“Sound taxonomy is the foundation of all meaningful research in Biology. It has great relevance in various fields like biodiversity, ecology, agriculture, medicine etc.” (Narendran, 2001). The importance of this statement is increasing day by day because of the swelling number of workers in various fields like biology, ecology, evolution, zoogeography, economic and medical entomology, etc. Their work includes the detailed study and identification of the systematic position of a single species or a limited set of species. The nontaxonomists can seek help from taxonomists to know the exact identity of the specimens on which they are planning to work. The main criticism against Taxonomy is that it does not need high field work or intelligence and the identification can be made easily by just running the key. But according to Narendran (2001) “Research in taxonomy needs hard field oriented work involving dangerous situations”. A taxonomist needs several hours or days, looking through his microscope for identifying a single specimen and he needs dedication and intelligence for analyzing various characters. To identify a species authentically, expertise developed through years is called for.

Biodiversity - the key factor of the existence of life on earth - is under threat due to high rate of extinction. Conservation of the existing flora and fauna is one of the best method for maintaining the biodiversity. And for the conservation we want to know the existing biodiversity, and for this taxonomy is an essential tool.
1.1. **Hymenoptera: a species rich group**

Order Hymenoptera, one of the most species rich insect orders in Class Insecta, contains 132 families, 8423 extant genera with an additional 685 extinct genera and 1,53,088 extant species, in addition to 2429 extinct species (Aguiar *et al.*, 2013). Hymenopterans are found in most terrestrial environments and play key roles in many ecosystems, notably as pollinators of flowering plants, as parasitoids and predators of phytophagous insects (Ronquist, 1999).

The Order Hymenoptera has two suborders viz. Symphyta and Apocrita. Symphyta are commonly called as sawflies due to their saw like structure on ovipositor. Apocrita has two divisions viz. Parasitica and Aculeata. The social wasps having predatory nature and stinging capacity to humans are mainly included in Aculeata. And the Parasitica or Parasitic hymenoptera contains the wasp species which are ecto or endo parasitic in nature. The parasitic hymenopterans are one of the most important groups of insects to human beings due to their potential in biological control. More than 85% of species used in classical biological control programs are parasitic hymenopterans (Greathead, 1986).

1.2. **Super family - Chalcidoidea**

Among the hymenopteran super families Chalcidoidea has its own place with 23 families, 2045 genera and 22,784 species from all over the World (Aguiar *et al.*, 2013). The members of this superfamily show diversity in structure, biology and behavior. And they have a special mark in biological control programs. Over 800 species are recorded as useful biocontrol agents against insect pests (Narendran, 2013). Majority of the species under Chalcidoidea are entomophagus and some are phytophagus in nature and few of them are both entomophagus and phytophagus in nature. The
entomophagous species show high diversity in host preference, they parasitise several species belonging to Coleoptera, Diptera, Heteroptera, Hymenoptera, Lepidoptera, Neuroptera, Orthoptera, Odonata, Psocoptera, Siphonaptera, Thysanoptera and some species of Arachnida.

The chalcids or members of Chalcidoidea were easily identified by their prominent taxonomic characters, the most important of them are, fore wing with reduced wing venation and no closed cells, presence of prepectus and many of them are having bright metallic coloration.

1.3. Family: Eurytomidae

Eurytomidae is one of the species rich families of super family Chalcidoidea, which contains 72 valid genera and 1621 species (Noyes, 2016) from the world. The eurytomids are widely distributed throughout the world. They have wide host associations, which include primary parasitoids, secondary parasitoids, gall makers, entomophagous and phytophagous forms. Normally the eurytomids are black, brown or yellow (*Sycophila*) in color with an exception of genus *Chryseida* Spinola having bright metallic color. Even though Eurytomidae contains 72 genera more than half of the species are included under the genus *Eurytoma*, and naturally it is the most species rich genus in this family. Due to the high number of members in the genus, *Eurytoma* shows high degree of variations and similarities between species and according to many authors *Eurytoma* may have many species complex.

**Taxonomic Position of Eurytomidae**

According to many authors the number of subfamilies of Eurytomidae varies. The major ones are; Burks (1971) divided the family Eurytomidae into 8 subfamilies Viz. Aximinae, Eudecatominae, Eurytominae, Harmolitinae, Heimbrinae, Philoleminae, Prodecatominae and Rileyinae. Zerova (1988) divided the family into seven subfamilies by excluding the subfamilies
Prodecatominae and Philoleminae from Burk’s classification and added a new subfamily Buresiinae, the author included the subfamilies Prodecatominae and Philoleminae under the subfamily Eurytominae. Boucek (1988) recognized that there are only three subfamilies in family Eurytomidae namely Rileyinae, Eurytominae and Heimbrinae. Lotfalizadeh et al (2007) added a new subfamily Buresiinae Boucek (to the concept of Boucek, 1988) and considered that Eurytominae have four subfamilies. Gates (2008 (a)) recognized that family Eurytomidae have only three subfamilies by synonymising the subfamily Buresiinae to subfamily Eurytominae. The most acceptable classification of Eurytomidae are

2. Narendran in 1994 also accepted the classification proposed by Boucek.
3. Gates (2008 (a)).

The members of the family Eurytomidae are common in all Zoogeographical realms. At subfamily level Eurytominae is cosmopolitan in distribution. But the subfamily Heimbraine is present only in Neotropical regions, and the subfamily Rileyinae found mainly in Neotropical regions and also representation with less number of species in Africa, Australia, Europe and Central Asia. Eurytominae is the largest subfamily in Eurytomidae having 64 genera, the subfamily Rileyinae has 6 genera and Heimbraine has 2 genera. In the Oriental Region, only Eurytominae is present. There is a high difference in the number of genera while comparing Eurytominae with the other two subfamilies and it is also expressed in the case of its host associations. The Eurytominae has wide host range while comparing with the other two subfamilies. Rileyinae are mainly egg parasitoids of gall forming cecidomyiids. Heimbraine are associated with wood boring beetles.
The best references for Eurytomidae of Oriental region are Boucek, 1988 for Australasian Region and Narendran, 1994 for Indian Subcontinent. The Oriental Eurytomidae have 281 species under 35 genera (Noyes, 2016), as like other regions the most species rich genera are *Eurytoma* followed by *Bruchophagus*. Narendran (1984-2013) made the highest contribution to the Oriental Eurytomidae, and about 50% of the Oriental species are authored by him, the percentage become higher if we take the number of species in India or Kerala.

**Economic Importance**

Some of the members of Eurytominae are exclusively phytophagous and they include the genera *Austrodecatoma* Girault, *Ausystole* Boucek, *Risbecoma* Subba Rao, *Systole* Walker and *Tetramesa* Walker. Many of these genera and the species having phytophagous nature act as pests or may cause negative influence on the cultivated or beneficial crops. The genus *Austrodecatoma* mainly feed on gall fruits of *Atalantia* (Rutaceae), *Ausystole* are mainly associated with seeds of legume. The members of the genus *Systole* are seed eaters especially the seeds of Umbellifera, but in Kerala the *Systole* is mainly found associated with galls of *Calycopteris* species (Combretaceae), eg: *Systole calycopterae* Narendran. The larval stages of *Tetramesa* are feeding the soft tissues present inside the internodes of grass stem eg: *Tetramesa tritici* (Fitch) infest on stems of wheat. In the Oriental region especially in India the members of the genus *Tetramesa* are mainly associated with agricultural crops especially rice and vegetables. In addition to these genera, there are also phytophagous species in many other large genera like *Bruchophagus*, *Eurytoma* etc. for example *Bruchophagus fellis* (Girault) cause galls on citrus plant and it is also important that not all species under these genera are phytophagous in nature.
The eurytomids also show entomophagous nature and such members are present in many genera especially in *Bruchophagus* and *Eurytoma*. The entomophagous forms in Eurytomidae are mainly primary or secondary parasitoids. Among this, most of them are primary parasitoids but a few are secondary parasitoids which mainly parasitize members of family Ichneumonidae and Braconidae. Some of the examples are, *Eurytoma* sp. infesting on *Quadrastichus erythrinae* (Erythrina Gall wasp), *Philolema braconidis* Ferrière infest on *Diaphania indica* Saunders, *Eurytoma chinnarensis* Sureshan and Narendran associated with *Bracon* sp. (Braconidae). *Eurytoma parva* Phillips infests first and second instars of *Tetramesa tritici* (Fitch), this *Eurytoma* shows phytophagy before or after consuming the host. The similar case also happens in the larvae of *Eurytoma brunniventris* Ratzeburg which is associated with oaks and feed both the gall forming larvae and the tissues in gall.

**Importance in Biological Control**

The family Eurytomidae also pose due importance in biological control. An important aspect in this regard is the phytophagous forms of eurytomids shows best results in biological control. The phytophagous eurytomids are used against the weeds or invasive plants in the agricultural fields, eg: *Tetramesa romana* (Walker) has been successfully used against *Aurundo donax* Linnaeus in USA. *Aurundo donax* Linnaeus is a bamboo like plant, which is cultivated for ornamental and fibre uses in Europe, South Asia, including North Africa and Arabian Peninsula. This plant was introduced to USA in early 1500s and quickly become naturalised with fast growth. But the exponential increase in the number of this single species led to loss of biodiversity, damage to bridges, stream bank erosion etc. The U.S. Government was under stress to cop up with high cost for the safe implementation of mechanical or chemical control methods to manage this
issue. After studying the impact of parasitoid, the U.S. Department of Agriculture (USDA) gave sanction to the field release of *Tetramesa romana* (Walker) against *Aurundo donax* Linnaeus. Another example is *Eurytoma* sp. which was found to be good as biological control agent against *Quadrastichus erythrinae* Kim by the study conducted by the Agricultural department of Hawaii, and successfully implemented it in 2007. Delvare in 1988 found that *Eurytoma oryzivora* Delvare is a good parasitoid against the African stem borer *Maliarpha separatella* Ragonot in Africa.

1.4. **Significance of the Study**

India is blessed with rich biodiversity and one of the megadiversity countries with four hot spots, the Eastern Himalayas, the Western Ghats, Sundaland and Indo-Burma Border. Regarding the hymenopteran diversity of India, about 60% of them are concentrated in the area from Kashmir to Nagaland, about 20% are present in the hilly areas of Eastern and Western ghats and the remaining 20% are present in the plains of Central and North India. The family Eurytomidae in India have 24 genera and 183 species. Among the 183 eurytomid species of India, more than 70% are reported from Western Ghats and the majority are from Southern Western Ghats (this may be due to the highest diversity of Eurytomidae in Western Ghats and also due to the studies of Dr. T. C. Narendran by his monumental work “Eurytomidae and Torymidae of Indian Sub continent” in 1994).

Major studies on Eurytomidae of Kerala are hardly reported after 1994. Molecular phylogenetic studies on Eurytominae (Lotfalizadeh *et al.*, 2007), the generic composition of Eurytomidae underwent several changes and synonymies. These changes in the generic composition will have major effect on the faunal taxonomy of this region. Both of these factors reveal the importance of the studies on taxonomy of Eurytomidae. Taxonomic descriptions of the new and existing species, dichotomous Key for the
identification of genera and species, distribution of species, host parasite list and checklist will become a significant platform for further applied studies based on Eurytomids.

The Eurytomid fauna of Kerala is represented by 96 species under 14 genera (Noyes, 2016).

1.5. Objectives of the present study

1. Surveying of eurytomid species from all districts of Kerala.
2. Identifying, describing new taxa and redescribing little known taxa.
4. Distribution of genera and species in the State.
5. Host-parasite list of the genera and species studied.

The specimen samples for the present study were collected from all 14 districts of Kerala. During the course of the study, more than 1200 specimens are examined which included the specimens deposited in Zoological Survey of India, Western Ghat Regional Centre, Kozhikode. The collected specimens mainly included the already described species under the genera Eurytoma Walker and Bruchophagus Ashmead. The specimens belonging to the genera Philolema Cameron, Prodecatoma Ashmead, Neobephrata Narendran and Padmasenan, Sycophila Walker, Systole Walker and Tetramesa Walker have good number of described and new species, which are described in the present work.

Describing all the genera, species and new species of the family Eurytomidae of Kerala are beyond the scope of the present study. But taxonomic revision of the genera Philolema Cameron, Prodecatoma
Ashmead, Neobephrata Narendran and Padmasenan, Sycophila Walker, Systole Walker and Tetramesa Walker are highly necessary because, many of the species under these genera should need taxonomic redescriptions for their correct identification. So the genera Philolema, Prodecatoma, Neobephrata, Sycophila, Systole and Tetramesa are taken for complete taxonomic analysis. Diagnosis, distribution details and key to species of all the remaining genera (Aximopsis Ashmead, Bruchophagus Ashmead, Eurytoma Walker, Eurytomocharis Ashmead, Fronsoma Narendran, Plutarchia Girault, Ramdasoma Narendran and Risbecoma Subba Rao) are provided.