

**STUDIES ON THE SYSTEMATIC
ASPECTS OF BIODIVERSITY OF
SOME GENERA AND SPECIES OF
BRACONIDAE (HYMENOPTERA) OF
KERALA STATE**

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C E R T I F I C A T E

This is to certify that this thesis is an authentic record of the work carried out by **Ms. Sheeba. M.**, from October 2002 to January 2008 under my supervision in partial fulfilment of the requirements of the degree of Doctor of Philosophy in Zoology, under the Faculty of Science of the University of Calicut. No part of the thesis has been presented before for any other degree.

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

Prof. T.C.NARENDRAN

D E C L A R A T I O N

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

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INTRODUCTION

Systematics, the language of biology is the scientific study of the kinds and diversity of organisms and of any and all relationships among them (**Simpson, 1961**). The knowledge on biosystematics of any group of organism is the foundation for all meaningful research. Without studying systematics it is virtually impossible to study the biodiversity of any group of organism. Hence it is essential that efforts should be made to study the systematics of our fauna and flora before attempting to know their diversity. The multitude of species occurring in nature are studied, classified and named so that they can be identified in future. Once its correct name is known then it becomes a label by which information concerning that organism including all past work done on it can be stored and retrieved (**Narendran, 2000 & 2006**).

The importance of systematics to Biological Control

Biological control and systematics are interrelated and interdependent. Systematics has great importance in biological control programmes. When natural enemies are being sought or transferred from one region to another in order to bring about biological control of a pest, the correct identification of both the pest and natural enemy species is of utmost importance (**Narendran, 2003**).

Parasitic Hymenoptera is the most important group of biological control agents utilized in various biological control programmes. Out of 393 species of parasitoids established in classical biological control programmes, 344 (87%) were Parasitic Hymenoptera (**Greathead, 1986**). There are several examples of successful biological control programmes using parasitic hymenopterans. However there have also been failures. The failures in biological control are mostly attributed to poor or inadequate taxonomic knowledge on the pest, parasitoid and predator. Any advance in the knowledge of the biosystematics of parasitic hymenopterans can supply a lot

of information necessary for undertaking biological control or integrated pest management programmes using these insects.

Role of Braconids in Biological Control Programmes

The family Braconidae is the second largest family (after Ichneumonidae) in the order Hymenoptera. It contains at least 40,000 species in the world (**van Achterberg, 1988; Sharkey, 1993 & Narendran, 2001**). The family contains about 17,600 valid species (**Yu et al., 2005**). Majority of them are primary parasitoids of other insects and are normally associated to a single host (**Hanson & Gauld, 1995**). They are considered key-species for maintenance of the balance of the communities that include them (**Scatolini & Penteado-Dias, 1997**). Since their hosts include several pests of agricultural importance, many braconids are used as biological control agents against insect pests. As the conventional pest control strategy, using chemical pesticides is posing many ecological problems, biological control methods are gaining importance in recent years. Braconidae plays a significant role in many biological control programmes.

The parasitic behaviour of braconids was known since the early eighteenth century. Vallisneri discovered an attack of the gregarious braconid internal parasite, *Apanteles glomeratus* (L.) which emerged from conspicuous cocoons on the cabbage butterfly, *Pieris rapae* (L.) (**Coppel & Martins, 1977**). In 1883, the United States successfully imported this parasite from England against *Pieris rapae* (L.). This was the first intercontinental transfer of a parasitoid for biological control. In this way, Braconidae became the pioneer Parasitic Hymenoptera in the field.

The most common hosts of braconid parasitoids are Lepidoptera, Coleoptera and Diptera (**Wharton, 1997**). Sometimes Hemiptera and Hymenoptera are also found as hosts of Braconidae (**Narendran, 2001**). Many braconids are egg-larval parasitoids, laying an egg in the host egg but consuming the host in its larval stage. The members of Ichneutinae and a few

scattered species of other groups are sawfly parasitoids (**Wahl & Sharkey, 1993**).

Many biological control programmes have been successfully launched in the twentieth century, against agricultural pests. Several species of braconids have been of considerable value in the biological control work against insect pests. *Ischiogonus syagrii* Full. was imported into Hawaii from Australia in 1921 for controlling *Syagrius fulvitaris* Pasc., *Opius fletcheri* Silv. and *O. tryoni* Cam. have reduced the infestation of *Bactocera cucurbitae* Coq., and *Ceratitis capitata* Wied. respectively in Hawaii. *Apanteles solitarius* Ratz. and *Meteorus versicolor* Wesm., both of European origin, have been responsible for adequate control of the satin moth, *Stilpnotia salicis* L. in several sections of North America (**Clausen, 1962**).

Several species of braconids are used effectively in biological control works in South and South East Asia. Of these *Bracon brevicornis* Wesmael has been an important biological control agent used against *Opisina arenosella* Walker, pest of coconut in South India (**Sudheendrakumar et al., 1982**) *Meteorus hutsoni* (Nixon) is also another braconid parasitizing *O. arenosella* in Kerala (**Sudheendrakumar et al., 1979**).

Biological control programmes against Cotton Bollworms (*Earias* sp.) in several places in North West India using the indigenous parasite, *Bracon greeni* (Ashmead) are reported to be successful (**Rao et al., 1971**). *Bracon gelechia* (Ashmead) an exotic parasite from Canada was used against Potato Tuber-moth, *Phthorimaea operculella* (Zeller) in India (**Narendran, 2001**).

Biology

Members of Braconidae have a variety of biologies. Vast majority of the braconids are parasitoids of other insects while recently discovered few are phytophagous (**Maçedo & Monteiro, 1989; Wharton, 1993; Infante et al., 1995**). The female braconid searches for a suitable host in the appropriate habitat, lays one or more eggs on or in the host, and the immature

stages then develop to completion at the expense of a single host, killing it in the process (**Wharton, 1997**).

Parasitism by Braconidae may be either internal or external. It depends on the habits of the host stages that are subject to attack (**Clausen, 1962**). Though both are well represented, internal parasitism is more common than external parasitism (**Wharton, 1997**).

Endoparasitism occurs if the hosts are free living. It has evolved independently on several occasions within the family. Although certain advantages are gained by developing inside the host. Since the braconid inside the host body is subject to attack by the host's immune system a variety of strategies are evolved to overcome this, including the injection of viruses at the time of oviposition. The relationship between braconids and viruses constitutes one of the few known mutualism between viruses and eukaryotes. The virions produced in the wasp ovaries are injected into host larvae where virus genes are expressed, allowing successful development of the parasite by inducing host immunosuppression and developmental arrest (**Provost et al., 2004**). Braconid endoparasitoids, including all of the species in large subfamilies as the Alysiinae, Microgastrinae, and Opiinae (**Wharton, 1997**).

Among endoparasitic species both gregarious and solitary parasitism is common. The Cheloninae are predominantly solitary internal parasites of lepidopterous larvae. *Ascogaster quadridentata* Wesm. oviposit in the egg and completing their larval development when the host larva is nearly mature. The endoparasitic gregarious species deposit the full complement of egg at one insertion of the ovipositor. For example the female of *Apanteles militaris* (Walsh) deposits up to 72 eggs at one insertion. The members of Macrocentrinae and Matorinae are solitary or gregarious internal parasitoids of lepidopterous larvae (**Clausen, 1962**).

Ectoparasitoids parasitize hosts in concealed locations, such as stem tunnels, pupal cells, leaf rolls or cocoons. Many species inject venom before the eggs are laid, the resulting paralysis may be temporary or permanent, or

even fatal. The egg is sometimes deposited next to the host, especially when paralysis is permanent. If only temporary paralysis is induced the egg is often deposited on the host but where the host cannot get to it (**Wahl & Sharkey, 1993**). Braconid ectoparasitoids are represented by members of the subfamilies Braconinae, Hormiinae and Doryctinae (**Wharton, 1997**). The females of some species of *Microbracon* penetrate the burrows of the host and attack the larvae directly. *Bracon hylobii* Ratzeburg, scrapes away the frass at the entrance of the burrow of *Hylobius*, turns about, and inserts the ovipositor into the burrow (**Clausen, 1962**).

Stenobracon deesae (Cam.), an ectoparasite of the larvae of different species of lepidopterous borers of sugar-cane. The female detects the position of the fine hole in the cane stem containing the host by feeling with the antennae. Then it inserts the ovipositor into the hole and an egg is laid on the body of the host larva. Immediately after hatching the parasite larva begins to feed on the host by sucking its contents (**Narayanan, et al., 1954**).

In addition to ectoparasitic and endoparasitic lifestyles, braconid biology can be viewed in another way, idiobionts and koinobionts. Idiobionts are often ectoparasitoids; do not allow the host to develop after oviposition. They generally paralyze their host, lay an egg on or near the host, and begin consuming the host immediately after the egg hatches. Koinobionts are usually endoparasitoids, parasitizing the eggs or early larval stages of the host. Parasitoid development is delayed or protracted, allowing the host to reach the later larval instars or pupal stage before it is consumed. They usually do not paralyze their prey, and typically an egg is laid inside the host, the egg hatches immediately but undergoes a quiescent period while the host grows to an appropriate size and stage (**Askew & Shaw, 1986; Sharkey, 1993; Wharton, 1997**). Koinobionts usually exercise some control over the development of their hosts (**Vinson & Iwantsch, 1980**) and because they are closely associated with the life cycles of their hosts they have limited host

ranges. Conversely, idiobionts are usually not closely synchronized with their hosts, and host ranges are generally quite large (**Askew & Shaw, 1986**).

Hyperparasitism is only infrequently encountered in braconids. Euphorine genus *Syntretus* shows hyperparasitism on Ichneumonids.

Polyembryony occurs in a few species. The members of the subfamily Cheloninae lay egg inside the host egg and the parasite matures when the host larva is nearly mature (**Narendran, 2001**). This mode of reproduction was first suspected (**Voukassovitch, 1927**) in *Macrocentrus linearis* (Nees) (= *Macrocentrus abdominalis* Fabricius) parasitic in caterpillars of *Psammotis* and *Tortrix* in Europe. This kind of reproduction also occurs in *Microbracon gifuensis*, a parasitoid of the European corn borer (**Parker, 1931**).

Species diversity and Scope of Study

The family Braconidae comprising about 40,000 species which are distributed throughout the world in several different habitats (**Achterberg, 1988; Sharkey, 1993; Narendran, 2001**). The family contains 1,019 genera and 17,605 valid species (**Yu et al., 2005**). They are considered as key-species for maintenance of the balance of communities that include them (**Scatolini & Penteado-Dias, 1997**). The members of the family are widely used as models for the study of host-parasitoid interactions (**Wharton, 1993**). The taxonomy of Braconidae is still in its infancy in India. Hence the study of the systematics of Braconidae is very important in economic point of view. Since it is not feasible to revise all the genera of Braconidae, the present investigation was undertaken with a view to bring about the systematics of some genera of Braconidae of Kerala (viz. *Adesha* Quicke, *Aphrastobracon* Ashmead, *Aspidobracon* van Achterberg, *Bracon* Fabricius, *Cassidibracon* Quicke, *Chelonogastra* Ashmead, *Furcadesha* Quicke, *Philomacroploea* Cameron, *Shelfordia* Cameron, *Stenobracon* Szepligeti, *Testudobracon* Quicke, *Tropobracon* Cameron and *Spathius* Nees) and to provide workable keys to identify them.

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REVIEW OF LITERATURE

The historical resume of braconid wasps may be said to have started with **Linnaeus** (1758). In the tenth edition of this famous book 'Systema naturae' he described *Atanycolus denigrator* under the name *Ichneumon denigrator*. In the later part of eighteenth century, **Fabricius** contributed much towards this particular group of insects. In 1775 he described *Bracon capitator* under the name *Ichneumon capitator*, *Bracon defensor* under the name *Ichneumon hospitator*, *Campyloneurus mutator* under the name *Ichneumon mutator*, *Cyanopterus profiscator* under the name *Ichneumon dubitorius* and *Vipio desertor* under the name *Ichneumon desertor*. The same author described two species of *Iphiaulax* under *Ichneumon* viz. *Ichneumon denunciator* and *Iphiaulax fastidiator* in 1781 and described another two species viz. *Ipobracon ornator* under the name *Ichneumon ornator* and *Vipio nominator* under the name *Ichneumon nominator* in 1787.

In another major contribution, **Fabricius** (1793) described *Bracon femorator* under the name *Ichneumon femorator*, *Bracon aculeator* under the name *Ichneumon aculeator*, *Bracon pinnator* under the name *Ichneumon pinnator*, *Bracon itinerator* under the name *Ichneumon itinerator*, *Atanycolus initiator* under the name *Ichneumon initiator* and *Cyanopterus flavator* under the name *Ichneumon flavator*. After seven years (1798) he described five species of *Bracon* under *Ichneumon* viz., *Bracon minutator*, *B. fabricii*, *B. elector*, *B. laminator* and *B. urinator*. In the same year he described *Glabriolum castrator* under the name *Ichneumon castrator*.

Latreille (1802) erected the first braconid genus *Sigalphus*. After two years (1804) he erected two more genera viz., *Micorgaster* and *Vipio*. He was followed by **Fabricius** who erected the genus *Bracon* based on *Ichneumon minutator*. **Stephens** (1829) used the name Braconidae in his systematic catalogue of British insects. In 'Essay on parasitic hymenoptera', **Haliday**

(1835) discussed five new braconid genera. **Wesmael** (1835) published a monograph on Braconidae of Belgium. In addition to this he erected five new genera. In the second part of 'Essay on parasitic hymenoptera', **Haliday** (1836) erected five new genera. In the second monograph on Braconidae of Belgium, **Wesmael** (1838) contributed another seven new genera. In his first contribution on Braconidae, **Brulle** (1846) described six new species from India. Twenty two years later **Walker** (1860) described eight new species of Braconidae under four genera. In the same year **Smith** (1860) described a new species of *Bracon* viz., *B. jaculatus* from India. The contribution of **Foerster** (1862) towards the taxonomy of World Braconidae is undoubtedly noteworthy. In his 'Synopsis der Familien und Gattungen der Braconiden' he compiled most of the braconid genera described till then and erected twenty two new genera.

Westwood (1882) described a new species of *Bracon* viz., *B. sculptilis* from Sri Lanka (= Ceylon) and a new species of *Spinaria*, viz., *S. leuconelaena* from Combodia. **Ashmead** (1896a) erected a new genus, viz., *Aphrastobracon* with *A. flavipennis* from Sri Lanka (= Ceylon). **Ashmead** (1896b) described three new species from Sri Lanka (= Ceylon). The catalogue of World Braconidae was a good piece of work by **Dalla Torre** (1896). **Cameron** (1897a & b) published Vth and VIth parts of 'Hymenoptera Orientalia' or contribution to knowledge of the Hymenoptera of Oriental Zoological Region. Two years later **Cameron** (1899) published his first paper on the braconid fauna of Khasia Hills in Assam and erected a new genus with one species and twenty other new species. In the following year **Cameron** (1900) published his second paper on the braconids of Khasia hills and described four new species and erected four new genera.

Bingham (1901) described two new species of *Bracon*, viz., *B. nicevillei* and *B. famulus* from Bengal. **Cameron** (1902a) studied the Hymenoptera collected by Major Nurse at Deesa, Simla and Ferozepur, erected two new genera and described two new species of *Bracon* viz., *B.*

punjabensis and *B. deesae*. **Szepligeti** (1904) published the 22nd volume of 'Genera Insectorum' dealing with the braconid genera of the world. Besides revising the World genera, he provided a key to the World genera of Braconidae. **Cameron** (1905a) described two new species of genus *Iphiaulax* from Deesa (Gujarat), India. **Cameron** (1905b) studied the phytophagous and Parasitic Hymenoptera collected by Green in Sri Lanka (= Ceylon) and described twenty five new species of Braconidae. **Szepligeti** (1906) described two new species of genus *Bracon* and *Rhadinobracon* from Sri Lanka (= Ceylon). **Cameron** (1906a) studied the Tenthredinidae and Parasitic Hymenoptera collected in Baluchistan by Nurse, erected a new genus and described twelve new species under seven genera. In the same year he (1906b) studied Himalayan Braconidae.

Cameron continued his research on the taxonomy of Braconidae in the following few years. **Cameron** (1907a) published a paper on some undescribed phytophagous and Parasitic Hymenoptera from the Oriental Zoological Region. In the same year he described six new species of braconids from Sikkim and Himalayas. In another paper he described three new species from Deesa while studying the hymenoptera collected by Nurse at Deesa, Matheran and Ferozepur. **Cameron** (1910a, b, c & d) studied some Asiatic and African species of the braconid subfamilies and erected five new genera for five new species from Sri Lanka (= Ceylon) and described ten new species under known genera from Sri Lanka (= Ceylon) and India. **Cameron** (1913) described four new species of braconids reared from Lac and Sal insects in India, viz., *Apanteles tachardiae*, *Bracon tachardiae*, *Iphiaulax sal* and *I. immsi*. **Dudgeon & Gough** (1914) described a new species of *Microbracon* from Punjab, viz., *M. lefroyi*. **Szepligeti** (1914) described a new species of *Glyptomorpha* viz. *G. orientalis*.

Enderlein (1920) described two new species of *Campyloneurus*, viz., *C. gibbensis* and *C. reticulatus* from Sri Lanka (= Ceylon) and *Cyanopterus sola* from Sikkim. **Viereck** (1921) described a new species of *Habrobracon*.

Cushman (1922) studied the identity of *Habrobracon brevicornis* (Wesmael). **Ramakrishna Ayyar** (1924a) published the first catalogue of Indian Braconidae. In this he compiled 213 species under 40 genera from India and adjacent countries. **Ramakrishna Ayyar** (1924b) reported *Philomacroploea basimacula* Cameron and *Tropobracon maculipennis* Cameron for the first time from India and provided short notes on them. **Ramakrishna Ayyar** (1925) discussed the parasitic status of some known South Indian braconids. In the following year the same author revised the genus *Aphrastobracon* and described a new species, *A. maculipennis* from South India and provided a key to the species of *Aphrastobracon* described till then. **Ayyar** (1927) published a list of 47 braconids of economic importance noted from South India. In his work (1928) 'A contribution to our knowledge of South Indian Braconidae', he discussed the position, distinguishing features and classification of the family Braconidae, provided a brief revision of the previous work done on this family in India and reviewed the subfamily Vipioninae in detail. In this paper he discussed 12 genera and 33 species. Of these 2 genera and 17 species are new to science.

Fahringer (1928) studied the Indo-Malayan species of *Stenobracon* and provided a key to the Indo-Malayan species. **Wilkinson** (1931) studied the Indo-Australian and Ethiopian species of the genus *Spathius* Nees. **Ramakrishna Ayyar** and **Margabandhu** (1934) provided a list of the Indian hymenopteran parasites of economic importance in which braconids contribute a major part. **Lal** (1939) described four new species of Braconidae under four genera, viz., *Apanteles muzzaffarensis*, *Iphiaulax safderazae*, *Rhaconotus roslinensis* and *Stenobracon karnalensis* from India. **Nixon** (1939) described two new species of *Spathius* and two new species of *Rhaconotus*, and also provided a key to Indian species of *Rhaconotus*. **Nixon** (1943) revised the subfamily Spathinae of the Old World, and treated four known genera, viz., *Spathius*, *Pseudospathius*, *Paraspathius* and *Platyspathius* and erected three new genera viz., *Parana*, *Toke* and *Sisupala*. He divided the genus *Spathius* into forty two species groups.

Lal (1947) discussed the identity of *Bracon hebetor* and *B. brevicornis*. **Cherian & Margabandhu** (1949) discussed the identity of *Microbracon brevicornis* and *M. hebetor* and came to a conclusion that they are distinct species. **Watanabe** (1950) revised the genus *Aphrastobracon* Ashmead and provided a key to the Oriental species. **Puttarudriah** and **Channa Basavanna** (1956) also studied the identity of *Bracon brevicornis* and *B. hebetor* and came to a conclusion that *B. brevicornis* is a synonym of *B. hebetor*.

Capék (1969) made an attempt at a natural classification of the family Braconidae based on various unconventional characters such as larval taxonomy, biology and host relations. **Shenefelt** (1969) published the first volume of the catalogue of Braconidae of the world dealing with the subfamilies Euphorinae, Cosmophorinae, Neoneurinae and Macrocentrinae. Later in 1970 (a & b), 1974, 1975, 1976 and 1978 the same author published several other parts of the catalogue of world Braconidae. **Baltazar** (1972) reclassified some Indo-Australian and African Braconinae and Rogadinae. **Tobias** (1975) erected a new braconid genus of Tropic origin in the fauna of middle Asia, viz., *Victroviella* with *V. deserticola* as type species. **van Achterberg** (1976) provided a preliminary key to the subfamilies of Braconidae.

Quicke (1981a & b) reclassified some Oriental and Ethiopian species of Braconinae and in another paper he discovered the type specimen of the genus *Shelfordia* Cameron, reclassified the species, proposed synonymy and added notes on related genera. **van Achterberg** (1983) erected six new Braconinae from the Afro-tropical region and erected a new tribe Adeshini for the genus *Adesha* Cameron and a new genus *Adeshoides* with *A. asculcatus* from Senegal as type species. **Quicke** (1983) reclassified twenty species of Tropical and Old World Braconinae described by Cameron, Strand and Szepligeti. In the next year (1984a) he reevaluated several species of Afro-tropical and Indo-Australian Braconinae based on a study of the type

specimens, which resulted in reclassification of several species. In this he provided notes to aid the identification of some of the genera involved in the study. In this he gave a partial review of genera with merinotoid metasoma. In the same year in another paper **Quicke** (1984b) erected two new genera viz., *Sylvibracon* for *Ipobracon annulicornis* Szepligeti and *Monilobracon* with *M. speciosus* as type species from Sierra Leone. In a third paper in the same year **Quicke** (1984c) erected three new genera of Indo-Australian Braconinae, viz., *Gammabracon* with *G. scrobi*, *Paranesaulax* with *P. nitor* and *Rostraulax* with *R. vechti* as type species. Besides the above **Quicke** (1985a) erected three new genera of Braconinae from Afrotropical region, viz., *Sororarchibracon* with *S. striolatus*, *Fraterarchibracon* with *F. rubricorpus* as type species from Sierra Leone and *Sobrinarchibracon* with *S. nigroflagellasis* as type species from Kenya. **Quicke** (1985b) reclassified three species of Iranian Braconinae described by Hedqvist and Telenga and in a separate paper (1985c & d) reclassified some Indo-Australian and Afrotropical Braconinae.

In the following year **Quicke** (1986) contributed four publications on Braconidae. **Quicke** (1986a) revised the Adeshini and erected three new genera from the Palaetropics, viz., *Furcadesha* with *F. huddlestoni* and *Indadesha* with *I. achterbergi* from India and Cameroon. In addition he provided a key to the species of *Adesha*. He (**Quicke**, 1986b) erected seven new genera of Braconinae from Australia and Indonesia. In another paper (**Quicke**, 1986c) the same author erected three new genera of Braconini from the Afro-tropical and Australian region. In the next year **Quicke** (1987a) published an illustrated key to the Old World genera of Braconinae. In this he provided notes on each genus and on a number of characters employed in the key and described a new tribe, viz., Bathyaulacini and five new genera, viz., *Angustibracon* from India, *Serraulax* from Afro-tropical Region, *Virgulibracon* from Australia and *Vomeribracon* from New Guinea. In the same year, a new subfamily Vaepellinae, based on a new genus viz., *Vaepellis* with *V. varica* as type species from Ghana was raised by **Quicke**

(1987b). **Quicke** (1988) reclassified 24 species of Old World Braconinae based on the examination of type material in the British Museum, London; the Museum National d'Historie Naturelle, Paris; the Hungarian Natural History Museum, Budapest and in the Museum for Naturkunde aus der Humboldt Universital Zu Berlin.

van Achterberg (1989) erected three new genera of Braconinae from Philippines and Malaysia and a new genus of Rogadinae from Malaysia. **Quicke** (1989a) revised the Afro-tropical braconine genus *Archibracon* Saussure. He described 27 species and provided an illustrated key for the separation of most females. **Quicke** (1989b) provided an illustrated key to the females of *Euurobracon* species of Indo-Australian and Palaeartic Region. He also described three new species of *Euurobracon* from Malaysia, Dutch New Guinea and New Guinea. **Quicke** (1989c) erected three new genera of Braconini from Australasia and Malaysia. **Quicke** (1989d) erected two new genera of Braconinae from Brunei. **Quicke** and **Walker** (1989) erected a new genus of Braconinae, parasitic on Hispididae from Indo-Australian Region, viz., *Scutibracon* with *Microbracon hispae* Viereck as type species. **van Achterberg** (1990) published an illustrated key to the subfamilies of Holarctic Braconidae.

van Achterberg & Quicke (1991) erected a new genus of Braconinae from the Oriental region. **Quicke** (1991) revised Australian species of *Iphiaulax* and *Chaoilta*. **Heneidy & Quicke** (1991) discussed the Indo-Australian species of the braconin wasp genus *Zaglyptogastra* Ashmead. **Quicke & Walker** (1991) erected a new Indo-Australian genus of Braconinae. **van Achterberg** (1992) erected four new genera of Braconinae from Indo-Australian region. **Beyarslan** (1992) described two new species of Braconinae from Turkey and Lebanon. **van Achterberg** (1993a) revised the genus *Tropobracon* Cameron. **van Achterberg** (1993b) described a new species of the genus *Shelfordia* Cameron from North-east India. **van Achterberg** (1993c) published an illustrated key to the subfamilies of the

Braconidae. **Quicke** (1993) described a new genus of Braconinae reared from plant galls in India. **Chishti & Quicke** (1993) described a new species of *BicariniBracon* Quicke & Walker with a revised key to species. **Chishti & Quicke** (1994) revised the Indo - Australian genus *Macrobracon* Szepligeti with description of two new species. In addition to this an illustrated key to males and females of 13 known species of the genus *Macrobracon* Szepligeti are provided. **Kurhade & Nikam** (1994) described a new species of *Spathius* Nees from India. **Narendran et al.** (1994) described three new species of *Cassidibracon* Quicke from India.

Chishti & Quicke (1995) erected a new genus *Annectobracon* with *A. eventus* as type species from China and *A. excavata* from India and Sri Lanka. **Chishti & Quicke** (1996) revised the Indo-Australian species of *Stenobracon* Szepligeti parasitic on Lepidopterous stem borers of graminaceous crops. **Quicke & Lanshao** (1996) described a new species of *Calcaribracon* Quicke parasitic on larvae of *Casmara patrona* Meyrick in China. **van Achterberg** (1997) published an illustrated key to subfamilies of Braconidae. **Quicke et al.** (1997) described a new species of *Physaraia* Shenefelt from China. **Braet** (1999) described two new species of Braconinae from Papua New Guinea and Namibia. **Papp** (1999) described a new species, viz., *Bracon (Glabrobracon) dilatatus* from Iran and Iraq with taxonomic remarks on several related species.

van Achterberg & Weiblen (2000) erected new genus, *Ficobracon* with *F. brusi* as type species reared from figs in Papua New Guinea. **Belokobylskij & Quicke** (2000) erected seven new genera of the subfamily Doryctinae with ten species from the Old World. **Papp** (2000) redescribed a little known species, *Bracon poleris* Hellen. **Quicke & Polaszek** (2000) erected a new genus for the Adeshini with first host records.

Belokobylskij (2002) erected two new Oriental genera of Doryctinae from termite nests. **Belokobylskij** (2003) published a paper on species of *Spathis* Nees, not included in Nixon's Monograph (1943). **Wang et al.**

(2003a) studied the subtribe Aphrastobraconini Ashmead from China and described 5 new species belonging to three genera. **Wang et al.** (2003b) reported the genus *Shelfordia* Cameron for the first time from China and described a new species of the same genus. **Wang et al.** (2003c) revised the genus *Testudobracon* Quicke from Eastern China and described three new species. In addition a key to species of the genus *Testudobracon* Quicke is also provided. **Haider et al.** (2003) erected a new genus *Zakaella* to accommodate *Bathyaulax alami* Zaka-ur-Rab. **Haider et al.** (2004a) described a new species of the genus *Habrobracon* Ashmead, along with key to the Indian species of *Habrobracon* Ashmead. **Haider et al.** (2004b) studied the genus *Tropobracon* Cameron from India with description of two new species. **Yu et al.** (2005) published an interactive catalogue of world Ichneumonoidea. **Sarmiento & Sharkey** (2005) studied the status of some species of Braconidae described by J.C. Fabricius and synonymised *Dichelosus* Szepligeli with *Coccygidium* De Saussure. **Wang et al.** (2006a) discovered *Spinadesha* Quicke from S. China and described a new species viz., *S. sinica*. **Wang et al.** (2006b) studied the *Coeloides* Wesmael. **Wang et al.** (2007) studied the genera *Aspidobracon* van Achterberg and *Philomacroploea* Cameron from China and described two new species of *Aspidobracon*.

SHEEBA M. "STUDIES ON THE SYSTEMATIC ASPECTS OF BIODIVERSITY OF SOME GENERA AND SPECIES OF BRACONIDAE (HYMENOPTERA) OF KERALA STATE". THESIS. DEPARTMENT OF ZOOLOGY, UNIVERSITY OF CALICUT, 2008.

MATERIALS AND METHODS

1. Collection Work

The adult specimens were collected alive from the field. They are usually found among thick vegetation. Capturing and preserving specimens is essential for systematic studies. Standard entomological collection equipments include Sweep Net, Malaise trap, Moericke trap, Pitfall trap, etc. Since the group under investigation is mainly parasitoids, host eggs, larvae and pupae are also collected from the field and reared in the laboratory. Since some are parasitic in gall forming insects, the galls are also collected from the field for rearing.

a. Study Area

Specimens were collected from all districts of Kerala. The state stretches for about 360 miles along the Malabar Coast on the western side of the Indian Peninsula; its width varies from 20 to 75 miles. It has an area of 38,863 square kilometers and is located between 8°18'N and 12°48'N latitudes and 74°52'E and 77°22'E longitudes. Kerala is bound by Arabian Sea on the west, Karnataka on the north and northeast and Tamil Nadu on the east and south. Some of the richest varieties of flora and fauna in India are found in Kerala.

Kerala may be divided into three geographical regions: Highlands, Midlands and Lowlands. The highlands slope down from the Western Ghats which rise to an average height of 900 m, with a number of peaks well over 1,800 m in height. The midlands lying between the mountains and the lowlands, is made up of undulating hills and villages. The lowlands or the coastal area, which is made up of the river deltas, back waters and the shore of the Arabian sea, is essentially a land of coconut and rice.

b. Climate

The climate is equable and varies from season to season. Four alternate seasons cover the climate of Kerala. They are hot season (March to May), South-West monsoon (June to September) Post-monsoon (October - November) and North-East monsoon (December to February). The temperature normally ranges from 26 - 32°C in the plains but drops to about 21°C in the highlands. The state gets its due share of both the southwest as well as the northeast monsoons, and the rainfall is heavy, averaging around 3000 mm annually. The mean relative humidity ranges from 60 - 90%.

2. Methods of Collection

Collections were done by different methods. They are as follows.

a. Net Sweeping

This is the best method for collecting Braconidae as well as other parasitic Hymenoptera. The net used in the present investigation is a modified model designed by **Narendran** (2001). The sweep net (Plate IA) essentially consists of a triangular frame which holds a net bag. A cylindrical handle (length of 106-122 cms) made of aluminium tube is connected to the triangular aluminium frame (48 x 46 x 48 cms). The frame can be fitted to one end of the handle and can be easily separated when not in use. The long handle makes sweeping possible even underneath hanging bushes easier and extends the area of each individual sweep. The 60 cm net bag is made up of thin white cotton cloth or terelene cloth having fine mesh that will permit easy passage of air but at the same time prevents escape of smaller insects of less than 1 mm in size. The rim of the bag is reinforced with a thick material preferably canvas.

It is important to choose an area where the vegetation is as diverse as possible for sweeping. Grassland surrounded by diverse array of bushes and trees from an excellent location for collection. The sweeping is done as described by **Noyes** (1982). Once caught inside the net, twisting the net sideways, so that the bag folds over the rim and thus retains the capture

prevented the escape of these insects. The specimens from the net are sucked up, by using the Aspirator (Plate IB). The Aspirator consists of a glass or plastic vial, fitted with a two-holed cork, holding two thin transparent glass or plastic tubes, acting as a sucker and an entry tube. One end of the entry tube is placed deep down the vial and the other end extends well out to be placed against the desired insect. One end of the sucker inside the vial is covered with a piece of fine netting or screening to prevent the suction of insects and the other end is connected to a moderately long rubber tube, to act as sucking device. This connection should be airtight. The vacuum created inside the vial draws the desired insect into it through the entry tube. Once the insects are collected in the Aspirator, they are killed by placing a piece of cotton wool soaked in ethyl acetate.

b. Malaise trap

Originally invented by Dr. R. Malaise, this trap makes use of the negatively geotactic and positively phototactic behaviour of insects. A suitable design of Malaise trap (Plate IC) has been well described by **Townes** (1972). This tent like device catches insects by chance as they fly into the sides of the trap, they crawl upwards to the roof (negatively geotactic behaviour) where they enter the collecting bottle (usually situated in the direction of sunlight), which contains 70% alcohol. Several modifications of the original Malaise trap are available. In the present work, the net made by M/s. Marris House Net's (England) have been used. The complete trap is about 183 cm wide, 106.7 cm high at one end and 198 cm high at the other end. This net has two advantages, it needs to be visited only once a week for emptying and can be serviced even by a non-entomologist. Species belonging to the subfamilies Microgastrinae, Doryctinae, Braconinae, and Agathidinae have been collected by this method.

c. Pitfall trap

This is a specialized method of collecting ground dwelling insects, which otherwise may be overlooked. This is a suitable method of sampling in

habitats where sweeping by sweep net is not practical. The pitfall trap consists of a jar sunk in the ground and partly filled with 50% alcohol or ethylene glycol/water mix or salt solution. This can be left for a week without servicing. The specimens collected in the pitfall trap with ethylene glycol/water mix or salt solution must be thoroughly washed in clean water before transferring to 70% alcohol.

d. Rearing

This is the most useful method of collecting parasitic Hymenoptera, since this method gives several pieces of useful information like the host data, host association and other biological information about the parasitoids. Rearing parasites from hosts will enable one to positively associate males with their females which otherwise is often difficult because males of many species of a group closely resemble each other.

Since group under investigation are mainly parasitoids immature stages such as eggs, larvae and pupae of suspected hosts and leaf and stem galls were also collected from the field. They are placed in suitable containers for emergence of parasitoids.

e) Yellow Pan or Moericks Trap

The principle that many insects are attracted to yellow colour forms the basis of this method. The trap consists of a shallow tray, about 60-75 mm deep and about 30 cm square, which is painted yellow inside and black on the outside (Plate ID). The tray was flitted with water to which a few drops of detergent were added to break the surface tension. It was then laid on the ground in a suitable habitat (where yellow flowers are not present among the vegetation). The tray was emptied once a day with a small net. Before transferring the specimens to alcohol, they were washed with fresh water to prevent the formation of deposits on the specimens due to contamination from the detergent.

3. Storing and Preservation

a. Unmounted material

The unmounted materials are stored in 70% alcohol in small bottles which are kept in a refrigerator. Long term preservation can be improved by freezing. The bottles were numbered and labeled. The alcohol was changed periodically so as to prevent deterioration. They can be mounted whenever convenient.

b. Mounted material

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

4. Relaxing

Relaxing helped to prevent breakage of specimens when they were being card mounted. A plastic sandwich box with a tight fitting lid, containing a few drops of glacial acetic acid in a layer of cotton wool can be used as a relaxing chamber. Specimens to be relaxed were kept on a piece of tissue paper in a glass dish and kept over the cotton wool for 6-8 hours.

5. Mounting

The method adopted by **Noyes** (1982) is followed in the present work. The well dried specimens were mounted on a rectangular card. They were mounted in such a way that one side of their thorax was glued to the card. This method has been preferred since this enables to see the features from front, dorsal side and from lateral aspect. This method also given better protection than other methods like triangular card mounting, bristle mounting, pin gluing etc. The white background of the card enables one to see the various parts of the specimen more clearly.

The materials used for card mounting were 1) Microscope, 2) Rectangular cards 3) Blotting paper, 4) A fine zero point brush, 5) Entomology pins, 6) Water soluble glue and 7) Table lamp.

Before mounting, it was made sure that the glue was completely cold water soluble. First of all, the specimen to be mounted was placed on a piece of blotting paper, so that the blotting paper absorbed the moisture content from the specimen. It was then dried under the table lamp. The specimen was placed under a microscope and its antennae, labial and maxillary palpi, legs and wings were spread and properly positioned with the help of a brush and pins. Asta pins of No.3 with size 38 mm and 0.55 mm made by M/s. Newey Goodman and Co's (England) and Ento Sphinx insect pins of No.3 with size 38mm and 0.50mm made by Ento Sphinx s.r.o. Pardubice (Czech Republic) were used. A small drop of glue was placed on the card using the tip of a pin. The tip of the brush was moistened with alcohol. The specimen

was picked up using the brush and placed on the gum. Then the specimen was gently and firmly pressed down with the brush for good adhesion. Care was taken to keep antenna, legs, wings, etc. free from glue. The wings were stretched out and flat on the card. The mounted specimens were held on Asta pins. Then the specimens were labelled.

6. Labelling and Registering

Temporary labels were written in the field at the time of collecting specimen. After mounting the specimen, permanent labels indicating the name of the country (in capital letters), name of the state, name of the locality from which the specimen was collected, name of the person who collected the specimen, date of collection, name of hosts and collection number were added. Registering of specimens was done after the specimens have been identified at least upto generic level. The registering of entries is as follows: 1) Serial number, 2) Collection number, 3) Scientific name, 4) Name of the person who determined the species, 5) Name of the locality, 6) Date of collection, 7) Name of the hosts/hosts, 8) Name of the collector and 9) Remarks.

7. Observations and Illustrations

Sorting and mounting were done using Olympus (Japan made) microscope. Card mounted specimens were studied illustrated using the drawing tube of Leica MZ6 Stereozoom (Switzerland) microscope and enlarged using KB enlarger of B₂M model. Taxonomic descriptions were done using Leica MZ6 stereozoom (Switzerland) microscope.

MORPHOLOGICAL TERMINOLOGY

- Aciculate - Appearing as if scratched with a fine needle, referring to surface sculpture.
- Aciculatorugose - Irregularly, longitudinally wrinkled, referring to surface sculpture (Fig.26).
- Acuminate - Tapering to a long point.
- Antenna
(Pl. =antennae) - Paired segmented appendage located between the compound eyes on the anterior or dorsal surface of the head. There are sensory structures composed of three primary segments, ie., scape, pedicel, and flagellum. The flagellum is always multi segmented in Braconidae (Fig.6).
- Anterior tentorial pits - Pair of pits, demarcating the dorsolateral limits of the clypeus and the insertions of the anterior arms of the tentorium (Fig.3) (internal support structure of the head.)
- Antescutal depression - A median, usually triangular depression immediately in front of the anterior margin of the mesoscutum. It appears to be formed by an anterior deflection of the posterior, carinate margin of the pronotum.
- Areola
(Pl. = areolae) Central cell or margined area sometimes present on the propodeum (Fig.118)
- Areolate - Surface that is divided into a number of cells or areolae, referring to surface sculpture (Fig.118).
- Basitarsus - Most basal of the tarsal segments (Fig.)
- Bifurcate - Cleft, divided into two parts
- Carina - Ridge (Fig.5)
- Carinate - Ridged referring to surface sculpture.
- Carapace - Refers to the dorsal surface of the metasoma when it is composed of more than 4 visible terga that are more or less ridged and expanded laterally and

posteriorly so as to cover the entire metasoma.

- Clypeus - Medial sclerite of the head lying immediately above the labrum and delimited dorsolaterally by the anterior tentorial pits, and dorsally by the face (Fig.3)
- Coriaceous - Leather like in sculpture or texture.
- Coxa - Most basal of the primary leg segment (Fig.7)
- Crenulate - Referring to grooves that are broken by a number of transverse ridges.
- Cyclostome - Condition describing the oral region of the head in which there is a circular to elliptical opening or gap between the clypeus and mandibles (when the mandibles are in the closed position) and a concave labrum (Fig.11). The opening is referred as hypoclypeal depression. Cyclostome also refers to a group of braconid subfamilies, most of which have this condition.
- Dorsal carinae - Pair of prominent longitudinal carinae of the first metasomal tergum (Fig.13)
- Dorsope - Pit, usually at the base of the dorsal carinae of the first metasomal tergum
- Ectoparasitoid - Parasitoid that, while in the larval stage, feeds externally on its host.
- Egg-larval - A koinobiont strategy in which the parasitoid egg is deposited inside the egg of the host, but development proceeds slowly and the host is not killed until it becomes a larger instar larva.
- Emarginate - Notched (indented) on the margin.
- Endodont - Usual condition of mandibulate insects in which the teeth of the mandibles are facing towards the midline of the body when the mandibles are closed.
- Endoparasitoid - Parasitoid that, while in the larval stage, feeds on its host internally.
- Exodont - Condition in which the teeth of the mandibles are facing anteriorly and do not overlap when the mandibles are closed.

Face	- Part of the anterior surface of the head ventral to the antennal sockets and dorsal to the clypeus (Fig.3)
Femur	- Third major segment of the leg, lying between the trochanter and tibia (Fig.7). The femur is subdivided and the basal portion is known as the trochantellus.
Filiform	- Antenna that have slender, cylindrical flagellomeres making the antennae appear thread like (Fig.6).
Flagellomere	- Segment or article of the flagellum. The shape, size and especially the number of these constitute important characteristics. Atleast some and usually most of the flagellomeres of braconids possess sensory structures known as placodes.
Flagellum	- Third and most distal primary segment of the antenna. In the Braconidae, each flagellum is subdivided into a number of flagellomeres or articles.
Flange	- Projecting rim or edge. It refers to the condition of the propleuron where the posteroventral edge projects over the ventral extremity of the pronotum (Fig.6)
Foveate	- Pitted with numerous, uniform depression that are somewhat larger than punctures.
Frons	- Part of the anterior or dorsal part of the head, between the median ocellus and the antennal sockets (Fig.4). The frons may be variously sculptured.
Gena (Pl.=genae)	- Lateral part of the head, bordered anteriorly by the compound eye, posteriorly by the occipital carina ventrally by the base of mandible and dorsally by the vertex (Fig.3). The dorsal half of the gena is temple. The length of the gena is the shortest distance between the posterior margin of the compound eye and the occipital carina.
Glabrous	- Smooth, hairless and without punctures or structures.
Glymma	- Groove in the side of first tergite (Fig.2).
Granulate	- Referring to sculpture that appears granular under high magnification as in sand paper.
Hamulus (Pl.=hamuli)	- One of a series (often 3) of hooked, bristle like setae on the anterior margin of the hind wing. These couple with the hind margin of the fore wing (Fig.10).

Hyaline	- Transparent and not or very weakly pigmented.
Hypoclypeal depression	- Depression in the oral cavity formed by a concave apical margin of the clypeus and a concave labrum (Fig.11).
Hypopygium	- Last visible metasomal sternum (Fig.10).
Hypostomal carina	- Ridge on the posterior surface of the head, lateral to the maxilla and labium, mesal to the occiput (Fig.)
Idiobiont	- Parasitoid that does not allow further development of the host once oviposition takes place. This is the usual strategy of ectoparasitoids.
Inclivous	- Position of transverse vein of which the anterior end is nearer to the wing base than its posterior end.
Infumate	- Smoke coloured.
Infusate	- Smoky grayish brown with blackish tinge, used in reference to wings.
Interstitial	- A vein is said to be interstitial when it meets another vein end to end; that is, the vein intercepts a point between two cells.
Intertentorial distance	- Distance between two anterior tentorial pits.
Koinobiont	- Parasitoid that allows the host to develop after oviposition takes place. This is a common strategy for endoparasitoids.
Labrum	- Anterior, unpaired, median appendage of the mouth, attached to the posterior side of the clypeus (Fig.3). The shape of the labrum varies considerably in Braconidae - Most members of the "Cyclostome" braconids have the labrum exposed, concave, and glabrous (lacking setae). The labrum of other braconids is mostly uncealed by the clypeus and mandibles.
Lamelliform	- Leaf-like or referring to highly raised thin ridges.
Laterad	- Towards the lateral side of a structure.
Laterope	- Deep invagination or a round or oval pit in the lateral,

	basal, surface of the first metasomal tergum.
Malar space	- Area between the ventral margin of the compound eye and the base of the mandible (Fig.3).
Malar suture	- Suture between ventral margin of compound eye and the base of the mandible (Fig.58).
Mandible	- Paired, heavily sclerotized appendage of the mouth situated between the labrum and maxilla. In the Braconidae these usually bear two teeth (denticles) apically and the teeth point mesally and somewhat posteriorly when the mandibles are closed (endodont). In braconids with exodont mouthparts there are usually 3 or 4 teeth and these face anteriorly when the mandibles are closed.
Membranous	- Integument that is thin, flexible and weakly sclerotized.
Median carina	- Median longitudinal ridge.
Median mesonotal lobe	- Notauli may divide the mesonotum into a median and two lateral lobes (Fig.5).
Mesonotum	- Tergum or dorsal surface of the mesothorax composed of the mesoscutum and scutellum (Fig.5).
Mesopleuron	- Lateral sclerite of the mesothorax (Fig.2).
Mesoscutum	- Anterior sclerite of the mesonotum (Fig.5).
Metanotum	- Tergum or dorsal surface of the mesosoma. In the Braconidae this is a rather narrow band between the scutellum and the propodeum (Fig.5).
Metapleural flange	- Protruding part of metapleuron near the base of the middle coxa (Fig.2)
Metapleuron	- Lateral sclerite of the metathorax. In lateral view, most of the metapleuron lies ventral to the propodeum (Fig.2).
Metasoma	- Part of body after the second strong constriction and consisting of second and following abdominal segments (Fig.2).
Notaulus (Pl.=notauli)	- Pair of longitudinal, posteriorly converging grooves on the mesoscutum (Fig.5). These may be short, barely

extending beyond the anterolateral margin, or long, reaching the transcupal articulation. They may be represented by weak, shallow impressions or deep, heavily sculptured grooves.

- Occipital carina - Ridge on the posterior surface of the head that separates the genae and vertex from the occiput. The completeness and the absolute presence or absence of this carina, as well as its point of intersection ventrally (meeting the subgenal carina or the hypostomal carina) are all important diagnostic characters (Fig.5).
- Occipital flange - Lamella above the mandibular condylus and formed by the confluent part of occipital and hypostomal carinae.
- Occiput - Posterior surface of the head mesal to the occipital carina and lateral to the hypostomal carina.
- Ocellus
(Pl.= Ocelli) - Simple eye composed of one facet. In the Braconidae there are three ocelli located on the vertex, one median ocellus and a pair of lateral ocelli (Fig.4).
- Open cell - Wing cell that is not surrounded by veins.
- Ovipositor - An egg laying apparatus composed of two pairs of interlocking styles that form a hollow tube (Fig.2).
- Ovipositor sheath - One of a pair of setiferous sheaths that envelop the ovipositor (Fig.2).
- Palp - Tactile, paired and usually segmented structures borne by the maxillae and the labium.
- Pedicel - Second primary segment of the antenna.
- Penultimate - Next to the last
- Petiole - First metasomal segment (Fig.107).
- Petiolate - With a slender (Petiole like) connection.
- Pleural sulcus - Groove (usually crenulate) posteriorly at the mesopleuron (Fig.2).
- Posterior scutellar depression - Small, median, usually transverse depression or differentiated patch of sculpture along the posterior margin of the scutellum.
- Postpectal carina - Transverse carina on the ventral surface of the mesopleuron immediately anterior to the middle coxa

(Fig.2).

- Precoxal sulcus - Transverse depression on mesopleuron, anteriorly more dorsally situated than posteriorly (Fig.2).
- Prepectal carina or Epicnemial carina - Ridge on the anterolateral and anteroventral surface of the mesopleuron (Fig.2). The presence or absence of this ridge is a very important diagnostic character.
- Pronope - Dorsomedian pit on the pronotum.
- Pronotum - Tergum of the prothorax. In the Braconidae this is usually a narrow dorsal band anterior to the mesoscutum that extends ventrally on each side and widens on the anterolateral surface of the mesosoma (Fig.5).
- Propleural carina - Carina on the posterodorsal surface of the propleuron running parallel to the anteroventral margin of the pronotum.
- Propleural flange - A flaplike extension of the posterolateral corner of the propleuron that curves up over the ventral apex of the pronotum.
- Propleuron - Lateral sclerite of the prothorax. In the Braconidae this constitutes the anteroventral surface of the mesosoma, below the head and above the fore coxae.
- Propodeal areola - Central cell or area sometimes present on the propodeum.
- Propodeum - Most posterior of the four segments of the mesosoma. It is the true first abdominal segment which is fused with the metathorax and separated from the remainder of the abdomen by a constriction.
- Punctate - With punctures (fine small depressions) referring to surface sculpture.
- Punctation - Punctures
- Punctulate - With small punctures.
- Rugose - Wrinkled, referring to surface sculpture.
- Rugosities - Wrinkles, referring to surface sculpture

Rugulose	- Minutely wrinkled, referring to surface sculpture.
Scape	- Basal segment of the antenna (Fig.6).
Scutellar disc	- Area of the scutellum posterior to the scutellar sulcus, usually triangular.
Scutellar sulcus	- Transverse depression of the scutellum directly posterior to the mesoscutum, often appearing as two large pits (Fig.5).
Scutellum	- Posterior sclerite of the mesonotum. The area between the anterior margin of the scutellar sulcus and the metanotum (Fig.5).
Shagreen	- Covered with a closely set roughness like the rough surfaced horse leather or shark leather.
Sinuate	- Wavy, often referring to wing veins or the margins of sclerites.
Sternaulus	- Groove running from near the base of the middle coxa towards the anterior margin of the mesopleuron. The stermaulus is frequently sculptured and depending on the shape of the mesopleuron, may vary in position from horizontal to nearly vertical.
Sternum (Pl.= sterna)	- Ventral sclerite of a metasomal segment. Sterna are numbered from the most basal to the most apical as sternum 1, sternum 2, etc.
Stria (Pl.=striae)	- Fine groove, finer than costae.
Striate	- Composed of a number of striae or fine grooves, referring to surface sculpture.
Sub-	- Latin prefix meaning slightly less than e.g. subapical, slightly less than apical or almost apical.
Tarsal claws	- Pair of claws borne by the telotarsus (Fig.7) (apical tarsomere)
Tarsomere	- Segment of the tarsus (Fig.7). Most members of the Braconidae have 5 tarsomeres on all legs. The apical tarsomere (tarsomere 5 or telotarsus) bears the tarsal claws.
Tarsus	- Most apical of the primary leg segments (Fig.7). In the

	Braconidae the tarsus is subdivided into five Tarsomeres.
Teeth	- Denticles of the mandible, usually at the apex and usually two in number. Teeth or tooth - like projections may also be found at the apex of the clypeus or the apex of the clypeus.
Tegula	- Sclerite near the extreme base of the costa of the fore wing that overlaps the wing base.
Telotarsus	- Apical Tarsomere (Fig.7).
Tergite	- Subplate of a tergum (Fig.2). In the Braconidae the terga of the metasoma, especially the anterior terga are divided into one median and two lateral tergites.
Tergum (Pl. =terga)	- Dorsal sclerite of a metasomal segment. Often divided into one median and two lateral tergites. Terga are numbered from the most basal to the most apical as tergum 1, tergum 2, etc.
Temple	- Upper part of gena posteriad the compound eye (Fig.4).
Tentorioocular distance	- Distance between an anterior tentorial pit and lower margin of eye of the same side.
Tibia	- Fourth primary leg segment lying between the femur and tarsus (Fig.7).
Tibial spur	- Spine-like structure at the apex of the tibiae (Fig.7).
Trochanter	- The second major segment of the leg, lying between the coxa and the trochantellus (Fig.7).
Trochantellus	- Basal division of the femur, lying between the trochanter and the femur proper (Fig.7).
Truncate	- Cut off squarely at the tip.
Vertex	- Dorsal surface of the head, bordered anteriorly by the frons, laterally by the compound eyes, and posteriorly by the occiput (Fig.4).
Width	- Maximum width, unless otherwise stated.

SYSTEMATIC STATUS OF THE FAMILY BRACONIDAE

Taxonomic studies on braconids started with **Linnaeus** (1758) when he described braconids, ichneumonids and other terebrantia under the genus *Ichneumon*. **Stephens** (1829) erected the family Braconidae. **Wesmael** (1835) divided braconids into the "braconides endodontes" and the "braconides exodontes." The *braconides exodontes* (having peculiar out-turned mandibles) are now called Alysiinae. The *braconides endodontes* (having inwardly directed mandibles) included all other braconids. Wesmael divided them into four subdivisions: polymorphs, cryptogastres, areolaires and cyclostomes.

Foerster (1862) recognized 26 families are given subfamilial status by modern workers. **Szepligeti** (1904) divided Braconidae into 31 subfamilies. **van Achterberg** (1976) discussed the systematic position and evolutionary trends of Braconidae and divided the family into 22 subfamilies. **Quicke** and **van Achterberg** (1990) recognized 43 subfamilies. **van Achterberg** (1993c) recognised 45 subfamilies. **Sharkey** (1993) discussed the subfamilies of Braconidae by dividing the family into two major groups, Cyclostome and Non-cyclostome Braconidae and recognized 29 subfamilies. **van Achterberg** (1997) divided the family Braconidae into 47 subfamilies.

Recent classification by **Yu et al.** (2005) includes 48 subfamilies. It is as follows: Acampsohelconinae, Adeliinae, Agathidinae, Alyscinae, Amicrocentrinae, Aphidiinae, Apozyginae, Betylobraconinae Blacinae, Brachistinae, Braconinae, Cardiochilinae, Cenocoeliinae, Charmontinae, Cheloninae, Dirrhopinae, Doryctinae, Ecnomiinae, Euphorinae, Exotheeinae, Gnamptodontinae, Helconinae, Histeromerinae, Homolobinae, Hormiinae, Ichneutinae, Khoikhoiinae, Lysiterminae, Macrocentrinae, Masoninae, Maxfischeriinae, Mendesellinae, Mesostoinae, Meteorideinae,

Microgastrinae, Microtypinae, Miracinae, Opiinae, Orgilinae, Pambolinae, Protorhyssalinae, Pselaphaninae, Rhysipolinae, Rhyssalinae, Rogadinae, Sigalphinae, Trachypelinae and Xiphozelinae. Among these families Adeliinae, Amicrocentrinae, Apozyginae, Brachistinae, Ecnomiinae, Khoikhoiinae, Masoninae, Maxfischeriinae, Mendesellinae, Mesostoinae, Protorhyssalinae, Pselaphaninae, Rhysipolinae and Trachypelinae are not so far reported from Oriental Region.

DIAGNOSIS OF THE FAMILY BRACONIDAE

Antennae with 17 or more segments (Fig. 6); costal cell absent; fore wing vein 2m-cu absent (except in rare Chilean genus *Apozyx* Mason); fore wing vein 1-SR+M present (Fig. 8); vein r-m of hind wing usually basal to separation of R1 and RS; presence of a trochantellus (Fig. 7) (i.e. trochanter appears two segmented); tip of propodeum not prolonged beyond hind coxal base; second and third tergites fused.

KEY TO THE SUBFAMILIES OF BRACONIDAE OF ORIENTAL REGION

1. Mandibles straight or curved outwards, their tips not touching when closed and with three or four teeth (exceptional two teeth or lobes: "exodont braconids").....**Alysiinae**
- = Mandibles curved inwards, their tips touching when closed and with one or two teeth (Fig.3).....**2**
2. Marginal cell of fore wing extremely narrow and rather long; trace of vein 2-CU of hind wing nearly always present and situated at or above level of vein cu-a; fore wing sometimes with one or two closed cells.....
.....**Agathidinae**

- = Marginal cell of fore wing of different shape, wider or comparatively short; vein 2-CU of hind wing nearly always absent, or vein 2-CU near level of vein 2A, far below middle of vein cu-a; fore wing with at least three closed cells.....**3**
- 3. Metasoma with a carapace, covering fourth and following tergites; vein 2-CU far below middle of vein cu-a; outer hind tarsal claw modified and more than 1.50x mid tarsal claw.....**Acampsohelconinae**
- = Metasoma with or without carapace (Fig.2); other characters not as above partly or completely different**4**
- 4. Hind basitarsus about twice as long as combined length of following segments of tarsus.....**Histeromerinae**
- = Hind basitarsus shorter than combined length of following segments (Fig.7).....**5**
- 5. Laterope round, deep and far removed from base of first metasomal tergite; vein cu-a of hind wing very long and strongly reclinous.....
.....**Xiphozelinae**
- = Laterope more or less elliptical and nearly always subbasally situated at first tergite or laterope absent; vein cu-a of hind wing usually straight and medium sized**6**
- 6. Vein 2-CU of hind wing sclerotised; scape truncate apically or shallowly concave.....**7**
- = Vein 2-CU of hind wing absent; characters not as above, partly or completely different.....**8**
- 7. Fourth and following metasomal tergites well exposed (Fig.2); vein 2-CU of hind wing situated far above level of vein 2A, near middle of vein cu-a; dorsal carinae of first tergite absent or obsolescent; marginal cell of fore wing normal, and comparatively long.....**Meteorideinae**

- = Fourth and following tergites largely or comparatively retracted below third tergite; vein 2-CU of hind wing situated near lower level of vein 2A, far below middle of vein cu-a; dorsal carinae of first tergite usually strongly developed; marginal cell of fore wing short.....**Sigalphinae**
- 8. Femur and telotarsus of fore leg strongly widened; if rather slender then second metasomal tergite with small triangular area mediobasally; dorsal carinae of first tergite united basally.....**Betylobraconinae**
- = Femur and telotarsus of fore leg normal; other characters partly or completely different**9**
- 9. Hypoclypeal depression deep and wide, middle ventral margin of clypeus distinctly above upper level of mandibular bases (Fig.11).....**10**
- = Hypoclypeal depression absent (Fig.3); if present then shallow, indistinct and medioventral margin of clypeus close to upper level of mandibular bases..... **19**
- 10. Posterior flange of propleuron absent, only very exceptionally present; first tergite with lateral parts flattened or tergite immovably connected to second tergite; prepectal carina absent laterally; ventral part of clypeus depressed, forming dorsal part of hypoclypeal depression.....
.....**Braconinae**
- = Posterior flange of propleuron present; first tergite with convex lateral parts and movably connected to second tergite; if immovably connected then prepectal carina present laterally**11**
- 11. Fore tibia with row of stout pegs or spines, which are at most as long as about 6x their width, or hind coxa angulate anteroventrally (Fig.115), frequently with a ventral tubercle; ovipositor dorsally nearly always with double nodus subapically; posterior flange of propleuron largely dorsally situated.....**Doryctinae**

- = Fore tibia without row of pegs or spines, but frequently bristly or with a cluster of bristly spines and length of bristles about 8.0x their width; other characters partly or completely different.....**12**
- 12. Second and third tergites largely membranous dorsally, nearly always less sclerotised than their epipleura and median carina of propodeum short or absent; pedicellus nearly as long as scapus**Hormiinae**
- = Second and third tergites similarly or more strongly sclerotized than their epipleura, if exceptionally tergites are desclerotized then median carina of propodeum long; pedicellus distinctly shorter than scapus**13**
- 13. Prepectal carina completely absent**14**
- = Prepectal carina present (Fig.2).....**15**
- 14. Second tergite with transverse elevated area basally; occipital carina largely absent; vein M + CU1 of fore wing completely sclerotised.....
.....**Gnamptodontinae**
- = Second tergite without transverse elevated area basally; occipital carina mediodorsally absent, present laterally; M+CU1 of fore wing largely unsclerotised; if completely tubular and fully sclerotised then laterope of first metasomal tergite distinct.....**Opiinae**
- 15. Inner side of eyes distinctly emarginate (Fig.11); median carina of propodeum usually at least half as long as propodeum; second tergite frequently with small triangular area mediobasally.....**Rogadinae**
- = Inner side of eyes not distinctly emarginate; other characters partly or completely different**16**
- 16. Median carina of propodeum long; medial areola small or incomplete.....
.....**Exothecinae**

- = Median carina of propodeum shorter than half length of propodeum; areola of propodeum complete (Fig.118).....**17**
- 17. Spiracle of second and third tergites situated in their notum and surrounded by striae; if exceptionally in their epipleuron then metasoma longitudinally striate with interconnecting sculpture and fourth and following tergites largely retracted under their tergite
.....**Lysiterminae**
- = Spiracle of second and third tergites situated in their epipleuron (Fig.2), distinctly below lateral fold, or near lateral fold, not surrounded by striae; metasoma without interconnecting sculpture if longitudinally striate; fourth and following tergites usually largely exposed behind third tergite **18**
- 18. Antennal segments 11-14; if more than 14 then labrum sculptured, labrum usually (nearly) flat, propodeum with a pair of distinct, acute tubercles and/or first tergite distinctly widened apically.....**Pambolinae**
- = Antennal segments with more than 14 segments; labrum smooth, and (slightly) concave; propodeum usually without tubercles; first tergite variable, usually differently shaped**Rhyssalinae**
- 19. Postpectal carina complete in front of middle coxae ventrally; metasoma with a carapace or metasoma inserted near level of dorsal face of propodeum**20**
- = Postpectal carina absent, at most a short carina medioventrally; metasoma usually without a carapace or differently shaped; metasoma inserted near hind coxae.....**21**
- 20. First metasomal tergite inserted near level of dorsal face of propodeum, far above hind coxae; first tergite movably joined to second tergite; metasoma without carapace.....**Coenocoeliinae**

- = First metasomal tergite inserted distinctly below dorsal level of propodeum close to hind coxae; first and second tergites immovably joined; metasoma forming a rigid carapace**Cheloninae**
- 21. Vein SR1 of fore wing partly or completely unsclerotized, resulting in a distally open marginal cell distally; metasoma often short**22**
- = Vein SR1 of fore wing completely sclerotized, tubular, reaching margin of wing, resulting in a closed marginal cell distally (Fig.8); metasoma usually elongate.....**28**
- 22. Vein 1-M of fore wing abruptly curved at its anterior end; vein r of fore wing long; vein 2-SR of fore wing absent; marginal cell of fore wing short and vein SR1 nearly straight; vein m-cu of fore wing nearly vertical.....
-**Ichneutinae**
- = Vein 1-M of fore wing straight at its anterior end; vein r of fore wing medium sized, short or absent; vein 2-SR of fore wing present; other characters partly or completely different.....**23**
- 23. Occipital carina completely absent; spiracles of first tergite in its weakly sclerotized epipleuron**24**
- = Occipital carina present laterally; spiracles of first tergite in its distinctly sclerotized notum**26**
- 24. Vein 3-SR of fore wing much longer than vein r and sclerotized (Fig.8); antenna with 20-51 segments, number not fixed; vein 2r-m of hind wing absent; scutellum with a more or less developed medioposterior depression.....**Cardiochilinae**
- = Vein 3-SR of fore wing shorter than vein r or vein r-m absent; number of antennal segments fixed to 14 or 18; vein 2r-m of hind wing usually present; scutellum without a medioposterior depression, but area may be sculptured.....**25**

25. Antennae with 14 segments; vein 2-SR of fore wing connected with pterostigma or nearly so; notum of first tergite strongly narrowed towards apex and medially; scutellar sulcus absent.....**Miracinae**
- = Antennae with 18 segments; vein 2-SR of fore wing connected to vein r; shape of notum of first tergite different, even if strongly narrowed posteriorly; scutellar sulcus more or less developed.....
-**Microgastrinae**
26. Vein cu-a of hind wing present as a medium sized tubular vein, forming a closed subbasal cell; notum of first tergite constricted behind spiracles; short trace of vein n-cu of hind wing present.....**Dirrhopinae**
- = Vein cu-a of hind wing (largely) absent, at most as a short vein, nearly always resulting in an open subbasal cell (Fig.9); notum of first tergite not constricted behind spiracles; without any trace of vein m-cu of hind wing
-**27**
27. Scutellar sulcus smooth; hind wing usually without a closed cell; marginal cell of fore wing moderately long.....**Aphidiinae**
- = Scutellar sulcus with median carina or crenulate (Fig.5); hind wing usually with one or two closed cells (Fig.9); marginal cell of fore wing small; vein SR1 of fore wing curved; prepectal carina present laterally; first tergite distinctly petiolate (Fig. 107).....**Euphorinae**
28. Anterior side of all trochantelli with (sub) apical comb of short pegs, exceptionally pegs absent on hind trochantellus; metasoma connected to propodeum somewhat above hind coxae; occipital carina absent; middle lobe of mesoscutum more or less protruding above lateral lobes.....
-**Macrocentrinae**

- = Trochantelli without pegs; metasoma at least partly inserted between hind coxae; if slightly above hind coxae then occipital carina present; middle lobe of mesosutum similarly convex as lateral lobes.....**29**
- 29. Pronotum with a distinct antescutellar depression; first tergite distinctly narrowed behind spiracles; marginal cell of hind wing widened apically.....
.....**Homobinae**
- = Pronotum without an antescutellar depression (Fig.5); first tergite almost always not or slightly narrowed behind spiracles; marginal cell of hind wing usually parallel-sided or narrowed apically.....**30**
- 30. Ventral rim of clypeus with a row of almost confluent punctures; mesoscutum protruding anteriorly; vein 2A of hind wing present and vein r-m of fore wing absent.....**Charmontinae**
- = Clypeus without such a row of punctures ventrally; mesoscutum not protruding anteriorly; vein 2A of hind wing usually absent, if present vein r-m of fore wing present.....**31**
- 31. Hind tibia with pegs near base of spurs; if very exceptionally absent, then scutellum without crenulate depression medioposteriorly; costulae of propodeum absent or nearly so.....**Orgilinae**
- = Hind tibia without pegs near base of spurs; scutellum with crenulate depression medioposteriorly; costulae of propodeum usually present.....**32**
- 32. Dorsal carinae of first tergite more or less curved anteriorly or dorsal carina absent.....**Blasinae**
- = Dorsal carinae of first tergite running directly to margin of tergite anteriorly and at least basally distinct or carinae absent anteriorly.....**33**
- 33. Second submarginal cell of fore wing small and triangular or narrow trapezoid; dorsal carinae of first metasomal tergite weakly developed or absent medially.....**Microtypinae**

= Second submarginal cell of fore wing medium sized and quadrangular or wide trapezoid; dorsal carinae of first tergite usually distinctly developed basally.....**Helconinae**

ABBREVIATIONS

DZUC	=	Department of Zoology, University of Calicut, Kerala.
ICZN	=	International commission an Zoological Nomenclature
OOL	=	Ocellocular line
POL	=	Postocellar line

Museum containing Types

Below is the list of museums that contain types of Braconidae dealt in this study preceded by the code that is used in the body of the text to indicate a particular museum.

BMNH	=	British Museum (Natural History), London, UK.
USNM	=	United States National Museum, Washington, D. C.
TMA	=	Természettudományi Muzeum, Budapest
TNAU	=	Tamil Nadu Agricultural University, Coimbatore

SHEEBA M. "STUDIES ON THE SYSTEMATIC ASPECTS OF BIODIVERSITY OF SOME GENERA AND SPECIES OF BRACONIDAE (HYMENOPTERA) OF KERALA STATE". THESIS. DEPARTMENT OF ZOOLOGY, UNIVERSITY OF CALICUT, 2008.

SUBFAMILY **BRACONINAE** NEES

Diagnosis: Head varying from transverse to cubical; lower part of clypeus strongly reflexed into hypoclypeal depression, and clypeal carina present or absent; labrum concave (Fig.11); occipital and epinemial carinae absent; posterior flange of propleuron absent, only very exceptionally present ; prepectal carina absent laterally; hind wing vein 1-M at least 1.5 x M+CU and usually more or less widened basally (Fig.10); first tergite with lateral parts flattened or tergite immovably connected to second tergite.

Biology: Most species are idiobiont ectoparasitoids of concealed larvae of xylophagous and stem-boring coleoptera and Lepidoptera larvae and rarely of Diptera and Symphyta. Several genera are gregarious endoparasitoids of Lepidoptera pupae (van Achterberg, 1984; Quicke, 1987a).

Distribution: World wide.

Discussion: The subfamily Braconinae is close to Doryctinae and can be separated from the characters mentioned in diagnosis mainly in having: 1) Posterior flange of propleuron absent (Posterior flange of propleuron present in Doryctinae); 2) Prepectal carina absent laterally (Prepectal carina present in Doryctinae) and 3) First tergite with lateral parts flattened or tergite immovably connected to second tergite (First tergite with convex lateral parts and movably connected to second tergite in Doryctinae).

Remarks: The subfamily Braconinae is the largest and most diverse of the family Braconidae, comprising 180 genera and 2,893 species (Yu *et al.*, 2005). Quicke (1987a) revised the genera of the Old World. It is a worldwide subfamily and is particularly diverse in the Indo-Australian and Afrotropical regions (Quicke, 1988).

KEY TO THE GENERA OF BRACONINAE OF INDIA

1. Clypeus with two tufts of long hairs; radial cell of fore wing greatly shortened.....**Vipio** Latreille
- = Clypeus has no tuft of hairs; radial cell of fore wing not shortened and reaches wing tip.....**2**
2. First to third tergites of metasoma immovably joined and fused laterally (Fig.16).....**3**
- = First and second tergites of metasoma movably joined, not fused laterally...
.....**6**
3. First to third metasomal tergites forming a carapace, completely hiding subsequent tergites, suture between these three tergites indistinguishable; posterior margin of carapace produced into a pair of submedial spines.....
.....**Physaraia** Shenefelt
- = Metasoma with six clearly visible tergites; posterior margin third to fifth tergites either simple or with a pair of widely separated spines**4**
4. Sixth metasomal tergite posteriorly with a median emargination; first and sometimes second metasomal tergites with a distinct midlongitudinal carina; third and subsequent tergites without clearly defined anterolateral areas (Fig.79).....**Philomacroploea** Cameron
- = Sixth metasomal tergite posteriorly truncate or protruding; second metasomal tergite without midlongitudinal carina; third and subsequent tergites with well developed grooves defining anterolateral areas.....**5**
5. Sixth tergite posteriorly truncate; claws with large pointed basal lobes; angle formed by C+SC+R and 1-SR less than 60°; first tergite with well developed lamelliform dorsolateral carinae
.....**Eutropobracon** Ramakrishna Ayyar

- = Sixth tergite posteriorly protruding (Fig.15); claws without pointed basal lobes; angle formed by C+SC+R and 1-SR more than 65° (Fig.16); first tergite without dorsolateral carinae.....***Aspidobracon*** van Achterberg
- 6. Vein CU1a of fore wing arising at same level as vein 2-CU1; vein CU1b of fore wing much longer than 3-CU1.....7
- = Vein CU1a of fore wing arising far posterior to vein 2-CU1; vein 3-CU1 much longer than CU1b rarely these may be of same length.....8
- 7. Fifth tergite with posterior margin strongly produced on either side of mid line, forming a fork like structure, which divided medially by a deep narrow emargination (Fig.73); second tergite with a distinct midbasal triangular area produced posteriorly to form a carina.....
.....***Furcadesha*** Quicke
- = Fifth tergite with distinct pair of posterior sublateral semicircular emargination (Fig.101); second tergite with a smooth, long, acute midbasal area.....***Adesha*** Cameron
- 8. First subdiscal cell of fore wing oval, formed in part of rather thickened veins and in particular, vein CU1b usually widening strongly anteriorly where it is far wider than posterior part of vein 3-CU1(Fig.10); eyes very large (Fig.11).....***Aphrastobracon*** Ashmead
- = First subdiscal cell of fore wing not oval; eyes usually much smaller.....
.....9
- 9. Posterior margin of sixth metasomal tergite with a narrow deep median incision and distinctly produced posterolaterally, remainder of tergite with rugose sculpture (Fig.84).....***Testudobracon*** Quicke
- = Sixth metasomal tergite, if visible strongly sculptured, its posterior margin not emarginated..... 10

10. Apical antennal segment blunt, more or less strongly laterally compressed; third and fourth hind tarsal segment obconate but not produced distomedially; second metasomal tergite without a midbasal triangular area usually with a pair of large clearly defined anterolateral triangular area.....***Glyptomorpha*** Holmgren
- = Apical antennal segment not blunt and strongly laterally compressed; other characters not as above, partly or completely different.....**11**
11. Scape subcylindrical, with a very large apicomedial ledge and sharply and concavely narrowed at base.....**12**
- = Scape variable, sometimes with a weak to moderate apicomedial ledge, but never sharply contracted at base.....**13**
12. Apicoventral bristles of fourth hind tarsal segment reaching less than 0.70 of the way along ventral side of telotarsus (excluding claw).....
-***Atanycolus*** Foerster
- = Apicoventral bristles of fourth hind tarsal segment long, usually reaching more than 0.85 of the way along length of telotarsus (excluding claw).....
-***Chaoilta*** Cameron
13. Tarsal claws with basal lobes distinctly pointed or at least sharply angular distally (Fig.89).....**14**
- = Tarsal claws simple, with basal lobe not protruding distally or if protrudes then it is not pointed or formed in to a large protruding square lamella....**17**
14. Ovipositor apically without a dorsal nodus or notch and ventral serration (Fig.66); eyes densely hairy.....***Pachybracon*** Cameron
- = Ovipositor apically with a distinct preapical dorsal nodus or notch and usually with well developed ventral serration (Fig.29); eyes not hairy.....**15**

15. Metanotum protruding medio-posteriorly and its media carina absent; second tergite with rugulose sculpture and with a pair of posteriorly converging grooves which extends length of tergite (Plat VB).....
.....*Tropobracon* Cameron
- = Metanotum with a complete mid-longitudinal or anterior median carina; second tergite not as above.....**16**
16. Angle between fore wing veins 1-SR and C+SC+R 75° -90° (Fig.17); propodeum with or without median carina; mesoscutum partly glabrous.....
.....*Bracon* Fabricius
- = Angle between fore wing veins 1-SR and C+SC+R approximately 75° (Fig.60); propodeum always with a complete or posterior median longitudinal carina; mesoscutum densely and evenly hairy.....
.....*Cassidibracon* Quicke
17. Suture between second and third tergites totally smooth.....**18**
= Suture between second and third tergites not completely smooth.....**19**
18. Fore wing vein 3-CU1 distinctly expanded posteriorly; length of ovipositor variable, usually more than metasoma.....
.....*Euurobracon* Ashmead
- = Fore wing vein 3-CU1 not distinctly expanded posteriorly; ovipositor as long as metasoma.....*Ischnobracon* Baltazar
19. First metasomal tergite narrow behind spiracles medially; metasoma smooth; angle between veins 1-SR and C + SC + R of forewing about 80°..
.....*Amyosoma* Viereck

- = First metasomal tergite not narrowed behind spiracles; metasoma sculptured; angle between vein 1 SR and C+ SC + R of fore wing less than 80° **20**
- 20. Fore wing vein 1-SR + M straight or curving slightly towards anterior wing margin after arising from 1-SR; forewing vein C + SC + R and 1-SR forming an angle of less than 50°; fore wing vein are at least 0.69x length of m-cu..... **21**
- = Fore wing vein 1-SR + M usually distinctly curving posteriorly after arising from 1-SR, either evenly or sharply (Fig.10) or if vein 1-SR + M straight or curving slightly anteriorly, then vein 1-SR forms an angle of more than 55° with C + SC + R and vein R less than 0.65x length of m-cu.. **24**
- 21. Hind wing vein 2-SC+R distinctly transverse; scutellar sulcus totally smooth..... **22**
- = Hind wing vein 2-SC+R interstitial or distinctly longitudinal; scutellar sulcus atleast with weak crenulations..... **23**
- 22. Second tergite with a smooth midbasal area; fore wing vein 3-CU1 not expanded posteriorly; third to fifth tergites with well developed antero-lateral areas, bordered posteriorly by deep crenulate grooves.....
.....**Annectobracon** Chishti & Quicke
- = Second tergite without a smooth midbasal area; fore wing vein 3-CU1 usually distinctly expanded posteriorly; at least third tergite with anterolateral areas defined posteriorly by crenulate grooves **Bathyaulax** Szepligeti

23. Frons with a midlongitudinal groove; metanotum without midlongitudinal carina; second submarginal cell of fore wing medium sized; vein 3-CU1 not expanded posteriorly; fore basitarsus 5.14- 7.0x its maximum width....
.....**Stenobracon** Szepligeti
- = Frons without midlongitudinal groove; metanotum with a very short anterior median carina; second submarginal cell of fore wing variable in length, slightly wider apically than basally; vein 3-CU1 distinctly expanded posteriorly, sometimes forming a distinct spur; fore basitarsus more than 8.0x its maximum width.....**Angustibracon** Quicke
24. Dorsal valves of ovipositor smooth, without a preapical notch, nodus or sharp angle (Fig.66), lower valves smooth or with very weak serrations only near extreme apex; ovipositor sheath shorter than body.....**25**
- = Dorsal valves of ovipositor atleast with a sharp preapical angle, usually with a well developed notch or nodus or if dorsal valves smooth and more or less without serrations then ovipositor sheaths are more than 1.50x than body.....**31**
25. Eyes more or less densely hairy.....**26**
- = Eyes glabrous.....**28**
26. Posterior margin of fifth tergite with a distinct median semicircular emargination.....**27**
- = Posterior margin of fifth tergite not emarginate.....**Pycnobracon** Cameron
27. Posterior margin of fifth tergite narrowly emarginate.....
.....**Ectemnoplax** Enderlein
- = Posterior margin of fifth tergite broadly emarginate.....
.....**Chelonogastra** Ashmead
28. Hind wing vein 1r-m and SC+R1 of approximately equal length.....
.....**Hybogaster** Szepligeti

- = Hind wing vein 1r-m usually a little longer than SC+R1.....
.....*Iphiaulax* Foerster
- 29. Notauli absent; first tergite less than 1.25x its apical width.....
.....*Meganeura* Szepligeti
- = Notauli well developed (Fig.111); first tergite more than 1.20x its apical
width.....**30**
- 30. Midlongitudinal carina of first tergite well developed anteriorly strongly
raised there; scape usually more than 3.0x its width medially.....
.....*Cratobracon* Cameron
- = Midlongitudinal carina of first tergite only present posteriorly (Fig.106);
scape usually less than 2.50x its width medially.....*Shelfordia* Cameron
- 31. Fore wing vein 1-SR+M straight (Fig.16); notauli weakly impressed or
only visible anteriorly.....**32**
- = Fore wing vein 1-SR+M slightly to strongly curved; notauli shallowly to
strongly impressed.....**33**
- 32. Fore wing vein cu-a slightly postfurcal; apical antennal segment long,
pointed but not acuminate; frons very weakly impressed behind antennal
sockets, depression with a weak midlongitudinal ridge.....*Simra* Quicke
- = Fore wing vein cu-a distinctly antifurcal or slightly postfurcal; apical
antennal segment acuminate; frons with a suture.....
.....*Cyanopterus* Haliday
- 33. Fore wing vein 1-SR+M slightly curved basally; angle between veins 1-
SR and C+SC+R less than 50°; notauli shallowly impressed; clypeus
without dorsal carina; cu-a sub-interstitial.....
.....*Indabracon* van Achterberg
- = Fore wing vein 1-SR+M strongly curved after arising from 1-M; angle
between veins 1-SR and C+SC+R more than 50°; notauli strongly
impressed; clypeus with dorsal carina; cu-a not as above.....**34**

34. Scape long and narrow, longer ventrally than dorsally (Fig.103) in lateral aspect but not markedly emarginate apicolaterally; second tergite with well developed midbasal triangular area formed into a strong carina posteriorly***Craspedolcus*** Enderlein
 = Scape variable; second tergite not as above.....**35**
35. Angle between 1-SR and C+SC+R 67°; propodeum smooth.....
***Zakaella*** Haider, Ahmad & Shuja- Uddin
 = Angle between 1-SR and C+SC+R less than 67°; propodeum smooth or weakly crenulate.....**36**
36. Scape normal; double propodeal carina present; rectotergal fusion absent...
***Bicarini*** Quicke & Walker
 = Scape ventrally produced (Fig.103); double propodeal carina absent; rectotergal fusion absent.....***Campyloneurus*** Szepligeti

GENUS *APHRASTOBRACON* ASHMEAD

Aphrastobracon Ashmead, 1896a. *Proc. U.S. Nat. Mus.* 18: 646. Type species: *Aphrastobracon flavipennis* Ashmead, 1896.

Diagnosis: Head transverse and narrow (Fig.12); eyes very large with inner emargination occupying the whole side of head, leaving remaining space very narrow; face coriaceous with crenulate ridges running parallel to inner orbit of eye; antenna usually as long as body; notauli complete; first subdiscal cell of fore wing oval (Fig.10), formed in part of rather thickened veins and in particular, vein CU1b usually widening strongly anteriorly where it is far wider than posterior part of vein 3-CU1; vein 2-1A often forming a distinct angle with 1-1A or distinctly bent shortly after arising from it; vein cu-a often far antefurcal; fore wing vein 1-SR+M strongly curved (Fig.10); submedian cell in fore wing short; first tergite with dorsolateral carinae; midbasal triangular area of second tergite short and broad; ovipositor without dorsal nodus.

Biology: A larval parasite of *Eublemma scitula* Rambur (Noctuidae), which is predaceous on scale insects such as lac insects (*Tachardia lacca*. Kerr.). (Ashmead 1895)

Distribution: Australian, Ethiopian and Oriental regions.

Discussion: *Aphrastobracon* Ashmead comes very close to *Testudobracon* Quicke in having vein CU1a of fore wing arising far posterior to vein 2-Cu1 and 3CU1 much longer than CU1b. However it can be separated by the combination of characters given under diagnosis, mainly in 1) First subdiscal cell of fore wing oval (First subdiscal cell of fore wing not oval in *Testudobracon*) and Eyes very large (Eyes much smaller in *Testudobracon*).

Remarks: Ashmead (1895) erected the genus *Aphrastobracon* to include an interesting new braconid viz.; *A. flavipennis* bred out from the lac insect

Tachardia albizziae Gr. from Sri Lanka (=Ceylon). On the basis of the antefurcal fore wing vein cu-a, *Aphrastobracon* was given the rank of a tribe, Aphrastobraconini, by Ashmead (1900) and that of a subfamily, Aphrastobraconinae by Szepligeti (1904). Now it is placed in the subfamily Braconinae as pointed out by Ashmead (1895). (Ramakrishna Ayyar, 1926).

In the Oriental region this genus is represented by four species (Watanabe, 1950). It is the first record of this genus from Kerala.

KEY TO THE INDIAN SPECIES OF *APHRASTOBRACON* ASHMEAD

1. Wings yellow, apical part faintly smoky and iridescent; fore wing vein C+SC+R yellow; ovipositor 0.93 x metasoma (Fig.10); length (excluding ovipositor) 5.18 mm. Sri Lanka and South India.....

.....*A. flavipennis* Ashmead

- = Wings not uniformly yellow; fore wing vein C+SC+R above first marginal cell black; other characters not as above.....**2**

- 2 Fore wing vein cu-a interstitial with 1-M, very feebly developed and short; edge of vein C+SC+R above first submarginal cell smoky brown; both discal cells hyaline with surrounding veins of second discal cell with slight infumation. South India..... *A. alcidiphagus* Ayyar

- = Fore wing vein cu-a antefurcal with 1-M; vein C+SC+R above first submarginal cell and hairs in this region black; both discal cells with apparent smoky brown colour but of a lighter tinge. South India.....

.....*A. ayyari* Watanabe

Aphrastobracon flavipennis Ashmead

(Figs.10-14)

Aphrastobracon flavipennis Ashmead, 1896a. *Proc. U.S. Nat. Mus.* 18: 648.

Redescription: Female: Length of body (excluding ovipositor) 5.18mm, antenna 5.36mm, fore wing 5.40mm and ovipositor 2.27mm.

Head: Transverse, narrower posteriorly; width 1.24 and 2.1 x its median length in anterior (Fig.11) and dorsal (Fig.12) view respectively; antenna with 46 segments, a trifle longer than body; length of scape 1.50x width; pedicel 0.25x length of scape; length of third antennal segment 0.75x fourth; length of third, fourth and penultimate antennal segments 1, 1.3 and 1.30x their width respectively, others a trifle wider than long; frons with shallow area, shagreen, glabrous, with median longitudinal groove starting from median ocellus; stemmaticum surrounded by shallow groove; diameter of posterior ocellus 1.30x anterior ocellus; OOL: diameter of posterior ocellus: POL = 6:3:4; vertex behind ocelli smooth, shiny with sparse hairs; eyes very large, glabrous with inner emargination, occupying whole side of head, leaving face very narrow; length of eye 5.30x temple in dorsal view; temple with widely separated punctures, hairs arising from punctures; face shagreen, moderately hairy with midlongitudinal carina broaden towards clypeus (Fig.11); width of face 6.90x its length and 0.36x width of head in anterior view; intertentorial distance 1.75x tentorioocular distance; width of hypoclypeal depression 0.50x minimum width of face; malar space coriaceous, 0.17x length of eye.

Mesosoma: Length of mesosoma 1.35x height (Fig.10); pronotum and metanotum glabrous; propleuron, mesonotum and metapleuron smooth, shiny and hairy; notauli well impressed anteriorly, hardly impressed posteriorly; propodeum smooth, shiny, hairy without median carina; wings hairy, yellow hyaline; length of fore wing 2.60x its maximum width (Fig.10); stigma 5.0x breadth; fore wing vein r 0.86x 2-SR; vein 3-SR 2.08x r; ratio of length of fore wing veins: r:3-SR:SRI = 0.6:1.3: 2.9; 2-SR:3-SR:r-m = 1.4:2.6:1.1; 1-SR+M distinctly curving posteriorly after arising from 1-SR, which makes first cubital cell very narrow at base; 1-M straight; submedian cell distinctly smaller than median; cu-a antefurcal; subdiscoidal cell oval shaped; 2-CU1

and 3-CU1 distinctly rounded and more or less thickened at its junction with other veins; m-cu joins first cubital cell just before its apex, and CU1a not interstitial; hind wing with three hamuli; hind coxa moderately hairy with punctures at base of hairs; length of femur, tibia and basitarsus of hind leg 3.75, 7.20 and 4.30x their width respectively.

Metasoma: Length 0.87x length of head and mesosoma together; first tergite as long as its apical width, with midlateral longitudinal grooves and median wedge shaped area, its surface smooth, shiny and hairy (Fig.13); second tergite with basal triangular area extending to a little beyond its half, grooves along sides of triangle distinctly crenulate and sides of segment close to each lateral margin have also longitudinal grooves; width of third tergite 2.83x its length and with a small shallow depression at each anterior angle of segment (Fig.14); suture between second and third tergites deeply impressed and finely crenulate; remaining tergites smooth and shiny; ovipositor 0.93x metasoma.

Colour: Yellowish brown; antenna (except scape and pedicel brown), tip of mandible and ovipositor sheath dark brown; eyes grey; ocelli pale yellow; wings hyaline and yellow; basal part of mandible, stigma and wing veins yellow; basal part of mandible, stigma and wing veins yellow; ovipositor reddish brown.

Male: Length 4.50mm. Head and mesosoma shagreen; face smooth and shiny; antenna 48 segmented, as long as body; scape 3.0x its width; pedicel small; third antennal segment longer than wide, remaining segments wider than long; notauli distinct; submedian cell of fore wing shorter than median cell; m-cu joins first submarginal cell at its apical fifth; vein 3-SR 2.50x vein r; sides of first tergite with grooves and forming a wedge shaped plate; second segment with basal triangular elevation; third and fourth tergites delicately sculptured.

Colour: Brownish yellow. Eyes black; antenna brownish black; wings yellowish hyaline; stigma and veins yellow.

Host and Host Relations: *Eublemma scitula* Rambur (Noctuidae). Though in the early years, when the insect was bred out from Coccid material, it was thought to be a natural enemy of the scale itself, it was later on found that the real host of the parasite is a Noctuid caterpillar, *Eublemma scitula* Ramb., which latter is the real enemy of the scale-insect (Ramakrishna Ayyar, 1926).

Biology: The wasp parasitises the young caterpillar of *E. scitula*, which has the curious habit of protecting its body with a covering made up of the empty shells and exuviae of the scale-insects which it has devoured, and this covering later serves as a cocoon. The wasp deposits the egg by piercing the thin wall of the covering. So far only one grub has been found on a single caterpillar (Ramakrishna Ayyar, 1926).

Distribution: Oriental (South India and Sri Lanka (=Ceylon)).

Material Examined: 1Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Padmasenan, 9.viii.1989.

Discussion: *A. flavipennis* Ashmead is similar to *A. ayyari* in having smooth and shining mesonotum, large stigma and 3-CU1 distinctly rounded and more or less thickened at its junction with other veins but differs in the following features: 1) Head transverse and narrower posteriorly (Head more or less spherical in *A. ayyari*); 2) Ocelli placed in a shallow area (Ocelli placed on slightly raised area in *A. ayyari*); 3) Frons with single median longitudinal groove (Frons with two or three median longitudinal grooves in *A. ayyari*) and 4) Antenna a trifle longer than body (Antenna as long as body in *A. ayyari*).

Remarks: Since the available description of this species is inadequate for easy identification, the species is redescribed here. Male is not represented in the present collection. The above diagnosis of male is based on original description by Ramakrishna Ayyar (1926).

GENUS *ASPIDOBRACON* VAN ACHTERBERG

Aspidobracon van Achterberg, 1984. *Tijdschr. Ent.*, 127: 145-146. Type species: *Aspidobracon pierreii* van Achterberg (original designation).

Diagnosis: Frons without V-shaped grooves; eye not emarginate and without subocular groove; malar suture shallow; apical antennal segment long, pointed but not acuminate; notauli complete, not meeting posteriorly and smooth or finely crenulate; scutellar sulcus wide; metanotum with complete or incomplete median carina, slightly protruding dorsally; angle between fore wing veins C+SC+R and 1-SR more than 65° (Fig.16); vein cu-a of fore wing interstitial; dorsal carina of first tergite united without dorsolateral carinae; second tergite without median carina; third to fifth tergites with a distinct subposterior transverse groove; sixth metasomal tergite posteriorly protruding; ovipositor sheath extending beyond apex of metasoma less than 0.30x metasomal length; hypopygium of female variable.

Biology: Parasitic on Hesperidae and Nymphalidae. (Wang *et al.*, 2007)

Distribution: Afrotropical and Oriental (India, Sri Lanka (=Ceylon)).

Discussion: Genus *Aspidobracon* van Achterberg comes close to *Eutropobracon* Ramakrishna Ayyar in having second metasomal tergite without a midlongitudinal carina although sometimes with a number of striae running posteriorly from posteriorly united dorsal carinae of first tergite; third and subsequent metasomal tergites with well developed grooves defining anterolateral areas. However it differs from *Eutropobracon* in the combination of characters given under diagnosis, mainly in 1) Sixth tergite posteriorly protruding (Sixth tergite posteriorly truncate in *Eutropobracon*); 2) Angle between veins 1-SR and C+SC+R of fore wing more than 65° (Angle between veins 1-SR and C+SC+R of fore wing less than 65°) and 3) First metasomal tergite without dorsolateral carinae (First metasomal tergite with well developed lamelliform dorsolateral carinae).

Remarks: van Achterberg (1984) erected the genus *Aspidobracon*. It is a small genus, known from Afrotropical and Oriental region. It is represented by only one species viz., *Aspidobracon noyesi* van Achterberg from India. It is the first record of this genus from Kerala.

KEY TO ORIENTAL SPECIES OF *ASPIDOBRACON* VAN
 ACHTERBERG

1. Frons (laterally), vertex, temple and face punctulate; mesopleuron indistinctly punctulate, precoxal sulcus only medially shallowly impressed and with some curved striae in front (Fig.15); angle between veins 1-SR and C+SC+R 74° (Fig.16); sixth tergite more gradually narrowed apically; hind coxa largely smooth; claws more robust; scape black; temple behind eye with conspicuous black spot.....
*A. noyesi* van Achterberg
2. Frons, vertex, temple and face smooth; mesopleuron largely smooth, precoxal sulcus only impressed and smooth; angle between veins 1-SR and C+SC+R 89°; sixth tergite more abruptly narrowed apically; claws less robust; scape yellow; temple behind eye without black spot.....
*A. hesperivorus* van Achterberg

Aspidobracon noyesi van Achterberg

(Figs.15-16)

Aspidobracon noyesi van Achterberg, 1984. *Tijdschr. Ent.* 127: 145 – 146
 Holotype. Female. India (BMNH).

Diagnosis: Female: Length 3.0mm. Antenna with 37 segments; length of third antennal segment 1.10x fourth; length of third, fourth and penultimate antennal segments 2.20, 2.0 and 1.70x their width, respectively; frons (laterally), vertex, temple and face punctulate; length of eye in dorsal view 3.0x temple; OOL: diameter of ocellus: POL = 9:3:5; length of malar space

1.40x basal width of mandible; mesosoma 1.10x its height; precoxal sulcus only medially shallowly impressed and with some curved striae in front, rest of mesopleuron indistinctly punctulate (Fig.15); mesoscutum and scutellum smooth; metanotum with short incomplete carina anteriorly; propodeum smooth with complete longitudinal carina and some crenulae near it; angle between veins 1-SR and C+SC+R 74°; ratio of length of fore wing veins: r:3-SR:SRI = 6:11:36; vein 2-SR: 3-SR: r-m = 9:1:6 (Fig.16); hind coxa smooth; length of femure, tibia and basitarsus of hind leg 3.50, 9.0 and 5.0x their width, respectively; first tergite coarsely rugoseretulate, in front of dorsal carinae medially deeply impressed and with V-shaped crenulation and dorsal carinae absent basally; second to sixth tergites coarsely rugoseretulate, with shallow anterolateral grooves; sixth tergite gradually narrowed apically and only slightly angled laterally; length of ovipositor sheath 0.12 x fore wing; hypopygium acute apically.

Colour: Yellowish brown except following: patch behind eyes, frons medially, stemmaticum and area behind it, scape and pedicel (remaining part dark brown), lobes of mesonotum, metasoma dorsally black; wings infuscated; wing veins and ovipositor sheath dark brown; propodeum partly, base and apex of hind tibia, mid and hind tarsi infuscated; rest of legs and temples ventrally light yellow.

Male: Unknown.

Host: Hesperidae (*Melanitis leda ismene* Cramer *Mycalesis gotama* (Moor), *Parnara guttata* (Bremer & Gray) and *Pelopidas mathias* (F.)) and Nymphalidae - Acraeinae (van Achterberg, 1984).

Biology: Pupae of *Pelopidas mathias* (F.), *Parnara guttata* (Bremer & Gray) and *Mycalesis gotama* (Moore) (Lepidoptera: Hesperidae) (He *et al.*, 1990); *Melanitis leda ismene* Cramer (Lepidoptera: Satyridae) (Yu *et al.*, 1994).

Distribution: India [Karnataka, Kerala, Tamil Nadu], China.

Type Locality: India (Karnataka)

Material Examined: 9 Females, INDIA: Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E), Sheeba, M., 2.xi.2003; Kozhikode Dt., Kallai (11°70'N 75°53'E) Sumodan, 24.vi.1987; Kerala, Thrissur Dt., Peechi, Vallakkarithadam (10°31'N 76°13'E), Sumodan, 5.ii.1989; Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 2.iii.1988; Kerala, Kannur Dt., Aralam farm (11°58'N 75°40'E), Sumodan, 31.x.1988; Kerala, Thiruvananthapuram Dt., Attingal (8°41'N 76°50'E), Sumodan, 23.iii.1989; Kerala, Kollam Dt., Neendakara (8°56'N 76°32'E), Sumodan, 22.ii.1989; Kerala, Palakkad Dt., Ottapalam (10°47'N 76°22'E), T.C. Narendran and Party, 19.xii.2003; Kerala, Kozhikode Dt., Moodadi (11°28'N 75°38'E), Sumodan (30.x.1988; Male, Kerala, Thiruvananthapuram Dt., Attingal (8°41'N 76°50'E), Sumodan, 23.ii.1989.

Discussion: The species *Aspidobracon noyesi* van Achterberg closely resembles *A. hesperivorus* van Achterberg in having sixth tergite less protruding apically; posterior half of metanotum without medial carina; propodeum (except for medial carina and some crenalae) smooth medially and vein 3-SR of fore wing about 2x vein r or less. However it differs from *A. hesperivorus* van Achterberg in having 1) Temple behind eye with conspicuous black spot (Temple behind eye without black spot in *A. hesperivorus*); 2) Sixth tergite more gradually narrowed apically (Sixth tergite more abruptly narrowed apically in *A. hesperivorus*); 3) Claws more robust (Claws less robust in *A. hesperivorus*); 4) Antennal segments of female 35-37 (Antennal segments of female 33-34 in *A. hesperivorus*); 5) Frons, vertex, temple and face punctulate (Frons, vertex, temple and face smooth in *A. hesperivorus*); 6) Hind coxa largely smooth (Hind coxa coriaceouspunctulate in *A. hesperivorus*) and 7) Hypopygium large (Hypopygium medium sized in *A. hesperivorus*).

GENUS **BRACON** FABRICIUS

- Bracon* Fabricius, 1804. *Systema Piezatorum*: 102. Type species (designated by ICZN, Opinion, 162 (1945): *Ichneumon minutator* Fabricius, 1798.
- Braco* Wesmael, 1838. *Nouv. Mem. Acad. Sci. R. Bruxelles* 11:7 (invalid emendation).
- Brachon* Agassiz, 1846. *Nomina Systematica Generum Hymenopterorum* (invalid emendation).
- Brazon* Schulz, 1911. *Zool. Annln.* 4: 60 (invalid emendation).
- Habrobracon* Ashmead (in Johnson), 1895. *Zool. Soc. Long. Proc.*: 324. Type species (designated by Viereck, 1914): *Bracon gelechia* Ashmead, 1889.
- Microbracon* Ashmead, 1890. *Bull. Colo. biol. Ass.* 1: 15. Type species (by monotypy): *Microbracon sulcifrons* Ashmead, 1890 (not *Bracon sulcifrons* Brulle, 1846; *Bracon sulcifronsior* Shenefelt, 1978).
- Amicoplidea* Ashmead, 1900. *Proc. U.S. natn. Mus.* 23: 118. Type species (By original designation): *Phylax palliventris* Provancher, 1880.
- Tropidobracon* Ashmead, 1900. *Proc. U.S. natn. Mus.* 23: 118. Type species (By original designation): *Braxcon gastroideae* Ashmead, 1889.
- Macrodyctium* Ashmead, 1900. *Proc. U.S. natn. Mus.* 23:138. Type species (By original designation): *Bracon eurae* Ashmead, 1889 (= *Bracon angelesius* Provancher, 1888).
- Liobracon* Nason, 1905. *Ent. News* 16:298. Type species (designated by Viereck, 1914): *Bracon nuperus* Cresson, 1872.
- Seliodus* Brethes, 1909. *An. Mus. nac. Hist. nat. B. Aires* 19: 32. Type species (By original designation): *Seliodus testaceus* Brethes, 1909.
- Lovenzoa* de Stefani-Perez, 1909. *Marcelia* 8: 15-16. Type species (by monotypy): *Lorenzoa solani* de Stefani-Perez, 1909 (type (from Eritrea) probably lost; synonymy based on original description only). Synonymized by van Achterberg & Polaszek, 1996.
- Kulczynskia* Niezabitowski, 1910. *Spraw. Kon. fizyogr. Krajow* 44: 65. Type species (By monotypy): *Kulczynskia aciculata* Niezabitowski, 1910. Synonymized by van Achterberg & Polaszek, 1996.
- Striobracon* Fahringer, 1927. *Opuscula braconologica. 1. Palaearktischen Region.* 4-6: 232. Type species (Designated by Tobias, 1959): *Ichneumon minutator* Fabricius, 1798.
- Glabrobracon* Fahringer, 1927. *Opuscula braconologica. 1. Palaearktischen Region.* 4-6: 281. Type species (Designated by Tobias, 1959). *Bracon variator* Nees, 1812.

Orthobracon Fahringer, 1927. *Opuscula braconologica*. 1. *Palaearktischen Region*. 4-6: 232. Type species designated by Tobias, 1959): *Bracon exhilator* Nees, 1834.

Lucobracon Fahringer, 1927. *Opuscula braconologica*. 1. *Palaearktischen Region*. 4-6: 238, 248. Type species (here designated): *Bracon lautus* Szeplegeti, 1901a; existing designation of *Bracon suchorukovi* Telenga, 1936, is invalid because it was not included by Fahringer).

Chivinia Shestakov, 1932. *Zoo. Anz.* 99: 258. Type species (By monotypy): *Chivinia zimini* Shestakov, 1932. Synonymized by van Achterberg & Polaszek, 1996.

Cyanopterocon Tobias, 1957. *Ent. Obozr.* 36: 480. Type species (designated by Tobias, 1959). *Bracon sabulosus* Szepliget, 1896.

Asiabracon Tobias, 1957. *Ent. Obozr.* 36: 481. Type species (by monotypy): *Bracon quadrimaculatus* Telenga, 1936.

Sculptobracon Tobias, 1961. *Ent. Obozr.* 40: 660. Type species (by original designation): *Bracon burjaticus* Tobias, 1961.

Pilibracon Tobias, 1961. *Ent. Obozr.* 40: 662. Type species (by original designation): *Bracon disparilis* Tobias, 1961.

Diagnosis: Small to medium sized wasps; face more or less convex; median antennal segments more than 1.05x its width; mesoscutum partly glabrous; vein r of fore wing shorter than vein 2-SR; fore wing vein 3-SR more than 1.60x length of vein r (Fig.17), usually less than 1.20x vein r; fore wing vein 2-SR+M shorter; vein CU1a of fore wing far below level of vein 2-CU1; vein 1r-m of hind wing short (Fig.22); tarsal claws simple or with lobe; propodeum with or without median carina; second tergites without distinct V-shaped area or grooves medioanteriorly; second and third tergite without anterolateral grooves; sculpture of tergites highly variable (smooth to rugose); ovipositor distinctly extended beyond apex of metasoma, with a preapical dorsal notch and its lower valve with minute teeth (Fig.17).

Biology: The genus *Bracon* contains (partly gregarious) idiobiont ectoparasites of larvae belonging to Lepidoptera (Crambidae, Pyralidae, Tortricidae, Gelechiidae, Sesiidae, Coleophoridae, Gracillariidae and Cochylidae), Coleoptera (Curculionidae, Anobiidae and Bruchidae), Diptera (Cecidomyiidae, Lonchaeidae, Chloropidae, Tephritidae, Anthomyiidae,

Agromyzidae and Scatophagidae) and less commonly also Hymenoptera (Cephidae, Tenthredinidae, Eurytomidae and Cynipidae).

Distribution: Cosmopolitan and common.

Discussion: This genus comes close to *Cassidibracon* Quicke in having eyes not hairy, ovipositor apically with a distinct preapical dorsal nodus and a well developed ventral serration. However it differs from *Cassidibracon* in having 1) Angle between fore wing veins 1-SR and C+SC+R 75° - 90° (Angle between fore wing veins 1-SR and C+SC+R 75° in *Cassidibracon*); 2) Propodeal carina absent rarely present (Propodeum always with a complete or posterior median longitudinal carina in *Cassidibracon*) and 3) Mesoscutum partly glabrous (Mesoscutum densely and evenly hairy in *Cassidibracon*).

This genus also comes close to *Pycnobracon* Cameron in having fore wing vein 1-SR+M more or less straight or at most weakly angled or curved posteriorly after arising from 1-M but differs in the combination of characters given in diagnosis, mainly in median antennal segments more than 1.05x its width and third and fourth metasomal tergites without antero-lateral areas.

Remarks: *Bracon* is one of the largest known genera of Braconidae currently containing about 1700 described species (van Achterberg & Polaszek, 1996). *Bracon aculeator* (Fabricius), *B. cecidobius* Kieffer, *B. daphnaphilae* Szepliget, *B. femorator* (Fabricius), *B. ingratus* Cameron, *B. incarnatus* (Ramakrishna Ayyar), *B. kitchneri* (Dudgeon & Gough), *B. laminator* Fabricius, and *B. richei* Brulle are not included in the key because of the unavailability of literature.

KEY TO INDIAN SPECIES OF *BRACON* FABRICIUS

1. Fore wing vein 3-SR 1.35 - 1.75x r; width of head 1.17 and 2.07x its median length in anterior and dorsal view respectively; length of eye in dorsal view 1.90x temple; hypoclypeal depression 0.40x minimum width of face; OOL; diameter of posterior ocellus: POL = 4:1.5:3.5; second tergite without median carina, 2.47x its length; suture between second and third tergites faintly crenulate.....***B. gelechia*** Ashmead
 = Fore wing vein 3-SR 0.90 to a little less than 4.0x r; other characters not as above partly or completely different.....**2**
2. Fore wing vein 2-SR 2.0x r-m; 3-SR more than 2.0x r; third and fourth tergites with faint dark marks apicomediaally.....
B. gelechidiphagus Ramakrishna Ayyar
 = Characters not as above, partly or completely different or in different combination.....**3**
3. Body completely smooth and shiny; first tergite narrow, 2.0x its width; second tergite with cuneiform base medially and emarginate laterally; ovipositor equal to second to fifth tergites together; length 4.0 - 5.50mm
B. albolineatus Cameron
 = Body not completely smooth; other characters partly or completely different from above.....**4**
4. Mesosoma (at least partly) sculptured; length 1.80 - 4.60mm.....**5**
 = Mesosoma smooth and shiny completely; length 2.0 – 10.0mm**17**
5. Mesoscutum smooth and shiny; fore wing vein 3-SR 0.90 - 2.30x vein r; vertex smooth and shiny**6**
 = Mesoscutum sculptured; fore wing vein 3-SR as long as to a little less than 4.0x r; vertex smooth, punctate or shagreen.....**8**

6. Fore wing vein 3-SR 2.0x r (Fig.47); length 2.95mm; ovipositor sheath 0.75x fore wing; propodeum smooth and shiny; second to seventh metasomal tergites shagreen (Fig.49); frons shagreen; ovipositor with dorsal nodus and five ventral teeth; ovipositor not extending beyond tip of metasoma.....**B. molycaon** sp. nov.
- = Fore wing vein 3-SR less than 2.0x r; length less than 2.0mm; ovipositor sheath less than 0.75x fore wing; propodeum granulate to smooth; second to seventh tergites granulate to smooth and shiny; frons finely granulate; other characters partly or completely different from above....7
7. Face with short setae (Fig.21); fore wing vein 3-SR 1.20 - 1.80x r (Fig.22); antenna slightly longer than length of head and mesosoma combined; antennal segments of female 16-19; vertex with adpressed hairs, not reaching above upper level of posterior ocellus (Fig.20).....
B. brevicornis Wesmael
- = Face with long setae (Fig.36); fore wing vein 3-SR 0.9 - 1.20x r (Fig.37); antenna shorter or equal to length of head and mesosoma combined; antennal segments of female 13-15; vertex with erect hairs, partly reaching above upper level of posterior ocellus (Fig.35).....
.....**B. hebetor** Say
8. Mesoscutum punctate; propodeum smooth and shiny.....9
- = Mesoscutum shagreen; propodeum variable.....13
9. Metasoma shagreen; ovipositor as long as metasoma; mesoscutum finely punctate; notauli distinct.....**B. incarnatus** Ramakrishna Ayyar
- = Metasoma not shagreen; ovipositor shorter or as long as metasoma; mesoscutum and notauli variable.....10
10. Fore wing vein 3-SR and r almost equal; notauli indistinct; first tergite with carina towards posterior border, remaining tergites smooth and shiny.....**B. melleus** Ramakrishna Ayyar

- = Fore wing vein 3-SR longer than r; notauli distinct; metasoma sculptured **11**
- 11.** Fore wing vein 3-SR a little more than 3.0x r; all tergites coarsely punctate and punctures almost form irregular longitudinal striae especially on first four tergites; length 4.50 mm.....
B. pongamiaensis Shenefelt
- = Fore wing vein 3-SR less than 2.0x vein r; metasoma not as above; length less than 4.0mm..... **12**
- 12.** Frons, vertex and face punctate; first tergite medially smooth, laterally punctate, dorsolateral carina crenulate; remaining tergites granulate; length 2.35mm.....
B. bicolor Haider, Ahmad, Pandey & Shujauddin
- = Frons and face shagreen; vertex shagreen anteriorly, and behind ocelli, smooth and shiny laterally; first and second tergites rugoseretulate; third to fifth tergites aciculatorugose (Fig.54); sixth tergite shagreen; fourth to sixth tergites with an anterior smooth area and transverse groove basally; frons shagreen (Fig.56); length 3.04 mm.....
.....***B. stom*** sp. nov.
- 13.** Propodeum areolate at extreme apex; width of first tergite at apex 2.0x width at base; antenna 25-27 segmented; length 2.0 -3.0 mm
B. lefroyi (Dudgeon & Gough)
- = Propodeum carinate; other characters different from above **14**
- 14.** First tergite slightly granulate with raised median area; second to sixth tergites rugose; fourth to sixth tergites with faintly crenulated anterior transverse groove (Fig.51); fore wing vein 3-SR 2.30x r; length 2.49mm
B. procnis sp. nov.

- = Metasoma shagreen; fore wing vein 3-SR 1.50 - 2.90x r; length more than 2.5mm.....15
15. Metanotum and propodeum with long mid longitudinal carina; frons without median longitudinal groove (Fig.31); cu-a vertical slightly antefurcal; hypopygium not extending beyond apex of metasoma; 3-SR 2.75x r; 1-SR 0.31x 1-M (Fig.29); 2-SR slightly sinuate; ovipositor 0.73 mm.....**B. daris** sp. nov.
- = Metanotum with anterior median carina; propodeum with posterior median carina; frons with median longitudinal groove; cu-a slightly postfurcal; hypopygium extending beyond apex of metasoma; 2-SR straight; ovipositor more than 1.0mm.....16
16. Notauli distinct, deep; fore wing vein 3-SR 2.88x r (Fig.17); vein 1-SR 0.25x 1-M; ovipositor 1.17mm, with dorsal nodus and two ventral teeth; first tergite 0.63x its width at apex antenna with 28 segments; length 3.66mm.....**B. agathon** sp. nov.
- = Notauli distinct not very deep; fore wing vein 3-SR 1.55x r (Fig.23); vein 1-SR 0.17x 1-M; ovipositor 1.86mm with dorsal nodus and two ventral teeth; first tergite 1.20x its width at apex; antenna with 23 segments; length 3.55mm.....**B. charien** sp. nov.
17. Head smooth and shiny; face closely and distinctly but not strongly punctured and sparsely covered with pale long hairs; frons with a narrow longitudinal furrow; first tergite stoutly, irregularly longitudinally striolated apicomediaally; second tergite coarsely, irregularly, rugosely punctured, irregularly longitudinally striolated mediobasally, lateral depression striated at bottom and irregularly striated apicomediaally; length 9-10 mm.....**B. punjabensis** Cameron
- = Characters not as above partly or completely different.....18

18. Fore wing vein 3-SR 3.0x or more than 3.0x r; antenna 24-25 segmented; frons shagreen or smooth and shiny19
- = Fore wing vein 3-SR less than 3.0x r; antenna with 18-14 segments; frons smooth, shiny to faintly reticulate.....20
19. Metasoma shagreen; fore wing vein 3-SR 3.0x r; head smooth; length 2.5 – 3.0mm.....**B. greeni** Ashmead
- = First tergite rugose; second tergite rugose-reticulate with median triangular carina and lateral grooves; third to fourth tergites rugose-reticulate, remaining tergites shagreen (Fig.32); fore wing vein 3-SR 3.17x r; head shagreen except anteriorly granulose and posteriorly smooth vertex; length 3.60mm**B. decor** sp. nov.
20. Fore wing vein 3-SR more than 2.0x r; vein 2-SR straight; antenna with 21 - 32 segments.....21
- = Fore wing vein 3-SR less than 2.0x r; vein 2-SR slightly sinuate, rarely straight; antenna with 18-24 segments.....22
21. Length 3.44 mm; antenna with 32 segments; ovipositor 1.58mm; metanotum with anterior median carina; ovipositor with dorsal nodus and five ventral teeth; hypopygium slightly extending beyond tip of metasoma (Fig.26); ovipositor 0.46 x forewing.....
- B. dachaon** sp. nov.
- = Length 2.4 mm; antenna with 21 segments; ovipositor 2.24 mm; metanotum without median carina; ovipositor with dorsal nodus and four ventral teeth; hypopygium not extending beyond tip of metasoma (Fig.50); ovipositor 1.06 x forewing.....**B. nexperon** sp. nov.
22. Propodeum with posterior median longitudinal carina extending beyond middle of propodeum; metanotum without median carina; ovipositor with dorsal nodus and four ventral teeth; vein 1-SR 0.55x 1-M (Fig.44); ovipositor sheath 0.56x forewing**B. koridor** sp. nov.

- = Propodeum with posterior median carina not extending to middle of propodeum; other characters not as above, partly or completely different**23**
- 23.** Hypopygium extending beyond tip of metasoma; vein 1-SR+M straight (Fig.38); ovipositor sheath 0.87x fore wing; 1-SR 0.46x 1-M.....
B. heteron sp. nov.
- = Hypopygium not extending beyond tip of metasoma; vein 1-SR+M slightly sinuate (Fig.41); ovipositor sheath 0.37x fore wing; 1-SR 0.35x 1-M.....***B. keralense*** sp. nov.

***Bracon agathon* sp. nov.**

(Figs.17-19)

Holotype: Female: Length of body 3.66mm, of antenna 3.56mm, of fore wing 3.32mm and of ovipositor 1.17 mm.

Head: Width 1.13x and 1.77x its median length in anterior (Fig.18) and dorsal (Fig.19) views respectively; antenna with 28 segments; length of third antennal segment 1.17x fourth; third, fourth and penultimate antennal segments 2.90, 3.0 and 3.33x their width, respectively; apical antennal segment acuminate; frons flat, shagreen with median shallow groove and hairy laterally (Fig.19); OOL: diameter of posterior ocellus: POL = 6: 5: 6.5; stemmaticum slightly raised above surface of vertex, surface shagreen and surrounded by shallow groove; vertex shagreen sparsely hairy mediodorsally and moderately hairy along outer margin of eye; eyes glabrous, slightly emarginate; length of eye in dorsal view 2.94x temple; temple shagreen and hairy; face shagreen hairy and without a ridge dorsally (fig.18); width of face 2.23x its height; intertentorial distance 2.0x tentorioocular distance; width of hypoclypeal depression 0.45x maximum width of face; occipital flange narrow; malar space shagreen shagreen as long as basal width of mandible.

Mesosoma: Length of mesosoma 1.20x its height; pronotum shagreen, laterally with a faintly crenulate groove; mesoscutum, scutellum, propleuron, mesopleuron, metapleuron and propodeum, shagreen (Fig.17); mesoscutum hairy along notauli anteriorly and densely hairy posteriorly; notauli distinct without crenulations; scutellar sulcus wide with 9 carinae; metanotum smooth with anterior median carina; propleuron and metapleuron hairy; mesopleuron hairy except dorsally and medially; pleural sulcus narrow and smooth; metapleuron hairy; propodeum sparsely hairy medially, densely hairy laterally and with a median posterior carina; propodeal spiracle oval shaped, small and medially situated; fore wing vein 1-SR 0.25x 1-M and continuous with it; ratio of length of fore wing veins: r:3-SR: SR1 = 8:23:31; vein 3-SR 2.88x r; 1-SR+M slightly sinuate; SR1 straight; cu-a vertical, slightly

postfurcal; 2-SR straight; 2-SR : 3-SR : r-m = 12.5 : 23: 7.5; m-cu converging to 1-M posteriorly, 0.50x 1-M (Fig.17); hind wing vein SC + R1 straight and 1.50x 1r-m; hind coxa shagreen; tarsal claws with basal lobe produced into tooth; length of femur, tibia and basitarsus of hind leg 3.65, 6.75 and 4.67x their width, respectively; length of hind tibial outer and inner spurs 0.29 and 0.43x hind basitarsus.

Metasoma (Fig.17): Length of first tergite 0.63x its apical width, surface shagreen with a raised median area posteriorly, surface of median area shagreen and sides crenulate; glymma shallow, narrow and smooth; dorsolateral carina of first tergite complete; second tergite rugose, reticulate submedially with an anterior median triangular area; third tergite rugose; suture between second and third tergites crenulate; fourth to sixth tergites shagreen with anterior transverse groove; all tergites hairy; ovipositor with dorsal nodus and with two ventral teeth; length of ovipositor sheath 0.37x fore wing and covered with long hairs; hypopygium extending beyond tip of metasoma and apically acute.

Colour: Yellow. Eye black, outer rim yellow; ocelli shining yellow; antenna tip of mandible, stemmaticum, claws and ovipositor sheath brown; wing veins and stigma pale brown; ovipositor orange.

Male: Unknown

Host: Unknown

Distribution: India (Kerala)

Etymology: Species name is taken from the Greek adjective “agathon” meaning good.

Material examined: Holotype: Female, INDIA: Kerala, Kollam Dt., Neendakara (8°56'N 76°32'E), Sumodan, 22.ii.1989. Paratypes: 3Females, Kerala, Palakkad Dt., Malampuzha (10°53'N 76°46'E), Sumodan, 10.xii.1987; Kerala, Palakkad Dt., Walayar (10°1'N 76°1'E); Sumodan, 8.i.1988.

Discussion: This new species comes close to *B. lefroyi* in having mesoscutum and propodeum shagreen. However it differs from *B. lefroyi* in having 1) Propodeum with a median posterior carina (Propodeum without median carina at extreme apex, areolate in *B. lefroyi*); 2) Apical width of first tergite 1.25x its basal width (Apical width of first tergite 2.0x its basal width in *B. lefroyi*); 3) Width of second tergite 3.3x its length (Width of second segment 4x its length in *B. lefroyi*); 4) Third segment 1.44x second tergite (Third segment a little longer than second in *B. lefroyi*).

This new species also comes close to *B. charien* sp. nov. in having metanotum with anterior median carina; propodeum with posterior median carina; frons with median longitudinal groove; cu-a slightly postfurcal; 2-SR straight and hypopygium extending beyond apex of metasoma. However, in addition to characters mentioned in key it differs from *B. charien* in having 1) Fore wing vein 1-SR 0.25x 1-M (Fore wing vein 1-SR 0.17x 1-M in *B. charien*); 2) Mesoscutum hairy along notauli (Mesoscutum moderately hairy except midlobe anteriorly posteromedially and lateral lobes medially in *B. charien*); 3) First tergite completely shagreen (First tergite smooth with rugose, raised median posterior area in *B. charien*) and 4) Second and third tergites rugoseretulate (Second and third tergites aciculatorugose, laterally shagreen in *B. charien*).

***Bracon brevicornis* (Wesmael)**

(Fig.20-22)

Bracon brevicornis Wesmael, 1838. *Nouv. Mem. Acad. Sci. R. Bruxelles* 11:23.

Bracon brevicornis (Wesmael): Shenefelt, 1978. *Hym. Cat. (nov. ed.)* 15: 1590-1593.

Habrobracon brevicornis (Wesmael): n. comb. by Genieys, 1925. *Annls ent. Soc. Am.* 18: 143.

Bracon brevicornis (Wesmael): van Achterberg & Polaszek, 1996. *Zool. Verh. Leiden* 304: 28-29.

Diagnosis: Female & Male: Length of body 1.80 - 2.60 mm. Antenna with 16-19 segments, slightly longer than length of head and mesosoma combined in female, 22-27 segments in male; vertex smooth with adpressed hairs, not reaching above upper level of posterior ocellus (Fig. 20); frons and clypeus finely granulate; face granulate with short hairs (Fig. 21); mesoscutum smooth, shiny, largely hairy; vein 3-SR of fore wing 1.20-1.80x r (Fig.22); propodeum superficially granulate. Colour variable.

Host: *Dioryctia abietella* (Fabr.), *Earias insulna* (Boisd.), *Ephestia cautella* (Walker), *Helicoverpa armigera* Hubner, *Noorda moringae* Tams, *Opisina arenosella* walter, *Platyedra gossypiella* (Saund.), *Sesamia cretica* (Led.).

Biology: An extremely polyphagous ectoparasite, attacking Crambidae and Pyralidae in stored products and in the field also other Lepidopterous parasites.

Distribution: Cosmopolitan.

Material Examined: 12Females & 18 Males, INDIA: Kerala, Kasargode (12°30'N 74°59'E), Sujatha, 24.i.2003, 3Females & 1Male, Kerala, Kottayam (9°35'N 76°31'E), Chandrika Mohan, 2004; 7 Females & 1Male, Kerala, Kasargode, CPCRI (12°31'N 74°59'E), Chandrika Mohan, X.i.2006; 15Females & 19Males, Kerala, Kasargode, CPCRI (12°31'N 74°59'E), Subaharan, x.ii.2006.

Discussion: *B. brevicornis* (Wesmael) is similar to *Bracon hebetor* Say in having ovipositor sheath less than 0.75x forewing, propodeum granulate to smooth, second to seventh tergites granulate to smooth and shiny and frons finely granulate. However it can be separated from *Bracon hebetor* Say in having: 1) Face with short setae (Face with long setae in *B. hebetor*); 2) Vein 3-SR of fore wing 1.20-1.80x vein r (Vein 3-SR of fore wing 0.90-1.20x vein r in *B. hebetor*); 3) Antenna slightly longer than length of head and mesosoma combined (Antenna shorter than or equal to length of head and mesosoma combined in *B. hebetor*); 4) Antennal segments of female 16-19, male 22-27 (Antennal segments of female 13-15, male 20-23 in *B. hebetor*) and 5) Vertex with adpressed hairs, not reaching above upper level of posterior ocellus (Vertex with erect hairs, partly reaching above upper level of posterior ocellus in *B. hebetor*).

Remarks: The above diagnosis is from van Achterberg & Polaszek (1996)

***Bracon charien* sp. nov.**

(Figs.23-25)

Holotype: Female: Length of body 3.55 mm, of antenna 3.05 mm, of fore wing 3.03 mm and of ovipositor 1.86 mm.

Head: Width 1.3x and 1.72x its median length in anterior (Fig.24) and dorsal (Fig.25) views respectively; antenna with 23 segments; length of third segment 1.18x fourth, length of third, fourth and penultimate segments 2.35, 2.75, and 2.50x their width respectively; apical segment acuminate; frons shagreen, sparsely hairy laterally and with median longitudinal groove; OOL: diameter of posterior ocellus: POL = 6:2:5; stemmaticum surrounded by a shallow groove; vertex shagreen moderately hairy; eyes glabrous, slightly emarginated; length of eye in dorsal view 2.67x temple; temple shagreen; moderately hairy; face shagreen, with raised median area and sparsely hairy width of face 2.11x its height; intertentorial distance 1.27x tentorioocular

distance; width of hypoclypeal 0.37x maximum width of face; occipital flange narrow; malar space shagreen 0.57x basal width of mandible.

Mesosoma: Length of mesosoma 1.42x its height, mesosoma shagreen; pronotum hairy laterodorsally; mesoscutum moderately hairy except mid and lateral lobes medially; notauli distinct not very deep; scutellum densely hairy; propleuron densely hairy; mesopleuron hairy except dorsally and medially; pleural sulcus narrow smooth metapleuron thickly hairy; metanotum with anterior median carina; propodeum hairy with short posterior carina and lateral carinae on either side, sparsely hairy anteromedially, densely hairy laterally; forewing vein 1-SR 0.17x 1-M and continuous with it; ratio of length of fore wing veins: r:3-SR : SR1 = 6:17:30.5; 1-SR+M straight; cu-a slightly postfurcal, vertical; 2-SR straight; 2-SR:3-SR: r-m = 11:17:8; 3-SR 1.55x r m-cu 0.50x 1-M (Fig.23); hind wing vein SC+R1 1.90x 1r-m; hind coxa shagreen; tarsal claws with pointed basal lobe; length of femur, tibia and basitarsus of hind leg 4.0, 6.50 and 5.80x their width respectively; length of hind tibial outer and inner spur 0.24 and 0.34x hind basitarsus.

Metasoma: Length of first tergite 1.20x its apical width; first tergite smooth with rugose, raised median posterior area; second and third tergites aciculatorugose, shagreen laterally; suture between second and third tergites wide and crenulate; fourth to sixth tergites shagreen; seventh tergite smooth and shiny; all tergites hairy; hypopygium extending beyond apex of metasoma (Fig.23); ovipositor sheath covered with long hairs 0.49x fore wing; ovipositor with dorsal nodus and three ventral teeth.

Colour: Yellowish brown. Eyes black with outer grey layer; antenna, stigma, veins, last tarsomere, claws, ovipositor sheath, and propodeum posteriorly brown; apex of third tergite with two submedian brown patches.

Male: Unknown.

Host : Unknown.

Biology: Unknown.

Distribution: India: Kerala.

Etymology: Species name is taken from the Greek adjective meaning graceful, neuter gender.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dist., Calicut University Campus (11°7'N 75°5'E), T.C. Narendran, 1989. Paratypes: 2Female, data same as holotype.

Discussion: This new species comes close to *B. lefroyi* (Dudgeon & Gough) in having mesoscutum and propodeum shagreen. However, it differs from *B. lefroyi* in having 1) Propodeum with short posterior carina and lateral carinae on either side of it (Propodeum without median carina except at extreme apex which is finely areolate in *B. lefroyi*); 2) Apical width of first tergite 1.40x its basal width (Apical width of first tergite 2.0x its basal width in *B. lefroyi*) and 3) Third tergite as long as second (Third tergite a little longer than second in *B. lefroyi*).

This new species also comes close to *B. agathon* sp. nov. in having metanotum with anterior median carina; propodeum with posterior median carina; frons with median longitudinal groove; cu-a slightly postfurcal; 2-SR straight and hypopygium extending beyond apex of metasoma. However, in addition to characters mentioned in key it differs from *B. agathon* in having 1) Fore wing vein 1-SR 0.17x 1-M (Fore wing vein 1-SR 0.25x 1-M in *B. agathon*); 2) Mesoscutum moderately hairy except midlobe anteriorly posteromedially and lateral lobes medially (Mesoscutum hairy along notauli in *B. agathon*); 3) First tergite smooth with rugose; (First tergite completely shagreen in *B. agathon*) and 4) Second and third tergites aciculatorugose, laterally shagreen (Second and third tergites rugoseretificate in *B. agathon*).

***Bracon dachaon* sp. nov.**

(Figs.26-28)

Holotype: Female: Length of body 3.44mm, of antenna 3.93mm, of fore wing 2.95mm and of ovipositor 1.58mm.

Head: Width 1.23 and 1.95x its median length in anterior (Fig.27) and dorsal (Fig.28) views respectively; antenna with 32 segments; length of third antennal segment 1.07x fourth segment: length of third, fourth and penultimate antennal segments 4.0, 3.75 and 3.33x their width, respectively; apical antennal segment acuminate; frons flat, faintly reticulate, with a shallow median groove; OOL: diameter of posterior ocellus: POL = 12: 3.5: 6; stemmaticum slightly raised above level of vertex, surrounded by narrow shallow groove; vertex, temple, and gena smooth, shiny and hairy; eyes glabrous, slightly emarginate; length of eye in dorsal view 2.50x temple; face flat, smooth, shiny and hairy with a faint median ridge dorsally; width of face 2.26x its height; clypeus smooth, shiny without transverse carina; intertentorial distance 0.91x tentorioocular distance; width of hypoclypeal depression 0.34x maximum width of face; occipital flange narrow; malar space faintly granulose as long as basal width of mandible.

Mesosoma (Fig.26): Length of mesosoma 1.73x its height; pronotum smooth, shiny and hairy dorsally sides glabrous; mid lobe of mesoscutum glabrous medio anteriorly, hairy posteriorly, lateral lobes hairy; notauli distinct and smooth; scutellar sulcus wide with 9 carinae; scutellum smooth, shiny and hairy; metanotum with anterior median carina; propleuron, smooth; shiny and hairy; mesopleuron hairy anteriorly and posteroventrally, glabrous dorsomedially; metapleuron smooth, shiny and covered with long hairs; metapleural flange medium sized; propodeum smooth shiny, hairy with a median posterior carina; propodeal spiracle round, small and medially situated; fore wing vein 1-SR 0.36x 1-M and continuous it; ratio of length of fore wing veins: r:3-SR:SR1 = 6:14.5: 35; vein 3-SR 2.42x r; 1-SR+M slightly sinuate; SRI straight, cu-a vertical and interstitial; 2-SR straight; 2-SR:3-SR: r-m = 9.5:14.5: 6; m-cu converging to 1-M posteriorly and 0.68x shorter than 1-M; hind wing vein SC+R1 straight and 1.59x 1r-m; hind coxa

smooth, shiny and hairy; tarsal claws with basal lobe protruding; length of femur, tibia and basitarsus of hind leg 3.63, 8.89 and 5.33x their width, respectively; length of hind tibial outer and inner spurs 0.31 and 0.44x hind basitarsus; hind tarsus with both dorsal and ventral rows of setae.

Metasoma: Length of first tergite 0.89x its apical width, surface rugose with raised median area posteriorly, sides of median area crenulate, rugose posteriorly; glymma narrow, shallow and crenulate; dorsolateral carina of first tergite complete; second tergite strongly rugoseretate with median triangular area extending to its tip, surrounded by crenulate grooves on either side; suture between second and third tergites crenulate; remaining tergites aciculatorugose with crenulate anterior transverse groove (Fig.26); ovipositor with dorsal nodus and five ventral teeth; length of ovipositor sheath 0.46x fore wing and covered with long hairs; hypopygium slightly extending beyond apex of metasoma.

Colour: Honey yellow except for following: eyes grey; ocelli shining yellow; antenna (except basal half of scape honey yellow), stemmaticum, median triangular area of second tergite and ovipositor sheath (except tip black) brown.

Male: Unknown.

Host: Unknown.

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

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Divakaran, 9.viii.2001. Paratypes: 8Femals, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sabirabi, 3.viii.1999; 28.ii.2000; Sudheer, 16.vii.2001; 9.viii.2001.; Simi, 16-19.ix.2002.

Discussion: This new species comes close to *B. punjabensis* in having mesosoma smooth and shiny completely, however differs from *B.*

punjabensis in having: 1) Face smooth, shiny and hairy with a faint median ridge dorsally (Face closely and distinctly but not strongly punctured in *B. punjabensis*); 2) First tergite rugose with rugose raised median area apically (First tergite stoutly, irregularly, longitudinally striolated apicomediaally in *B. punjabensis*); 3) Second tergite rugosereticulate with median triangular area extending to its tip, surrounded by crenulate grooves on either side (second tergite coarsely, irregularly, rugosely punctured, basomedially, irregularly longitudinally striolated, lateral depressions striated at bottom, apicomediaally irregularly striated in *B. punjabensis*); and 4) Remaining tergites aciculatorugose with crenulate anterior transverse groove (Other tergites closely punctured, fourth and fifth with oblique depressions laterally and transverse furrow at apex in *B. punjabensis*).

This species also comes close to *B. nexperon* sp. nov. in having frons faintly reticulate; vertex smooth and shiny; pronotum smooth and shiny laterally and scutellum smooth, shiny and hairy. However it differs from *B. nexperon* sp. nov. in having 1) Hind coxa smooth (Hind coxa punctate in *B. nexperon* sp. nov.); 2) First tergite rugose with raised median area posteriorly, sides crenulate and rugose posteriorly (First tergite smooth with laterally crenulate raised median area posteriorly in *B. nexperon* sp. nov.); 3) Second tergite strongly rugosereticulate with median triangular area extending to its tip surrounded by crenulate grooves on either side (second tergite faintly rugosereticulate with anterolateral and posterior smooth area in *B. nexperon* sp. nov.); 4) Fourth to sixth tergites rugulose (Fourth to sixth tergites weakly rugose in *B. nexperon* sp. nov.).

***Bracon daris* sp. nov.**

(Figs.29-31)

Holotype: Female: Length of body 3.42mm, of antenna 2.86mm, of fore wing 2.92mm and of ovipositor 0.73mm.

Head: Width 1.44 and 1.96x its median length in anterior (Fig.30) and dorsal (Fig.31) views respectively; antenna with 22 segments; length of third antennal segment 1.20x fourth; length of third, fourth and penultimate antennal segments 3.60, 3.0 and 2.60x their width respectively; apical antennal segment acuminate; frons shagreen, without median groove, moderately hairy; OOL: diameter of posterior ocellus: POL = 5:3:7; stemmaticum shagreen, sparsely hairy, surrounded by shallow groove; vertex shagreen, moderately hairy laterally; eyes slightly emarginate; length of eye in dorsal view 6.83x temple; temple and gena shagreen, sparsely hairy; face shagreen, moderately hairy, with median raised area; width of face 1.84x its height; intertentorial distance 2.4x tentorioocular distance; width of hypoclypeal depression 0.55x maximum width of face; occipital flange narrow; malar space shagreen, 0.17x basal width of mandible.

Mesosoma: Length of mesosoma 1.19x its height; mesosoma shagreen; midlobe of mesoscutum hairy posteriorly, lateral lobes medially not hairy; notauli weakly indicated; scutellar sulcus narrow with carinae; scutellum hairy; metanotum with complete median carina; pleural sulcus narrow, smooth; mesopleuron hairy except dorsally and medially glabrous; metapleural flange narrow; propodeum with complete mid longitudinal carina and small transverse carinae on either side of it; fore wing vein 1-SR 0.31x 1-M and continuous with it; ratio of length of fore wing veins: r:3-SR:SR1 = 8:22:35; 3-SR 2.75x r; 1-SR+M straight; cu-a vertical, slightly antifurcal; 2-SR slightly sinuate; 2-SR : 3-SR : r-m = 14:22:9; m-cu 0.62x 1-M (Fig.29); hind wing vein SC+R1 2.67x 1r-m; hind coxa shagreen; tarsal claws with pointed basal lobe; length of femur, tibia and basitarsus of hind leg 3.53, 8.8 and 5.83x their width respectively; length of hind tibial outer and inner spurs 0.34 and 0.26x hind basitarsus.

Metasoma: Length of first tergite as long as its apical width; apical width of first tergite 1.50x its basal width; first tergite shagreen, with crenulate sided raised median area posteriorly; second tergite shagreen, with parallel sided

median area basally extending its middle and sides of median area rugose; width of second tergite 2.80x its width; suture between second and third tergites wide and crenulate; third and fourth tergites reticulaterugose medially, shagreen laterally; remaining tergites shagreen; hypopygium not extending beyond tip of metasoma; ovipositor sheath 0.26x fore wing; ovipositor with dorsal nodus and three ventral teeth (Fig.29).

Colour: Body reddish yellow with black markings on metasomal tergites (except pale yellow face either side of middle line); head, basal eight segments of antenna, mesosoma (except black medial part of propodeum), legs (except brown claws), large lateral portion of second and fifth tergites, lateral part of third and fourth tergite, sixth tergite and ovipositor reddish yellow; eyes black surrounded by grey area; stigma and veins yellow; ovipositor sheath, small medial part of first, second and fifth tergites brown; large medial area of third and fourth tergites black.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala).

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

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sheeba, M., 17.xi.2005. Paratypes: 2 Females, data same as holotype.

Discussion: This new species comes close to *B. lefroyi* in having mesoscutum and propodeum shagreen. However, it differs from *B. lefroyi* in having 1) Propodeum with complete midlongitudinal carina and small transverse carinae on either side of it (Propodeum without median carina except at extreme apex, areolate in *B. lefroyi*); 2) Apical width of first tergite 1.50x its basal width (Apical width of first tergite 2.0x its basal width in *B. lefroyi*); 3) Width of second tergite 2.80x its length (Width of second tergite

4.0x its length in *B. lefroyi*); 4) Third tergite a trifle shorter than second (Third tergite a little longer than second in *B. lefroyi*).

This new species also comes close to *B. agathon* sp. nov. in having frons, mesoscutum, hind coxa and fourth tergite shagreen. However it differs from *B. agathon* sp. nov. in having 1) Frons without median groove (Frons with median shallow groove in *B. agathon* sp. nov.); 2) Face with a median raised area (Face without a raised area medially in *B. agathon* sp. nov.); 3) Pronotum shagreen (Pronotum smooth and shiny, punctate laterally in *B. agathan* sp. nov.); 4) Mesoscutum hairy posteriorly (Mesoscutum hairy along notauli in *B. agathon* sp. nov.); 5) Scutellar sulcus narrow (Scutellar sulcus wide in *B. agathon* sp. nov.); 6) Metanotum with complete median carina (Metanotum with anterior median carina in *B. agathan* sp. nov.); 7) Propodeum with long median carina (Propodeum with a median posterior carina in *B. agathan* sp. nov.); 8) Fore wing vein cu-a slightly postfurcal (Fore wing vein cu-a slightly antefurcal in *B. agathan* sp. nov.) 9) Second tergite shagreen (Second tergite rugose-reticulate in *B. agathon* sp. nov.).

***Bracon decor* sp. nov.**

(Figs.32-34)

Holotype: Female: Length of body 3.6mm, of antenna 2.79mm, of fore wing 3.29mm and of ovipositor 1.48mm.

Head: Width 1.15x and 1.97x its median length in anterior (Fig.33) and dorsal (Fig.34) views respectively; antenna with 25 segments; length of third antennal segment 11.50x fourth; length of third, fourth and penultimate antennal segments 2.17, 1.67 and 2.50x their width, respectively; apical antennal segment acuminate; frons flat, shagreen with median longitudinal carina extending from between antennal, toruli to middle of frons hairy laterally (Fig.34); OOL: diameter of posterior ocellus: POL = 7:4.5: 6.5; stemmaticum slightly raised above level of vertex and surrounded by a

shallow groove; vertex rugose, anteriorly smooth, shiny posteriorly and hairy; eyes glabrous, slightly emarginate; length of eye in dorsal view 2.50x temple; temple smooth, shiny and hairy (Fig.34); face shagreen, hairy with a small median smooth longitudinal ridge dorsally, extends between toruli; width of face 1.65x its height; clypeus faintly punctate, not separated from face by carina, its apical margin upcurved, thin and with a row of long hairs; intertentorial distance 1.65x tentorioocular distance; width of hypoclypeal depression 0.56x minimum width of face; occipital flange narrow; malar space granulose 0.92x basal width of mandible.

Mesosoma (Fig.32): Length of mesosoma 1.51x its height; pronotum smooth and shiny; mesoscutum smooth, shiny hairy; notauli weakly impressed; posteriorly, smooth; scutellar sulcus wide with 8 carinae; scutellum smooth, shiny and hairy; metanotum with anterior median carina; propleuron smooth shiny and hairy; mesopleuron hairy anterodorsally and ventrally, glabrous medioposteriorly; pleural sulcus narrow, smooth; metapleuron smooth, shiny and hairy; metapleural flange lamelliform, and obtuse, medium sized; propodeum smooth, shiny with a few hairs anteriorly and posterior median longitudinal carina extending its middle; propodeal spiracle round, small and medially placed propodeal spiracle fore wing vein 1-SR 0.25x 1-M continuous with it; ratio of length of fore wing veins: r: 3-SR: SR1 = 6: 19: 35; vein 3-SR 3.17x r; veins 1-SR + M and SR1 straight; cu-a vertical, interstitial; 2-SR sinuate; 2-SR: 3-SR: r-m 14:19:7; m-cu converging to 1-M posteriorly and 0.48x 1-M; hind wing vein SC+R1 straight, 1.67x longer than 1r-m; hind coxa smooth, shiny and hairy; tarsal claws with basal lobe produced into a distinct tooth; length of femur, tibia and basitarsus of hind leg 3.88, 8.4 and 5.0x their width, respectively; length of hind tibial outer and inner spurs 0.27 and 0.33x hind basitarsus.

Metasoma: Length of first tergite 0.83x its apical width, surface reticulate with a median triangular area posteriorly, sides of median area crenulate; and posterior side rugose; glymma shallow wide and crenulate; dorsolateral carina

of first tergite complete; second tergite rugoseretate with median triangular carina and lateral grooves (Fig.32); suture between tergites crenulate; third and fourth tergites rugoseretate; remaining tergites shagreen (Fig.32); ovipositor with dorsal nodus; length of ovipositor sheath 0.43x fore wing and covered with long hairs; hypopygium extending beyond tip of metasoma and 0.33 apically acute; ovipositor 0.7x length of metasoma.

Colour: Black. Palpi pale yellow; mandibles (except brown tip), fore leg, mid trochanter, mid femur, base and apex of mid femur, extreme apex of hind femur, extreme base of hind tibia yellow; claws, mid femur medially, mid tarsus, three fourth of hind tibia and hind tarsus; stigma and veins (except pale brown 1-SR+M, 2-SR+M and m-cu) brown; wings infumate.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala).

Etymology: The species name is an arbitrary combination of letters

Material examined: Holotype: Female, INDIA: Kerala, Palakkad Dt., Kalkkandi (11°1'N 76°28'E), Sumodan, 13.xii.1987. Paratypes:3 Females, Data same as that of holotype.

Discussion: This new species come close to *B. greeni* in having smooth and shiny mesosoma and ovipositor 0.70x length of metasoma but differs in having 1) Fore wing vein 3-SR 3.17x r (Fore wing vein 3-SR 3.0x r in *B. greeni*) and 2) Antenna 0.78x length of body (Antenna nearly as long as body in *B. greeni*).

***Bracon gelechidiphagus* (Ramakrishna Ayyar)**

Microbracon gelechidiphagus Ramakrishna Ayyar, 1928. *Mem. Dept. Agric. Indian Ent. Ser.* 10. 147.

Bracon gelechidiphagus: n. comb. by Sohi, 1964: 131.

Diagnosis: Female: Body reddish to ochraceous brown. Head more or less yellowish and antenna greyish to reddish brown; wings hyaline; stigma and veins light brown; 3-SR more than 3.0x r; second cubital cell is long and narrow; propodeum and mesopleura with no dark markings; third and fourth tergites with faint dark marks apicomediaally.

Male: Unknown.

Host: *Pectinophora gossypiella* Saud., *Phthorimaea blapsigona* (Meyr).

Distribution: India (Kerala, Punjab, Simla)

Material examined: 1Female, INDIA: Kerala, Trissur Dt., Kerala Agricultural University Campus (11°7'N 75°5'E), T.C. Narendran & Party; 1.vii.2003; 2Females, Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E), Sheeba, M., 4.x.2003; 1Female, Kerala, Kozhikode Dt., Kakkodi (11°20' N 75°51'E), Girish Kumar, P., 21.xi.2004; 1Female, Kerala, Thiruvananthapuram Dt., Sreekaryam (8°29 N76°59 E) T.C. Narendran & Party, 11.xii.2004.

Discussion: *B. gelechidiphagus* Ramakrishna Ayyar comes close to *B. greeni* Ashmead. It differs from *B. greeni* in having third and fourth tergites with faint dark marks apico medially (Extreme apex of second tergite and dorsal blotches on third and fourth segments black in *B. greeni*).

Remarks: The above diagnosis is based on the original description by Ramakrishna Ayyar (1928).

***Bracon greeni* Ashmead**

Bracon greeni Ashmead 1896a. *Proc. U.S. natn. Mus.* 18: 645.

Microbracon greeni Ashmead, 1896a. 1896a. *Ind. Jour. Ent.* 7 (122): 37-40.

Bracon tachardiae Cameron, 1899. Synonymized by Yu *et al.*, 2005.

Diagnosis: Female. Length 2.5-3.0mm. Brownish yellow. Head and thorax smooth; antenna 24 segmented; wings hyaline; stigma and veins brown; fore wing vein 3-SR about 3.0x r; vein m-cu joins first submarginal cell a little beyond its apical third; metasoma broadly oval and shagreen; second to fourth metasomal tergites subequal, remaining a little shorter.

Colour: Brownish yellow. Disc of metasoma, extreme apex of second tergite and large dorsal blotches on third and fourth tergites black; wings hyaline, stigma and veins brown.

Male: Length 2-2.5 mm. Similar to female except antenna 25 segmented, longer than body.

Host: *Adisura atkinsoni* Moore, *Alcides affaber* L., *Earias fabia* Stoll., *Heliothis obsoleta* L., *Rabila frontalis* Wlk.,

Distribution: India (Kerala, Uttar Pradesh)

Material examined: 1Female, INDIA: Kerala, Kannur Dt., Aralam farm (11°58'N 75°40'E), Sumodan, 31.x.1988; 1Female, Kerala, Palakkad Dt., Kalkkandi (11°1'N 76°28'E) Sumodan, 13.xii.1987; 1Female, Kerala, Kozhikode Dt., Koyilandi, Kanayamkode (11°27'N 75°41'E), Girish Kumar, P., 9.i.2004; 1Female, Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E), Sheeba, M., 10.iv.2005.

Discussion: *B. greeni* comes close to *B. punjabensis* Cameron in having head and mesosoma smooth and shiny. However, it differs from 1) Wings hyaline (Wings uniformly dark-furcous in *B. punjabensis*); 2) Metasoma shagreen (First tergite stoutly, irregularly, longitudinally striolated apico-medially, second tergite coarsely, irregularly rugosely punctured, basomedially irregularly longitudinally striolated, lateral depressions striated at bottom, apicomediaally irregularly striated, remaining tergites closely punctured, fourth and fifth with oblique depressions laterally and transverse furrow at apex in *B. punjabensis*).

Remarks: The above diagnosis is based on the original description by Ramakrishna Ayyar (1928).

***Bracon hebetor* Say**

(Figs.35-37)

Bracon hebetor Say, 1836. *Boston J. nat. Hist.* 1: 252. Type data: Holotype. Whereabouts unknown Female (destroyed?).

Habrobracon hebetor (Say, 1836): Risbec, 1950. *C. r. Ier Conf. Int. Afric Ouest.* 1: 324.

Bracon dorsator Say, 1836. *Boston, J. nat. Hist.* 1: 253.

Bracon juglandis Ashmead, 1889. *Proc. U.S. nat. Mus.*, 11: 621.

Habrobracon vernalis Szepliget, 1901a. *Term-Tud. Közl.* 33:182.

Habrobracon beneficentor Viereck, 1911. *Proc. U.S. nat. Mus.* 40: 182.

Habrobracon plotnicovi Bogoljubov, 1914. *Turkest. sel. Khoz.* 9: 280.

Bracon breviantennatus de Stefani-Perez, 1919. *Min. Agri.-Dir. gen. Agr. (Serv. Fitopatologia), Palermo:* 44.

Habrobracon hebetor tortricidarum Goidanich, 1934. *Boll. 1st. Ent. Univ. Bologna.* 6: 225.

Habrobracon pectinophorae Watanabe, 1935. *Insecta matsum* 10: 44.

Habrobracon turkestanicus Telenga, 1936. *Fauna Rossii (n.s.)* 4: 131, 432.

Habrobracon flavus Telenga, 1936. *Fauna Rossii (n.s.)* 4: 343.

Habrobracon lozinskii Bogachev, 1939. *Izv. azerbaidzh. Fil. Akad. Nauk S.S.S.R* 3: 136.

Habrobracon hebetor var. *asiatica* Telenga, 1936. *Fauna Rossii (n. s.)* 4: 132-133.

Microbracon serinopae Cherian, 1928. *Year Book. Dept. Agric. Madras* 12-22.

Bracon hebetor Say, 1836: van Achterberg & Polaszek, 1996. *Zool. Verh. Leiden* 304: 29-30.

Diagnosis: Female & Male: Length of body 1.30 - 2.70 mm. Antenna with 13-15 segments, shorter than or equal to length of head and mesosoma combined in female, 20-23 segments in male; vertex smooth with erect hairs, partly reaching above upper level of posterior ocellus (Fig.35); face granulate with some long hairs (Fig. 36); mesosocutum smooth, shiny, largely hairy; vein 3-SR of fore wing 0.90 - 1.20x r (Fig.37); propodeum superficially granulate or smooth. Colour variable and similar to that of *Bracon brevicornis* (Wesmael).

Host: *Antigastra catalaunalis* (Duponchel), *Corcyra cephalonica* (Stainton), *Dichocrocis punctiferalis* (Guenee), *Ephestia cautella* (Walker), *Ephestia eleutella* (Hubner), *Ephestia kuhniella* (Zeller), *Galleria mellonella* (L.), *Helicoverpa armigera* Hubner, *Opisina arenosella* Walter, *Pyralis farinalis* L., *Pyroderces simplex* Walsingham, *Sitotroga cerealella* (Oliv.), *Spodoptera exigua* (Huebner), *Stomopteryx subsecivella* Zeller.

Biology: An extremely polyphagous ectoparasite, attacking Crambidae and Pyralidae in stored products and in the field also other lepidopterous families (Noctuidae, Tortricidae, Gelechiidae) may be attacked.

Type Locality: Indiana, USA.

Distribution: Cosmopolitan.

Material Examined: 1Female, INDIA: Kerala, Kayamkulam (9°10'N 76°30'E), Chandrika Mohan, x-xii.2002; 8 Females & 11 Males, INDIA: Kerala, Kasaragode (12°30'N 74°59'E), Sujatha, 24.i.2003; 7 Females & 4 Males, INDIA: Kerala, Kollam (8°53'N 76°35'E), Chandrika Mohan, 2004; 8 Males, INDIA: Kerala, Kottayam (9°35'N 76°31'E), Chandrika Mohan, 2004.

Discussion: *B. hebetor* Say comes close to *B. brevicornis* (Wesmael) in having ovipositor sheath less than 0.75x fore wing, propodeum granulate to smooth, second to seventh tergites granulate to smooth and shiny and frons finely granulate. However it can be separated from *B. brevicornis* in having: 1) Face with long setae (Face with short setae in *B. brevicornis*); 2) Vein 3-

SR of fore wing 0.90-1.20x vein r (Vein 3-SR of fore wing 1.20-1.80x vein r in *B. brevicornis*); 3) Antenna shorter than or equal to length of head and mesosoma combined (Antenna slightly longer than length of head and mesosoma combined in *B. brevicornis*); 4) Antennal segments of female 13-15, male 20-23 (Antennal segments of female 16-19, male 22-27 in *B. brevicornis*) and 5) Vertex with erect hairs, partly reaching above upper level of posterior ocellus (Vertex with adpressed hairs, not reaching above upper level of posterior ocellus *B. brevicornis*).

***Bracon heteron* sp. nov.**

(Figs.38-40)

Holotype: Female: Length of body 2.80mm, of antenna 2.43mm, of fore wing 2.56mm and of ovipositor 2.40mm.

Head: Width 1.27 and 1.49x its median length in anterior (Fig.38) and dorsal (Fig.40) views respectively; antenna with 20 segments; length of third antennal segment 1.38x fourth; length of third, fourth and penultimate antennal segments 4.50, 3.26 and 3.0x their width, respectively; apical antennal segment acuminate; frons flat, smooth, shiny, sparsely hairy laterally with median longitudinal groove (Fig.38); OOL: diameter of posterior ocellus: POL = 10:4:9; stemmaticum slightly raised above level of vertex, surrounded by narrow shallow groove; vertex smooth, shiny with widely separated hairs (Fig.40); eyes glabrous, slightly emarginate; length of eye in dorsal view 1.75x temple; temple smooth, shiny, and sparsely hairy; face flat, mostly smooth and shiny, faintly granulate, with a median ridge dorsally, sparsely hairy and with a single row of long hairs near inner margin of eye; width of face 2.0x its height; clypeus without dorsal carina, its apical margin upcurved, intertentorial distance 1.88x tentorioocular distance; width of hypoclypeal depression 0.63x maximum width of face; occipital flange narrow; malar space granulate, 1.27x basal width of mandible.

Mesosoma (Fig.38): Length of mesosoma 1.44x its height; pronotum smooth, shiny; mid lobe of mesoscutum glabrous anteriorly, hairy posteriorly and lateral lobes glabrous; notauli distinct and smooth; scutellar sulcus wide with 5 carinae; scutellum smooth, shiny and hairy; metanotum with anterior median carina; propleuron smooth, shiny; mesopleuron hairy dorsally and ventrally, glabrous medially; pleural sulcus narrow and smooth; metapleuron smooth, shiny and covered with long hairs; propodeum smooth, shiny with posterior median carina and few hairs laterally; propodeal spiracle round, small medially situated; fore wing vein 1-SR 0.46x 1-M and continuous with it; ratio of length fore wing veins: r :3-SR : SR1 = 7:12:43; 3-SR 1.71x r; fore wing veins 1-SR + M and SR1 straight; cu-a vertical and interstitial; 2-SR slightly sinuate; 2-SR : 3-SR : r-m = 12:12.5: 6.5; m-cu converging to 1-M posteriorly and 0.50x it ((Fig.38) ; hind wing vein SC + R1 straight and 1.57x 1r-m; hind coxa smooth, shiny and hairy; tarsal claws with basal lobe produced into tooth; length of femur, tibia and basitarsus of hind leg 4.13, 10.50 and 5.0x their width, respectively; length of hind tibial outer and inner spurs 0.40 and 0.47x hind basitarsus; hind tarsus with dorsal and ventral row of setae.

Metasoma: Length of first tergite 0.75x its apical width, surface rugulose with smooth, shiny raised median area posteriorly, sides of median area crenulate; glymma shallow, smooth; dorsolateral carina of first tergite complete; second tergite aciculatorugose with crenulate sided median triangular carina; suture between second and third tergite crenulate; third tergite mostly smooth, laterally faintly reticulate, with curved crenulate grooves anterolaterally and transverse crenulate groove subposteriorly; remaining tergites faintly reticulate; ovipositor with dorsal nodus and three ventral teeth; length of ovipositor sheath 0.87x forewing and covered with long hairs; hypopygium extending beyond apex of metasoma and apically acute.

Colour: Yellow. Eyes black; antenna (except scape and pedicel yellow), wing veins, stigma (except pale yellow base), ovipositor sheath, claws, tip of

mandible, first tergite, suture between first and second tergite, third, fourth and fifth tergites medioposteriorly brown; ocelli shining yellow; stemmaticum mostly yellow, brown near ocelli.

Male: Unknown.

Host: Emerged from *Ficus racemosa* L. leaf galls.

Etymology: Species name is taken from the Greek adjectives meaning different.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram, Nilambur, Chokkad, C.K. Colony (11°16'N 76°14'E), Sheeba, M., 22.iv.2006. Paratypes: 2 Females of data same as that of holotype.

Distribution: India (Kerala).

Discussion: This new species comes close to *B. punjabensis* in having mesosoma smooth and shiny. However it differs from *B. punjabensis* in having (1) Face flat, mostly smooth and shiny, faintly granulose (Face closely and distinctly but not strongly punctured in *B. punjabensis*); 2) Second tergite aciculatorugose, with crenulate sided median triangular carina (Second tergite coarsely, irregularly, rugosely punctate, basomedially irregularly, longitudinally striolated, lateral depressions striated at bottom, apicomediaally irregularly striated in *B. punjabensis*); 3) Third tergite mostly smooth, laterally faintly reticulate, with curved crenulate grooves anterolaterally and with transverse crenulate groove subposteriorly (Third tergite closely punctured in *B. punjabensis*); 4) Fourth and fifth tergites faintly reticulate (Fourth and fifth tergites closely punctured with oblique depressions laterally and striated transverse groove apically in *B. punjabensis*) and 5) Sixth tergite faintly reticulate (Sixth tergite closely punctured in *B. punjabensis*).

***Bracon keralense* sp. nov.**

(Figs. 41-43)

Holotype: Female: Length of body 2.05mm, of antenna 1.99mm of fore wing 2.21mm and of ovipositor 0.77mm.

Head: Width 1.47 and 1.92x its median length in anterior (Fig.42) and dorsal (Fig.43) views respectively; antenna with 18 segments; length of third antennal segment 1.43x fourth; third, fourth and penultimate antennal segments 3.33, 2.33, and 3.25x their width, respectively; apical antennal segment acuminate; frons smooth, shiny with shallow median groove and with single row of hairs along eye margin (Fig.43); OOL: diameter of posterior ocellus: POL = 12.5:8; stemmaticum slightly raised above surface of vertex, surface smooth and surrounded by shallow groove; vertex smooth, shiny and sparsely hairy; eyes glabrous, not emarginate; length of eye in dorsal view 2.30x temple; temple smooth, shiny and sparsely hairy (Fig.43); face (Fig.42) mostly smooth faintly reticulate dorsally, hairy with a median ridge extending from between antennal toruli to middle of face; width of face 2.11x its height; clypeus faintly granulose without dorsal carina and its apical margin upcurved; intertentorial distance as long as tentorioocular distance; width of hypoclypeal depression 0.37x maximum width of face; occipital flange narrow; malar space faintly granulose, hairy, 1.33x basal width of mandible.

Mesosoma (Fig.41): Length of mesosoma 1.45x its height pronotum smooth and shiny; mesoscutum smooth, shiny and hairy along notauli anteriorly and lateral sides of mid lobe posteriorly; notauli distinct and smooth; scutellar sulcus wide with six carinae; scutellum smooth, shiny and hairy; metanotum smooth without median carina; propleuron smooth, shiny, glabrous; mesopleuron smooth, shiny, hairy posteriorly; pleural sulcus narrow, smooth; metapleuron, smooth, shiny and hairy; metapleural flange medium sized; propodeum smooth, shiny, hairy laterally and with median posterior carina; not extending beyond its middle; propodeal spiracle round small and medially situated; fore wing vein 1-SR 0.35x 1-M; ratio of length of fore wing veins: r: 3-SR: SR1 = 7:12.5:42.5; vein 3-SR 1.79x r; 1-SR + M slightly sinuate; SR1

straight; cu-a vertical, interstitial; 2-SR slightly sinuate; 2-SR: 3-SR: r-m = 13:12.5:7; m-u converging to 1-M posteriorly and 0.48x 1-M; hind wing vein SC+R1 straight and 0.90x 1r-m; hind coxa smooth, shiny and hairy; tarsal claws with basal lobe produced into a distinct tooth; length of femur, tibia and basitarsus of hind leg 4.14, 9.0 and 7.0x their width respectively; hind tibial outer and inner spurs 0.29 and 0.36x hind basitarsus.

Metasoma: Length of first tergite 0.53x its apical width, depressed anteriorly, surface reticulate medioposteriorly with a smooth, shiny elevated area surrounded by crenulations, dorsolateral carinae complete; second tergite mediobasally with smooth and parallel sided area, remaining part largely aciculatorugose, anteriorly, laterally and posteriorly smooth and with anterolateral grooves (Fig.41); suture between second and third tergites deep, crenulate; third tergite faintly aciculatorugose with crenulate groove posteriorly (Fig.41); remaining tergites smooth, shiny with crenulate groove posteriorly; length of ovipositor sheath 0.37x forewing; ovipositor with dorsal nodus and three ventral teeth; hypopygium short not extending beyond tip of metasoma.

Colour: Pale yellow except pedicell and other antennal segments, claws of all legs, tip of mandible, suture between second and third tergites and ovipositor sheath brown; eyes dark brown; ocelli shining yellow with outer reddish brown line; veins light brown.

Male: Similar to female except: length 1.41mm; forewing 1.84mm; OOL: diameter of posterior ocellus: POL = 12:8:4; width of face 1.50x its height; r: 3-SR: SR1 = 6:10.5:34.5; length of femur tibia and basitarsus of hind leg 4.50, 6.0 and 7.0x their width.

Host: Emerged from leaf galls of *Cinnamomum malabattrum* (Burm.)

Distribution: India (Kerala).

Etymology: The species name is after the locality of collection.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Manjeri, Marathani (11°7'N 76°7'E), Sheeba, M., 9.xi.2004. Paratypes: 61 Females and 25 Males, data same as holotype except date, 9-18.xi.2004.

Discussion: The new species comes close to *B. heteron* sp. nov. in having propodeum with posterior median carina not extending to middle of propodeum; frons and vertex smooth, shiny with median longitudinal groove and mesoscutum smooth and shiny. However it differs from *B. heteron* sp. nov. in having: 1) Metanotum with anterior median carina (Metanotum without median carina in *B. heteron*.); 2) Hypopygium extending beyond tip of metasoma (Hypopygium not extending beyond tip of metasoma in *B. heteron*.); 3) Fore wing vein 1-SR+M straight (Fore wing vein 1-SR+M slightly sinuate in *B. heteron*.); 4) First tergite reticulate with smooth, shiny raised median area (First tergite rugulose with smooth, shiny raised median area in *B. heteron*.); 5) Second tergite with smooth and parallel sided area mediobasally, remaining part largely aciculatorugose, smooth anteriorly, laterally and posteriorly and with anterolateral grooves (second tergite aciculatorugose with crenulate sided median triangular carina in *B. heteron*.); 6) Third tergite faintly aciculatorugose with crenulate groove posteriorly (Third tergite mostly smooth, laterally faintly reticulate, with curved crenulate grooves anterolaterally and transverse crenulate groove sub posteriorly in *B. heteron*) and 7) Other tergites smooth, shiny with crenulate groove posteriorly (Remaining tergites faintly reticulate in *B. heteron*).

This new species also comes close to *B. punjabensis* Cameron in having head and mesosoma smooth and shiny and frons with midlongitudinal groove. However it differs from *B. punjabensis* in having 1) Face mostly smooth faintly reticulate dorsally (Face closely and distinctly, but not strongly, punctate in *B. punjabensis*); 2) First tergite reticulate, medioposteriorly with a smooth, shiny elevated area surrounded by crenulations (First tergite stoutly, irregularly, longitudinally striolated apicomediaally in *B. punjabensis*); 3) Second tergite mediobasally with

smooth and parallel sided area, largely aciculatorugose, anteriorly, laterally and posteriorly smooth, shiny, with anterolateral grooves (Second tergite coarsely, irregularly, rugosely punctured, basomedially irregularly, longitudinally striolated, lateral depressions striated at bottom, apicomediaally irregularly striated in *B. punjabensis*); 4) Third tergite faintly aciculatorugose, with crenulated groove posteriorly (Third segment closely punctured in *B. punjabensis*); 5) Fourth and fifth tergites smooth, shiny with crenulate groove posteriorly (Fourth and fifth tergites closely punctured with oblique depressions laterally and striated transverse groove apically in *B. punjabensis*) and 6) Sixth tergite smooth, shiny with crenulate groove posteriorly (Sixth tergite punctured without crenulate groove in *B. punjabensis*).

***Bracon koridor* sp. nov.**

(Figs.44-46)

Holotype: Female: Length of body 2.90mm, of antenna 2.49mm, of fore wing 2.87mm and of ovipositor 1.63mm.

Head: Width 1.17 and 1.89x its median length in anterior (Fig.45) and dorsal (Fig.46) views respectively; antenna with 24 segments; third antennal segment as long as fourth: length of third, fourth and penultimate antennal segments 3.50, 3.50 and 2.50x their width, respectively; apical antennal segment acuminate; frons flat, smooth, shiny, hairy laterally and with a median longitudinal groove (Fig.46); OOL: diameter of posterior ocellus: POL = 10:4:8; stemmaticum slightly raised above level of vertex, surrounded by a narrow shallow groove; ocelli in equilateral triangle; vertex smooth, shiny and sparsely hairy; eyes glabrous, not emarginate; length of eye in dorsal view 2.38x temple; temple smooth, shiny; gena sparsely hairy; face flat, smooth, shiny, hairy and with a row of hairs along inner eye margin (Fig.45); width of face 1.88 x its height; clypeus smooth and shiny; intertentorial distance 2.0x tentorioocular distance; width of hypoclypeal

depression 0.37x maximum width of face; occipital flange narrow; malar space shagreen, 0.80x basal width of mandible.

Mesosoma (Fig.44): Length of mesosoma 1.41x its height; pronotum smooth, shiny and with a row of hairs dorsally, smooth and shiny laterally; mesoscutum smooth, shiny and sparsely hairy posteriorly, midlobe of mesoscutum anteriorly with two longitudinal grooves; notauli distinct, smooth; scutellar sulcus wide with 8 carinae; scutellum smooth, shiny and sparsely hairy; metanotum without median carina; propleuron smooth, shiny and sparsely hairy; mesopleuron glabrous except posteriorly; pleural sulcus narrow and smooth; metapleuron smooth, shiny and sparsely hairy; propodeum smooth, shiny, with transverse row of hairs anteriorly, sparse long hairs laterally and with a posterior median longitudinal carina extending beyond middle of propodeum; propodeal spiracle round, small and medially situated; fore wing vein 1-SR 0.55x 1-M and continuous with it; ratio of length of fore wing veins: r:3-SR : SR1 = 7:12:44; 3-SR 1.71x r; 1-SR+M and SR1 straight; cu-a vertical and interstitial; 2-SR slightly sinuate; 2-SR:3-SR: r-m = 10.5:11.5:8; vein m-cu converging to 1-M posteriorly and 0.74x 1-M (Fig.44); hind wing vein SC+R1 straight and 1.38x 1r-m; hind coxa smooth, shiny and hairy; length of femur, tibia and basitarsus of hind leg 4.42, 10.13 and 7.25x their width, respectively; length of hind tibial spurs 0.28 and 0.21x hind basitarsus; hind tarsus with dorsal and ventral rows of setae.

Metasoma: Length of first tergite 0.90x its apical width and with a raised median area posteriorly, surface of median area smooth anteriorly, rugose posteriorly, sides crenulate; glymma shallow, narrow and smooth; dorsolateral carina of first tergite complete; second tergite aciculate rugoseretate, with median triangular carina extending posteriorly, and anterolateral grooves; suture between second and third tergites crenulate (Fig.44); third tergite aciculatorugose; fourth tergite rugoseretate; remaining tergites rugose; third to sixth tergites with crenulate anterior transverse groove (Fig.44); ovipositor with dorsal nodus and four ventral teeth; length of

ovipositor sheath 0.56x forewing and covered with long hairs; hypopygium extending beyond tip of metasoma.

Colour: Brown. Head and pronotum yellow; eyes black surrounded by outer greyish layer; ocelli shining yellow; tegula, legs except claws, lateral side of second tergite, median area of fifth tergite and sixth tergite pale yellow; ovipositor shining orange.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

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

Material examined: Holotype: Female, INDIA: Kerala, Kannur Dt., Kottiyoor, Panniyarmala (10°8'N 78°49'E), T.C. Narendran and Party, 22.viii.2006. Paratypes: 13Females, data same as holotype except locality of one specimen, Kerala, Kannur Dt., Pambarpan (10°9'N 78°49'E); 2Females, Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E), Sheeba, M., 17.viii.2003; Kerala, Malappuram Dt, Nilambur, Kurumbalangode, (11°16'N 76°14'E), Sheeba, M., 12.vii.2004.

Discussion: This new species comes close to *B. punjabensis* Cameron in having mesosoma completely and vertex smooth and shiny. However it differs from *B. punjabensis* in having 1) Face flat, smooth, shiny, hairy and with a row of hairs along inner eye margin (Face closely and distinctly, but not strongly punctured and with long sparse hairs in *B. punjabensis*); 2) Posterior raised median area of first tergite smooth anteriorly, rugose posteriorly (Posterior median area of first tergite stoutly, irregularly longitudinally striolated in *B. punjabensis*); 3) Second tergite aciculate rugoseretate with median triangular carina extending posteriorly, laterally with oval shaped area surrounded by crenulations (Second tergite coarsely, irregularly, rugosely punctured, irregularly longitudinally striolated

mediobasally, lateral depressions striated at bottom and irregularly striated apicomediaally in *B. punjabensis*); 4) Third tergite aciculatorugose (Third tergite closely punctured in *B. punjabensis*); 5) Fourth and fifth tergites reticulate rugose with crenulate anterior transverse groove (Fourth and fifth tergites closely punctured with oblique depressions laterally and transverse groove apically in *B. punjabensis*).

This species also comes close to *B. keralense* sp. nov. in having frons, vertex and mesoscutum smooth and shiny and forewing vein cu-a interstitial. However it differs from *B. keralense* in having 1) Median longitudinal carina of propodeum extending beyond its middle. (Median longitudinal carina of propodeum not extending beyond its middle in *B. keralense*; 2) Second tergite aciculate rugoseretate with median triangular carina extending posteriorly, laterally with oval shaped area surrounded by crenulations (Second tergite mediobasally with smooth and parallel sided area mediobasally, remaining part largely aciculatorugose, anteriorly, laterally, and posteriorly smooth and with anterolateral grooves in *B. keralense*.); 3) Fourth to sixth tergites smooth, shiny with crenulate groove posteriorly (Fourth to sixth tergites reticulaterugose with crenulate groove anteriorly in *B. keralense*); 4) Hypopygium not extending beyond tip of metasoma (Hypopygium extending beyond tip of metasoma in *B. keralense*)

***Bracon lefroyi* (Dudgeon & Gough)**

Rhogas lefroyi Dudgeon & Gough, 1914. *Agric. Jour. of Egypt*. 3: 109.

Microbracon lefroyi (Dudgeon & Gough, 1914); n. comb. by Brues, 1920. *Rept. 3rd Ent. Meet., Pusa*; 1026.

Bracon lefroyi (Dudgeon & Gough, 1914); n. comb. by Khan & Verma 1946. *Indian J. Ent.* 7: 41.

Diagnosis: Female. Length 2.0-3.0mm. Antenna with 25 to 27 segments; mesonotum shagreen; scutellum shining; propodeum distinctly shagreen, but often more nearly smooth basomedially with a median carina at extreme

apex; mesopleura finely shagreen with a narrow polished strip along its posterior margin; metasoma oval or nearly circular; first segment 2.0x its width at apex, posterior corners separated by deep grooves, and with a median triangular field; width of second tergite 4.0x its length, with an obsolete median carina; third tergite a trifle longer than second; remaining tergites shorter; metasoma except corners of first segment finely roughened, without distinct punctures or reticulations, except on second and third segments medially; ovipositor two-third length of metasoma.

Colour: Body honey yellow to black and piceous. Legs paler. Face dorsally, base of antenna, stemmaticum, propodeum, irregular marks on pleura, third to five tergites except narrow lateral border and ovipositor sheaths with black markings.

Male: Length 2mm. Similar to female except antenna 24-25 segmented; head and thorax darker.

Host: *Adisura atkinsoni* Moore, *Alcides affaber* Linnaeus, *Alcides leopardus* Oliver, *Anarsia melanoplecta* Meyrick, *Carpomyia vesuviana* Costa, *Crocidolomia binotatis* Zeller, *Earias fabia* (Stoll), *Earias insulana* Boisd., *Eublemma amabilis* Moor, *Eublemma quadrilineata* Moor, *Gnorimoschema blapsigona* M., *Heliothis obsoleta* Linnaeus, *Pectinophora gossypiella* Saud., *Rabila frontalis* Wlk.

Distribution: India (Kerala, Punjab)

Material examined: 3Females, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 5-11.vi.1987; 1 Female, Kerala, Malappuram Dt., Parappanangadi (11°3'N 75°52'E), Sumodan, 28.viii.1987; 1 Female, Kerala, Kannur Dt., Payyannur (12°6'N 75°12'E), 26.ii.1988; 1 Female, Kerala, Malappuram, Manjeri (11°7'N 76°7'E), Sheeba, M., 17.viii.2003.

Discussion: This species comes close to *B. albolineatus* Cameron in having metasoma oval shaped. However it differs from *B. albolineatus* Cameron in

having 1) Metasoma brownish yellow, extreme apex of second and large dorsal blotches on third and fourth tergites black (Metasoma black, pleural regions of first two tergites yellowish white, apex of third to seventh tergites narrowly yellowish white which is interrupted medially in third and fourth tergites in *B. albolineatus*); 2) Metasoma shagreen (Metasoma smooth in *B. albolineatus*); 3) Length 2.5-3 mm (Length 4.5.5 mm in *B. albolineatus*).

***Bracon molycaon* sp. nov.**

(Figs.47-49)

Holotype: Female: Length of body 2.95mm, of antenna 2.54mm, of fore wing 2.76mm and of ovipositor 2.12mm.

Head: Width 1.28 and 1.76x its median length in anterior (Fig.48) and dorsal (Fig.49) views respectively; antenna with 22 segments; length of third antennal segment 1.42x fourth; length of third, fourth and penultimate antennal segments 3.40, 2.40 and 2.20x their width respectively; apical antennal segment acuminate; frons shagreen, with median longitudinal groove, sparsely hairy laterally (Fig.49); OOL: diameter of posterior ocellus: POL = 9:2:3; stemmaticum surrounded by a shallow groove; vertex shagreen anteriorly, smooth shiny and moderately hairy posteriorly, hairs adpressed mostly not reaching above upper level of posterior ocellus (Fig.49); eyes glabrous, not emarginate; length of eye in dorsal view 5.29x temple; temple smooth, shiny and hairy; face shagreen, hairy, without raised median dorsal area (Fig.48); width of face 2.0x its height; intertentorial distance 1.14x tentorioocular distance; width of hypoclypeal depression 0.36x maximum width of face; occipital flange narrow; malar space smooth and shiny, 1.50x basal width of mandible.

Mesosoma (Fig.47): Length of mesosoma 1.28x its height; pronotum smooth and shiny; mesoscutum smooth and shiny, hairy posteriorly; notauli distinct scutellar sulcus wide with carinae; scutellum smooth, shiny and hairy;

metanotum with anterior median carina propleuron smooth, shiny and hairy; mesopleuron faintly rugose medially and sparsely hairy; metapleuron smooth, shiny, sparsely hairy; pleural sulcus narrow, smooth; propodeum smooth, shiny, sparsely hairy laterally, posteriorly with a short median carina; forewing vein 1-SR 0.29 x 1-M and continuous with it; ratio of length of fore wing veins: r:3-SR : SR1 = 5.5 : 11: 42; vein 3-SR 2.0x r; 1-SR+M and 2-SR straight; cu-a vertical and postfurcal; 2-SR:3-SR:r-m = 11:11:7; m-cu 0.5 x 1-M (Fig.47); hind wing vein SC+R1 1.33x 1-rm; hind coxa smooth and shiny; length of femur, tibia and basitarsus of hind leg 3.93, 6.73 and 5.33x their width respectively; length of hind tibial outer and inner spurs 0.31 and 0.47 x hind basitarsus.

Metasoma (Fig.47): Length of first tergite 0.83 x its apical width; first tergite smooth and shiny with raised median area, sides of median area crenulate and surface faintly rugose; second tergite rugose, submedially foveate and with a median triangular area extending to posterior end of tergite; suture between second and third tergites wide, crenulate; remaining tergites rugose with crenulate posterior transverse groove; hypopygium not extending beyond tip of metasoma; ovipositor sheath 0.75x forewing.

Colour: Yellow. Eyes black; antenna, claws, ovipositor sheath brown; ocelli and mandible, shining red; stigma and veins pale yellow; suture between second and third tergites medially black.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

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

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E) Sheeba, M., 6.i.2004. Paratypes: 4Females, data same as holotype except date of one, 19.iv.2006; 6Females, Kerala, Malappuram Dt., Calicut University Campus (11°7' N 75°5'E), Sumodan, 3.iv.1987; 13.iv.1987; 8.v.1987; 17.v.1988.

Discussion: This new species comes close to *Bracon brevicornis* Wesmael in having mesoscutum smooth, shiny and scutellar sulcus distinctly crenulate. However it differs from *B. brevicornis* in having 1) Face and frons shagreen (Face and frons finely granulate in *B. brevicornis*); 2) Propodeum smooth and shiny (Propodeum superficially granulate in *B. brevicornis*); 3) Second tergite shagreen with median triangular area extending to posterior end of tergite (Second tergite superficially granulate, shiny and without mediobasal area in *B. brevicornis*) and 4) Other tergites rugose (Other tergites superficially granulate in *B. brevicornis*).

***Bracon nexperon* sp. nov.**

(Fig.50)

Holotype: Female: Length of body 2.40mm, of antenna 2.14mm, of fore wing 2.28mm and of ovipositor 2.24mm.

Head: Width 1.15 and 1.60x its median length in anterior and dorsal views respectively; antenna with 21 segments; length of third antennal segment 1.20x fourth segment; length of third, fourth and penultimate antennal segments 3.0, 2.67 and 2.0x their width respectively; apical antennal segment acuminate; frons faintly reticulate, collapsed; OOL: diameter of posterior

ocellus: POL = 9: 4.5: 8; stemmaticum surrounded by a shallow groove; vertex smooth, shiny and sparsely hairy; eyes glabrous, not distinctly emarginate; length of eye in dorsal view 3.13x temple; temple smooth, shiny and narrow; face slightly convex, shagreen, sparsely hairy, with a median dorsal ridge; width of face 2.90x its height; clypeus smooth, shiny without dorsal carina, its apical margin upcurved, thin with a row of long hairs; intertentorial distance 1.70x tentorioocular distance; width of hypoclypeal depression 0.32x maximum width of face; occipital flange narrow; malar space shagreen, 0.31x basal width of mandible.

Mesosoma: Length of mesosoma 1.26x its height; sides of pronotum smooth and shiny; mesoscutal lobes hairy except medially glabrous; notauli distinct; scutellar sulcus narrow with 7 carinae; scutellum smooth, shiny and hairy; metanotum without median carina; propleuron smooth, shiny; mesopleuron smooth, shiny, hairy anterodorsally and posteromedially; pleural sulcus narrow, smooth; metapleuron convex, smooth, shiny and hairy; metapleural flange lamelliform and obtuse, medium sized; propodeum smooth, shiny, with a few hairs anteriorly and median posterior longitudinal carina; propodeal spiracle round, small and medially situated; fore wing vein 1-SR continuous with 1-M; ratio of length of fore wing veins: r: 3-SR: SR1 = 6:15:43; vein 3-SR 2.50x r; veins 1-SR+M, 2-SR and SR1 straight; cu-a vertical and interstitial; 2-SR: 3-SR : r-m = 10: 15: 8; m-cu converging to 1-M posteriorly and 0.55x 1M; hind wing vein SC+R1 straight and 1.53x 1r-m; hind coxa punctate; length of femur, tibia and basitarsus of hind leg 4.90, 6.80, and 6.0x their width respectively; length of hind tibial spurs 0.22 and 0.17x hind basitarsus.

Metasoma: Length of first tergite as long as its apical width, surface smooth with laterally crenulate raised median area posteriorly, glymma shallow wide and crenulate; dorsolateral carinae of first tergite complete; second tergite aciculate rugoseretate with small anterior and posterior smooth areas, and a triangular carina running to tip of tergite surrounded by crenulate

grooves; suture between second and third tergites crenulate; remaining tergites rugose with shallow crenulate posterior grooves; ovipositor with dorsal nodus and four ventral teeth; length of ovipositor sheath 1.06x fore wing and covered with long hairs; hypopygium not extending beyond tip of metasoma.

Colour: Pale yellow except following: eyes black; antenna (except scape and pedicel yellow), ovipositor sheath, posterior tip of mandible, claws and dorsolateral carina of first tergite brown; wing veins and distal half of stigma pale brown; ocelli and ovipositor shining yellow; head, scape and pedicel yellow.

Male: Similar to female except length 1.83mm .

Host: Emerged from *Syzygium cumini* (L.) leaf galls

Biology: Unknown.

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

Material examined: Holotype: Female, INDIA: Kerala, Thiruvananthapuram Dt., Near Art Gallery (8°29N 76°59E), Sheeba, M., 20.i.2006. Paratypes: 1Male, data same as that of holotype; 2Females & 1Male, Kerala, Thiruvananthapuram Dt., Near Art Gallery (8°29N 76°59E), Santhosh, 9.xi.2007.

Discussion: This new species comes close to *Bracon punjabensis* Cameron in having mesosoma and head smooth and shiny. However it differs from *B. punjabensis* in having 1) Face shagreen (Face closely and distinctly but not strongly punctured in *B. punjabensis*); 2) Second tergite aciculate rugoseretulate with anterior and posterior smooth areas and a triangular carina running to tip of tergite surrounded by crenulate groove (Second tergite coarsely, irregularly, rugosely punctured, irregularly longitudinally striolated mediobasally, lateral depressions striated at bottom and irregularly striated apicomediaally in *B. punjabensis*); 3) All other tergites weakly rugose with shallow crenulate posterior groove (Other tergites closely punctured,

fourth and fifth with oblique depressions laterally and transverse groove at apices).

This species also comes close to *B. dachaon* sp. nov. in having frons faintly reticulate, vertex and temples smooth and shiny. However it differs from *B. dachaon* in having: 1) Face shagreen (Face smooth and shiny *B. dachaon*); 2) Mesoscutal lobes hairy except medially glabrous (Mesoscutum hairy except mid lobe medioanteriorly glabrous in *B. dachaon*); 3) Hypopygium not extending beyond tip of metasoma (Hypopygium slightly extending beyond tip of metasoma in *B. dachaon*) and 4) Ovipositor 1.06 x forewing (Ovipositor 0.46 x forewing in *B. dachaon*)S

***Bracon procnis* sp. nov.**

(Fig.51-53)

Holotype: Female: Length of body 2.49mm, of antenna 2.20mm, of fore wing 2.30mm and of ovipositor 1.0mm.

Head: Width 1.22 and 1.82x its median length in anterior (Fig.52) and dorsal (Fig.53) views respectively; antenna with 20 segments; length of third antennal segment 1.20x fourth segment; length of third, fourth and penultimate antennal segments 3.0, 2.50 and 2.80x their width respectively; apical segment acuminate; frons flat, shagreen without median groove (Fig.53); OOL: diameter of posterior ocellus: POL = 7:4:5; stemmaticum slightly raised above level of vertex, granulose, surrounded by a shallow groove; vertex shagreen anteriorly, faintly reticulate posteriorly, sparsely hairy; eyes glabrous, emarginated (Fig.53); length of eye in dorsal view 2.50x temple; temple faintly reticulate and sparsely hairy; face flat, shagreen sparsely hairy with median raised area dorsally (Fig.52); width of face 1.37x its height; intertentorial distance 3.0x tentorioocular distance; width of hypoclypeal depression 0.54x maximum width of face; occipital flange narrow; malar space shagreen 0.40x basal width of mandible.

Mesosoma: Length of mesosoma 1.37x its height; pronotum faintly reticulate laterally; mesoscutum shagreen hairy along notauli and posteriorly; notauli distinct, smooth; scutellar sulcus narrow with 8 carinae; scutellum smooth and hairy; metanotum smooth with anterior median carina; propleuron faintly reticulate and hairy; mesopleuron, metapleuron and propodeum shagreen (Fig.51); mesopleuron hairy mediolongitudinally; pleural sulcus narrow, smooth; metapleuron moderately hairy; propodeum sparsely hairy with a posterior median carina; propodeal spiracle oval, small and medially situated; fore wing vein 1-SR 0.31x 1-M and continuous with it; ratio of length of fore wing veins: r:3-SR:SR1 = 10:23:38; vein 3-SR 2.30x r; veins 1-SR+M, SR1 and 2-SR straight; cu-a slightly postfurcal and vertical; 2-SR: 3-SR: r-m = 13: 23: 7; m-cu converging to 1-M posteriorly and 0.54x 1-M; hind wing vein SC+R1 straight, 2.33x length of 1-M (Fig.51); hind coxa shagreen; length of femur, tibia, and basitarsus of hind leg 4.77, 7.0 and 5.17x their width respectively; length of hind tibial outer and inner spurs 0.37 and 0.45x hind basitarsus.

Metasoma: Length of first tergite as long as its apical width, surface granulate with a raised median area posteriorly, surface of median area faintly granulate glymma shallow, narrow and smooth; dorsolateral carina of first tergite complete; second to fourth tergites minutely reticulate (Fig.51); suture between second and third tergites wide and crenulate; fifth tergite faintly reticulate basally, shagreen apically; sixth tergite shagreen; fourth to sixth tergites with faint crenulate anterior transverse groove; last tergite smooth and shiny; ovipositor with dorsal nodus and with two ventral teeth; length of ovipositor sheath 0.47x forewing and covered with long hairs; hypopygium extending beyond tip of metasoma and apically acute.

Colour: Yellow. Eye black with outer margin pale yellow; ocelli shining yellow; antenna, stemmaticum, tip of mandible, third and fourth tergites medially and ovipositor sheath brown; stigma and veins pale brown; ovipositor orange.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

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

Material examined: Holotype: Female, INDIA: Kerala, Alappuzha Dt., Memana (9°54'N 76°19'E), Sumodan, 26.ii.1989. Paratypes: 11 Females, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 8.ii.1989; Kerala, Wayanad Dt., Puzhamudi (11°47'E 75°47'N), Sumodan, 23.ii.1988; Kerala, Kannur Dt., Payyannur (12°6'N 75°12'E), Sumodan, 26.ii.1988; Kerala, Wayanad Dt., Mananthavady (11°27'N 75°47'E), Sumodan, 29.ii.1988; Kerala, Thiruvananthapuram Dist., Neyyar (8°37'N 77°7'E), 29.ii.1989; Kerala, Palakkad Dt., Agali (11° 9' N 76° 59' E), Sumodan, 12.xii.1989; Kerala, Kannur Dt. Kannavam forest (11°50'N 75°40'E), Sumodan, 31.x.1988; Kerala, Palakkad Dt., Walayar (10°51'N 76°51'E), Sumodan, 8.i.1989.

Discussion: This new species comes close to *B. lefroyi* in having mesoscutum and propodeum shagreen. However it differs from *B. lefroyi* in having 1) Propodeum with a posterior median carina (Propodeum without median carina except at extreme apex, areolate in *B. lefroyi*); 2) Apical width of first tergite 1.50x its basal width (Apical width of first tergite 2.0x its basal width in *B. lefroyi*); 3) Width of second segment 3.33x its length (Width of second tergite 4.0x its length in *B. lefroyi*); 4) Third tergite as long as second (Third tergite a little longer than second in *B. lefroyi*).

This new species comes close to *B. molycaon* sp. nov. in having frons shagreen, notauli distinct, scutellum smooth, metanotum with anterior median carina and propodeum with a posterior median carina. However it differs from *B. molycaon* in having 1) Frons without median groove (Frons with median longitudinal groove in *B. molycaon*); 2) Vertex and temple faintly reticulate (Vertex and temple smooth and shiny in *B. molycaon*); 3)

Mesoscutum shagreen (Mesoscutum smooth and shiny in *B. molycaon*); 4) Scutellar sulcus narrow (Scutellar sulcus wide in *B. molycaon*); 5) Propleuron shagreen (Propleuron smooth shiny and hairy in *B. molycaon*); 6) Mesopleuron shagreen (Mesopleuron faintly rugose medially and sparsely hairy in *B. molycaon*); 7) Propodeum shagreen (Propodeum smooth and shiny in *B. molycaon*); 8) Hind coxa shagreen (Hind coxa smooth and shiny in *B. molycaon*); 9) Second to fourth tergites minutely reticulate; fifth and sixth tergites rugose, fourth to sixth tergites with faint, crenulate anterior transverse groove (Second tergite shagreen with median triangular area extending to posterior end of tergite, remaining tergites rugose in *B. molycaon*).

***Bracon stom* sp. nov.**

(Fig.54-56)

Holotype: Female: Length of body 3.04mm, of antenna 3.21mm, of fore wing 2.69mm and of ovipositor 0.94mm.

Head: Width 1.33 and 2.20x its median length in anterior (Fig.55) and dorsal (Fig.56) views respectively; antenna with 28 segments; length of third antennal segment 1.31x fourth; length of third, fourth and penultimate antennal segments 3.40, 2.60 and 2.50x their width respectively; apical antennal segment acuminate; frons shagreen, hairy laterally and with median longitudinal groove (Fig.56); OOL: diameter of posterior ocellus: POL = 8.5:3:3.5; stemmaticum surrounded by a shallow groove; eyes glabrous, slightly emarginate; vertex covered with dense short hairs, shagreen anteriorly and behind ocelli, smooth and shiny laterally; length of eye in dorsal view 3.10x temple, temple smooth, shiny and hairy; face hairy, shagreen and with median dorsal ridge (Fig.55); width of face 2.17x its height; intertentorial distance 1.64x tentorioocular distance; width of hypoclypeal depression 0.46x maximum width of face; occipital flange narrow; malar space shagreen, 1.83 x basal width of mandible.

Mesosoma: Length of mesosoma 1.32x its height; pronotum smooth, shiny and hairy; mesoscutum except anteriorly a small area of mid lobe glabrous; scutellum densely hairy and sparsely punctate; notauli distinct, smooth; scutellar sulcus wide with 11 carinae; metanotum with anterior median carina; propleuron smooth, shiny and hairy; mesopleuron smooth and shiny except medially a small glabrous area (Fig.54); propodeum smooth, shiny, sparsely hairy medially, densely hairy anterolaterally and with a median longitudinal carina and transverse carinae on either side of it; fore wing vein 1-SR 0.24x 1-M and continuous with it; ratio of length of fore wing veins: r: 3-SR:SR1 = 9:14.5:30; vein 3-SR 1.61x r; 1-SR+M and SR straight; cu-a vertical, antifurcal; 2-SR: 3-SR: r-m = 14:14.5:9; m-cu 0.60x 1-M; hind wing vein SC+R1 1.80x 1r-m (Fig.54); hind coxa smooth, shiny and hairy; tarsal

claws with pointed basal lobe length of femur, tibia and basitarsus of hind leg 4.29, 10.86 and 2.0x their width respectively; length of hind tibial outer and inner spurs 0.43 and 0.27x hind basitarsus.

Metasoma (Fig.54): Length of first tergite 0.83 x its apical width; first tergite rugoseretulate with anteriorly smooth median posterior area; second tergite aciculate rugoseretulate; suture between second and third tergites narrow, crenulate; third tergite aciculatorugose; fourth to sixth tergites with an anterior smooth area and transverse groove basally, aciculatorugose apically; sixth tergite shagreen; ovipositor with dorsal nodus and two ventral teeth; ovipositor sheath 0.35x fore wing; hypopygium not extending beyond tip of metasoma.

Colour: Reddish yellow with black markings on metasoma. Head mesosoma (except black propodeum), legs (except brown claws), lateral sides of second to fifth tergites and sixth tergite completely reddish yellow; tip of mandible red; eyes, first tergite, second tergite medially black.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

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

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E) Sheeba, M., 10.iv.2005. Paratypes: 1Female. Data same as that of holotype; 20Females, Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E) Sheeba, M., 5.ii.2006; 4Females, Kerala, Wayand Dt., Kalpetta, Pookode (12°37'N 80°14'E), T.C. Narendran & Party, 7-8.ii.2003; 2Females, Kerala, Idukki Dt., Cheruthoni (9°51'N 76°58'E), T.C. Narendran & Party, 10.i.2004; 4Females, Kerala, Kozhikode Dt., Nanminda (11°26'N 75°50'E), Girish Kumar, P. 10.i.2004; 1Female, Kerala, Kollam Dt., Neendakara (8°56'N 76°32'E), Sumodan, 22.ii.1989; 1Female,

Kerala, Thiruvananthapuram Dt., Attingal (8°41'N 76°50'E), Sumodan, 23.ii.1989; 1Female, Kerala, Palakkad Dt., Walayar (10°51'N 76°51'E), Sumodan, 27.ii.1989; 8Females, Kerala, Wayanad Dt., Mananthavady (11°27'N 75°47'E), Sumodan, 29.ii.1988; 1Female, Kerala, Malappuram Dt., Karimpuzha (10°46'N 76°22'E), Sumodan, 23.iv.1989.

Discussion: This species comes close to *B. pongamiaensis* Ramakrishna Ayyar in having fore wing vein 3-SR longer than r and notauli distinct. However it differs from *B. pongamiaensis* in having 1) Fore wing vein 3-SR x vein (Fore wing vein 3-SR a little more than 3 x r in *B. pongamiaensis*); 2) First and second tergites rugose-reticulate (First and Second tergite punctate, and punctures almost form irregular longitudinal striae in *B. pongamiaensis*); 3) Third to fifth tergites aciculatorugose, fourth to sixth tergites with an anterior smooth area and transverse groove basally (Third and fourth punctate; punctures form irregular longitudinal striae, fifth without such longitudinal striae) in *B. pongamiaensis*; 4) Sixth tergite shagreen (Sixth tergite coarsely punctate in *B. pongamiaensis*) and 5) Frons shagreen (Frons very closely and finely punctured).

GENUS *CASSIDIBRACON* QUICKE

Cassidibracon Quicke, 1987a. *J. Nat. Hist.* 21(1): 142-144. Type species:
Cassidibracon castus Quicke.

Diagnosis: Head transverse (Fig.59); frons with a midlongitudinal sulcus posteriorly extending to median ocellus; hypoclypeal depression bordered by a distinct carina; clypeus not separated from face by a distinct carina; malar groove distinct; antenna long, terminal flagellomeres acuminate, median flagellomeres longer than wide, longitudinally striate, densely hairy; mesoscutum and scutellum densely hairy, mesoscutum shiny; notauli distinct; scutellar sulcus wide and crenulate; metanotum more or less smooth; propodeum smooth with midlongitudinal carina; mesopleuron and metapleuron shiny, hairy; pleural sulcus distinct and weakly crenulate; second submarginal cell of fore wing narrower apically than basally; 1-SR+M weakly curved; SR1 distinct; cu-a interstitial; hind wing vein 1r-m shorter than SC+R1; vein 2-1A absent; metasoma short, wide, hairy, rugosely sculptured; second and third metasomal tergites combined, occupying approximately three quarters of dorsal length of metasoma; second tergite with a pair of sublateral grooves.

Biology: Unknown.

Distribution: West Africa, India.

Discussion: This genus comes close to *Bracon* Fabricius in having eyes not hairy, ovipositor apically with a distinct preapical dorsal nodus and a well developed ventral serration. However it differs from *Bracon* in having 1) Angle between fore wing veins 1-SR and C+SC+R approximately 75° (Angle between fore wing veins 1-SR and C+SC+R 75°-90° in *Bracon*); 2) Propodeum always with a complete or posterior median longitudinal carina (Propodeal carina absent rarely present in *Bracon*) and 3) Mesoscutum densely and evenly hairy (Mesoscutum partly glabrous in *Bracon*).

Remarks: The genus is represented by three species from Oriental region. All are from India, Kerala (Narendran *et al.*, 1994).

KEY TO ORIENTAL SPECIES OF THE GENUS *CASSIDIBRACON*
QUICKE

(Modified from Narendran *et al.* 1994)

1. Propodeum with complete midlongitudinal carina; body yellowish brown2
- = Propodeum with incomplete midlongitudinal carina; body brown or blackish brown 3
2. Fore wing vein 3-SR 2.38x vein r; face shiny, finely coriaceous, sparsely hairy; antenna with 29-30 segments, length about 4.60 – 4.80mm.....
..... *C. castus* Quicke
- = Fore wing vein 3-SR 1.71x r (Fig.65); face smooth, densely hairy; antenna with 23 segments; length about 2.76mm.....
.....
.....*C. sumodani* Narendran and Madhavikutty
3. Midlongitudinal carina of propodeum not reaching half of it; ovipositor nearly as long as metasoma; scutellum rugulose; fore wing vein 3-SR 2.20x vein r (Fig.60).....*C. indicus* Narendran & Rema
- = Midlongitudinal carina of propodeum reaching beyond half of it; ovipositor shorter than metasoma; scutellum not rugulose; fore wing vein 3-SR less than 2.20x vein r.....4
4. Fore wing vein 3-SR 1.20x vein r (Fig.61); metasoma rugulose, densely hairy; mesopleuron smooth.....*C. malabaricus* Narendran
- = Fore wing vein 3-SR more than 1.30x vein r; metasoma not rugulose; mesopleuron sculptured.....5

5. Scutellum punctate; fore wing vein 3-SR 1.65x vein r; 2-SR straight (Fig.57); hypopygium not extending beyond apex of metasoma; propodeum smooth, shiny with a transverse row of hairs anteriorly, sparsely hairy laterally; intertentorial distance 1.50x tentorioocular distance; antenna 20 segmented.....*C. debatus* sp. nov.
- = Scutellum smooth and shiny; fore wing vein 3-SR 2.18x vein r (Fig.62); 2-SR slightly sinuate; hypopygium extending beyond tip of metasoma; propodeum smooth, shiny, laterally rugose and with transverse carinae on either side of median carina; intertentorial distance as long as tentorioocular distance; antenna 23 segmented.....

*C. rebatus* sp. nov.

Cassidibracon debatus sp. nov

(Fig.57-59)

Holotype: Female: Length of body 2.27mm, of antenna 2.21mm, of fore wing 2.18mm and of ovipositor 0.34mm.

Head: Width 1.29 and 1.90x its median length in anterior (Fig.58) and dorsal (Fig.59) view respectively; antenna with 20 segments; length of third antennal segments 1.07x fourth; length of third, fourth and penultimate antennal segments 2.57, 2.50 and 3.50x their width respectively; apical antennal segment acuminate; frons smooth, shiny, hairy with a median longitudinal groove (Fig.59); OOL: diameter of posterior ocellus: POL = 9:4:6.5; stemmaticum, hairy surrounded by a narrow shallow groove; vertex smooth, shiny and hairy (Fig.59); eyes glabrous; not emarginate; length of eye in dorsal view 2.13x temple; temple smooth, shiny, hairy; face flat, smooth, shiny, hairy, without raised median ridge dorsally (Fig.58); width of face 2.0x its height, clypeus smooth and shiny; intertentorial distance 1.50x tentorioocular distance; width of hypoclypeal depression 0.43x maximum

width of face; occipital flange narrow; malar space smooth, shiny, hairy and with malar groove, 2.13x basal width of mandible.

Mesosoma: Length of mesosoma 1.39x its height; pronotum smooth and shiny; mesoscutum thickly hairy, with sparse punctures at base of hairs; notauli distinct, smooth; scutellar sulcus wide with 9 carinae; scutellum punctate, hairy; metanotum with short anterior median carina; propleuron smooth, shiny and hairy; mesopleuron punctate, hairy except medially glabrous (Fig.57); pleural sulcus narrow, smooth; metapleuron punctate and hairy; metapleural flange medium sized; metanotum with anterior median carina; propodeum smooth, shiny with transverse row of hairs anteriorly, sparsely hairy laterally and with median posterior carina; propodeal spiracle oval shaped, small and medially located fore wing vein 1-SR 0.25x 1-M continuous with it; ratio of length of fore wing veins: r: 3-SR: SRI= 8.5 : 14: 39.5; vein 3-SR 1.65x r; 1-SR+M straight; cu-a vertical and slightly postfurcal; 2-SR straight; 2-SR: 3-SR: r-m = 12:14:9; m-cu converging to 1-M posteriorly 0.50x 1-M; hind wing vein SC+RI straight, 2.44x 1r-m (Fig.57); hind coxa smooth, shiny and hairy; length of femur, tibia and basitarsus of hind leg 3.86, 7.27 and 6.40x their width; respectively; length of hind tibial outer and inner spurs 0.22 and 0.31x hind basitarsus.

Metasoma (Fig.57): Length of first tergite 0.86x its apical width, smooth, shiny with a raised median area, smooth anteriorly, rugose posteriorly and sides crenulate; second to fifth tergites aciculate rugose, second tergite with a median triangular area, extending beyond middle of tergite as a carina; suture between second and third tergites crenulate; fifth faintly sculptured; remaining tergites not visible; ovipositor sheath 8.19x fore wing; ovipositor with a dorsal nodus and three ventral teeth; hypopygium not extending beyond tip of metasoma.

Colour: Brown except following parts: face, gena, temple, vertex anteriorly, anterolateral areas of second and third tergites brownish yellow; eye black; tip

of mandible reddish brown; legs (except claws brown) pale yellow; ocelli shining yellow.

Male: Similar to female except length 2.28mm

Host: Unknown

Biology: Unknown

Distribution: India (Kerala)

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

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt. Nilambur, Kurumbalangode (11°14'N 75°17'E), Sheeba, M., 12.vii.2004. Paratypes: 2Females, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sheeba, M., 17.xi.2005; 23.xi.2005; 2Females, Kerala, Malappuram Dt., Manjeri (11°7'N 76°7'E), Sheeba, M., 27.xi.2005; 1Female, Kerala, Kozhikode Dt., Nanminda (11°26'N 75°50'E), 4.vii.2004.

Discussion: This new species comes close to *C. malabaricus* Narendran in having midlongitudinal carina of propodeum reaching beyond its half; ovipositor shorter than metasoma and vertex smooth, shiny and hairy. However it differs from *C. malabaricus* in having 1) Mesoscutum and scutellum sparsely punctate (Mesoscutum and scutellum smooth in *C. malabaricus*); 2) Mesopleuron punctate, hairy except medially glabrous (Mesopleuron smooth, shiny and hairy in *C. malabaricus*); 3) Ratio of length of fore wing veins: r: 3-SR: SR1 = 8.5: 14: 39.5 (r: 3-SR: SR1= 5: 6: 20 in *C. malabaricus*); 4) First tergite smooth, shiny with a raised median area smooth anteriorly, rugose posteriorly and sides crenulate (First tergite rugulose with a median oval shaped smooth area bordered by carina in *C. malabaricus*) and 5) Second to fifth tergites longitudinally reticulate (All tergites rugulose in *C. malabaricus*).

This new species also comes close to *C. rebatus* sp. nov. in having frons, vertex and face smooth, shiny, hairy with a median longitudinal groove.

However it can be separated from *C. rebatus* in having 1) Scutellum punctate (Scutellum smooth and shiny in *C. rebatus*); 2) Fore wing vein 3-SR 1.65x vein r (Fore wing vein 3-SR 2.18x vein r hypopygium extending beyond tip of metasoma); 3) Hypopygium not extending beyond apex of metasoma (Hypopygium extending beyond tip of metasoma in *C. rebatus*); 4) Propodeum smooth, shiny with a transverse row of hairs anteriorly, sparsely hairy laterally (Propodeum smooth, shiny, laterally rugose and with transverse carinae on either side of median carina in *C. rebatus*) and 5) Intertentorial distance 1.50x tentorioocular distance (Intertentorial distance as long as tentorioocular distance in *C. rebatus*).

***Cassidibracon indicus* Narendran & Rema**

(Fig.60)

Cassidibracon indicus Narendran & Rema, 1994. *Biove.* 5(2): 128. Holotype. Female. India (TMA).

Diagnosis: Female: Length 2.81mm. Head transverse; face smooth, densely hairy; antenna with 24 segments; eye length: malar space = 12: 2; temple and vertex smooth and hairy; OOL: POL = 13: 4; mesoscutum, scutellum, mesopleuron and metapleuron rugulose and densely hairy; notauli distinct; longitudinal carina of propodeum not reaching half of it; ratio of length of fore wing veins: r: 3-SR: SRI = 5: 11: 25; metasoma rugulose and hairy; first tergite smooth with a basal longitudinal groove and an inverted U-shaped area; second tergite without longitudinal carina; fifth tergite visible in dorsal view; ovipositor 1.08mm, long as long as metasoma.

Colour: Blackish brown except following: mandible yellow basally, brown apically; clypeus brown; face yellow except black line running from base of antenna up to clypeus; median ocellus and stemmaticum black; lateral ocelli yellowish brown; temple and vertex blackish brown; mesonotum black (except line of notauli yellowish brown); scutellum, metanotum, propodeum

and metasomal tergites black; legs yellow except tarsi yellowish brown; ovipositor yellowish brown; ovipositor sheath black.

Male: Similar to female except length 2.88mm.

Biology: Unknown.

Distribution: India (Kerala).

Type Locality: India (Kerala: Calicut University Campus).

Material examined: Paratypes.

Discussion: *Cassidibracon indicus* Narendran and Rema comes close to *Cassidibracon malabaricus* Narendran in having propodeum with incomplete midlongitudinal carina. However it differs from *C. malabaricus* in having 1) Midlongitudinal carina of propodeum shorter than half of it (Midlongitudinal carina of propodeum longer than half of it in *C. malabaricus*); 2) Second tergite without a midlongitudinal carina (Second tergite with a midlongitudinal carina in *C. malabaricus*) and 3) Ovipositor long as long as metasoma in *A. indicus* (Ovipositor short about one third length of gaster in *C. malabaricus*).

Cassidibracon malabaricus Narendran

(Fig.61)

Cassidibracon malabaricus Narendran, 1994. *Biove.* 5(2): 127. Holotype. Female. INDIA: Kerala (TMA).

Diagnosis: Female: Length 2.85mm. Head transverse; vertex and face smooth and hairy; antenna 21 segmented; median antennal segments approximately 2.50x longer than wide; OOL : POL = 10 : 3; eye length : malar space = 10 : 6; mesonotum, scutellum and metanotum densely hairy, almost smooth; scutellar sulcus wide and crenulate; propodeum smooth, sparsely hairy with a midlongitudinal carina fades out basally; mesopleuron and metapleuron smooth, shiny and hairy; ratio of length of fore wing veins: r : 3-SR : SR1= 5 : 6 : 20; metasoma rugulose and hairy; first tergite with a basal longitudinal groove and a median oval shaped smooth area bordered by carina; second tergite with a midlongitudinal carina and sublateral posteriorly

converging short grooves; fifth tergite not visible in dorsal view; ovipositor short and about one third length of metasoma.

Colour: Face honey yellow; eyes grey; antenna brown; ocelli gleaming yellow; stemmaticum dark brown; temple, mesopleuron and metapleuron yellowish brown; vertex, mesoscutum, scutellum, metanotum and propodeum dark brown; tegula yellowish brown; wings hyaline; stigma and veins dark brown; legs pale yellow (except apical tarsi dark brown); metasomal tergites blackish brown with yellowish tinge; ovipositor pale yellow; ovipositor sheath black.

Male: Similar to female except having the following features: length 3.12mm; fifth and sixth tergites visible dorsally; propodeal carina stronger than that of female.

Biology: Unknown.

Distribution: India (Kerala).

Type locality: India (Kerala: Aralam farm)

Material examined: Paratypes.

Discussion: *Cassidibracon malabaricus* Narendran is similar to *Cassidibracon indicus* Narendran and Rema in having propodeum with incomplete midlongitudinal carina and brown to blackish brown body. However it differs from *C. indicus* in having 1) Midlongitudinal carina of propodeum longer than half of it (Midlongitudinal carina of propodeum shorter than half of it in *C. indicus*); 2) Second tergite with a midlongitudinal carina (Second tergite without a midlongitudinal carina in *C. indicus*) and 3) Ovipositor short about one third length of metasoma (Ovipositor long nearly as long as metasoma in *C. indicus*).

***Cassidibracon rebatus* sp. nov**

(Figs.62-64)

Holotype: Female: Length of body 2.38mm, of antenna 2.38mm, of fore wing 2.10mm and of ovipositor 0.35mm.

Head: Width 1.24 and 1.92x its median length in anterior (Fig.64) and dorsal (Fig.63) views respectively; antenna with 23 segments; length of third antennal segment 1.29x fourth; length of third, fourth and penultimate antennal segments 4.50, 3.50 and 3.0x their width, respectively; apical antennal segment acuminate; frons smooth, shiny and densely hairy with median longitudinal groove (Fig.63); OOL: diameter of posterior ocellus: POL = 6: 3: 5, stemmaticum round and surrounded by shallow groove; vertex smooth, shiny and densely hairy; eyes glabrous not emarginate; length of eye in dorsal view 4.75x temple; temple smooth, shiny and densely hairy; face smooth shiny, hairy with dorsal median longitudinal ridge (Fig.64); width of face 1.73x its height; intertentorial distance as long as tentorioocular distance; width of hypoclypeal depression 0.53x maximum width of face; occipital flange narrow; malar space with malar groove 1.20x basal width of mandible.

Mesosoma: Length of mesosoma 1.39x its height; pronotum shiny with faint crenulations laterally; mesoscutum rugose and densely hairy; notauli distinct, not very deep; scutellar sulcus wide with 6 carinae; scutellum smooth, shiny and hairy; metanotum with complete midlongitudinal carina; propleuron smooth, shiny, hairy; mesopleuron weakly rugose anteriorly and hairy except dorsally and medially (Fig.62); pleural sulcus wide and crenulate; metapleuron sparsely rugose, hairy; propodeum smooth, shiny and rugose laterally, with a posterior midlongitudinal carina extending beyond its middle and transverse carinae on either side of the median carina; fore wing vein 1-SR 0.31x 1-M and continuous with it; ratio of length of fore wing veins: r: 3-SR: SRI = 5.5: 12: 39; 3-SR 2.18x r; 1-SR+M straight; cu-a vertical, slightly postfurcal; 2-SR slightly sinuate; 2-SR: 3-SR: r-m=11:12:8; m-cu 0.59x1-M; hind wing vein SC+R1 2.3.0x 1r-m (Fig.62); hind coxa smooth and shiny;

length of femur, tibia and basitarsus of hind leg 3.47, 7.40 and 5.67x their width, respectively; length of hind tibial outer and inner spurs 0.24 and 0.35x hind basitarsus.

Metasoma (Fig.62): Length of first tergite 0.64x its apical width; first tergite rugose with posterior raised median area, sides of median area crenulate; remaining tergites reticulate with setiferous punctae in between; second tergite with anterolateral crenulate grooves; ovipositor with dorsal nodus and three ventral teeth; ovipositor sheath 0.18x fore wing covered with long hairs; hypopygium extending beyond apex of metasoma and acute apically.

Colour: Head yellowish brown; eyes grey; antenna, tip of mandible, claws ovipositor sheath, stinga and veins brown; pronotum, mesoscutum (except lobes medially black) mesopleuron, metapleuron and propodeum red; mesosternum, stematicum, second tergite apicomediaally, third and fourth tergites medially black; scutellum, legs (except pale brown distal half of hind tibia and hind tarsus), first tergite, second tergite anteriorly, third and fourth tergite laterally honey yellow; fifth tergite yellowish with slight brown tinge medially.

Male: Similar to female except length 2.04mm.

Host: Unknown

Biology: Unknown

Distribution: India, Kerala

Etymology: Arbitrary combination of letters.

Material examined: Holotype: Female, INDIA: Kerala, Kasaragod Dt., Chowky (12°31'N 74°59'E), T.C. Narendran and party, 22.i.2003. Paratypes: 2Females, data same as that of holotype; 1Female, Kerala, Kasaragod, Kudlu (12°30'N 75°0'E), T.C. Narendran & Party, 22.i.2003; 1Female, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sudheer, K., 12.vii.2001; Nilambur, Nedumkayam (11°16'N 76°14'E), Sheeba, M., 20.ix.2004.

Discussion: This new species comes close to *C. malabaricus* Narendran in having face and vertex smooth and hairy; ovipositor shorter than metasoma and midlongitudinal carina of propodeum reaching beyond half of propodeum. However it differs from *C. malabaricus* Narendran in having 1) Mesoscutum rugose (Mesoscutum smooth in *C. malabaricus*); 2) Propodeum smooth and shiny, rugose laterally (Propodeum smooth in *C. malabaricus*); 3) Mesopleuron closely punctate and hairy except dorsally and medially (Mesopleuron smooth, shiny and hairy in *C. malabaricus*); 4) Ratio of fore wing veins: r: 3-SR: SR1= 5.50: 12: 39 (r: 3-SR: SR1= 5: 6: 20 in *C. malabaricus*); 5) First tergite rugose, remaining tergites reticulaterugose (Metasoma rugulose in *C. malabaricus*) and 6) Second tergite with anterolateral crenulate grooves (Second tergite with a midlongitudinal carina and sublateral posteriorly converging short grooves in *C. malabaricus*).

This new species also comes close to *C. debatus* sp. nov. in having frons, vertex and face smooth, shiny, hairy with a median longitudinal groove. However it can be separated from *C. debatus* in having 1) Scutellum smooth and shiny (Scutellum punctate in *C. debatus*); 2) Fore wing vein 3-SR 2.18x vein r hypopygium extending beyond tip of metasoma (Fore wing vein 3-SR 1.65x vein r in *C. debatus*); 3) Hypopygium extending beyond tip of metasoma (Hypopygium not extending beyond apex of metasoma in *C. debatus*); 4) Propodeum smooth, shiny, laterally rugose and with transverse carinae on either side of median carina (Propodeum smooth, shiny with transverse row of hairs anteriorly, sparsely hairy laterally in *C. debatus*) and 5) Intertentorial distance as long as tentorioocular distance (Intertentorial distance 1.50x tentorioocular distance in *C. debatus*).

***Cassidibracon sumodani* Narendran & Madhavikutty**

(Fig.65)

Cassidibracon sumodani Narendran and Madhavikutty, 1994. *Bioved.* 5(2): 132. Holotype. Female. INDIA (TMA).

Diagnosis: Female: Length 2.75 mm. Head transverse; vertex smooth, hairy; antenna 23 segmented; face smooth, densely hairy; eye length: malar space = 18:8; mesoscutum densely and evenly hairy; notauli distinct; scutellar sulcus wide and crenulate; scutellum shiny, densely hairy; metanotum with midlongitudinal carina and lateral carinae arising from it; mesopleuron smooth, shiny and hairy; r: 3-SR: SR1 = 7:12:39; metasoma rugose; second tergite without carina; ovipositor 0.62 mm about half of metasoma.

Colour: Body yellowish brown except following: Face, scutellum, tegula, coxa, trochanter and femur of hind leg, fore and mid leg (except distal tarsi brown) yellow; antenna, metanotum, propodeum, mesopleuron, wing veins and stigma brown; eyes, stemmaticum and ovipositor sheath black; ocelli gleaming white; mesonotum black with yellow along notauli; second tergite yellow basally dark brown distally; third and fourth tergites dark brown with yellow laterally; fifth tergite and ovipositor yellowish brown.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala).

Type locality: India (Kerala: Calicut University Campus).

Material examined: Paratypes.

Discussion: *Cassidibracon sumodani* Narendran and Madhavikutty is similar to *Cassidibracon castus* Quicke in having propodeum with complete midlongitudinal carina and yellowish brown body. However it differs from *C. castus* in having 1) Antenna with 23 segments (antenna with more than 29-32 segments in *C. castus*) and 2) Face without midlongitudinal ridge in *C. sumodani* (Face with a midlongitudinal ridge in *C. castus*).

GENUS *CHAOILTA* CAMERON

Chaoilta Cameron, 1899. *Mem. Manch. Soc.* 43(3): 80. Type species:
Chaoilta lamellata Cameron, India.

Blastomorpha Szepligeti, 1900. *Termes. Fuzetek*, 23: 43. Type species:
Blastomorpha decorata Szepligeti, New Guinea.

Platybracon Szepligeti, 1900. *Termes. Fuzetek*, 23: 49. Type species
Platybracon depressus Szepligeti, New Guinea.

Iphioilta Ramakrishna Ayyar, 1928. *Mem. Dept. Agric. India. Ent. Ser.*
10(1): 60d. Type species: *Iphioilta malabarica* Ramakrishna Ayyar.
Synonymised by Quicke, 1987a.

Diagnosis: Head almost rectangular; eyes small; malar space broad; dorsal clypeal carina medially protruding; bases of antennae tuberculate; thorax more or less dorsoventrally flattened; legs stout, apicoventral bristles of fourth tarsal segments very long, usually reaching more than 0.85 of telotarsus; legs densely setose; hind tibia robust; second tergite of gaster without posterolateral tooth.

Biology: Unknown.

Distribution: Indo-Australian (India).

Discussion: This genus comes close to *Atanycilus* Foerster in having subcylindrical scape, with very large apicomedial ledge, sharply and concavely narrowed at base. However it can be separated from *Atanycilus* in having: Apicoventral bristles of fourth hind tarsal segment long, usually reaching more than 0.85 of the way along length of telotarsus excluding claw (Apicoventral bristles of fourth hind tarsal segment reaching less than 0.70 of the way along ventral side of telotarsus excluding claw).

Remarks: This genus is not represented in the present collection. It was originally described from Kerala (Taliparamba) by Ramakrishna Ayyar (1928).

Chaoilta malabarica (Ramakrishna Ayyar)

Iphioilta malabarica Ramakrishna Ayyar, 1928. *Mem. Dept. Agric. India. Ent. Ser.* 10(1): 60d. Female. India, Kerala.

Chaoilta malabarica (Ramakrishna Ayyar): Synonymized by Quicke, 1987a

Diagnosis: Female: Length 16mm. Head almost quadrate above; vertex very spacious, smooth and shiny; malar space broad smooth and shiny; mesosoma long, ovoid, more or less flat; notauli not distinct; legs stout, femora slightly swollen at apex; metasoma broadly ovoid not longer than head and mesosoma; first tergite longer than broad, deeply grooved along each side, central triangular area finely longitudinally striated; second, third and fourth segments broader than long with dorsal surface finely longitudinally striate; ovipositor almost as long as body.

Male: Unknown

Host: Unknown

Distribution: India (Kerala)

Type locality: Kerala (Palakkad).

Remarks: This species is not represented in the present collection. The above diagnosis is based on the original description by Ramakrishna Ayyar (1928).

GENUS *CHELONOASTRA* ASHMEAD

Chelonogastra Ashmead, 1900. *Proc. U. S. natn. Mus.*, 23: 139. Type species:
Chelonogastra koebelei Ashmead.

Diagnosis: Head transverse; eyes with long, dense hairs; clypeus not separated from face by a carina, sometimes distinctly raised above level of face; mesoscutum densely hairy; notauli distinct; propodeum not projecting above spiracles, without a midlongitudinal carina; angle between forewing veins 1-SR and C+SC+R more than 65° (Fig.66); base of hind wing more or less evenly hairy; metasoma robust, short, broad, rather oval, at least tergites second and third with coarse sculpture; second tergite with a small midbasal triangular area forming a carina posteriorly and with a pair of sublateral crenulate grooves; fifth tergite broadly emarginate apically; ovipositor without preapical dorsal notch.

Biology: Unknown.

Distribution: Indo – Australian and South-East Palaearctic.

Discussion: This genus comes close to *Ectemnoplax* Enderlein in having posterior margin of fifth metasomal tergite with a distinct medial semicircular emargination. However *Chelonogastra* Ashmead differs from *Ectemnoplax* in having: 1) Posterior margin of fifth metasomal tergite broadly emarginated (Posterior margin of fifth metasomal tergite narrowly emarginated).

Remarks: Ashmead (1900) erected the genus *Chelonogastra*. It is represented by only one species from India. The genus consists of eight world species. It is the first report of this genus from Kerala.

KEY TO THE INDIAN SPECIES OF *CHELONOGASTRA*
ASHMEAD

1. Mesoscutum with coarse punctures; propodeum carinate; wings hyaline; head brownish yellow; antenna and legs yellow.....
..... *C. trifasciata* Ramakrishna Ayyar
- = Mesoscutum smooth and shiny; propodeum with some rugae posteriorly; wing slightly infumate; head black; antenna and mid leg brown, fore leg reddish brown and hind leg black.....
.....
..... *C. sumodani* sp. nov.

Chelonogastra sumodani sp. nov.

(Fig.66)

Holotype: Female: Length of body 3.13mm, of antenna 3.59mm, of fore wing 3.38mm and of ovipositor 1.03mm.

Head: Width 1.14 and 2.18x its length in anterior and dorsal view respectively; antenna with 32 segments; length of third antennal segment 1.50x fourth; length of third, fourth and penultimate antennal segments 2.40, 1.60, and 1.50x their width respectively; frons smooth, shiny and densely hairy with a midlongitudinal groove beginning in front of median ocellus; stemmaticum covered with short hairs and surrounded by a shallow groove; vertex smooth, shiny, densely hairy; OOL: diameter of posterior ocellus: POL = 3.5 : 2 : 3; eyes hairy, not emarginate; length of eye in dorsal view 4.50x temple; temple smooth, shiny and sparsely hairy; face granulate, densely hairy with a median ridge dorsally; width of face 1.37x its height; inter-tentorial distance 0.8x tentorioocular distance; width of hypoclypeal depression 0.36x maximum width of face; malar space granulate with malar groove.

Mesosoma: Length of mesosoma 1.13x its height; pronotum smooth and shiny; mesoscutum and scutellum smooth, shiny and densely hairy; notauli distinct, smooth; scutellum convex; scutellar sulcus narrow with 6 carinae; metanotum with anterior median carina; propleuron smooth, shiny and hairy; mesopleuron smooth, shiny and moderately covered with short hairs except small glabrous areas dorsally and posteriorly; pleural sulcus smooth; metapleuron smooth, shiny and covered with long hairs; basal half of propodeum hairy, medially glabrous and with some rugae posteriorly; wings slightly infumated; fore wing 2.77x its width; $r = 3\text{-SR} : \text{SR1} = 11:29:50$; cu-a interstitial; $2\text{-SR}:3\text{-SR}: r\text{-m} = 14:29:14$; hind wing vein $1r\text{-m} = 0.39 \times \text{SC} + \text{R1}$; hind coxa smooth, shiny, densely hairy; length of femur, tibia and basitarsus of hind leg 2.94, 6.30 and 5.20x their width respectively.

Metasoma: Length of first tergite 0.67x its apical width, rugoseretulate, with anteriorly smooth and posteriorly rugoseretulate raised median area, sides of median area crenulate; second tergite reticulate with medial basal triangular area extending to tip of tergite as carina and crenulate lateral converging grooves extending beyond middle of tergite, not reaching to tip of tergite, densely hairy; suture between second and third tergites narrow crenulate; third tergite reticulate, densely hairy; fourth and fifth tergites with two regions, basal region smooth, shiny basally, longitudinally striate transverse groove apically and apical sculptured region; apical region of fourth tergite reticulate and of fifth tergite granulate medially, reticulate laterally, both tergites densely hairy; apical margin of fifth tergite emarginate; ovipositor sheath 0.31x fore wing; ovipositor short, thick and broadens apically.

Colour: Body black except the following: eyes gray; mesosoma fore leg and ovipositor sheath reddish brown; mandibles pale yellow, apically reddish brown; ocelli shining yellow; antenna, wing veins, mid leg, and ovipositor sheath dark brown; hind leg black.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Etymology: Named after the collector of the type specimen.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Nilambur (11°16'N 76°13'E), Sumodan, 1985. Paratypes: 2 Females, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 18.ix.1987 and 3.vi.1988.

Discussion: This new species similar to *C. trifasciata* Ramakrishna Ayyar in having scutellar sulcus crenulate and notauli distinct. However it differs from *C. trifasciata* Ramakrishna Ayyar in having 1) Propodeum with some rugae posteriorly (Propodeum carinate in *C. trifasciata*); 2) Mesoscutum smooth and shiny (Mesoscutum coarsely punctate in *C. trifasciata*); 3) Wing slightly infumate (Wings hyaline in *C. trifasciata*); 4) Head black (Head brownish yellow in *C. trifasciata*) and 5) Antenna and mid leg brown, fore leg reddish brown and hind leg black (Antenna and legs yellow in *C. trifasciata*).

GENUS *EUTROPOBRACON* RAMAKRISHNA AYYAR

Eutropobracon Ramakrishna Ayyar, 1928. *Mem. Dept. Agric. India, Ent. Ser.* 10(1): 40. Type species: *Eutropobracon indicus* Ramakrishna Ayyar (Original designation)

Diagnosis: Eyes not emarginate; frons with medial groove; middle lobe of mesoscutum without grooves; notauli complete and finely crenulate; scutellar sulcus wide; metanotum with short median carina anteriorly; propodeum with tubercles; angle between fore wing veins 1-SR and C+SC+R 55°; vein cu-a postfurcal (Fig.68); tarsal claws with obtuse lobe; dorsal carinae of first tergite complete; third to fifth tergites medially much shorter than laterally; sixth tergite apically truncate and lamella slightly upcurved; ovipositor far protruding beyond apex of metasoma; hypopygium large and truncate apically.

Biology: Unknown.

Distribution: Oriental (India)

Discussion: The genus *Eutropobracon* Ramakrishna Ayyar comes close to *Aspidobracon* van Achterberg in having third tergite with lamelliform lateral margin; sixth tergite truncate without median carina and antescutal depression absent or present as narrow cleft. However it differs from *Aspidobracon* van Achterberg in having: 1) Third to fifth tergites medially much shorter than laterally (Third to fifth tergites medially about as long as laterally in *Aspidobracon*); 2) Sixth tergite truncate apically (Sixth tergite posteriorly protruding in *Aspidobracon*); 3) Ovipositor sheath longer than metasoma (Ovipositor sheath shortly protruding beyond apex of metasoma in *Aspidobracon*); 4) Tarsal claws with lobe (Tarsal claws without lobe in *Aspidobracon*); 5) Vein cu-a of fore wing shortly postfurcal (Vein cu-a of fore wing interstitial in *Aspidobracon*); 6) Angle between vein 1-SR and C+SC+R of fore wing about 55° (Angle between vein 1-SR and C+SC+R of fore wing more than 70°) and 7) Propodeal tubercle present (Propodeal tubercle absent).

Remarks: This genus is represented by only one species, viz., *E. indicus* Ramakrishna Ayyar, 1928, from India. It is not represented in the present collection.

Eutropobracon indicus Ramakrishna Ayyar

(Fig.67-68)

Eutropobracon indicus Ramakrishna Ayyar, 1928. *Mem. Dept. Agric. India, Ent. Ser.* 10(1): 40-41. Lectotype. Female. India (TNAU)

Diagnosis: Female: Antenna with 34 segments; length of third antennal segment 1.10x fourth segment; length of third, fourth and penultimate antennal segments 2.0, 1.80 and 1.80x their width; frons, vertex and face punctulate, OOL; diameter of ocellus: POL = 18:8:9; length of malar space 0.90x basal width of mandible; length of mesosoma 1.40x its height; mesoscutum and scutellum punctulate; mesopleuron rather coarsely punctate; propodeum largely smooth, except some crenulae near median carina and rugae near tubercles; fore wing vein m-cu parallel to 1-M; angle between fore wing veins 1-SR and C+SC+R 55°; ratio of length of fore wing veins: r: 3-SR: SR1 = 7:11:36; 2-SR: 3-SR; r-m = 10:11:8 (Fig.68); hind coxa smooth; length of femur, tibia and basitarsus of hind leg 3.60, 8.30 and 6.20x their width; first tergite largely smooth with dorsolateral carinae behind spiracles strong and lamelliform, slightly concave in front of dorsal carinae; second to sixth tergites reticulatepunctate with shallow anterobasal, curved and crenulate depressions (Fig.67); second suture narrowly crenulate.

Colour: Brownish yellow. Second to fifth tergites with pair of sublateral brown patches; pterostigma brown; apex of antenna, ovipositor sheath, stemmaticum partly, and hind tarsus largely, dark brown; wing membrane hyaline.

Male: Unknown.

Host: Unknown.

Biology: Unknown

Distribution: India (Kerala).

Type locality: Kerala (Palakkad: Walayar Forests).

Remarks: This species is not represented in the present collection. The above diagnosis is based on the redescription by van Achterberg (1984).

GENUS *FURCADESHA* QUICKE

Furcadesha Quicke, 1986d. *Zoologica scripta*. 15:266. Type species: *Furcadesha huddlestoni* Quicke, 1986d (Monobasic and original designation).

Diagnosis: Head very transverse (Fig.70); frons steeply sloping in front of the ocelli; back of head smooth and shiny; scape shorter ventrally than dorsally, strongly expanded dorsobasally; face densely hairy; clypeus not separated from face by a carina; notauli distinct and crenulate; mesoscutum densely hairy, but more or less smooth, shiny and glabrous medioanteriorly; scutellum densely hairy; metanotum with a lamelliform midlongitudinal carina; propodeum with a complete, midlongitudinal carina; fore-wing veins 3-SR and 2-M more or less straight and parallel; veins 1-SR and C+SC+R forming an angle of approximately 50°; veins m-cu and CU1b more or less forming a straight line (Fig.72); vein cu-a more or less interstitial; base of hind wing hairy; hind tarsi with a distinct, ventral, longitudinal row of short, dark hairs; metasoma largely with rugulose to striatepunctulate sculpture; laterope absent; different anterior face of first tergite steeply differentiated; posterior margin of fifth tergite strongly produced submedially to form a pair of posteriorly rounded projections which are divided medially by a deep cleft.

Biology: Unknown.

Distribution: Australasian, Oriental.

Discussion: This genus comes close to *Adesha* Cameron in having vein CU1a of fore wing arising at same level as vein 2-CU1 and vein CU1b of fore wing much longer than 3-CU1. However it can be separated from *Adesha* in having: 1) Fifth tergite with posterior margin strongly produced on either side of mid line, forming a fork like structure, which divided medially by a deep

narrow emargination (Fifth tergite with distinct pair of posterior sublateral semicircular emargination in *Adesha*) and 2) second tergite with a distinct midbasal triangular area produced posteriorly to form a carina (second tergite with a smooth, long, acute mid-basal area in *Adesha*)

The genus also comes close to *Indadesha* Quicke in having propodeum with a complete mid-longitudinal carina, absence of laterope, the differentiation of a steep, anterior face of first tergite and the angle between 1-SR and C+SC+R approximately 50°. However it differs from *Indadesha* Quicke in having 1) Antennal sockets projecting in lateral aspect; 2) mesopleuron and mesosternum largely smooth and shiny; 3) Propodeum with coarse, rugose sculpture and 4) second tergite with a midbasal triangular area which is formed posteriorly into a carina.

Remarks: The genus was erected by Quicke (1986d) with a single female specimen from India (Tamil Nadu: Salem). It is represented by 2 species from world. It is the first report of the genus from Kerala.

KEY TO INDIAN SPECIES OF *FURCADESHA* QUICKE

1. Intertentorial distance 2.0x tentorioocular distance; fore wing vein 1-R+M 5.0x 2-SR+M (Fig.72); mesoscutum more or less smooth and largely densely hairy (Fig.71); first tergite rugose behind dorsal carinae.....

F. huddlestoni Quicke

- = Intertentorial distance less than 2.0x tentorioocular distance; fore wing vein 1-SR+M less than 5.0x 2-SR+M; mesoscutum sculptured and hairy; first tergite reticulaterugose behind dorsal carinae.....2

2. Mesopleuron rugose, hairy, glabrous posteroventrally; metapleuron rugose with dense silvery hairs; fore wing vein 3-SR 3.50x r; propodeum strongly rugose; second tergite reticulate; fore wing 2.77x its width (Fig.73).....

F. nitida sp. nov

= Mesopleuron smooth, shiny, hairy except anteromedially and medially glabrous; metapleuron smooth, shiny and densely hairy; fore wing vein 3-SR 5.30x r; propodeum smooth, shiny anterolaterally rugose; forewing 3.04x its width (Fig.76).....*F. peethavarna* sp. nov.

***Furcadesha huddlestoni* Quicke**

(Figs.69-72)

Furcadesha huddlestoni Quicke, 1986c. *Zool Scr.* 15(3): 265-274. Holotype.Female. India (BMNH)

Diagnosis: Female: Length of body 3.30mm, of fore wing 3.10mm; head transverse; width of head 1.32 and 1.84x its median length in anterior (Fig.69) and dorsal (Fig.70) views respectively; scape shorter ventrally than dorsally, strongly expanded dorsobasally; frons steeply sloping in front of ocelli (Fig.69); POL: diameter of posterior ocellus: OOL= 4:3:8; back of head smooth and shiny; face distinctly though weakly protruding below antennal sockets, protruding part with slightly transverse and striatepunctulate; height of face: minimum distance between eyes= 6:11; mesosoma 1.70x its height; bristles arising from midanterior part of pronotum curving posteriorly (Fig.71); mesopleuron with patches of hairs ventrally and posteroventrally adjacent to pleural suture; metapleuron and lateral part of propodeum densely covered with silvery hairs; ratio of length of fore wing veins: r:3-SR:SR1= 5:18:48 (Fig.72); hind wing with 1 hamul; hind femur: tibia: basitarsus= 35:52:22; first metasomal tergite 1.60x its width; second metasomal tergite coarsely rugose anteriorly but this merging with finer sculpture posteriorly; third to fifth tergites composed of fine longitudinal striae separated by distinctly punctured regions; fifth tergite with a distinct crenulate transverse basal groove.

Male: Unknown.

Host: Unknown

Biology: Unknown

Distribution: India (China, Kerala, Tamil Nadu)

Material examined: 7 Females & 1 Male, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 10.v.1987; 4.xii.1987; Sudheer, K., 16.ix.2002; Kerala, Malappuram Dt., Nilambur (11°16'N 76°15'E), T.C. Narendran, 24.ix.1994; Kerala, Pathanamthitta Dt., Ranni (9°22'N 76°49'E), Sumodan, 25.ii.1988; 24.viii.1988; Kozhikode Dt., Anangadi (11°6'N 75°7'E), Sumodan, 30.vii.1988; Kerala, Palakkad Dt., Parambikulam (10°23'N 76°49'E).

Discussion: *F. huddlestoni* Quicke comes close to *F. nitida* sp. nov in having: frons steeply sloping in front of ocelli and third to fifth tergites composed of fine longitudinal striae separated by distinctly punctured regions. However it can be separated from *F. nitida* in having 1) Intertentorial distance 2.0x tentorioocular distance (Intertentorial distance 0.90x tentorioocular distance in *F. nitida*); 2) Mesoscutum more or less smooth and largely densely hairy (Mesoscutum rugose and covered with long white hairs in *F. nitida*) and 3) First tergite rugose behind dorsal carinae (first tergite reticulaterugose behind dorsal carinae in *F. nitida*).

F. huddlestoni Quicke comes close to *F. peethavarna* sp. nov in having: frons steeply sloping in front of ocelli and third to fifth tergites composed of fine longitudinal striae separated by distinctly punctured regions. However it can be separated from *F. peethavarna* in having 1) Intertentorial distance 2.0x tentorioocular distance (Intertentorial distance as long as tentorioocular distance in *F. peethavarna*); 2) Mesoscutum more or less smooth and largely densely hairy (Mesoscutum smooth and shiny, middle lobe almost glabrous, except anterior reticulate part, hairy only along notauli, lateral lobes glabrous centrally, sides hairy in *F. peethavarna*) and 3) First tergite rugose behind dorsal carinae (first tergite reticulaterugose behind dorsal carinae in *F. peethavarna*).

Remarks: The above diagnosis is based on the redescription by Quicke 1986d.

***Furcadesha nitida* sp. nov.**

(Figs.73-75)

Holotype: Female: Length of body 3.30mm; of ovipositor 0.42mm ; of fore wing 2.66mm; of antenna 4.38mm.

Head: Width 1.23 and 1.74x its median length in anterior (Fig.74) and dorsal (Fig.75) view respectively (Fig.); antenna with 35 segments; scape swollen basodorsally; third antennal segment 1.20x fourth; terminal antennal segment acuminate; frons steeply sloping in front of ocelli, rugose anteromedially smooth and shiny with a shallow, wide groove in front of anterior ocellus (Fig.75); OOL: diameter of posterior ocellus: POL = 10:3.5:6; vertex rugose and moderately hairy; occiput smooth and shiny; eyes glabrous; length of eye in dorsal view 3.0x temple; temple smooth, shiny and sparsely hairy; face rugose, shiny and moderately hairy (Fig.74); height of face 0.50x its minimum width; clypeus flat; height of clypeus: intertentorial distance: tentorioocular distance = 3:9:10; width of hypoclypeal depression 0.32x minimum width of face; malar space smooth, shiny and moderately hairy length of malar space 2.0x basal width of mandible; occipital flange narrow.

Mesosoma: Length of mesosoma 1.55x its height; pronotum short, smooth, shiny and hairy laterally, erect bristles arising from its median anterior part; mesoscutum rugose and covered with long white hairs (Fig.73); notauli distinct; scutellar sulcus wide, deep with 7 carinae; scutellum slightly punctate and moderately covered with long white hairs, sides of scutellum smooth and shiny; metanotum smooth and hairy with a midlongitudinal carina; propleuron smooth, shiny and covered with short hairs; epicnemial area rugose; mesopleuron rugose, hairy and glabrous posteroventrally; episternal scrobe round; pleural sulcus crenulate; metapleuron rugose with dense silvery hairs; propodeum strongly rugose, hairy with complete median carina; length of fore wing 2.77x its maximum width; ratio of length of fore wing veins: r: 3-SR:SR1 = 4:14:36; vein cu-a interstitial; 2-SR:3-SR:r-m =

11.5:14:9; 3-SR straight and parallel to 2-M; vein 1-SR+M 1.30x 2-SR+M; 2-SR+M: m-cu= 6:10.5; CU1b slightly postfurcal; vein 1-R1 1.31x length of pterostigma; vein r 0.57x width of pterostigma; hind wing vein 1r-m as long as 2-SC+R; M+CU : 1M = 12:31 (Fig.73); apex of C+SC+R with 3 hamuli; length of hind femur: tibia: basitarsus = 27:43:17; length of femur, tibia and basitarsus of hind leg 5.40, 14.33 and 8.50x their width, respectively.

Metasoma (Fig.73): Length of first tergite 0.63x its apical width, with more or less vertical anterior face, surface strongly reticulate; second tergite reticulate with a smooth triangular area basally, sides of triangular area foveate; suture between second and third tergites wide and crenulate; third to fifth tergites composed of fine longitudinal striae separated by distinctly punctured regions; ovipositor sheath 0.17x fore wing, hairy; ovipositor extending beyond the apex of metasoma.

Colour: Black except for following: tegula and antenna dark brown (except for the extreme base of scape and anellus); face yellowish brown; mandibles yellowish basally and brownish apically; eyes brownish medially with outer greyish layer; ocelli shining yellow; malar space yellow.

Male: Unknown.

Host: Unknown

Biology: Unknown

Distribution: India (Kerala).

Etymology: The species name is from Latin meaning smooth and shiny, indicating the smooth and shiny pronotum.

Material examined: Holotype. Female, INDIA: Kerala, Kozhikode Dt., Kakkodi (11°20'N 75°51'E), Girish Kumar, P., 21.xi.2004. Paratypes: 1 Female. Data same as holotype; 2 Females, Kerala, Kozhikode Dt., Nanminda (11°26'N 75°50'E), Girish Kumar, P, 8.iv.2001; 28.ii.2004.

Discussion: This new species comes close to *F. peethavarna* sp. nov in having pronotum smooth and shiny, dorsally with bristles arising from its median anterior part, metapleuron densely hairy and third to fifth tergites with fine longitudinal striae separated by distinctly punctured region. However it differs from *F. peethavarna* in having 1) Fore wing vein 3-SR 3.50x r (Fore wing vein 3-SR 5.30x r in *F. peethavarna*); 2) Mesopleuron rugose, hairy and glabrous posteroventrally (Mesopleuron smooth, shiny, hairy except anteromedially and medially glabrous in *F. peethavarna*); 3) Propodeum strongly rugose (Propodeum smooth, shiny and densely hairy in *F. peethavarna*); 4) Metapleuron rugose with dense silvery hairs (Metapleuron smooth, shiny and densely hairy in *F. peethavarna*) and 5) Pronotal bristles erect (Pronotal bristles curving posteriorly in *F. peethavarna*).

***Furcadesha peethavarna* sp. nov.**

(Figs.76-78)

Holotype: Female: Length of body 4.36mm; of ovipositor 1.48mm; of fore wing 4.42mm; of antenna 5.72mm.

Head: Width 1.09 and 1.72x its median length in anterior (Fig.77) and dorsal (Fig.78) view respectively; antenna with 42 segments; scape swollen basodorsally; third antennal segment 1.17x fourth; terminal antennal segment acuminate; frons steeply sloping in front of ocellus, smooth, with a shallow median groove (Fig.78); OOL: diameter of posterior ocellus: POL = 11.5: 3:6; vertex smooth, shiny and moderately hairy; occiput smooth and shiny; eyes glabrous; length of eye in dorsal view 3.80x temple; temple smooth, shiny and sparsely hairy; face smooth, shiny and hairy; height of face 0.64x its minimum width; clypeus flat; height of clypeus: intertentorial distance: tentorioocular distance = 1:2.2:2; width of hypoclypeal depression 0.43x minimum width of face; malar space smooth, shiny and moderately covered with short hairs; length of malar space 3.0x basal width of mandible; occipital flange narrow.

Mesosoma: Length of mesosoma 1.60x its height; pronotum short, smooth dorsally, with posteriorly curving bristles arising from the median anterior part, sides of pronotum smooth shiny and sparsely hairy dorsally, with crenulate groove medially, slightly punctate and hairy ventrally; mesoscutum smooth and shiny, middle lobe almost glabrous, except anterior reticulate part, hairy only along notauli, lateral lobes glabrous centrally, sides hairy; notauli distinct; scutellar sulcus wide, deep with 5 longitudinal carinae; scutellum smooth, shiny and covered with short hairs, sides of scutellum smooth and shiny; metanotum smooth, shiny and sparsely hairy with mid longitudinal carina; propleuron smooth and shiny; epicnemial area smooth, shiny and hairy; mesopleuron smooth, shiny and hairy except anteromedially and glabrous medially (fig.76); episternal scrobe round; pleural sulcus smooth; metapleuron smooth, shiny and densely hairy; propodeum with a complete midlongitudinal carina, smooth and shiny anterolaterally rugose; fore wing length 3.04x its maximum width; ratio of length of fore wing veins: r: 3-SR:SR1= 3:16:33; vein cu-a interstitial; 2-SR:3-SR: r-m = 11:16:8.5; 1-SR+M 3.50x 2-SR+M; 2-SR+M: m-cu = 4:10 ; CU1b interstitial; 1-R1 1.31x length of pterostigma; vein r 0.38x width of pterostigma; hind wing vein 1r-m, 1.30x 2-SC+R; M+CU:1M = 8:31 (Fig.76); apex of C+SC+R with 3 hamuli; length of hind femur : tibia : basitarsus = 24:42:14.5; length of femur tibia and basitarsus of hind leg 4.80, 14.0 and 7.25x their width, respectively; hind coxa smooth, shiny and hairy.

Metasoma (Fig.76): Length of first tergite 0.60x its apical width, clearly demarked, more or less vertical, anterior face bordered by somewhat irregular dorsal carina, behind dorsal carina first tergite is strongly reticulate rugose; second tergite rugose with a triangular area basally; third to fifth tergites composed of fine longitudinal striae separated by distinctly punctured regions; third, fourth and fifth tergites with crenulate transverse groove basally; ovipositor sheath 0.33x fore wing, hairy.

Colour: Yellow. Antenna except scape, ovipositor sheath, medial area of mesoscutal lobes, claws, stigma and wing veins brown; eyes grey, medially black; propodeum posteriorly and carina, lateral parts of tergites black.

Male: Unknown.

Host: Unknown

Biology: Unknown

Distribution: India (Kerala).

Etymology: Species name is the Latinised Sanskrit word meaning yellow colour, indicating yellow body colour. Feminine gender.

Material examined: Holotype. Female, INDIA: Kerala, Malappuram Dt. Nilambur, Nedumkayam (11°16'N 76°14'E), Sheeba, M., 20.ix.2004, Paratypes: 3Females, Kerala, Thiruvananthapuram, Dt., Palode (8°42' N 77°2'E), T.C. Narendran & party, 10.xii.2006; Kerala, Pathanamthitta, Ranni (9°22'N 76°49'E), Sumodan, 25.xi.1988; Kerala, Palakkad Dt., Parambikulam (10°23'N 76°49'E), T.C. Narendran & party, 14.xii.1988.

Discussion: This new species is similar to *F. huddlestoni* Quicke in having vertex smooth and shiny; pronotum dorsally with posteriorly curving bristles arising from median anterior part and propodeum with a complete mid longitudinal carina. However it differs from *F. huddlestoni* in having 1) Mesoscutum smooth and shiny, middle lobe almost glabrous except anterior reticulate part hairy only along notauli, lateral lobes glabrous centrally (Mesoscutum more or less smooth and largely densely hairy in *F. huddlestoni*); 2) Epicnemial area smooth (Epicnemial area crenulate in *F. huddlestoni*); 3) Ratio of length of fore wing veins: r: 3-SR: SR1 = 3:16:33 (Ratio of length of fore wing veins = r: 3-SR: SR1 = 5:18:48); 4) Body colour yellow (Body colour black in *F. huddlestoni*).

This new species comes close to *F. nitida* sp. nov in having pronotum smooth and shiny, dorsally with bristles arising from its median anterior part, metapleuron densely hairy and third to fifth tergites with fine longitudinal

striae separated by distinctly punctured region. However it can be separated from *F. nitida* in having: 1) Fore wing vein 3-SR 5.30x r (Fore wing vein 3-SR 3.50x r in *F. nitida*); 2) Mesopleuron smooth, shiny, hairy except anteromedially and medially glabrous (Mesopleuron rugose, hairy and glabrous posteroventrally in *F. nitida*); 3) Propodeum smooth, shiny and densely hairy (Propodeum strongly rugose in *F. nitida*); 4) Metapleuron smooth, shiny and densely hairy (Metapleuron rugose with dense silvery hairs in *F. nitida*) and 5) Pronotal bristles curving posteriorly (Pronotal bristles erect in *F. nitida*).

GENUS *PHILOMACROPLOEA* CAMERON

Philomacroploea Cameron, 1905b. *Spolia zeyl.*, 3: 88. Type species: *Philomacroploea basimacula* Cameron, 1905b (Monotypic).

Diagnosis: Eyes without subocular groove and not emarginate; antennae longer than body, second joint of flagellum about twice longer than width; frons and vertex with shallow median longitudinal depression; temples obliquely narrowed; malar space large; mesoscutum densely and evenly hairy; notauli crenulate and probably complete; scutellar sulcus medium-sized; smooth posterior part of median area of metanotum rather pointed, and produced antero-dorsally; propodeum without tubercles and at least with lateral carinae posteriorly; fore wing vein 3-SR less than 1.1x length of 2-SR (Fig.80); dorsal carinae of first tergite united and connected to median carina and dorso-lateral carinae indistinct; ovipositor shorter than metasoma; hypopygium of female medium - sized and obtusely protruding apically.

Biology: Parasitic on *Macroploea elisa* (Butler, 1866) and *Euploea core* (Cramer, 1780) (Shenefelt, 1978).

Distribution: China, India, Sri Lanka.

Discussion: This genus comes close to *Eutropobracon* Ramakrishna Ayyar in having: eyes not emarginate and without subocular groove; pleural sulcus

crenulate; middle lobe of mesoscutum without grooves and notauli complete and crenulate, but differs in the combination of characters given under diagnosis mainly in 1) Propodeum without tubercles (Propodeum with tubercles); 2) Angle between 1-SR and C+SC+R of forewing about 70° (Angle between 1-SR and C+SC+R of forewing about 55°); 3) Vein cu-a interstitial (Vein cu-a shortly postfurcal) and 4) Sixth tergite semicircularly emarginate medioapically (Sixth tergite apically truncate).

Remarks: It is a small genus known from Oriental Region. It is the new record of the genus from Kerala.

***Philomacroploea basimacula* Cameron**

(Figs.79-80)

Philomacroploea basimacula Cameron, 1905b. *Spolia. zeyl.* 3: 88. Lectotype Female. Sri Lanka (BMNH) (Monotypic).

Diagnosis: Female: Length of third antennal segment 1.30x fourth segment; frons, vertex and face smooth; OOL: diameter of posterior ocellus: POL = 14:9:10; length of malar space 1.20x basal width of mandible; length of mesosoma 1.20x its height; mesoscutum and scutellum finely punctulate; mesopleuron partly rugulose anteriorly, rest punctulate (Fig.79); propodeum largely smooth with a patch of punctures anterolaterally; angle between 1-SR and C+SC+R 67°; ratio of length of fore wing veins: r: 3-SR: SR1 = 11:19:66; 2-SR: 3-SR: r-m = 17:19:12; m-cu subparallel to 1-M (Fig.80); hind coxa punctulate; length of femur, tibia and basitarsus of hind leg 4.40, 8.20 and 5.0x their width, respectively; length of hind spurs 0.25 and 0.30x basitarsus; first tergite 0.60x its apical width, surface reticulate; second tergite with medial carina; second to sixth tergite punctatereticulate (Fig.79); ovipositor sheath 0.07x fore wing.

Colour: Dark brown. Head, mesosoma (but ventral half of mesopleuron, metapleuron and mesosternum dark), brown; legs, palpi, tegulae, ovipositor

sheath, large patch at posterior half of first and second tergite medially, posterior margin of third to fifth tergite brownish yellow; wing membrane subhyaline; pterostigma dark brown; veins rather dark brown.

Male: Similar to female except apical emargination of sixth tergite shallow and length 2.67mm.

Host: *Euploea core* (Cramer, 1780) (Shenefelt, 1978) and *Macroploea elisa* (Butler, 1866)

Distribution: China, India (Kerala), Sri Lanka.

Type Locality: Sri Lanka.

Material examined: 2Females, INDIA: Kerala, Malappuram Dt. Calicut University Campus (11°7'N 75o5'E), Sumodan, 21.viii.1988 & 21.vii.1998; 1Female, Kerala, Malappuram Dt., Nilambur (11°16'N 76°13' E), Sudheer, K. 30.i.2003; 1Male, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75o5'E), Sumodan, 20.v.1987; 1Male, Kerala, Thiruvananthapuram Dt., Palode (8°42'N 77o2'E), 10.xii.2004.

Remarks: The above diagnosis is based on the redescription of van Achterberg 1984.

GENUS *STENOBRACON* SZEPLIGETI

Stenobracon Szepligeti, 1901b. *Természetr. Füzet.* 24: 359. Type species: *Stenobracon oculatus* Szepligeti, 1901b. (By monotypy)

Elphea Cameron, 1903. *J. Straits Br. Asiat. Soc.* 39:121. Type species: *Elphea lutea* Cameron, 1903 (= *Stenobracon oculatus* Szepligeti, 1901b) Synonymized by Roman, 1914.

Euvipio Szepligeti, 1904. *Genera insect.* 22: 14. Type species: *Euvipio rufa* Szepligeti, 1904. Synonymized by van Achterberg & Polaszek, 1996.

Phanaulax Cameron, 1910a. *Tijdschr. Ent.* 53: 43. Type species: *Phanaulax levituberculatus* Cameron, 1910a (= *Stenobracon nicevillei* (Bingham, 1901). Synonymized by Roman, 1914.

Diagnosis: Head transverse; antenna longer than body; frons with a midlongitudinal groove; vertex and temple generally sparsely punctured and hairy; occiput moderately long, hairy especially towards sides; eyes large, glabrous, weakly emarginate; face without protruberance, and without reticulate sculpture, usually largely smooth or coriaceous; clypeus bordered dorsally by a carina; malar suture weakly developed; mesoscutum largely glabrous, anteriorly sparsely hairy or punctured; scutellar sulcus at least with weak crenulations; metanotum without midlongitudinal carina; posterior margin of propodeum usually smooth, occasionally weakly crenulate; inner side of fore tibia with band of bristles or slender spines; angle between veins 1-SR and C+SC+R of fore wing about 30°; second submarginal cell of fore wing medium sized; vein 3-CU1 not expanded posteriorly; hind wing vein 2-SC+R interstitial or distinctly longitudinal; fore basitarsus 5.14- 7.0x its maximum width; metasoma ovate to elongate; first tergite longer than wide, with elongate raised median area; second tergite basally with smooth mediobasal triangular area nearly reaching subposterior margin; third tergite with foveate, rugose or punctiform sculpture, grooves bordering anterolateral areas posteriorly, more or less evenly wide along their entire length; fourth tergite with distinct anterolateral grooves; ovipositor sheath much longer than metasoma; ovipositor often with a pre-apical dorsal notch or abrupt angulation.

Colour: Body largely pale yellow to dark brown except for following black or piceous: scape and pedicel (usually ventrally yellow), tip of mandible, ovipositor sheath, a small triangular mark on posterobasal region of tegula; flagellomere dark brown; wings basally yellow; fore wing with apical half largely and hind wing with apical third to posterior half dark brown.

Male: Similar to female except for following: apical antennal segments 3.0x maximum width; eyes considerably larger and face correspondingly narrower;

third metasomal tergite 0.33-0.55x combined length of second and third tergites medially.

Biology: These insects are parasitic on stem borers (belonging to Pyralidae and Noctuidae) of sugarcane, paddy, wheat, jowar and maize.

Distribution: Indo-Australian, Afrotropical, Oriental (India, Indonesia, Malaysia, New Guinea, Philippines), and South Palaearctic Regions.

Discussion: This genus closely resembles *Anguistibracon* Quicke in having Hind wing vein 2-SC+R interstitial or distinctly longitudinal and scutellar sulcus atleast with weak crenulations. However it differs from *Anguistibracon* in having: 1) Frons with a midlongitudinal groove (Frons without midlongitudinal groove in *Anguistibracon*); 2) Metanotum without midlongitudinal carina (Metanotum with a very short anterior median carina in *Anguistibracon*); 3) Second submarginal cell of fore wing medium sized (Second submarginal cell of fore wing variable in length, slightly wider apically than basally in *Anguistibracon*); 4) Vein 3-CU1 not expanded posteriorly (Vein 3-CU1 distinctly expanded posteriorly, sometimes forming a distinct spur in *Anguistibracon*) and 5) Fore basitarsus 5.14 - 7.0x its maximum width (Fore basitarsus more than 8.0x its maximum width in *Anguistibracon*)

Remarks: The genus *Stenobracon* was erected by Szepligeti (1901). It is represented by five species from India. *Stenobracon karnalensis* Lal, 1939 is not included in the key because of the unavailability of literature. It is the first report of the genus from Kerala.

KEY TO THE INDIAN SPECIES OF *STENOBRACON* SZEPLIGETI

(Modified from van Achterberg & Potaszek, 1996)

1. Ovipositor shorter than metasoma; notauli indistinct; third metasomal tergite coarsely rugose; fifth and sixth tergites reddish brown; cu-a slightly postfurcal.....*S. frontomaculatus* Ramakrishna Ayyar
- = Ovipositor longer than metasoma; notauli distinct; third metasomal tergite largely smooth or rugulose or rugose to weak longitudinal striations; fifth metasomal tergite yellow or medially black; cu-a interstitial or postfurcal**2**
2. Vertex in both sexes yellow (without broad black transverse band); fifth and sixth tergites yellowish and in male sixth tergite alone black; vein cu-a of forewing far postfurcal; face somewhat widened and head dorsally partly yellow; third tergite rugulose medially.....
.....*S. deesae* (Cameron)
- = Vertex in both sexes largely black or with black band; fifth and sixth tergites blackish medially; vein cu-a of fore wing interstitial or just postfurcal by about width of vein; face of male somewhat narrower and head dorsally completely black except near antennal sockets; third tergite variable medially**3**
3. Apical width of second tergite of female 0.70 - 1.0 x its median length, of male 0.90 - 1.20x; third tergite of female frequently smooth anteromedially, and usually anterolateral grooves rather weak or absent*S. oculatus* Szepligeti
- = Apical width of second tergite of female 1.10- 1.50x its median length, of male 1.20 -1.60x; third tergite of female usually rugosestriae anteromedially and with distinct anterolateral grooves.....
.....*S.nicevillei* (Bingham)

Stenobracon deesae (Cameron)

Bracon deesae Cameron, 1902a. *J. Bombay nat. Hist. Soc.* 14: 433.
Lectotype. Female, India; Gujarath: Deesa (BMNH)

Glyptomorpha deesae (Cameron, 1902a). n. comb. by Husain and Mathur
(1923) 1924. *Rep. 5th Ent. Meet. Pusa*, 5: 120.

Stenobracon deesae (Cameron, 1902a). n. comb. by Ramakrishna Ayyar,
1928. *Mem. Dept. Agric. India, Ent. Ser.* 10: 35.

Vipio deesae (Cameron, 1902a); n. comb. by Bhalla & Venkatraman, 1963.
Indian J. Entomol. 25: 26.

Iphianlax deesae (Cameron, 1902a); n. comb. by Baltazar 1972 (1969).
Philippine J. Sci. 46: 271.

Diagnosis: Female: Length 8.55 - 15.68mm. Antenna approximately 82-86 flagellomeres; scape 1.60 - 1.70x apical width; tentorioocular distance: intertentorial distance = maximum width across mandibles = 1.0: 1.33 - 1.90: 3.0 - 3.8; face broad across lower half of eyes in frontal view; width of face: width of head: maximum length of eye in dorsal view = 1.0: 1.77 - 2.70: 0.72 - 1.0; frons densely setose; shortest distance between posterior ocellus and eye: distance between median ocellus and antennal socket: width of head behind eyes (occiput) = 1.0 : 0.63 - 0.83 : 3.89 - 4.31; mesosoma 1.80 - 2.20x height; notauli marked by a line of hairs; submarginal cell of fore wing rather short; vein 3-CU1 posteriorly weakly expanded; ratio of length of fore wing veins: r : 3-SR : SR1 = 1.0 : 1.31 - 2.21 : 2.30 - 3.10; 2-SR: 3-SR : r-m = 0.86 - 1.14 : 1.17 - 1.85 : 1.0; hind wing vein 1r-m 1.04 - 1.58x SC+R1; hind tibia 1.53 - 1.63x hind femur; tarsus ventrally rather long, thickly hairy; first tergite 1.10 - 1.30x width; second tergite 1.30 - 1.48x its width; first to second tergites longitudinally strigose; third to fourth rugulose, basal protruding area smooth; fifth to seventh moderately long hairy; ovipositor approximately as long as length of body.

Colour: Body brownish yellow except stemmaticum, sometimes with a triangular mark on either side of lateral ocellus and hind tarsal segments 3-5 black or dark brown.

Male: Similar to female except tentorioocular distance: intertentorial distance: maximum width across mandibles = 1.0: 2.17 - 3.20: 4.67 - 6.0; width of face: width of head: maximum length of eye in dorsal view = 1.0: 2.60 - 3.0: 1.36 - 1.62; shortest distance between posterior ocellus and eye: distance between median ocellus and antennal socket: width of head behind eyes (occiput) = 1.0: 0.8 - 0.96: 4.36 - 5.22.

Colour: Same as female except top of head usually with a narrow transverse band across stemmaticum between compound eyes, posterior half of sixth metasomal tergite and anteromedial half of seventh tergite black or dark brown.

Host: *Bissetia steniellus* (Hampson), *Bombyx mori* Linnaeus, *Chilo auriculus* Dudgeon, *C. infuscatellus* Snellen, *C. incertulus* Walker, *C. partellus* Swinhoe, *C. sacchariphagusindicus* (Kapur), *C. simplex* Butler, *C. supperssalis* (Walker), *C. tumidicostalis* (Hampson), *C. zonellus* Swinhoe, *Crocidolomia binotalis* Zeller, *Dendrolimus punctatus* (Walker) *Emmalocera depressella* Swinhoe, *Euproctis lunata* Walker, *Polyocha depressella* (Swinhoe), *Proceras indicus* Kapur, *Raphimetopus ablutellus* (Zeller), *Scirpophaga exceptalis* (Walker), *S. innovata* (Walker), *S. nivella* (Fabricius), *Sesamia inferens* (Walker), *S. uniformis* Dudgeon (Chisti and Quicke, 1995), *Tryporyza incertulus* (Walker).

Biology: The larvae of *S. deesae* parasitize a wide range of lepidopteran both in the field and in the laboratory (Shenefelt, 1976). It is reported to be parasite of *Chilo partellus*, *C. sacchariphagus*, *Corcyra cephalonica* Stainton and *Sesamia* sp. Eurytomid and pteromalid hyperparasitoids of *S. deesae* have been reported (Narayanan & Subba Rao, 1953 and Narayanan *et al.*, 1951).

Distribution: Oriental (India (Gujarat, Karnataka, Kerala, Tamil Nadu and Uttar Pradesh), China, Malaysia, Pakistan), South Palaearctic (Oman), and Afrotropical (introduced: Madagascar, Mauritius, Mascarenes, Sudan)

Material Examined: 4Females, INDIA, Kerala, Malappuram, Dt., Calicut University Campus (11°7'N 75°5'E), T.C. Narendran and party, vi.1985; Sudheer, K., 4.vii.2001; Sudheer, K. 09.iii.2001; 1Female, Kerala, Kozhikode Dt., Kakkoor (11°23'N 75°49'E), Girish Kumar, P. 27.viii.2004; 3 Females, Kerala, Malappuram, Dt.; Kerala, Calicut University Campus (11°7'N 75°5'E), Sumodan, 1-vi.1985; 28.ix.1987; 10.x.1987; 1male, Kerala, Malappuram Dt., Vallikkunnu (11°8'N 75°50'E), 27.viii.1987; 3Males, Kerala, Kozhikode Dt., Kakkoor (11°23'N 75°49'E), Girish Kumar, 27.viii.2004.

Discussion: *S. deesae* (Cameron) is similar to *S. nicevillei* in having second tergite with (minute) smooth mediobasal area, often weakly indicated and transverse, fore wing vein 3-SR 1.20-1.80x r rarely up to 2.20x and anterolateral grooves of third tergite comparatively narrow or obsolescent, often weakly crenulate or smooth but differs in the following features: 1) Vertex in both sexes yellowish without black transverse band (Vertex in both sexes blackish or with broad black transverse band in *S. nicevillei*); 2) Sixth tergite of female yellowish (Sixth (and fifth) tergite of female blackish medially in *S. nicevillei*); 3) Vein cu-a of fore wing may be far postfurcal (Vein cu-a forewing interstitial or just postfurcal by about width of vein in *S. nicevillei*) and 4) Third tergite rugulose, basal protruding area smooth (Third tergite mediobasally rugose to with weak longitudinal striations in *S. nicevillei*).

Remarks: The above diagnosis is based on the redescription by Chishti and Quicke 1996.

***Stenobracon nicevillei* (Bingham)**

Stenobracon nicevillei Bingham, 1901. *Ann. Mag. Nat. Hist.* 8: 555.

Phanaulax levituberculatus Cameron, 1910a. *Tijdschr. Ent.* 53: 43. Female. Sri Lanka. Synonymised by Chisti & Quicke, 1996.

Glyptomorpha nicevillei (Bingham, 1901): n. comb. By Ramakrishna Ayyar (1923) 1924a: 263. *Proc. Ent. Mtgs. Pusa.* 5: 263.

Stenobracon nicevillei (Bingham, 1910): n. comb. By Ramakrishna Ayyar, 1928. *Mem. Dept. Agric. India. Ent.* 10: 35.

Stenobracon levituberculatus Cameron, 1910a: n. comb. By Fahringer, 1928. *Ent. Mitt.* 17: 26.

Diagnosis: Female: Length 9.3-15.2mm. Antenna with 83-85 flagellomeres; scape 1.70x apical width; vertex and temple moderately punctured and hairy; tentorioocular distance: intertentorial distance: maximum width across mandibles = 1.0: 1.33-1.92: 3.0-3.6; shortest distance between posterior ocellus and eye: distance between median ocellus and antennal socket: width of head behind eyes (occiput) = 1.0: 0.67-0.83: 3.83-4.19; mesosoma 1.80-1.90x its height; vein 1-SR+M curving posteriorly towards anterior wing margin; ratio of length of fore wing veins: r: 3-SR: SR1 = 1.0: 1.47-1.86: 2.03-2.81; hind wing vein 1r-m more or less straight, 1.01-1.39x SC +R1; hind tibia 1.53-1.67x length of hind femur; hind basitarsus 9.80-10.0x its maximum width; first tergite approximately 1.10x its width, raised median area anterolaterally with short longitudinal striations, posteriorly with one to numerous mediolongitudinal carinae and with a few short transverse carinae arising from main carinae; width of second tergite 1.29-1.52x length, dorsolaterally depressed, short rugose with carinae arising mostly from medial triangular area; third tergite mediobasally rugose to with weak longitudinal striation, grooves defining posterior margin of anterolateral area weakly crenulate.

Colour: Body pale yellow brown, following black or piceous: top of head completely or with a narrow transverse band across stemmaticum between compound eyes, fifth to sixth tergites (sixth not laterally).

Male: Similar to female except for the following: tentorioocular distance: intertentorial distance: maximum width across mandibles = 1.0: 2.60-3.25: 5.0-6.50; width of face: width of head: maximum length of eye in dorsal view = 1.0: 2.86-3.11: 1.50-1.67; shortest distance between posterior ocellus and antennal sockets: width of head behind eyes (occiput) = 1.0: 0.81-0.88: 4.29-4.57; fore wing vein 3-SR 1.67-1.95x r; second tergite 1.35-1.57x width.

Colour: Similar to female except for the following black; top of head completely, sixth and anterior half of seventh tergites; face reddish brown.

Host: *Chilo auricilius* Dudgeon, *C. infuscatellus* Snellen, *C. partellus* Swinhoe, *C. sacchariphagus indicus* (Kapur), *C. suppressalis* (Walker), *C. zonellus* Swinhoe, *Proceras indicus* Kapur, *Scirpophaga excerptalis* (Walker), *S. incertulus* (Walker), *S. innovata* (Walker), *S. nivella* (Fabricius), *Sesamia inferens* (Walker), *Tryporyza incertulus* (Walker).

Distribution: India (Kerala, Tamil Nadu, West Bengal), Nepal, Sri Lanka.

Material examined: 1Female and 1Male, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), T. C. Narendran, 1987.

Discussion: *S. nicevillei* (Bingham) is similar to *S. deesae* (Cameron) in having second tergite with (minute) smooth mediobasal area, often weakly indicated and transverse, fore wing vein 3-SR 1.20-1.80x r rarely up to 2.20x and anterolateral grooves of third tergite comparatively narrow or obsolescent, often weakly crenulate or smooth but differs in the following features: 1) Vertex in both sexes blackish or with broad black transverse band (Vertex in both sexes yellowish without black transverse band in *S. deesae*); 2) Sixth (and fifth) tergite of female blackish medially (Sixth tergite of female yellowish in *S. deesae*); 3) Vein cu-a forewing interstitial or just postfurcal by about width of vein (Vein cu-a of fore wing may be far postfurcal in *S. deesae*) and 4) Third tergite mediobasally rugose to with weak longitudinal striations (Third tergite rugulose, basal protruding area smooth in *S. deesae*).

Remarks: The above diagnosis is based on the redescription by Chishti and Quicke 1996.

GENUS *TESTUDOBRACON* QUICKE

Testudobracon Quicke, 1986b. Ent. Mon. Mag., 119: 25-27. Type species: *Testudobracon niger* Quicke Holotype Female. Java (BMNH). (Monobasic and original designation).

Diagnosis: Head transverse; face with a distinct midlongitudinal ridge (Fig.82); frons with a ridge on either side of midlongitudinal groove; middle lobe of mesoscutum with a pair of submedial longitudinal anterior grooves; notauli deeply impressed along entire length of mesoscutum; propodeum with a midlongitudinal carina; second submarginal cell of fore wing short and distally narrowed; hind wing with a trace of 2-1A basally; second metasomal tergite produced anteroventrally and with a small area of reduced sculpture midbasally; third to sixth metasomal tergites roundly produced posterolaterally; ovipositor with a pre-apical dorsal nodus and with apicoventral serrations.

Biology: The members of the genus *Testudobracon* Quicke are ectoparasitoids of gall forming Cecidomyiid Diptera, especially Asphonolyini (Quicke, 1986c; Maeto, 1991).

Distribution: Australasian (Australia), Eastern Palaearctic (China: Zhejiang) and Oriental Regions (China, India and Java).

Discussion: This genus comes close to *Glyptomorpha* Holmgren in having first subdiscal cell of fore wing not oval and eyes usually small. However it differs from *Glyptomorpha* in having posterior margin of sixth tergite with a deep median incision and distinctly produced posterolaterally (Posterior margin not emarginated in *Glyptomorpha*).

Remarks: This genus is represented by nine species from world. Of these four species are Oriental (Yu *et al.*, 2005). This is the first report of the genus from India.

KEY TO ORIENTAL SPECIES OF *TESTUDOBRACON* QUICKE

1. Depth of semicircular emargination of sixth tergite less than 0.51x median length of sixth tergite; posterolateral projection of sixth tergite angular in lateral view.....2
- = Depth of semicircular emargination of sixth tergite 0.60- 0.76x median length of sixth tergite; posterolateral projection of sixth tergite round in lateral view (Fig.81) (if semicircular emargination of sixth tergite more than 0.76x its posterolateral projection angular (Fig.85))4
2. Width of third tergite less than 3.10x its median length; mid lobe of mesoscutum largely hairy; median area of second and third tergites pale brown; depth of median emargination of sixth tergite 0.47x median length of tergite (Eastern China, Japan)..... *T. pleuralis* (Ashmead)
- = Width of third tergite more than 3.10x its median length; mid lobe of mesoscutum glabrous except posterolaterally densely hairy; if completely densely hairy width of third tergite less than 3.10x its median length; other characters different.....3
3. Length 2.45mm; vertex slightly convex, coriaceous and finely hairy; eyes slightly emarginate; propodeum smooth and shiny, hairy laterally, with weak mediolongitudinal ridge and two weak posteriorly diverging branches; ratio of length of fore wing veins: r: 3SR:SR1= 9:20:63; second and third tergites pale yellow, foveately rugose; width of third tergite 2.40x its median length; mesoscutum finely punctate, and evenly hairy (Eastern China).....*T. flavus* Chen& He
- = Length 3.20mm; vertex smooth, shiny, with sparse minute punctures; eyes not emarginate; propodeum smooth and shiny, not hairy laterally, with dense fine punctures laterally and slightly depressed triangular pit anteromedially; ratio of length of fore wing veins: r: 3SR:SR1= 10:26:59; second and third tergites dark brown, coarsely areolately rugose; width of third tergite 3.30x its median length; mesoscutum smooth and shiny, mid lobe glabrous and densely hairy posterolaterally (Eastern China).....

-*T. grandiventris* Wang, Chen& He
4. Frons coriaceous: vertex coriaceous or with sparse minute punctures.....5
- = Frons and vertex shagreen.....6
5. Propodeum smooth and shiny posteriorly, with long silvery hairs laterally; vein 1-SR+M sinuate basally; depth of median emargination of sixth tergite 0.60x median length of tergite; mid lobe of mesoscutum smooth and shiny, anteriorly with a weak midlongitudinal ridge; length 2.90mm...
T. niger Quicke
- = Propodeum densely granulate, with distinct midlongitudinal ridge and depressed anterior median pit and short silvery hairs; vein 1-SR+M straight; depth of median emargination of sixth tergite 0.75x median length; mid lobe of mesoscutum flat glabrous without midlongitudinal ridge; lateral lobes finely punctate, nearly smooth; length 3.10mm (Eastern China).....*T. quangxinensis* Wang, Chen& He
6. Vertex shagreen (Fig.83); mid lobe of mesoscutum with moderately developed median longitudinal ridge; mesopleuron rugose, moderately hairy anterodorsally, punctate and hairy anteroventrally, smooth, shiny and hairy posteriorly except around pleural sulcus glabrous; sixth tergite slightly rounded posterolaterally; semi circular emargination of sixth tergite 0.64x its medial length (Fig.84).....*T. malabaricus* sp. nov.
- = Vertex shagreen anteriorly, rugose posteriorly (Fig.87); mid lobe of mesoscutum with a weak median longitudinal ridge; mesopleuron rugosostriate, moderately hairy except posteroventrally glabrous; sixth tergite with small angular protuberences posterolaterally; semicircular emargination of sixth tergite 0.80x median length of sixth tergite (Fig.88)
.....*T. travancorensis* sp. nov.

Testudobracon malabaricus sp. nov.

(Fig.81-84)

Holotype: Female: Length of body 2.85mm, of ovipositor 1.31mm of fore wing 2.42mm, and of antenna 2.13mm.

Head: Width 1.31 and 2.19x its median length in anterior (Fig.82) and dorsal (Fig.83) view respectively; antenna with 22 segments; length of third antennal segment 1.17x that of fourth; length of third, fourth and penultimate antennal segments 2.80, 2.40, and 2.0x their maximum width, respectively; frons and vertex shagreen, moderately hairy (Fig.83); frons with shallow, narrow groove; OOL: diameter of posterior ocellus: POL = 18; 8: 17; stemmaticum separated from vertex by a groove and eyes glabrous, not emarginate; length of eye 2.38x that of temple in dorsal view; temple smooth shiny and sparsely hairy; height of eye: width of face: width of head in anterior view = 27:33:59; shortest distance between eyes 0.54x width of head; face shagreen with a median longitudinal ridge (Fig.82); height of clypeus: intertentorial distance: tentorioocular distance = 3.5:15:95; clypeus with weak dorsal carina; width of hypoclypeal depression 0.41x minimum width of face; malar space shagreen and moderately hairy; length of malar space 1.40x basal width of mandible; mandibles smooth, shiny and hairy.

Mesosoma: Length of mesosoma 1.30x its height; pronotum smooth, shiny, laterally with crenulate groove not hairy; mesoscutum moderately and closely punctate, moderately hairy; mid lobe with moderately developed median longitudinal ridge; notauli complete without crenulations; scutellar sulcus wide deep with 6 carinae; scutellum smooth shiny and hairy with a pit medioanteriorly; metanotum smooth, shiny, with anterior median carina; propleuron smooth, shiny and hairy; epicnemial area smooth and hairy; mesopleuron rugose and moderately hairy anterodorsally, punctate and hairy anteroventrally remaining area smooth shiny and hairy except around precoxal sulcus glabrous (Fig.81); episternal scrobe round, pleural sulcus smooth dorsally, crenulate ventrally; metapleuron faintly rugose and moderately hairy; propodeum with a row of few hairs anteriorly and a long

median carina, glabrous medially faintly rugose and hairy laterally; length of fore wing vein 1-SR 0.47x that of vein 1-M (Fig.81); ratio of length of fore wing veins: r: 3-SR: SR1 = 6:11.5: 35.5; 2-SR: 3-SR: r-m = 10.5: 11.5: 6.5; hind wing with a single bristle at apex of vein C+SC+R; 1r-m: SC+R1 = 5:11; fore femur: tibia: tarsus = 22: 22.5: 25; hind coxa smooth, shiny and moderately hairy; hind femur: tibia: basitarsus = 28:34.5:13.5; length of hind femur and tibia 4.0 and 6.80x their maximum width; length of hind basitarsus 5.40x its maximum width.

Metasoma (Fig.81): Length of first tergite 0.58x its apical width; first tergite with a posterior carina area; second tergite foveately rugose, median anterior half slightly raised in relation to lateral parts and with a pair of parallel sublateral carinae; third tergite longitudinally rugoseretulate, laterally rugose; fourth to sixth tergites rugose; fourth and fifth tergites slightly rounded, posterolaterally in side view; sixth metasomal tergite, slightly rounded posterolaterally with a deep semicircular median emargination 0.64x maximum length of sixth tergite medially (Fig.84); length of ovipositor 0.86x that of metasoma and 0.53x length of forewing; ovipositor sheath moderately long hairy.

Colour: Yellowish brown except following: antenna, tip of mandible stemmaticum, wing veins, stigma, claws, third tergite medially and apically, fourth and fifth tergites laterally, distal half of tibia and ovipositor sheath brown; eyes grey; ocelli shining yellow; ovipositor shining orange, apically brown.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala).

Etymology: The species is named after the region from where it is collected.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (75°5'E 11°7'N), Anitha, P.V., 20.viii.2001. Paratypes: 5Females, Kerala, Kozhikode, Dt., Kallai (75°32'E 11°42'N),

24.vi.1987; Kerala, Malappuram Dt., Vallikkunnu (75°5'E 11°8'N), 27.viii.1987; Kerala, Ernakulam (76°18'E 10°1'N), 9.ii.1989; Kerala, Alapuzha Dt., Kayamkulam (9°10'N 76°30'E), 21.ii.1989; Kerala, Malappuram Dt., Karimpuzha (76°26'E 10°55'N), 23.iv.1989. All specimens were collected by Sumodan.

Discussion: This new species is similar to *Testudobracon niger* Quicke in having posterolateral protuberences of sixth tergite rounded. However it differs from *T. niger* in having 1) Frons shagreen, moderately hairy and with a shallow narrow groove (Frons coriaceous in *T. niger*); 2) Vertex shagreen (Vertex coriaceous in *T. niger*); 3) Pronotum smooth, shiny with crenulate groove laterally (Pronotum partially hairy, rugose posteriorly in *T. niger*); 4) Mid lobe of mesoscutum with moderately developed median longitudinal ridge (Mid lobe of mesoscutum with weak midlongitudinal ridge in *T. niger*) and 5) Fore wing vein 1-SR+M straight (1-SR+M slightly curved basally towards posterior margin in *T. niger*).

This new species is similar to *T. travancorensis* sp. nov. in having frons shagreen; pronotum smooth, shiny with crenulate grooves laterally; 1-SR + M straight and scutellar sulcus with six carinae. However it differs from *T. travancorensis* in having 1) Vertex shagreen; mid lobe of mesoscutum with moderately developed median longitudinal ridge (Vertex shagreen anteriorly, rugose posteriorly; mid lobe of mesoscutum with a weak median longitudinal ridge in *T. travancorensis*); 2) Mesopleuron rugose, moderately hairy anterodorsally, punctate and hairy anteroventrally, smooth, shiny and hairy posteriorly except around pleural sulcus glabrous (Mesopleuron rugosostriate, moderately hairy except posterioventrally glabrous in *T. travancorensis*); 3) Sixth tergite slightly rounded posterolaterally (Sixth tergite with small angular protuberences posterolaterally in *T. travancorensis*) and 4) Semi circular emargination of sixth tergite 0.64x its medial length (Semicircular emargination of sixth tergite 0.80x median length of sixth tergite in *T. travancorensis*).

Testudobracon travancorensis sp. nov.

(Figs.85-88)

Holotype: Female: Length of body 3.60mm, of ovipositor 1.42mm, of fore wing 2.92mm and of antenna 2.54mm.

Head: Width 1.43 and 2.03x its median length in anterior (Fig.86) and dorsal (Fig.87) view respectively; antenna 24 segmented; length of third antennal segment as long as fourth; length of third, fourth and penultimate antennal segments 2.50, 2.50 and 2.67x their width respectively; frons shagreen with median groove and hairy laterally (Fig.87); OOL: diameter of posterior ocellus: POL = 10:4:7; stemmaticum separated from vertex by a groove and sparsely hairy; vertex shagreen anteriorly, rugose posteriorly, moderately hairy; eyes glabrous, not emarginate; length of eye 2.63x temple; temple smooth, shiny and sparsely hairy; height of eye : width of face: width of head = 26:31:59; shortest distance between eyes 0.52x width of head; face shagreen with median longitudinal ridge dorsally, laterally moderately and medially sparsely hairy (Fig.86); height of clypeus ; intertentorial distance: tentorioocular distance = 3.5: 12.5:10; clypeus with weak dorsal carina; width of hypoclypeal depression 0.46x minimum width of face; malar space granulate, hairy, 0.67x basal width of mandible; mandibles smooth, shiny and hairy.

Mesosoma: Length of mesosoma 1.17x its height; pronotum smooth, shiny, laterally with crenulate groove, not hairy; mesoscutum faintly punctate, densely hairy, mid lobe with a weak midlongitudinal ridge; notauli distinct without crenulations; scutellar sulcus wide, deep with 6 carinae; scutellum smooth, shiny and hairy; metanotum smooth, shiny with short anterior median carina; propleuron smooth, shiny and hairy; anterior half of mesopleuron rugosestriate, moderately hairy except a small area dorsally, and near precoxal sulcus glabrous (Fig.85); metapleuron punctate and densely hairy; propodeum rugose, rugosity long oblique dorsally and with a complete midlongitudinal carina; length of vein 1-SR 0.53x 1-M; ratio of length of fore wing veins: r: 3-

SR : SR1 = 6:11:31.5; 2-SR: 3-SR: r-m = 10:11:6; hind wing with a single bristle at apex of vein C+SC+ R; 1r-m : SC+R1 = 6:9 (Fig.85); fore femur:tibia : tarsus = 21:20.5:25; hind coxa punctate and moderately hairy; hind femur: tibia: basitarsus = 28:31:13.5; hind femur and tibia 3.41 and 6.2x their width respectively.

Metasoma (Fig.85): Length of first tergite 0.70x its apical width; first tergite with a raised median area posteriorly, sides of median area crenulate; median anterior half of second tergite slightly raised in relation to lateral parts and with a pair of parallel sublateral carinae, area between carinae foveately rugose, laterally reticulate; third tergite reticulate; fourth to sixth tergites rugose; all tergites sparsely hairy; third to fifth tergites rounded posterolaterally; sixth tergite with small angular protuberence posterolaterally and deep semicircular emargination, not reaching basal region of tergite, 0.80x median length of tergite (Fig.88); ovipositor 0.67x metasoma and 0.48x fore wing.

Colour: Body yellowish brown except following: antenna, eyes, occiput, propleuron, mesopleuron dorsally wing veins, stigma, mid coxa, basal three fourth of hind femur and lateral corners of third to fifth tergites brown; frons on either side of median groove, stemmaticum three fourth of mid lobe of mesoscutum, posterior half of lateral lobes, propodeum, mesopleuron ventrally, hind coxa femur, and tibia black; ocelli shining yellow; fore leg, mid leg except coxa and hind trochanter yellow.

Male: Unknown.

Host: Unknown.

Biology: Unknown.

Distribution: India (Kerala).

Etymology: The species is normal after the region (Travancore region of Kerala State) from where the specimen is collected.

Material examined: Holotype: Female. INDIA: Kerala, Thiruvananthapuram Dt., Palode (8°42'N 77°2'E), T.C. Narendran & Party, 10.xii.2004. Paratypes: 1Female, Kerala, Palakkad Dt., Pattambi, Central Orchard (10°49'N 76°12'E), T.C. Narendran & Party, 12.viii.2003.

Discussion: This new species similar to *T. niger* Quicke in having third to fifth antennal segments approximately equal length to one another; mid lobe of mesoscutum with a weak median longitudinal ridge but differs from it in having 1) Face shagreen with median longitudinal ridge dorsally (Face rugulose and punctate laterally in *T. niger*); 2) Ratio of length of forewing vein lengths = r: 3-SR: SR1 = 6:11:31.5 (r: 3-SR : SR1 = 9:17:51 in *T. niger*); 3) Forewing vein 1-SR+M straight in *T. travancorensis* sp. nov. (1-SR+M slightly curved basally towards posterior margin in *T. niger*); 4) Width of median emargination of sixth tergite 0.80x median length of tergite (Width of median emargination of sixth tergite 0.60x median length of tergite in *T. niger*); 5) Sixth tergite with small angular protuberences posterolaterally (Posterolateral protuberences of sixth tergite rounded in *T. niger*).

This new species is also similar to *T. malabaricus* sp. nov. and differs from the same in having frons shagreen; pronotum smooth, shiny with crenulate grooves laterally; 1-SR + M straight and scutellar sulcus with six carinae. However it differs from *T. malabaricus* in having 1) Vertex shagreen anteriorly, rugose posteriorly; mid lobe of mesoscutum with a weak median longitudinal ridge (Vertex shagreen; mid lobe of mesoscutum with moderately developed median longitudinal ridge in *T. malabaricus*); 2) Mesopleuron rugosostriate, moderately hairy except posteroventrally glabrous (Mesopleuron rugose, moderately hairy anterodorsally, punctate and hairy anteroventrally, smooth, shiny and hairy posteriorly except around pleural sulcus glabrous in *T. malabaricus*); 3) Sixth tergite with small angular protuberences posterolaterally (Sixth tergite slightly rounded posterolaterally in *T. malabaricus*) and 4) Semicircular emargination of sixth tergite 0.80x

median length of sixth tergite (Semi circular emargination of sixth tergite 0.64x its medial length in *T. malabaricus*).

GENUS **TROPOBRACON** CAMERON

Tropobracon Cameron, 1905b. *Spolia Zeylan.* 3:91. Type species (by monotypy): *Tropobracon luteus* Cameron, 1905.

Shirakia Viereck, 1913. *Proc. U.S. natn. Mus.* 44: 643. Type species (by original designation): *Shirakia schoenobii* Viereck, 1913.

Diagnosis: Head granulate, but sculpture may be superficial or absent dorsally; antennae long; mesoscutum largely glabrous, only near notauli with some hairs; notauli complete; antescutal depression present; prescutellar sulcus crenulate; side of scutellum with round depression; metapleura densely hairy (Fig.89); propodeum granulate, reticulate or anteriorly largely smooth and shiny; vein SR1 of fore wing reaching wing margin more than 0.70 of the way from apex of pterostigma to the wing tip; vein 1-SR+M straight (Fig.89); base of hind wing hairy; first tergite with posteriorly uniting dorsal carinae; second tergite with a pair of converging narrow grooves, without medio-basal area; second and following tergites without anterolateral grooves; ovipositor with ventral teeth subapically and without nodus; hypopygium acute apically, not extending beyond apex of metasoma.

Distribution: Afrotropical and Oriental.

Biology: Gregarious ectoparasites of stemborers in Graminae belonging to Crambidae, Pyralidae and Noctuidae (Lepidoptera). The genus appears to be exclusively parasitic on cereal stem borers in the Old World Tropics (van Achterberg & Polaszek, 1996).

Discussion: The genus *Tropobracon* Cameron comes close to *Pachybracon* Cameron in having tarsal claws with basal lobes distinctly pointed or at least sharply angular distally. However it differs from *Pachybracon* in having: 1) Ovipositor apically with a dorsal nodus or notch and ventral serration

(Ovipositor apically without a dorsal nodus or notch and ventral serration in *Pachybracon*) and 2) Eyes glabrous (Eyes densely hairy in *Pachybracon*).

Remarks: This genus is represented by five species from India.

KEY TO INDIAN SPECIES OF *TROPOBRACON* CAMERON.

1. Fore wing vein cu-a postfurcal, lateral grooves of median area of second tergite wide, widely crenulate and united in basal half of tergite; scutellum with a pit medioanteriorly; hind wing vein 1-SC+R distinctly narrower than vein 1r-m; anterior half of propodeum granulate and mat*T. comorensis* van Achterberg
 = Fore wing vein cu-a antefurcal or subintersitital or interstitial, lateral grooves of median area of second tergite comparatively narrow, crenulate and ending near apex of tergite, or grooves absent posteriorly; other characters partly or completely different 2
2. Fore wing vein 1-SC+R as wide as 1r-m; hind coxa granulate3
 = Fore wing vein 1-SC+R slightly or distinctly narrower than 1r-m; hind coxa shagreen or granulate.....5
3. Lateral grooves of median area of second tergite not meeting or reaching second metasomal suture and without distinct triangular area; propodeum granulate; face brown4
 = Lateral grooves of median area of second tergite complete and reaching second metasomal suture; propodeum coarsely and densely reticulaterugose, with a narrow smooth part; face completely

yellowish**T. luteus** van
Achterberg

4. Vertex smooth; lateral grooves of second tergite shallow, only basally distinctly impressed and not extending middle of tergite; fore wing vein 3-SR 3.60x vein r; scutellum without pit medioanteriorly

.....**T. infuscatus** van Achterberg

- = Vertex granulate; lateral grooves of second tergite extending beyond middle of tergite, but not reaching second metasomal suture; fore wing vein 3-SR 1.40x vein r; scutellum with a pit medioanteriorly

T. shafee Haider

5. Propodeum granulate; fore wing vein cu-a antefurcal; hind femur 2.80x its width; fore wing vein 3-SR 1.29x r; scutellar sulcus with 8 longitudinal carinae; mesopleuron superficially coriaceous anteriorly; smooth

medially**T. hyati** Haider

- = Propodeum rugose or reticulaterugose; fore wing vein cu-a interstitial or just antefurcal; hind femur 3 or more than 3 x its width; fore wing vein 3-SR 1.20-2.60x vein r; scutellar sulcus with less than 8 longitudinal carinae, mesopleuron not coriaceous**6**

6. Propodeum, rugose, smooth anteriorly; fore wing vein 3-SR 1.40-2.50x vein r; scutellum with pit medioanteriorly **7**

- = Propodeum reticulate rugose with a smooth area anteriorly; fore wing vein 3-SR 1.20–1.75x vein r; scutellum with or without pit anteriorly.....**8**

7. Vertex smooth and shiny (Fig.100); fore wing vein cu-a just antefurcal; fore wing vein r 0.50x width of stigma; hind femur 3.57x its width (Fig. 98)**T. recens** sp. nov.
- = Vertex with setiferous punctae, interstices superficially reticulate anteriorly, smooth and shiny posteriorly (Fig.94); fore wing vein cu-a interstitial; fore wing vein r 0.75x width of stigma; hind femur 3.18x its width **T. mustus** sp. nov
8. Fore wing vein cu-a interstitial (Fig.95); hind coxa shagreen; hind femur 3.0x its width; scutellar sulcus with 6 carinae; hind wing vein 1-SC+R slightly narrower than vein 1r-m**T. pulchrum** sp.nov.
- = Fore wing vein cu-a just antefurcal (Fig.89); hind femur 3.29x its width; scutellar sulcus with 4 carinae; hind wing vein 1-SC+R distinctly narrower than 1r-m**T. kainoschemon** sp. nov

***Tropobracon luteus* Cameron**

Tropobracon luteus Cameron, 1905b. *Spolia zeylon.* 3:91. (Type lost?)

Shirakia schoenobii Viereck, 1913, *Proc. U.S. natn. Mus.* 44: 643.
Synonymized by Delfinado, 1959:349.

Bracon dorsalis Matsumura, 1910. *Z. Morph. Okol. Tiere.* 6: 49, 84,
Synonymized by van Achterberg, 1993a: 58.

Tropobracon luteus var. *indica* Ramakrishna Ayyar. 1928: *Mem. Dept. Agria. India, Ent.* 10: 39. Synonymized by van Achterberg, 1993a: 58.

Diagnosis: Female: Length 4.50mm. Antenna 52 segmented; frons granulate; vertex and length of eye 2.8x temple; temple roundly narrowed posteriorly; OOL: diameter of posterior ocellus: POL = 11:3:6; face granulate; clypeus flat; length of mesosoma 1.60x its height; mesoscutum smooth, granulate medioposteriorly with a short carina and a short groove medioanteriorly;

scutellum without pit medioanteriorly; metapleuron finely rugose, with long whitish setae; propodeum without median carina, coarsely and densely reticulate rugose, with a narrow smooth part; ratio of length of fore wing veins: r : 3-SR: SRI = 11: 16: 70; cu-a just antefurcal; 2-SR: 3-SR; r-m= 18: 16: 15; hind wing vein 1r-m straight, completely free from 1-SC+R and somewhat longer than 2-SC+R; hind coxa granulate; length of femur, tibia and basitarsus of hind leg 3.10, 9.20 and 5.0x their width respectively; surface behind united dorsal carinae of first tergite coarsely reticulate rugose, its lateral areas wide and partly smooth; first tergite convex medioposteriorly; grooves of second tergite reaching second metasomal suture; second to sixth tergites densely and rather coarsely reticulaterugose; length of ovipositor sheath 0.35x fore wing.

Colour: Yellowish brown; stemmaticum, middle of frons, antenna (scape ventrally and annelus paler), propleuron, mesopleuron dorsally, mesosternum dorsally, pterostigma, wing veins, first to fifth metasomal tergites (except medially and laterally) and legs (except fore tibia, and all femora) dark subbasally; second to sixth tergites with slender pale yellowish triangle.

Male: Distinctly smaller and number of antennal segments less than females. Propleuron, mesopleuron and mesosternum partly and whole hind tarsus yellowish brown.

Host: *Tryporyza incertulus* (Walker), ex. *Schoenobius incertulus* (Walker) (van Achterberg, 1993a)

Biology: The cocoon is white, thin rather transparent (van Achterberg, 1993a).

Distribution: India (Kerala, Tamil Nadu, Uttar Pradesh), Indonesia, Pakistan, Taiwan and South China.

Discussion: *T. luteus* Cameron comes near to *T. infuscatus* van Achterberg in having hind wing vein 1-SC+R about as wide as vein 1r-m, scutellum without pit medioanteriorly and lateral grooves of median area of second tergite

narrow. However it differs from *T. infuscatus* van Achterberg in having 1) Lateral grooves of second tergite distinctly impressed and complete (Lateral grooves of second tergite shallow and absent towards posterior half in *T. infuscatus*); 2) Vertex granulate (Vertex smooth and shiny in *T. infuscatus*); 3) Propodeum without median carina, coarsely and densely reticulaterugose with a narrow smooth part (Propodeum granulate, smooth anteriorly, shiny with shallow median depression in *T. infuscatus*); 4) Fore wing vein cu-a just antefurcal (Fore wing vein cu-a subinterstitial in *T. infuscatus*); 5) Length of hind basitarsus 5.0x its width (Length of hind basitarsus 6.0x its width in *T. infuscatus*) and 6) Second to sixth tergites densely, and rather coarsely reticulate rugose (Second tergite superficially rugose, shiny, third to sixth tergites rather coarsely granulate, smooth posteriorly in *T. infuscatus*).

Remarks: This species is not represented in the present work and the above diagnosis is from the original description by van Achterberg, 1993a.

***Tropobracon kainoschemon* sp. nov**

(Figs.89-91)

Holotype: Female: Length of body 5.30mm, of ovipositor 1.40mm, of fore wing 4.20mm and of antenna 6.30mm.

Head: Width 1.30 and 2.10x its median length in anterior (Fig.90) and dorsal (Fig.91) views respectively; antenna with 54 segments; length of third antennal segment 1.40 x fourth antennal segment; third, fourth and penultimate antennal segments 3.40, 2.40, and 2.0x their width, respectively; frons punctate, interstices shagreen, sparsely hairy and with a median longitudinal groove; OOL: diameter of posterior ocellus: POL = 14: 3:5; vertex with setiferous punctae, punctures separated by distance more than their diameter, interstices shagreen, posteriorly smooth and shiny (Fig.91); eyes glabrous; length of eye in dorsal view 2.60x temple temple smooth, shiny, roundly narrowed posteriorly; face shagreen and moderately hairy;

width of face 2.50x its height; clypeus flat; intertentorial distance : tentorioocular distance = 10 : 13; width of hypoclypeal depression 0.30x minimum width of face; malar space broad, shagreen; length of malar space 2.60x basal width of mandible; occipital flange narrow.

Mesosoma: Length of mesosoma 1.50x its height; pronotum short, sides of pronotum punctate with crenulate groove; mesoscutum smooth and shiny, medioposteriorly rugose with a short carina, and small transverse carinae on either side of it, medioanteriorly with a short groove extending beyond middle, hairs arranged along notauli; notauli complete, smooth; scutellar sulcus with 4 longitudinal carinae; scutellum slightly punctate with a tuft of hairs at apex; metanotum with a tuft of hairs medially; propleuron smooth and shiny; epicnemial area aciculopunctate and hairy; mesopleuron rugose and densely hairy dorsally, glabrous medially (Fig.89); precoxal sulcus minutely punctate and hairy; episternal scrobe round; pleural sulcus crenulate; metapleuron rugose, thickly hairy; propodeum without median carina, anterior small area smooth and shiny remaining area densely reticulaterugose; length of fore wing 3.0x its maximum width; ratio of length of fore wing veins: r : 3-SR:SRI = 5 : 6 : 32; cu-a just antifurcal; 2-SR: 3-SR: r-m = 18:12:14; vein 3-SR straight; vein 1-R1 1.04x length of pterostigma; vein r 0.71x width of pterostigma; 1-SC+R of hind wing as wide as 1r-m ; M+CU : IM = 11:30 (Fig.89); hind coxa punctate; length of femure, tibia and basitarsus of hind leg 3.29, 10.25, and 5.20x their width, respectively; length of hind tibial spurs 0.38 and 0.46x hind basitarsus.

Metasoma (Fig.89): Length of first tergite 0.56x its apical width, reticulaterugose, foveate laterally; second tergite 1.47x third tergite, reticulaterugose, lateral grooves wide, reaching apex of tergite; remaining tergites aciculorugose; ovipositor with a nodus and three ventral teeth; hypopygium acute apically, not extending apex of metasoma; length of ovipositor sheath 0.30x fore wing.

Colour: Orange yellow except following parts: flagellar segments (except annelus and last 7 segments) and distal end of telotarsus brown; apical seven segments of flagellum, claws, stigma, ovipositor sheath, tip of mandible and wing veins dark brown; ocelli golden yellow; eyes black with a yellow outer layer; first tergite and triangular area between grooves of second tergite pale yellow; sides of triangular area of second tergite and remaining tergites brownish yellow.

Male: Unknown

Host: Unknown

Biology: Unknown

Distribution: India (Kerala)

Etymology: The species name is taken from the Latin word 'kinos' meaning beautiful.

Material Examined: Holotype: Female, INDIA: Kerala, Kottayam Dt., Kumarakam, Kavanattinkara (9°36'N 76°26'E), Sheeba, M., 7.xii. 2005. Paratypes: 2Females, Kerala, Kozhikode Dt., Chaliyam, Vattaparamba, (11°9'N 75°49'E), Sheeba, M., 14.iii.2003; 1Female, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 28. ix. 1987; 1Female, 12. x. 1988; Kerala, Kannur Dt., Payyannur (12°6'N 75°12'E), Sumodan, 26.ii.1988; 1Female; Kerala, Ernakulam Dt. (10°1'N 65°18'E), Sumodan, 9.ii.1989; 3Females, Kerala, Kottayam Dt., Kumarakam (9°36'N 76°26'E), T.C. Narendran & Party, 17.iv.2004; 1Female, Kerala, Alapuzha Dt., Kayamkulam, Vettikode Adimulam Nagarageswari temple (9°10'N 76°30'E), T.C. Narendran & party, 10.i.2007; 1Female, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 12.x.1988; 3Females, Kerala, Kozhikode Dt., Koyilandi, Kanyamkode (11°20'N 75°51'E), Girish Kumar, P., 9.i.2004.

Discussion: It comes near *Tropobracon luteus* Cameron in having smooth mesoscutum with medioposteriorly short carina and reticulaterugose propodeum without median carina. It differs from *T. luteus* in having: 1) Length of third antennal segment 1.40x fourth antennal segment (Third antennal segment 1.70x fourth antennal segment in *T. luteus*); 2) Vertex with setiferous punctae (In *T. luteus* vertex granulate) 3) Frons shagreen (Frons granulate in *T. luteus*); 4) Face shagreen (Face granulate in *T. luteus*); 5) Malar space 2.60x basal width of mandible (Malar space 1.50x basal width of mandible in *T. luteus*); 6) Scutellar sulcus with 4 longitudinal carinae (Scutellar sulcus with 7 longitudinal carinae in *T. luteus*); 7) Ratio of fore wing veins: r:3-SR: SRI = 11:16;70); 8) 2-SR: 3-SR: r-m; 16: 12:14 (2-SR: 3-Sr: r-m = 18:16:15 in *T. luteus*); 9) Hind coxa punctate (Hind coxa granulate); 10) First tergite 0.56x its apical width (First tergite 0.90x its apical width in *T. luteus*).

This new species also similar to *T. pulchrum* sp.nov in having propodeum reticulaterugose with a smooth area anteriorly, fore wing vein 3-SR 1.20 – 1.75x vein r and scutellum without pit medioanteriorly. However it can be separated from *T. pulchrum* in having: 1) Fore wing vein cu-a just antifurcal (Fore wing vein cu-a interstitial in *T. pulchrum*); 2) Vertex punctate, interstices shagreen (Vertex shagreen in *T. pulchrum*); 3) Scutellum slightly punctate (Scutellum smooth and shiny in *T. pulchrum*); 4) Hind coxa punctate (Hind coxa shagreen in *T. pulchrum*); 5) Fore wing vein r 0.71x width of pterostigma (Fore wing vein r 0.67x stigma in *T. pulchrum*); 6) Hind femur 3.29x its width (Hind femur 3.0x its width in *T. pulchrum*); 7) Scutellar sulcus with 4 carinae (Scutellar sulcus with 6 carinae in *T. pulchrum*) and 8) Hind wing vein 1-SC+R distinctly narrower than 1r-m (Hind wing vein 1-SC+R slightly narrower than vein 1r-m in *T. pulchrum*) .

***Tropobracon mustus* sp. nov**

(Figs.92-94)

Holotype: Female: Length of body 3.81mm, of ovipositor 1.04mm, of fore wing 3.30mm and of antenna 4.90mm.

Head: Width 1.26 and 1.80x its median length in anterior (Fig.93) and dorsal (Fig.94) view respectively; antenna with 46 segments; length of third antennal segment 1.80x fourth segment, third, fourth and penultimate antennal segments 4.50, 2.50, and 2.60x their width, respectively; frons flat, superficially reticulate, moderately hairy with a broad shallow median groove (Fig.94); OOL: diameter of posterior ocellus: POL = 11:3:7; stemmaticum surrounded by a shallow groove, with a few hairs; vertex with setiferous punctae, interstices superficially reticulate anteriorly, smooth and shiny posteriorly; eyes glabrous; length of eye in dorsal view 2.20x temple; temple smooth, shiny sparsely hairy and roundly narrowed posteriorly; face (Fig.93) with setiferous punctae, interstices superficially reticulate; width of face 2.75x its height; clypeus flat; its ventral margin rather protruding outwards; intertentorial distance: tentorioccular distance: 8 : 7; width of hypoclypeal depression 0.44x minimum width of face; malar space broad, granulate, sparsely hairy; length of malar space 1.83x basal width of mandible; occipital flange narrow.

Mesosoma: Length of mesosoma 1.54x its height; pronotum short, side of pronotum smooth; mesoscutum smooth, shiny, with a short transverse groove medioanteriorly, and a short carina medioposteriorly, hairs only near notauli; notauli complete, smooth; scutellar sulcus with 7 longitudinal carinae; scutellum smooth and shiny with a tuft of hair at apex; metanotum with a tuft of hair medially; propleuron smooth and shiny; mesopleuron with moderate setiferous punctae dorsally, smooth, shiny and sparsely hairy ventrally, glabrous medially (Fig.92); epicnemial area punctate and moderately hairy; precoxal sulcus smooth, shiny and sparsely hairy; episternal scrobe round; pleural sulcus faintly crenulate; metapleuron rugose and densely hairy; propodeum with a small smooth, shiny area anteriorly, remaining area rugose, sparsely hairy medially and densely hairy laterally and without median carina;

length of fore wing 2.87x its maximum width; ratio of length of fore wing veins: r : 3-SR : SR1 = 2 : 3: 13; cu-a interstitial; 2-SR : 3-SR: r-m = 10 : 9 : 8; vein 3-SR straight; 1-RI 1.17x pterostigma; vein r 0.75x width of pterostigma ; hind wing vein 1r-m short and straight; vein 1-SC+R of hind wing narrower than 1r-m; M+CU : 1M = 12 : 33 (Fig.92); mid and hind coxa shagreen; length of femur, tibia and basitarsus of hind leg 3.18, 8.40, and 4.83x their width, respectively; length of outer and inner hind tibial spurs 0.34 and 0.48x hind basitarsus.

Metasoma (Fig.92): Length of first tergite 0.60x its apical width, surface behind united dorsal carinae coarsely reticulaterugose lateral areas rugose; second tergite 1.40x third tergite, grooves narrow, crenulate and reaching apex of tergite; second to sixth tergites rugose; all tergites hairy except triangulate area of second tergite; hypopygium acute apically, not extending apex of metasoma; ovipositor sheath 0.32x fore wing; ovipositor with a dorsal nodus and three ventral teeth.

Colour: Orange yellow. All tergites (except triangular area between grooves of second tergite and median area of all tergites and all tarsal segments (except distal end of telotarsus) brownish yellow; ocelli shining yellow; stemmaticum, small portion of vertex on either side of stemmaticum, antenna (except anellus) ovipositor sheath, tip of mandible (except basal part yellow), wing veins, distal half of telotarsus and claws brown; triangular area of second tergite, subbasal ring of hind tibia pale yellow; sternaulus reddish brown; wings slightly infusate.

Male: Similar to female except following: length of 4.43mm and r: 3-SR: SRI = 3: 5: 23.

Host: Unknown

Biology: Unknown

Distribution: India (Kerala).

Etymology: The species name is taken from the Latin word 'mustu' meaning new.

Material examined: Holotype: Female. INDIA: Kerala, Kottayam Dt. Kumarakam (9°36'N 76°26'E), T.C. Narendran & party, 17.iv.2004. Paratypes: 1Female, Kerala, Kozhikode Dt, Chaliyam, Vattaparamba (11°9'N 75°49'E), Sheeba, M., 18.iii.2003; 1Female, Kerala, Malappuram Dt. Calicut University Campus (11°7'N 75°5'E), Sheeba, M., 18.xii.2003; 1Male, data same as holotype; 1Male, Kerala, Alapuzha Dt., Kayankulam, Onattukara (9°10'N 76°30'E), T.C. Narendran & Party, 19.iv.2004; 3Females, Kerala, Kozhikode Dt., Koyilandi, Kanyamkode (11°20'N 75°51'E), Girish Kumar, P., 9.i.2004.

Discussion: This species resembles *Tropobracon luteus* Cameron in having smooth mesoscutum with medioposteriorly short carina and propodeum without median carina. It differs from *T. luteus* in having 1) Length of third and fourth antennal segments 4.50 and 2.50x their width (Third and fourth antennal segments 3.20 and 1.90x their width in *T. luteus*); 2) Vertex and frons superficially reticulate (Vertex and frons granulate in *T. luteus*); 3) Mesoscutum medioposteriorly smooth (Mesoscutum medioposteriorly granulate in *T. luteus*); 4) fore wing vein cu-a interstitial (Vein cu-a antifurcal in *T. luteus*); 5) Hind coxa shagreen (Hind coxa granulate in *T. luteus*); 6) Length of first tergite 0.60x its apical width (Length of first tergite 0.90x its apical width in *T. luteus*); 7) Propodeum rugose with small smooth and shiny area anteriorly, sparsely hairy medially and densely hairy laterally (Propodeum coarsely and densely reticulaterugose, with a narrow smooth part in *T. luteus*).

This new species also similar to *T. recens* sp. nov. in having propodeum rugose, smooth anteriorly and scutellum with a pit medioanteriorly. However it differs from *T. recens* in having 1) Vertex superficially reticulate anteriorly and with widely separated setiferous punctae posteriorly (Vertex smooth and shiny in *T. recens*); 2) Fore wing vein

cu-a interstitial (Fore wing vein cu-a just antifurcal in cu-a interstitial *T. recens*); 3) Fore wing r 0.75 x width of stigma (Vein r 0.50 x width of stigma in *T. recens*) and 4) Hind femur 3.18x its width (Hind femur 3.57x its width in *T. recens*).

***Tropobracon pulchrum* sp. nov**

(Figs.95-97)

Holotype: Female: Length of body 3.7mm, of ovipositor 1.89mm, of fore wing 4.37mm and of antenna 7.20mm.

Head: Width 1.30x and 1.93x its median length in anterior (Fig.96) view and dorsal (Fig.97) view respectively; antenna 55 segmented; length of third antennal segment as long as fourth segment; length of third, fourth and penultimate antennal segments 3.0, 3.0, and 3.0x their width, respectively; frons flat with setiferous punctae, interstices shagreen (Fig.97); OOL: diameter of posterior ocellus: POL = 10: 3.5: 6; vertex with setiferous punctae, interstices shagreen, smooth and shiny posteriorly; length of eye in dorsal view 3.30x temple; temple roundly narrowed posteriorly; face punctate, interstices shagreen, moderately hairy (Fig.96); face about 2.50x wider than high; hypoclypeal depression wide, 0.34 x minimum width of face; occipital flange narrow; malar space broad, shagreen; length of malar space 2.33x basal width of mandible.

Mesosoma: Length of mesosoma 1.54x its height; pronotum short sides minutely punctate; mesoscutum smooth and shiny, midlobe of mesoscutum with a short groove medioanteriorly and with a short carina medioposteriorly; notauli crenulate; scutellar sulcus wide, deep and with six longitudinal carinae; scutellum smooth and shiny, with a pit medioanteriorly and a tuft of hairs medioposteriorly metanotum smooth, with a few hairs medially; propleuron smooth and shiny; epicnemial area smooth, shiny and hairy; mesopleuron minutely rugose hairy dorsally, glabrous medially, sparsely

hairy ventrally (Fig.95); episternal scrobe round; pleural sulcus finely crenulate; metapleuron granulate and covered with white hairs; propodeum without median carina, anteriorly small smooth area on either side of median line, rest densely reticulaterugose; length of fore wing 3.0x its maximum width; ratio of fore wing veins: r: 3-SR: SR1 = 4: 7:33; vein cu-a interstitial; 2-SR : 3-SR: r-m = 7.5: 7 : 6; vein 3-SR straight; 1-RI 1.45x length of pterostigma; vein r 0.67x width of pterostigma ; hind wing vein 1r-m short and straight; M+CU : 1M = 8 : 33; mid and hind coxa shagreen; length of femur, tibia and basitarsus of hind leg 3.0, 10.0, and 7.50x their width, respectively; length of outer and inner hind tibial spurs 0.33 and 0.27x hind basitarsus.

Metasoma (Fig.95): Length of first tergite 0.71x its apical width, its surface behind united dorsal carinae reticulaterugose, lateral areas smooth with longitudinal carina; grooves of second tergite narrow, reaching apex of tergite; second tergite reticulaterugose; remaining tergites rugose; ovipositor with a dorsal nodus and three ventral teeth; length of ovipositor sheath 0.44x fore wing; ovipositor sheath hairy throughout.

Colour: Head, fore and mid legs hind femur and metasoma yellow; eyes grey; mesosoma, hind coxa, trochanter, tibia and tarsus yellowish brown; antenna, wing veins, stigma, ovipositor sheath and claws brown; ovipositor shining reddish brown.

Male: Unknown

Host: Unknown

Biology: Unknown

Distribution: India (Kerala).

Etymology: The species name is taken from the Latin word 'kinos' meaning beautiful.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Vallikkunnu (11°8'N 75°50'E), Sumodan, 27.viii.1987. Paratypes: 11 Females, Malappuram Dt., Kadakkattupara (11°9'N 75°49'E), Sumodan, 9.ii.1988; Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 12.x.1988; Sudheer, K., 31.v.2001; Kerala, Kozhikode Dt, Kallai (75°32'E 11°42'N), Sumodan, 25.v.1987; Kerala, Kannur Dt., Aralam farm (11° 58' N 75° 40'E), Sumodan, 25.ii.1988; Kerala, Kannur Dt., Payyannur (12°6'N 75°12'E), 26.ii.1988; Kerala, Kasaragod Dt., Manjeswaram (12°42'N 74°53'E), Sumodan, 27.ii.1988; Kerala, Alapuzha Dt. Kayamkulam, Vettikode Adimulam Naganageswari temple (9°10'N 76°30'E), T.C. Narendran & party, 10.i.2007.

Discussion: This species comes close to *T. luteus* Cameron in having propodeum reticulaterugose with a small smooth area anteriorly and grooves of second tergite narrow and reaching second metasomal suture. However it differs from *T. luteus* in having 1) Frons and vertex shagreen (Frons and vertex granulate in *T. luteus*); 2) Scutellum with a pit medioanteriorly (Scutellum without pit medioanteriorly); 3) Fore wing vein cu-a interstitial (Forewing vein cu-a just antefurcal in *T. luteus*); 4) Hind wing 1-SC+R slightly narrower than vein 1r-m (Hind wing vein 1-SC+R as wide as 1r-m in *T. luteus*); 5) Ratio of fore wing veins: r: 3-SR: SRI= 4: 7:33 (r: 3-SR: SRI = 12: 21: 99 in *T. luteus*).

This species comes close to *T. kainoschimon* sp. nov. in having Propodeum reticulate rugose with a smooth area anteriorly. However it can be separated from *T. kainoschimon* in having: 1) Fore wing vein cu-a interstitial (Fore wing vein cu-a just antifurcal in *T. kainoschimon*); 2) Vertex shagreen (Vertex punctate, interstices shagreen in *T. kainoschimon*); 3) Scutellum smooth and shiny (Scutellum slightly punctate in *T. kainoschimon*) and 4) Scutellar sulcus with 6 carinae (Scutellar sulcus with 4 carinae in *T. kainoschimon*);

***Tropobracon recens* sp. nov**

(Figs.98-100)

Holotype: Female: Length of body 3.67mm, of fore wing 3.13mm, of antenna 4.85mm and of ovipositor 0.89mm.

Head: Width 1.32 and 1.90x its median length in anterior (Fig.99) and dorsal (Fig.100) view respectively; antenna 44 segmented, length of third antennal segment 1.50x fourth; third, fourth and penultimate antennal segments 3.0, 3.0 and 2.50x their width respectively; frons flat, shiny, superficially reticulate, laterally sparsely hairy and with a shallow median groove (Fig.100); OOL: diameter of posterior ocellus: POL = 10.5: 3.5: 8; vertex with setiferous punctae, interstices smooth and shiny; eyes glabrous; length of eye in dorsal view 2.50x temple; temple smooth, shiny sparsely hairy and roundly narrowed posteriorly; face shagreen, moderately hairy; width of face 2.79x its height; intertentorial distance: tentorioocular distance = 14 : 12; width of hypoclypeal depression 0.33x minimum width of face; malar space broad, shagreen; length of malar space 1.80x basal width of mandible; occipital flange narrow.

Mesosoma: Length of mesosoma 1.18x its height; pronotum short, smooth, shiny, glabrous except laterodorsally punctate; mesoscutum largely glabrous, only near notauli with a few hairs, medioposteriorly smooth with a short carina; notauli distinct and smooth; scutellar sulcus with six crenulations; scutellum with a pit medioanteriorly, smooth and shiny anteriorly, minutely punctate posteriorly and sparsely hairy; metanotum with few hairs medially; propleuron smooth shiny and hairy; epicnemial area punctate, and hairy; mesopleuron with setiferous punctae dorsally, glabrous anteromedially (Fig.98); episternal scrobe round; pleural sulcus crenulate; metapleuron granulose and covered with long, dense hairs; propodeum without median carina, rugose smooth anteriorly and covered with long white hairs except

medially; length of fore wing 3.43x its width; ratio of fore wing veins: r: 3-SR: S-RI= 4 : 10 : 40.5; fore wing vein cu-a just autefurcal; 2-SR : 3-SR : r-m = 9.5 : 10: 9.5 (Fig.98); 1-RI 0.83x length of pterostigma; r 0.50x width of pterostigma; hind wing vein 1r-m slightly curved; 1-SC+R as wide as 1r-m; hind coxa shagreen and hairy; length of femur, tibia and basitarsus of hind leg 3.57, 9.33 and 6.0x their width respectively; length of hind tibial outer and inner spurs 0.40 and 0.53x hind basitarsus.

Metasoma (Fig.98): Length of first tergite 0.66x its apical width, surface behind united dorsal carinae and laterally rugose; length of second tergite 1.29x that of third; grooves of second tergite narrow, crenulate reaching apex of tergite resulting in a large triangular area; second to fourth tergites aciculatorugose; remaining tergites rugose; all tergites except triangular area between grooves of second tergite hairy; ovipositor sheath 0.33x fore wing and densely hairy throughout; ovipositor with four ventral teeth and a single nodus.

Colour: Yellow except following: antenna (except yellow annelus), frons, vertex anteriorly, mandible distally, lobes of mesoscutum (except posteromedially yellow), ovipositor sheath, wing veins and stigma brown; ocelli shining pale yellow; propodeum yellowish brown; fore tibia and tarsus light brown; propleuron and sternaulus reddish brown; sixth tergite and ovipositor orange; first tergite completely, second tergite medially yellow, laterally brown; third to fifth submedially brown, medially and laterally yellow.

Male: Length 3.90mm. Similar to female except following: width of head in anterior and dorsal view 1.78 and 1.28x its median length respectively; ratio of fore wing veins: r: 3-SR: SR1= 3: 6.5: 26.

Host: Unknown

Distribution: India (Kerala)

Etymology: The species name is taken from the Latin word 'recens' meaning new.

Materials examined: Holotype: Female. INDIA: Kerala, Malappuram Dt., Pedur, Nr Calicut University Campus (11°7'N 75°5'E); Sheeba, M., 18.xii.2003. Paratypes: 1Male, data same as holotype; 2Males, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sheeba, M., 23.xi.2005; Sudheer, K, 8.x.2001; 2 Males, Kerala, Kozhikode Dt., Nanminda (11°26'N 75°50'E) Girish Kumar, P., 8.iv.2001; 1Male, Kerala, Kottayam Dt., Kumarakam (9°36' N 75°26'E) Girish Kumar, P., 17.iv.2004.

Discussion: This new species comes close to *T. comorensis* van Achterberg in having hind wing vein 1-SC+R distinctly narrower than 1r-m and scutellum with a pit medio-anteriorly. However it differs from *T. comorensis* van Achterberg in having 1) Frons shagreen (Frons granulate in *T. comorensis*); 2) Vertex shagreen (vertex superficially granulate in *T. comorensis*); 3) Temple smooth and shiny (Temple superficially granulate in *T. comorensis*); 4) Fore wing vein cu-a just antefurcal in (Fore wing vein cu-a slightly postfurcal in *T. comorensis*); 5) Second to fourth tergites longitudinally rugose, remaining tergites rugose (Second to third tergites distinctly and rather finely rugose, fourth and fifth tergites distinctly coriaceous and partly regulose in *T. comorensis* Achterberg).

This species is also close to *T. mustus* sp. nov in having propodeum rugose, smooth anteriorly and scutellum with a pit medioanteriorly. It can be separated from *T. mustus* in having: 1) Vertex smooth and shiny (Vertex superficially reticulate in *T. mustus*); 2) Fore wing vein cu-a just antifurcal (Fore wing vein cu-a interstitial in *T. mustus*) and 3) Fore wing vein r 0.50x width of stigma (Fore wing vein r 0.75x width of stigma in *T. mustus*).

GENUS *ADESHA* CAMERON

Adesha Cameron, 1912. *Soc. ent.* 27: 74-78. Type species: *Adesha albolineata* Cameron.

Diagnosis: Head and mesosoma smooth; antenna with more than 50 antennal segments; mesoscutum densely hairy, with a deep midlongitudinal groove posteriorly; fore wing vein 2-SR+M more than 0.55x m-cu; vein 3-CU1 longitudinal (Fig.101); claws with or without pointed basal lobes; mesosternum smooth; laterope distinct, sometimes very well developed; second tergite with smooth, acute midbasal area; posterior margin of fifth metasomal tergite with distinct semicircular emargination laterally.

Biology: Unknown.

Distribution: Indo - Australian (Brunei, India, Malaysia and Sarawak).

Discussion: This genus comes close to *Furcadesha* in having Vein CU1a of fore wing arising at same level as vein 2-CU1 and vein CU1b of fore wing much longer than 3-CU1. However it differs from *Furcadesha* in having: 1) Fifth tergite with posterior margin strongly produced on either side of mid line, forming a fork like structure, which divided medially by a deep narrow emargination (Fifth tergite with distinct pair of posterior sublateral semicircular emargination in *Adesha*) and 2) Second tergite with a distinct midbasal triangular area produced posteriorly to form a carina (Second tergite with a smooth, long, acute mid-basal area in *Adesha*).

The genus *Adesha* Cameron also comes close to *Indadesha* Quicke in having, a pair of lateral semicircular emarginations on posterior margin of fifth tergite and densely hairy mesoscutum. However it differs from *Indadesha* in the combination of characters given in diagnosis above and mainly in 1) Mesosternum smooth (Mesosternum coriaceous in *Indadesha*); 2) Laterope well developed (Laterope absent in *Indadesha*) and 3) Fore wing vein CU1a longitudinal (Fore wing vein CU1a not differentiated in *Indadesha*).

Remarks: Cameron (1912) erected the genus *Adesha*. The genus is represented by three species from Indo-Australian region. It is the first record of this genus from Kerala.

KEY TO THE INDO-AUSTRALIAN SPECIES OF **ADESHA** CAMERON

(Modified from Quicke, 1986)

- 1 Posterolateral emargination of fifth tergite shallow and poorly defined medially; claws with large but distally rounded basal lobe; scutellum black; metasoma laterally yellowish white.....
**A. *albolineata*** Cameron
- = Posterolateral emargination of fifth tergite deep and sharply defined medially; claws with large, pointed basal lobe; scutellum not as above; metasoma laterally yellowish brown or completely reddish brown.....
**2**
- 2 Mid lobe of mesoscutum with deep and sharply defined midlongitudinal groove on its anterior half; propodeum midposteriorly with a number of anteriorly diverging carinae without distinct rugae on either side of midlongitudinal carina, remaining area weakly and unevenly corrugated; second tergite largely rugose with midbasal triangular area with a midlongitudinal carina reaching about middle of tergite; third to fifth tergites finely rugose; scutellum and metasoma laterally yellowish brown**A. *acuta*** Quicke
- = Mid lobe of mesoscutum with a shallow midlongitudinal groove (Plate VIC); propodeum smooth, shiny with a medial crenulate groove, posteriorly with an areola and anteriorly diverging carina; second tergite reticulate with a midbasal triangular area, without a midlongitudinal carina; third and fourth tergites finely pitted fifth

tergite coarsely and deeply pitted; scutellum dark brown; metasoma reddish brown.....*Adesha* sp.1

Adesha sp. I

(Figs.101-102)

Holotype: Female: Length of body 2.91mm, of fore wing 2.45mm, of antenna 3.41mm and of ovipositor 43mm.

Head: Width 1.38 and 1.78x its length in anterior and dorsal view respectively; antenna with 34 segments; length of third antennal segment 1.33 and 1.45x fourth and fifth respectively; length of fifth segment 2.75 x its width; frons flat, smooth, shiny and hairy with a midlongitudinal groove extends between antennal toruli; stemmaticum hairy, raised above level of vertex; vertex, temple, gena and face smooth, shiny and hairy; height of clypeus: intertentorial distance: tentorioocular distance = 5:12:9; height of face: minimum distance between eyes = 9:14; antennal sockets not strongly produced in front of eyes.

Mesosoma: Length of mesosoma 1.5x its height; pronotum protruding anteriorly and slightly emarginate in front when viewed from dorsal side, laterally smooth, shiny with narrow, faintly crenulate groove; mesoscutum smooth, shiny, densely hairy except mid lobe rugose anteriorly; mid lobe of mesoscutum with shallow midlongitudinal groove on its anterior half (Plate VI C); notauli distinct, with carina; scutellum smooth shiny and densely hairy; metanotum with complete mid longitudinal carina; propleuron smooth shiny and hairy; epicnemial area rugose, hairy; mesopleuron smooth and shiny, hairy except medially, dorso medially and posteroventrally; metapleuron smooth, shiny with long hairs; propodeum smooth and shiny, with a medial crenulated groove, posteriorly with an areola and anteriorly diverging carinae; ratio of fore wing veins: r:3+SR:SRI = 6: 33: 57; 2-SR:3-SR: r-m = 10:16.5:8; vein r thicker than veins 2-SR and 3-SR; hind wing vein SC+R1

1.2x 1r – m (Fig.101); fore femur : tibia : tarsus = 4.2 : 4.9 : 2.3; hind femur : tibia : basitarsus = 5.1:7.8 : 3.4; claws with pointed basal lobe.

Metasoma: Length of first tergite 0.56x apical width, with rugose raised median area and a mid-longitudinal carina; second tergite reticulate, pitted laterally with a midbasal triangular area not give rise to midlongitudinal carina; suture between second and third tergites wide and crenulate; third and fourth tergites finely pited; posterolateral emargination of fifth tergite deep and sharply defined medially (Plate VI D & Fig.102), coarsely and deeply pitted.

Colour: Dark brown. Face and medial posterior area of second tergite brownish yellow; metasoma reddish brown; eyes grey; a small area behind eye on vertex and legs yellow; ocelli shining pale yellow; stigma, veins and ovipositor sheath brown; ovipositor shining orange.

Male : Unknown.

Host : Unknown.

Biology: Unknown.

Etymology: The species not named since only one specimen could be collected so far.

Material examined: Holotype. Female, INDIA: Kerala, Wayanad Dt., Noolpuzha (76°5'E 11°36'N), Sheeba, M., 26.ii.2005.

Discussion: This new comes close to *Adesha acuta* Quicke in having posterolateral emarginations of fifth tergite deep and sharply defined medially, claws with large, pointed basal lobes and antennal sockets not strongly produced in front of eyes. However it differs from *A. acuta* in having: 1) Mid lobe of mesoscutum with shallow midlongitudinal groove on its anterior half (Mid lobe of mesoscutum with a well developed midlongitudinal groove which widens and deepens subposteriorly in *A. acuta*); 2) Pronotum slightly emarginate in front when viewed from above

(Pronotum distinctly emarginate in front when viewed from above in *A. acuta*); 3) Propodeum smooth and shiny, with medial crenulate groove, posteriorly with an areola and anteriorly diverging carinae (Propodeum midposteriorly with a number of anteriorly diverging carinae without distinct rugae on either side of midlongitudinal carina, remainder being weakly and unevenly corrugated in *A. acuta*); 4) $r:3\text{-SR} : \text{SR1} = 6:33:57$ (In *A. acuta* $r : 3\text{-SR}:\text{SR1} = 11:12:53$); 5) Fore wing vein *r* thicker than 2-SR and 3-SR (Veins *r* and 2-SR noticeably thinner than 3-SR in *A. acuta*). 6) Length of first tergite 0.56x its width at apex in *A. wayanadensis* sp. nov. (First tergite 1.20x its apical width in *A. acuta*); 7) Second tergite reticulate with a midbasal triangular area not give rise to midlongitudinal carina (Second tergite largely rugose with midbasal triangular area give rise to a midlongitudinal carina reaching about middle of tergite in *A. acuta*) and 8) Third and fourth tergites finely pitted, fifth tergite coarsely and deeply pitted (Third to fifth tergites finely rugose in *A. acuta*).

This new species is also similar to *Adesha albolineata* Cameron in having mid lobe of mesoscutum with a weak, midlongitudinal carina on its anterior half but differs from it in having: 1) Posterolateral emargination of fifth tergite deep and sharply defined medially (Posterolateral emargination of fifth tergite shallow and poorly defined medially in *A. albolineata*); 2) Claws with pointed basal lobe (Claws with pointed but distally rounded basal lobe in *A. albolineata*) and 3) Metasoma completely reddish brown (Metasoma laterally yellowish white in *A. albolineata*).

GENUS **SHELFORDIA** CAMERON

Shelfordia Cameron, 1902b. *J. straits Brch Asiat.* 37: 35-36. Type species:
Shelfordia ruficeps Cameron, 1902 (By monotypy).

Schelfordia; Szepligiti, 1904. *Genera Insectorum* 22: 45 (Misspelling)

Sigalphogastra Cameron, 1903. *J. straits Brch. R. asiat. Soc.* 39:124. Type species: *Sigalphogastra ashmeadi* Cameron, 1903 (By monotypy) Synonymised by Quicke, 1981b.

Barthasis Cameron, 1972 ; Baltazar, 1972: 276; Quicke, 1981b: 227 (as "*Barthasis ruficeps*"; nom-nud).

Rostraulax Quicke, 1984b. *Ent. mon. Mag.* 120: 77-78. Type species: *Rostraulax vechti* Quicke, 1984b (By original designation) Synonymized by Van Achterberg, 1993c.

Dignosis: Head more or less transverse; apical antennal segment pointed but not produced into a spine, partially fused with the penultimate segment especially on its medial side; scape slightly longer ventrally than dorsally, strongly emarginate dorsolaterally (Fig.103), weakly or not emarginate medially; labiomaxillary complex produced into a proboscis; clypeus elevated above face, more or less carinate dorsally; face punctate or punctate only without rugae or carinae; frons distinctly concave medially with or without a shallow median groove; mesoscutum largely glabrous, middle lobe strongly produced in front of the lateral lobes; notauli complete; metanotum with nearly complete median carina, with short median carina anteriorly or carina absent; angle between veins 1-SR and C+SC+R of forewing less than 60°; 1-SR+M gently curving; cu-a of fore wing interstitial or slightly postfurcal; 3-CU1 and CU1b of equal width; apex of fore tibia with thickened bristles; median carina or crest of propodeum distinct anteriorly, and connected to elliptical medial area or absent, at most with a weak median ridge anteriorly and medial area absent, at most with a pair of carinae; first tergite with strongly elevated and comparatively narrow parallel sided median area in posterior 0.7 of tergite and median area with angular sides; median carina of first tergite at least anteriorly absent and in lateral view tergite low anteriorly, dorsal carinae absent or present and protruding at margin of median area; second tergite more or less robust; third tergite without complete antero-lateral grooves without transverse groove subapically; fifth tergite truncate or slightly concave posteriorly and smooth, or strongly convex posteriorly and sculptured.

Biology: Unknown.

Distribution: Indo - Australian (Mainly Oriental).

Discussion: The genus *Shelfordia Cameron* is closely related to *Cratobracon Cameron* in having middle lobe of mesoscutum strongly protruding in front of lateral lobes; first tergite either with a well developed midlongitudinal carina anteriorly or with more or less complete dorsal carinae; apex of fore tibia without a row of distinctly thickened bristles but differs in having mid-longitudinal carina of first tergite only present posteriorly; scape usually less than 3x width in middle region; clypeus separated from face by a carina and labiomaxillary complex produced into a proboscis.

Remarks: Cameron (1902) erected the genus *Shelfordia*. The genus is represented by 43 species from the world (Yu *et al.*, 2005), Of these 36 species are recorded from Oriental Region and 2 among these are from India (van Achterberg, 1993). It is the first report of this genus from Kerala.

KEY TO THE INDIAN SPECIES OF *SHELFORDIA* CAMERON

1. Vertex convex, punctate; frons with shallow, narrow median groove ...
.....**2**
- = Vertex shiny, impunctate, covered with long, black, sparse hairs behind; frons with wide deep groove.....***S. khasiana*** (Cameron)
2. Length 15.20mm; outer apex of scape dorsally somewhat longer than ventrally; face flattened, coarsely punctate, its interspaces coriaceous, with curved groove to antennal sockets; metanotum with short median carina anteriorly; propodeum punctate; cu-a postfurcal
.....***S. longicaudata*** van Achterberg.
- = Length 10.35 mm; outer apex of scape ventrally longer than dorsally; face punctate, medially smooth with hairs on lower half, granulose upper half with median groove extending between toruli and with a row of widely separated long hairs along eye margin; metanotum without

median carina; propodeum smooth and shiny; cu-a interstitial (Fig.103)
.....*Shelfordia* sp. I

Shelfordia sp.I

(Figs.103-106)

Holotype: Female: Length of body 10.35mm, of antenna, of forewing 7.88mm and of ovipositor 1.90mm.

Head: Width 1.10x and 1.64x its median length in anterior (Fig.103) and dorsal (Fig.105) view respectively; antenna with 41 segments; length of third antennal segment 1.43 and 1.67x fourth and fifth respectively; length of third, fourth and penultimate antennal segments 2.50, 1.75, and 0.87x their width respectively; scape rather slender, its length 2.83x medial width, ventrally longer than dorsally; frons with shallow, narrow median groove, distinctly concave, medially glabrous, laterally sparsely hairy (Fig.104); OOL: diameter of posterior ocellus: POL = 10:3:4; stemmaticum shiny with a few hairs and punctures at base, surrounded by shallow groove; vertex largely smooth, shiny, convex and sparsely hairy with punctures at base; eyes glabrous, not emarginate; length of eye in dorsal view 1.38x temple; temple largely smooth, shiny and sparsely hairy with punctures at base; face (Fig.104) flattened, coarsely punctate, moderately hairy laterally, smooth with hairs on lower medial half, upper medial half granulose with a median groove extending between toruli, and with a row of widely separated long hairs along eye margin; width of face 1.51x its height; clypeus flat, coarsely punctate, shiny, slightly elevated above plane of face, dorsally straight, margined by carinae on all sides; inter-tentorial distance 0.92x tentorioocular distance; width of hypoclypeal depression 0.39x maximum width of face; occipital flange narrow, not protruding below base of mandible; malar space with malar groove, shagreen and 1.14x basal width of mandible; mandible with longitudinal depression ventrobasally (Fig.).

Mesosoma: Length of mesosoma 1.67x its height; pronotum smooth, shiny with sparse hairs; mesonotum smooth, shiny, with a few hairs along notauli, mid lobe strongly protruding in front of lateral lobes, convex as other lobes; scutellar sulcus narrow with 7 crenulae; scutellum smooth, shiny and hairy apically; metanotum smooth, shiny, without median carina; propleuron smooth, shiny and hairy; mesopleuron smooth, shiny, hairy anterodorsally and posteroventrally (Fig.103); episternal scrobe present only as a small pit; pleural sulcus narrow, smooth; metapleuron shiny, punctate, moderately hairy; metapleural flange medium sized; propodeum smooth, shiny sparsely hairy and posteriorly with short crenulae, without median carina, spiracle oval shaped, slightly posteriorly situated and hairy; wings infumated; fore wing vein 1-SR 0.56x 1-M and continuous with it; r: 3-SR: SR1 = 1:6:7; 1-M straight; 1-SR+M slightly sinuate (Fig.103); cu-a interstitial and vertical; 2-SR: 3-SR : r-m = 3:8:3; vein r-m sinuate; 2-SR without widened part; base of 3-SR widened; second submarginal cell widened distally; hind wing vein 1r-m 0.56x SC+RI; area near upper part of cu-a hairy and lower part not hairy. Hind coxa with fine punctures and hairy; tarsal claws basally pectinate and with some long setae; length of femur, tibia and basitarsus of hind leg 3.67, 10.60 and 6.30x their width respectively; length of hind tibial outer and inner spurs 0.16 and 0.32x hind basitarsuss.

Metasoma: Length of first tergite 1.10x its apical width, surface smooth, shiny, median elevated area with a ridge posteriorly surrounded (Fig.) by curved carinae; dorsolateral carinae complete and strong; second tergite with triangular mediobasal area, connected to median carina, surrounded by rugoseretitulations, which are surrounded by posteriorly converging rugae (Fig.106) suture between second and third tergite deep, crenulate and wide medially and narrow laterally; third tergite longitudinally striate except smooth anterior sublateral areas; fourth tergite longitudinally striate with smooth small anterior sublateral areas and posterior margins; remaining tergites smooth, shiny and hairy; ovipositor sheath hairy; hypopygium extending beyond apex of metasoma (Fig.103).

Colour: Body black except following: head, pronotum, propleuron, fore leg (except brown telotarsus), mid leg (except black coxa, first segment of trochanter and brown telotarsus) and stigma basally yellow; wings infumate; antenna and tip of mandible dark brown; stigma apically (except basally yellow) and veins brown; stematicum black; ocelli shining yellow.

Male: Unknown

Host: Unknown

Biology: Unknown

Etymology: The species is not named only one specimen could be collected so far.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Santhosh, S., 2.xii.2006, (M.T.)

Distribution: India (Kerala).

Discussion: This species similar to *S. longicaudata* van Achterberg in having vertex convex; middle lobe of mesoscutum strongly protruding in front of lateral lobes, convex as other lobes; scutellar sulcus narrow; suture between second and third tergites deep, crenulate and wide medially and narrow laterally but differs in 1) Outer apex of scape ventrally longer than dorsally (Outer apex of scape dorsally somewhat longer than ventrally in *S. longicaudata*); 2) Face punctate, medially smooth with hairs on lower half, granulate upper half with median groove extending between toruli and with a row of widely separated long hairs along eye margin (Face flattened, coarsely punctate, its interspaces coriaceous, with curved groove to antennal sockets in *S. longicaudata*); 3) Metanotum without median carina (Metanotum with short median carina anteriorly in *S. longicaudata*); 4) Propodeum smooth and shiny (Propodeum punctulate in *S. longicaudata*); 5) cu-a interstitial (cu-a postfural in *S. longicaudata*); 6) Clypeus coarsely punctate, shiny and margined by carinae on all sides (Clypeus with subventral row of punctures, without dorsal carina and largely smooth in *S. longicaudata*); 7) Area near

upper part of cu-a hairy and lower part not hairy (Area near cu-a sparsely hairy in *S. longicaudata*); 8) Occipital flange not protruding below base of mandible (Occipital flange protruding below base of mandible in *S. longicaudata*) and 9) Antenna with 41 segments (Antenna with 61 segments in *S. longicaudata*).

Genus *Shelfordia* Cameron

Shelfordia Cameron, 1902b. *J. straits Brch Asiat.* 37: 35-36. Type species:
Shelfordia ruficeps Cameron, 1902 (By monotypy).

Schelfordia; Szepligiti, 1904. *Genera Insectorum* 22: 45 (Misspelling)

Sigalphogastra Cameron, 1903. *J. straits Brch. R. asiat. Soc.* 39:124. Type
species: *Sigalphogastra ashmeadi* Cameron, 1903 (By monotypy)
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second tergite more or less robust; third tergite without complete antero-lateral grooves without transverse groove subapically; fifth tergite truncate or slightly concave posteriorly and smooth, or strongly convex posteriorly and sculptured.

Biology: Unknown.

Distribution: Indo - Australian (Mainly Oriental).

Discussion: The genus *Shelfordia* Cameron is closely related to *Cratobracon* Cameron in having middle lobe of mesoscutum strongly protruding in front of lateral lobes; first tergite either with a well developed midlongitudinal carina anteriorly or with more or less complete dorsal carinae; apex of fore tibia without a row of distinctly thickened bristles but differs in having mid-longitudinal carina of first tergite only present posteriorly; scape usually less than 3x width in middle region; clypeus separated from face by a carina and labiomaxillary complex produced into a proboscis.

Remarks: Cameron (1902) erected the genus *Shelfordia*. The genus is represented by 43 species from the world (Yu *et al.*, 2005), Of these 36 species are recorded from Oriental Region and 2 among these are from India (van Achterberg, 1993). It is the first report of this genus from Kerala.

Key to the Indian Species of *Shelfordia* Cameron

1. Vertex convex, punctate; frons with shallow, narrow median groove ...
.....2
- = Vertex shiny, impunctate, covered with long, black, sparse hairs behind; frons with wide deep groove.....**S. khasiana** (Cameron)
2. Length 15.20mm; outer apex of scape dorsally somewhat longer than ventrally; face flattened, coarsely punctate, its interspaces coriaceous, with curved groove to antennal sockets; metanotum with short median

carina anteriorly; propodeum punctate; cu-a postfurcal
.....*S. longicaudata* van Achterberg.

= Length 10.35 mm; outer apex of scape ventrally longer than dorsally; face punctate, medially smooth with hairs on lower half, granulose upper half with median groove extending between toruli and with a row of widely separated long hairs along eye margin; metanotum without median carina; propodeum smooth and shiny; cu-a interstitial (Fig.103)*Shelfordia* sp. I

Shelfordia sp.I

(Figs.103-106)

Holotype: Female: Length of body 10.35mm, of antenna, of forewing 7.88mm and of ovipositor 1.90mm.

Head: Width 1.10x and 1.64x its median length in anterior (Fig.103) and dorsal (Fig.105) view respectively; antenna with 41 segments; length of third antennal segment 1.43 and 1.67x fourth and fifth respectively; length of third, fourth and penultimate antennal segments 2.50, 1.75, and 0.87x their width respectively; scape rather slender, its length 2.83x medial width, ventrally longer than dorsally; frons with shallow, narrow median groove, distinctly concave, medially glabrous, laterally sparsely hairy (Fig.104); OOL: diameter of posterior ocellus: POL = 10:3:4; stemmaticum shiny with a few hairs and punctures at base, surrounded by shallow groove; vertex largely smooth, shiny, convex and sparsely hairy with punctures at base; eyes glabrous, not emarginate; length of eye in dorsal view 1.38x temple; temple largely smooth, shiny and sparsely hairy with punctures at base; face (Fig.104) flattened, coarsely punctate, moderately hairy laterally, smooth with hairs on lower medial half, upper medial half granulose with a median groove extending between toruli, and with a row of widely separated long hairs along eye margin; width of face 1.51x its height; clypeus flat, coarsely punctate, shiny,

slightly elevated above plane of face, dorsally straight, margined by carinae on all sides; inter-tentorial distance 0.92x tentorioocular distance; width of hypoclypeal depression 0.39x maximum width of face; occipital flange narrow, not protruding below base of mandible; malar space with malar groove, shagreen and 1.14x basal width of mandible; mandible with longitudinal depression ventrobasally (Fig.).

Mesosoma: Length of mesosoma 1.67x its height; pronotum smooth, shiny with sparse hairs; mesonotum smooth, shiny, with a few hairs along notauli, mid lobe strongly protruding in front of lateral lobes, convex as other lobes; scutellar sulcus narrow with 7 crenulae; scutellum smooth, shiny and hairy apically; metanotum smooth, shiny, without median carina; propleuron smooth, shiny and hairy; mesopleuron smooth, shiny, hairy anterodorsally and posteroventrally (Fig.103); episternal scrobe present only as a small pit; pleural sulcus narrow, smooth; metapleuron shiny, punctate, moderately hairy; metapleural flange medium sized; propodeum smooth, shiny sparsely hairy and posteriorly with short crenulae, without median carina, spiracle oval shaped, slightly posteriorly situated and hairy; wings infumated; fore wing vein 1-SR 0.56x 1-M and continuous with it; r: 3-SR: SR1 = 1:6:7; 1-M straight; 1-SR+M slightly sinuate (Fig.103); cu-a interstitial and vertical; 2-SR: 3-SR : r-m = 3:8:3; vein r-m sinuate; 2-SR without widened part; base of 3-SR widened; second submarginal cell widened distally; hind wing vein 1r-m 0.56x SC+RI; area near upper part of cu-a hairy and lower part not hairy. Hind coxa with fine punctures and hairy; tarsal claws basally pectinate and with some long setae; length of femur, tibia and basitarsus of hind leg 3.67, 10.60 and 6.30x their width respectively; length of hind tibial outer and inner spurs 0.16 and 0.32x hind basitarsuss.

Metasoma: Length of first tergite 1.10x its apical width, surface smooth, shiny, median elevated area with a ridge posteriorly surrounded (Fig.) by curved carinae; dorsolateral carinae complete and strong; second tergite with triangular mediobasal area, connected to median carina, surrounded by

rugoseretulations, which are surrounded by posteriorly converging rugae (Fig.106) suture between second and third tergite deep, crenulate and wide medially and narrow laterally; third tergite longitudinally striate except smooth anterior sublateral areas; fourth tergite longitudinally striate with smooth small anterior sublateral areas and posterior margins; remaining tergites smooth, shiny and hairy; ovipositor sheath hairy; hypopygium extending beyond apex of metasoma (Fig.103).

Colour: Body black except following: head, pronotum, propleuron, fore leg (except brown telotarsus), mid leg (except black coxa, first segment of trochanter and brown telotarsus) and stigma basally yellow; wings infumate; antenna and tip of mandible dark brown; stigma apically (except basally yellow) and veins brown; stematicum black; ocelli shining yellow.

Male: Unknown

Host: Unknown

Biology: Unknown

Etymology: The species is not named only one specimen could be collected so far.

Material examined: Holotype: Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Santhosh, S., 2.xii.2006, (M.T.)

Distribution: India (Kerala).

Discussion: This species similar to *S. longicaudata* van Achterberg in having vertex convex; middle lobe of mesoscutum strongly protruding in front of lateral lobes, convex as other lobes; scutellar sulcus narrow; suture between second and third tergites deep, crenulate and wide medially and narrow laterally but differs in 1) Outer apex of scape ventrally longer than dorsally (Outer apex of scape dorsally somewhat longer than ventrally in *S. longicaudata*); 2) Face punctate, medially smooth with hairs on lower half,

granulose upper half with median groove extending between toruli and with a row of widely separated long hairs along eye margin (Face flattened, coarsely punctate, its interspaces coriaceous, with curved groove to antennal sockets in *S. longicaudata*); 3) Metanotum without median carina (Metanotum with short median carina anteriorly in *S. longicaudata*); 4) Propodeum smooth and shiny (Propodeum punctulate in *S. longicaudata*); 5) cu-a interstitial (cu-a postfureal in *S. longicaudata*); 6) Clypeus coarsely punctate, shiny and margined by carinae on all sides (Clypeus with subventral row of punctures, without dorsal carina and largely smooth in *S. longicaudata*); 7) Area near upper part of cu-a hairy and lower part not hairy (Area near cu-a sparsely hairy in *S. longicaudata*); 8) Occipital flange not protruding below base of mandible (Occipital flange protruding below base of mandible in *S. longicaudata*) and 9) Antenna with 41 segments (Antenna with 61 segments in *S. longicaudata*).

SUBFAMILY DORYCTINAE FOERSTER

Diagnosis: Head slightly broader than long; labrum concave; hypoclypeal depression distinct; occipital carina present but usually absent ventrally; frons may be transversely striate or smooth or shallowly punctate; mesosoma compressed dorsoventrally in some species; posterior flange of propleuron present; fore tarsus usually with spines along anterior margin; prepectal carina present; vein m-cu of hind wing present; hind coxa frequently angulate anteroventrally, or tuberculate; fore tibia with a row of small pegs or spines, at most as long as 6.0x their width; first tergite with convex lateral parts and movably connected to second tergite.

Biology: They are idiobiont ectoparasites of concealed larvae, especially of Coleoptera, but also Lepidoptera and occasionally Hymenoptera (sawflies). Larvae of some Neotropical species may be phytophagous in seeds (Shaw & Huddleston, 1991).

Distribution: Cosmopolitan.

Discussion: It can be separated from the subfamily Braconinae by the characters mentioned in the diagnosis mainly in having: 1) Posterior flange of propleuron present (Posterior flange of propleuron absent in Braconinae); 2) Prepectal carina present (Prepectal carina absent laterally in Braconinae) and first tergite with convex lateral parts and movably connected to second tergite (first tergite with lateral parts flattened or tergite immovably connected to second tergite in Braconinae).

Remarks: The subfamily Doryctinae contains 169 genera and 1,335 species (Yu *et al.*, 2005). Shenefelt and Marsh (1976) catalogued the world species. Marsh (1965) reviewed the genera of North America.

GENUS *SPATHIUS* NEES

Spathius Nees, 1818, *N. Acta. Acad. Nat. Curios. Halla* 9:301. Type species : (*Cryptus clavatus* Panzer) = *Spathius exarator* (L.)

Stenophasmus Smith, 1859. *Trans. Linn. Soc. Lond. Zool.* 3: 169. Type species: *Stenophasmus ruficeps* Smith.

Euspathius Foerster, 1862. *Verh. Nat. Ver. preuss. Rheinl.* 19: 236. Emendation of *spathius*.

Rhacospathius Cameron, 1905b. *Spol. Zeylan.* 3: 86 Type species: *Rhacospathius striolatus* Cameron.

Diagnosis: Head cubical (Fig.114); scape of antenna, short, cup shaped, usually not more than 1.50x its width; third antennal segment usually longer than fourth, rarely as long but never shorter; ocelli rarely in an equilateral triangle, base almost always clearly longer than sides, never shorter; occiput margined; pronotum frequently with a transverse keel (Fig.107); notauli distinct, often obscured behind by a wide rugose area; fore and mid femora without a blister like swelling; fore and mid tibia with a row of 10 or more spines on anterior edge; hind coxa with or without a dentiform projection beneath at base (Fig.108), usually much shorter than hind femur or if not, then latter is not abruptly narrowed at base; some species micropterous; vein m-cu entering second submarginal cell, sometimes at its extreme base and thus appearing interstitial with 2-SR; cu-a interstitial; vein 3-SR longer than 2-SR; metasoma petiolate, petiole abruptly dilated at apex; metasoma sculptured or smooth, very variable in appearance, tergites (2+3) never with a suture or furrow marking division between its two component parts, epipleura of its two component parts always fused; ovipositor variable in length but always at least half as long as metasoma.

Biology: The members of the genus *Spathius* are parasitic on wood-boring beetles.

Distribution: Worldwide.

Discussion: The genus *Spathius* is similar to *Paraspathius* Nixon in having fore and mid femora without a blister like swelling, epipleura of second and third tergites fused and petiole more or less abruptly dilated at apex. However it differs from *Paraspathius* in having: 1) Scape short, cup shaped, usually not more than 1.50x its width, apical rim simple (Scape elongate, cylindrical, fully twice as long as maximum width, apical rim distinctly reflexed and hence not closely wrapped around pedicel in *Paraspathius*) and 2) Hind coxa usually much shorter than hind femur or if not, then latter is not abruptly narrowed at base (Hind coxa narrowly ovate and as long as short, swollen hind femur in *Paraspathius*).

Remarks: Genus *Spathius* currently containing 341 described species from world. (Yu *et al.*, 2005).

KEY TO INDIAN SPECIES OF *SPATHIUS* NEES

1. Face with fine absolutely even transverse aciculation, like the surface of a gramophone record2
- = Face without such fine even transverse aciculation6
2. Head transverse, clearly narrower behind eyes than across them; vertex finely striated, striation fading out towards temples and against eye margin; notauli indistinct; hind coxa without a basal projection (Fig.107)...
.....*S. araeceri* Nixon
- = Head not or only a little, narrower behind eyes than across them; vertex with fine striation or almost smooth; notauli distinct throughout; hind coxa with a distinct basal projection.....3
3. Wings vestigial; yellowish brown with metasoma except tergites second plus third pale in part black; narrow apical margin of second plus third tergite finely, longitudinally striate*S. critolaus* Nixon.

- = Wings fully developed; other characters not as above.....4
- 4. Tergites second plus third, extremely closely reticulate, appearing finely rugulose, almost shagreen, basal half entirely yellow and a yellowish spot on each side of apical half**S. sul** Nixon
- = Sculpture and colour of tergite second plus third different 5
- 5. Fore wing vein 3-SR only slightly more than half length of SRI; base of tergite second plus third with a finely, more or less obliquely aciculate yellowish semicircular area; ovipositor long; basal carina of propodeum as long as its forks, dorsal area with feeble broken reticulation spreading over basal half.....**S. vulnificus** Wilkinson
- = Fore wing vein 3-SR 0.67x SRI; base of tergite second plus third yellowish but without this colour being restricted to semicircular area and in greater part finely longitudinally striate; ovipositor short; propodeum without a distinct basal carina and areola, hence without delimited dorsal areas.....**S. critolaus** Nixon
- 6. Head and mesosoma conspicuously flattened dorsoventrally; pronotum lying virtually in same plane as mesonotum (Fig.120).....7
- = Head and mesosoma not flattened; pronotum by no means lying in same plane as mesonotum 9
- 7. Mesosoma very strongly flattened, its length in profile, from apex of pronotum to posterior end of propodeum 5.0x its width at tegulae; head, in profile greatly flattened (Fig.120)**S. tereus** Nixon
- = Mesosoma much less flattened, its length at most 3.25x its width at tegulae; head slightly flattened.....8
- 8. Pronotal keel sharp, strongly free, raised above level of posterior margin of pronotum ovipositor sheath 4.30x metasoma.....**S. labdacus** Nixon

- = Pronotum strongly, transversely swollen and surmounted by obsolescent pronotal keel; ovipositor sheath hardly 0.67x metasoma.....
-**S. ochus** Nixon
- 9. Metasoma except first tergite smooth and shiny.....**10**
- = Metasoma sculptured **18**
- 10. Infraclypeal cavity, fully twice as wide as long (Fig.109); tentorial pits considerably much farther from each other than either from an eye.....**11**
- = Infraclypeal cavity nearly circular, less than twice as wide as long; tentorial pits at most a little farther from each other than either from an eye
- **16**
- 11. Vertex completely smooth; base of ocellar triangle clearly a little longer than sides (Fig.110)..... **12**
- = Vertex striated; if smooth with deep smooth furrow skirting each posterior ocellus; ocelli in an equilateral triangle (Fig.114) **13**
- 12. Face weakly striated, punctate between striation, medially smooth and shiny (Fig.109); pronotal keel well marked, separated from posterior margin of pronotum (Fig.108); scutellum smooth and shiny.....
-**S. keralensis** sp. nov.
- = Face with shining subconfluent striation, interrupted medially with a weak elevation; pronotal keel very indistinct, medially almost obliterated; scutellum smooth or with traces of ground sculpture.....
-**S. opis** Nixon
- 13. Basal carina of propodeal areola as long as its forks (Fig.118); mesopleura smooth or with faint scaly reticulation..... **14**
- = Basal carina 0.33 to 1.50x its forks; mesopleura smooth..... **15**

14. Vertex smooth with a deep smooth furrow skirting each posterior ocellus, join behind ocelli and each terminates anteriorly in a large pit; ocelli almost in a equilateral triangle; pronotal keel present only medially as a very feeble ridge; scutellum with thick transverse rugae.....
.....**S. melpomene** Nixon
- = Vertex shiny with traces of striation posterolaterally; base of ocellar triangle longer than its sides (Fig.117); pronotal keel well developed (Fig.115); scutellum smooth and shiny.....**S. palodensis** sp. nov.
15. Face transversely striated, somewhat confluent but more or less obliterated along middle line; frons and vertex with fine, strong transverse striation; lobes of mesoscutum less clearly defined with strong shining rugosities; areas of propodeum virtually smooth and highly polished except rugose spiracular area**S. dido** Nixon.
- = Face with weak striation; frons and vertex much less coarsely striated; middle lobe of mesoscutum more sharply defined, its lateral margin being almost carinate; areas of propodeum not conspicuously polished.....
.....**S. medon** Nixon.
16. Vertex completely smooth**17**
- = Vertex rugose at least in places**19**
17. Scutellum almost flat and smooth; hind coxa elongate, roundly angled beneath at base with no trace of projection; mesonotum falling somewhat gradually to pronotum; pronotal keel well separated from posterior margin of pronotum**S. daedalus** Nixon
- = Scutellum slightly convex, smooth and shiny; hind coxa with a small dentiform projection; mesonotum falling perpendicularly to pronotum; pronotal keel fused with posterior margin of pronotum.....**16**
18. Petiole 1.60x propodeum; ovipositor a little longer than metasoma; hind basitarsus 2.0x first metatarsal tergite; mesonotum entirely black.....

-**S. *alcine*** Nixon
- = Petiole a little shorter than propodeum; ovipositor 4.0x metasoma; hind basitarsus slightly less than 2.0x first tergite
-**S. *nearchoides*** Nixon
19. Head some what subquadrate, narrower behind eyes than across them; face rugosereticulate with weak transverse elements; vertex rugose with only a feeble transverse, element visible; scutellum dull more or less flat, finely sculptured all over; head and sides or pronotum above and mesonotum, except for an elongate brownish patch on each lateral lobe pale brownish yellow suffused with dark colouring on face; mesosoma brownish red; precoxal sulcus black**S. *ares*** Nixon
- = Head transverse, a little narrower behind eyes than across them; face with shiny transverse striation obliterated medially; vertex with transverse striation become coarsely rugose on anterior half and to sides of ocelli; scutellum very slightly convex, feebly sculptured; head, mesosoma and first tergite (remaining tergites with yellowish tinge) reddish brown; mesosternum black.....**S. *cavillator*** Wilkinson
- 20 Pronotal keel not developed**21**
- = Pronotal keel well developed**22**
21. Frons closely rugosestriate all over; face dull, evenly and moderately strongly rugosereticulate; scutellum almost flat; mesopleuron shiny with traces of surface sculpture; first tergite a little shorter than propodeum with very weak longitudinal elements except towards apex; hairs of upper surface of hind tibia much shorter than middle width of tibia; hind basitarsus 2.0x first metatarsus**S. *capaneus*** Nixon
- = Frons closely smoothly striate; face with transverse striation, more or less obliterated on middle elevation; scutellum strongly and evenly convex; mesopleuron smooth and shiny; first tergite 1.50x propodeum and with

- fine broken longitudinal striation; hairs of upper surface of hind tibia as long as middle width of tibia; hind basitarsus a trifle longer than 2.0x first metatarsus..... **S. siculus** Nixon
22. Mesonotum sloping perpendicularly to pronotum; pronotal keel widely fused with posterior margin of pronotum, rarely merely contiguous with it in middle.....**23**
- = Mesonotum sloping gradually to pronotum; pronotal keel free or raised above level of posterior margin of pronotum.....**24**
23. Frons transversely striate or rugose-striate; face with weak transverse striation; propodeal areola poorly developed; head slightly narrower behind eyes than across them; vertex completely smooth; hairs of upper surface of hind tibia hardly more than half its middle width; basal half of second plus third tergites with finely striatepunctate and striation become scaly where it weakens.....**S. generosus** Wilkinson.
- = Frons smoothly striate, face with broken transverse striation, almost transversely rugulose; propodeal areola well defined; head as wide behind eyes as across them, rarely very slightly narrower; vertex smoothly striate; hairs of upper surface as long as middle width; basal half of tergites second plus third irregularly punctatereticulate, towards apex surface more finely and evenly punctate reticulate.....
-**S. elaboratus** Wilkinson.
24. Pronotal keel raised above level of posterior margin of pronotum; mesopleuron dull and sculptured; areola present but not sharply defined.....
-**S. apicalis** Westwood.
- = Pronotal keel free; mesopleuron nearly smooth rarely carinae of precoxal sulcus extends upwards leaving no polished surface; areola well defined**25**

25. Basal carina of propodeal areola as long as its forks, dorsal area not delimited posteriorly, surface mostly finely reticulaterugose; first tergites 2.0x propodeum; ovipositor sheath longer than metasoma.....
**S. priapus** Nixon
- = Basal carina 1.50x its forks, dorsal area shining; first tergite slightly less than 2.0x propodeum; ovipositor sheath a little less than metasoma.....
**S. seriphus** Nixon

Spathius araeceri Nixon

Spathius araeceri Nixon, 1943. *Trans. Roy. Ent. Soc. London.*, 93(2): 355-356. Female. Java (BMNH).

Redescription: Female: Length of body 3.35mm, of antenna 4.15mm, of fore wing 2.32mm and of ovipositor 1.27mm.

Head: Width 1.21 and 1.49x its median length in anterior and dorsal view respectively; antenna with 28 segments; length of scape 1.50x width; length of pedicel 0.83x width; length of third, fourth and penultimate antennal segments 6.66, 5.0, and 5.0x their width respectively; frons flat, with fine transverse striations; OOL: diameter of posterior ocellus: POL = 9:4:7; base of ocellus triangle distinctly longer than its sides; vertex finely transversely striated, without hairs; eyes glabrous; temple 3.33x length of eye in dorsal view and with weak striations; face with fine transverse striations, sparsely hairy length of face 0.80x its width; clypeus narrow; width of hypoclypeal depression 0.47x minimum width of face; malar space transversely striated, 2.0x basal width of mandible.

Mesosoma: Length 1.73x its height; sides of pronotum rugulose; pronotal keel barely indicated, medially apparently fused with posterior margin of

pronotum (Fig.107); mesonotum shagreen; falling almost perpendicularly to pronotum; notauli absent on dorsal surface of mesonotum; mesonotum posteriorly with a single fine carina; scutellar sulcus wide crenulate; scutellum shagreen, strongly convex; propleuron rugulose; metanotum with a median carina and two submedian carinae; mesopleuron shagreen; pleural sulcus crenulate; metapleura rugose; propodeum with obsolescent areation; fore wing more dappled in appearance; length of fore wing 3.43 x its maximum width; stigma 4.0x its width; vein r 0.70x width of stigma; 3-SR 4.29x r; ratio of length of fore wing veins: r: SR1 : 3-SR = 3.5: 26:15; 2-SR 0.77x 1-M; 2-Sr : 3-SR : r-m = 9.5: 15: 7 (Fig.107); cu-a postfurcal, vertical; hind coxa without a projection beneath, shagreen, 1.77x width; length of femur, tibia and basitarsus of hind leg 6.64, 10.25, and 5.20x their width respectively.

Metasoma: Length of first tergite 3.16x its apical width, longitudinally rugosestriate; second and third tergites united, finely rugulose; all tergites finely rugulose; ovipositor sheaths 0.72x metasoma, hairy throughout its length (Fig.107).

Colour: More or less deep chocolate brown with head paler, yellowish brown in tint; antenna up to about 23rd segment yellowish, flagellar segments rather strikingly ringed with brown at apex, apical five flagellar segments brown; basal one third of stigma pale yellow, rest brown; tip of mandible brown; ocelli shining.

Male: Similar to female.

Host: *Aracerus fasciculatus* (Degeer).

Biology: Unknown.

Distribution : India (Kerala), Malaysia.

Material examined; 5Females, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 9.iv.1987; 29.ix.1987; 2.iv.1988; 18.iv.1989; 18.vi.1989; Kerala, Idukki Dt., Moolamattam (10°18'N

76°38'E), Sumodan, 18.iv.1089; Kerala, Idukki Dt., Vandiperiyar (9°35'N 77°5'E), T.C. Narendran & party, 8.i.2004; 6 Males, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), Sumodan, 20.iii.1987; 3.iv.1987; 13.iv.1987; 2.v.1987; 6.v.1987.

Discussion: *S. araeceri* Nixon is similar to *S. critolaus* Nixon in having face with fine absolutely even transverse aciculation; pronotal keel feeble, medially fused with posterior margin of pronotum and propodeum with obsolescent areation. However it differs from *S. critolaus* in having 1) Head transverse, clearly narrower behind eyes than across them (Head at most very slightly narrower behind eyes than across them in *S. critolaus*); 2) Vertex finely striate, striation fading out towards temple and against eye margin (Vertex almost smooth, at most with traces of transverse aciculation in *S. critolaus*); 3) Hind coxa without a basal projection (Hind coxa with a distinct projection beneath base in *S. critolaus*); 4) Tergites second plus third longitudinally rugosestriate (Tergites second plus third finely striated almost to apex in *S. critolaus*).

Remarks: As the original description is insufficient for identification of the species, a redescription is provided here. It is the first record of the species from Kerala.

Spathius critolaus Nixon

Spathius critolaus Nixon, 1939. *Bull. Ent. Res.* 30: 119 Holotype. Female. India (BMNH).

Diagnosis: Female. Length 2.80 - 3.10mm. Macropterous. Head at most very slightly narrower behind eyes than across them; antenna 25 segmented; third antennal segment slightly longer than scape plus pedicel; vertex almost smooth, at most with traces of transverse aciculation; base of ocellar triangle longer than sides; pronotal keel feebly developed, medially fused with posterior margin of pronotum; lobes of mesonotum feebly shining, vaguely

scaly reticulate and with a few long outstanding hairs; mesonotum small in micropterous females; propodeum irregularly rugose without distinct basal carina and areola; precoxal sulcus broad, shallow with striations; fore wing vein r arising distinctly from beyond middle of stigma; 3-SR as long as or slightly longer than 2-SR; micropterous forms with fore wing reduced to an elongate; scale like stump reaches to about anterior margin of propodeum; hind coxa with a distinct projection beneath at base; hairs of upper surface of hind tibia much shorter than its middle width; basitarsus 2.0x first metatarsal tergite; third metatarsus a little shorter than telotarsus; petiole, 2.0x its apical width, rugose, but becoming striate on apical one third; second and third tergites longitudinally striated apically; ovipositor sheaths a little shorter than metasoma.

Male: Length 2.50 - 2.90mm. Micropterous. Antenna 24 segmented; wings as in female; basal carina and areola of propodeum well developed; second and third tergites of macropterous forms with longitudinal sculptures broken up into scaly reticulations and pale at base with yellowish spot on each side more apically.

Colour: Head, mesosoma and first tergite reddish brown to yellowish brown in female, yellowish brown in male; palpi pale yellow; antenna yellow, apical five or six segments darkened; legs more or less honey brown with hind femur slightly darkened on anterior and posterior sides.

Host: *Hypolixus truncatulus* (Fab.), *Pempherulus affinis* (Faust.), *Sinoxylon sudanicum* Lesne.

Distribution: India (Kerala, Punjab).

Discussion: *S. critolaus* Nixon is similar to *S. vulnificus* Wilkinson in having pronotal keel very feeble fused with posterior margin of pronotum and base of ocellar triangle distinctly longer than its sides. However, it can be separated from *S. vulnificus* by a combination of characters given in the key and also by 1) Head very slightly narrower behind eyes than across them (Head transverse

as wide behind eyes as across them in *S. vulnificus*); 2) Vertex almost smooth, at most with traces of transverse aciculation (Vertex transversely striated in *S. vulnificus*); 3) Pronotal keel medially fused with posterior margin of pronotum (Pronotal keel widely fused with posterior margin of pronotum in *S. vulnificus*) and 4) Mesopleura sculptured (Mesopleura smooth and shining in *S. vulnificus*).

Remarks: This species is not represented in the present collection. The above diagnosis is from the original description by Nixon (1943).

Spathius dido Nixon

Spathius dido Nixon, 1943. *Trans. R. Ent. Soc. London.* , 93: 285- 286.

Holotype. Female. India (BMNH)

Diagnosis: Female: Length 5.0mm, ovipositor 7.0mm. Head narrower behind eyes than across them; frons and vertex with strong regular transverse striation; ocelli nearly in an equilateral triangle; eyes less bulging longer axis 3.0x length of malar space; face transversely striate, obliterated along medially; pronotal keel hardly developed, medially more or less contiguous with posterior margin of pronotum, laterally sharply delimited, smooth on at least posterior half; mesonotum falling perpendicularly to pronotum, its lobes less clearly defined as separate convexities with strong shining rugosities; scutellar sulcus with three carinae; scutellum very feebly convex, scaly reticulate; basal carina of propodeal areola 0.33 to 1.50x its forks, ridge between areola and area petiolaris usually strong, propodeal areas virtually smooth and highly polished except rugose spiracular area; mesopleuron smooth and polished precoxal sulcus crenulate; hind coxa with a prominent projection and strongly striate dorsally; hairs on the upper surface of hind tibia only a little longer than middle width of tibia; first tergite 2 x propodeum; with more or less shining transverse rugae from spiracles to apical dilation; ovipositor sheath distinctly longer than body.

Colour: Head rust red; mesosoma dorsally black; pronotum, mesopleura and mesosternum suffused with dull red; first tergite black with apex red; remaining tergites very dark brown with slight reddish tint; antenna more or less honey brown; hind femur infuscated, paler at base; hind tibiae honey yellow; hind tarsus brown; stigma dark brown apically pale basally.

Male: Unknown

Host: Unknown

Distribution: India (Kerala, Tamil Nadu)

Materials Examined: 1Female, INDIA: Kerala, Kozhikode Dt., Chaliyam, Vattaparamba (11°9'N 75°49'E) Sheeba, M., 14.iii.2003; 1Female, Kerala, Malappuram Dt., Calicut University Campus (11°7'N 75°5'E), 10.vi.2003; 3Females, Kerala, Malappuram Dt, Nilambur (11°16'N 76°15'E) Sumodan, 1985.

Discussion: *S. dido* Nixon is similar to *S. medon* Nixon in having mesopleura smooth; scutellum not transversely rugose and basal carina 0.33 to 1.50x its forks. However it differs from *S. medon* Nixon in having: 1) Face transversely striated, somewhat confluent but more or less obliterated along middle line (Face with weak striation in *S. medon*); 2) Frons and vertex with fine, strong transverse striation (Frons and vertex much less coarsely striated in *S. medon*); 3) Lobes of mesoscutum less clearly defined with strong shining rugosities (Middle lobe of mesoscutum more sharply defined, its lateral margin being almost carinate in *S. medon*) and 4) Areas of propodeum virtually smooth and highly polished except rugose spiracular area (Areas of propodeum not conspicuously polished in *S. medon*).

Remarks: The above diagnosis is from the original description by Nixon (1943).

***Spathius keralensis* sp. nov.**

(Figs.108-111)

Holotype: Female: Length of body 3.98mm of antenna 4.63mm, of fore wing 2.97mm and of ovipositor 3.65mm.

Head: Width 1.11 and 1.60x its median length in anterior (Fig.109) and dorsal (Fig.110) view respectively; antenna segmented; length of scape 1.67x its width; length of third, fourth and penultimate antennal segments 6.0, 4.0, and 3.0x their width respectively; frons transversely striated, obliterated medially; OOL: diameter of posterior ocellus: POL = 9: 4: 8; base of ocellar triangle longer than its sides; vertex smooth, shiny with long, sparse hairs (Fig.110); temple 0.60x length of eye, smooth, shiny and sparsely hairy; face with weak transverse striations, punctate between striation; medially smooth and shiny; length of face 0.60x width; intertentorial distance: tentorioocular distance = 8:3; malar space smooth and shiny.

Mesosoma: Length of mesosoma 1.71x its height; sides of pronotum striated dorsally, reticulate ventrally; pronotal keel well marked, separated from posterior margin of pronotum; mesonotum shagreen with sparse outstanding hairs; notauli distinct and crenulate; scutellar sulcus wide with three carinae; scutellum flat smooth, shiny with three pairs of hairs laterally; propleuron striated; mesopleuron medially smooth, anterodorsally rugose, anteriorly reticulaterugose; precoxal sulcus foveate; pleural sulcus crenulate, sparsely hairy except medially; metapleuron reticulaterugose, covered with sparse long hairs; propodeum areolate, dorsal areas well marked (Fig.111); fore wing 4.14x its maximum width; stigma 4.86x its width; vein r 0.86x width of stigma; vein 3-SR 4.75x r; ratio of length of fore wing veins = r : 3-SR: SRI = 3 : 8.5 : 20; 2-SR: 3-SR:r-M = 11.5 : 8.5 : 6.5 (Fig.108); cu-a interstitial; hind coxa angular beneath; length of femur, tibia and basitarsus of hind leg 4.07, 16.33, and 8.0x their width respectively.

Metasoma (Fig.108): First tergite reticulaterugose; remaining tergites smooth and shiny; ovipositor 1.21x fore wing.

Colour: Head, scape, pedicel, femora, tibiae and tarsi of all legs and ovipositor yellowish brown; coxae and trochanters of all legs yellow; mesosoma and first tergite reddish brown; eyes, ocelli, all tergites (except first) black; ovipositor sheath brown.

Male: Similar to female except length 3.17mm

Host: Unknown.

Biology: Unknown.

Etymology: Named after Kerala State from where the holotype was collected.

Material examined: Holotype, Female, INDIA: Kerala Thiruvananthapuram Dist., Sreekaryam (8°32'N 76°55'E), T.C. Narendran & Party, 11.xii.2004. Paratypes: 2 Females. Data same as that of holotype.

Discussion: This new species comes close to *S. opis* Nixon in having vertex completely smooth and base of ocellar triangle clearly a little longer than sides. However it differs from *S. opis* Nixon in having 1) Face weakly striated, punctate between striation, medially smooth and shiny (Face with shining subconfluent striation, interrupted medially with a weak elevation in *S. opis*); 2) Pronotal keel well marked, separated from posterior margin of pronotum (Pronotal keel very indistinct, medially almost obliterated in *S. opis*); 3) Scutellum smooth and shiny (Scutellum smooth or with traces of ground sculpture in *S. opis*).

***Spathius medon* Nixon**

Spathius medon Nixon. 1943. *Trans. R. Ent. Soc. London.*, 93: 286.
Holotype. Female. India (BMNH).

Diagnosis: Female. Length 3.5mm. Antenna 40-42 segmented; frons and vertex with a little more fine striations; face weakly striated; mesonotum with less smooth raised rugosities; middle lobe more sharply defined and lateral

margin carinate; carinae formed by short often incomplete connections between transverse rugosities slope down into notauli; areas of propodeum not quite conspicuously polished; vein m-cu received into second cubital cell nearer 2-SR.

Colour: Propodeum and metapleura black; mesosoma entirely red; first tergite red; remaining tergites pale, especially towards base.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala, Tamil Nadu).

Materials Examined: 52Females & 2Males, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11°7' N 75° 5' E), Sudheer, K., 31.v.2001; Divakaran, 16.vii.2001; Anitha, P.V., 20.vii.2001; Girish Kumar, P., 31.viii.2001; Sumodan, 5.vi.1987; 9.vi.1987; x.vi.1987; 13.vi.1987; 24.vi.1987; 18.vii.1987; 14.viii.1987; 12.x.1988; Kerala, Malappuram Dt., Nilambur, Manimooly forest (11°17'N 76°15'E), T.C. Narendran & party, 29.i.2003; Nilambur (11°16'N 76°15'E), Sumodan, 1985; Kerala, Kannur Dt., Kottiyoor forest (10° 7' N 78° 49' E), T.C. Narendran & party, 17 & 18.ii.2003; Kerala, Thiruvananthapuram Dt., Palode (8°42'N 77°2'E), T.C. Narendran & party, 10.xii.2004; Kerala, Thrissur Dt., Vellakkarithadam (10°33'N 75°1'E), Sumodan, 5.ii.1989; Kerala, Thrissur Dt., Peechi (10°31'N 76°13'E), Sumodan, 5.ii.1989, Kerala, Wayanad Dt., Puzhamudi (11°37'N 76°6'E), Sumodan, 24.ii.1988; Kerala, Kozhikode Dt., Nedumpoyil (11°17'N 75°49'E), Sumodan, 24.ii.1988; Kerala, Pathanamthitta Dt., Konni (9°16'N 76°46'E), Sumodan, 24 & 26.xi.1989; Kerala, Wayanad Dt., Adimali (10°2' N 76°59' E), Sumodan, 3.xii.1988.

Discussion: *S. medon* Nixon is similar to *S. dido* Nixon in having mesopleura smooth; scutellum not transversely rugose and basal carina 0.33 to 1.50x its forks. However it differs from *S. medon* Nixon in having: 1) Face with weak striation (Face transversely striated, somewhat confluent but more or less

obliterated along middle line in *S. dido*); 2) Frons and vertex much less coarsely striated (Frons and vertex with fine, strong transverse striation in *S. dido*); 3) Middle lobe of mesoscutum more sharply defined, its lateral margin being almost carinate (Lobes of mesoscutum less clearly defined with strong shining rugosities in *S. dido*) and 4) Areas of propodeum not conspicuously polished (Areas of propodeum virtually smooth and highly polished except rugose spiracular area in *S. dido*).

Remarks: The above diagnosis is from the original description by Nixon (1943).

***Spathius ochus* Nixon**

(Fig.112-114)

Spathius ochus Nixon. 1943. *Trans. Roy. Ent. Soc. London*. 93(2): 372-373. (USNM).

Redescription: Female: Length of body 4.78 mm, fore wing 3.06mm, and of ovipositor mm.

Head: Head compressed dorsoventrally; width 1.42 and 1.25x its median length in anterior (Fig.113) and dorsal (Fig.114) view respectively; tip of antenna broken; length of scape 2.0x width 0.60x third antennal segment; length of third and fourth antennal segments 6.67, and 5.0x their width respectively; frons with transverse broken striations; ocelli almost in an equilateral triangle; OOL: diameter of posterior ocellus: POL = 7:3.5:5; vertex with fine transverse striations sublaterally (Fig.114), sparsely hairy; eye glabrous slightly more obliquely placed; temple striated, 0.54x length of eye in dorsal view; gena weakly rugose; face finely rugose, moderately long hairy; length of face 0.39x its width; width of hypoclypeal depression 0.47x minimum width of face; malar space rugose, 1.80x basal width of mandible.

Mesosoma (Fig.112): Length 3.20x its height; pronotum reticulate rugose, transversely swollen just behind middle, the swelling surmounted by the

obsolescent pronotal keel; mesonotum shagreen with carinae and raised rugosity posteriorly and sparse outstanding hairs; notauli superficially impressed; scutellar sulcus wide, crenulate scutellum flat; metanotum carinate, moderately hairy; propleuron rugose; mesopleuron shagreen, with sparse outstanding hairs; precoxal sulcus shallow feebly crenulate; pleural sulcus crenulate; metapleuron rugosereticulate; propodeum finely reticulaterugose, dorsal area not differentiated, open behind; fore wing strongly dappled; length 4.15x its maximum width; stigma 5.0x its width; vein r as long as width of stigma; vein 3-SR 3.78 x r; ratio of length of fore wing veins: r: 3-SR:SR1= 4.5:17:20.5; 2-SR:3-SR:r-m= 8:17:6; cu-a postfurcal, vertical hind coxa rounded beneath, shagreen, with sparse outstanding hairs, 1.63x width; hind femur stouter; length of femur, tibia and basitarsus of hind leg 2.59, 10.67 and 8.0x their width respectively.

Metasoma: First tergite reticulaterugose with a pair of sublateral and lateral carinae; remaining tergites shagreen; ovipositor sheaths 0.50x metasoma, hairy throughout its length (Fig.112).

Colour: Head and antenna reddish brown; Eyes black with gray, thin outer layer; mesosoma and first tergite black; fore and mid coxae, trochanters, apical half of tibiae, ovipositor basally and tarsal segments (except apical tarsal segment) yellow; wings dappled, veins and apical two third of stigma brown, (except basal one third of stigma pale); hind coxa, all femora, basal half of tibia, second tergite onwards and apical half of ovipositor blackish brown.

Male: Unknown

Host: Unknown

Biology: Unknown

Materials examined: 1Female. INDIA: Kerala, Wayanad Dt., Banasura Hills (11°28'N 75°46'E), K, Rajmohana, 12.v.2005.

Discussion: *S. ochus* Nixon is similar to *S. labdacus* Nixon in having mesosoma much less flattened, its length at most 3.25x its width at tegulae and head at most slightly flattened. However it differs from *S. labdacus* in having 1) Pronotum strongly transversely swollen and surmounted by obsolescent pronotal keel (Pronotal keel sharp, strong, free raised above level of posterior margin of pronotum in *S. labdacus*); 2) Face rugose (Face reticulaterugose in *S. labdacus*); 3) Mesonotum shagreen, with carinae and raised rugosity posteriorly (Mesonotum scaly reticulate, feebly shining); 4) Scutellum flat (Scutellum evenly convex in *S. labdacus*).

Remarks: As the original description is insufficient for identification of the species, a redescription is provided here. The above diagnosis is from the original description by Nixon (1943).

***Spathius palodensis* sp. nov.**

(Figs.115-118)

Holotype: Female. Length of body 3.74mm, of antenna 5.18mm, of fore wing 2.33mm and of ovipositor 2.31mm.

Head: Width 1.19 and 1.76x its median length in anterior (Fig.116) and dorsal (Fig.117) view respectively; antenna with 33 segments; length of scape 1.67x its width; length of pedicel as long as its width; length of third, fourth and penultimate antennal segments 5.50, 4.50, and 5.0x their width respectively; frons with fine transverse striations, broken medially; OOL: diameter of posterior ocellus: POL = 9:4.5:7.5; base of ocellar triangle longer than its sides (Fig.117); vertex shiny, with traces of striation posterolaterally and with a few hairs; temple 0.30x length of eye, smooth, shiny with a few hairs; face with broken striation but not strongly, medially smooth; length of face 0.70x its width; intertentorial distance : tentorioocular distance = 3:1; malar space smooth and shiny.

Mesosoma: Length of mesosoma 1.75x its height; pronotum shiny, with slight rugose sculpture laterally, pronotal keel well indicated, separated from posterior margin of pronotum; mesonotum falling gradually to pronotum, shagreen, with two submedian posterior carinae and sparse outstanding hairs along notauli; notauli distinct and crenulate; scutellar sulcus wide with one complete median carina and two lateral incomplete carinae, extending to anterior half not to anterior margin of sulcus; scutellum flat, smooth, shiny with 2 pairs of hairs laterally; metanotum carinate, with short hairs; propleuron rugose; mesopleuron smooth, shiny with sparse hairs; pleural sulcus foveate; pleural sulcus, crenulate; mesopleuron reticulaterugose; propodeal areola well developed, basal carina as long as its forks; fore wing 3.75x its maximum width; length of stigma 4.75x its width; vein r 0.50x width of stigma; 3-SR 4.50x r; ratio of lengths of fore wing veins: r:3-SR :SR1 = 2:9:21; 2-SR:3-SR:r-m = 11:9:6 (Fig.115); cu-a interstitial; hind coxa angular

beneath; length of femur, tibia and basitarsus of hind leg 4.50, 13.0, and 6.0x their width respectively.

Metasoma: Length of first tergite 3.40x its apical width; all tergites smooth and shiny; ovipositor sheath as long as metasoma (Fig.115).

Colour: Head, hind tarsal segments and basal nine antennal segments and apical antennal segment and metasoma except first tergite yellowish brown; 14 medial antennal segments brown; 11 apical antennal segments (except last segment yellowish brown) and base of mandibles (except reddish brown tip), coxae and trochanters of all legs pale yellow; pronotum, mesoscutum, mesopleuron anterodorsally and posteroventrally, first tergite reddish brown; mesopleuron medially, mesosternum and propodeum black; femora, tibiae and tarsi of fore and mid legs and tibiae of hind leg yellow; femur of hind leg yellow with a brown patch medially; wing veins and ovipositor sheath pale brown.

Male: Unknown.

Host: Unknown

Biology: Unknown.

Distribution: India (Kerala)

Etymology: Named after the locality Palode from where the holotype is collected.

Material examined: Holotype. Female. INDIA: Kerala, Thiruvananthapuram Dt., Palode (8°42'N 77°2'E), T.C. Narendran & Party, and 10.xii.2004, Paratypes: 4Females and 1 male. Data same as that of holotype.

Discussion: This new species is similar to *S. melpomene* Nixon in having basal carina of areola as long as its forks. However it differs from *S. melpomene* in having 1) Frons with fine transverse striation, not broken medially (Frons with strong, shining irregular transverse striation in *S.*

melpomene); 2) Vertex shiny, with traces striation posterolaterally (Vertex completely smooth with a deep smooth furrow skirting each posterior ocellus, join behind ocelli and each terminates anteriorly in a large pit); 3) Base of ocellar triangle longer than its sides (Ocelli arranged almost in an equilateral triangle in *S. melpomene*); 4) Eyes normal (Eyes rather large, very bulging in *S. melpomene*); 5) Pronotal keel well marked (Pronotal keel present only medially as a very feeble ridge in *S. melpomene*); 6) Scutellum smooth and shiny (Scutellum with thick, transverse rugae in *S. melpomene*)

***Spathius priapus* Nixon**

(Fig.119)

Spathius priapus Nixon, 1943. *Trans. R. Ent. Soc. London.*, 93: 377.
Holotype. Female. Malaysia. (USNM).

Diagnosis: Female: Length of body 5.50 – 9.0mm. Antenna very long, slender with 60 segments; third antennal segment 1.42x scape plus pedicel; vertex behind eyes with strong smooth striation; base of ocellar triangle longer than its sides; face transversely rugose; pronotal keel well developed, free; mesonotum sloping gradually to pronotum, lobes shining, with very fine, broken scaly reticulation, posterior carinae with short lateral branches forming costae of notauli; basal carina of propodeal areola ill defined, as long as its forks, dorsal areas not delimited, surface finely reticulaterugose; mesopleura usually smooth, sometimes crenulation of precoxal sulcus extends upwards leaving no extensive polished surface; length of fore wing 4.90x its width; ratio of length of fore wing veins: r: 3-SR: SRI = 6:19.5:25; vein r not in straight line with 3-SR; vein m-cu 0.83x r; vein M+CU sinuate; hind femur not very abruptly narrowed at base; hairs of upper surface of hind tibia 1.25 to 1.50x its middle width; first tergite as long as propodeum, reticulaterugose except anterior to spiracles and apically; tergite second plus third 1.18x its apical width, transverse and anteriorly concentric smooth parallel aciculation apically, either aciculate and continuous with apical area or finely transversely

rugose; remaining tergites with smooth transverse aciculation; ovipositor sheath as long as body.

Colour: Blackish brown to black with head reddish or brownish red. Fore and mid coxae and palpi pale yellow; all femora and tibiae brown to blackish throughout; tarsi except apical segment, yellowish-brown; fore wing, except for a faint and very narrow transverse hyaline fascia at middle, without any marked darker and paler patches; antenna brownish yellow dark apically.

Male: Length 5.2mm. Length of tergite second plus third more than 2.0x its apical width, with very fine punctatereticulation basally and finely rugose with transverse aciculation apically.

Host: Unknown

Biology: Unknown

Distribution: India (Kerala), Philippines.

Materials examined: 1 Female, INDIA, Kerala, Kozhikode Dt., Nanminda (11° 26' N 75° 50' E), Girishkumar, P., 14.v.2006.

Discussion: *S. priapus* Nixon is similar to *S. seriphus* Nixon in having pronotal keel free; mesopleuron nearly smooth, rarely carinae of precoxal sulcus extend upwards leaving no polished surface and areola well defined. However it differs from *S. seriphus* in having 1) Tergites except first tergite with smooth transverse aciculation (Tergites except first finely longitudinally rugose, in *S. seriphus*); 2) Basal carina of propodeal areola as long as its forks (Basal carina 1.50x its forks in *S. seriphus*); 3) Dorsal area not delimited posteriorly and surface mostly finely reticulaterugose (Dorsal area shining in *S. seriphus*) and 4) Ovipositor sheath longer than metasoma (Ovipositor sheath a little less than metasoma in *S. seriphus*).

Remarks: Male is not represented in the present work. The above diagnosis of male is from the original description of Nixon (1943). The above diagnosis is from the original description by Nixon (1943).

***Spathius seriphus* Nixon**

Spathius seriphus Nixon. 1943. *Trans. R. Ent. Soc. London.* 93: 377.
Holotype. Female. Singapore (USNM).

Diagnosis: Female. Length 4.50mm Head slightly narrower behind eyes than across them; frons with fine transverse striations; base of ocellar triangle slightly longer than its sides; vertex virtually smooth with merest trace of sculpture medially; pronotal keel well developed; mesonotum sloping gradually to pronotum covered with long, sparse, outstanding hairs; propodeal areola well developed, basal carina 1.50x its forks; dorsal areas shining, with raised though very feeble rugosity; mesopleura nearly smooth; fore tarsus not much longer than fore tibia; length of mid basitarsus 3.0x its width; hind basitarsus 2.0x first metatarsal segment; mid tarsus 3.0x its width; first tergite thick, 1.80x length of propodeum; remaining tergites almost parallel sided; tergites second plus third with a sharp completely differentiated lateral margin; tergite fine disproportionately larger than six; tergites except first dull with fine rugose longitudinal striation, interstices of ridges rugulose; ovipositor sheaths a little longer than metasoma.

Colour: Head and mesosoma (except propodeum suffused with black posteriorly) yellowish red; first tergite dark reddish brown; remaining tergites deep ochraceous yellow with a large reddish brown patch; legs honey yellow.

Male: Unknown.

Host: Unknown.

Distribution: India (Kerala), Malaysia.

Materials examined: 2Females, INDIA: Kerala, Kozhikode Dt., Tiruvannur (11° 16' N 75° 47' E), Rajmohana, 6.vii.2000; 10.viii.2005.

Discussion: *S. seriphus* Nixon is similar to *s. priapus* Nixon. It can be separated from *S. priapus* Nixon in having the characters given in the key.

Remarks: The above diagnosis is from the original description by Nixon (1943).

Spathius siculus Nixon

Spathius siculus Nixon, 1943. *Tans. R. Ent. Soc. London.*, 93: 348. Holotype. Female. India (BMNH).

Diagnosis: Female: Head not narrower behind eyes than across them; antenna 30 segmented; frons and vertex closely smoothly striated; face with broken transverse striation, more or less obliterated on the medial elevation; length of eye 3.0x malar space; base of ocellar triangle longer than sides; pronotal keel not developed; mid lobe of mesoscutum angularly truncate in front, truncature feebly concave, its base lying distinctly posterior to its apex; notauli well defined and carinate; posterior carina of mesonotum well defined; lobes of mesoscutum scaly reticulate; scutellum strongly and evenly convex, propodeum with basal carina as long as its forks, areola fused with area petiolaris, dorsal area dull, scaly reticulate; hind coxa sharply angled at base; hind tibia sparsely hairy; upper surface with erect hairs, as long as middle width of tibia; basal third of median and submedian cell hyaline and without hairs; petiole 1.50x propodeum, with fine broken longitudinal striation; second and third tergites with slightly more wide meshed scaly reticulation on an ill defined basal area; remaining tergites with fine surface sculpture; ovipositor sheath about as long as metasoma.

Colour: Brown, with a yellowish tinge on mesosoma; pale flagellar segments not markedly ringed with black apically; apical half of hind coxa brown; hind tibiae not at all or only feebly paler at extreme base.

Male: Unknown

Host: Bred from bamboo pole.

Distribution: India (Kerala, Punjab)

Discussin: *S. siculus* Nixon is similar to *S. capaneus* Nixon in having pronotal keel not well developed, vertex smoothly striate and hind coxa with dentiform projection indicated. However it differs from *S. capaneus* in having 1) Head narrower behind eyes than across them (Head subcubical, hardly narrower behind eyes than across them in *S. capaneus*); 2) Face with broken transverse striation; more or less obliterated on medial elevation (Face evenly and moderately strongly rugose reticulate in *S. capaneus*); 3) Frons with close smooth striation in *S. siculus* (Frons closely rugosestriate all over in *S. capaneus*); 4) Scutellum strongly and evenly convex (Scutellum almost flat, shining and more or less smooth in middle, weakly striated laterally in *S. capaneus*); 5) First tergite 1.50x propodeum (First tergite a little shorter than propodeum in *S. capaneus*) and 6) ovipositor sheath as long as metasoma (Ovipositor sheath longer than metasoma in *S. capaneus*).

Remarks: This species is not represented in the present collection. The above diagnosis is based on the original description by Nixon (1943).

***Spathius tereus* Nixon**

(Figs.120-121)

Spathius tereus Nixon. 1943. *Trans. Roy. Ent. Soc. London*, 93 (2): 373.
Holotype. Female. Philippines (USNM).

Redescription: Female: Length of body 3.156mm, of antenna 2.91mm, of fore wing 2.13mm and of ovipositor 0.72mm.

Head: Dorsoventrally compressed; width 1.32x its median length in dorsal (Fig.121) view antenna 25 segmented; length of scape 1.50x its width; length of third, fourth and penultimate segments 6.67, 5.33 and 3.33x their width respectively; frons flat, shiny finely rugose; OOL: diameter of posterior ocellus: POL= 6:2:6; vertex smooth and shiny; ocelli almost in an equilateral triangle; temple 0.67x length of eye in dorsal view; face shagreen; malar space smooth and shiny;

Mesosoma: Dorsoventrally compressed; length 5.54x its height; pronotum, mesonotum, scutellum and propodeum at same level (Fig.120); pronotum reticulaterugose; mesonotum shagreen, reticulaterugose posteromedially; mesoscutum with a posterior midlongitudinal carina; notauli absent; scutellar sulcus narrow; propleuron rugose; mesopleuron shagreen, smooth and shiny medially; pleural sulcus crenulate; metapleura shagreen; propodeum with a midlongitudinal carina basally and a pair of lateral carinae, shagreen anteriorly, reticulaterugose posteriorly; length of fore wing 4.51x its width; ratio of length of fore wing veins: r: 3-SR: S-RI = 3: 15.5: 18.5; vein 3-SR 5.17x r (Fig.120); cu-a interstitial; M+CU strongly curved; hind coxa swollen, shagreen; hind femur swollen; length of femur, tibia and basitarsus of hind leg 2.93, 9.63, and 7.50x their width respectively.

Metasoma: Length 1.45x mesosoma; first tergite longitudinally rugosestriate; remaining tergites shagreen; ovipositor sheath 0.44x metasoma.

Colour: Black except following: all femora brown; head reddish brown; scape, pedicel, eight basal segments (remaining antennal segments brown), extreme apex of tibiae, all tarsi brownish yellow; eyes grey, medially black; coxa of fore and mid legs, trochanter, femur and tibiae of all legs and ovipositor sheath brown; wings infumate.

Male: Similar to female (Nixon, 1943).

Host: Unknown

Biology: Unknown

Distribution: India (Kerala), Philippines.

Materials examined: 1Female, INDIA: Kerala, Malappuram Dt., Calicut University Campus (11° 7' N 75° 5' E), Sumodan, P.K., 20.v.1989.

Discussion: *Spathius tereus* Nixon is similar to *S. ochus* Nixon in having head and mesosoma conspicuously flattened dorsoventrally ocelli almost in an equilateral triangle and pronotum lying virtually in same plane as mesonotum. However it differs from *S. ochus* in having 1) Frons flat, shiny

and finely rugose (Frons with broken transverse striation in *S. ochus*); 2) vertex smooth and shiny in *S. tereus* (vertex finely transversely striated in *S. ochus*) and 3) Face shagreen in *S. tereus* (Face finely rugose in *S. ochus*).

Remarks: As the original description is insufficient for identification of the species, a redescription is provided here. Male is not represented in the present collection. The details of male is from the original description by Nixon(1943). It is the firs record of this species from Kerala.

**CHECK LIST OF BRACONID SPECIES OF INDIA BELONGING TO
THE SUBFAMILIES OF BRACONINAE AND DORYCTINAE
SUBFAMILY 1. BRACONINAE**

GENUS 1. *AMYOSOMA* VIERECK

1. *Amyosoma chinensis* (Szepligeti, 1902) India (Karnataka, Bihar, Kerala, Tamil Nadu, Delhi), Indonesia, Korea, Malaysia, Mauritius, Philippines, Taiwan, Thailand
= *Bracon chinensis* Szepligeti,

1902

= *Microbracon chilocida*

Ramakrishna Ayyar,

1928

GENUS 2. *ANNECTOBRACON* CHISHTI & QUICKE

1. *Annectobracon excavata* Chishti & India (Ranchi), Sri Lanka
Quicke, 1995

GENUS 3. *APHRASTOBRACON* ASHMEAD

1. *Aphrastobracon alcidiphagus* India (Tamil Nadu)
Ramakrishna Ayyar, 1928
2. *Aprastobracon ayyari* Watanabe, India (Tamil Nadu)
1950
= *Aphrastobracon maculipennis*
Ramakrishna Ayyar,
1926
3. *Aphrastobracon flavipennis* India (Tamil Nadu, Kerala)
Ashmead, 1896

GENUS 4. *ANGUISTIBRACON* QUICKE

1. *Anguistibracon leptogaster* India (Assam)
(Cameron,
1899)
= *Bracon leptogaster* Cameron,

GENUS 5. **ASPIDOBRACON** VAN ACHTERBERG

1. *Aspidobracon noyesi* India (Karnataka, Kerala, Tamil Nadu), China
van Achterberg,
1984

GENUS 6. **ATANYCOLUS** FOERSTER

1. *Atanycolus hookeri* (Cameron, India (Sikkim)
1907)
= *Iphiaulax hookeri* Cameron,
1907

GENUS 7. **BATHYAULAX** SZEPLIGETI

1. *Bathyaulax carpomyiae* India (Tamil Nadu)
Ramakrishna Ayyar,
1928
2. *Bathyaulax trypaeniphaga* India (Tamil Nadu)
Ramakrishna Ayyar,
1928

GENUS 8. **BRACON** FABRICIUS

1. *Bracon aculeator* (Fabricius, India (Tamil Nadu)
1793)
= *Ichneumon aculeator*
Fabricius,
1793
2. *Bracon agathon* sp. nov. India (Kerala)
3. *Bracon albolineatus* Cameron, South India, Malaysia, Sri Lanka,
1910 Thailand
4. *Bracon bicolor* (Haider, Ahmed, India (Punjab)
Pandey & Shujauddin, 2004)

- =*Habrobracon bicolor* Haider,
Ahmed, Pandey & Shujauddin,
2004
5. *Bracon brevicornis* (Wesmael, 1838) Cosmopolitan
= *Habrobracon brevicornis*
(Wesmael, 1838)
= *Braco brevicornis* Wesmael,
1838
6. *Bracon charien* sp. nov. India (Kerala)
7. *Bracon cecidobius* Kieffer, 1905 North India
8. *Bracon dachaon* sp. nov. India (Kerala)
9. *Bracon daphnephilae* Szepligeti, 1905 North India
- 10 *Bracon daris* sp. nov. India (Kerala)
- .
- 11 *Bracon femorator* (Fabricius, 1793) India (Tamil Nadu)
- .
- = *Ichneumon femorator*
Fabricius, 1793
- 12 *Bracon fletcheri* Silvestri, 1916 India (Bihar)
- .
- 13 *Bracon gelechia* Ashmead, 1889 North India, West Indies, Bermuda
- .
- = *Habrobracon gelechia*
(Ashmead, 1889)
- = *Microbracon gelechia*
(Ashmead, 1889)
- = *Bracon tetralophae*
(Viereck, 1912)
- = *Habrobracon tetralophae*

- Viereck, 1912
 = *Habrobracon johannsoni*
 Viereck, 1912
 = *Bracon diversicolor*
 (Viereck,
 1921)
 = *Habrobracon diversicolor*
 Viereck, 1921
- 14 *Bracon gelechidiphagus* India (Kerala, Punjab, Simla)
 · (Ramakrishna Ayyar, 1928)
 = *Microbracon gelechidiphagus*
 (Ramakrishna Ayyar, 1928)
- 15 *Bracon greeni* (Ashmead, 1896) India (Kerala, Uttar Pradesh), Sri
 · Lanka
 = *Microbracon greeni* Ashmead,
 1896
 = *Bracon tachardiae* Cameron,
 1899
- 16 *Bracon hebetor* Say, 1836 Cosmopolitan
 · = *Bracon dorsator* Say, 1836
 = *Bracon juglandis* Ashmead,
 1889
 = *Habrobracon vernalis*
 Szepligeti, 1901
 = *Habrobracon beneficentior*
 (Viereck, 1911)
 = *Habrobracon plotnicovi*
 Bogoljubov, 1914
 = *Bracon breviantennatus*
 de Stefani-Perez, 1919
 = *Habrobracon tortricidarum*
 Goidanich, 1934
 = *Habrobracon pectinophorae*

- Watanabe, 1935
 = *Habrobracon turkestanicus*
 Telenga, 1936
 = *Habrobracon lozinskii*
 Bogachev, 1939
 = *Habrobracon hebetor* var.
asiatica Telenga, 1936
 = *Microbracon serinopae*
 Cherian, 1929
- 17 *Bracon heteron* sp. nov. India (Kerala)
 .
- 18 *Bracon ingratus* Cameron, 1897 India (Tamil Nadu)
 .
- 19 *Bracon incarnatus* (Ramakrishna Ayyar, 1928) India (Tamil Nadu)
 .
 = *Microbracon incarnates*
 Ramakrishna Ayyar, 1928
- 20 *Bracon keralense* sp. nov. India (Kerala)
 .
- 21 *Bracon kitchneri* (Dudgeon & Gough, 1914) India (Madhya Pradesh, Maharashtra, Gujarat, Rajasthan, Uttar Pradesh), Western Palearctic Regions
 .
 = *Rhogas kitchneri* Dudgeon & Gough, 1914
 = *Microbracon kitchneri* (Dudgeon & Gough, 1914)
 = *Habrobracon kitchneri* (Dudgeon & Gough, 1914)
- 22 *Bracon koridor* sp. nov. India (Kerala)
 .
- 23 *Bracon laminator* (Fabricius, 1798) India (Tamil Nadu)
 .
 = *Ichneumon laminator*

Fabricius,

1798

- 24 *Bracon lefroyi* (Dudgeon & Gough, 1914) India (Kerala, Punjab)
·
= *Rhogas lefroyi* Dudgeon & Gough, 1914
- 25 *Bracon melleus* (Ramakrishna Ayyar, 1928) India (Tamil Nadu)
·
= *Microbracon melleus* Ramakrishna Ayyar, 1928
- 26 *Bracon molycaon* sp. nov. India (Kerala)
·
- 27 *Bracon nexperon* sp. nov. India (Kerala)
·
- 28 *Bracon pongamiaensis* (Ramakrishna Ayyar, 1928) India (Tamil Nadu)
·
- 29 *Bracon procnis* sp. nov. India (Kerala)
·
- 30 *Bracon punjabensis* Cameron, 1902 India (Punjab)
·
- 31 *Bracon richei* Brulle, 1846 India (Punjab)
·
- 32 *Bracon stom* sp. nov. India (Kerala)
·

Genus 9. ***BicariniBracon*** Quicke & Walker

1. *BicariniBracon luteus* Quicke & Walker, 1991 India
2. *BicariniBracon tricarinatus* (Cameron, 1897) India
= *Campyloneurus tricarinatus* Cameron, 1897
= *Bracon tricarinatus* Cameron,

1897

Genus 10. *Campyloneurus* Szepligeti

1. *Campyloneurus campbelli* North India
(Cameron, 1907)
= *Iphiaulax campbelli* Cameron,
1907
2. *Campyloneurus carinogasterus* India (Karnataka)
Ramakrishna Ayyar, 1928
3. *Campyloneurus firmus*
(Cameron, 1900) India (Meghalaya)
= *Bracon firmus* Cameron, 1900
4. *Campyloneurus gibbiventris* North India
Enderlein, 1920
5. *Campyloneurus hindostanus* India
(Smith, 1873)
= *Bracon apicalis* Brulle, 1846
6. *Campyloneurus itea* (Cameron, India (Tamil Nadu)
1897)
= *Bathyaulax itea* (Cameron,
1897)
= *Bracon itea* Cameron, 1897
7. *Campyloneurus lacciphagus* India (Tamil Nadu)
Shenefelt, 1978
= *Campyloneurus indicus*
Ramakrishna Ayyar, 1928
8. *Campyloneurus reticulates* India
Enderlein, 1920
9. *Campyloneurus sikkimensis* India (Sikkim)
(Cameron, 1907)
= *Iphiaulax sikkimensis*

Cameron,

1907

- 10 *Campyloneurus umbratilis* India (Meghalaya)
(Cameron, 1899)
= *Bracon umbratilis* Cameron,
1902

GENUS 11. **CASSIDIBRACON** QUICKE

1. *Cassidibracon debatus* sp.nov. India (Kerala)
2. *Cassidibracon indicus* India (Kerala)
Narendran
& Rema, 1994
3. *Cassidibracon malabaricus* India (Kerala)
Narendran, 1994
4. *Cassidibracon rebatus* sp. nov. India (Kerala)
5. *Cassidibracon sumodani* India (Kerala)
Narendran & Madhavikutty,
1994

GENUS 12. **CHAOILTA** CAMERON

1. *Chaoilta himalayensis* India (Meghalaya)
(Cameron,
1899)
= *Bracon himalayensis* Cameron,
1899
2. *Chaoilta lamellate* Cameron, India (Assam)
1899
3. *Chaoilta malabarica* India (Kerala)
(Ramakrishna Ayyar, 1928)
= *Iphioilta malabarica*
Ramakrishna Ayyar, 1928

GENUS 13. **CHELONOGASTRA** ASHMEAD

1. *Chelonogastra trifasciata* India (Kerala)
Ramakrishna Ayyar, 1928
2. *Chelonogastra sumodani* sp. nov. India (Kerala)

GENUS 14. **CRASPEDOLCUS** ENDERLEIN

1. *Craspedolcus simlaensis* India (Sikkim, Meghalaya)
(Cameron, 1899)
= *Iphiaulax lineaticarinatus*
Cameron, 1907
= *Bracon lepcha* Cameron, 1899
2. *Craspedolcus pauperatus* India (Meghalaya)
(Cameron, 1900)
= *Bracon pauperatus* Cameron,
1900
3. *Craspedolcus seditiosus* India (Meghalaya)
(Cameron, 1899)
= *Bracon seditiosus* Cameron,
1899
4. *Craspedolcus phaedo* (Cameron, 1899) India (Meghalaya)
1899
= *Bracon phaedo* Cameron, 1899

GENUS 15. **CRATOBRACON** CAMERON

1. *Cratobracon jaculatus* (Smith, 1860) India
1860
= *Bracon jaculatus* Smith, 1860

GENUS 16. **CYANOPTERUS** CAMERON

1. *Cyanopterus dentiscapa* India (Tamil Nadu)
(Ramakrishna Ayyar, 1928)
= *Ipobracon dentiscapa*
Ramakrishna Ayyar, 1928

2. *Cyanopterus kanarensis* India
(Ramakrishna Ayyar, 1928)
= *Ipobracon kanarensis*
(Ramakrishna Ayyar, 1928)

GENUS 17. **ECTEMNOPLAX** ENDERLEIN

1. *Ectemnoplax ceylonicus* India (Tamil Nadu),
(Cameron, 1897)
= *Campyloneurus ceylonicus*
(Cameron, 1897)
= *Bracon ceylonicus* Cameron, Sri Lanka
1897

GENUS 18. **EUTROPOBRACON** RAMAKRISHNA AYYAR

1. *Eutropobracon indicus* India (Kerala)
(Ramakrishna Ayyar, 1928)
= *Bracon indicus* Ramakrishna
Ayyar, 1928

GENUS 19. **EUUROBRACON** ASHMEAD

1. *Euurobracon triplagiatus* India (Assam)
(Cameron, 1900)
= *Delmira triplagiatus* Cameron,
1900
= *Exobracon maculipennis*
Cameron, 1910

GENUS 20. **FURCADESHA** QUICKE

1. *Furcadesha huddlestoni* Quicke, India (Karnataka, Kerala)
1986
2. *Furcadesha nitida* sp. nov. India (Kerala)
3. *Furcadesha peethavarna* sp. nov. India (Kerala)

GENUS 21. **GLYPTOMORPHA** HOLMGREN

1. *Glyptomorpha pectoralis* (Brulle, India (Maharashtra)
1832)
= *Glyptomorpha smenus*
(Cameron, 1905)
= *Vipio smenus* (Cameron, 1905)
= *Iphiaulax smenus* Cameron,
1905

GENUS 22. **HYBOGASTER** SZEPLIGETI

1. *Hybogaster dodonaeus* India (Meghalaya)
(Cameron,
1899)
= *Bracon dodonaeus*, Cameron,
1899
2. *Hybogaster xanthopsis* India (Gujarat, Maharashtra)
(Cameron,
1905)
= *Iphiaulax spilocephalus*
Cameron, 1907
= *Iphiaulax xanthopsis* Cameron,
1905

GENUS 23. **INDABRACON** VAN ACHTERBERG

1. *Indabracon trimaculatus* India (Assam)
(Cameron, 1900)
= *Campyloneurus trimaculatus*
(Cameron, 1900)
= *Spinaria trimaculatus*
Cameron, 1900

GENUS 24. **INDADESHA** QUICKE

1. *Indadesha achterbergi* Quicke, India (Tamil Nadu)
1986

GENUS 25. **IPHIAULAX** FOERSTER

1. *Iphiaulax agraensis* (Cameron, 1897) India (Haryana)
= *Bracon agraensis* Cameron, 1897
2. *Iphiaulax elizeus* Cameron, 1905 India (Maharashtra)
3. *Iphiaulax immsi* Cameron, 1913 India (Himalaya)
4. *Iphiaulax spilocephaliformi* India (Karnataka,
Ramakrishna Ayyar, 1928 Tamil Nadu)

GENUS 26. **ISCHNOBRACON** BALTAZAR

1. *Ischnobracon indiscretus* India (Meghalaya)
(Cameron, 1899)
= *Bracon indiscretus* Cameron, 1899
2. *Ischnobracon v-macula* India (Meghalaya)
(Cameron, 1899)
= *Stenobracon v-macula*
(Cameron, 1899)
= *Elphea v-macula* (Cameron, 1899)
= *Bracon v-macula* Cameron, 1899
= *Bracon orientalis* Cameron, 1899

GENUS 27. **MEGANEURA** SZEPLIGETI

1. *Meganeura famulus* (Bingham, 1901) India (West Bengal)
= *Bracon famulus* Bingham, 1901

GENUS 28. **PACHYBRACON** CAMERON

1. *Pachibracon declaratus* India (Meghalaya)
(Cameron, 1899)
= *Bracon declaratus* Cameron,
1899
2. *Pachibracon jejanus* (Cameron, India (Meghalaya)
1899)
= *Bracon jejanus* Cameron,
1899
3. *Pachibracon rothneyi* (Cameron, India (Haryana)
1897)
= *Bracon rothneyi* Cameron,
1897

GENUS 29. **PHILOMACROPLOEA** CAMERON

1. *Philomacroploea basimacula* India (Kerala),
Cameron, 1905 Sri Lanka

GENUS 30. **PICNOBRACON** CAMERON

1. *Pycnobracon niger* (Cameron, India (Himalaya)
1899)
= *Iphiaulax sal* Cameron, 1913

GENUS 31. **PHYSARAIA** SHENEFELT

1. *Physaraia sumatrana* (Enderlein, India (Tamil Nadu), Malaysia,
1905) Sumatra, Philippines, Taiwan
= *Gastrotheca sumatrana*
Enderlein, 1905

GENUS 32. **SHELFORDIA** CAMERON

1. *Shelfordia longicaudata* van India (Sikkim)
Achterberg, 1992
2. *Shelfordia khasiana* (Cameron, India (Meghalaya)
1899)

= *Bracon khasianus* Cameron,
1899

3. *Shelfordia* sp. 1 India (Kerala)

GENUS 33. **SIMRA** QUICKE

1. *Simra cecidophila* Quicke, 1993 India (Manipur)

GENUS 34. **STENOBRACON** SZEPLIGETI

1. *Stenobracon deesae* (Cameron, 1902) India (Gujarat, Karnataka, Kerala, Punjab, West Bengal, Pusa), Pakistan, Malaysia
2. *Stenobracon frontomaculatus* India (Tamil Nadu)
Ramakrishna Ayyar, 1928
3. *Stenobracon karnalensis* Lal, India (Punjab)
1939
4. *Stenobracon levituberculatus* India (Tamil Nadu)
(Cameron, 1910)
4. *Stenobracon nicevillei* India (Tamil Nadu)
(Bingham, 1901)
West Bengal)
= *Bracon nicevillei* Bingham,
1901

GENUS 35. **TESTUDOBRACON** QUICKE

1. *Testudobracon malabarensis* sp. nov. India (Kerala)
2. *Testudobracon travancorensis* India (Kerala)
sp. nov

GENUS 36. **TROPOBRACON** CAMERON

1. *Tropobracon comorensis* India (Bihar),
van Achterberg, 1993 Afrotropical (Comore)
2. *Tropobracon hyati* Haider, 2004 India (Uttar Pradesh)

3. *Tropobracon infuscatus* van Achterberg, 1993 India (Andhra Pradesh), China (Hong-Kong)
4. *Tropobracon kainoschemon* sp. nov. India (Kerala)
5. *Tropobracon luteus* Cameron, 1905 India (Kerala, Tamil Nadu, Uttar Pradesh), Bengladesh, Indonesia, Pakistan, Taiwan and Southern China.
6. *Tropobracon mustus* sp. nov India (Kerala)
7. *Tropobracon pulchrum* sp. nov India (Kerala)
8. *Tropobracon recens* sp. nov India (Kerala)
9. *Tropobracon shafee* Haider, 2004 India (West Bengal)

GENUS 37. **VIPIO** LATREILLE

1. *Vipio bicarinatus* Brulle, 1846 India
2. *Vipio scutum* Brulle, 1846 India

GENUS 38. **ZAKAELLA** HAIDER, AHMAD & SHUJAUDDIN

1. *Zakaella alami* (Zaka-ur-Rab, 1963) India (Uttar Pradesh)
 = *Bathyaulax alami* Zaka-ur-Rab,
 1963

GENUS 39. **ADESHA** CAMERON

1. *Adesha* sp. 1 India (Kerala)

SUBFAMILY 1. DORYCTINAE

GENUS 1. *SPATHIUS* NEES

1. *Spathius alcine* Nixon, 1943 India (Uttaranchal),
The Netherlands.
2. *Spathius apicalis* Westwood,
1882 India (Bihar, Orissa,
Uttaranchal, West
Bengal), Andamans
Borneo, China, Java,
Malaysia, Philippines
3. *Spathius araceri* Nixon, 1943 India (Kerala), Java,
Malaysia
4. *Spathius ares* Nixon, 1943 India (West Bengal)
5. *Spathius capaneus* Nixon, 1943 India (West Bengal)
6. *Spathius cavillator* Wilkinson,
1931 India (Maharashtra,
Uttaranchal, West Bengal)
7. *Spathius critolaus* Nixon, 1939 India (Kerala, Punjab,
Tamil Nadu)
8. *Spathius daedalus* Nixon, 1943 India (Uttaranchal)
9. *Spathius dido* Nixon, 1943 India (Kerala,
Tamil Nadu)
10. *Spathius elaboratus* Wilkinson,
. 1931 India (Uttaranchal)
11. *Spathius generosuss* Wilkinson,
. 1931 India (Uttaranchal)
12. *Spathius keralensis* sp. nov.
. India (Kerala)
13. *Spathius labdacus* Nixon, 1939
. India (Tamil Nadu)
14. *Spathius medon* Nixon, 1943
. India (Kerala, Tamil
Nadu), Sri Lanka

- 15 *Spathius melpomene* Nixon, India (Maharashtra), Philippines
 . 1943 = *Spathius decanensis*
 Kurhade &
 Nikam, 1994
- 16 *Spathius nearchoides* Nixon, India (Uttaranchal)
 . 1943
- 17 *Spathius ochus* Nixon, 1943 India (Kerala), Borneo,
 . Philippines,
 Sunda Islands
- 18 *Spathius palodensis* sp. nov. India (Kerala)
 .
- 19 *Spathius opis* Nixon, 1943 India (Tamil Nadu), Africa
 .
- 20 *Spathius priapus* Nixon, 1943 India (Kerala), Borneo, Philippines
 .
- 21 *Spathius seriphus* Nixon, 1943 India (Kerala), Malaysia
- 22 *Spathius siculus* Nixon, 1943 India (Kerala, Tamil Nadu)
 .
- 23 *Spathius sul* Nixon, 1943 India (Uttaranchal)
 .
- 24 *Spathius tereus* Nixon, 1943 India (Kerala), Philippines
 .
- 25 *Spathius vulnificus* Wilkinson, India (West Bengal)
 . 1931

HOST-PARASITE INDEX OF THE GENERA TREATED IN THIS WORK

Adisura atkinsoni Moore (Lepidoptera: Noctuidae)

Bracon lefroyi (Dudgeon & Gough)

Bracon greeni Ashmead

Alcides affaber (Aurivillius). (Coleoptera: Curculionidae)

Bracon lefroyi (Dudgeon & Gough)

Bracon greeni Ashmead

Alcides leopardus Oliver (Coleoptera: Curculionidae)

Bracon lefroyi (Dudgeon & Gough)

Anarsia melanoplecta Meyrick (Lepidoptera: Gelechiidae)

Bracon lefroyi (Dudgeon & Gough)

Antigastra catalaunalis (Duponchel) (Lepidoptera: Crambidae)

Bracon hebetor Say

Araecerus fasciculatus (De Geer) (Coleoptera: Antribidae)

Spathius araeceri Nixon

Batrachedra amydraula (Meyrick) (Lepidoptera: Cosmopterygidae)

Bracon brevicornis (Wesmael)

Bissetia steniellus (Hampson) (Lepidoptera: Crambidae)

Stenobracon deesae (Cameron)

Bombyx mori L. (Lepidoptera: Bombycidae)

Stenobracon deesae (Cameron)

Carpomyia vesuviana Costa (Diptera: Tephritidae)

Bracon lefroyi (Dudgeon & Gough)

Chilo auriculices Dudgeon (Lepidoptera: Pyralidae)

Stenobracon deesae (Cameron)

Stenobracon nicevillei (Bingham)
Chilo incertulus Walker (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Chilo infuscatellus Snellen (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Stenobracon nicevillei (Bingham)
Chilo partellus Swinhoe (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Stenobracon nicevillei (Bingham)
Tropobracon comorensis van Achterberg
Chilo sacchariphagus indicus (Kapur) (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Stenobracon nicevillei (Bingham)
Chilo simplex Butler (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Chilo suppressalis (Walker) (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Stenobracon nicevillei (Bingham)
Chilo tumidocostalis (Hampson) (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Chilo zonellus Swinhoe (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Stenobracon nicevillei (Bingham)
Corcyra cephalonica (Stainton) (Lepidoptera: Pyralidae)
Bracon hebetor Say
Stenobracon deesae (Cameron)
Crocidolomia binotalis Zeller (Lepidoptera: Pyralidae)

Bracon lefroyi (Dudgeon & Gough)
Dendrolimus punctatus (Walker) (Lepidoptera: Lasiocampidae)
Stenobracon deesae (Cameron)
Dichocrocis punctiferalis (Guenee) (Lepidoptera: Pyralidae)
Bracon hebetor Say
Dioryctia abietella (Fabr.) (Lepidoptera: Pyralidae)
Bracon brevicornis (Wesmael)
Earias fabia (Stoll) (Lepidoptera: Noctuidae)
Bracon greeni Ashmead
Bracon lefroyi (Dudgeon & Gough)
Earias insulna (Boisd.) (Lepidoptera: Noctuidae)
Bracon brevicornis (Wesmael)
Bracon lefroyi (Dudgeon & Gough)
Emmalocera depressella Swinhoe (Lepidoptera: Plutellidae)
Stenobracon deesae (Cameron)
Ephestia cautella (Walker) (Lepidoptera: Pyralidae)
Bracon brevicornis (Wesmael)
Bracon hebetor Say
Ephestia eleutella (Hubner) (Lepidoptera: Pyralidae)
Bracon hebetor Say
Ephestia kuhniella (Zeller) (Lepidoptera: Pyralidae)
Bracon hebetor Say
Eublemma amabilis Moor (Lepidoptera: Noctuidae)
Bracon lefroyi (Dudgeon & Gough)
Eublemma quadrilineata Moor (Lepidoptera: Noctuidae)
Bracon lefroyi (Dudgeon & Gough)
Eublemma scitula (Rambur) (Lepidoptera: Noctuidae)

Aphrastobracon flavipennis Ashmead
Euploea core (Cramer) (Lepidoptera: Nymphalidae)
Philomacroploea basimacula Cameron
Euproctis lunata Walker (Lepidoptera: Lymantridae)
Stenobracon deesae (Cameron)
Galleria mellonella (L.) (Lepidoptera: Galleriidae)
Bracon hebetor Say
Gnorimoschema blapsigona M. ((Lepidoptera: Gelechiidae)
Bracon lefroyi (Dudgeon & Gough)
Helicoverpa armigera Hubner (Lepidoptera: Noctuidae)
Bracon brevicornis (Wesmael)
Bracon hebetor Say
Bracon greeni Ashmead
Heliiothis obsoleta (Fab.) (Lepidoptera: Noctuidae)
Bracon lefroyi (Dudgeon & Gough)
Bracon greeni Ashmead
Hypolixus truncatulus Fab. (Coleoptera: Chrysomelidae)
Spathius critolaus Nixon
Macroploea elisa (Butler) (Lepidoptera: Nymphalidae)
Philomacroploea basimacula Cameron
Mecistocerus fluctiger Fst. (Coleoptera: Curculionidae)
Spathius cavillator Wlkn.
Melanitis leda isnene Cramer (Lepidoptera: Satyridae)
Aspidobracon noyesi van Achterberg
Mycalesis gotama (Moore) (Lepidoptera: Hesperidae)
Aspidobracon noyesi van Achterberg
Noorda moringae Tams (Lepidoptera: Crambidae)

Bracon brevicornis (Wesmael)
Opisina arenosella Walker (Lepidoptera: Oecophoridae)
Bracon brevicornis (Wesmael)
Bracon hebetor Say
Parnara guttata (Bremer & Gray) (Lepidoptera: Hesperidae)
Aspidobracon noyesi van Achterberg
Pectinophora gossypiella Saud. (Lepidoptera: Gelechiidae)
Bracon gelechidiphagus (Ayyar)
Bracon lefroyi (Dudgeon & Gough)
Pelopidas mathias (F.) (Lepidoptera: Hesperidae)
Aspidobracon noyesi van Achterberg
Pempherulus affinis Fst. (Coleoptera: Curculionidae)
Spathius critolaus Nixon
Phthorimaea blapsigona (Meyr.) (Lepidoptera: Gelechiidae)
Bracon gelechidiphagus (Ayyar)
Phycita infusella Meyr. (Lepidoptera: Pyralidae)
Bracon lefroyi (Dudgeon & Gough)
Platyedra gossypiella (Saund.) (Lepidoptera : Gelechiidae)
Bracon brevicornis (Wesmael)
Polyocha depressella (Swinhoe) (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Proceras indicus Kapur (Lepidoptera: Pyralidae)
Stenobracon deesae (Cameron)
Pyralis farinalis L. (Lepidoptera: Pyralidae)
Bracon hebetor Say
Pyroderces simplex Walsingham (Lepidoptera: Cosmoplerygidae)
Bracon hebetor Say

Raphimetopus ablutellus (Zeller) (Lepidoptera: Pyralidae)

Stenobracon deesae (Cameron)

Rabila frontalis Walker (Lepidoptera: Noctuidae)

Bracon greeni Ashmead

Bracon lefroyi (Dudgeon & Gough)

Schoenobius incertulus (Walker)

Tropobracon luteus Cameron

Scirpophaga excerptalis (Walker) (Lepidoptera: Pyralidae)

Stenobracon deesae (Cameron)

Stenobracon nicevillei (Bingham)

Scirpophaga innovata (Walker) (Lepidoptera: Pyralidae)

Stenobracon deesae (Cameron)

Stenobracon nicevillei (Bingham)

Scirpophaga nivella (Fabricius) (Lepidoptera: Pyralidae)

Stenobracon deesae (Cameron)

Stenobracon nicevillei (Bingham)

Sesamia cretica (Led.) (Lepidoptera: Noctuidae)

Bracon brevicornis (Wesmael)

Sesamia inferens (Walker) (Lepidoptera: Noctuidae)

Stenobracon deesae (Cameron)

Stenobracon nicevillei (Bingham)

Sesamia uniformis Dudgeon (Lepidoptera: Noctuidae)

Stenobracon deesae (Cameron)

Sinoxylon sudanicum Lesne (Coleoptera: Bostrychidae)

Spathius critolaus Nixon

Sitotroga cerealella (Oliv.) (Lepidoptera: Gelechiidae)

Bracon hebetor Say

Spodoptera exigua (Huebner) (Lepidoptera: Noctuidae)

Bracon hebetor Say

Stomopteryx subsecivella Zeller (Lepidoptera: Gelechiidae)

Bracon hebetor Say

Sylepta derogata Fabr. (Lepidoptera: Pyraustidae)

Bracon lefroyi (Dudgeon & Gough)

Tryporyza incertulus (Walker) (Lepidoptera: Pyralidae)

Stenobracon deesae (Cameron)

Stenobracon nicevillei (Bingham)

Tropobracon luteus Cameron

SUMMARY

The present study deals with the systematic aspects of biodiversity of some genera and species of Braconidae of Kerala, which forms the study area. Braconidae is the second largest family of the order Hymenoptera. In this study 15 genera and 53 species of braconid wasps have been studied, of these 14 genera from Subfamily Braconinae and 1 genus from Subfamily Doryctinae. A total of 53 species have been studied under 15 genera, of which 26 species are new to science. The table given below gives the details of the total number of new species in each genus and the number of new records from Kerala in each of them.

Sl. No.	Genus	Total No. of species	No. of new species	New records from Kerala
1	<i>Aphrastobracon</i> Ashmead	1	-	1
2	<i>Aspidobracon</i> van Achterberg	1	-	1
3	<i>Bracon</i> Fabricius	17	12	13
4	<i>Cassidibracon</i> Quicke	5	2	2
5	<i>Chaoilta</i> Cameron	1	-	-
6	<i>Chelonogastra</i> Ashmead	1	1	1
7	<i>Eutropobracon</i> Ramakrishna Ayyar	1	-	-
8	<i>Furcadesha</i> Quicke	3	2	3
9	<i>Philomacroploea</i> Cameron	1	-	1
10	<i>Stenobracon</i> Szepliget	2	-	2
11	<i>Testudobracon</i> Quicke	2	2	2
12	<i>Tropobracon</i> Cameron	5	4	4
13	<i>Adesha</i> Cameron	1	1	1
14	<i>Shelfordia</i> Cameron	1	1	1
15	<i>Spathius</i> Nees	11	2	6

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

A. Subfamily **Braconinae** Nees

1. Genus *Aphrastobracon* Ashmead
Species 1. *Aphrastobracon flavipennis* Ashmead
2. Genus *Aspidobracon* van Achterberg
Species 1. *Aspidobracon noyesi* van Achterberg
3. Genus *Bracon* Fabricius
Species 1. *Bracon agathon* sp. nov.
2. *Bracon brevicornis* Wesmael
3. *Bracon charien* sp. nov.
4. *Bracon dachaon* sp. nov.
5. *Bracon daris* sp. nov.
6. *Bracon decor* sp. nov.
7. *Bracon gelechidiphagus* (Ramakrishna Ayyar)
8. *Bracon greeni* Ashmead
9. *Bracon hebetor* Say
10. *Bracon heteron* sp. nov.
11. *Bracon keralense* sp. nov.
12. *Bracon koridor* sp. nov.
13. *Bracon lefroyi* (Dudgeon & Gough)
14. *Bracon molycaon* sp. nov.
15. *Bracon nexperon* sp. nov.
16. *Bracon procnis* sp. nov.
17. *Bracon stom* sp. nov.
4. Genus *Cassidibracon* Quicke
Species 1. *Cassidibracon debatus* sp. nov.
2. *Cassidibracon indicus* Narendran & Rema
3. *Cassidibracon malabaricus* Narendran
4. *Cassidibracon rebatus* sp. nov.
5. *Cassidibracon sumodani* Narendran & Madhavikutty
5. Genus *Chaoilta* Cameron
Species 1. *Chaoilta malabarica* Ramakrishna Ayyar
6. Genus *Chelonogastra* Ashmead
Species 1. *Chelonogastra sumodani* sp. nov.
7. Genus *Eutropobracon* Ramakrishna Ayyar
Species 1. *Eutropobracon* Ramakrishna Ayyar
8. Genus *Furcadesha* Quicke
Species 1. *Furcadesha huddlestoni* Quicke
2. *Furcadesha nitida* sp. nov.
3. *Furcadesha peethavarna* sp. nov.

9. Genus *Philomacroploea* Cameron
Species 1. *Philomacroploea basimacula* Cameron
10. Genus *Stenobracon* Szepliget
Species 1. *Stenobracon deesae* (Cameron)
2. *Stenobracon nicevillei* (Bingham)
11. Genus *Testudobracon* Quicke
Species 1. *Testudobracon malabaricus* sp. nov.
2. *Testudobracon travancorensis* sp. nov
12. Genus *Tropobracon* Cameron
Species 1. *Tropobracon luteus* Cameron
2. *Tropobracon kainoschemon* sp. nov.
3. *Tropobracon mustus* sp. nov.
4. *Tropobracon pulchrum* sp. nov.
5. *Tropobracon recens* sp. nov.
13. Genus *Adesha* Cameron
Species 1. *Adesha* sp. 1
14. Genus *Shelfordia* Cameron
Species 1. *Shelfordia* sp. 1
- A. Subfamily **Doryctinae** Foerster
 1. Genus *Spathius* Nees
Species 1. *Spathius araceri* Nixon
2. *Spathius critolaus* Nixon
3. *Spathius dido* Nixon
4. *Spathius keralensis* sp. nov.
5. *Spathius medon* Nixon
6. *Spathius ochus* Nixon
7. *Spathius palodensis* sp. nov.
8. *Spathius priapus* Nixon
9. *Spathius seriphus* Nixon
10. *Spathius sculus* Nixon
11. *Spathius tereus* Nixon

The diversity of parasitic braconids collected during the present investigation was very high. Only the taxa belonging to selected genera have been systematically analysed in this study. All the species were properly identified and described. Diagnosis of already known specimens and redescription of poorly described species were given. In addition to the keys to the subfamilies of the Oriental region and key to the genera and species of India are also provided. The map (Fig.1b) gives an account of the distribution

of the genera treated in this study. A checklist of the genera and species of braconids wasps reported from India is given. A host-parasite index of the genera treated in this work is also provided. All the type materials are kept in the collection of the Department of Zoology, University of Calicut (DZUC).

SHEEBA M. "STUDIES ON THE SYSTEMATIC ASPECTS OF BIODIVERSITY OF SOME GENERA AND SPECIES OF BRACONIDAE (HYMENOPTERA) OF KERALA STATE". THESIS. DEPARTMENT OF ZOOLOGY, UNIVERSITY OF CALICUT, 2008.

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