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## Diversity, relative abundance and status of butterflies in the coastal area of cuddalore district, Tamil Nadu

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### Abstract

In the present study, line transect count method was followed to determine the diversity of butterflies and their abundance in the coastal area of Cuddalore District, Tamil Nadu during December 2013 to November 2014. The butterflies observed in the coastal villages of the District were identified under five families *viz.* Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae under the superfamilies, Papilionoidea and Hesperoidea of order Lepidoptera respectively. There were 52 species and 40 genera found in the study area. Out of which 28 species were found common based on their relative abundance. Highest number of butterflies (286) were observed during December, 2013 followed by January with 245 numbers and February recorded 242 numbers. Another peak was observed during July and August, 2014 with 195 and 202 numbers respectively while the least number of butterflies (141) were observed during May 2014. Among the families of butterflies recorded, Nymphalidae was witnessed with maximum number of butterflies (838) followed by Pieridae (540) and Papilionidae with 401 numbers from all the villages surveyed during the study period of one year comprising all seasons.

**Keywords:** Diversity, butterflies, lepidoptera, relative abundance, coastal area

### Introduction

An insect fauna represents more than 70% in the ecosystem found on the land and also play a vital role in food chain and act as bio-indicators<sup>[8]</sup>. Butterflies are colorful insects with scaled wings and belong to the order Lepidoptera under the class Insecta. The order includes butterflies (Rhopalocera) and moths (Heterocera), of which 17,000-20,000 taxa are butterflies. Butterflies are an important part of any natural ecosystem and environment and their adults act as pollinators and larvae feeds on crops and called as primary herbivores. This is peculiar with butterfly that food and method of feeding are different in their young and adult stages<sup>[18]</sup>. They are the bio indicators of urbanization and sensitive to changes in environment and the availability of host plants for egg laying and larval development<sup>[28, 13]</sup>. Butterflies serve as an important plant pollinators in the ecosystem and environment and more than 50 economically important crop plants are pollinated<sup>[7]</sup>. Some of the butterfly species plays major role in the weed management in crop fields. It appears that a close association between butterflies and plants, their lives are extremely interlinked<sup>[11]</sup>.

The development of roads, buildings and green lawns are increased and it corresponds with decrease in butterfly diversity, abundance and species richness<sup>[6, 9]</sup>. This is due to habitat degradation which reduced plant species diversity, water quality and increased air pollution<sup>[4]</sup>. The reduction in the area and quality of natural habitat related with urban development leads to decline in biodiversity of the nature<sup>[21]</sup>. Seasonality is a common phenomenon in butterfly population and the seasonal fluctuations are often unfair due to environmental factors including the temperature, light, rainfall, RH, variation in the availability of larval food resources and greeneries such as herb and shrubs<sup>[29]</sup>. Information related to migratory number of butterflies in different region of India were given by (Williams 1938)<sup>[32]</sup> and (Bharos 2000)<sup>[5]</sup>. In India, pioneering work on butterfly research was reported from 19th century<sup>[33, 14]</sup>. There are various studies on butterflies from different parts of Indian region<sup>[12, 22]</sup>. The number of Indian butterflies reported is one fifth of total amount of the world butterfly species<sup>[18]</sup>. The total number of butterfly species observed from the Indian region is about 1,501, out of which Peninsular India hosts 350 and 331 species were observed from Western Ghats, and butterflies from South India recorded 313 species, out of them 42 are endemic<sup>[14]</sup>.

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The butterfly fauna is very rich and diverse in southern part of the Indian region when compared to the parts peninsular due to the accessibility of diversified habitats with a wide range of altitudinal gradients associated with microclimate regimes. The contemporary communication regarding butterfly conservation strategies and its importance is lacking among the public. There are several works done on butterfly diversity by many researchers in isolated pockets of Tamil Nadu and in Western Ghats area whereas no concrete work was evidenced in the coastal area of Tamil Nadu, related to diversity and population abundance. Hence, a maiden attempt was made to fulfill the lacuna in the area of butterfly diversity in the coastal district of Cuddalore, Tamil Nadu.

### Materials and Methods

The butterflies were observed in the villages namely Sivapuri, Pitchavaram, Bhuvanagiri, Naduvanthittu, Annamalai nagar, Puduchatram located in the coastal area of Cuddalore District from various ecosystems viz., agricultural land, grassland, bushy areas etc. Survey for butterflies was made in all the four seasons namely, winter, summer, South West Monsoon and North East Monsoon from December 2013 to November 2014. The study areas were surveyed twice a month and the data were documented under the particular month of the study period. The data on butterfly diversity and its abundance were recorded based on observation of the individual butterfly species and also by photographic documentation. The survey was made from 8.30 to

11.30h during good weather period and the butterflies were diagnosed in the field condition. Line transect count method according to Kunte (2000) [18] were followed to find the butterfly abundance [18]. The transects were fixed in the routes along the paths once in a week covering a section of 50 meter around a radius of 5 meter front from the observer and 2.5m on his either sides. The unidentified butterflies were collected by using nylon net and brought to the laboratory for better identification. The collected butterflies were placed in the wide mouthed bottle consists a cotton piece soaked in ethyl acetate (killing jar) for 1 hour. The killed butterflies were properly preserved in an envelope and made using fixed on the spreading board using entomological pins (Size 001/002/003). The collected butterflies were identified and confirmed by using the field guides [10, 14, 18, 16]. All scientific names used in the present study are in accordance with Varshney (1983) [30] and common English names were used from Wynter-Blyth (1957) [34]. The observed butterflies were categorized under five groups on the basis of their abundance in the study area as VC-very common (75-100 sightings), C-common (50-75 sightings), LC-less common (25-50 sightings), R-rare (5-25 sightings), VR-very rare (1-5 sightings) [23]. The diversity indices and evenness were worked out by following Shannon-Wiener diversity index [25, 3].

### Results and Discussion

The butterfly diversity and abundance were observed in the coastal area of Cuddalore district during December 2013 to November 2014 is given in Table 1. The results revealed that the butterflies observed/collected were identified under the Clade Macrolepidoptera, Superfamily Hesperioidea and Papilionoidea. There were 52 species of butterflies identified and segregated under five different families according to the Kristensen *et al.* classification [17]. The families namely Papilionidae, Pieridae, Nymphalidae and Lycaenidae were grouped under Papilionoidea and the family Hesperioidea under Hesperioidea. Among the butterflies recorded in the

study area, six of them were very common (Crimson Rose, Common Mormon etc.) and belong to the family Papilionidae and 28 species were common (Common Wanderer, Mottled Emigrants etc.) and they were recognized under Pieridae, Nymphalidae and Hesperioidea while 16 number of butterflies were categorized under less common (Crimson Tip, Yellow Orange Tip, etc.). Two numbers of butterfly species belongs to Pieridae (Psyche) and Hesperioidea (Fulvous piedflat) one each was found rare in the investigation area based on their relative abundance. Regarding the abundance of the butterflies in the survey area, Common Grass Yellow was found all over the year from January to December. Multiple cropping pattern followed in the study area and vegetation in and around the field might be the reason for the above common occurrences of butterflies. Each and every village had various crops and cropping pattern. In addition to that, the villages were found with bushy areas, grassland and orchards etc. The results are in tune with the findings of Venkataramana (2010) [31] who reported that the relative abundance of butterfly species of Eastern ghats in Andhra Pradesh under various categories like very common (7%), common (30%), less common (6%), rare (5%) and very rare (1%). The results of the study coincided with the findings of Aiswarya *et al.* (2014) [2] who found that the status of butterflies in Sarojini Naidu college campus under various categories like very common (11%), common (31%), less common (14%), rare (6%), and very rare (2%). Further, the results are supported by Rajagopal *et al.* (2011) [26] who observed that the relative abundance of butterfly species diversity generally increase with diversity of plant species in Arigar Anna Zoological park during 2005 to 2006.

The results of the butterfly richness during the study period are furnished in Fig. 1 and 2. A total of 2,310 butterflies were noticed during the study period from all the six villages surveyed in the coastal area of Cuddalore District. It was observed that maximum number (286) of butterflies were observed during December, 2013 followed by January with 245 numbers and February (242) numbers while the least number of butterflies (141) were observed during May 2014. Another peak was observed during August 2014 and July 2014 with 202 and 195 numbers respectively. Family wise collection of butterflies revealed that Nymphalidae was witnessed with maximum number of butterflies (838) followed by Pieridae (540) and Papilionidae with 401 numbers from all the villages surveyed during the whole study period of one year comparing all seasons. It was supported by earlier finding of Ramesh *et al.* (2013) [27] who reported that the period from September to February was conducive climate for butterflies. Further, the reports it is confirmed with the findings of Rajagopal *et al.* (2011) [26] who found that the temperature precipitation are two vital factors which directly influence the butterflies richness and population. Earlier studies by Kunte (2001) [19] and Pandhaye *et al.* (2006) [24] also indicated that the temperature and rainfall are two important factors which directly influence the butterflies richness and population. Further, the results are in accordance with the findings of Hussain (2011) [15] who identified 13 genera and 20 species under Nymphalidae out of 44 genera and 56 species recorded in the DAE campus, Kalpakam Tamilnadu. In southern plains, the ultimate breeding season for most of the butterfly species is North East Monsoon and it continues till winter. This might be due to the fact that during these seasons Tamil Nadu receives enough rain and incidence of ideal temperature. These two factors are essential for both butterflies as well as host plants [20]. The

results of the study coincided with the butterfly movement from October to January/February at Nilgiri and Annamalai hills of southern Western Ghats <sup>[19]</sup>. The Shannon-Wiener diversity index of the butterfly families collected in the study

area indicated that the Nymphalidae was rich in species diversity with 1.92 than other families. The evenness was also found more with Nymphalidae.

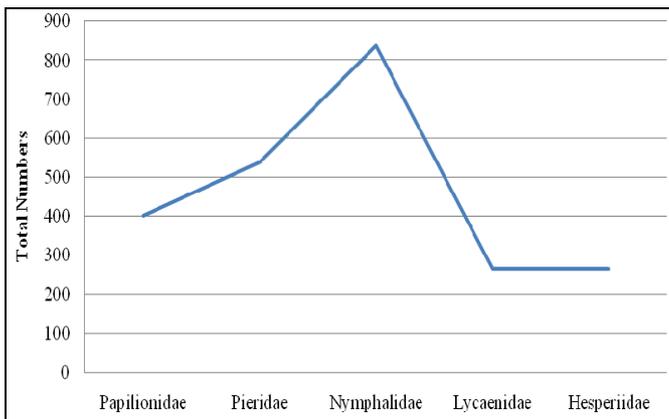
**Table 1:** Butterfly diversity and their abundance in coastal area of Cuddalore District, Tamil Nadu during December 2013 -November 2014.

Sl. No.	Family	Common Name	Species	Relative Abundance		
1	Papilionidae	Crimson Rose	<i>Atrophaneura hector</i>	*****		
		Common Rose	<i>Atrophaneura aristolochiae</i>	****		
		Lime Butterfly	<i>Papilio demoleus</i>	****		
		Common Mormon	<i>Papilio polytes</i>	*****		
		Tailed Jay	<i>Graphium agamemnon</i>	****		
2	Pieridae	Common Blue Bottle	<i>Graphium sarpedon</i>	****		
		Common Wanderer	<i>Pareronia valeria</i>	*****		
		Common Jezebel	<i>Delias eucharis</i>	**		
		Mottled Emigrant	<i>Catopsilia pyranthe</i>	*****		
		Common Emigrant	<i>Catopilia Pomona</i>	****		
		Common Gull	<i>Cepora nerissa</i>	****		
		Indian Cabbage White	<i>Pieris canidia india</i>	****		
		Green Veined White	<i>Pieris napi</i>	****		
		Common Grass Yellow	<i>Eurema hecabe</i>	****		
		Small Grass Yellow	<i>Eurema brigitta</i>	**		
		Great Orange Tip	<i>Hebomoia glaucippe</i>	**		
		Yellow Orange Tip	<i>Ixias pyrene</i>	**		
		Crimson Tip	<i>Colotis danade</i>	**		
		Psyche	<i>Leptosia nina</i>	**		
		3	Nymphalidae	Blue Tiger	<i>Tirumala limniace</i>	*****
				Striped Tiger	<i>Danaus genutia</i>	****
				Plain Tiger	<i>Danaus chrysippus</i>	****
Common Crow	<i>Euploea core</i>			*****		
Common Evening Brown	<i>Melanitis leda</i>			****		
Dark Evening Brown	<i>Melanitis phedima</i>			****		
Tawny Coster	<i>Acraea terpsicore</i>			**		
Joker	<i>Byblia ilithyia</i>			****		
Lemon Pansy	<i>Junonia lemonias</i>			*****		
Blue Pansy	<i>Junonia orithiya</i>			****		
Chocolate Pansy	<i>Junonia iphita</i>			****		
Peacock Pansy	<i>Junonia almana</i>			*****		
Yellow Pansy	<i>Junonia hierta</i>			**		
Common Castor	<i>Ariadne merione</i>			**		
Great Eggfly	<i>Hypolimnas bolina</i>			**		
Danaid Eggfly	<i>Hypolimnas misippus</i>			**		
Common Leopard	<i>Phalanta phalantha</i>			**		
Common Bush Brown	<i>Mycalasis perseus</i>			**		
Common Fourring	<i>Ypthima huebneri</i>			*****		
4	Lycaenidae			Dark Grass Blue	<i>Zizeeria karsandar</i>	****
		Common Pierrot	<i>Catalius rosimon</i>	****		
		Indian Sunbeam	<i>Curetis thetis</i>	****		
		Monkey Puzzle	<i>Rathinda amor</i>	****		
		Angled Pierrot	<i>Caleta caleta</i>	****		
		Pea Blue	<i>Lampides boeticus</i>	****		
		Common Cerulean	<i>Jamides celeno</i>	**		
		Common Silverline	<i>Spindasis vulcanus</i>	**		
5	Hesperiidae	Dark Palm Dart	<i>Telicota ancilla</i>	****		
		Indian Skipper	<i>Spialia galba</i>	*****		
		Bush Hopper	<i>Ochus subvittatus</i>	*****		
		Great Swift	<i>Pelopidas assamensis</i>	**		
		Common Grass Dart	<i>Taractrocera maevius</i>	**		
		Fulvous Piedflat	<i>Pseudocoladenia dan</i>	**		

\*Very Rare \*\* Rare \*\*\* Less Common \*\*\*\*Common \*\*\*\*\*Very Common



**Fig 1:** Status of butterflies observed in coastal area of Cuddalore District, Tamil Nadu during December 2013 to November 2014



**Fig 2:** Butterfly families observed in coastal area of Cuddalore District, Tamil Nadu during December 2013-November 2014.

## Conclusion

A total of 2,310 butterflies were observed from six villages of coastal area of Cuddalore District. They were identified under 52 species, 40 genera belonging to 5 families. Among the families of butterflies, Nymphalidae excelled others in terms of abundance followed by Pieridae. The survey was undertaken only for a period of one year. The species diversity indices obtained from the study area may not actually indicate the exact values. Further samplings are necessary to confirm the butterflies species diversity and also richness. In fact, the study area may be with some endemic and protected species. Conservation of the natural resources may be helpful for the survival of many of the butterfly species. In order to protect the diversity, proper conservation strategies may be followed.

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