PREFACE

PREFACE

Insects live wherever a living organism can sustain itself with food and find a mate. This include all wild environments such as homes, warehouses, cultivated ornamental plants, field crops and sometimes even on or in our bodies and those of our domestic animals. Since, we are unable to escape direct contact with a variety of insects, we are naturally curious about these small and often pesty forms of life.

Insects are successful and abundant than any other animal because of its protective exoskeleton, effective mobility, small body size, reproductive fecundity and short length of life cycle, complex metamorphosis and protective colouration.

The class insecta contains more species than any other class of animals and far exceeds the total number of species in the entire plant kingdom and all of the rest of the animals combined. Approximately 8,00,000 species, about 80% of all the animal species now known have been named and their external features described. Although estimates vary widely, there is little doubt that more than million species and perhaps twice that number of insects exists. Whether or not we will ever

discover the final number depends on how rapidly we destroy natural habitat.

Man is fighting never ending war against various pests. Agricultural pests are causing great loss to the human welfare. Pests are attacking each and every stage of crop in fields, as well as in stores. Since, World War II various synthetic organic pesticides are under practice to check agricultural insect pests. Now, it is widely recognised that the chemical pesticides are temporary relief from pest problems. Frequent, over use of such pesticides resulted in serious worldwide problems. Resurgence of target pests due to the development of pesticides resistance coupled with the elimination of natural enemies and competitors as well as change in status of minor pests to major ones occured. Increasing use of pesticides has caused contamination of bio-system. Acute poisioning is often caused by careless and massive use of chemicals. According to S. Jayraj (1988) carcinogenic, teratogenic and tumorogenic effects are common. Safer, less costly alternatives to chemical control are therefore necessary. Biological control with its firm basis in sound ecological principles and in vast practical experience, is by far the most successful and most

promising of alternatives (David Rosen, 1984) . Hundres of biological control projects have been successfully carried out in many parts of the world (Laing, J. and Hamai, J. 1976; Clausen, P, 1978). The recent trend towards integrated pest management (IPM) should not obscure the paramount improtance of biological control.

Important factor of biological control is parasites. The main group of parasites utilised in the biological control of arthropod pests is the Hymenoptera (Ichneumonoidea, Chalcidoidea, Proctotrupoidea) and Diptera (Tachinidae). Ichneumonid larvae develop as external or internal parasites mostly in the larvae or pupae of Lepidoptera , though Coleoptera, Hymenoptera and rarely Diptera are also parasitized. Some species also parasitize spiders or their eggs. Female Inchnemonids lay their eggs on or inside the body of host, which is stug (and paralysed) at that time. Eggs are mostly placed on definite part of the host body, mainly brain, thoracic ganglia, head, gut, coelome or attached to the body wall. By their parasitic habits they destroy a large number of insects injurious to agriculture and forestry.

The parasitic Hymenoptera, particularly the Ichneumonidae, are the most important group of entomophagous insects utilized in the biological control of insect pests. Studies on the taxonomy, biology and other aspects of entomophagous insects can supply the basic information necessary for undertaking biological control and for its effective operation.

The family Ichneumonidae is one of the important and largest of all the animal groups. It includes more species than entire vertebrate, it comprises, more than 6% of all insect species. These are of economic and biological importance. It is estimated (Townes, 1969) that there are nearly 60,000 species in the world fauna, of which about 16,000 species occure in the Oriental region. Hardly 15% of these are known today.

Ichneumonids of the world are mainly studied by Jurine (1801-1807), Fabricious (1804), Gravenhorst (1815-1820), Thunberg (1822-1829), Foerster (1868), Holmgren (1869-1872), Thomson (1873-1897), Cresson (1887-1928), Ashmead (1900), Roman (1912-1936), Viereck (1914-1922), Guhan & Rohwer (1917-1918), Cushman (1921-1926), Clausen (1940), Perkins (1943), Townes (1944-1984), Short (1969-1971), Perkins (1962),

Townes, Momoi and Townes (1965), Townes and Townes (1951-1973), Walkley (1967), Fitton and Gauld (1976) and many others.

Indian Ichneumonids are mainly studied by Morley (1912-1913), Rao (1953), Gupta (1955-1973), Kamat and Gupta (1972), Jonathan and Gupta (1973), Gupta and Tikar (1976), Gupta and Gupta (1977), Gupta and Maheshwari (1970-1977), Chandra and Gupta (1977), Kaur and Jonathan (1979), and Nikam (1980). In addition to this there are many other notable workers.

Family Ichneumonidae is included in superfamily Ichneumonoidea together with Braconidae, Stephanidae, Gasteruptiidae, Aphididae, Hybrizontidae. The oldest known fossils of Ichneumonidae are from the early Cretaceous, it might be originated in the Jurassic.

The members of family Ichneumonidae can be easily identified by their hymenopteran body, the venation of the forewing in which costal and subcostal veins fuses and appear as single, second recurrent vein always present except Ophionellus, Gnypetomorpha, Neorhacodes, Romaniella, Sathropterous, Mesochorus obliterator and Polyaulon stavnicensis. The Braconidae and Stephanidae agree with Ichneumonidae in having the costal and subcostal veins touching, but these two families always lack second recurrent vein. Inchneumonids can be

distinguished from Stephanidae by their possession of spurs on the middle tibia. Braconidae differs from these ichneumonid genera in having abdominal tergites two and three ankylosed or secondarily flexible. All ichneumonids, except Rothneyia, Hemigaster and females of Polyaulon and Pedunculus, have the second and third tergites separated by a flexible suture. The antennal legnth is useful for distinguishing ichneumonids from other hymenoptera. In ichneumonids antenna is long and with more than 14 segments. Mandible of ichneumonid has only two teeth, exceptionally the upper tooth weakly subdivided or with the lower tooth absent. Morphological terminology for the adult body of ichneumonid is illustrated in fig. 1 to 4.

In Maharashtra noteworthy work on ichneumonids from Marathwada region is carried out by Nikam. There is no any such work from Western Maharashtra. Western Maharashtra is rich in agricultural production and green vegetation. Therefore studies on ichneumonids from Western Maharashtra is attempted here. As parasites of other insects they are major factor in the natural control of insect population.

The dissertation deals with the taxonomic studies on Parasitic hymenoptera of the family Ichneumonidae from Western Maharashtra, India. For this collection and survey of ichneumonids alongwith their cocoons and hosts was made during 1986 to 1988. In addition, material from collections of Dr. K.S.Heble and Prof. D.G. Patil was studied. This is the first attempt to the study of ichneumonids from Western Maharashtra.