Science. A contribution of 24 new species viz., *Tetrastichus figensis, T. clubensis, T. minutus, T. eggaevorus, T. narendranii, T. mallitalensis, T. hillensis, T. bhimtali, Aprostocetus hayatae, A.silvestriae, Neotrichoporoides mani, Mestocharella kausaniensis, M. pauri, Tamarixia brassicae, T. minerensis, Bishtiella indica, Elachertus indica, Euplectrus scutellaris, Entedon erdosensis, E. dubeyensis, Chrysocharis malus, C. orientalis, Neochrysocharis parthenicus and Euderus elongata are* new to entomological science. Seven species namely *Tetrastichus clavatus* Khan *et al.*, *T. taprobanensis* Ranweera, *Euplectrus bristlis* Khan *et al.*, *Diglyphus horticola* Khan, *Chrysocharis longiclavatus* Khan *et al.*, *Euderus albitarsis* (Zett.) and *E. agromyzae* Gangrade have been redescribed.

A key to serve as a ready reckoner for quick identification of Indian Eulophid genera has been prepared. A checklist for all the examined genera indicating latest acceptable names has also been compiled.

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