

MIGRATION OF BUTTERFLIES (LEPIDOPTERA: RHOPALOCERA) IN THE NEW AMARAMBALAM RESERVE FOREST OF THE NILGIRI BIOSPHERE RESERVE

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Abstract

Migration of five species of butterflies viz., *Appias albina darada* C. & R. Felder, *A. wardii* Moore, *A. indra shiva* Swinhoe, *Cepora nadina remba* Moore and *Graphium sarpedon teredon* Felder were recorded during February 2000 in the New Amarambalam Reserve Forest located at an elevation of 650m in the Kerala part of Western Ghats, India. The orientation of flight was from north-east to south-west, along the banks of the river Karimpuzha, and the groups comprised of about 77% of males giving a male to female ratio of 3.4 : 1. The most abundant migratory species were *Appias albina darada* (53.55%) and *A. indra shiva* (37.16%) followed by *Graphium sarpedon teredon* (4.92%), *A. wardii* (2.73%) and *Cepora nadina remba* (1.64%). The peak hours of flight was between 1200hr and 1300hr when as many as 160 butterflies/minute were recorded. Mud-puddling behaviour was also observed among the females of *A. albina darada*.

Key words

Lepidoptera, butterflies, migration, mud-puddling, New Amarambalam, Western Ghats, Kerala

Introduction

Migration in butterflies is a well-known phenomenon and our knowledge of migration of butterflies has been greatly enhanced by the studies of Dr. C.B. Williams from all parts of the world (Williams, 1930). Information pertaining to migration of a number of butterflies in India has been given by Williams (1938), Wynter-Blyth (1957) and Larsen (1978, 1987a,b,c). In addition to these, there have been several reports on the migration of butterflies from different parts of India (Gupta, 1991; Jamdar, 1991; Bharos, 2000, Palot *et al.*, 2002).

In a recent study on the faunal diversity of New Amarambalam

Reserve Forests in the Western Ghats during 1998-2000, we observed local aggregation and migration of butterflies. This forest reserve is situated between 11°14' & 11°24' N and 76°19' & 76°33' E in the Malappuram District of Kerala (Fig. 1). Located north-west to the Silent Valley National Park, it forms part of the Nilgiri Biosphere Reserve core area. It has a total extent of 265km² out of which, about 250km² are covered by unexploited natural forests of evergreen and semi evergreen types. The lower and outer foot hills, which were once covered by moist deciduous forests have been converted to teak plantations. Observations made on the migratory patterns as well as behaviour of various butterflies involved in the migration are presented herein.

Materials and Methods

The migratory patterns of butterflies were studied at Meenmutti for three days between 8 and 10 November 2000. In order to assess the density of butterflies taking part in the migration, counts were made at 20-minute intervals. For this, the surveyor stood about 5m away from the path of the butterfly migration and all the butterflies flying in front of the surveyor in one minute period were counted. The counting started at around 0800hr as soon as the first butterfly was sighted and continued till 1700hr when the butterflies almost ceased to fly. During counting no effort was made to ascertain the species involved and only the number was noted. This effort was replicated three times.

In order to identify the butterflies involved in the migration and to assess their relative abundance, sweep net sampling was carried out during various parts of the day. Samples included butterflies in flight as well as those present in mud-puddling assemblages. The butterflies thus collected were set, curated and later identified following Wynter-Blyth (1957) and D' Abrera (1982, 1985, 1986) and also with reference to the butterfly collections of Kerala Forest Research Institute.

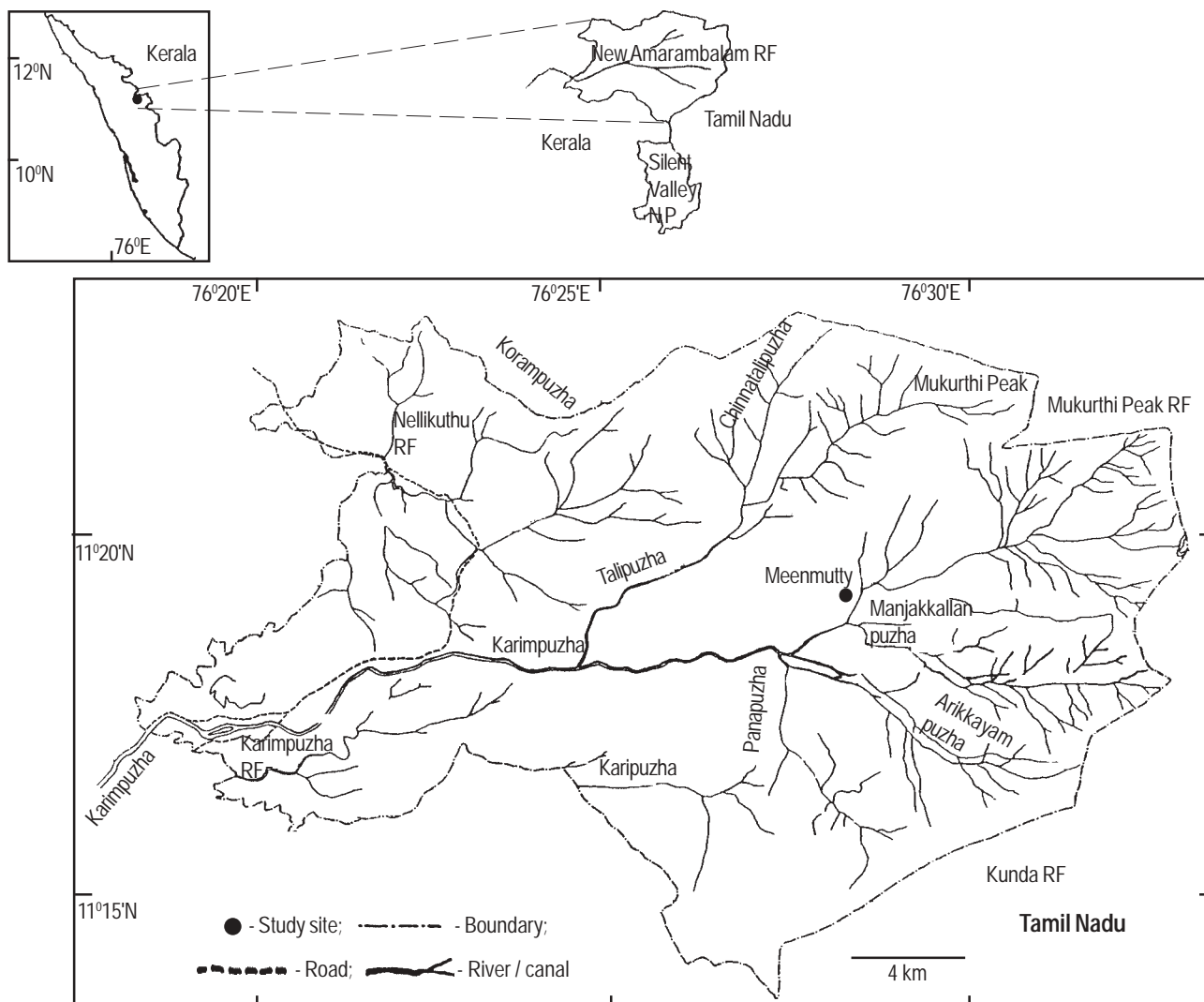


Figure 1. Map of New Amarambalam Reserve Forest

Results and Discussion

Small scale population build up of butterflies was first observed on 6 November 2000 at Ganiyan mala area situated at 1400m. The butterflies were flying at about 1-2m above the ground and the course of the flight was along the banks of the river Karimpuzha from north-east to south-west direction. The populations attained highest density at mid elevations as revealed by the observations carried out at Meenmutti located at 650 m.

Species composition

Altogether, 17,795 butterflies were counted in 27 research hours spent in studying the migratory patterns among butterflies at Meenmutti. Five species of butterflies were observed in the

migration viz., The Common Albatross (*Appias albina darada* C&R Felder), The Plain Puffin (*Appias indra shiva* Swinhoe), The Lesser Albatross (*Appias wardii* Moore), The Lesser Gull (*Cepora nadina remba* Moore), and The Common Blue Bottle (*Graphium sarpedon teredon* Felder). Apart from these, the polyphenetic forms of the females of *A. albina darada*, form *semiflava* and form *flava* were also recorded.

Of the various butterflies observed, *A. albina darada* (including the polyphenetic forms, *semiflava* and *flava*) constituted about 53.55% of the total followed by *A. indra shiva* (37.16%), *G. sarpedon teredon* (4.92%) and *A. wardii* (2.73%) of the total population (Fig. 2). Least abundance was recorded for *C. nadina remba*, (1.64%). All the species recorded above are pierids except

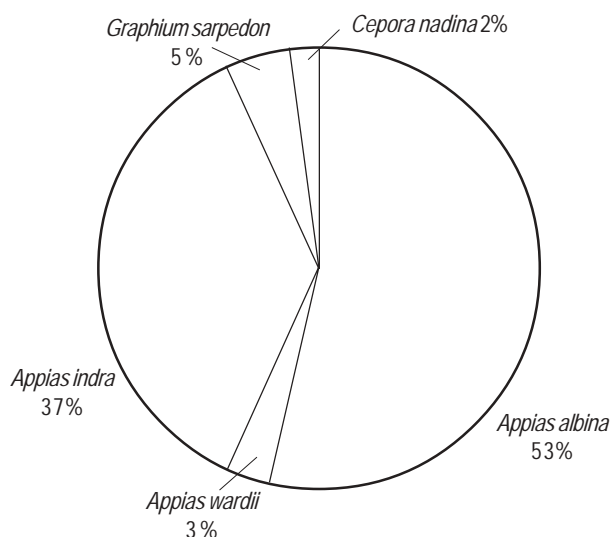


Figure 2. Chart showing the proportion of butterfly species in migration

G. sarpedon teredon, which is a papilionid.

Periodicity of migrant butterflies

The flight of butterflies started at around 0800hr and was over by 1700hr. The density of the migrating butterflies was maximum during 1200-1300hr on all days of observation. During this period, up to 160 butterflies were counted per minute. The abundance slowly started to decline from 1430hr when about 56 butterflies were recorded per minute (Fig. 3). Thereafter, the density and flight pattern became irregular. By 1630hr the migration was almost over with just two butterflies recorded per minute. It should be noted here that the highest abundance for butterflies was recorded during the hottest period (1200-1300hr) of the day. There was no significant difference in abundance or in flight activity during the three days of observation.

Mud-puddling behaviour

Even as the migration was taking place, a small population of butterflies was found to rest on damp patches along the migratory path. These butterflies appeared to be attracted to natural puddles on rocky depressions as well as man-made salt licks (burnt wood, charcoal, etc.). During 1030hr only about 50 individuals were found in the mud-puddling swarms. Around 1300hr, which was the hottest period of the day, as many as 500 individuals were observed at every salt lick. This included the migrant butterflies mentioned earlier as well as some other butterflies that were not found in the swarms such as The Blue Mormon (*Papilio polymnestor*), The Red Helen (*P. helenus*), The Common Blue Bottle (*G. sarpedon teredon*) (Papilionidae), The Common Club Beak (*Libythea myrrha*), The Map Butterfly (*Cyrestris thyodamas*), The Blue Tiger (*Tirumala limniace*)

Table 1. Butterflies involved in mud-puddling during migration

Common name	Scientific name	Host plants
Papilionidae		
**Blue Mormon	<i>Papilio polymnestor</i>	<i>Citrus decumana</i> , <i>Glycosmis mauritiana</i> , * <i>Atlantia wightii</i>
Red Helen	<i>Papilio helenus</i>	Cultivated <i>Citrus</i> , * <i>Zanthoxylum rhetsa</i> , <i>Glycosmis mauritiana</i>
Five Bar Swordtail	<i>Graphium antiphates</i>	* <i>Desmos lawii</i>
Common Blue Bottle	<i>Graphium sarpedon teredon</i>	<i>Persea odoratissima</i> , * <i>Persea macrantha</i> , * <i>Cinnamomum zeylanicum</i> , <i>Camphora officinalis</i> , <i>Litsea chinensis</i> , <i>Litsea salicifolia</i> , <i>Alseodaphne semicarpitulia</i>
Nymphalidae		
Club Beak	<i>Libythea myrrha</i>	<i>Celtis tetrandra</i>
Map Butterfly	<i>Cyrestris thyodamas</i>	<i>Ficus religiosa</i> , * <i>Ficus benghalensis</i> , * <i>Ficus racemosa</i>
Tawny Rajah	<i>Charaxes bernardus</i>	* <i>Millettia tomentosa</i> , * <i>Tamarindus indica</i>
Blue Tiger	<i>Tirumala limniace</i>	* <i>Asclepiads</i> , <i>Vallisneria spiralis</i>
Lycaenidae		
Common Pierrot	<i>Castalius rosimon</i>	* <i>Zizyphus rugosa</i> , * <i>Zizyphus xylopyrus</i>
Banded Blue Pierrot	<i>Discolampa ethion</i>	* <i>Zizyphus oenoplia</i> , * <i>Zizyphus xylopyrus</i>
Malayam	<i>Megisba malaya</i>	* <i>Allophylus cobbe</i>
Common Hedge Blue	<i>Acytolepis puspa</i>	<i>Cylista scariosa</i> , <i>Xylia dolabiformis</i> , * <i>Hiptage madablota</i> , * <i>Schleichera oleosa</i>
Line Blues	<i>Nacaduba</i> spp.	
Pieridae		
Common Albatross +	<i>Appias albina darada</i>	
***Lesser Albatross +	<i>Appias wardii</i>	<i>Drypetes venusta</i>
Plain Puffin +	<i>Appias indra shiva</i>	* <i>Drypetes oblongifolia</i>
Lesser Gull +	<i>Cepora nadina remba</i>	<i>Capparis roxburghii</i> , <i>Capparis moonii</i> , <i>Capparis rheedii</i>

* Host plants recorded from New Amarambalam; ** Endemic to India and Sri Lanka; *** Endemic to Western Ghats; + Schedule II as per the Indian Wildlife (Protection) Act, 1972

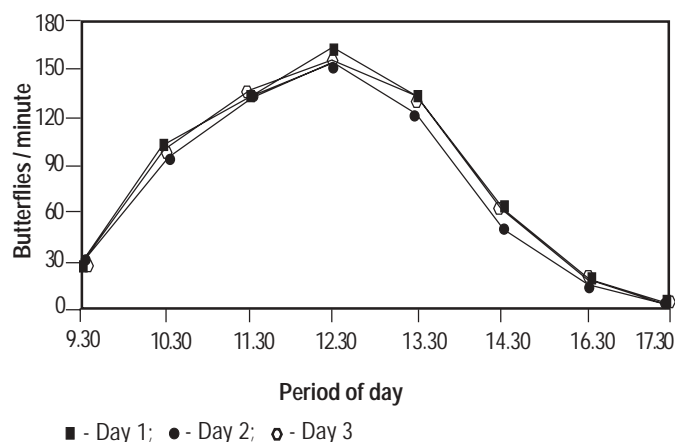


Figure 3. Periodicity of migrant butterflies

(Nymphalidae), The Common Pierrot (*Castalius rosimon*), The Banded Blue Pierrot (*Discolampa ethion*), The Malayan (*Megisba malaya*), The Common Hedge Blue (*Acytolepis puspa*) and Line Blues (*Nacaduba* spp.) (Lycaenidae) (Table 1). Butterflies are known to visit mud puddles mainly for sodium salts (Arms *et al.*, 1974). So far, only the males are reported to visit the puddles. In this study, the females of *A. albina darada* were also found to be very much active in mud-puddling. The requirement for more water and salts during migration might be the reason for this.

During the time of peak aggregation, individual butterflies vying for the limited space available in the salt licks, were found to alight on one another leading to mortality. The cause may be either due to drowning or by wing damage as a result of fixation in mud and water. It was found that for a group of around 300 individuals, approximately six instances of mortality were observed after one hour. Mortality was assessed by periodically scaring away the butterflies from the salt licks. Twenty such salt licks/damp patches were observed for this purpose.

The cause of large-scale migration of butterflies is still not fully known. However, it is probable that the stimulation to migrate in vast numbers might be due to population outbreak leading to depletion of host plants (Ford, 1990). Gilbert and Singer (1975) have also pointed out the availability of larval as well as adult food resources as a limiting factor in the mass occurrence and migration of butterflies. The host plants of migrant butterflies recorded from New Amarambalam are given in Table 1. However their role in the migration of butterflies observed herein could not be conclusively established although a recent survey carried out in the study area has indicated population outbreaks of the Plain Puffin, *Appias indra shiva* breeding on *Drypetes oblongifolia* (Binoy & Mathew, 2000). We lack details pertaining

to the population dynamics of most species of butterflies found in this area and detailed observations are required to clearly understand the causes for butterfly migration.

Acknowledgements

This study was made in connection with a project sponsored by the Ministry of Environment and Forests, Government of India. We are grateful to the Director, KFRI, for his interest in this study.

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