



## **A comparative study on the species diversity of butterflies in Alagarkovil hills and Lady Doak College, Madurai.**

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### **Abstract**

Butterflies are important bio indicators which should be protected to conserve the biodiversity. This study aims at comparing the richness and species diversity of butterflies in Alagar Kovil hills which is a reserve forest area, and Lady Doak College campus, a suburban area. Survey was done from July 2017- January 2018, between 0800-1600 hrs, thrice a week using the transect method. Total of 166 species belonging to six families were recorded. Of which, the Nymphalidae family was dominant with 49 species. In both the study sites, 21 plant species were identified as host plants. Though urbanized, the presence of favorable habitat has made Lady Doak college campus rich in butterfly diversity. Similar conservation practices in urbanized cities could restore the biodiversity index.

**Keywords:** Butterflies, biodiversity, Alagar Kovil hills, Nymphalidae family.

### **Introduction**

Insects are an integral part of the ecosystem. Among insects, butterflies play a vital role in the ecosystem and are considered as good indicators of habitat quality (Kocher and Williams, 2000). Urbanization pose a serious threat to all wildlife, including the butterflies. The natural habitats of butterflies are replaced or reduced by the construction of buildings and concretes, which leads to substantial decline in the butterfly diversity that can be an indicator of environmental degradation (Tiple and Khurad, 2009; Ghazanfar et al., 2016; Öckinger et al., 2006).

### **Materials and Methods**

The objective of the study aims at comparing the species diversity of butterflies in the Alagar Kovil hills (a reserve forest area 21 km North-East of Madurai city) and Lady Doak college campus (suburban area with luscious green vegetation) (Figure 1,2),to understand the effects of anthropogenic activities on habitat characteristics and its influence on the community structure of butterflies. The survey was undertaken for a period of seven months from July 2017- January 2018, between 0800-1600 hrs, thrice a week using the transect method of sampling and the butterflies were identified in the field with the help of field guides (Gunathilagaraj et al., 1998; Kunte, 2000). Specimen collection was strictly avoided and the specimens were photographically documented using Canon 1200 D camera.



Figure 1 – Study site 1-The geographical location of Alagar Kovil hills is 10.06°N-10.17°N, 78.19°E-78.28°E, covering an area of 14,900 acres, 300m mean sea level.

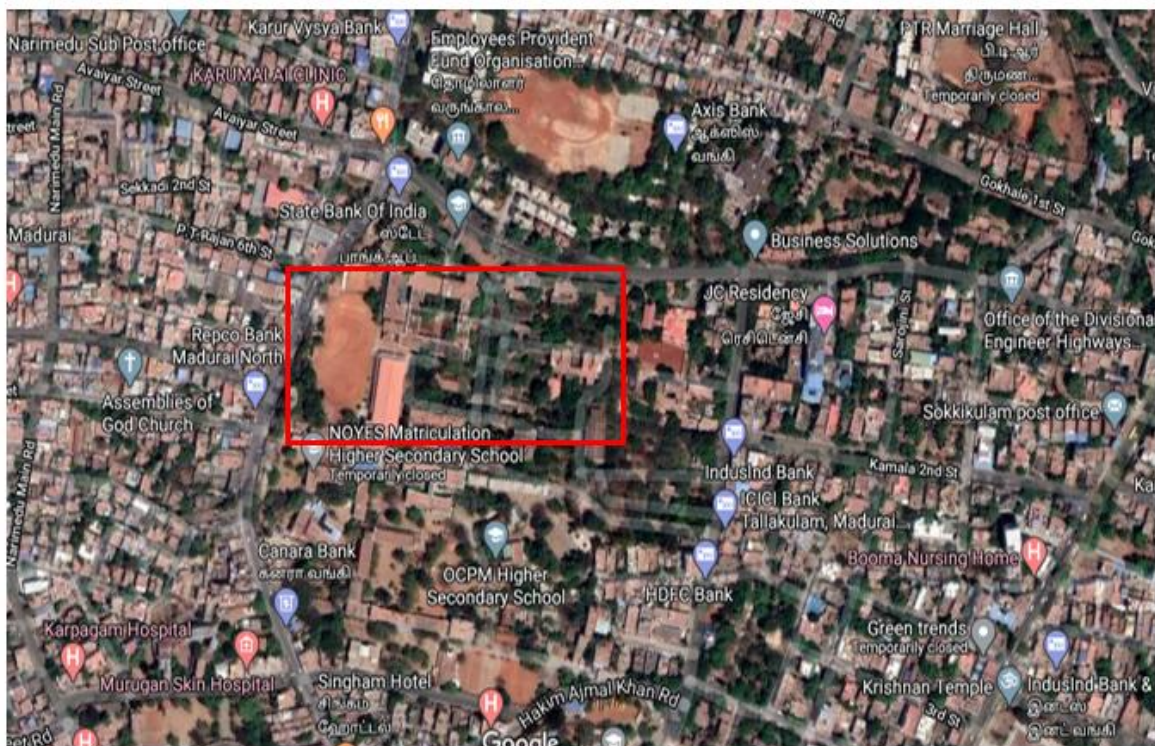


Figure 2 – Study site 2 - Lady Doak college campus located at 9°56 8.24 N 78°7 53.29 E, covering 18.4 acres.

## Results and Discussion

Out of 16,823 species of butterflies recorded around the globe, 1501 species of butterflies i.e. 9 % is found in India (Goankar, 1996). The geographical features of India favors the presence of butterflies in wide numbers all over the country. During the study period, a total of 166 species of butterflies belonging to 6 families were recorded, with the Nymphalidae family being dominant with 49 species, followed by Lycaenidae with 41 species, Pieridae with 36 species, Papilionidae with 21, Hesperidae with 18 species and Riodinidae with 1 species. In Alagar Kovil hills, 34 species of Nymphalidae, 29 species of Lycaenidae, 21 species of Pieridae, 14 species of Hesperidae, 12 species of Papilionidae and 1 species of Riodinidae were documented (Table 1). In Lady Doak college campus, 18 species of Nymphalidae, 15 species of Pieridae, 12 species of Lycaenidae, 9 species of Papilionidae and 4 species of Hesperidae were recorded. As represented in Figure 3, the species diversity of butterflies were comparatively higher in the Alagar Kovil hills than the Lady Doak college campus. Among the 166 species of butterflies recorded, 108 (65%) were found in the Alagar Kovil hills and 58 (35%) were in the Lady Doak college campus (Figure3). Similarly, Sharmila and Thatheyus (2013), have recorded a total of 101 species of butterflies in the Alagarhills, Tamilnadu in eight study sites during Nov 2009 – Oct 2011. Notable works on butterfly diversity includes Pandharipande (1990), who listed 61 species in Nagpur city and 52 species in Amaravati University campus and Subba Reddi *et al.*, (2002) has documented 54 butterflies in Andhra University. In Tamilnadu, Kalakad-Mudanthurai Tiger reserve, Western Ghats region 24 species of butterflies were identified (Ambrose and Raj, 2005). Alagumurugan *et al.*, (2011), have reported the presence of 65 species of butterflies belonging to 8 families in an open land habitat of Peraiyur Taluk. In Kudankulam Nuclear Power Plant area, Tirunelveli, 64 species of butterflies belonging to 47 genera were reported (Kumar and Murugesan 2014). Kanagaraj and Kathirvelu(2016), have reported a total of 40 genera and 52 species from the Annamalai University campus during December 2013 to November 2014. Evangeline and Santhi (2017), studied the butterfly diversity at

Guindy National Park in Metropolitan City of Chennai, Tamil Nadu, South India from February 2016 to July 2016, wherein they reported a total of 90 species of butterflies belonging to 5 families.

In the present study, Nymphalidae was found to be predominant with 34 species in Alagar Kovil hills and 18 species in the Lady Doak college campus. Similarly, Sharmila and Thatheyus (2013), have reported Nymphalidae to be the dominant family with 32 species in Alagarhills. Jeyaprabha and Mohideen (2017) have also reported Nymphalidae to be prominent with 12 species (60%) in the Tirunelveli, Tamilnadu. However, Evangeline and Santhi 2017, have reported a lesser percentage (28.8%) of species belonging to the Nymphalidae family in Guindy National Park in Metropolitan City of Chennai, Tamil Nadu. The maximum species diversity of Nymphalidae in Alagar Kovil hills and Lady Doak college campus, might be attributed to the dominance of larval food plants in the study area (Balasubramaniam *et al.*, 2001). Except for Riodinidae, the other families viz., Nymphalidae, Lycaenidae, Pieridae, Hesperidae, Papilionidae were observed in both the study sites (Plate 2a-3e). Riodinidae species are rare with low population density mostly found in restricted or specific microhabitats (Siewert *et al.*, 2014). In this study, *Abisara bifasciata* (Plate 2f) is the only species of Riodinidae that was recorded in Alagar Kovil hills. It has been reported to be prevalent in tropical rainforests at the elevation of 800m mean sea level. Earlier study by Sharmila and Thatheyus (2013), have not reported the presence of Riodinidae in Alagarhills. Plate 4 represents the “rare species” like *Moduza procris*, *Abisara bifasciata*, *Mycalopsis subdita*, *Lethe drypetis*, *Tagiades jupiter*, *Spalgis epius* and *Surendra quercetorum*, which were sighted only once in the entire study period. Among the 166 species observed, *Atrophaneura hector*, *Papilio polymnester*, *Troides minos* and *Delias eucharis* are endemic to Peninsular India and Srilanka. *Atrophaneura hector* (Crimson Rose) belonging to Papilionidae and *Hypolimnas misippus* (Danaid Egg fly) of Nymphalidae are listed as scheduled I species and *Euthalia aconthea* (Common Baron) belonging to Nymphalidae is listed as scheduled II species under Indian Wildlife Protection Act (1972).

Table 1: Checklist of all the species observed in Alagar Kovil Hills and Lady Doak College campus.

S.NO	FAMILY	COMMON NAME	ZOOLOGICAL NAME	AKH	LDC
1	Hesperidae	African marbled skipper	<i>Gomalia elma</i>	*	*
2		Brown awl	<i>Badamia exclamationis</i>	*	
3		Bush hopper	<i>Ampittia dioscorides</i>	*	
4		Chestnut bob	<i>Iambrix salsala</i>	*	
5		Common banded awl	<i>Hasaro chromus</i>	*	*
6		Common snow flat	<i>Tagiades japedus</i>	*	
7		Common dartlet	<i>Oriens goloides</i>	*	
8		Golden angle	<i>Caprona ransonnetti</i>	*	
9		Grass demon	<i>Udaspes folus</i>	*	
10		Indian skipper	<i>Spialia galba</i>	*	*
11		Parnara swift	<i>Parnara guttatus</i>	*	
12		Rice swift	<i>Barbo cinnara</i>	*	*
13		Tricoloured pied flat	<i>Coladenia indrani</i>	*	
14		White banded awl	<i>Hasaro taminatus</i>	*	
15		African babul blue	<i>Azanus jesous</i>	*	
16		Angled pierrot	<i>Caleta caleta</i>	*	
17		Apefly	<i>Spalgis epius</i>	*	
18		Banded blue pierrot	<i>Castalius ethion</i>	*	
19		Common acacia	<i>Surendra quercetorum</i>	*	
20		Common cerulean	<i>Jamides celeno</i>	*	
21		Common line blue	<i>Prosotas nora</i>	*	
22		Common guava blue	<i>Deudorix Isocrates</i>	*	
23		Common pierrot	<i>Castalius rosimon</i>	*	*
24		Common silverline	<i>Spindasis vulcanus</i>	*	
25		Dark cerulean	<i>Jamides bochus</i>	*	
26		Dark grass blue	<i>Zizeeria karsandra</i>	*	*
27		Forget me not	<i>Catochrysops Strabo</i>	*	*
28		Gram blue	<i>Euchrysops cnejus</i>	*	*
29		Grass jewel	<i>Freyeria trochylus</i>	*	*
30		Indian sunbeam	<i>Curetis thetis</i>	*	
31		Lesser grass blue	<i>Zizina otis</i>	*	*
32		Lime blue	<i>Chilades lajus</i>	*	*
33		Malayan	<i>Megisba malaya</i>	*	
34		Monkey puzzle	<i>Rathinda amor</i>	*	*
35		Oriental grass jewel	<i>Freyeria putli</i>	*	*
36		Plains cupid	<i>Chilades pandava</i>	*	
37		Pointed ciliate lineblue	<i>Anthene lycaenina</i>	*	
38		Striped pierrot	<i>Tarucus nara</i>	*	*
39		Slate flash	<i>Rapala manea</i>	*	

40		Small cupid	<i>Chilades Parrahsius</i>	*	
41		Tailless line blue	<i>Prosotas dubiosa indica</i>	*	
42		Tiny grass blue	<i>Zizula hylax</i>	*	*
43		Zebra blue	<i>Leptotes plinius</i>	*	*
44		Anamolous nawab	<i>Polyura agraria</i>	*	
45		Angled castor	<i>Ariadne ariadne</i>	*	*
46		Bamboo tree brown	<i>Lethe europa</i>		*
47		Black rajah	<i>Charaxes solon</i>	*	
48		Blue pansy	<i>Junonia orithiya</i>	*	*
49		Blue tiger	<i>Tirumala limniace</i>	*	*
50		Chocolate pansy	<i>Junonia iphita</i>	*	
51		Chestnut streaked sailor	<i>Neptis jumbah</i>	*	
52		Club beak	<i>Libythea myrrha</i>	*	
53		Commander	<i>Moduza procris</i>	*	
54		Common baron	<i>Euthalia aconthea</i>	*	
55		Common bushbrown	<i>Mycalesis mineus</i>	*	*
56		Common castor	<i>Ariadne merione</i>	*	*
57		Common crow	<i>Euploea core</i>	*	*
58		Common lascar	<i>Pantoporia hordonia</i>	*	
59		Common leopard	<i>Phalanta phalantha</i>	*	
60		Common evening brown	<i>Melanitis leda</i>	*	*
61		Common nawab	<i>Polyura athamas</i>	*	
62		Common sailor	<i>Neptis hylas</i>	*	
63		Danaid eggfly	<i>Hypolimnas misippus</i>	*	*
64		Dark blue tiger	<i>Tirumala septentrionius</i>	*	*
65		Double branded crow	<i>Euploea Sylvester</i>	*	
66		Glassy blue tiger	<i>Parantica aglea</i>	*	
67		Great eggfly	<i>Hypolimnas bolina</i>	*	*
68		Joker	<i>Byblia ilithya</i>		*
69		Lemon pansy	<i>Junonia lemonias</i>	*	*
70		Lobed beak	<i>Libythea lepita</i>	*	
71		Peacock pansy	<i>Junonia almana</i>	*	*
72		Plain tiger	<i>Danaus chrysippus</i>	*	*
73		Striped tiger	<i>Danaus genutia</i>		*
74		Tamil bushbrown	<i>Mycalesis sp.</i>	*	
75		Tawny coster	<i>Acraea violae</i>	*	*
76		White four ring	<i>Ypthima ceylonica</i>	*	
77	Nymphalidae	Yellow pansy	<i>Junonia hierta</i>	*	*

78		Blue mormon	<i>Papilio polymnester</i>	*	*
79		Common banded peacock	<i>Papilio crino</i>	*	
80		Common blue bottle	<i>Graphium sarpedon</i>	*	*
81		Common jay	<i>Graphium doson</i>	*	*
82		Common rose	<i>Atrophaneura aristolochiae</i>	*	*
83		Common mime	<i>Papilio clytia</i>	*	*
84		Common mormon	<i>Papilio polytes</i>	*	*
85		Crimson rose	<i>Atrophaneura hector</i>	*	*
86		Lime butterfly	<i>Papilio demoleus</i>	*	*
87		Tailed jay	<i>Graphium Agamemnon</i>	*	*
88		Southern bird wing	<i>Troides minos</i>	*	
89	Papilionidae	Spot swot tail	<i>Graphium nomius</i>	*	
90		Common albatross	<i>Appias albina</i>	*	*
91		Common emigrant	<i>Catopsilia Pomona</i>	*	*
92		Common grass yellow	<i>Eurema hecabe</i>	*	*
93		Common gull	<i>Cepora nerissa</i>	*	*
94		Common jezebel	<i>Delias eucharis</i>	*	*
95		Common wanderer	<i>Pareronia valeria</i>	*	*
96		Crimson tip	<i>Colotis danae</i>	*	
97		Dark wanderer	<i>Pareronia ceylanica</i>	*	
98		Great orange tip	<i>Hebomoia glaucippe</i>	*	
99		Large salmon arab	<i>Colotis fausta</i>	*	
100		Mottled emigrant	<i>Catopsilia pyranthe</i>	*	*
101		One spot grass yellow	<i>Eurema andersoni</i>	*	*
102		Pioneer	<i>Belenois aurota</i>	*	*
103		Plain orange tip	<i>Colotis eucharis</i>	*	
104		Psyche	<i>Leptosia nina</i>	*	*
105		Three spot grass yellow	<i>Eurema blanda</i>	*	*
106		Small grass yellow	<i>Eurema brigitta</i>	*	*
107		Small salmon arab	<i>Colotis amata</i>	*	*
108		Striped albatross	<i>Appias libythea</i>	*	
109		Yellow orange tip	<i>Ixias pyrene</i>	*	*
110	Pieridae	White orange tip	<i>Ixias Marianne</i>	*	*
111	Riodinidae	Double banded judy	<i>Abisara bifasicata</i>	*	

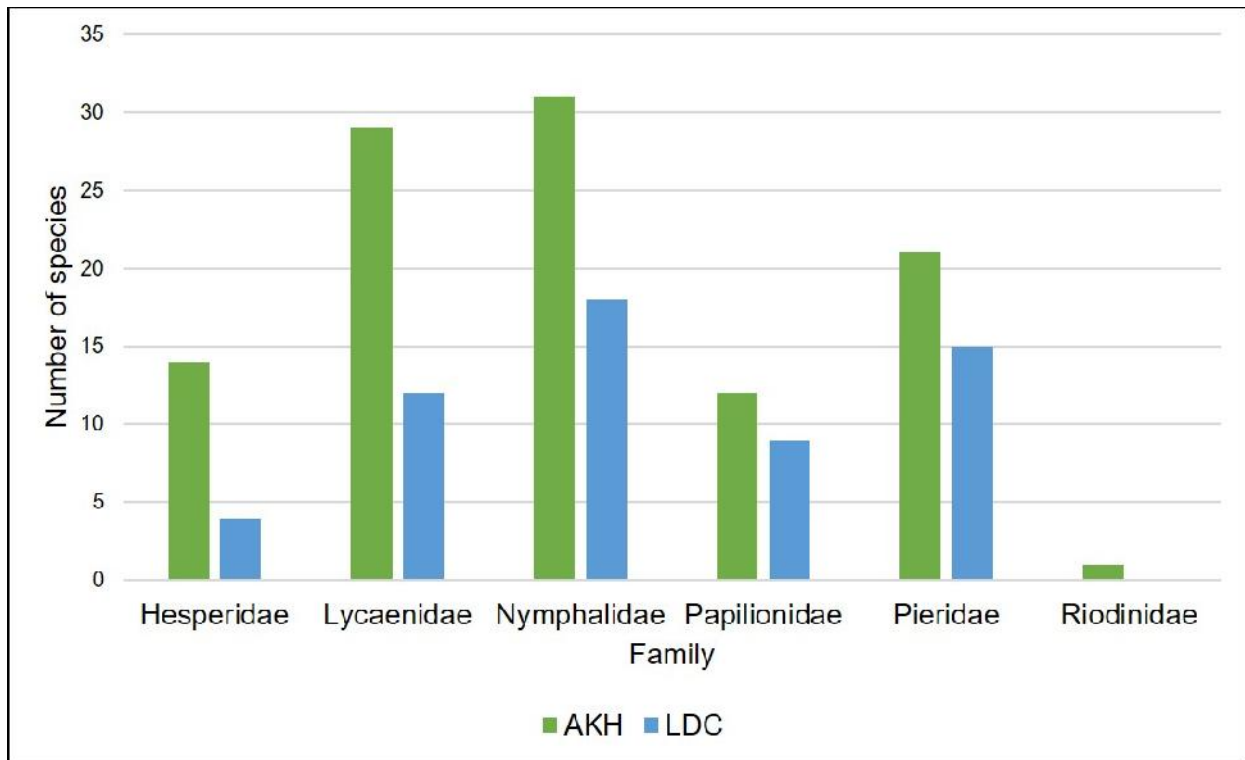


Figure 3 – Comparison of species diversity of butterflies in the Alagar Kovil hills and the Lady Doak College campus.

### Host plant preference

Diversity of butterflies depends on the presence of a favorable habitat. Butterflies are dependent on host plants during various stages of their development, while caterpillar is dependent on foliage, the adult is dependent on nectar and pollen (Mukherjee et al., 2015). Hence, the host plant diversity greatly influences the species diversity, richness and community structure of butterflies (Padhye et al., 2006). A good habitat for the butterflies includes the presence of host plants, open sunny space and reduced use of pesticides. A total of 21 plant species were identified as host plants in the survey sites. Table 2, shows the preference of host plants by various species of butterflies. Plant species such as *Acacia* sp., *Butea monosperma*, *Cadaba frusticosa*, *Capparis* sp. and *Citrus* sp. hosted maximum number of butterfly species (4) followed by *Aristolochia* sp., *Cassia* sp., *Cinnamomum* sp., *Pongamia pinnata*, *Terminalia* sp., *Vigna* sp, *Wattakaka volubilis* and *Ziziphus* sp. hosting 3 species of butterflies each. The *Tylophora* sp. hosted only *Acraea violae* (Tawny coster) which was found in both the study sites. The host plant

preference of various species of butterflies attribute to their prevalence in the Alagar Kovil hills and their absence in the Lady Doak college campus, where host plants like *Acacia* sp., *Terminalia* sp., and *Ziziphus* sp., were absent. Though Lady Doak college campus is a suburban area, the presence of various host plants belonging to the families Fabaceae, Malvaceae, Rubiaceae, Annonacea etc. enriched the species diversity of butterflies. In similar studies, Evangeline and Santhi (2017) has identified 11 species of larval host plants in Guindy National Park, Chennai wherein *Hygrophila auriculata* plant hosted maximum number of butterfly species. Kumar et al., (2014) have reported that Nymphalids butterfly feed on fourteen species of angiosperms. Thus host plant preference has been noted to be a major factor controlling butterfly diversity. The survival of butterflies are higher in urban cities which have rich vegetation and favorable habitat like the Lady Doak college campus. Considering the landscape of Madurai, with effective implementation of the ecological conservation strategies, the species diversity, richness and community structure of the butterflies could be restored efficiently.

Table 2: The host plant preference of butterflies in the Alagar Kovil hills and Lady Doak college campus.

Sl.NO	PLANT SPECIES	COMMON NAMES
1	<i>Acacia spp</i>	Common line blue, African babul blue, Common nawab, Anamolous nawab.
2	<i>Albizia spp</i>	Common grass yellow, Zebra blue
3	<i>Aristalochia spp</i>	Common rose, Crimson rose, Southern bird wing.
4	<i>Butea monosperma</i>	Common emigrant, Mottled emigrant, Common cerulean, Gram blue.
5	<i>Cadaba frusticosa</i>	Crimson tip, Common gull, Pioneer, White orange tip,
6	<i>Capparis spp</i>	Crimson tip, Yellow orange tip, Great orange tip , Common wanderer
7	<i>Cassia spp</i>	Common emigrant, Mottled emigrant, small grass yellow.
8	<i>Chloroxylon swietania</i>	Common banded peacock, lime blue
9	<i>Cinnamomum spp</i>	Common jay, Common bluebottle, Tailed jay Common mime
10	<i>Citrus spp</i>	Blue mormon, Common mormon, Lime blue, Chestnut bob
11	Bamboos and grasses	Bush brown, White four rings,
12	<i>Murray koenigii</i>	Lime, Common mormon.
13	<i>Oryza sativa</i>	Common bushbrown, Common evening brown.
14	<i>Pongamia pinnata</i>	Common cerulean, common banded awl , Common sailor
15	<i>Ricinis communis</i>	Angled castor, common castor .
16	<i>Sida spp</i>	Pansies and Indian skipper
17	<i>Terminalia spp</i>	Black rajah, Oak blue , Brown awl
18	<i>Tylophora spp</i>	Tawny coster
19	<i>Vigna spp</i>	Common sailor, Lime blue, Pea blue
20	<i>Wattakaka volubilis</i>	Blue tiger, Dark blue tiger , Glassy blue tigers
21	<i>Ziziphus spp</i>	Pierrots, Common silverline , and Flashes

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