

CHAPTER-I
INTRODUCTION

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The dominant group of animals on the earth is insects which surpass all other terrestrial animals in number and occur practically everywhere. Several hundred thousand different kinds have been described, three times as many as there are in the rest of the animal kingdom and some authorities believe that the total number of different kinds may approach 30 million (Gupta, 2004). More than a thousand kinds may occur in fair-sized backyard, their populations often number many millions per acre (Gupta, 2004).

Many insects are extremely valuable to humans. Society could not exist in its present form without them. Insect pollinating activities make possible higher production of many agricultural crops, including many orchard fruits, nuts, clovers, vegetables, cotton, and tobacco, etc. Insects provide us honey, bee wax, silk and other products of commercial value. They serve as food for many birds, fishes and other beneficial animals including man (Shrivastava, 1996). They perform valuable services as scavengers and helping to keep harmful animals and plants in check. They are useful in medicine and in scientific research and are looked

upon as interesting animals by people in all walks of life. A few insects are harmful and cause enormous losses each year to agricultural, horticultural and forest crops and stored products. They may transmit diseases that seriously affect the health of plants and humans and other animals.

Majority of insects are relatively small, probably three-fourth or more are less than 6 mm in length. Their small size make them suitable to live in places that would not be possible to larger animals. Insects measure in size from about 0.25 to 330 mm in body length and from about 0.5 to 300 mm in wing span. One fossil dragonfly had a wing spread of over 760 mm. Some of the longest insects are very slender measuring about 330 mm is a walking stick occurring in Borneo but, some beetles have a body nearly as large as one's first (Borror *et al.*, 1982). The largest insects in North America are some of the moths with a wing span of about 150 mm, and the walking sticks, with a body length of about 150 mm (Gupta, 2004). Insects are the only invertebrates with wings and these wings have had an evolutionary origin different from that of the vertebrates. Insects have different colours from very drab to brilliant. No other animals on earth are more brilliantly coloured than some of the insects.

Insects are cold-blooded creatures. They have tremendous reproductive capacity. Most people do not realize just how great they are.

Insects have different feeding habits. They feed on an almost variety of foods. They are defoliators, sap suckers, blood suckers, gall formers, borers, ~~leaf~~ miners, leaf rollers, etc. Thousands of species feed on plants and practically every kind of plant (on land or in fresh water) is fed upon by some kind of insects. The plant feeders may feed on almost any of the plant part; caterpillars, beetles and leaf hoppers feed on the leaves; aphids feed on the stems, leaves, flowers; white grubs feed on the roots; certain weevil and moth larvae feed on the fruits and so on. Some insects burrow into soil and feed on roots. Thousands of insects are carnivorous, feeding on other animals. Some are predators and some are parasitoids. Many insects that feed on vertebrates are blood sucking. Some of the parasite insects such as mosquitoes, lice, fleas and certain bugs not only are annoying pests because of their bites but also serve as disease vectors. Some insects feed on dead wood, others feed on stored food of all types. Some feed on various fabrics and many feed on decaying materials.

Crickets are very important group of Class Insecta since they are visualized as pest insects in western and other countries. They are hardy insects and are not damaged by being picked up and handle. They do not bite and do not transmit any diseases. House crickets, field crickets, camel crickets, ant crickets, scaly crickets etc. are some important types of crickets. Crickets are somewhat related to grasshoppers and more closely related to katyids or bush crickets. They have somewhat flattened bodies and long antennae. Crickets belong to the family Gryllidae of Order Orthoptera. According to Vasanth(1993) there are about 2300 species of crickets in the world. Crickets tend to be nocturnal and are often confused with grasshoppers. Crickets are popular pets and are considered goodluck in Asia especially, China where they are kept in cages.

House crickets are 3/4 to 1 inch long, light yellowish brown with three dark brown bands on the head. They are nocturnal and prefer warm areas such as kitchen, basement, fireplace, cracks and crevices, behind base boards, etc. They make distinctive, annoying chirping sound. They eat just about anything but, love bread crumbs and liquids, including beer, often ruin stored clothing.

Field crickets are 1/2 to 1-1/4 inch long and black in body colouration. They found in pastures, meadows, lawns, occasionally indoors. They also eat almost anything but are associated with field crops, especially wheat, oats, rye, alfalfa and several plants, dead insects, seeds, leather, paper and old cloths, etc. They also feed on textiles of cotton, linen, wood and silk. Usually, one generation is completed in a single year. They generally hatch in May and come out in massive number with swarms covering many square miles. Several species are recognized which differ chiefly in habits, life history and song. Most species of *Gryllus* chirp but one species occurring in the Southwest, *G. rubens* Scudder, produces a more or less long trill. The most common species of *Gryllus* in the East is probably the Northern field cricket, *Gryllus pennsylvanicus* Burmeister.

Crickets can be found in many locations most species can be found in grasslands and forests. Scaly crickets *Pseudomogoplistes scamper* can be found on sea shores. Bod bush crickets *Merioptera brachytera* Linnaeus can be found in logs and marshes. Camel crickets are natural cave dwellers. The mole crickets *Gryllotalpa gryllotalpa* Latreille can be found underground, many other species live

in trees, ex. the Oak bush cricket *Meconoma thalassinum* De Geer while, the ant cricket *Mymecophilus acervorum* Panzer lives only in ant nests.

Camel crickets are lighttan to dark brown coloured, measuring about 1/2 to 1-1/2 inch in body length. They have hump-back appearance and found in cool, damp areas such as under logs or stones and in crawl spaces, basements and attics. They are nocturnal and they feed on clothes and lace curtains. Females lay eggs in spring, which hatch around April. Only one generation is completed in a year by this cricket. Unlike other crickets, they do not chirp. They become immobile in the presence of strong light. Field crickets, in adult stage spend their days in shallow burrows beneath a stone, clod of dirt or a tuft of plant. They are most active during the night. Males begin their nightly serenading to attract female mates. Females do not stridulate or rub special body structures together for producing sound. At the front of each wing male has a heavy vein with a row of teeth on the under side. According to some workers, the

pitch of the chirps is slightly higher than the highest octave on a piano. The warmer the night, the faster they chirp. Crickets have their special songs for courtship, fight and sound.

China is very famous country in the World for organizing cricket fightings and songs. Cricket fightings were very popular in ancient China. The practice became rare after the revolution, due to its 'Bourgeois nature'. Now it is making a come back. In Beijing there are many associations for organizing crickets. The associations sponsor national tournaments whereby modern equipment such as video cameras are used to zoom in and project the fighting onto many television sets which enable many viewers to see the fighting simultaneously.

The female of field cricket lays her eggs in the fall, approximately two weeks after maturation and development of wings. Firm base soil sites are preferred for egg laying. A single female lays 150 to 400 eggs. Eggs remain in the soil throughout the winter and hatch the following spring. Thus, eggs hatched into nymphs. Nymphs can be identified by the incomplete development of the wings. Nymphal period lasts for about three months. Nymphs

become adults. The adult stage is capable for fly and mate.

Cricket outbreaks are also common when large number of nymphs complete their development and embark on night time mating flights. The largest cricket outbreaks seem to occur during days of springs and summers. The reason for cricket outbreaks under such conditions is not fully understood. Although crickets are locally abundant throughout the year but, numbers appear to be highest in August and September when a summer drought is broken by rainfall and cooler weather.

Field crickets become a considerable household nuisance in abundant condition. They are primarily outdoor insects and as such are on accidental indoor invaders. Unlike house crickets, they do not breed or establish permanently indoor. However, they damage clothing, drapes or wall covering by their feeding activities or by staining with their feces or regurgitations. Crickets can damage fabrics, soiled clothing or clothes stained with perspiration. During severe outbreaks crickets can create an aesthetically unacceptable situation around places of business. Dead crickets

quickly pile up, causing odors and become repulsive to many people.

Crickets get attracted to bright light. Buildings that are brightly light at night are most likely to attract the largest number of crickets. Reducing outdoor lights is the first and most important step in a cricket control programme. Low pressure sodium vapour lamps and yellow incandescent "bug lights" are less attractive to crickets than standard incandescent, fluorescent, mercury vapour or halogen lights. Lighting schedule should be restricted to a few hours each night for reducing cricket populations.

Crickets are especially likely to enter cracks and openings around outdoor lights. They should be checked carefully. Steel or brass wool in weep holes are temporary insect barriers.

Crickets around building perimeters can be killed with any of several insecticidal baits and sprays. Baits for crickets include product containing hydramethylnon (Maxforce® and Combat® granular, ant and cricket baits), metaldehyde, carbaryl (Green Light Bug and Snail Bait) and trichlorform (Larva-Lur™).

Liquid insecticide sprays may be applied to outdoor sites around weep holes, doorways,

windows and other cricket entryways. Indoor sprays are not very effective for field crickets and are not recommended. Pesticides found effective against crickets refers to Chlorpyrifos (Dursban®), Carbaryl (Sevin®), Permethrin (Spectracic Bug Stop® and others), Cyfluthrin (Bayers Advanced Home™) and bifenthrin (Ortho Bug B Gon®).

Cricket control with insecticides should be considered as only partial solution to cricket problems. Insectides should be used in combination with reduction in outdoor lighting for best control.

Mole crickets are relatively common but, because they are nocturnal and spend nearly all their lives underground in extensive tunnel systems, they are rarely seen. Agricultural fields, lawns and golf courses, etc are the common places where mole crickets inhabit. Except Antarctica they are present in every continent and are commonly considered pests. Very interestingly, in East Asia, they are sometimes used as fried food.

Mole crickets are omnivorous insects. They feed on larvae, roots and grasses. Mole crickets can be predated by birds, rats, skunks, armadillos, raccoons and foxes, etc. In some places, mole cricket numbers are declining due to soil erosion and habitat destruction. Along the

North Carolina coast, over the past ten years, mole crickets have become the number one insect pest of home lawns, golf courses, municipal and commercial properties and sod farms. Mole crickets remain a challenge to effective management in western countries. Their management requires advanced planning and full-scale programme for best results. However, pest status of these crickets has not been widely attempted in India.

Mole crickets have three basic developmental stages: the egg, the nymph or immature and the adult. Overwintering takes place as either in last nymphal stage or adult that can remain somewhat active throughout the winter. In winter they cause damage by short tunnel mounds. As the soil temperature rises in March and April, the crickets do more tunneling. Crickets that overwintered as nymphs finish their development into adults during the spring. Only one generation is completed during a year by the mole cricket.

In late March and early April, the adults begin to fly and mate. Mole cricket prepares chamber and acts much like a megaphone. A soft toad like call is produced by male for about an hour after sunset specially at warm evenings in April. The call attracts the female for mating. Egg laying takes

place shortly after mating at the end of April or early May. Mated female lays her eggs at the depth of 3 to 10 inches in the soil. She usually constructs three to five chambers and lays a total of 100 to 150 eggs. Eggs are rounded, translucent and white. They hatch within 20 days between late May and July. The Southern mole crickets may continue to lay eggs throughout the summer and incubation occurs in August and September. The males die after mating while, female die shortly after completion of egg laying.

The newly emerged nymphs are small, about $\frac{1}{4}$ inch in length. There are 6 to 8 instars in nymphal stage. Small nymphs do not show wings, but the larger nymphs have small wing pads. Crickets continue to feed and grow through the summer and become most destructive in late August to early October. A mole cricket can prepare a tunnel of a length of 10 feet. Mole cricket activity is regulated by temperature and soil moisture. Mostly, they feed at night. During cold weather, the crickets may stay deep in the soil but, they have their tunneling near the surface in hot weather. Mole crickets damage golf courses, home lawns, recreational areas and sod farms. Damage intensity is increased in the spring and is usually minimal

after the middle of May. If the soil is very dry, a second drench of pure water may be necessary to flush the crickets. There is great interest and demand to develop nonchemical control technology for mole crickets in turfgrass. Great advances have been made in nonchemical control in the past few years (Castner, 1987). Biological control of mole cricket has been launched in North Carolina (Castner, 1988).

Maharashtra (fig.1) is leading state of India in agricultural and natural wealth. Out of 35 districts of Maharashtra, Kolhapur (fig. 2) is economically very advanced district. The district Kolhapur is very rich in flora and fauna. Noting the taxonomical characteristics of crickets and their abundance would be interesting from the view point of biodiversity and economic importance since crickets are visualized as a pest insects. No work has been reported from Maharashtra on the taxonomy of crickets. Therefore, present topic has been selected.

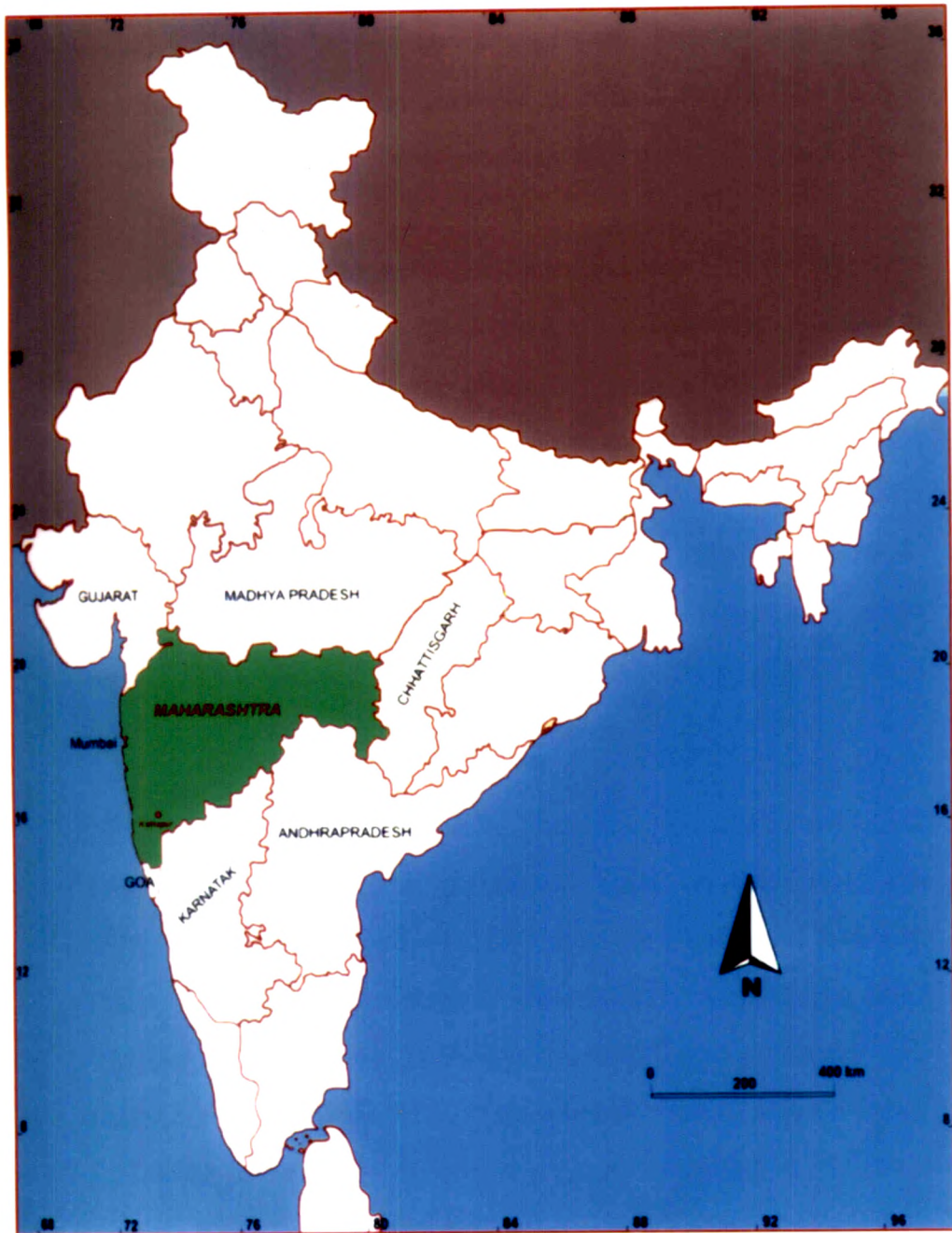


Fig.1: Map of India showing Maharashtra



Fig. 2: Map of Maharashtra showing Kolhapur district