

## *Chapter - 9*

# SUMMARY

The State of West Bengal has a diverse climate, which supports and favours a diversity of ecological habitats like forests, grasslands, wetlands, coastal and marine ecosystems, which harbour and sustain immense biodiversity. The information available on butterfly diversity and bio-ecology is sketchy and sporadic in West Bengal. The present study is an attempt to make an inventory of the butterfly communities based on bio-geographic zones of West Bengal with a note on their ecological adaptations. It also emphasizes the need for conservation of this delicate species as they are regularly traded from this part of India.

During the last five years of study period (2008-2012), total 330 species of butterflies belonging to 174 genera, 25 sub-families, and six families under two super-families were recorded. Out of these 330 species, 33 belong to family Papilionidae (swallowtails), 34 to family Pieridae (whites and yellows), 90 to family Lycaenidae (blues), 3 to family Riodinidae (metal-marks), 112 to family Nymphalidae (brush-footed), and 58 to family Hesperidae (skippers). Out of these 174 genera, 4 belong to family Papilionidae, 17 to family Pieridae, 55 to family Lycaenidae, 2 to family Riodinidae, 51 to family Nymphalidae, and 45 to family Hesperidae. Genus *Papilio* of family Papilionidae is the largest genus having 16 species. Genus *Graphium* of family Papilionidae and genus *Neptis* of family Nymphalidae have the second highest count, both contains 11 species each. The number of species of other genus varies from 1-8. Distribution of different butterfly species in four bio-geographic zones is different. They were restricted in to one and/or more than one province depending on their capability of ecological adaptations. The Lower Gangetic Plain (7B) is the species rich province having total count of 294, followed by Central Himalaya (2C) – 145 species, Chotta Nagpur (6B) – 88 species, and East Coast (8E) – 86 species. A total of 33 butterflies were recorded for the first time from West Bengal (range extension).

Butterfly species diversity was assessed quantitatively across different habitats of Gorumara National Park for seasonal patterns, abundance and habitat associations during January 2010 to December 2011. The analysis of the recorded data revealed that availability of butterflies is distinctly influenced by the respective season. Maximum butterflies were recorded during pre-monsoon (April-May) and post-monsoon (October-November). Monsoon (June-September) also emerged as good season for butterflies. The forest was noted to record the highest

butterflies both in terms of abundance and diversity, followed by that of grassland and bamboo habitats.

During the study period *Acraea violae* was found feeding on *Hybanthus enneaspermus* (Spade Flower or Pink Ladies Slipper) leaves and *Euploea core* larva was found feeding on *Adenium obesum* (Mock Azalea or Desert Rose) leaves. These two plants are recorded for the first time as larval host plant for the two butterfly species.

Life cycle of two butterfly species namely *Appias libythea* and *Hyarotis adrastus praba* were studied in laboratory conditions on their known larval host plant *Crataeva adansonii* (Garlic Pear Tree or Caper Tree) and *Phoenix acaulis* (Stem-less Date Palm) respectively. The total development time from egg laying to adult eclosion varied between 24-29 days in case of Striped Albatross. The period is 28-33 days for Tree Flitter. This in turn may permit a maximum of eight to nine overlapping broods per year if all factors remain suitable. The result of quantitative data on food consumption for both the species showed that the amount of food consumed gradually increased from larval instar I to V. Similarly, weight gained corresponded to the food consumption trend of each larva. The values of growth rate also increased with the age of larvae. Larger portion of the ingested food was lost in the form of faeces. Food consumption in the last two instars (instar IV and V) was over 80% and this may have helped in building up reserve energy for utilization in the non-feeding pupal period.

Threats that butterfly communities are facing constantly in each life stages were identified. These could be natural and/or anthropogenic (man-made disturbances). The natural risk included attack by parasitoids, parasites and predators. Whereas, anthropogenic disturbances through habitat destruction, degradation and fragmentation, application of pesticides and weedicides in agricultural practices, fire in forested area, livestock grazing, environmental pollution that leads to climate change and illegal trade and poaching directly or indirectly affect the survival of this delicate creature. The Wild Life (Protection) Act, 1972 of India ensures protection at various levels of animals including butterflies, host plants and their habitats. In the present study a total of 49 species and sub-species were found to be protected under three Schedules of the Wild Life (Protection) Act, 1972 (Schedule I Part IV – 5, Schedule II Part II – 35, and Schedule

IV - 9). This Act was the first, modern legal step at the national level towards the conservation of all wildlife in India. However, the butterfly lists in the Schedules of Wild Life (Protection) Act, 1972 are very biased and inadequate and butterflies have also not been chosen based on extent of their geographical distribution and abundance. On the other hand many threatened species, species having small geographic distribution (restricted distribution) or habitat specific are not mentioned in the lists. For these reasons, an objective revision of the Schedule lists will be very useful in providing appropriate and adequate legal protection to Indian butterflies.

Many butterflies are considered as flagship species for conservation in general and in particular for invertebrates. However, laws on paper are not likely to save wildlife unless sufficient actions are taken simultaneously to protect their habitats and to create public consciousness on their role and efficacy in maintaining the ecological equilibrium. Developing butterfly gardens may be most efficient to conserve butterflies. As human is responsible for their survival risk, it is responsibility of human beings to conserve them properly.