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Research Paper

DIVERSITY AND DISTRIBUTION OF BUTTERFLIES IN THE SHENDURNEY WILDLIFE SANCTUARY

T P Narayanankutty¹, Revathy V S^{2*} and George Mathew²

*Corresponding Author: **Revathy V S** ✉ revathybiju143@gmail.com

Diversity and distribution patterns of butterflies in the Shendurney Wildlife Sanctuary were studied. Butterflies recorded in the study belonged to five families with Nymphalidae (81 numbers) and Hesperidae (71 numbers) containing maximum number of species followed by Lycaenidae (72 numbers), Pieridae (24 numbers) and Papilionidae (17 numbers). Based on the base line data, the diversity and distribution pattern of butterflies has been assessed. Key words: Diversity, Butterflies, Shendurney Wildlife Sanctuary

Keywords: Seasonality, Butterflies, Lepidoptera, Shendurney Wildlife Sanctuary

INTRODUCTION

Shendurney Wildlife Sanctuary, part of Agasthyamalai Biosphere Reserve, is one of the richest areas of bio-diversity in Western Ghats. The biotic richness and distinct biographic features of this forest area makes it an ideal gene pool reserve. Shendurney Wildlife Sanctuary has substantial natural vegetation ranging from southern secondary moist mixed deciduous forest to southern subtropical hill forest. Tropical evergreen and semi evergreen forest comprises three fourth of the total area of the sanctuary. The undulating terrains, rocky mountains, waterfalls, grasslands etc. form the habitat of a variety of tropical flora and fauna. The sanctuary is located in Kollam District and comes under the control of Agasthyavanam Biological Park Circle.

The significance of the sanctuary lies in its ecological, faunal, floral and geo-morphological importance. Various factors contributing to the significance of the area are the rich abundance of *Gluta travancorica*, an endemic species of Agasthyamalai region. It is also a treasure house of plant diversity. About 951 species of flowering plants belonging to 150 families are reported from this sanctuary of which 309 species are endemic to Western Ghats. Occurrence of more than 100 species of threatened plants within the sanctuary, which is the type locality of several endemic and threatened species. The presence of wild populations of lion-tailed macaque, a highly endangered species adds its uniqueness. Other wild animals like elephant, tiger, leopard, bear, Nilgiri langur, Malabar giant squirrel etc are also

¹ Additional PCCF, Kerala.

² Forest Health division, Kerala Forest Research Institute, Peechi, Kerala.

seen. The avifaunal wealth ~ 245 species of birds were reported including migratory, endemic and endangered species

Invertebrates, because of their overwhelming majority on earth in terms of individuals, species and biomass have important roles in the functioning of natural ecosystems. As has already been stated, there are human settlements in the vicinity of the Sanctuary which leads to various types of threats such as cattle grazing, green manure collection etc. Invertebrates, being highly fragile in nature, even minor perturbations in the ecosystem can affect their survival. Lepidoptera, because of their close association with vegetation, has been stated as biotic indicators of stand quality. So, the present study aimed to generate a baseline data on the diversity, habitat associations and distribution patterns of butterflies in the sanctuary and to assess the conservation status of Butterflies.

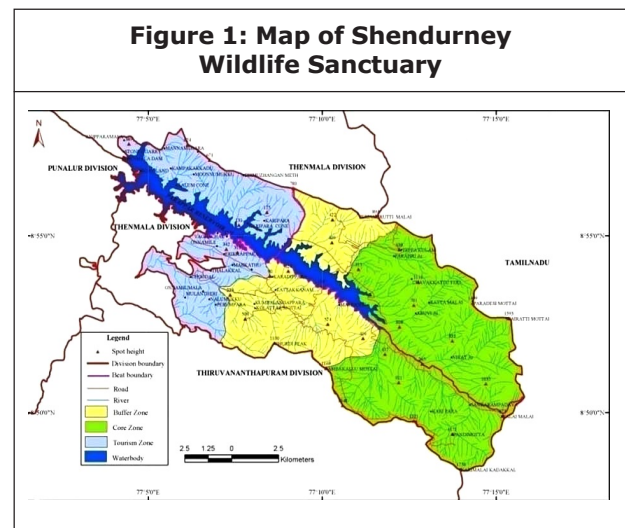
METHODOLOGY

Study has been carried out in representative plots in different habitats, forest types covering openings, forest edges, interior forest and banks of water bodies in the Shendurney Wildlife Sanctuary.

MONITORING OF BUTTERFLIES AND TRANSECT COUNT

In order to assess the diversity and distribution of butterflies, the standard transect counting method (Pollard, 1997; Ishaii, 1993) was selected. The butterflies encountered along a fixed transect route of 1 Km length, traversing the sanctuary were recorded regularly at an interval of 15 days for a two year period from September 2008 to March 2011. All the butterflies observed at a distance of 10m from the observer were recorded

during the counts. Besides the identity of butterflies, date of observation, the number of species and individuals encountered, natural mortality factors as well as weather parameters were recorded. All observations were made during the forenoon hours between 10.30 and 11:30 hrs during which the butterfly has maximum activity. Initially, the unfamiliar species were collected for identification and released later. Identification of butterflies was done using literature (Larsen, 1987, 1988; and Wynter-Blyth, 1957) or by reference to the insect collection at KFRI.



The transect count was carried out by making observations along a transect route traversing the selected patches of the sanctuary. The transect count was carried out in the different areas representing distinct vegetation the sanctuary such as West coast Tropical Evergreen Forest, Southern hill top Tropical Evergreen Forest, West Coast Semi Evergreen Forest and Southern moist mixed Deciduous Forests. The selected areas were

- Kallar – Southern Hill top Tropical Evergreen forests & west coast tropical evergreen forest
- Kattalappara-Southern secondary moist

deciduous forests and west coast tropical evergreen forest

- Pandimotta- Southern Hill top Tropical Evergreen forests and Reed area
- Umayar – West coast tropical evergreen forests. This tract is has significant area with Evergreen forests, Riparian forests, secondary forests with habitations.

DATA ANALYSIS

The seasonal index of butterflies of each family was calculated by using the formula:

$$\text{Seasonal Index} = \frac{\text{Month-wise mean}}{\text{Overall mean}} \times 100$$

where, the month-wise mean is the number of butterflies for a given family sighted during the study period and the overall mean is the mean of all month-wise means. By calculating the seasonal index, we can interpret the mean occurrence of each butterfly in a month in relation to the overall mean monthly sightings. Mean abundance and seasonal index of butterflies of each family were calculated and graphically presented.

RESULTS

265 species of butterflies belonging to five families including Nymphalidae (81 numbers) and Lycaenidae (72 numbers) containing maximum number of species followed by Hesperidae (71 numbers), Pieridae (24 numbers) and Papilionidae (17 numbers) were recorded from the study site (Appendix I). Maximum number of species recorded belonged to the families Nymphalidae. The commonly occurring species were belonging to that of Danainae and Papilionidae. Butterflies belonging to other families are found only occasionally. Out of the species

recorded three were of protected under different schedules, six endemic to Western Ghats and fifteen extremely rare butterflies were recorded (Appendix I). The rare butterflies like *Papilio paris*, *Elymnias hypemenstra*, *Appias indra shiva*, *Limenitis procris*, *Athyma ranga*, *Tanaecia lepidea*, *Junonia atlites*, *J.iphita*, *Kaniska canace*, *Cupha erymanthis*, *Caleta caleta*, *Rapala manea*, *Charaxes solon solon*, *Doleschalia bisaltidae*, *Mycalesis patnia* and *Melanitis zitenius gokala* were observed in the sanctuary .

The pattern of occurrence of certain species was interesting. *Pachliopta aristolochiae*, *P.pandiyana*, *Graphium agamemnon*, *Papilio demoleus*, *P.polytes*, *P.polymnestor*, *Catopsilia pomona*, *Eurema hecabe*, *Delias eucharis*, *Leptosia nina*, *Melanitis leda*, *Mycalesis perseus*, *Orsotrioena medus*, *Acraea violae*, *Cirrochroa thais*, *Parantica aglea*, *Tirumala limniace*, *Euploea core*, *Jamides celeno*, *Loxura atymnus atymnus*, *Lambrix salsala lutipennis*, *Talica nyseus*, *Ariadne merione merione*, *Suastus gremius*, *Ypthima huebneri huebneri*, *Psolos fuligo*, *Zizula hylax*, *Tanaecia lepida miyana*, *Euchrysops cnejus cnejus* were present in abundance in certain seasons and most of them were visitors for nectaring and egg lying. *Zeltus amasa* species usually shows mud puddling during February.

POPULATION TRENDS AND SEASONALITY OF BUTTERFLIES

Various factors such as vegetation types, climate, habitat as well as incidence of parasites, predators and pathogens are known to influence the population trends of butterflies. Monthly sightings of butterflies belonging to five different families are given in Appendix II. The data generated on the population present in the four

areas such as Kallar , Kattalappara, Pandimotta and Umayar have been presented as Appendix III.

PAPILIONIDAE

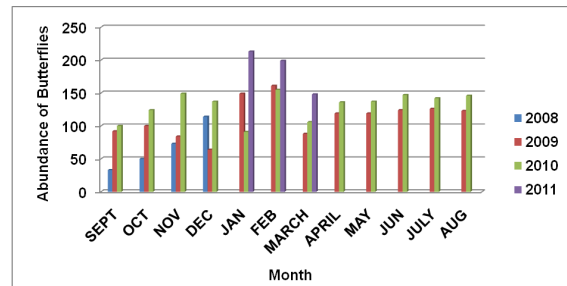
The population was present throughout the year, with maximum number of sightings observed in December 2010. The population showed a decline during September 2008. From 2008 onwards, the population registered an increase and reached its peak in 2011 January. The seasonal index reached a peak during January and February and showed a sharp decline in September and October.

Among the Papilionids, the common rose (*Pachilopta aristolochia*) was observed during all months of the year, with lowest members in March. February had the highest count and moderate population is seen in the remaining months. The common mormon (*Papilio polytes*) showed a peak in November and sudden drop in March. This species is not observed throughout the year. In the case of Southern Birdwing (*Troides minos*), the population was observed throughout the year, with highest number recorded in November and lowest number in May. In the case of Common Blue bottle (*Graphium sarpedon*), the population build up was observed from March to August, with highest number in recorded in August and lowest in September and not present in November and December.

PIERIDAE

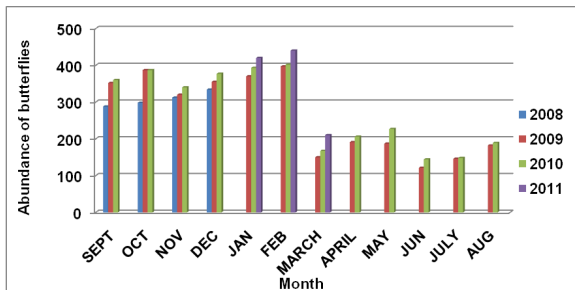
The population was present throughout the year. Maximum number of sightings was recorded during January –February 2011. Population was low during June –July, probably due to rains. However the number of sightings in January-February 2011 was considerably higher than

Figure 2: Population Abundance of the Butterflies of the Family Papilionidae



previous years. In the case of seasonal index, the highest value was in January-February and the lowest in June-July. Common emigrant (*Catopsilla pomona*) and mottled emigrant (*Catopsilla pyranthe*) occur throughout the season in all months except mottled emigrant absent in September.

Figure 3: Population Abundance of the Butterflies of the Family Pieridae



NYMPHALIDAE

The highest count was obtained in November 2010, followed by October 2010. The counts in November 2010 were higher than those of November 2008 and 2009. Similarly the number observed in 2010 is more than that of the year 2009 in all the months. In both the years, March, April, May had few individuals. However population increased in the next succeeding years.

Figure 4: Population Abundance of the Butterflies of the Family Nymphalidae

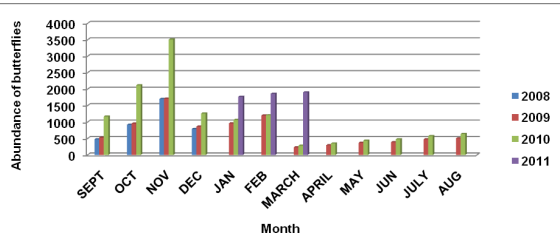
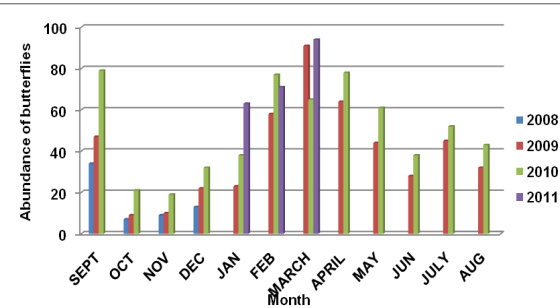


Figure 5: Population Abundance of the Butterflies of the Family Lycaenidae



LYCAENIDAE

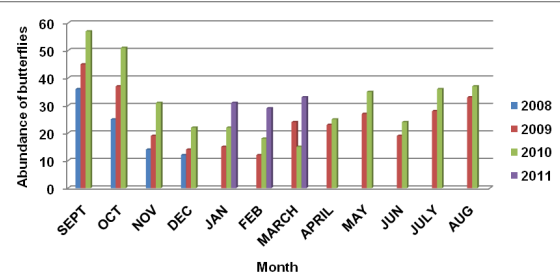
In the first year (2008-2009), there was peak numbers in March 2009, which decreased in October, November. In the second year during the October and November, the population was slightly more than the previous year. During October, November, a few individuals were recorded. The seasonal index showed a peak in March and decreased until June and then October -November, after which gradually increased.

HESPERIIDAE

The members of this family are not conspicuous and sampling was not adequate and the number of individuals sighted was low. Highest number were observed during -September. The seasonal index showed the highest value during September and then declining trend until June. The population registered an upward trend during

September, October and then declined from November to February.

Figure 6: Population Abundance of the Butterflies of the Family Hesperidae



FLIGHT PATTERN OF BUTTERFLIES

The flight of Butterflies determines how they are able to live. The home range of butterflies differ dramatically between nomads and the stay at homes and the many species that are neither some species remain within their home of birth for the entire life time. Others may wander wide distances especially the males in search of females and after mating. The flight pattern of Butterflies has been observed in the sanctuary which is detailed as Annexure-2

BUTTERFLY AND HABITAT ASSOCIATION

Butterflies show distinct pattern of habitat association. The nature of vegetation, humidity, sunshine, availability of water, etc. are factors that determine the survival of a given species in a particular habitat and information on such habitat preferences will be very useful in developing appropriate conservation strategies for the various species in future (Mathew and Rahamathulla, 1992).

DISCUSSION

The state of Kerala, especially the Western Ghat

harbours some of the world's richest biodiversity, is the home of more than 334 species of butterflies. Large-scale habitat deforestation and fragmentation has led to the decline of several butterfly populations in the state, and many species believed to be common during the early part of the 20th Century have now declined rapidly through much of their range. This decline in species, so typical of the third-world today, is an indication of the ongoing global environmental crisis, and if not checked will perhaps reach a point where downward trends can no longer be reversed.

Over much of India, butterflies are treated as non-target species in the conservation and management of wildlife. The current "Protected Area Network" of the country set up by the Government, is directed towards the conservation of 'flagship species' such as the Tiger and Indian Rhino. In the state of Kerala as in other states of India, there is very little conservation activity directed towards butterflies. The important inter-specific relationships and landscape-level ecological processes taking place through smaller life-forms are largely ignored.

Population sample has been collected from all the four forest main regions of the sanctuary such as Kallar – Southern Hill top Tropical Evergreen forests & west coast tropical evergreen forest, Kattalappara-Southern secondary moist deciduous forests & west coast tropical evergreen forest, Pandimotta- Southern Hill top Tropical Evergreen forests and Reed area and Umayar – West coast tropical evergreen forests having significant area with Evergreen forests, Riparian forests, secondary forests with habitations and their population dynamics has been studied.

Butterflies recorded in the study belonged to five families with Nymphalidae (81 numbers) and Hesperidae (71 numbers) containing maximum number of species followed by Lycaenidae (72 numbers), Pieridae (24 numbers) and Papilionidae (17 numbers). Based on the base line data, the habit association and distribution pattern of butterflies and the conservation status of Butterflies in each area has been assessed.

Butterflies act as important indicators of environmental health and the 'ecosystem services' provided by Lepidoptera is immense. However a contemporary discourse regarding butterfly conservation and its importance is lacking amongst the public.

Although inventories exist for several other biological groups, the parks and sanctuaries of the state do not even have butterfly lists. Moreover, very few serious ecological studies on the Lepidoptera of the region have been undertaken and thus very little technical information is available for managers and policy makers to take steps for effective butterfly conservation.

Effective conservation of butterflies though must be achieved through awareness and participation of people, because biological resources need protection against inappropriate uses and overexploitation.

Thus, there is a need for awareness regarding problems facing butterfly conservation amongst the public. There is also a need for capacity building at grassroots level in order to form a conservation working group and a network to study butterflies.

RECOMMENDATIONS

1. Butterfly watching should be encouraged by setting up of Butterfly clubs in schools and

colleges in association with Nature clubs and Tourism clubs. Park management should engage experts on butterflies to teach student community while doing nature interpretation studies.

2. A booklet in Malayalam on common butterflies of Shendurney should be brought in giving small description on identification, ecology, and behavior as a tool for its conservation.
3. Many endangered and rare butterflies can be reared in insectaries and released in the wild to sustain their population.
4. Butterfly host plants of rare and endangered butterflies can be planted, conserved to improve the Butterfly population.
5. State Butterfly has to be named along with butterflies for each sanctuary depending upon its endemic nature and importance for its conservation.

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APPENDIX I

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
	PAPILIONIDAE	
1.	<i>Chilasa clytia</i>	Common
2.	<i>Graphium agamemnon</i>	Common
3.	<i>Graphium antiphates</i>	Uncommon
4.	<i>Graphium doson</i>	Common
5.	<i>Graphium nomius</i>	Uncommon
6.	<i>Graphium sarpeon</i>	Common
7.	<i>Pachilocta aristolochia</i>	Common
8.	<i>Pachiopta pandiyana</i>	Common, Endemic to w. ghat
9.	<i>Pachilocta hector</i>	Common
10.	<i>Papilio helennus</i>	Common
11.	<i>Papilio polymnestor</i>	Common
12.	<i>Papilio dravidarum</i>	Uncommon, endemic w. ghat
13.	<i>Papilio demoleus</i>	Common
14.	<i>Papilio liomedon</i>	Uncommon, endemic to W.Ghat
15.	<i>Papilio paris</i>	Uncommon
16.	<i>Papilio hector</i>	Common
17.	<i>Troides minos</i>	Common, Endemic to w. ghat
	PIERIDAE	
18.	<i>Anaphaesis aurota</i>	Common
19.	<i>Appias indra</i>	common
20.	<i>Appias lalage</i>	Uncommon
21.	<i>Appias libythea</i>	uncommon
22.	<i>Appias lycida</i>	uncommon
23.	<i>Appias lalage</i>	uncommon
24.	<i>Appias albina</i>	common
25.	<i>Catopsilia pomona</i>	common
26.	<i>Catopsilia pyranthe</i>	Common

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
27.	<i>Cepora nerissa</i>	common
28.	<i>Cepora nadina</i>	uncommon
29.	<i>Delias eucharis</i>	common
30.	<i>Eurema andersonii</i>	uncommon
31.	<i>Eurema blanda</i>	common
32.	<i>Eurema brigitta</i>	uncommon
33.	<i>Eurema hecabe</i>	common
34.	<i>Eurema laeta</i>	uncommon
35.	<i>Hebomoia glaucippe</i>	common
36.	<i>Ixias pyrene</i>	uncommon
37.	<i>Leptosia nina</i>	common
38.	<i>Pereonia ceylonica</i>	uncommon
39.	<i>Pereronia valeria</i>	common
40.	<i>Pieris canidia</i>	Uncommon
41.	<i>Prioneris sita</i>	uncommon
	YMPHALIDAE	
42.	<i>Acraea violae</i>	common
43.	<i>Amathusia phidippus</i>	common
44.	<i>Ariadne ariadne</i>	uncommon
45.	<i>Ariadne merione</i>	common
46.	<i>Athyma perius</i>	common
47.	<i>Athyma ranga</i>	Uncommon
48.	<i>Athyma nefte</i>	common
49.	<i>Athyma selenophora</i>	common
50.	<i>Cethosia nietneri</i>	common
51.	<i>Charaxes bernardus</i>	Uncommon
52.	<i>Charaxes solon</i>	common
53.	<i>Cirrochroa thais</i>	common

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
54.	<i>Cupha erymanthis</i>	uncommon
55.	<i>Cyrestis thydomaas</i>	uncommon
56.	<i>.Danaus chrysippus</i>	common
57.	<i>Danaus genutia</i>	common
58.	<i>Discophora lepida</i>	Uncommon
59.	<i>Doleschallia bisaltide</i>	uncommon
60.	<i>Dolpha evelina</i>	Uncommon
61.	<i>Elymnias hypermenstra</i>	Common
62.	<i>Euploea core</i>	common
63.	<i>Euploea klugii</i>	Uncommon
64.	<i>Euploea Sylvester</i>	common
65.	<i>Euthalia aconthea</i>	common
66.	<i>Euthalia lubentina</i>	uncommon
67.	<i>Euthalia nais</i>	Uncommon
68.	<i>Hypolimnas bolina</i>	common
69.	<i>Hypolimnas misippus</i>	common
70.	<i>Idea malabarica</i>	Uncommon, endemic to W.Ghat
71.	<i>Junonia almanac</i>	common
72.	<i>Junonia atlites</i>	common
73.	<i>Junonia heirta</i>	common
74.	<i>Junonia iphita</i>	common
75.	<i>Junonia lemonias</i>	common
76.	<i>Junonia orithya</i>	Uncommon
77.	<i>Kallima horsefieldi</i>	Uncommon, endemic to W.Ghat
78.	<i>Kaniska canace</i>	Common
79.	<i>Lethe drypetis</i>	Common
80.	<i>Lethe europa</i>	Uncommon
81.	<i>Lethe rohira</i>	Uncommon

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
82.	<i>Libythea lepita</i>	Uncommon
83.	<i>Limenitis procris</i>	common
84.	<i>Melanitis leda</i>	Common
85.	<i>Melanitis phedima</i>	Common
86.	<i>Melantis zitenius</i>	Uncommon
87.	<i>Mycalesis anaxias</i>	Uncommon
88.	<i>Mycalesis davisoni</i>	Uncommon, Endemic to w
89.	<i>Mycalesis mineus</i>	Uncommon, Endemic to w.g.
90.	<i>Mycalesis oculus</i>	Uncommon
91.	<i>Mycalesis perseus</i>	Common
92.	<i>Mycalesis subdita</i>	Uncommon
93.	<i>Mycalesis visala</i>	Rare
94.	<i>Mycalesis patina</i>	Common
95.	<i>Orsotrianea medus</i>	Common
96.	<i>Neptis columella</i>	uncommon
97.	<i>Neptis hylas</i>	common
98.	<i>Neptis jumbah</i>	Common
99.	<i>Pantoporia hordonia</i>	Common
100.	<i>Pantoporia ranga</i>	common
101.	<i>Pantoporia sandaka</i>	Common
102.	<i>Parantica aglea</i>	common
103.	<i>Parantica nilgiriensis</i>	Uncommon,enedemic to W.Ghat
104.	<i>Parantirrhoea marshalli</i>	Uncommon,endemic to w. ghat
105.	<i>Parthenos sylvia</i>	Uncommon
106.	<i>Phalanta alcippe</i>	uncommon
107.	<i>Phalanta phalantha</i>	common
108.	<i>Polyura agaria</i>	Uncommon
109.	<i>Polyura athamas</i>	Common

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
110.	<i>Rohana parasatis</i>	uncommon
111.	<i>Tanaecia lepidea</i>	common
112.	<i>Tirumala limniace</i>	common
113.	<i>Tirumala septentrionis</i>	common
114.	<i>Vindula erota</i>	Uncommon
115.	<i>Ypthima asterope</i>	Uncommon
116.	<i>Ypthima avanta</i>	Rare
117.	<i>Ypthima baldus</i>	Common
118.	<i>Ypthima ceylonica</i>	Common
119.	<i>Ypthima chenui</i>	Uncommon, endemic to W.Ghat
120.	<i>Ypthima huebneri</i>	Common
121.	<i>Ypthima ypthimoides</i>	Rare, endemic to W.Ghat
122.	<i>Zipetis saitis</i>	Common, endemic to W.Ghat
	LYCAENIDAE	
123.	<i>Abisara echerius</i>	common
124.	<i>Actolepis puspa</i>	common
125.	<i>Amblypodia anita</i>	Uncommon
126.	<i>Anthene lycaenina</i>	Uncommon
127.	<i>Arhopala abseus</i>	uncommon
128.	<i>Arhopala alea</i>	Uncommon, endemic to W.Ghat
129.	<i>Arhopala amantes</i>	common
130.	<i>Arhopala bazaloides</i>	Uncommon
131.	<i>Arhopala pseudocentaurus</i>	common
132.	<i>Azanus jesous</i>	uncommon
133.	<i>Bindahara phocides</i>	uncommon
134.	<i>Caleta caleta</i>	common
135.	<i>Castalius rosimon</i>	common
136.	<i>Catapaecilma major</i>	Rare

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
137.	<i>Catochrysops strabo</i>	Uncommon
138.	<i>Celatoxia albidisca</i>	Uncommon, endemic to W.Ghat
139.	<i>Celestrina lavendularis</i>	Uncommon
140.	<i>Cheritra freja</i>	common
141.	<i>Chilades laius</i>	uncommon
142.	<i>Chilades pandava</i>	Uncommon
143.	<i>Curetis dentata</i>	Rare
144.	<i>Curetis siva</i>	common, endemic to w. ghat
145.	<i>Curetis thetis</i>	common
146.	<i>Deudorix epijarbas</i>	Uncommon
147.	<i>Discolampa ethion</i>	common
148.	<i>Euchrysops cnejus</i>	common
149.	<i>Everes lacturnus</i>	uncommon
150.	<i>Euchrysops cnejus</i>	common
151.	<i>Freyeria trochylus</i>	uncommon
152.	<i>Hypolycaena othona</i>	Rare
153.	<i>Ionolyce helicon</i>	Rare
154.	<i>Iraota timolean</i>	Uncommon
155.	<i>Jamides alecto</i>	common
156.	<i>Jamides bochus</i>	Uncommon
157.	<i>Jamides celeno</i>	common
158.	<i>Lampides boeticus</i>	common
159.	<i>Leptotes plinius</i>	uncommon
160.	<i>Loxura atymnus</i>	common
161.	<i>Magisba malaya</i>	Uncommon
162.	<i>Nacaduba beroe</i>	Uncommon
163.	<i>Nacaduba caluria</i>	uncommon
164.	<i>Nacaduba hermus</i>	Uncommon

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
165.	<i>Nacaduba kurava</i>	Uncommon
166.	<i>Nacaduba pactolus</i>	Uncommon
167.	<i>Neopithecops zalmora</i>	common
168.	<i>Petrolaea dana</i>	Uncommon
169.	<i>Prosatus dubiosa</i>	common
170.	<i>Prosatus nora</i>	common
171.	<i>Prosatus noreia</i>	uncommon
172.	<i>Pseudozizeeria maha</i>	common
173.	<i>Rachana jalindra</i>	rare
174.	<i>Rapala iarbus</i>	uncommon
175.	<i>Rapala lankana</i>	Rare
176.	<i>Rapala manea</i>	common
177.	<i>Rapala varuna</i>	Rare
178.	<i>Rathinda amor</i>	common
179.	<i>Spalgis epius</i>	Common
180.	<i>Spindasis elima</i>	Uncommon
181.	<i>Spindasis ictis</i>	Uncommon
182.	<i>Spindasis lohita</i>	Uncommon
183.	<i>Spindasis schistacea</i>	Uncommon
184.	<i>Spindasis vulcanus</i>	common
185.	<i>Surendra quercetorum</i>	uncommon
186.	<i>Tajuria cippus</i>	common
187.	<i>Talicauda nyseus</i>	common
188.	<i>Thaduka multicaudata</i>	uncommon
189.	<i>Udara akasa</i>	Uncommon
190.	<i>Zeltus amasa</i>	common
191.	<i>Zesius chrysomallus</i>	Uncommon
192.	<i>Zizeeria karsandra</i>	uncommon

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
193.	<i>Zizina otis</i>	uncommon
194.	<i>Zizula hylax</i>	common
	HESPERIIDAE	
195.	<i>Aeromachus dubius</i>	uncommon
196.	<i>Aeromachus pygmaeus</i>	common
197.	<i>Ampittia dioscorides</i>	common
198.	<i>Arnetta mercara</i>	rare, endemic to W.Ghat
199.	<i>Badamia exclamationis</i>	common
200.	<i>Bibasis sena</i>	uncommon
201.	<i>Baracus vittatus</i>	common
202.	<i>Baoris farri</i>	common
203.	<i>Borbo bevani</i>	uncommon
204.	<i>Borbo cinnara</i>	common
205.	<i>Burara jaina</i>	uncommon
206.	<i>Caltoris kumara</i>	common
207.	<i>Caltoris canaraica</i>	uncommon, endemic to W.Ghat
208.	<i>Caltoris philippina</i>	rare
209.	<i>Caprona agama</i>	rare
210.	<i>Celaenorrhinus leucocera</i>	common
211.	<i>Celaenorrhinus leucocera</i>	common
212.	<i>Celaenorrhinus ruficornis</i>	uncommon
213.	<i>Cephrenes chrysozona</i>	uncommon
214.	<i>Choaspes benjaminii</i>	uncommon
215.	<i>Cupitha purreea</i>	rare
216.	<i>Gangara thyrasis</i>	common
217.	<i>Halpe homolea</i>	uncommon
218.	<i>Halpe porus</i>	uncommon
219.	<i>Hasora badra</i>	uncommon

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
220.	<i>Hasora chromus</i>	common
221.	<i>Hasora taminatus</i>	uncommon
222.	<i>Hasora vitta</i>	uncommon
223.	<i>Hyarotis adrastus</i>	uncommon
224.	<i>Iambrix salsala</i>	common
225.	<i>Matapa aria</i>	common
226.	<i>Notocrypta curvifascica</i>	common
227.	<i>Notocrypta paralysos</i>	common
228.	<i>Odontoptilum angulata</i>	uncommon
229.	<i>Odontoptilum ransonnetti</i>	common
230.	<i>Oriens concinna</i>	rare, endemic to W.Ghat
231.	<i>Oriens goloides</i>	common
232.	<i>Parnara bada</i>	uncommon
233.	<i>Pelopidas agna</i>	uncommon
234.	<i>Pelopidas conjuncta</i>	uncommon
235.	<i>Pelopidas mathias</i>	common
236.	<i>Pelopidas subochracea</i>	uncommon
237.	<i>Polytremis lubricans</i>	common
238.	<i>Potanthus confucius</i>	common
239.	<i>Potanthus pallida</i>	rare
240.	<i>Potanthus palnia</i>	rare
241.	<i>Potanthus pava</i>	uncommon
242.	<i>Potanthus pseudomaesa</i>	common
243.	<i>Psolos fuligo</i>	common
244.	<i>Psuedocolodenia dan</i>	common
245.	<i>Psuedocolodenia indrana</i>	common
246.	<i>Quedara basiflava</i>	Uncommon, endemic to W.Ghat
247.	<i>Salanoemia sala</i>	uncommon

APPENDIX I (CONT.)

Butterflies Sighted from Shendurney Wildlife Sanctuary with their Status		
S. No.	Scientific Name	Status
248.	<i>Sarangesa dasahara</i>	common
249.	<i>Sarangesa purendra</i>	rare ,endemic to western ghat
250.	<i>Sorvia hyrtacus</i>	uncommon,endemic to
251.	<i>Spialia galba</i>	common
252.	<i>Suastus gremius</i>	common
253.	<i>Suastus minuta</i>	rare
254.	<i>Tagiades gana</i>	common
255.	<i>Tagiades japetus</i>	uncommon
256.	<i>Tagides litigosa</i>	common
257.	<i>Tapena twaitthesi</i>	common
258.	<i>Taractoceras ceramas</i>	common
259.	<i>Taractrocera maevius</i>	uncommon
260.	<i>Telicota ancilla</i>	common
261.	<i>Telicota colon</i>	uncommon
262.	<i>Thoressa astigmata</i>	common, endemic to W.Ghat
263.	<i>Thoressa evershedii</i>	common,endemic to W.Ghat
264.	<i>Thoressa honorei</i>	uncommon, endemic to W.Ghat
265.	<i>Udaspes folus</i>	common

APPENDIX II

Monthly Sightings of Butterfly Families in Shendurney Wildlife Sanctuary																
Family	08 S	O	N	D	09 J	F	M	A	M	J	J	A	S	O	N	D
Papilionidae	33	50	73	114	149	161	88	119	119	124	126	123	92	100	84	64
Pieridae	288	298	312	334	370	397	150	191	187	121	146	182	352	387	320	355
Lycaenidae	34	7	9	13	23	58	91	64	44	28	45	32	47	9	10	22
Hesperiidae	36	25	14	12	15	12	24	23	27	19	28	33	45	37	19	14
Nymphalidae	477	918	1702	791	962	1199	233	297	371	390	476	506	525	954	1713	865

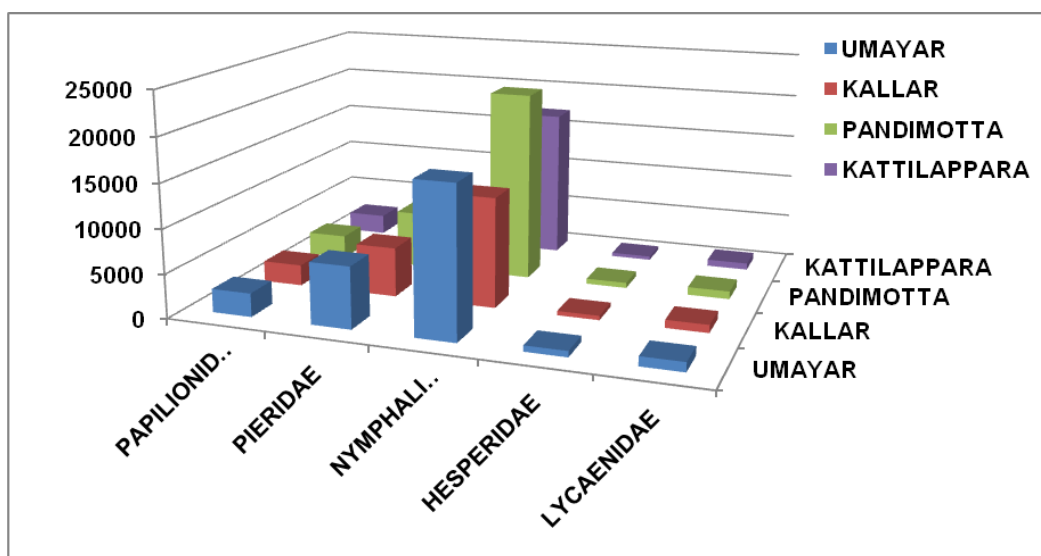
APPENDIX II (CONT.)

Monthly Sightings of Butterfly Families in Shendurney Wildlife Sanctuary															
Family	10J	F	M	A	M	J	J	A	S	O	N	D	11 J	F	M
Papilionidae	91	155	106	136	137	147	142	146	100	124	149	137	213	199	148
Pieridae	393	402	167	206	227	144	148	189	360	387	340	377	420	748	401
Lycaenidae	38	77	65	78	61	38	52	43	79	21	19	32	63	113	142
Hesperidae	22	18	15	25	35	24	36	37	57	51	31	22	31	29	33
Nymphalidae	1067	1207	284	349	436	475	573	639	1169	2119	3510	1260	1769	2949	1903

Note: 08-2008; 09-2009; 10-2010;11-2011. S-september, O-October, N-November, D-December, J-January, F-february, M-March, A-April, M-May, J-June, J-July, A-August.

APPENDIX III

Butterflies Sighted in Each Surveyed Areas and Their Graphical Presentation					
Area	Papilionidae	Pieridae	Nymphalidae	Hesperidae	Lycaenidae
Umayar	2670	6984	16972	683	1071
Kallar	2403	5649	12521	490	910
Pandimotta	2699	6487	21710	605	897
Kattilappara	2297	4681	17086	412	756



APPENDIX IV

Flight Pattern of Butterflies		
Family name	Name of Butterfly	Type of Flight Pattern
Papilionidae	All Butterflies	Very fast in danger situations
	Bird Wing	Begins to fly early morning- fly above the top of trees
	Jays	Fly fast from flower to flower
	Red Helen	Lazy flight in an irregular manner
	Lime Butterfly	Fly fast and straight
	Common Yellow Swallow Tail	Fly fast and straight interrupted by forage in the ground floor
	Malabar Rose	Early morning fly near ground , at noon fly very high
	Crimson Rose	Fly at low elevations
	Common Mime	Lazily flies most of the time round and round.quick flightTo chase another also
		Sometimes as fast as the fastest butterfly-charaxes
	Blue Mormon	Flight is fast and dodging-seldom fly high
	Paris Peacock	Flies in a desultory manner ,circling round the top of trees
		Or sweeping down to ground level and flying rapidly up.
	Malabar Banded Peacock	Flight is swift fly rapidly above top of trees
	Malabar Raven	Flies in shady spots near ground
	The Red Helen	Flies very rapidly and in irregular fashion usually flies near ground
	Common Mormon	Restless insect ,flying fast and close to ground
	Malabar Banded Swallow Tail	Male fly among the tree tops, female fly low
	Common Blue Bottle	Rapid flight ,fond of circling round the tree top
	Common Jay	Poor flier, mostly seen in damp forests at lower elevations
Pieridae	The Psyche	Seen flying among the undergrowth, never fly more than 3'above
	Common Jezebel	Flying slowly in an enquiring manner high among the leaves
	The Lesser Gull	Irregular flight among tree or bush, prefers forest undergrowth
	Painted Saw Tooth	Males fly very fast loop over tall trees
	Plain Puffin	Fly in open country side and forest areas
	Striped Albatross	Seen flying in open areas .most persistent migrant butterfly
	Chocolate Albatross	Swift and strong flier but not high above the ground
	Common Albatross	Seen flying in wooded country and a fast flier

APPENDIX IV

Flight Pattern of Butterflies		
Family name	Name of Butterfly	Type of Flight Pattern
Nymphalidae	Yellow Orange Tip	Found flying near thorny shrubs. flies hurriedly
	Great Orange Tip	Strong and swift fliers
	Dark Wanderer	Flight of male is strong. Female flies slowly, but if disturbed goes fast
	Lemon Emigrant	Flight is powerful and rapid .fly in a series of upward and downward fashion
	Mottled Emigrant	Less strong flier with irregular and jerky way in flight
	Painted Courtesan	Flight of male is fluttering at lower elevations
	Grey Count	Flying in clearings and open areas
	The Clipper	Powerful flier -quick beats of flight followed by sailing high among trees
	The Colour Sergeant	Flies in thick forest rapid flight around prominent heights.
	The Great Eggfly	Striking appearance by closing and opening wings on top of trees. Female flies
		Slowly compared to males that too near the scrub or jungle
	The Autumn Leaf	Swift flier in lower elevations in thick jungles.
	The Lemon Pansy	They fly along in front of one who walks fly around good gardens
	The Painted Lady	Flies strongly and swiftly in a dashing and discontinuous manner.
	The Indian Red Admiral	Flies rapidly up and down frequently settling on ground with half wing open
	The Common Leopard	Strong fliers but does not take sustained flight settles with half open wing
	The Rustic	Weak flier ,fly on the treetop and dives down to undergrowth when disturbed
	The Tamil Lacewing	Slow flier beats its wings up and down slowly
	The Angled Castor	Flight is weak jerky and irregular with series of ups and downs beat of wings
	Followed by sailing with horizontally and rest with them over the back	
Lycaenidae	The Red Pierrot	weak flier.flies close to the ground.like shades .settles only at dark.
	The Common Pierrot	Weak flier ,fly close to the ground.
	The Angled Pierrot	Very fast.flies rapidly over small trees and shrubs
	The Banded Blue Pierrot	Flies confined to thick jungles .weak flier
	African Babul Blue	Active on wings ,fond of sunshine,fly rapidly over small trees and bushes
	White Disc Hedge Blue	Flies fairly strongly
	The Lime Blue	Flies over grass and around food plants
	The Gram Blue	Strong on wings and flies rapidly around shrub and bushes rising high in the air

APPENDIX IV

Flight Pattern of Butterflies		
Family name	Name of Butterfly	Type of Flight Pattern
	The Plains Cupid	Not a strong flier
	The Forget Me Not	It is fast on wings
	The Pea Blue	Strong flier.
	The Dark Cerulean	Flight is extremely rapid usually round the bushes
	The Common Cerulean	Weak fluttering kind of flight
	The Indian Sunbeam	Powerful flier. male takes sharp flights to and from male high up in trees
	Many Tailed Oakblue	Flies round the food plants
	Large Oakblue	Flight is extremely fast.
	The Common Acacia Blue	Fast flier but not very far
	The Yamfly	Flutter weakly near the ground
	The Redspot	Flight is rapid and darting. the males settle high up on bushes, flying round fast
		When disturbed returning to the same spot after a short while.
	The Monkey Puzzle	Flight is weak and fluttering near to undergrowth occasionally in open clearings
	The Common Onyx	Flight is fairly weak and not sustained for long
	The Fluffy Tit	A weak flier mostly seen in the shady area
The Plane	Normally confined to jungles, sometimes fly fast on top of trees	
Hesperiidae	The Fulvous Pied Flat	Occasionally flies fast in the sunshine
	The Common Snow Flat	Fly alike in sunshine and shade
	The Chestnut Angle	Shady places are preferred to sunshine
	The Golden Angle	Flight is fast but not long sustained, near ground
	The Indian Skipper	It likes sunshine and flies close to the ground
	The Common Banded Awl	The flight is rapid and of the skipping type
	The Orange Awlet	Flies straight and extremely fast in nullahs in the morning and evening
	The Orange Tail Awl	Male flies up and down rapidly and coming to rest on a particular leaf
	The Brown Awl	Flight is rapid and bounding especially near to the jungle
	The Indian Palm Bob	Flies very fast and settles on flowers or leaves for a moment and leaves quickly
	The Common Redeye	Flight is very rapid and seen in clearings and edges of forest
	The Pigmy Scrub Hopper	Flies very close to the ground on grasses

APPENDIX IV

Flight Pattern of Butterflies		
Family name	Name of Butterfly	Type of Flight Pattern
	The Common Dartlet	Flies very rapidly near to the undergrowth
	The Madras Ace	Very fast on wings , fly high above the ground especially round the trees
	The Common Banded Demon	Flight is powerful but not any great height above the ground and not sustained

