



Diversity and Abundance of Butterflies in ten Sites of Palakkad District, Kerala

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ABSTRACT

Butterflies are the most fascinating group of insects to mankind and they are the good bio-indicators of the ecosystem and are very sensitive to changes in the environment. They play an important role in food chain and are valuable pollinators in the local environment. Present study focussed on the assessment of the butterfly diversity and its conservation priorities. A total of 132 species of butterflies belonging to five families was recorded. The family Nymphalidae was the most dominant with the highest number of species (47 species; 35.6%), followed by Pieridae (32 species; 24.24%), Papilionidae (31 species; 23.48%), Lycaenidae (19 species; 14.39%), Hesperidae (3 species; 2.27%). Among 132 species, 20 species of butterflies which are protected under various schedules of Indian Wildlife Protection Act, 1972. Nymphalidae was the dominating family with a highest number of species. Kulappully was found to be the most diverse site with 23 species followed by Mankara with 18 species and Chungamannam(7) , the least species diverse site. Shannon- Wiener diversity index of 4.48 was found on calculating total butterfly diversity in Palakkad District considering 10 sites. The present study focussed to have a checklist of the butterfly population in 10 selected sites in Palakkad District which will later contribute for planning development programmes to conserve butterflies.

Key words: *Butterfly, conservation, Nymphalidae, checklist, species diversity, agroecosystem, Palakkad*

1. INTRODUCTION

Butterflies are the most tantalizing and beautiful creatures among the insect group and are good biological indicators of habitat quality as well as general environmental health (Larsen, 1988). Among insects, butterflies perform major roles in pollination and bear a history of co-evolution with herbivores and plants. Being good pollinators, they play an important role in the existence of the ecosystem. These close relations with the ecosystem make it as a good indicator species to analyse the quality of the ecosystem and climate change (Kunte *et al*, 1999). Kerala has rich and diverse butterfly fauna because of the availability of wide range of habitats. Among the 1501 species so far recorded from India, 327 species are found in Kerala region (Palot *et al*, 2003). In our state detailed studies have been done only in some specific habitats. Butterflies were systematically studied and 220 butterfly species were recorded from Travancore area in 1891 (Fergusson, 1891). Western Ghats has 334 varieties of butterflies and 316 species reported from Kerala (Palot *et al*, 2003). In Kerala state the documentation of butterfly species done by several authors including few diversity studies in Palakkad (Mathew and Rahamathulla, 1993; Sudheendrakumar *et al*, 2000; Arun, 2003; Ambrose and Raj, 2005; Eswaran and Pramod, 2000; Prasadet *et al*, 2010; Lekshmi Priya *et al*, 2017; Palot, 1995; Narmadha and Varunprasath, 2018; Anjali and Dhivya, 2021 [5-14]. In this context, the present study focusses on diversity of Butterflies in ten selected sites which are mixed agroecosystems (Kulappully, Pathiripala, Chembalode, Kalippara, Mathur, Mankara, Kannanur, Chungamannam, Vennakkara and Mankurussi) from Palakkad District was attempted for a period of 5 months from January to May. observations on the butterfly diversity provide the information about variations in the species richness and the abundance in relation with vegetation along the landscape and the species interactions.

2. MATERIALS AND METHODS

2.1. STUDY AREA

The present study was carried out in ten mixed agroecosystems of Palakkad District. The flora of Palakkad district is characteristically tropical with moderate temperature. The climate of the study area is characterized by hot summers with the maximum temperature of 41°C during January to May, annual rainfall of 242.81 mms and has 228.92 rainy days (62.72% of the time) annually. Ten sampling sites were selected in the study area, which include: Kulappully (10.7875° N, 76.2798° E), Pathiripala (10.7795° N, 76.4708° E), Chembalode (10.7686° N, 76.6806° E), Kalippara (10.8009° N, 76.6807° E), Mathur (10.7352° N and 76.58835° E), Mankara (10° 44' 59.99" N, 76° 25' 59.99" E), Kannanur (10.7366° N, 76.6172° E), Chungamannam (10.7392° N, 76.5751° E), Vennakkara (10.7583° N, 76.6319° E) and Mankurussi (10.7981° N, 76.5180° E) in Palakkad District.

2.2. SURVEY METHOD

The field surveys on butterflies were carried out in the study area three times a week for the period of five months from January to May. Butterflies were accessed in the study area from (8.00-11.00 am and 3.00-5.00 pm) by random observations during walking through the ten selected sites based on habitats present in the study area. Photographs of the butterflies in the field were taken with the aid of camera for the identification purpose and identification was done on the site itself with the help of field guides (Anjali and Dhivya,2021; Kunte,2000; Kehimkar,2008; Padhey,2006; Wynter-Blyth,1957; Palot et al,2003).

3. RESULTS

Table .1 Family wise distribution of Butterflies in ten sites of Palakkad District.

No	Locality	Total No of species	Family wise species				
			Papilionidae	Lycaenidae	Pieridae	Nymphalidae	Hesperiidae
1	Kulappully	23	5	4	6	8	0
2	Pathiripala	11	3	2	3	3	0
3	Chembalode	15	2	3	4	6	0
4	Kalippara	8	1	1	3	3	0
5	Mathur	13	3	1	2	6	1
6	Mankara	18	4	1	5	8	0
7	Kannanur	11	0	2	4	3	2
8	Chungamannam	7	1	1	2	3	0
9	Vennakkara	13	4	1	2	6	0
10	Mankurussi	13	8	3	1	1	0
	Total	132	31	19	32	47	3

Table.2. Butterfly species identified from Kulappully

Species	Scientific Name	Common Name	Family	Nos	IUCN STATUS
1.	<i>Atrophaneura hector</i>	Crimson rose	Papilionidae	120	NT
2.	<i>Papilio polymnestor</i>	Blue mormon	Papilionidae	21	NT
3.	<i>Papilo polytes</i>	Common mormon	Papilionidae	83	NT
4.	<i>Troides minos</i>	Southern bird wing	Papilionidae	114	LC
5.	<i>Papilo dravidarum</i>	Malabar raven	Papilionidae	128	NT
6.	<i>Spindasis vulcanus</i>	Common silver line	Lycaenidae	125	NT
7.	<i>Catochrysops strabo</i>	Forget me not	Lycaenidae	12	NT
8.	<i>Jamides celeno</i>	Common cerulean	Lycaenidae	91	NT
9.	<i>Megisba malaya</i>	Malayan	Lycaenidae	3	Sch. II
10.	<i>Eurema brittiga</i>	Small grass yellow	Pieridae	223	NT
11.	<i>Leptosia nina</i>	Psyche	Pieridae	14	NT
12.	<i>Catopsilia pyranthe</i>	Mottled emigrant	Pieridae	116	NT
13.	<i>Eurema hecaba</i>	Common grass yellow	Pieridae	132	NT
14.	<i>Delias eucharis</i>	Common jazebal	Pieridae	119	NT
15.	<i>Pieris rapae</i>	Cabbage butterfly	Pieridae	114	NT
16.	<i>Euploea core</i>	Common crow	Nymphalidae	165	NT
17.	<i>Mycalesia mineus</i>	Dark banded bush brown	Nymphalidae	128	NT
18.	<i>Tirumala limnaceae</i>	Blue tiger	Nymphalidae	165	NT
19.	<i>Danus chrysippus</i>	Plain tiger	Nymphalidae	169	NT
20.	<i>Danus genutia</i>	Striped tiger	Nymphalidae	3	EN
21.	<i>Ypthima huebneris</i>	Common four ringed	Nymphalidae	19	NT
22.	<i>Ypthima baldus</i>	Common five ringed	Nymphalidae	18	NT
23.	<i>Parantica aglea</i>	Glassy blue tiger	Nymphalidae	163	NT

Table.3. Butterfly species identified from Pathiripala

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Papilio clytia</i>	common mime	Papilionidae	8	Sch. I
2.	<i>Papilio dravidarum</i>	Malabar raven	Papilionidae	214	NT
3.	<i>Triodes minos</i>	Southern bird wing	Papilionida	14	LC
4.	<i>Catopsilia pamona</i>	Common emigrant	Pieridae	156	NT
5.	<i>Euripus consimilis</i>	Painted courtesan	Nymphalidae	3	Sch.II
6.	<i>Ypthima baladus</i>	Common five ring	Nymphalidae	63	NT
7.	<i>Azanus ubaldus</i>	Bright babul blue	Lycaenidae	15	LC
8.	<i>Nathalis iola</i>	Dainty sulphur	Pieridae	6	GS
9.	<i>Echinargous isole</i>	Reakirt's blue	Lycaenidae	6	UC
10.	<i>Phoebis agarithe</i>	Large orange sulphur	Pieridae	9	R
11.	<i>Danaus plexippus</i>	Monarch	Nymphalidae	9	EN

Table.4. Butterfly species identified from Chembalode

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Tirumala limnaceae</i>	Blue tiger	Nymphalidae	51	NT
2.	<i>Mycalasia mineus</i>	Darck banded bush brown	Nymphalidae	67	NT
3.	<i>Danus chrysippus</i>	Plain tiger	Nymphalidae	59	C
4.	<i>Danus genutia</i>	Striped tiger	Nymphalidae	4	EN
5.	<i>Ypthima huebneris</i>	Common four ringeed	Nymphalidae	28	NT
6.	<i>Parantica aglea</i>	Glass blue tiger	Nymphalidae	125	NT
7.	<i>Leptosia nina</i>	Psyde	Pieridae	68	NT
8.	<i>Eurema brittiga</i>	Small grass Yellow	Pieridae	58	NT
9.	<i>Eurema hecaba</i>	Common grass yellow	Pieridae	74	NT
10.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	Pieridae	49	NT
11.	<i>Catochrysops panormus</i>	Forget me not	Lycaenidae	63	NT
12.	<i>Megisba malaya</i>	Malayan	Lycaenidae	3	Sch.II
13.	<i>Spindasis vulcanus</i>	Common silver line	Lycanidae	58	NT
14.	<i>Papilio polymnestor</i>	Blue Mormon	Papilionidae	24	NT
15.	<i>Papilio dravidarum</i>	Malabar Raven	Papilionidae	36	NT

Table.5. Butterfly species identified from Kalippara

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Pachliopta hector</i>	Crimson Rose	Papilionidae	2	LC
2.	<i>Catopsila pyrantide</i>	Mottled emigrant	Pieridae	63	NT
3.	<i>Junonia atlites</i>	Grey pansy	Nymphalidae	54	NT
4.	<i>Acraea terpsicore</i>	Tawny coster	Nymphalidae	152	NT
5.	<i>Delias eucharis</i>	Common Jezebel	Pieridae	67	NT
6.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	Nymphalidae	124	NT
7.	<i>Eurema hecaba</i>	Common grass yellow	Pieridae	189	NT
8.	<i>Tajuria cippus</i>	Peacock royal	lycaenidae	4	Sch.II

Table.6. Butterfly species identified from Mathur

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Pachliopta hector</i>	Crimson Rose	Papilionidae	6	LC
2.	<i>Ampitta dioscorides</i>	bush hopper	Hesperiidae	62	NT

3.	<i>Troides minos</i>	southern birdwing	Papilionidae	8	LC
4.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	Nymphalidae	89	NT
5.	<i>Pontia protodice</i>	southern cabbage butterfly	Pieridae	3	GS
6.	<i>Melanitis phedima</i>	dark evening brown	Nymphalidae	125	NT
7.	<i>Euploea core</i>	common crow	Nymphalidae	320	NT
8.	<i>Heteropsis pauper</i>	Butterfly	Nymphalidae	3	LC
9.	<i>Curetis thetis</i>	Indian sunbeam	Lycaenidae	29	NT
10.	<i>Pareronia hippia</i>	Indian wanderer	Pieridae	78	NT
11.	<i>Elymnias caudata</i>	Tailed palmfly	Nymphalidae	126	NT
12.	<i>Melanitis leda</i>	common evening brown	Nymphalidae	89	NT
13.	<i>Papilio machaon</i>	Swallowtail butterfly	Papilionidae	83	NT

Table.7. Butterfly species identified from Mankara

No	Scientific name	Common name	Family	No	IUCN STATUS
1.	<i>Danaus genutia</i>	Oriental Striped Tiger	Nymphalidae	78	NT
2.	<i>Tirumala limniace</i>	Blue tiger	Nymphalidae	48	NT
3.	<i>Orsotriaena medus</i>	Smooth-eyed bushbrown	Nymphalidae	63	NT
4.	<i>Junonia iphita</i>	Chocolate pansy	Nymphalidae	94	NT
5.	<i>Catopsilia pomona</i>	Lemon Emigrant	Pieridae	58	NT
6.	<i>Graphium agamemnon</i>	Tailed Jay	Papilionidae	29	NT
7.	<i>Troides minos</i>	southern birdwing	Papilionidae	3	LC
8.	<i>Delias eucharis</i>	Common Jezebel	Pieridae	230	NT
9.	<i>Euploea core</i>	common crow	Nymphalidae	126	NT
10.	<i>Pareronia hippia</i>	Indian wanderer	Pieridae	86	NT
11.	<i>Prioneris sita</i>	painted sawtooth	Pieridae	4	Sch.IV
12.	<i>Hynolimnas bolina</i>	Blue Moon	Nymphalidae	85	NT
13.	<i>Pachliopta hector</i>	Crimson Rose	Papilionidae	6	LC
14.	<i>Danaus plexippus</i>	Monarch	Nymphalidae	2	EN
15.	<i>Celastrina areiolus</i>	holly blue	Lycaenids	12	NT
16.	<i>Limenitis trivena</i>	Indian white admiral	Nymphalida	123	NT
17.	<i>Papilio clytia</i>	common mime	Papillionidae	8	Sch.I
18.	<i>Eurema hecabe</i>	Grass yellow butterfly	Pieridae	256	NT

Table.8. Butterfly species identified from Kannanur

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Jamides celeno</i>	common cerulean	lycaenids	79	NT
2.	<i>Leptosia nina</i>	Psyche	Pieridae	65	NT
3.	<i>Castalius rosimon</i>	common Pierrot	lycaenids	8	Sch.I
4.	<i>Ixias pyrene</i>	yellow orange tip	Pieridae	120	NT
5.	<i>Athyma nefte</i>	colour sergeant	Nymphalidae	230	NT
6.	<i>Mycalasis perseus</i>	Dingy Bush-brown	Nymphalidae	41	NT
7.	<i>Tirumala limniace</i>	Blue tiger	Nymphalidae	129	NT
8.	<i>Tapena thwaitesi</i>	black angle	Hesperiidae	4	Sch.IV
9.	<i>Eurema blanda</i>	three-spot grass yellow	Pieridae	67	NT
10.	<i>Baoris farri</i>	paintbrush swift	Hesperiidae	3	Sch. IV
11.	<i>Delias eucharis</i>	common Jezebel	Pieridae	25	NT

Table.9. Butterfly species identified from Chungamannam

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Pachliopta hector</i>	Crimson rose	Papillionidae	5	LC
2.	<i>Catopsilia pyranthe</i>	Mottled emigrant	Pieridae	56	NT

3.	<i>Junonia atlites</i>	Grey pansy	Nymphalidae	69	NT
4.	<i>Acraea terpsicore</i>	Tawny coster	Nymphalidae	57	NT
5.	<i>Tirumala limniace</i>	Blue tiger	Nymphalidae	65	NT
6.	<i>Eurema hecaba</i>	Common grass yellow	Pieridae	98	NT
7.	<i>Tajuria cippus</i>	Peacock royal	lycaenidae	6	Sch.II

Table.10. Butterfly species identified from Vennakkara

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Byasa polyeuctes</i>	Common windmill	Papilionidae	56	NT
2.	<i>Papilio polytes</i>	Common mormon	Papilionidae	85	NT
3.	<i>Papilio demoleus</i>	Lime butterfly	Papilionidae	7	NT
4.	<i>Papilio polymnestor</i>	Blue mormon	Papilionidae	12	NT
5.	<i>Danaus genutia</i>	striped tiger	Nymphalidae	125	NT
6.	<i>Parantica aglea</i>	Glassy tiger	Nymphalidae	68	NT
7.	<i>Bicyclus safitza</i>	Common bush brown	Nymphalidae	8	LC
8.	<i>Euthalia aconthea</i>	Common baron	Nymphalidae	9	Sch.II
9.	<i>Tirumala limniace</i>	Blue tiger	Nymphalidae	95	NT
10.	<i>Ypthima huebneri</i>	Common fourring	Nymphalidae	35	NT
11.	<i>Delias eucharis</i>	common Jezebel	Pieridae	73	NT
12.	<i>Appias olferna</i>	Striped albatross olferna	Pieridae	62	NT
13.	<i>Prosotas dubiosa</i>	Tailless line blue	Lycaenidae	123	NT

Table.11. Butterfly species identified from Mankurussi

No	Scientific Name	Common Name	Family	No	IUCN STATUS
1.	<i>Graphium agamemnon</i>	Tailed Jay	Papilionidae	120	NT
2.	<i>Graphium doson</i>	Common jay	Papilionidae	36	NT
3.	<i>Eurema hecabe</i>	Grass yellow butterfly	Pieridae	59	NT
4.	<i>Acytolepis puspa</i>	common hedge blu	Lycaenidae	67	NT
5.	<i>Tanaecia lepidea</i>	Grey count	Nymphalidae	9	Sch.II
6.	<i>Papilio polytes</i>	swallowtail butterfly	Papilionidae	23	NT
7.	<i>Papilio demoleus</i>	Lime butterfly	Papilionidae	7	NT
8.	<i>Pachilocta hector</i>	Crimson rose	Papilionidae	14	LC
9.	<i>Spalgis epius</i>	apefly	Lycaenidae	69	C
10.	<i>Papilio clytia</i>	common mime	Papilionidae	8	Sch.I
11.	<i>Neopithelops zalmora</i>	Quaker	Lycaenidae	96	NT
12.	<i>Papilio dravidarum</i>	Malabar Raven	Papilionidae	37	NT
13.	<i>Pachilocta pandiyana</i>	Malabar rose	Papilionidae	90	NT

Table .12. Diversity indices of Butterflies from Selected sites of Palakkad

Indices	Total study Area	Kulappully	Pathiripala	Chemba lode	Kalippara	Mathur	Mankara	Kannanur	Chungamannam	Vennakkara	Mankurussi
Shannon-Wiener index	4.48	2.87	1.54	2.52	1.73	2.08	2.41	1.97	1.70	2.29	2.27
Evenness Index	0.9175	0.916	0.641	0.931	0.83	0.81	0.835	0.82	0.872	0.892	0.887

Simpson Index	0.0136	0.061	0.2938	0.0872	0.198	0.1597	0.1096	0.1691	0.1947	0.1127	0.1175
Dominance Index	0.9864	0.939	0.7062	0.9128	0.802	0.8403	0.8904	0.8309	0.8053	0.8873	0.8825
Richness	132	23	11	15	8	13	18	11	7	13	13
Individuals	9022	2245	503	767	655	1021	1311	771	356	758	635

This was the first study which reports the abundance and distribution of butterflies in ten different sites (Kulappully, Pathiripala, Chembalode, Kalippara, Mathur, Mankara, Kannanur, Chungamannam, Vennakkara and Mankurussi) of Palakkad District. A total of 132 species of butterflies belonging to 5 family were identified from ten sites (Table.1-11). Among 132 species from 10 sites, 20 species identified were protected under various schedules of the Indian Wildlife (Protection) Act, 1972. *Troides minos*, *Azanus ubaldus*, *Pachliopta hector*, *Heteropsis heteropsis* comes under LC category. *Papilio clytia* and *Castalius rosimon* belongs to schedule I. *Megisba Malaya*, *Tajuria cippus*, *Euripus consimilis*, *Euthalia aconthea*, *Tanaecia lepidea* were included under schedule II. *Prioneris sita*, *Tapena thwaitesi* and *Baoris farri* were included under schedule IV. *Danus genita* and *Danaus plexippus* considered as EN, *Pontia protodice* and *Nathalis iola* under GS, *Phoebis agarithe*(R) and *Echinargous isole* (UC)(Table. 2-11).

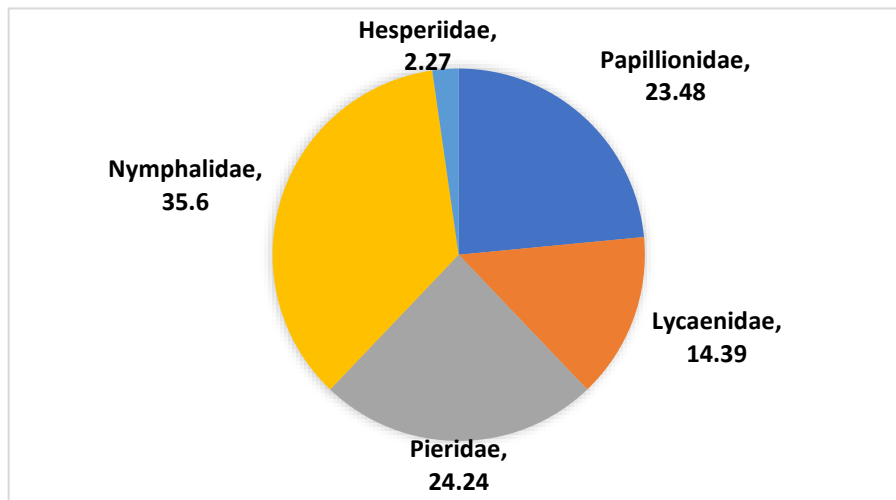


Fig.1. Familywise distribution of Butterflies from 10 sites of Palakkad in percentage.

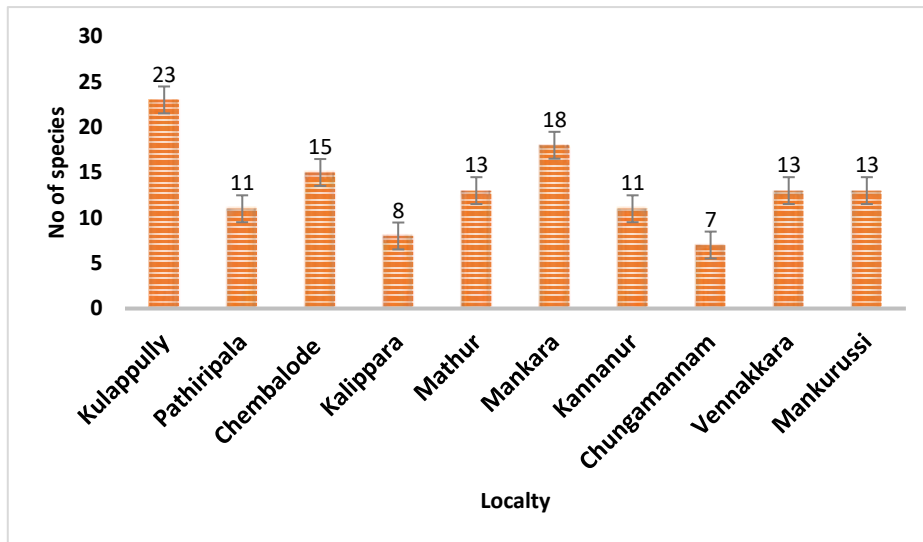


Fig.2.Species distribution of Butterfly in ten sites of Palakkad District.

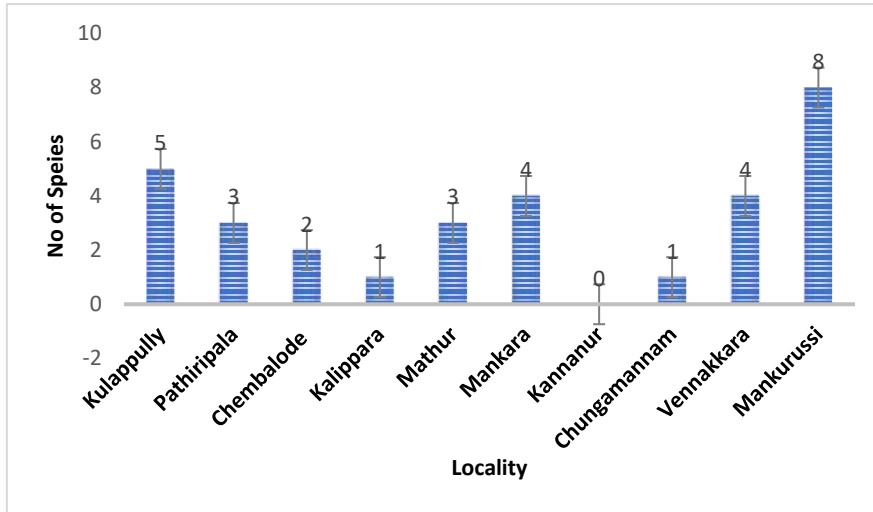


Fig.3. Distribution of Papilionidae family of Butterflies from ten sites in Palakkad.

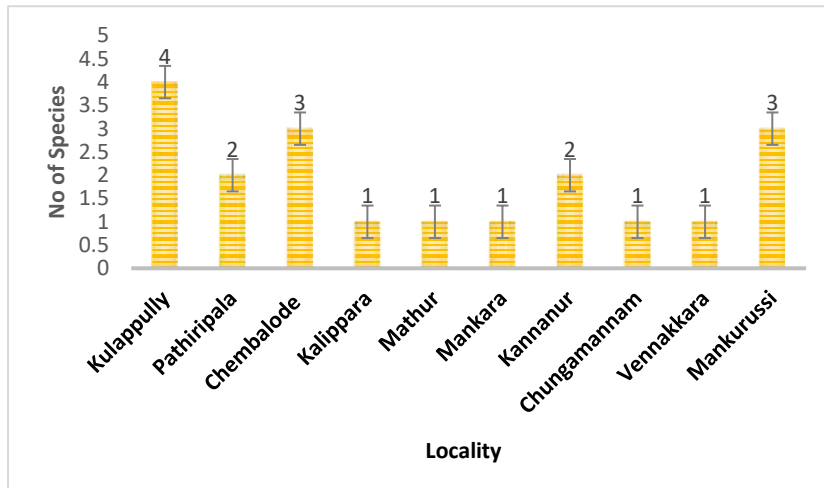


Fig.4. Distribution of Lycaenidae family of Butterflies in selected localities in Palakkad.

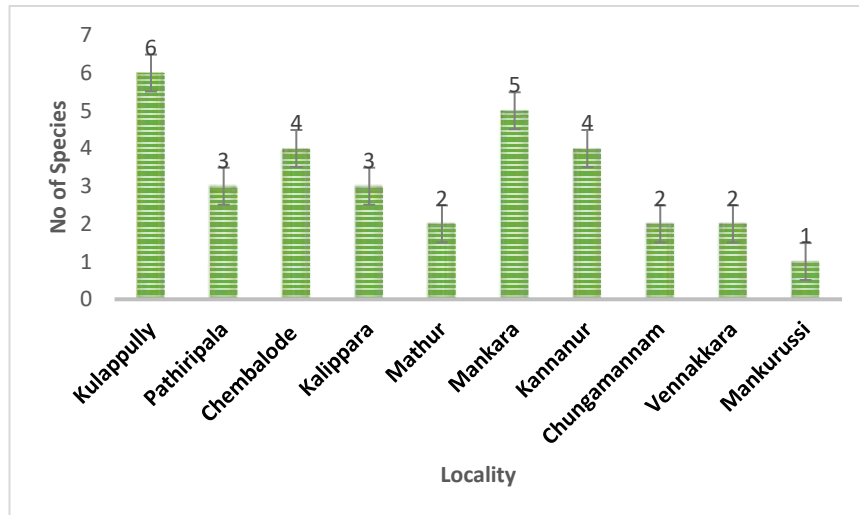


Fig.5. Distribution of Pieridae family of Butterflies in selected localities in Palakkad.

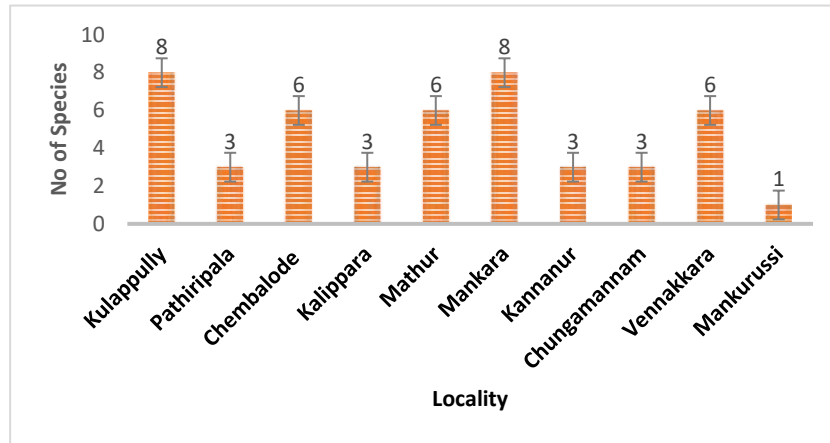


Fig.6. Distribution of Nymphalidae family of Butterflies in selected localities in Palakkad.

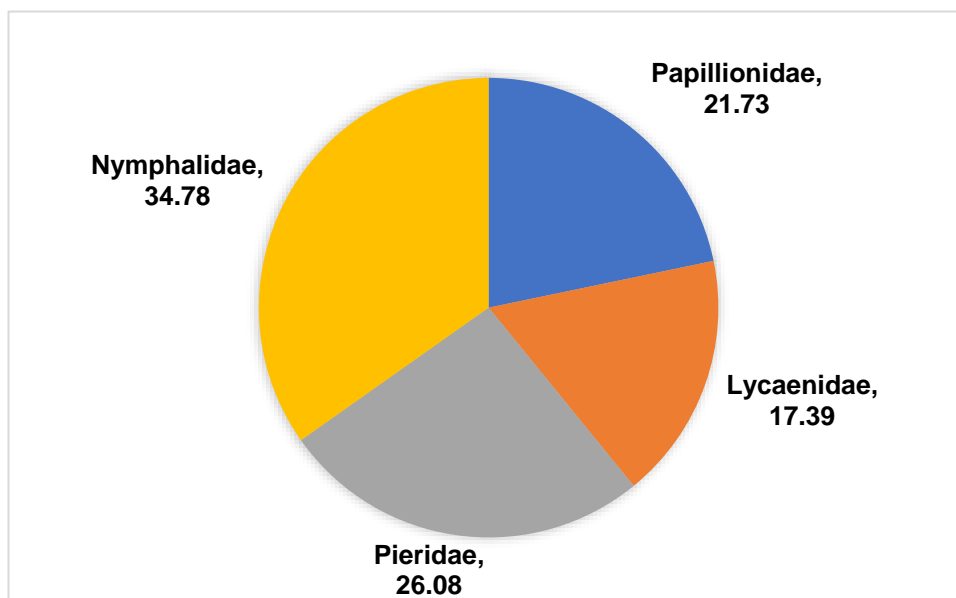


Fig.7. Percentage distribution of Butterflies in Kulappully

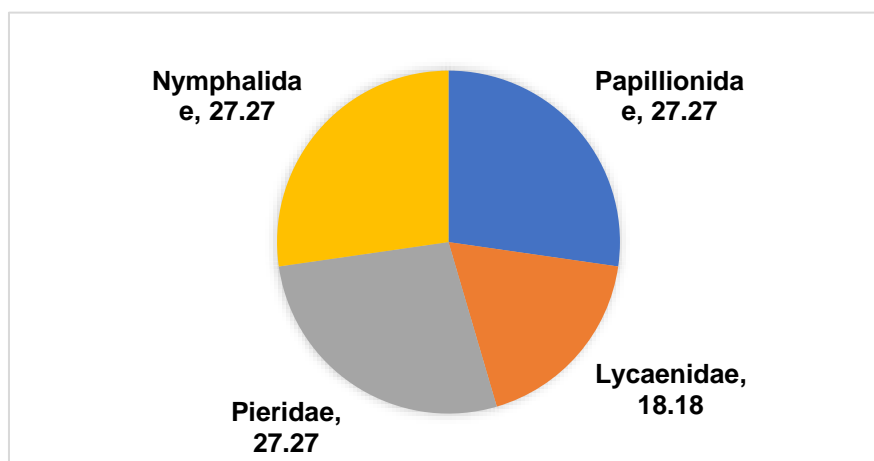


Fig.8. Percentage distribution of Butterflies in Pathiripala

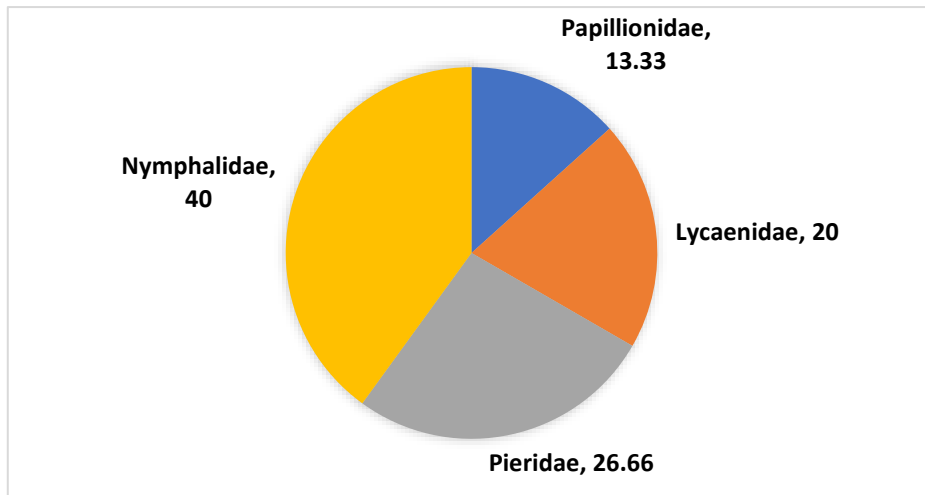


Fig.9. Percentage distribution of Butterflies in Chembalode

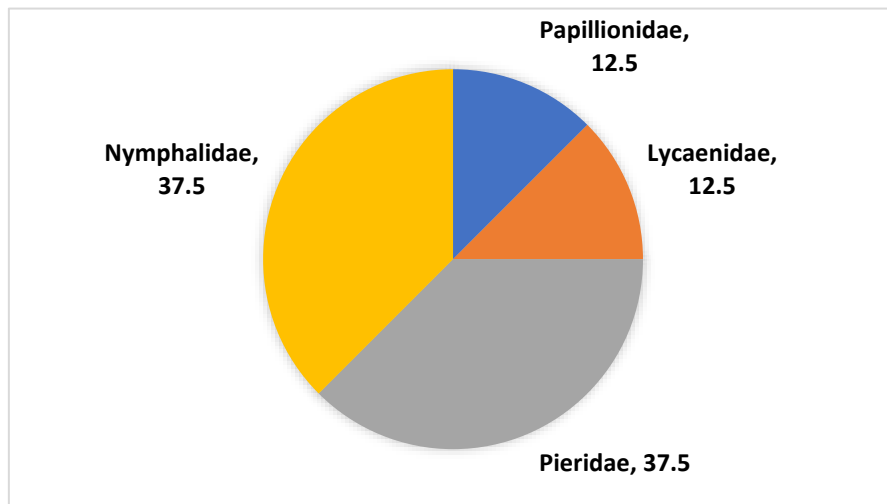


Fig.10. Percentage distribution of Butterflies in Kalippara

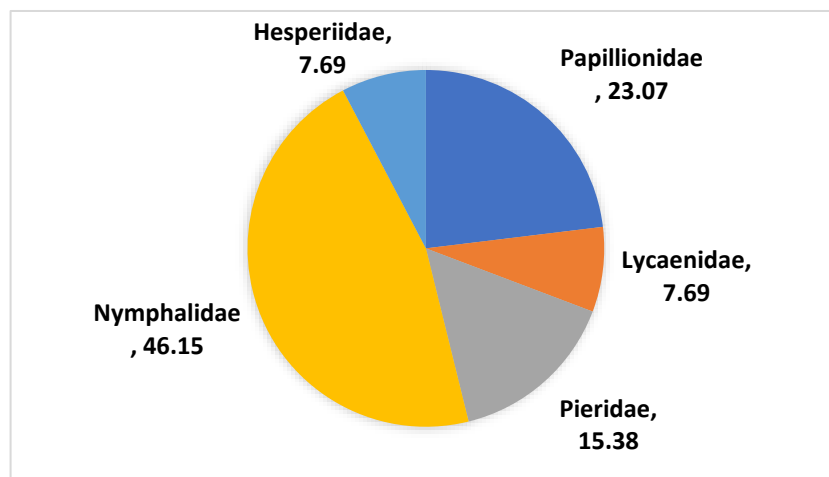


Fig.11. Percentage distribution of Butterflies in Mathur

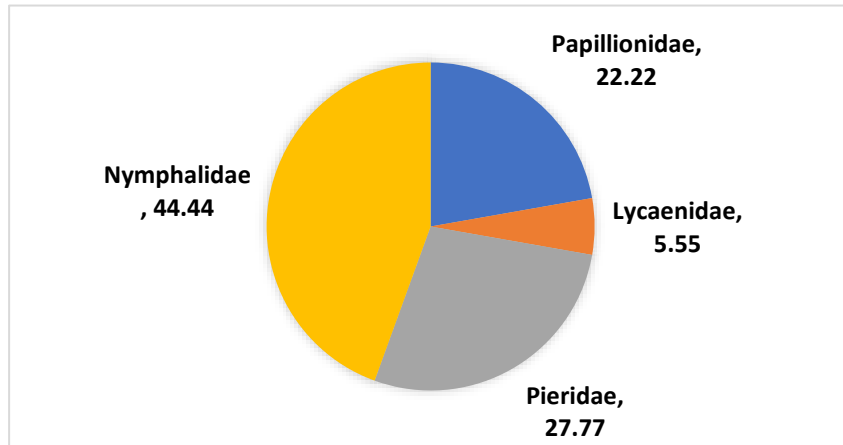


Fig.12. Percentage distribution of Butterflies in Mankara

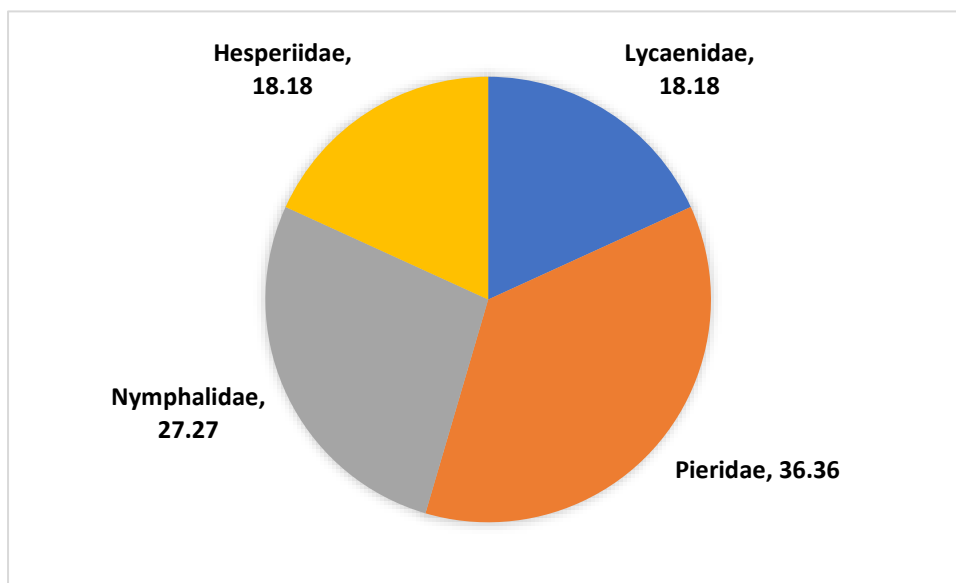


Fig.13. Percentage distribution of Butterflies in Kannanur

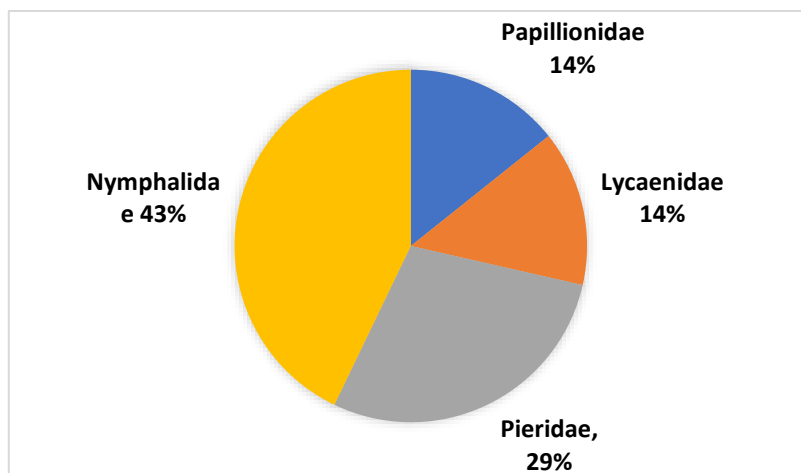


Fig.14. Percentage distribution of Butterflies in Chungamannam

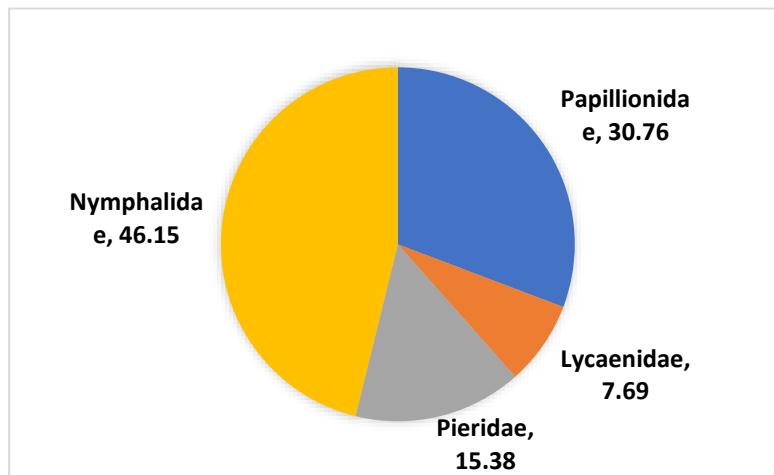


Fig.15. Percentage distribution of Butterflies in Vennakkara

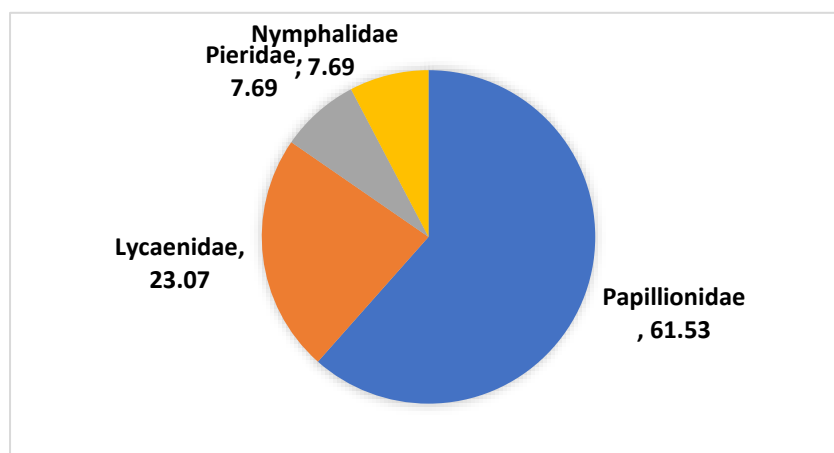


Fig.16. Percentage distribution of Butterflies in Mankurussi

Nymphalidae was found to be the dominant family with 47 species (35.6%), Pieridae with 32 species (24.24%), Papilionidae 31 species (23.48%), Lycaenidae 19 species (14.39%) and Hesperidae with 3 species. Maximum number of species was reported from Kulappully (23) followed by Mankara (18) (Fig.1&2). Distribution of Papilionidae family of butterflies among ten sites (Fig.3.) shows maximum diversity in Mankurussi (61.53%) with 8 species and no species reported in Kannanur (Fig.3). In Lycaenidae family Kulappully dominates than other sites (Fig.4). In Pieridae family maximum number of species (6) was reported from Kulappully (Fig.5) followed by Mankara with 5 species. From Nymphalidae family, 8 species each was reported from Kulappully and Mankara and a single species in Mankurussi (Fig.6).

In Kulappully Nymphalidae contributes 34.78% and no representation from Hesperidae (Fig.7). In Pathiripala, equal distribution of Nymphalidae, Pieridae and Papilionidae (27.27%) was found (Fig.8). In Chembalode, Nymphalidae (40%) dominates (Fig.9). In Kalippara Nymphalidae and Pieridae shares highest and equal percentage distribution (37.5%) and also Lycaenidae and Papilionidae in equal proportion (Fig.10). Mathur was the only one study site with 5 different families of Butterflies. In which Nymphalidae (46.15%) family dominates and Lycaenidae and Hesperidae (7.69%) least represented. In Mankara, Nymphalidae (44.44%) dominated (Fig.12). In Kannanur, Pieridae (36.36%) dominated and followed by Nymphalidae (27.27%), Lycaenidae and Hesperidae (18.18%) each (Fig.13). In Chungamannam Nymphalidae (43%) was the dominant family (Fig.14). In Vennakkara, Nymphalidae (46.15%) dominates followed by Papilionidae (30.76%) (Fig.15). In Mankurussi Papilionidae (61.53%) dominates and second Lycaenidae (23.07%) (Fig.16), Nymphalidae and Pieridae in equal share (7.69%). Diversity indices of study sites was described in Table.12. Shannon- Wiener diversity index of 4.48 was found on calculating total butterfly diversity in Palakkad District considering 10 sites, Evenness (0.9175), richness (132) and total number individuals observed 9022. The species diversity of the ten different sites ranged from 2.87 to 1.7. The maximum diversity was reported in Kulappully (2.87) with 2245 individuals and minimum diversity was found in Chungamannam (1.7) with 7 species and 356 individuals. Mankara site have a greater number of WPA 1972 butterflies. All the important butterflies coming under IUCN list are listed in plates 1-3.

4. DISCUSSION

Butterflies are ecologically important creatures that serve as indicators of environmental conditions (Stefanescu, 2004). The study area selected here are mixed agroecosystems with variety of plant species that host the butterfly populations. The earlier studies showed that heterogeneity of the habitats supports the rich butterfly diversity (Kuussaari et al, 2007; Mukherjee, 2015). In another study described that richness increased with the availability of

green space and the heterogeneity of habitats in terms of the available plant species (Öckinger and Smith,2006; Adler et al,1996). Family Nymphalidae, represented the highest number of butterfly with 47 species followed by Pieridae, Papilionidae, Lycaenidae, and Hesperidae. Nymphalidae family is having a peculiar mode of speciation and high dispersal ability (Adler and Dudley,1996), ecological adaptation(Jiggins,1996) and polyphagous nature(Sreekumar and Balakrishnan,2001) helped these butterflies to survive in selected 10 sites and especially kulappully and Mankara with 8 species each. Presence of Nymphalid members in all sites was due to their peculiar habit of forage in distant areas as they are active fliers that might help them in searching for resources in large areas (Eswaran and Pramod,2018; Krishnakumar et al,2008; Raut and Pendharkar,2010; Padhye,2006).

Hesperids are crepuscular habit and they are active early morning and to a lesser extent, in the evening, hence in the study few species reported from Mathur and Kannanur. A total of 132 species of butterflies belonging to 5 family were identified from ten sites in which Nymphalidae dominates in all sites except Mankurissi. Papilionidae dominated in Mankurissi. Lekshmi Priya et al,2017 reported in their study 79 species of butterflies belongs to five families Nymphalidae of 40 species, Lycaenidae (13), Papilionidae (9) Hesperidae (7) from different habitats like Grassland, Herbs and shrubs, Pond, Agrifield and Garden field. In another study 55 species of butterflies belonging to five different families were reported like Nymphalidae (27) species, Papilionidae (10) species, Pieridae (10) species, Lycaenidae (7) species and one Hesperidae species from Pallassana village, Palakkad district (Narmadha and Varunprasath,2018). The butterfly diversity and abundance were correlated with the availability of food plants and assemblage of plant varieties in the habitat (Kunte,2000). Species diversity of the butterflies recorded in ten selected sites in this study may be due the diverse vegetation which is inevitable for its existence. Butterfly species diversity always indicates a healthier ecosystem. With increasing need of human population and increased pollution rates, greeneries are being destroyed in an alarming rate. Chungamannam in this study reports only 7 species of butterflies and a smaller number of occurrences may be due to habitat destruction. This ecosystem destruction directly affects the destruction of butterfly diversity in that area (Thomas,2005). The rich diversity of the butterflies in Kulappully site can be attributed to the floristic diversity of that area which provides suitable larval host plants, nectar plants and protection from predators.

Among 132 species from 10 sites, 20 species identified were protected under various schedules of the Indian Wildlife (Protection) Act, 1972. *Troides minos*, *Azonus ubaldus*, *Pachliopta hector*, *Heteropsis heteropsis* comes under LC category. *Papilio clytia* and *Castalius rosimon* belongs to schedule I. *Megisba Malaya*, *Tajuria cippus*, *Euripus consimilis*, *Euthalia aconthea*, *Tanaecia lepidea* were included under schedule II. *Prioneris sita*, *Tapena thwaitesi* and *Baoris farri* were included under schedule IV. *Danus genita* and *Danaus plexippus* considered as EN, *Pontia protodice* and *Nathalis iola* under GS, *Phoebis agarithe*(R) and *Echinargous isole* (UC). Butterflies also serve as major pollinators of both wild and cultivated plants. The ill effects of urbanization and development may be the reason for the presence of butterflies under conservation status in the study sites in Palakkad District. This ecosystem destruction directly affects the destruction of butterfly diversity in that area (Thomas,2005). Endemism and common occurrence of butterflies in the study sites can be enhanced by planting endemic trees and plants supporting the biodiversity of butterflies. This will make sure that at least the common species will not go on to the verge of extinction.

5. CONCLUSION

Observations made in the present study concludes that Nymphalidae was the most dominant family in terms of number of species followed by Lycaenidae, Papilionidae, Pieridae and Hesperidae. This study indicates that, butterfly diversity is high in the study sites with a diversity index of 4.48 and have a greater ecological significance, in forming a link in the food web, hence there is a need to conserve both butterflies and host plants for conserving the population. Maintaining high plant diversity and different types of habitats is a good option for the conservation of species in human dominated landscape in the study sites, though Palakkad has a tropical wet and dry climate.

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