

CHALCIDOIDEA (HYMENOPTERA: INSECTA) STATUS AND DIVERSITY IN INDIA

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In the field of insect pest control, increasing attention is being paid to the ecofriendly and environmentally safe methods. Biological control has come to stay as one of the best alternatives to chemical control and the utilisation of insect parasites and predators has emerged as one of the most fruitful strategies in Integrated Pest Management. Biological control, however, depends to a considerable extent on taxonomy for the correct identification of both pests and their natural enemies.

The superfamily Chalcidoidea, commonly called the Chalcid wasps is one of the largest groups of parasitic Hymenoptera. Most members of the group attack major insect orders, many of which are agricultural and forest pests of economic importance. Chalcids attack a wide range of hosts which include 12 orders of insects and two orders of Arachnida (Table 1). Through their parasitic mode of life, they destroy populations of potential pest species in the field by regulating their numbers, thus playing an important role in the biological control of serious pests.

The chalcids are cosmopolitan and include about 2,000 genera and 19,000 described species from the world (Noyes, 1990). They are characterised by their minute size, ranging from 0.18mm to about 25mm and are readily distinguished from other groups of parasitic Hymenoptera by the reduced forewing venation without closed cells.

Despite the abundance of Chalcidoid taxa, their complex biological interactions and baffling morphology, the group has received relatively little attention in India. Several attempts have been made to document the Indian fauna by Mani (1938, 1989), Joseph, Narendran and Joy (1973), Subba Rao and Hayat (1985, 1986), Boucok (1979), Narendran (1989, 1991) and, Noyes and Hayat (1984).

Members of 19 families of Chalcidoidea are known from India (Sureshan, 1998). Among these, the Encyrtidae, Chalcididae, Eurytomidae, Aphelinidae and Trichogrammatidae are well documented. The families Tanaostigmatidae, Tetracampidae, Eulophidae, Pteromalidae, Perilampidae, Ormyridae etc., are less studied.

The approximate number of valid genera and species of Indian Chalcidoidea is 528 and 1724 respectively. This forms only 27 per cent and nine per cent respectively of the world genera and species (Table 2).

Chalcidoidea on the whole exhibit a very low level of endemism at generic level in India. However, at family level, Encyrtidae and Agaonidae show higher levels of endemism in general followed by Pteromalidae, Eurytomidae, Eulophidae, Aphelinidae and Eucharitidae. The families Leucospidae, Perilampidae, Torymidae, Signiphoridae and Tetracampidae contain no endemic genera. The range of endemism in species varies between 40 and 100 per cent among different families (Table 2). Second to the Oriental species, Palaearctic elements dominate in Indian Chalcid fauna, followed by Australian and Ethiopian species. Nearctic and Neotropical species are very poorly represented in India.

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Table 1. Host records of Chalcidoidea

| Family | Phytophagous | | | | Parasitic | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----------------|-------------|-------|------------|-------------|--------|-------|---------|--------|-------|------------|--------|-------|--------------------------------|-----------------|---------------|------------------------------|---------------------|--------------------|-----------------|----------------------|--------------------|---------|---------------|-------------------|------------------|----------------|----------------------|--------------------|--------|----------------|-------------------------------|
| | | | | | Lepidoptera | | | Diptera | | | Coleoptera | | | Larvae of aculeate Hymenoptera | Eggs of spiders | Eggs of mites | Eggs or larvae of neuroptera | Eggs of heteroptera | Eggs of psocoptera | Eggs of Odonata | Eggs of Thysanoptera | Eggs of Orthoptera | Coccids | Pseudococcids | Eggs of Homoptera | Eggs of Phasmida | Larvae of Ants | Ootheca of Cockroach | Ootheca of Mantids | Aphids | Eggs of Cicada | Cocoons of Moths, Butterflies |
| | Syconia of fig | Plant galls | Seeds | Grass stem | Egg | Larvae | Pupae | Egg | Larvae | Pupae | Egg | Larvae | Pupae | | | | | | | | | | | | | | | | | | | |
| Chalcididae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leucospidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eurytomidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Torymidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Agaonidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pteromalidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Perilampidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eucharitidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eupelmidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eulophidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetracampidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tanaostigmatidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mymaridae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trichogrammatidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aphelinidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Encyrtidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Elasmidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Signiphoridae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ormyridae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mymarommatidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rotoitidae | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 2. Diversity of Chalcidoidea

| Family | Genera | | | Species | | | | |
|-------------------|-------------|------------|------------------------------|--------------|-------------|------------------------------|------------------|--------------------------|
| | World-wide | In India | Percent represented in India | World-wide | In India | Percent represented in India | Endemic to India | Percent endemic in India |
| Leucospidae | 4 | 1 | 25 | 134 | 7 | 5 | 5 | 71 |
| Chalcididae | 91 | 34 | 37 | 1466 | 176 | 12 | 70 | 40 |
| Eurytomidae | 79 | 27 | 34 | 1200 | 180 | 15 | 130 | 72 |
| Torymidae | 103 | 21 | 20 | 950 | 55 | 6 | 42 | 76 |
| Agaonidae | 69 | 23 | 33 | 608 | 86 | 14 | 53 | 62 |
| Ormyridae | 2 | 2 | 100 | 66 | 3 | 5 | 3 | 100 |
| Pteromalidae | 551 | 102 | 19 | 3003 | 140 | 5 | 88 | 63 |
| Eucharitidae | 50 | 8 | 16 | 348 | 22 | 6 | 20 | 91 |
| Perilampidae | 19 | 4 | 21 | 229 | 12 | 5 | 9 | 75 |
| Tetracampidae | 14 | 2 | 14 | 44 | 2 | 5 | 2 | 100 |
| Tanaostigmatidae | 9 | 1 | 11 | 88 | 1 | 1 | 1 | 100 |
| Eupelmidae | 45 | 18 | 40 | 715 | 79 | 11 | 68 | 86 |
| Encyrtidae | 451 | 150 | 33 | 3277 | 415 | 13 | 342 | 82 |
| Signiphoridae | 4 | 3 | 7 | 75 | 9 | 12 | 7 | 78 |
| Eulophidae | 280 | 61 | 22 | 3400 | 210 | 6 | 159 | 76 |
| Elasmidae | 1 | 1 | 100 | 203 | 30 | 15 | 21 | 70 |
| Aphelinidae | 38 | 26 | 68 | 975 | 135 | 14 | 82 | 61 |
| Trichogrammatidae | 76 | 28 | 37 | 650 | 66 | 10 | 59 | 89 |
| Mymaridae | 100 | 17 | 17 | 1303 | 96 | 7 | 88 | 92 |
| Mymaromatidae | 1 | - | 0 | 3 | - | 0 | - | 0 |
| Rotoitidae | 1 | - | 0 | 1 | - | 0 | - | 0 |
| Total | 1988 | 528 | 27 | 18738 | 1724 | 9.2 | 1249 | 72 |