Indian Journal of Ecology (2022) 49(4): 1433-1439
DOI: https://doi.org/10.55362/IJE/2022/3681

Manuscript Number: 3681
NAAS Rating: 5.79

Distribution of Butterflies in Karanthamalai Reserve Forest, Tamil Nadu, Southern India

S. Sharmila and A. Joseph Thatheyus[1]

Department of Zoology, E.M.G.Yadava Women's College, Madurai-625 014, India
[1]PG & Research Department of Zoology, The American College, Madurai-625 002, India
E-mail: sharmilapoove116@gmail.com

***Abstract*:** Butterflies are monopolizing insects of the Order Lepidoptera, form an important part of the food chain and they are crucial for pollination. The present study was carried out to record the distribution and abundance of butterfly species at Karanthamalai Reserve Forest, Natham, Dindigul District, Tamil Nadu in Southern India from August 2016 to July 2018 using transect count method. The study revealed the occurrence of 79 individual species around 80.166 Km^2. Amid the five families Nymphalidae was dominant in respective to species, genus and abundance. Specific distribution was observed for *Papilio clytia* at Karrupusamy Temple and *Graphium cloanthus* at Thekkal Reserve Forest. Amid the Lycaenidae family *Zizina otis* dominated all study areas. Irrespective to the distribution and abundance Thekkal Reserve Forest was rich in the diversity of butterflies. These results suggest that the Karanthamalai Reserve forest harbours a rich diversity of butterfly species. The present study can be used as reference for the establishment of national or regional forest biodiversity evaluation indicator systems in India in future.

Keywords: Butterfly diversity, Karanthamalai, Lepidoptera, Natham, Reserve forest

Ecosystem has been evaluated based on the diversity of organisms. Biodiversity has rather an important key indicator of the healthy ecosystem. The class Insecta is the one of the most important among the phylum Arthropod due to its species richness. The winged wonders the butterflies (Order Lepidoptera) were most attracted by the scientist as the richest resources of all terrestrial ecosystem (Ghazoul 2002). Nearly, 20,000 species has been documented (Tiple 2012) worldwide, among which1504 species were recorded in Indian subcontinent (Kunte 2009).In terrestrial ecosystems, butterflies play a major role in pollination and herbivory (Tiple et al 2006). Butterflies as a pollinator, reflect the overall plant diversity of an ecosystem in a given area. Hence, they act as good indicators of a healthy ecosystem (Padhye et al 2006). Butterflies were rather very sensitive to habitat destruction and climatic fluctuation (Kunte 2000). Hence, butterflies are used as model organisms to study the threats posed to the environment (Kunte 2008). United Nations Convention on Biological Diversity (CBD) and The United Nations Environment Programme (UNEP) emphasizes the importance of biodiversity and insisted all nations to take part in monitoring and assessing the diversity of flora and fauna to eliminate the root cause of biodiversity loss. The average conservation value of butterflies in the evergreen forests was more than any other habitat, followed by riparian patches, deciduous forests, grasslands, and shrubs. In the Western Ghats, deforestation, as well as plantation activities are taking place on a large scale (Jha et al 2000, Tiple 2011). Monitoring of the butterflies is essential for formulating conservation priorities and the management of its diversity. With this backdrop the present work has been carried out to study the distribution of butterflies at Karanthamalai Reserve Forest.

MATERIAL AND METHODS

Study area: The present study is intended to enumerate the diversity of butterfly at Karanthamalai reserve forest, as there is no published data of butterfly diversity. Karanthamalai is a scenic village in the Perumalai hill ranges of Dindigul District, Tamil Nadu, India (Fig. 1, Table 1). Perumalai hills are part of the Sirumalai range of Eastern Ghats, and the natural vegetation comprises of dry forests. It is located in the reserved forest area with numerous wild streams, waterfalls and dense forest.

Methodology

The field survey of butterflies was conducted from August 2016 to July 2018 approximately 900m long and 5 m wide line transect was set up in each sampling unit and marked in the field along with GPS data for repeated observations. Transect in each sampling unit was observed from 9.00 forenoon to 12.00 noon. Collected butterfly individuals were identifies either in the field or after reaching the laboratory following the standard field guide proposed by Gunathilagaraj et al (1998) and Kunte (2000). All the species

were photographed with Canon EOS 1500D DSLR Camera, identified (Varshney 1983, Ackery 1984). For species level identification the butterflies were caught using sweep net and released back to the environment.

RESULTS AND DISCUSSION

India has 1,800 species and subspecies of butterflies (Kunte et al 2017) of which peninsular India hosts 350 species, while 331 species are found in the Western Ghats (Kunte 2001). Butterflies in all habitats showed a highly seasonal trend.

In the present study 79 species of butterflies were observed which comes under five families (Fig. 2; Table 2 to

Table 1. Sampling sites at Karanthamalai Reserve Forest

Sampling site	Latitude	Longitude
Karrupusamy Temple	78°14'38.835"E	10°17'51.344"N
Irranjan Medu	78°13'35.06"E	10°17'51.578"N
Malaiyur	78°13'32.343"E	10°18'32.099"N
Manikayan Kada Water Falls	78°14'18.522"E	10°19'3.683"N
Ayyanar Temple	78°12'55.7"E	10°20'49.788"N
Ayyanar Aruvi	78°12'14.687"E	10°19'28.346"N
Thekkal Reserve Forest	78°9'33.388"E	10°19'16.022"N
Punnapatti	78°11'10.061"E	10°16'37.816"N

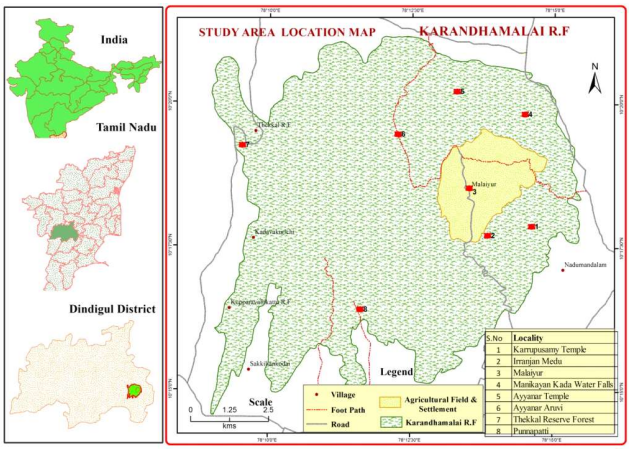

Fig. 1. Map showing the eight different sampling locations (indicated in red squares) in Karanthamalai Reserve Forest

Table 2. Butterflies of Nymphalidae family in Karanthamalai Reserve Forest

Genus	Scientific name	Common ame
Acraea	*Acraea violae* (F. 1775)	Tawny Coster
Ariadne	*Ariadne ariadne* (L. 1763)	Angled Castor
Charaxes	*Charaxes athamas* (Drury 1770)	Common Nawab
	C.solon (F. 1793)	Black Rajah
Chirrochora	*Chirrochora thais* (F. 1787)	Tamil Yeoman[2&3]
Danaus	*Danaus chrysippus* (L. 1758)	Plain Tiger
	D. genutia (Cramer 1779)	Striped Tiger
Euthalia	*Euthalia aconthea* (Cramer 1779)	Common Baron**
	E. nais (Forster1771)	Baronet
Euploea	*Euploea core* (Cramer 1780)	Indian Common Crow***
Hypolimnas	*Hypolimnas bolina* (L. 1758)	Great Eggfly[1&2]
	H. misippus (L. 1764)	Danaid Eggfly***[1]
Junonia	*Junonia almana* (L. 1758)	Peacock Pansy
	J. atlites (L. 1763)	Grey Pansy
	J. hierta (F.1798)	Yellow Pansy
	J. iphita (Cramer 1779)	Chocolate Pansy
	J. lemonias (L. 1758)	Lemon Pansy
	J. orithya (L. 1764)	Blue Pansy
Melanitis	*Melanitis leda* (L. 1758)	Common Evening Brown
Mycalesis	*Mycalesis mineus* (L. 1758)	Dark Brand Bush Brown
Neptis	*Neptis hylas* (L. 1758)	Common Sailer
Phalanta	*Phalanta phalantha* (Drury 1773)	Common Leopard
Tirumala	*Tirumala septentrionis* (Butler 1874)	Dark Blue Tiger
Thaumantis	*Thaumantis diores* (Sparrman 1768)	Jungle Glory
Ypthima	*Ypthima baldus* (F. 1775)	Common Five Ring
	Y. ceylonica (*Hewitson 1865)*	White Four Ring
	Y. huebneri (Kirby 1871)	Common Four Ring

Indian Wildlife Protection Act:*-Schedule I; **-Schedule II; ***-Schedule I,II& IV; [1] Endemic to Peninsular India;[2]Srilanka;[3]Southern India ; WG-Western Ghats

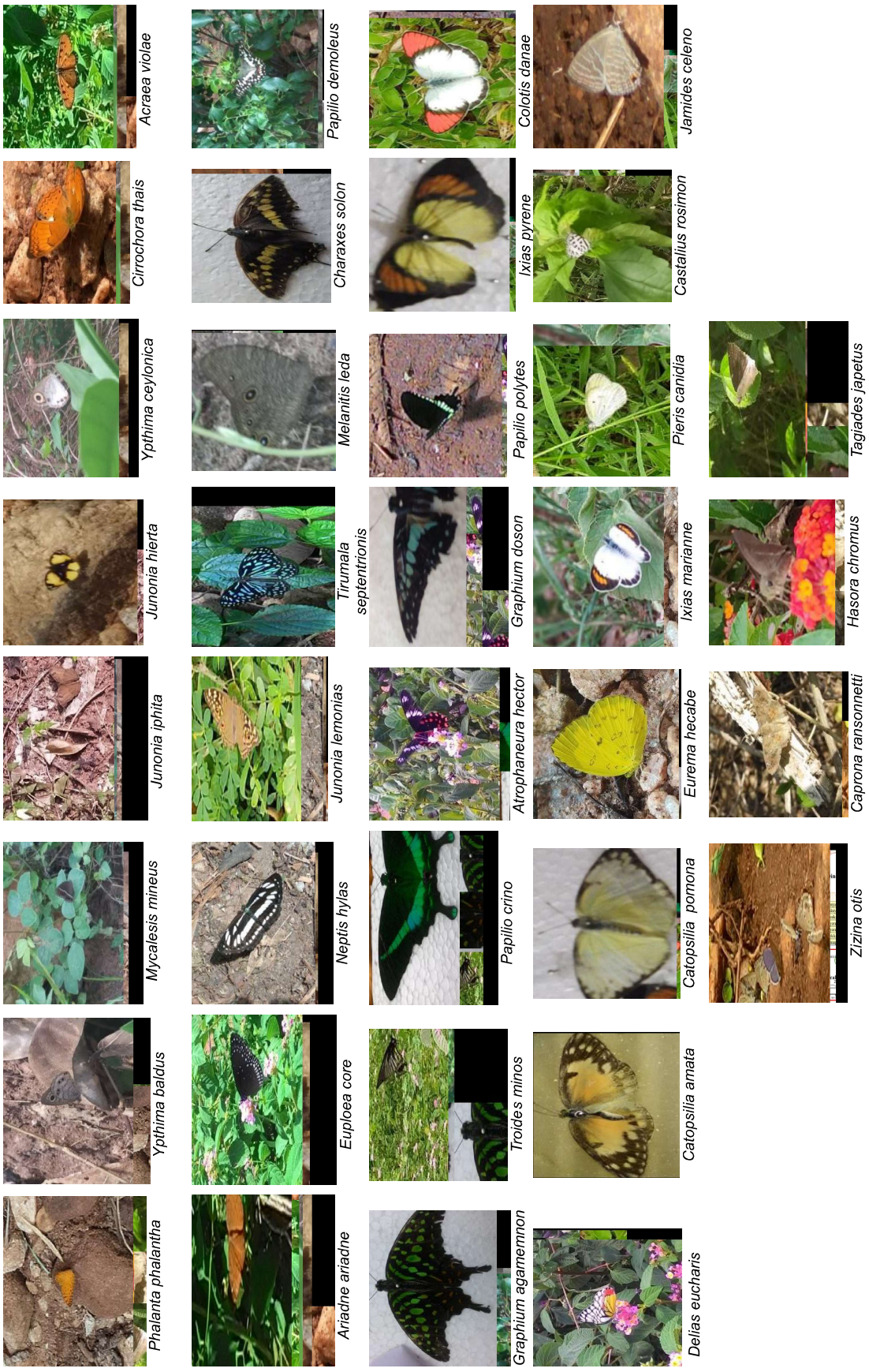

Fig. 2. Butterflies observed at Karanthamalai Reserve Forest

6). Nymphalidae is the dominant family in terms of species composition and its abundance irrespective of the sampling sites at Karanthamalai Reserve Forest. *Euploea core* species is abundant in site 1 followed by *Tirumala septentrionis* and *Junonia lemonias* at the same time *Neptis hylas* species is observed to be dominant followed by *Euploea core* and *Junonia iphita* at Irranjan Medu. Meanwhile the dominance varies among the study sites such

Table 3. Butterflies of Pieridae family in Karanthamalai Reserve Forest

Genus	Scientific name	Common name
Appias	*Appias albino* (C&R Felder 1865)	Common Albatross**
	A. libythea (F. 1775)	Striped Albatross
	A. lyncida (Cramer 1779)	Chocolate Albatross
Belenois	*Belenois aurota* (F. 1793)	Pioneer
Catopsilia	*Catopsilia pomona* (F. 1775)	Common Emigrant
	C. pyranthe (L. 1758)	Mottled Emigrant
Cepora	*Ceporanadina* (Lucas 1852)	Lesser Gull
	C. nerissa (F. 1775)	Common Gull**
Colotis	*Colotis amata* (Butler 1876)	Small Salmon Arab
	C. danae (F. 1775)	Crimson Tip
	C. fausta (Olivier 1804)	Large Salmon Arab
	C. vestalis (Butler 1876)	White Arab
Delias	*Delias eucharis* (Drury 1773)	Common Jezebel[1]
Eurema	*Eurema andersoni* (Moore 1886)	One Spot Grass Yellow
	E. brigitta (Stoll 1780)	Small Grass Yellow
	E. blanda (Boisduval 1836)	Three Spotted Grass Yellow
	E. hecabe (L. 1758)	Common Grass Yellow
Hebomoia	*Hebomoia glaucippe* (L. 1758)	Great Orange Tip
Ixias	*Ixias Marianne* (Cramer 1779)	White Orange Tip
	I. pyrene (L. 1764)	Yellow Orange Tip
Leptosia	*Leptosia nina* (F. 1793)	Psyche
Pareronia	*Pareronia valeria* (Cramer1776)	Common Wanderer
Pieris	*Pieris canidia* (Sparrman 1768)	Indian Cabbage White

Indian Wildlife Protection Act:*-Schedule I; **-Schedule II; ***-Schedule I,II& IV; [1] Endemic to Peninsular India; [2]Srilanka; [3]Southern India ; WG -Western Ghats

Table 4. Butterflies of Papilionidae family in Karanthamalai Reserve Forest

Genus	Scientific name	Common name
Atrophaneura	*Atrophaneura aristolochiae (L. 1758)*	Common Rose
	A. hector (L. 1758)	Crimson Rose*[2&3]
Graphium	*Graphium Agamemnon* (L. 1758)	Tailed Jay
	G. cloanthus (Westwood 1841)	Glassy Blue Bottle
	G. doson (Felder & Felder 1864)	Common Jay
	G. nomius (Esper 1798)	Spot Swordtail
Papilio	*Papilio crino* (F. 1792)	Common Banded Peacock
	P. clytia (L. 1758)	Common Mime
	P. demoleus (L. 1758)	Limeyellow Butterfly
	P. polymnestor (Cramer 1775)	Blue Mormon
	P. polytes (L. 1758)	Common Mormon
Troides	*Troides minos* (Cramer 1779)	Southern Birdwing*[3&WG]

Indian Wildlife Protection Act:*-Schedule I; **-Schedule II; ***-Schedule I,II& IV; [1] Endemic to Peninsular India; [2]Srilanka; [3]Southern India; WG -Western Ghats

as *Tirumala septentrionis* at Malaiyur; Among the 27 species of Nymphalide family *Euploea core* was noted to be dominant along with genus *Junonia* and *Tirumala* and *Danaus chrysippus* was observed specific at Punnapatti. Among the sampling site Thekkal Reserve Forest was noted to be dominant (16.27 %) in distribution of Nymphalidae and Pieridae family. *Appias* sp. was dominant among the Pieridae family. *Atrophaneura aristolochiae* and *Atrophaneura hector* of Papilionidae family was observed in all sampling sites. Malaiyur has richness in diversity of Papilionidae family. In the present study species uniqueness was recorded for *Papilio clytia* at Karrupusamy Temple and *Graphium cloanthus* at Thekkal Reserve Forest. Amid the Lycaenidae family *Zizina otis* dominated all study areas. Irrespective of the distribution and abundance Thekkal Reserve Forest was richness in the diversity of butterflies.

The nymphalids are a large group of robust bodied butterflies that come in almost every shape and colour. The highest numbers of butterfly species, belong to this family among the total reported in the study area. Totally 16 genera and 27 species of nymphalids were recorded during the study period (Fig. 3). The species of this family are distributed throughout the area. This may due to the fact that the monsoon in this region gradually diminishes in the month of September. Because of heat the thin layer of soil loses moisture very quickly and causes the grass to turn yellow at the end of October. The current work is in accordance with Afaq et al (2021), where highest number of Nymphalids were with 16 genera and 23 species. The next groups of butterflies were the family Pieridae with 23 species under 12 genera and the family Papilionidae with 12 species under 4 genera. In Assam University campus, Cachar district, Bora and Meitei (2014) observed 4 genera and 13 species of the family Papilionidae representing the swallow tails. Loss of suitable

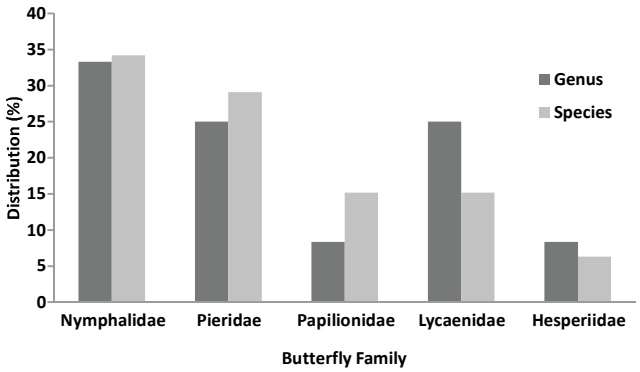

Fig. 3. Family level distribution of the existing butterflies in Karanthamalai Reserve Forest

Table 5. Butterflies of Lycaenidae family in Karanthamalai Reserve Forest

Genus	Scientific name	Common name
Abisara	*Abisara echerius* (Stoll 1790)	Plum Judy Brown
Arhopala	*Arhopala centaurus* (Moore 1884)	Centaur Oak Blue
Azanus	*Azanus jesous* (Guerin & Meneville 1849)	African Babul Blue
Caleta	*Caleta decidia* (Hewitson 1876)	Angled Pierrot
Castolius	*Castolius rosimon* (F. 1775)	Common Pierrot*
Catochrysops	*Catochrysops strabo* (F. 1793)	Forget Me Not
Chilades	*Chilades lajus* (Stoll 1780)	Lime Blue
Curetis	*Curetis thetis* (Drury 1773)	Indian Sun Beam
Jamides	*Jamides celeno* (Cramer 1775)	Common Cerulean
Prosotas	*Prosotas dubiosa* (Evans1925)	Tailless Lineblue
Spindasis	*Spindasis lohita* (Horsfield 1829)	Long Banded Silverline
Zizia	*Zizina otis* (Murray 1874)	Lesser Grass Blue

Indian Wildlife Protection Act :*-Schedule I; **-Schedule II; ***-Schedule I,II & IV; [1] Endemic to Peninsular India; [2]Srilanka; [3]Southern India and WG -Western Ghats

Table 6. Butterflies of Hesperiidae family in Karanthamalai Reserve Forest

Genus	Scientific name	Common name
Caprona	*Caprona ransonnetti* (R Felder 1868)	Golden Angle
Hasora	*Hasora chromus* (Cramer 1780)	Common Banded Owl
	H. taminatus (Hubner 1818)	White Banded Awl
Tagiades	*Tagiades japetus* (Stoll 1781)	Common Snow Flat
Thoressa	*Thoressa astigmata* (Swinhoe1890)	Southern Spotted Ace

habitat was considered to be a reason for the decline in population. Saravanan and Venkatramalingam (2021) have also reported a total of 22 butterfly species and among them the most dominant family was Nymphalidae (45.45%) followed by Pieridae (31.82%), Papilionidae (13.64%), and Lycaenidae (9.1%). The next family of dominating butterflies were represented by the members of Lycaenidae with 12 species under 12 genera (Table 5) followed by Hesperidae with 5 species under 4 genera (Table 6). Lycaenidae is the most abundant family of the Western Ghats, compared to all other families (Kunte 2000). Most browns are normal and frequently sighted, yet are less observed because of their resigning propensities. The members of Lycaenidae are seen in moderate numbers with jerky flight near the ground. Hesperiids fly vigorously and have greyish colour pattern on their wings so that their appearance is not easily noted. Occasionally these rapid fliers are visualized on flowers and near mud puddles. The small size, mysterious colouration and swift mobility of the butterflies belonging to the families Hesperiidae and Lycaenidae, make them very difficult to be identified (Arun and Azee 2003). Hence a very few members of this family were spotted in the study area. Deepak et al (2016) reported a total of 172 species, belonging to 117 genera and 18 subfamilies under six families in Dakshina Kannada District of Karnataka. Nymphalidae with 57 species (33.13%) was the dominant family followed by Hesperiidae with 37 species (21.51%), Lycaenidae with 45species (26.16%), Papilionidae with 17species (9.88%), Pieridae with 15 species (8.72%) and Riodinidae with one species (0.58%). Sushmita et al(2021) during month of June 2020 to November 2020, in Butterfly park of Nawab Wajid Ali Shah Zoological Garden, Lucknow, India recorded the highest population of family Nymphalidae with 20 species, followed by Lycaenidae comprising of 16 species, Hesperiidae with 2 species, Pieridae with 13 species and Papilionidae with 7 species. Similarly the present study also illuminates the abundance of butterfly species in different families with 79 species belonging to 48 genera under five families.

Butterflies are categorized under different schedules according to Wild Life Protection Act 1972. Several authors have attempted to find the status of the butterflies present in their study area. Gowda et al(2011) have reported 54 species in Lakkavalli range of Bhadra Wildlife Sanctuary in Karnataka. Among them Crimson Rose and Danaid Eggfly were in Schedule - I and Common Baron and Gray Count were in Schedule -II. Sharmila and Thatheyus (2013) recorded 101 species in Alagar Hills, Madurai, Tamil Nadu. Among them the species namely, Crimson Rose and Danaid Eggfly were classified under Schedule -I and Schedule -II contained Common Baron. Kumar and Murugesan (2014) recorded 64 species of Butterflies around 30km radius of Kudankulam Nuclear Power plant area of Tamil Nadu, India. Out of 64 species, Danaid Eggfly, Common Pierrot, Southern Bird wing and Crimson Rose were listed under Schedule –I; Common Albatross, Common Gull, Danaid Eggfly, and Gram Blue under Schedule -II and Common Indian Crow in Schedule -IV. In the present study also 79 species are recorded, in which Common Pierrot, Crimson Rose and Southern Birdwing come under schedule-I of Indian Wildlife Protection Act, 1972 and other species like Common Baron, Common Albatross and Common Gull are noted under the schedule –II. Butterflies such as Danaid Eggfly and Indian Common Crow are noted under schedule -I, II, & IV.

There is need to investigate endemic status of butterflies. Some previous works have been proposed by researchers in which endemism has been highlighted. Rajagopal et al (2011) suggested the presence of Blue Mormon and Common Jezebel that are endemic to Penninsular India and Sri Lanka and well as species like Crimson Rose, and Blue Mormon are endemic to Western Ghats and Sri Lanka. The Southern Birdwing the largest Indian butterfly which is endemic to Peninsular India. The Common Jeszebel, Danaid Eggfly, Baronet and Great Eggfly are endemic species which are found in Peninsular India and Sri Lanka (Sharmila and Thatheyus 2013, Gowda et al 2011). Tamil Yeoman that has been declared as state butterfly of Tamil Nadu (Shrikumar 2019) was spotted in the study area. This species is endemic to Southern India and Sri Lanka (Gaonkar 1996). The current research work also recorded the above mentioned endemic species in the study area. Species like Dark Blue Tiger (Krishna and Swamy 2014), and Indian Common Crow belonging to the family Nymphalidae; Common Mormon, Common Rose and Lime Yellow Butterfly belonging to the family Papilionidae; Common Emigrant, Common Grass Yellow, Large Salmon Arab and Mottled Emigrant belonging to the family Pieridae; Common Pierret of the family Lycanidae were more abundant in the study area and are observed throughout the year.

CONCLUSION

The present study reveals that the study area provides favourable ecological conditions and habitat for the survival of butterflies. The uncharted areas such as the population dynamics and seasonal patterns of butterflies in this particular geographical area may be thrown light to understand the species change and fluctuations in abundance over time. Moreover, the presence of eight threatened species and eight endemic species in this reserve forest makes it ideal butterfly habitat in terms of future restoration and conservation projects.

REFERENCES

Ackery PR 1984. Systematic and faunistic studies on butterflies. The biology of butterflies. *Symposium of the Royal Entomological London,* 4-9.

Afaq AD, Khowaja J, Muzamil S, Mohd A, Samy S, Ahmed G, Hosny K and Mohamed S 2021. Species richness, abundance, distributional pattern and trait composition of butterfly assemblage change along an altitudinal gradient in the Gulmarg region of Jammu & Kashmir, India. *Saudi Journal of Biological Sciences* **29**(4): 2262-2269.

Arun PR and Azee PA 2003. On the butterflies of Puyankutty forests, Kerala, India. *Zoos' Print Journal* **18**(12): 1276-1279.

Bora A and Meitei LR 2014. Diversity of butterflies (Order: Lepidoptera) in Assam University Campus and its vicinity, Cachar district, Assam, India. *Journal of Biodiversity and Environmental Science* **5**(3): 328-339.

Deepak N and Shafiul MM2016. A checklist of butterflies of Dakshina Kannada District, Karnataka, India. *Journal of Threatened Taxa.* 9491-9504.

Gaonkar H 1996. *Butterflies of the Western Ghats, India, including Sri Lanka*: In A biodiversity assessment of a threatened mountain system. *Centre for Ecological Sciences, IISc, Bangalore and the Natural History Museum, London,* 89.

Ghazoul J 2002. Impact of logging on the richness and diversity of forest butterflies in a tropical dry forest in Thailand. *Biodiversity and Conservation* **11**: 521-541.

Gowda JHT, Kumara V, Pramod AF and Hosetti B 2011. Butterfly diversity, seasonality and status in Lakkavalli range of Bhadra Wildlife Sanctuary, Karnataka. *World Journal of Science and Technology* **1**(11): 67-72.

Gunathilagaraj K, Berumal TNA, Jayaram K and Ganeshkumar M 1998. Butterflies of Coimbatore. *Zoos' Print Journal* **12**: 26 -27.

Jha CS, Dutt CBS and Bawa KS 2000. Deforestation and land use changes in Western Ghats, India. *Current Science* **79**(2): 231-237.

Krishna SR and Swamy AVS 2014. Butterfly diversity at Nagarjunasagar-Srisailam Tiger Reserve. *International Journal of Applied Biosciences* **2**(1): 48-63.

Kumar P and Murugesan AG 2014. Species diversity and habitat association of butterflies around 30 km radius of Kudankulam Nuclear Power Plant area of Tamil Nadu, India. *International Journal of Biodiversity and Conservation* **6**(8): 608-615.

Kunte K 2000. *Butterflies of Peninsular India*. Universities Press (Hyderabad) and Indian Academy of Sciences (Bangalore).

Kunte K 2001. Butterfly diversity of Pune city along the human impact gradient. *Journal of Ecological Society* **13/14**: 40-45.

Received 22 April, 2022; Accepted 12 July, 2022

Kunte K 2008. The Wildlife (Protection) Act and conservation prioritization of butterflies of the Western Ghats, south western India. *Current Science* **94**(6): 729.

Kunte K 2009. Occurrence of *Elymnias obnubila* Marshall and de Nicéville, 1883 (Lepidoptera: Nymphalidae: Satyrinae) in southern Mizoram: Range extension of the species and an addition to the Indian butterly fauna. *Journal of Threatened Taxa* **1**(11): 567-568.

KunteK, Sondhi S and Roy P (eds.) 2017. Butterflies of India, v. 2.30. *Indian Foundation for Butterflies*.

Padhye A, Dahanukar N, Paingaonkar M, Deshpande M and Deshpande D 2006. Season and landscape wise distribution of butterflies in Tamhini, northern Western Ghats, India. *Zoos' Print Journal* **21**(30): 2175-2181.

Rajagopal T, Sekar M, Manimozhi A, Baskar N and Archunan G 2011. Diversity and community structure of butterfly of Arignar Anna Zoological Park, Chennai, Tamil Nadu. *Journal of Environmental Biology* **32**: 20-32.

Saravanan N and Venkatramalingam K 2021. A preliminary study of butterflies in Theerthamalai, Tamil Nadu. *Journal of Entomology and Zoology Studies* **9**(3): 115-118.

Sharmila JE and Thatheyus JA 2013. Diversity of butterflies in Alagarhills, Tamil Nadu, South India. *Current Biotica* **6**(4): 473-479.

Shrikumar A 2019 July 29. On how Tamil Yaemon will become the State butterfly Tamil Nadu. THE HINDU News paper.https://www.thehindu.com/life-and-style/travel/there-are-several-reasons-why-tamil-nadu-picked-the-tamil-yeoman-as-its-statebutterfly/article28712915.ece

Sharma SB, Sharma DS and Kumar A 2021. Status of butterfly fauna (Order: Lepidoptera) in the summer season at Lucknow Zoo (Nawab Wajid Ali Shah Zoological Garden), U.P. India. *Journal of Emerging Technologies and Innovative Research* **8**(1).

Tiple A D2012. Butterfly species diversity, relative abundance and status in Tropical Forest Research Institute, Jabalpur, Madhya Pradesh, Central India. *Journal of Threatened Taxa* **7**: 2713-2717.

Tiple AD, Deshmukh VP and Dennis RLH 2006. Factors influencing nectar plant resource visits by butterflies on a university campus: Implications for conservation. *Nota Lepidopteralogica* **28**: 213-224.

Tiple AD 2011. Butterflies of Vidarbha region Maharashtra, India; A review with and implication for conservation. *Journal of Threatened Taxa* **3**(1): 1469-1477.

Varshney RK 1983. Index Rhopaloceraindica part II. Common names of butterflies from India and Neighbouring countries. *Zoological Survey of India* **47**: 1-49.