

HABITAT ASSOCIATIONS OF BUTTERFLIES IN THE PARAMBIKULAM WILDLIFE SANCTUARY, KERALA, INDIA¹

V.V. SUDHEENDRAKUMAR, C.F. BINOY, P.V. SURESH AND GEORGE MATHEW²

(With one text-figure)

Key words: Lepidoptera, diversity, habitats, forest, Kerala, Parambikulam Sanctuary

Habitat associations of 124 butterfly species were determined by analysing species records from five habitat types in the Parambikulam Wildlife Sanctuary, Kerala. The butterflies recorded belonged to 75 genera and 9 families. The families Nymphalidae, Pieridae, Lycaenidae and Satyridae were represented by the maximum number of species. Thirty-three species were present altogether in all the habitat types in the sanctuary. Fifteen species were found to be habitat specific, namely *Papilio buddha*, *Pathysa antiphates*, *Pachliopta pandiyana*, *Pantoporia ranga*, *Pareronia valeria hippia*, *Zipoetis saitis*, *Oriens concinna*, *Virachola perse ghela*, *Zesius chrysomallus* in the evergreen forests and *Ixias marianne*, *I. pyrene*, *Colotis etrida*, *C. danae*, *C. fausta*, *Ypthima ceylonica ceylonica* in the dry deciduous forests. Tropical wet evergreen forests possessed the greatest butterfly diversity in Parambikulam, followed by semi-evergreen and moist deciduous habitats. Significant reduction in butterfly diversity was observed in both dry deciduous habitats and teak plantations. Out of the butterflies recorded, 10 species are narrow endemic to Western Ghats and 18 species have protected status.

INTRODUCTION

Among invertebrates, butterflies are suitable for ecological studies, as the taxonomy, geographic distribution and status of many species are relatively well known. These insects, which are mostly phytophagous, serve as primary herbivores in the food chain and are also useful as pollinators of many angiosperms. As many butterflies are good bio-indicators of the environment, they can be used to identify ecologically important landscapes for conservation purposes.

Habitat is the single most important requisite for the proliferation and conservation of a butterfly species (Gilbert and Singer 1975, New 1990-92). All species prefer particular habitats, closely related to their life history: breeding behaviour, larval and adult food resources, etc. In many tropical countries, the rapid destruction of forest wealth has severely affected these butterfly habitats, which are slowly

changing into hostile environs (Wells *et al.* 1983). The process has diverse ecological consequences. Many species, which were once common, have become rare. This in turn adversely affects the diversity and abundance of plant species dependent upon them. The identification of important landscapes and their conservation is, therefore, very important.

The butterfly fauna of India is quite well known (Evans 1932, Talbot 1939, 1947, Wynter-Blyth 1957, Larsen 1987, 1988). However, very few studies were conducted in the Western Ghats of Kerala (Fergusson 1891, Fraser 1930, Mathew and Rahmathulla 1993, Palot *et al.* 1997). An attempt is made here to discuss the habitat preferences of butterflies in the Parambikulam Wildlife Sanctuary, an important tropical forest location in Kerala.

STUDY AREA

Parambikulam Wildlife Sanctuary (Fig. 1), a part of the Western Ghats, is situated in the Palghat district, Kerala (76° 35' E and 76° 50' E and between 10° 20' N and 10° 26' N). It opens up as a wide valley between the Nelliampathy

¹Accepted August, 1999

²Division of Entomology, Kerala Forest Research Institute, Peechi 680 653, Trichur, Kerala, India.

ranges in the north and Anaimalais in the south. The Sanctuary has a total area of 270 sq. km and a mean elevation of 600 m above msl. The vegetation is highly complex, a combination of Malabar and Deccan elements (Sebastine and Ramamurthy 1966). Different natural habitats include 1) the west coast tropical evergreen forest, 2) west coast semi-evergreen forest, 3) south Indian moist deciduous forest, and 4) south Indian dry deciduous forest. The man-made habitats include plantations of teak and eucalyptus covering 90 sq. km and 3 sq. km respectively, and small patches of bamboo and reeds. About 28 sq. km of the Sanctuary are occupied by the reservoir. The microhabitats in the Sanctuary include marshy fields or *vayals* and banks of rivers and streams.

MATERIAL AND METHODS

As part of a study on the diversity of a selected group of insects during 1995-97, observations were made by laying belt transects in the Karienshola (evergreen forests), Ammakundu (moist deciduous forests), Thekkady-Keerappady (dry deciduous forests) and Thunacadavu (teak plantations) areas from June 1996 to May 1997. These sites were chosen as representatives of the habitat types in the study area. Each transect was covered twice in a month, between 1000 hrs and 1400 hrs, and observations including the identity of the butterflies encountered were recorded. Sample specimens were collected only if they were needed for identification. Occasional observations were made in other parts of the Sanctuary like Poopara, Orukombankutty, Kuriarkutty, Velayudhankayi, Seechali and Thellikkal.

The identification was done with the help of butterfly collections in the Kerala Forest Research Institute, Peechi, the National Collections at the Zoological Survey of India and the Pusa Collections, Indian Agricultural Research Institute, New Delhi, and with

reference to Wynter-Blyth (1957) and D'Abrera (1982, 1985, 1986).

Based on their occurrence in different habitats, the butterflies were categorised as follows:

1. Common (C) - Present in 4 or more habitats
2. Uncommon (UC) - Present in 2-3 habitats
3. Rare (R) - Present in 1 habitat only

RESULTS

Butterflies of 124 species, belonging to 75 genera and 9 families were collected and identified. A list of species with their habitat associations is given in Table 1. Most of the butterflies collected belonged to Nymphalidae (28 species), Pieridae (22 species), Lycaenidae (20 species), Satyridae (16 species) and Papilionidae (15 species).

Butterfly associations in different habitats in the study area are discussed below.

Tropical evergreen forests: In Parambikulam, such forests are seen in Karianshola, Pulikkal, Karappara and Orukomban areas. Small patches of evergreen forests also occur at Karimalagopuram and Shettiwaramalai. Butterflies like *Papilio buddha*, *P. paris*, *Pathysa antiphates*, *Idea malabarica malabarica*, *Vindula erota saloma*, *Parthenos sylvia virens* etc., are seen in the forest canopies of this habitat. The understorey is occupied mostly by shade loving species that are excellent mimics of their surroundings like *Lethe rohria neelgheriensis*, *Ypthima* spp. and *Melanitis* spp. Species like *Cethosia nietneri mahratta*, *Cupha erymanthis maja*, *Catopsilia* spp., *Papilio helenus*, *Tagiades litigiosa* and *Celaenorrhinus ambareesa* are observed in forest clearings formed as a result of tree falls.

Semi-evergreen forests: Semi-evergreen forests appear where evergreen forests merge into moist deciduous forests. The vegetation is a combination of both evergreen and moist deciduous elements. Butterflies present here are common to both evergreen and moist deciduous forests. Species like *Papilio helenus*, *Charaxes*

HABITAT ASSOCIATIONS OF BUTTERFLIES

TABLE I
DISTRIBUTION OF BUTTERFLIES IN VARIOUS
HABITATS IN THE STUDY AREA

| Family / Species | Habitats | | | | |
|-----------------------------------|----------|-----|-----|-----|-----|
| | EVG | SEV | MDF | DDF | PLN |
| PAPILIONIDAE | | | | | |
| <i>Graphium sarpedon</i> | | | | | |
| teredon Felder | * | * | * | * | * |
| <i>G. agamemnon</i> Linnaeus | * | * | * | * | * |
| <i>G. doson eleius</i> | | | | | |
| Fruhstorfer | * | * | | | |
| <i>Pachliopta aristolochiae</i> | | | | | |
| Linnaeus | * | * | * | * | * |
| <i>P. hector</i> Linnaeus | * | * | * | * | * |
| <i>P. pandiyana</i> Moore | * | | | | |
| <i>Papilio polytes thesus</i> | | | | | |
| Cramer | * | * | * | * | * |
| <i>P. demoleus</i> Linnaeus | * | * | * | * | * |
| <i>P. paris tamilana</i> Moore | * | * | * | | |
| <i>P. buddha</i> Westwood | * | | | | |
| <i>P. helenus</i> Linnaeus | * | * | * | | * |
| <i>P. polymnestor parinda</i> | | | | | |
| Moore | * | * | * | * | * |
| <i>P. dravidarum</i> | | | | | |
| Wood-Mason | * | * | | | |
| <i>Pathysa antiphates</i> | | | | | |
| (Fabricius) | *S | | | | |
| <i>Troides minos</i> Cramer | * | * | * | *S | * |
| NYMPHALIDAE | | | | | |
| <i>Cethosia nietneri mahratta</i> | | | | | |
| Felder | * | * | * | | |
| <i>Charaxes bemardus imna</i> | | | | | |
| Butler | * | * | | | |
| <i>Cirrochroa thais thais</i> | | | | | |
| Fabricius | * | * | * | | |
| <i>Cupha erymanthis maja</i> | | | | | |
| Fruhstorfer | * | * | * | | |
| <i>Ariadne ariadne indica</i> | | | | | |
| Moore | * | * | * | * | * |
| <i>A. merione merione</i> | | | | | |
| Cramer | * | * | * | * | * |
| <i>Polyura athamas athamas</i> | | | | | |
| Drury | * | * | * | | * |
| <i>Euthalia lubentina arasada</i> | | | | | |
| Fruhstorfer | * | * | * | | |
| <i>E. aconthea meridionalis</i> | | | | | |
| Fruhstorfer | * | * | * | | |
| <i>Hypolimnas bolina</i> | | | | | |
| Linnaeus | * | * | * | | * |
| <i>H. misippus</i> Linnaeus | * | * | * | | * |
| <i>Junonia orithya swinhoei</i> | | | | | |
| Butler | * | * | * | | * |
| <i>J. lemonias</i> Linnaeus | * | * | * | * | * |
| <i>J. hierta</i> Fabricius | * | * | * | * | * |
| <i>J. almana</i> Linnaeus | * | * | * | | * |
| <i>J. atlites</i> Linnaeus | * | * | * | | * |

TABLE I (CONTD.)
DISTRIBUTION OF BUTTERFLIES IN VARIOUS
HABITATS IN THE STUDY AREA

| Family / Species | Habitats | | | | |
|------------------------------------|----------|-----|-----|-----|-----|
| | EVG | SEV | MDF | DDF | PLN |
| <i>J. iphita pluvialis</i> | * | * | * | * | * |
| Fruhstorfer | | | | | |
| <i>Kaniska canace viridis</i> | | | | | |
| Evans | * | * | * | | |
| <i>Moduza procris</i> Cramer | * | * | * | | * |
| <i>Neptis hylas varmona</i> | | | | | |
| Moore | * | * | * | * | * |
| <i>N. jumbah jumbah</i> Moore | * | * | * | | * |
| <i>Pantoporia hordonia</i> Stoll | * | * | * | | |
| <i>P. ranga</i> (Moore) | S | | | | |
| <i>Parthenos sylvia virens</i> | | | | | |
| Moore | * | * | | | |
| <i>Phalanta phalanta</i> Drury | * | * | * | | |
| <i>Tanaecia lepidea miyana</i> | | | | | |
| Fruhstorfer | * | * | * | | |
| <i>Vanessa cardui</i> Linnaeus | * | * | * | | |
| <i>Vindula erota saloma</i> | | | | | |
| Swinhoe | * | * | * | | * |
| AMATHUSIIDAE | | | | | |
| <i>Discophora lepida lepida</i> | | | | | |
| Moore | * | * | | | |
| SATYRIDAE | | | | | |
| <i>Lethe rohria neelgheriensis</i> | | | | | |
| Guerin | * | * | * | | * |
| <i>L. europa</i> Fabricius | * | * | | | |
| <i>Melanitis leda leda</i> Drury | * | * | * | | * |
| <i>M. phedima varaha</i> Moore | * | * | * | | * |
| <i>Mycalesis anaxias anaxias</i> | | | | | |
| Hewitson | * | * | * | | * |
| <i>M. igilia</i> Fruhstorfer | * | * | * | | |
| <i>M. patnia junonia</i> Butler | * | * | * | | |
| <i>M. perseus</i> Fabricius | * | * | * | | |
| <i>M. mineus polydecta</i> | | | | | |
| Cramer | * | * | * | | * |
| <i>M. visala</i> Moore | * | * | * | | |
| <i>Orsotriaena medus</i> | | | | | |
| <i>mandata</i> Moore | * | * | * | | |
| <i>Ypthima ceylonica ceylonica</i> | | | | | |
| Hewitson | | | | * | |
| <i>Y. baldus madrasa</i> Evans | * | * | * | * | * |
| <i>Y. philomela</i> Linnaeus | * | * | * | | |
| <i>Y. huebneri</i> Kirby | * | * | * | * | * |
| <i>Zipoetis saitii</i> Hewitson | * | | | | |
| ACRAEIDAE | | | | | |
| <i>Acraea terpsicore</i> Linnaeus* | | * | * | *S | |
| DANAIDAE | | | | | |
| <i>Danaus genutia genutia</i> | | | | | |
| Cramer | * | * | * | * | * |
| <i>D. chrysippus chrysippus</i> | | | | | |
| Linnaeus | * | * | * | * | * |

HABITAT ASSOCIATIONS OF BUTTERFLIES

TABLE 1 (CONTD.)
DISTRIBUTION OF BUTTERFLIES IN VARIOUS
HABITATS IN THE STUDY AREA

| Family / Species | Habitats | | | | |
|------------------------------------|----------|-----|-----|-----|-----|
| | EVG | SEV | MDF | DDF | PLN |
| <i>Euploea core core</i> Cramer | * | * | * | * | * |
| <i>Idea malabarica</i> | | | | | |
| <i>malabarica</i> Moore | * | * | | | |
| <i>Parantica aglea aglea</i> | | | | | |
| Cramer | * | * | * | * | * |
| <i>P. nilgiriensis</i> Moore | * | * | * | | |
| <i>Tirumala limniace</i> | | | | | |
| <i>leopardus</i> Butler | * | * | * | * | * |
| PIERIDAE | | | | | |
| <i>Appias libythea libythea</i> | | | | | |
| Fabricius | * | * | * | * | * |
| <i>A. lyncida latifascia</i> Moore | * | * | * | * | * |
| <i>A. albina darada</i> Felder | * | * | | | |
| <i>A. indra shiva</i> Swinhoe | * | * | * | | |
| <i>Anapheis aurota</i> | | | | | |
| Fabricius | * | * | * | | * |
| <i>Catopsilia pomona</i> | | | | | |
| <i>pomona</i> Fabricius | * | * | * | * | * |
| <i>C. pyranthe</i> Linnaeus | * | * | * | * | * |
| <i>Cepora nerissa phryne</i> | | | | | |
| Fabricius | * | * | * | * | |
| <i>C. nadina remba</i> Moore | * | * | | | |
| <i>Colotis fausta</i> (Olivier) | | | | * | |
| <i>C. etrida</i> Boisduval | | | | * | |
| <i>C. danae</i> Fabricius | | | | * | |
| <i>Delias eucharis</i> Drury | * | * | * | * | * |
| <i>Eurema laeta laeta</i> | | | | | |
| Boisduval | * | * | * | * | * |
| <i>E. hecabe</i> Linnaeus | * | * | * | * | * |
| <i>E. blanda</i> Boisduval | * | * | * | * | * |
| <i>E. brigitta rubella</i> Wallace | * | * | * | | * |
| <i>Hebomoia glaucippe</i> | | | | | |
| <i>australis</i> Butler | * | * | * | * | * |
| <i>Ixias pyrene sesia</i> Linnaeus | | | | * | |
| <i>I. marianne</i> Cramer | | | | * | |
| <i>Leptosia nina nina</i> | | | | | |
| Fabricius | | | * | * | |
| <i>Pareronia valeria hippia</i> | | | | | |
| Fabricius | *S | | | | |
| LYCAENIDAE | | | | | |
| <i>Caleta caleta</i> Hewitson | * | * | * | | * |
| <i>Castalius rosimon</i> | | | | | |
| (Fabricius) | * | * | * | * | * |
| <i>Celastrina lavendularis</i> | * | * | * | | |
| Moore | | | | | |
| <i>Cheritra freja</i> (Fabricius) | * | * | * | | |
| <i>Chilades pandava</i> | | | | | |
| <i>pandava</i> Horsfield | * | * | * | | |
| <i>Curetis dentata dentata</i> | | | | | |
| Moore | * | * | * | | |

TABLE 1 (CONTD.)
DISTRIBUTION OF BUTTERFLIES IN VARIOUS
HABITATS IN THE STUDY AREA

| Family / Species | Habitats | | | | |
|------------------------------------|----------|-----|-----|-----|-----|
| | EVG | SEV | MDF | DDF | PLN |
| <i>Virachola perse ghela</i> | | | | | |
| (Fruhstorfer) | S | | | | |
| <i>Discolampa ethion</i> | | | | | |
| <i>vavasanus</i> Fruhstorfer | * | * | * | | * |
| <i>Euchrysops cnejus cnejus</i> | | | | | |
| Fabricius | * | * | * | | * |
| <i>Jamides alecto</i> (Felder) | * | * | * | | * |
| <i>J. celeno</i> (Cramer) | * | * | * | * | * |
| <i>J. bochus bochus</i> Cramer | * | * | | | |
| <i>Loxura atymnus</i> Cramer | * | * | * | | |
| <i>Neopithecops zalmora</i> | | | | | |
| <i>dharma</i> Moore | * | * | | | |
| <i>Spindasis vulcanus</i> | | | | | |
| <i>vulcanus</i> Fabricius | * | * | * | | |
| <i>S. schistacea schistacea</i> | | | | | |
| Moore | * | * | * | | |
| <i>Talica nyseus nyseus</i> | | | | | |
| Guerin | * | * | | | |
| <i>Udara akasa</i> Horsfield | * | * | * | | |
| <i>Zesius chrysomallus</i> | | | | | |
| Hubner | *S | | | | |
| <i>Zizina otis decreta</i> Butler | * | * | * | | * |
| HESPERIIDAE | | | | | |
| <i>Badamia exclamationis</i> | | | | | |
| Fabricius | * | * | * | | |
| <i>Celaenorrhinus leucocera</i> | | | | | |
| Kollar | * | * | | | |
| <i>C. ambareesa</i> Moore | * | * | * | | * |
| <i>Hasora chromus chromus</i> | | | | | |
| Cramer | * | * | * | | |
| <i>Iambrix salsala luteipennis</i> | | | | | |
| Plotz | * | * | * | | |
| <i>Oriens concinna</i> El. | * | | | | |
| <i>Odontoptilum angulata</i> | | | | | |
| Felder | * | * | * | | |
| <i>Potanthus pava pava</i> | | | | | |
| Fruhstorfer | * | * | * | | |
| <i>Pelopidas subochracea</i> | | | | | |
| <i>subochracea</i> Moore | * | * | | | |
| <i>Spialia galba</i> Fabricius | * | * | * | | |
| <i>Tagiades litigiosa</i> | | | | | |
| Moschler | * | * | * | | * |
| <i>Taractrocera ceramas</i> | | | | | |
| <i>ceramas</i> Hewitson | * | * | * | | |
| <i>Telicota ancilla bambusae</i> | | | | | |
| Moore | * | * | * | | * |

Abbreviations: EVG - Evergreen; SEV - Semi-evergreen;
MDF - Moist Deciduous Forest; DDF - Dry Deciduous Forest;
PLN - Teak Plantation; S - Single observation during the entire
study period

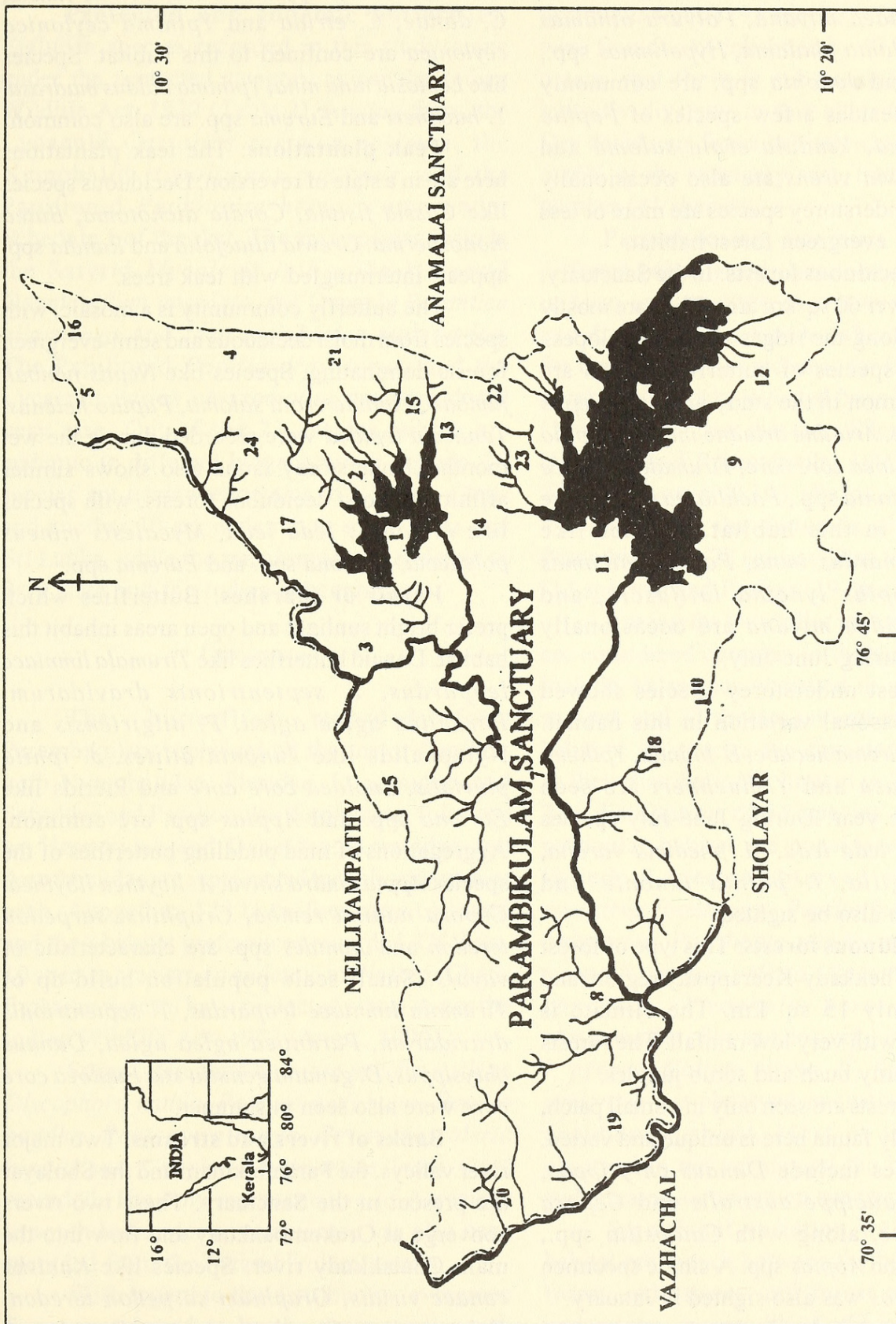


Fig.1: Map of Parambikulam Wildlife Sanctuary showing study sites

bernardus imna, *Cirrochroa thais thais*, *Tanaecia lepidea miyana*, *Polyura athamas athamas*, *Phalanta phalanta*, *Hypolimnas* spp., *Neptis* spp. and *Junonia* spp. are commonly found here. Besides a few species of *Papilio paris tamilana*, *Vindula erota saloma* and *Parthenos sylvia virens* are also occasionally sighted. The understorey species are more or less same as in the evergreen forest habitat.

Moist deciduous forests: In the Sanctuary, such forests cover 60 sq. km area. They are mostly encountered along the ridges and lower slopes.

Several species of butterflies which are generally common in the study area like *Neptis hylas varmona*, *Ariadne ariadne indica*, *Papilio demoleus*, *Euploea core core*, *Tirumala limniace leopardus*, *Junonia* spp., *Pachliopta* spp. etc are encountered in this habitat. Species like *Charaxes bernardus imna*, *Polyura athamas athamas*, *Appias lyncida latifascia*, and *Tanaecia lepidea miyana* are occasionally sighted here during June-July.

The forest understorey species showed remarkable seasonal variation in this habitat. Species like *Eurema hecabe*, *E. blanda*, *Ypthima baldus madrasa* and *Y. huebneri* are seen throughout the year. During June-July species like *Melanitis leda leda*, *M. phedima varaha*, *Mycalesis igilia*, *I. patnia junonia* and *M. perseus* can also be sighted.

Dry deciduous forests: This type of forest is seen in the Thekkady-Keerappady region, and constitutes only 15 sq. km. The climate is extremely dry with very low rainfall. The forests are mainly thorny bush and scrub jungles.

These forests are seen only in a small patch, and the butterfly fauna here is unique and varied. Canopy species include *Danaus chrysippus*, *Hebomoia glaucippe australis* and *Cepora nerissa phryne*, along with *Catopsilia* spp., *Junonia* spp. and *Appias* spp. A single specimen of *Troides minos* was also sighted in January.

This habitat harbours the most distinctive understorey fauna in the Sanctuary. Species like

Ixias marianne, *I. pyrene sesia*, *Colotis fausta*, *C. danae*, *C. etrida* and *Ypthima ceylonica ceylonica* are confined to this habitat. Species like *Leptosia nina nina*, *Ypthima baldus madrasa*, *Y. huebneri* and *Eurema* spp. are also common.

Teak plantations: The teak plantations here are in a state of reversion. Deciduous species like *Cassia fistula*, *Cordia dichotoma*, *Butea monosperma*, *Grewia tiliaefolia* and *Randia* spp. appear, intermingled with teak trees.

The butterfly community is a mosaic, with species from moist deciduous and semi-evergreen forests dominating. Species like *Neptis jumbah jumbah*, *Vindula erota saloma*, *Papilio helenus*, *Tanaecia lepidea* were recorded during the wet months. Understorey fauna also shows similar affinity to moist deciduous forests, with species like *Melanitis leda leda*, *Mycalesis mineus polydecta*, *Ypthima* spp. and *Eurema* spp.

Vayals or marshes: Butterflies which prefer bright sunlight and open areas inhabit this habitat. Danaid butterflies like *Tirumala limniace leopardus*, *T. septentrionis dravidarum*, *Parantica aglea aglea*, *P. nilgiriensis* and Nymphalids like *Junonia atlites*, *J. iphita pluvialis*, *Euploea core core* and Pierids like *Eurema* spp. and *Appias* spp. are common. Aggregations of mud puddling butterflies of the species *Appias indra shiva*, *A. libythea libythea*, *Cepora nadina remba*, *Graphium sarpedon teredon* and *Jamides* spp. are characteristic of vayals. Small scale population build-up of *Tirumala limniace leopardus*, *T. septentrionis dravidarum*, *Parantica aglea aglea*, *Danaus chrysippus*, *D. genutia genutia* and *Euploea core core* were also seen in summer.

Banks of rivers and streams: Two major river valleys, the Parambikulam and the Sholayar are present in the Sanctuary. These two rivers converge at Orukombankutty and flow into the main Chalakkudy river. Species like *Kaniska canace viridis*, *Graphium sarpedon teredon*, *Caleta caleta*, *Castalius rosimon*, *Discolampa ethion vavasanus* and *Jamides* spp. were recorded

from the banks of these rivers and streams.

Protected and endemic butterflies: Eighteen species recorded in this study come under the protected category as per the Indian Wildlife Act, 1972 (Table 2). Among them, the Lycaenid *Castalius rosimon rosimon*, the Nymphalid *Hypolimnas misippus*, and the Papilionid *Pachliopta hector* come under Schedule I of the Act. The rare species include the Satyrid *Mycalesis igilia*, the Hesperid *Odontoptilum angulata*, the Danaids *Parantica nilgiriensis* and *Idea malabarica malabarica*. The Papilionid *Papilio dravidarum* and the Lycaenid *Zesius chrysomallus* are considered very rare. Out of the 23 species, which are endemic to different biogeographic regions, 10 species are narrow endemics of Western Ghats and another 10 are endemic to south India and Sri Lanka, while the remaining 3 are endemic to Sri Lanka and the Indian subcontinent.

DISCUSSION

The butterflies recorded from Parambikulam represent all the major families, with Nymphalidae, Pieridae, Lycaenidae, and Satyridae and Papilionidae dominating, followed by Hesperidae and Danaidae. Acraeidae and Amathusiidae are represented by only one species each. Altogether, 124 butterflies were collected and their habitat preferences recorded. Of them, 10 species are narrow endemic to Western Ghats. Eighteen species have protected status as per the Indian Wildlife Act, 1972 (Anon., 1990).

Some interesting and rare species such as *Discophora lepida*, *Pathysa antiphates*, *Papilio buddha*, *Pantoporia ranga*, *Pareronia valeria hippia* and *Charaxes bernardus imna* were recorded. The only representative of Acraeidae in south India, *Acraea terpscire* has also been recorded from the Parambikulam forests.

With regard to the distribution, evergreen forest was found to be the most species-rich habitat (117 species). This was followed by semi-

evergreen forests (108 species) and moist deciduous forests (95 species). Teak plantations were found to be inhabited by 57 species, which means that there is substantial reduction in butterfly diversity in this altered environment. Dry deciduous forest habitat, which covers only 5.26% of the sanctuary area, harbours the least number (41 species).

Parambikulam contains a number of different habitats and climate zones, as diverse in form and structure as wet evergreen forests and dry deciduous forests, which may account for the high species richness for butterflies. The number of species collected from Parambikulam (124) is higher than that from Silent Valley (100) (Mathew and Rahmathulla, 1993) and Periyar Tiger Reserve (119) (Palot *et al.*, 1997). Endemism in the fauna is also higher in Parambikulam (23 species) than in Silent Valley (13 species) and Periyar (19 species).

Among the butterflies recorded, 60 species are considered common in the sanctuary. These include 33 species observed in all the habitats studied, and 27 species present only in the four habitats. 49 species are considered uncommon as their distribution is limited to 2 or 3 habitats. The distribution of 15 species restricted to a particular habitat are considered rare, which include 9 species observed exclusively in evergreen forests viz., *Papilio buddha*, *Pathysa antiphates*, *Pachliopta pandiyana*, *Pantoporia ranga*, *Pareronia valeria*, *Zipoetis saitis*, *Oriens concinna*, *Virachola perse* and *Zesius chrysomallus*. Six species viz., *Ixias marianne*, *I. pyrene*, *Colotis etrida*, *C. fausta*, *Ypthima ceylonica* are observed exclusively in the dry deciduous habitat. Most of the butterflies observed in the *vayals* and the banks of rivers and streams are common species.

Significant variation was observed in habitat preference between the butterflies in the forest understorey and forest canopy. Forest understorey species like *Lethe rohria*, *Ypthima ceylonica*, *Ixias pyrene*, *Colotis fausta* showed

HABITAT ASSOCIATIONS OF BUTTERFLIES

TABLE 2
LIST OF RARE AND ENDEMIC BUTTERFLIES RECORDED FROM PARAMBIKULAM

| FAMILY/SPECIES | STATUS | ENDEMISM |
|--|-----------------------------|---------------------------------|
| Papilionidae | | |
| <i>Troides minos</i> Cramer | | Western Ghats |
| <i>Pachliopta hector</i> Linnaeus | Protected, Schedule I | South India & Sri Lanka |
| <i>P. pandiyana</i> Moore | | Western Ghats |
| <i>Papilio buddha</i> Westwood | Protected, Schedule II | Western Ghats |
| <i>P. dravidarum</i> Wood-Mason | Very rare | Western Ghats |
| <i>P. polymnestor parinda</i> Moore | | Peninsular India & Sri Lanka |
| Pieridae | | |
| <i>Appias libythea libythea</i> Fabricius | Protected, Schedule IV | |
| <i>Appias lyncida latifascia</i> Moore | Protected, Schedule II | |
| <i>A. albina darada</i> Felder | Protected, Schedule II | Western Ghats |
| <i>A. indra shiva</i> Swinhoe | Protected, Schedule II | |
| <i>Cepora nadina remba</i> Moore | Wettest rainforests | |
| <i>Delias eucharis</i> Drury | | South India & Sri Lanka |
| Nymphalidae | | |
| <i>Cirrochroa thais thais</i> Fabricius | Only in wettest rainforests | South India & Sri Lanka |
| <i>Cethosia nietneri mahratta</i> Felder | Only in wettest rainforests | South India & Sri Lanka |
| <i>Euthalia lubentina</i> (Cramer) | Protected, Schedule IV | |
| <i>Hypolimnas misippus</i> Linnaeus | Protected, Schedule I | |
| <i>Neptis jumbah jumbah</i> Moore | Protected, Schedule I | |
| <i>Parthenos sylvia</i> Moore | Protected, Schedule II | |
| <i>Tanaecia lepidea miyana</i> Fruhstorfer | Protected, Schedule II | |
| <i>Pantoporia ranga</i> Moore | Protected, Schedule II | |
| Amathusiidae | | |
| <i>Discophora lepida lepida</i> Moore | Protected, Schedule II | South India & Sri Lanka |
| Satyridae | | |
| <i>Mycalesis anaxias anaxias</i> Hewitson | Protected, Schedule II | |
| <i>M. igilia</i> Fruhstorfer | Rare | Western Ghats |
| <i>M. patnia junonia</i> Butler | | South India & Sri Lanka |
| <i>Ypthima ceylonica ceylonica</i> Hewitson | | South India & Sri Lanka |
| <i>Zipoetis saitis</i> Hewitson | Protected, Schedule II | Western Ghats |
| Acraeidae | | |
| <i>Acraea terpsicore</i> Linnaeus | | Sri Lanka & Indian Subcontinent |
| Danaidae | | |
| <i>Parantica nilgiriensis</i> Moore | Rare | Western Ghats |
| <i>Idea malabarica malabarica</i> Moore | Rare | Western Ghats |
| Lycanidae | | |
| <i>Castalius rosimon rosimon</i> Fabricius | Protected, Schedule I | |
| <i>Euchrysops cnejus cnejus</i> Fabricius | Protected, Schedule II | |
| <i>Spindasis vulcanus vulcanus</i> Fabricius | | Sri Lanka & Indian Subcontinent |
| <i>S. schistacea schistacea</i> Moore | | South India & Sri Lanka |
| <i>Udara akasa</i> Horsfield | | Sri Lanka & Sri Lanka |
| <i>Zesius chrysomallus</i> Hubner | Very rare | Sri Lanka & Indian Subcontinent |
| Hesperiidae | | |
| <i>Odontoptilum angulata</i> (Feld.) | Rare | |
| <i>Oriens concinna</i> Elwes | Protected, Schedule IV | Western Ghats |

remarkable habitat specificity compared to forest canopy species like *Cirrochroa thais*, *Papilio demoleus*, *Delias eucharis*, and *Hebomoia glaucippe*. This may be the reason why canopy butterflies (barring a few species) are common in the Sanctuary.

The habitat association of butterflies discussed here is based on the observed distribution in various habitats. One of the reasons for a species' association with a particular habitat could be the presence of its host plants. For example, the papilionid *Pachliopta pandiyana* recorded from the evergreen forest habitat can survive only on the habitat-specific evergreen shrub, *Thottea siliquosa* (Lam.) Hou (Aristolochiaceae). Similar ecological data for other butterfly species could help to interpret their habitat associations precisely.

The presence of a rich butterfly fauna in the Parambikulam Wildlife Sanctuary is indicative of the diverse habitats in the Sanctuary,

which help in the proliferation and abundance of butterfly species. Holloway *et al.* (1992) observed that conversion of forests to plantation and other man-induced disturbances lead to reduction in the diversity of lepidopterans, both in species richness and in taxonomic and biogeographic quality. Parambikulam, with a variety of vegetation types, climatic zones, and remarkable endemism, must be given top priority for the conservation of its rich biodiversity.

ACKNOWLEDGEMENTS

This work was carried out as part of a project funded by the Kerala Forest Department (Wildlife Wing). We thank the Wildlife Warden and his staff, Parambikulam Wildlife Sanctuary, for cooperation; the Director, Kerala Forest Research Institute, Peechi for encouragement and facilities and experts from the ZSI and IARI for identification.

REFERENCES

- ANONYMOUS (1990): The Indian Wildlife Act (Protection), 1972. Nataraj Publishers, Dehra Dun, pp. 86.
- D'ABRERA, B. (1982, 1985, 1986): Butterflies of the Oriental Region. Parts I, II & III, Hill House, Australia.
- EVANS, W.H. (1932): The Identification of Indian Butterflies. Bombay Natural History Society, Bombay. 464 pp.
- FERGUSON, H.S. (1891): A list of the butterflies of Travancore. *J. Bombay nat. Hist. Soc.* 6: 438-448.
- FRASER, F.C. (1930): A note on some Malabar Lepidoptera. *J. Bombay nat. Hist. Soc.* 34: 260-261.
- GILBERT, L.E. & M.C. SINGER (1975): Butterfly ecology. *Ann. Rev. Ecol. Syst.* 6: 365-397.
- HOLLOWAY, J.D., A.H. KIRK-SPRIGGS & C.Y. KHEN (1992): The response of some rain forest insect groups to logging and conversion to plantation. *Phil. Trans. R. Soc. Lond. B.* 335: 425-436.
- PALOT, M., JAFER, G., MATHEW & V.J. ZACHARIAS (1997): Butterflies of Periyar Tiger Reserve, Kerala (India). *Adv. For. Res. India.* 27: 188-204.
- LARSEN, T.B. (1987): The Butterflies of the Nilgiri mountains of Southern India (Lepidoptera: Rhopalocera). *J. Bombay nat. Hist. Soc.* 84(1): 26-54; 84(2): 291-316; 84(3): 560-584.
- LARSEN, T.B. (1988): The butterflies of the Nilgiri mountains of southern India (Lepidoptera: Rhopalocera). *J. Bombay nat. Hist. Soc.* 85(1): 26-43.
- MATHEW, G. & V.K. RAHMATHULLA (1993): Studies on the butterflies of the Silent Valley National Park, Kerala, India. *Entomon* 18(3 & 4): 185-192.
- NEW, T.R. (1990-92): Conservation of butterflies in Australia. *J. Res. Lepid.* 29(4): 237-253.
- SEBASTINE, K.M. & K. RAMAMURTHY (1966): Studies on the flora of Parambikulam and Aliyar submergible areas. *Bull. Bot. Surv. India.* 8: 169-182.
- TALBOT, G. (1939): The Fauna of British India including Ceylon and Burma - Butterflies Vol. 1, Repr. 1975, Today and Tomorrow Printers and Publishers, New Delhi, pp. 600.
- TALBOT, G. (1947): The Fauna of British India including Ceylon and Burma—Butterflies Volume II, Reprint Edition (1975), Today and Tomorrow Printers and Publishers, New Delhi, pp. 506.
- WELLS, S.M., M.R. PYLE & MARK M. COLLINS (1983): The IUCN Invertebrate Red Data Book. IUCN, Switzerland, 623 pp.
- WYNTER-BLYTH, M.A. (1957): Butterflies of the Indian Region. Bombay Natural History Society, Bombay, 523 pp.





Sudheendrakumar, V V et al. 2000. "Habitat Associations of Butterflies in the Parambikulam Wildlife Sanctuary, Kerala, India." *The journal of the Bombay Natural History Society* 97, 193–201.

View This Item Online: <https://www.biodiversitylibrary.org/item/189503>

Permalink: <https://www.biodiversitylibrary.org/partpdf/155294>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In Copyright. Digitized with the permission of the rights holder

License: <http://creativecommons.org/licenses/by-nc/3.0/>

Rights: <https://www.biodiversitylibrary.org/permissions/>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.