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Life cycle of family Nymphalidae in detail with reference to each sub family

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ABSTRACT

In the present study life cycle of the sub families of the family Nymphalidae has been studied. Butterfly species of family Nymphalidae were identified as indicators of disturbance in any area. In the present study Morphological and natural history aspects of different stages of eleven species from different locations in Satara Tehsil, are presented with photographs.

Keywords: Satara, butterfly diversity, larva, morphology, Butterfly life Abundance, Biodiversity, conservation.

INTRODUCTION

In theendure to study the ecosystem it is always necessary to study the organisms. The study of the organism in relation to its morphology, habit, habitat and most importantly its life cycle. In insect-plant interactions, the phytophagous insects eat plants and convert plant carbohydrates to animal protein. This interaction served as the dominant factor in plant evolution (Ehrlich & Raven, 1964). However, due to large scale loss, fragmentation and degradation of natural habitats, many species are in the verge of extinction (Schultz & Chang, 1998) and urgent measures are required for conserving them from extinction.

In the past few decades, butterfly populations in India have declined (Grewal, 1996), and it is often suggested that captive rearing/breeding and releasing of butterflies in the wild will help restock at-risk populations and serve as a means of conservation (Varshney, 1986; Herms et al., 1996; Nicholls & Pullin, 2000;Mathew, 2001; Crone et al., 2007; Schultz et al. , 2008). The basic protocol is to collect eggs from wild-mated female, rear larvae to adult butterflies in captive propagation facilities, and release adults/pupae back in wild populations (Crone et al., 2007).For the development of effective breeding/rearing programs and conservation Management of butterflies, information on the life history and exact habitat requirements is essential (Pawar PA and Deshpande VY, 2016).

The immature stages of butterflies are increasing importance as sources of systematic characters, and often give important clues as to the placement of species in major groups (DeVries, et al., 1985; Freitas et al., 2002). Haribal (1992) noted that such information is lacking for 70% of the Indian butterflies.

MATERIAL AND METHODS

The present study was carried out at Satara Thesil during the calendar year 2013 to 2016. Satara Thesil lies between (17^0.5' to 18^0.1' N latitude and073^0 33' 74.76'E longitude) is located on the Western Ghats of India in the State of Maharashtra.The family Nymphalidae was studied so as to investigate the life cycle stages of its sub families. A representative of each sub family was studied.

The study area was regularly searched during the morning and evening hrs for the activity of the butterflies. Different habitats harboring different vegetation were selected for better availability of all the sub families. The entire study period was grouped in four seasons

Butterfly male and females were collected and mating was tried in laboratory conditions but it was not possible. The leaf with eggs were collected in Plastic jars (15 cm) diameter and brought to the laboratory. The leaf piece with eggs was then placed in a smaller jar (10 cm).They were examined regularly at 8 hrs Interval for recording the time of hatching. Each of the freshly emerged larvae was transferred to clean plastic jars. The larvae were supplied daily with tender leaves of the host plant. The faeces and the leftover of the food was collected .The growing larvae were observed regularly to note the instars changes and conversion into pupa. The Pupa were observed till the eclosion of butterflies took place

OBSERVATION

LIFE STAGES

ADULT

The male and female adults were observed to check the morphological peculiarities. The mating was observed in the field. Photography of the mating was done for some species. Courtship behavior is

where the male tries to please the female and consists of a mating ritual, where a male grasps the female in the air and brings her down to the ground, where mating occurs. Mating occurs several times, attempts frequently fail because of the resisting by females (e.g., Frey, 1997).
EGG

A gravid female lays eggs singly or in batches on the surface of the Leaves or under the leaf surface of the host plant. The females sits on the leaf edge and deposits the egg by bringing her ovipositor close to the leaf .At oviposition the eggs are white or translucent the color changes accordingly in different species before hatching. When freshly laid eggs appeared soft in texture, but within few seconds they became hard and hairy due to coming in contact with air. The maximum egg duration may vary according to the season, climatic condition and species.

LARVAL STAGE
Instars I, II.III, IV, V
The first instar immediately after emergence starts feeding on empty egg shells and then epidermis of leaflets of the host plant. The morphological characters are seen like the spines and bands.The coloration of the caterpillar becomes darker as compared to the first instar.The morphological characters are seen prominently the bands become darker and the caterpillar grows in size consuming more food The size grows there is continuous and rigorous feeding. the size keeps on growing in size. The fifth instar when fully grown stopped feeding. The larva became lethargic and slightly shrinked before entering into the pupal stage. This stage called as prepupal stage lasted for 8-10 hours and finally formed.

Pupa-The body contracted and the larva attached itself to the substratum with its posterior end hanging downwards or upward. The pupa (chrysalis) is formed by the larva hanging on a substrate, such as underside of leaves and twigs, usually unnoticeable place. This stage lasts for 2-3 days in normal conditions,after inclusion an adult butterfly emerges.

RESULT

The life cycle stages of 11 sub families has been observed and recorded.

1. Sub family Dyainae-Tribe danaini Genus Danus (kluk,1780)
   i.(Danaus.chrysippus)Plain tiger
2. Sub Family Calinaginae -- no Butterfly found in Maharashtra
3. Sub Family Charaxinae Tribe Charaxini (Hubner 1824)Genus Polyura.
   i. (Polyura.athamas.athamas)Common Nawab
4. Sub Family Morphinae-- --no Butterfly found in Maharashtra
5. Sub Family Satyrinae Melanitis
   i. (Melanitis.leda.leda) Common Evening Brown
6. Sub Family Limenitidinae Tribe limenitidini
   i. (Athyma.perius.perius.) Common Sergeant.
7. Sub family Heliconiinae Tribe Hrliconiini Genus Phalanta
   i. (Phalanta.phalanta.phalanta) Common Leopard
8. Sub Family Biblidinae Tribe biblidini Genus Ariadne
   i. (Ariadne.merione.merione) Common Castor
9. Sub FamilyApaturinae Tribe Apaturini Genus Rohana
   i. (Rohana.parisatis.atacinus) Black Prince
10. Sub Family Cyrestinae Tribe Cyrestini Genus Cyrestis
    i. (Cyrestis.thyodamanas.indica)Common Map
11. Sub Family Nymphalinae Tribe Junoniini Genus Junonia
    i. (Juznonia.atlites,atlites) Grey Pansy
12. Sub Family Acraeinae Tribe Acraeini Genus Acraea
    i. (Acraea.violae) Tawny Coster
13. Sub Family Libytheinae Genus Libythea
    i. (Libythea.myrrha.rama)Club Beak

DISCUSSION

Out of the 1318 butterflies found in Maharashtra. There are total thirteen sub families in the family Nymphalidae found in India but in Maharashtra only eleven sub families are found. Two Sub Family Calinaginae and Sub Family Morphinae are not found in Maharashtra according to available records and literature review and observation (Varshney R K and Smetacek P.(2015)In the study area only 11 sub families are found. Pawar P A and Deshpande VY. (2016)

The butterflies in study area are multivolatine hence diapause was not seen .The Precipitation during the North–West monsoon likely had its influence on reproduction via the host plant. (Atluri et al., 2004b).Humidity being a crucial factor for the life cycle stages due to dryness in the climate many species are migratory and not residential. For most of India Wynter - Blyth (1957) rated spring as the most favorable period, followed by post monsoon and South-West monsoon.

In the Northern Western Ghats, Kunte (1997) observed highest flight activity during late monsoon (August to September) and early winter (October to November)In the study area peak season was observed from (August to December) Pawar P A and Deshpande VY. (2016).The total number of speices as well, as the count of each species was high in this season as the study area has extreme climatic conditions the effect is also seen on the abundance ,count and life cycle stages.

The total development time from egg laying to adult eclosion was determined as 20-35 days,This behavior is in line with the expectation of tropical butterflies to have a short lifecycle, and multiple broods over the year (Owen, 1971)in some exceptional conditions when the climate had reached 40^0C the life cycle was longer and the emerging adult size was smaller as compare to the normal size. Since temperature influences instar duration and the overall development time (Mathavan & Pandian, 1975; Palanichamy et al., 1982; Pathak & Pizvi, 2003; Braby, 2003) Response to seasonality is an important aspect of life history characteristics of insects. It was seen that as the season changes the time requitrd to complete the life cycle also changed. (Tauber 1986) in response to seasonal variation many species may enter diapauses; others migrate while others are able to develop seasonal forms.(Roskam JC, 1999) such seasonal forms were seen in the Sub Family Satyrinae Genus Melanitis (Melanitis.leda.leda) Common Evening Brown. There was delayed pupation in some species but diapauses was not observed in the study.

The Climate is an important factor that influences the distribution, abundance and range of butterflies (Dennis, 1977; Turner *etal*, 1987).The climatatic changes lead to instability in numbers (Douwes, 1975; Pollard, 1979; Ehriich *et al.*, 1980; Deschamps-Cottin, 1996).It also affects the survival(Puech, 1983), fecundity (Boggs, 1986), rate of development(Shreeve, 1986)activity of adult (Douwes, 1976),also affects larval and adult food plants.

During summer the life cycle was longer in case of the Sub FamilyApaturinae Genus Rohana (Rohana.parisatis.atacinus) Black Prince as compared to monsoon either pre monsoon or post monsoon .The life cycles in monsoon were shortest. Whereas the life cycle of Sub family Dyainae, Genus Danus (Danaus.chrysippus.chrysippus)Plain Tiger was completed in a shorter time as compared to longer duration in other seasons than in summer. In summer the high temperature and dryness may lead to longer life cycle in (Rohana.parisatis.atacinus) and shorter in (Danaus.chrysippus.chrysippus).

The present study may provide immense knowledge of the life cycle stages of the sub families. The study may be subjected to the enviormnental conditions as the life cycles were performed in a natural condition and no additional temperature, humidity and light facilities were provided. It may help in captive rearing resulting in security from predators at the caterpillar stages .This study renders ample of knowledge on the duration of the life cycle stages from egg to adult. It is a small step in the conservation of butterflies.

CONCLUSION

Thus the present study provides information on the reproductive behavior egg laying, larval host and larval performance, growth and utilization, and the length of life cycle from egg to adult. The

present study also is a key step in the documentation of the life cycles of the eleven sub families of family Nymphalidae.

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