



Rapid Assessment of Butterfly Diversity and Host plants at Piplaidevi Forest Range, Dangs, Gujarat

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ABSTRACT: To record butterfly species and its nectar plants of few butterfly species, systematic field survey was conducted by observation at Natural mango forest patch of Piplaidevi forest range, Dangs during January 2015 to December 2016. A total 30 species of butterflies were recorded from Piplaidevi forest range out of 32 species Nymphalidae, were the most dominant groups (44%) followed by Pieridae (25%), Papilionidae (15%) and Lycaenidae (15%). Around 73 nectar producing and larval host plants from 28 families were identified in the study area based on literature studies of butterfly plant relationship. The paper also discusses the relevance of diversity of host plants in the forest areas for the occurrence of different butterfly species and describes the possible threats to this symbiotic relationship. A strong relation was observed between the occurrences of host plant species and butterfly species reported in the study area.

Keyword: Butterflies, Dangs, larva host plants, Piplaidevi forest, Nymphalidae

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INTRODUCTION

Amongst the faunal group, butterflies are one of the most important assemblages of insects that act as biodiversity indicators as well as nature's gardeners (Nair *et al.*, 2014). Butterfly belongs to Insecta class with more than 28,000 species across the world with 80 percent representation from the tropical regions. The Indian subcontinent with diverse terrain, climate and vegetation hosts about 1,504 butterfly species (Tipel, 2011). There are total 193 species occurring in Gujarat State (Parashartya and Jani, 2007). Butterflies play important role in provisions of ecosystem services through their role in pollination and serves important food chain (Aneesh *et al.*, 2013) components to play a role as a primary consumer. Butterflies are considered especially useful organisms as indicators of environmental quality (Brown, 1991, Kremen, 1992).

Butterflies are opportunistic foragers. Many butterflies are generalists and few are specialists in their food plant preferences. The food plant

specificity is well known among butterfly species and it is more often related with the available flora (Kumar *et al.*, 2007). Tudor *et al.* (2004) have reported the nectar feeding and flower preferences of butterflies. Several butterfly species show complex feeding evolutionary relationship during both adult and larval stages (Ehrlich *et al.*, 1964). Further, butterflies have rapid life cycles and tight association with plant resources; populations are very sensitive to local weather, microclimates and light levels (Ehrlich & Murphy 1987, Becalloni & Gaston 1995).

This forest has good diverse flora and fauna which are the part of the Tropical moist deciduous forest of Dangs district. Further, the study on the butterflies of the district is very limited and scattered and the present study would add value to the existing literature and knowledge. During present study larva host plants of butterfly was identified through available Sing, (2011) Parasharya and Jani (2007) and Ravikanthachari *et al.* (2018).

There are total 248 plants species recorded at study area however, 182 species of plants, belonging to 38 families of plant were used by butterfly as a host plants.

MATERIAL AND METHODS

A. Study Area

The present study was carried out at Pipaladevi forest range of Dangs, Gujarat and lies in the southernmost part of the North Dangs. The mountain ranges are rugged and lie in continuation to Satpuda mountain range. This forest receives heavy rainfall (1600 to 3500 mm) and classified as South Indian Moist Deciduous Forest (38%) and Southern Dry Deciduous Forest (58%). The Dangs forests fall in the biogeographic Zone 5 "The Western Ghats", under biotic province 5A "Malabar Coast" and 5B "Western

Ghat Mountains". The climate is tropical with three distinct seasons, viz., monsoon (June to October), winter (October to February) and summer (March to June). The maximum temperature of the area ranges from 34° C to 37° C with minimum temperature varying from 14° C to 18° C. April and May are the hottest month of the year.

The study sites situated between 20° 42'-20° 45' N and 73° 48'-73° 57' E (Fig.1), adjoining Chinchli village of Dangs District, Gujarat. The uniqueness of the site is the presence of natural wild mangoes growing in the slopes of the mountain range. These mangoes *Mangifera indica* are present in a belt of 10 km of total 7 forest compartments from Gadad to Chinchli village. At some places wild mangoes are grown along with the agricultural fields by the tribals.

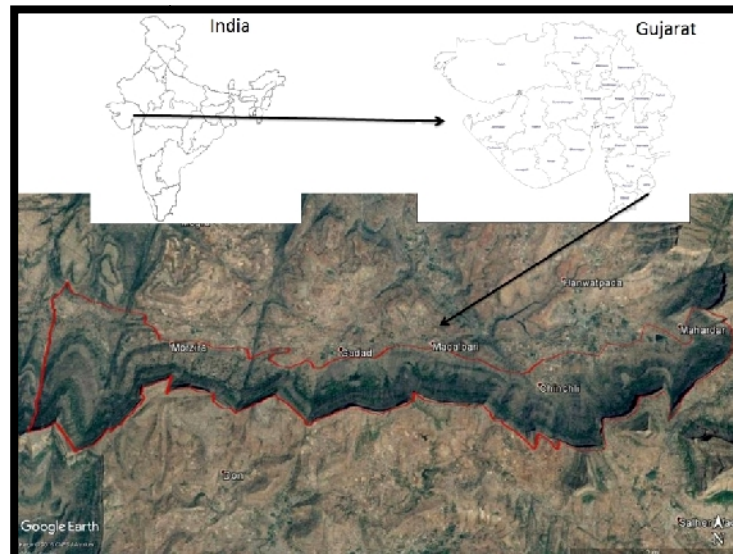


Fig. 1. Study area shown in map.

B. Methodology

Study was conducted at Pipladevi forest range of Dangs, Gujarat, in the period January 2015 to December 2016. Observations were made between 08:00 hrs to 18:00hrs and covered all the three seasons Viz. winter, summer and monsoon. The habitats surveyed included dense mango forests patches, teak plantations, grasslands, streams, cultivated fields, fallow lands and human dwellings. A total of 7 sampling sites were selected and line transects of around 1.5Km was laid. About one and half hour was spent in each transect. All butterflies were recorded during survey and identified directly in the field following photography and identification manual (Kunte *et. al.*, 2000, Evans, 1932 and Wynter-Blyth, 1957). No capture or collections was made during the present study, however butterflies were

photographed from different angles like dorsal, lateral and ventral view as often as possible to enable perfect identification of species.

The larval host plants were identified and noted along with their butterfly larvae and adults. Herbarium was prepared for the plants unidentified in the field and later identified in the lab following various identification manuals like butterflies of Gujarat by Parasharya and Jani (2007) and Sing, (2011) and host plants were classified based on Ravikanthachari *et.al.* (2018).

RESULTS AND DISCUSSION

During the present study about 32 species of Butterflies belonging to 4 families were recorded in Pipladevi forest range of Dangs (Table 1).

Table 1: Checklist of butterfly and their host plants available at the study site.

S. No.	Butterfly family	Common name	English	Scientific name	Family	Host plants present and verified from various reference book
	LYCAENIDAE					
1.		Indian Sunbeam		<i>Curetisthetis</i>	<i>Fabaceae, Mimosaceae</i>	<i>Abrus precatorious, Buteamonosperma, Pongamiapinnata.</i>
2.		Common Pierrot		<i>Castaliusrosimon</i>	<i>Rhamnaceae</i>	<i>Zizyphusrugosa</i>
3.		Common Cerulean		<i>Jamidesceleno</i>	<i>Fabaceae, Myrtaceae, Boraginaceae, Oxiladaceae</i>	<i>Buteamonosperma, Pongamiapinnata, Gonigynahirta, Indigofera, Pisum, Rhynchosia, Heliotropium, Oxalis</i>
4.		Pale Grass Blue		<i>Pseudozizeerimaha</i>	<i>fabaceae, zingerberaceae,</i>	<i>Abrus, Buteamonosperma, Pongamiapinnata</i>
5.		Grass jewel		<i>Chiladestochylus</i>	<i>oxiladaceae, acanthaceae</i>	<i>Oxalis, Strobilanthes</i>
	NYPHALIDAE					
6.		Common Castor		<i>Ariadne merione</i>	<i>Euphorbiaceae</i>	<i>Castor, Chrozophora, Ricinuscommunis</i>
7.		Joker		<i>Bybliaillithya</i>	<i>Euphorbiaceae</i>	<i>Dalechampsiscandens</i>
8.		Common crow		<i>Euploea core</i>	<i>Apocynaceae, Asclepiadiaceae, Moraceae, Asteraceae</i>	<i>Holarrhenea, Cryptolepsis, Hemidesmus, Tylophora, Ficus, Streblus, Agertaum</i>
9.		Plain Tiger		<i>Danauschrysippus</i>	<i>Asclepiadaceae</i>	<i>Asclepias, Calotropis, Tylophora</i>
10.		Striped tiger		<i>Danausgenutia</i>	<i>Asclepiadaceae</i>	<i>Asclepias, Tylophora</i>
11.		Blue Tiger		<i>Tirumalalimniace</i>	<i>Asclepiadaceae, Asteraceae, Amaranthaceae</i>	<i>Crotalaria, Tylophora, Ageratum, Celosia.</i>
12.		Tawny Coster		<i>Telchiniaviolae</i>	<i>Euphorbiaceae, Passifloraceae</i>	<i>Adenia, Passiflora,</i>
13.		Baronet		<i>Euthalianais</i>	<i>Dipterocarpaceae, Ebanaceae</i>	<i>Shorea, Diosypros</i>
14.		Common Sailer		<i>Neptishylas</i>	<i>Mimosaceae, Fabaceae, Bombacaceae, Malvaceae, Rhamnaceae, Tiliaceae,</i>	<i>Acacia, Albizia, Pongamia, Bombax, Zizyphus, Grewia, Eaeopcarpus, Dalbergia,</i>
15.		Danaideggfly		<i>Hypolimnasmisippus</i>	<i>Acanthaceae, portucalaceae</i>	<i>Barleria, Hygrophilla, Justicia,</i>
16.		Lemon pansy		<i>Junialemonias</i>	<i>acanthaceae, Malvaceae, Tiliaceae</i>	<i>Barleria, Hygrophilla, Justicia, Lepidagathis, Sida, Corchous</i>
17.		Blue Pansy		<i>Junoniaorithiya</i>	<i>Acanthaceae, Malvaceae, Tiliaceae, Mimoseceae</i>	<i>Hygrophilla, Justicia, Lepidagathis, Sida, Mimosa</i>
18.		Yellow Pansy		<i>Junoniahierta</i>	<i>Acanthaceae, Malvaceae,</i>	<i>Barleria, Hygrophilla, Ruellia</i>
19.		Chocolate pansy		<i>Junoniaiphita</i>	<i>Acanthaceae</i>	<i>Barleria, Hygrophilla, Justicia, Lepidagathis, Ruellia</i>
	PAPILIONIDAE					
20.		Common Jay		<i>Graphiumdoson</i>	<i>Annonaceae, Magnoneaceae,</i>	<i>Miliusa, Annoa</i>
21.		Lime butterfly		<i>Papiliodemoleus</i>	<i>Rutaceae,</i>	<i>Aegle, citrus,</i>

To be continued...

S. No.	Butterfly family	Common name	English	Scientific name	Family	Host plants present and verified from various reference book
	PAPILIONIDAE					
22.		Tailed Jay		<i>Graphiumagamemnon</i>	<i>Annonaceae, Lauraceae, Magnoneaceae, Aristolochiaceae</i>	<i>Annona, Miliusa</i>
23.		Common Rose		<i>Atrophaneuraaristolochiae</i>	<i>Aristolochiaceae</i>	<i>Aristolicha</i>
24.		Common Mormon		<i>Papiliopolytes</i>	<i>Rutaceae,</i>	<i>Aegle, citrus, Glycosmis, Limonia, Murraya</i>
	PIERIDAE					
25.		Lemon emigrant or Common emigrant		<i>Catopsiliapomona</i>	<i>Apocynaceae, fabaceae, Caesalpiaceae,</i>	<i>Carrisa, Bahunia, Butea, Cassia fistula, Cassia tora</i>
26.		Common Grass Yellow		<i>Teriashecabe</i>	<i>Fabaceae, Caesalpiaceae, mimosaceae</i>	<i>Aechynomeneindica, Albiziamara, Cassia fistula, Sennator, Sennaoccidentalis</i>
27.		Small Grass yellow		<i>Euremabrigitta</i>	<i>fabaceae, Caesalpiaceae, Mimosaceae.</i>	<i>Caesalpinia, Cassia, Acacia, Albizia, Sesbania.</i>
28.		Common Gull		<i>Ceporanerissa</i>	<i>Capparaceae</i>	<i>Capparis</i>
29.		Common Jezebel		<i>Delias eucharis</i>	<i>Loranthaceae</i>	<i>Viscum, Loranthus, Dendrophthoe</i>
30.		Crimson Tip		<i>Colotisdanae</i>	<i>Capparaceae</i>	<i>Cadaba, Capparis, Maerua</i>
31.		Yellow Orange tip		<i>Ixias pyrene</i>	<i>Capparaceae</i>	<i>Cadaba, Capparis, Maerua</i>
32.		White Orange Tip		<i>Ixias marianne</i>	<i>Capparaceae</i>	<i>Capparis</i>

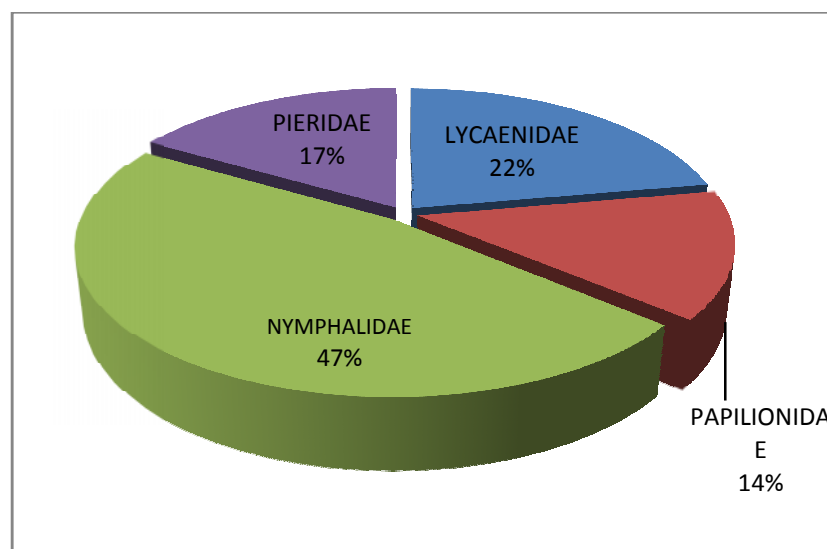


Fig. 2. Family wise representation of butterfly species reported in percentage in the study area.

Family Nymphalidae (14 species) was the most dominant with 44% of butterfly, followed by Pieridae (25%, 8 species), Papilionidae (16%, 5 species) and Lycaenidae (15%, 5 species) (Fig: 2, Table 1). Members of Hesperidae family are reported from bamboo forest but the present study area did not have bamboo forest. The choice of plants as host plants by butterflies depends on various factors including innate color preference, corolla depth, clustering of flowers from which nectar can be extracted chemicals present in leaf of plants (Porter et al., 1992). The plants obtain the services of pollinators in carrying pollen from one flower to another (Proctor et al., 1996).

There are total 248 species of plants present in the study area out of which 73 host plants of butterflies was identified in the study area. The family wise categorization of the host plants indicated that 47% of the plant family reported in present work used by Nymphalidae, followed by 22% by Lycaenidae group, 17% by Pieridae group and 14% by Papilionidae group. The strong relation between the plant host families versus the percentage representation of the butterfly family indicates that the forest type and the plant species composition govern the occurrence of butterflies. Present figure shows the number of host plants and species of butterfly (Fig. 3). Butterfly uses different host plants for nectar, laying eggs and larval development and therefore presence of host plants is important for the successful completion of the life cycle.

Butterflies are often considered opportunistic foragers that visit a wide variety of available

flowers as well as plant species of different families. However, they exhibit distinct flower preference which can differ between species (Jennersten, 1984). The flower scent is an important signal for butterflies initially to identify and subsequently to recognize and distinguish among rewarding plants (Sharma and Sharma, 2013).

The analysis indicated that Nymphalidae members used 34 Plant species belonging to 17 different plant families. This type of dominance is also reported by Tiple and Khurad (2009); and Nimbalkar et.al. (2011); Chowdhury and Soren (2011); Kumar and Murugesan (2014); Chowdhury (2014).

Nymphalidae is the only family reported which also feeds on the monocot plant species from Poaceae (23), Arecaceae (1) Zingiberaceae (1) others. Gosh and Saha (2015) reported preference of monocotyledons (Poaceae, Arecaceae, Zingiberaceae) by Nymphalidae members. During present study there are total 28 species of Poaceae species identified. In present study areas five species of butterfly of Nymphalidae family (Daniaideggfly *Hypolimnasmisippus*, Lemon Pansy *Junialemonias*, Blue Pansy *Junoniaorithya*, Yellow Pansy *Junoniahierta* and Chocolate Pansy *Junoniaiphita* use Acanthaceae family plants species. Four species of butterfly like Plain tiger *Danauschrysippus*, Striped tiger *Danausgenutia*, Blue tiger *Triumalalimniace*, Common crow *Euploea core* use Asclepiadaceae Calotropisfamily plants as a host plants.

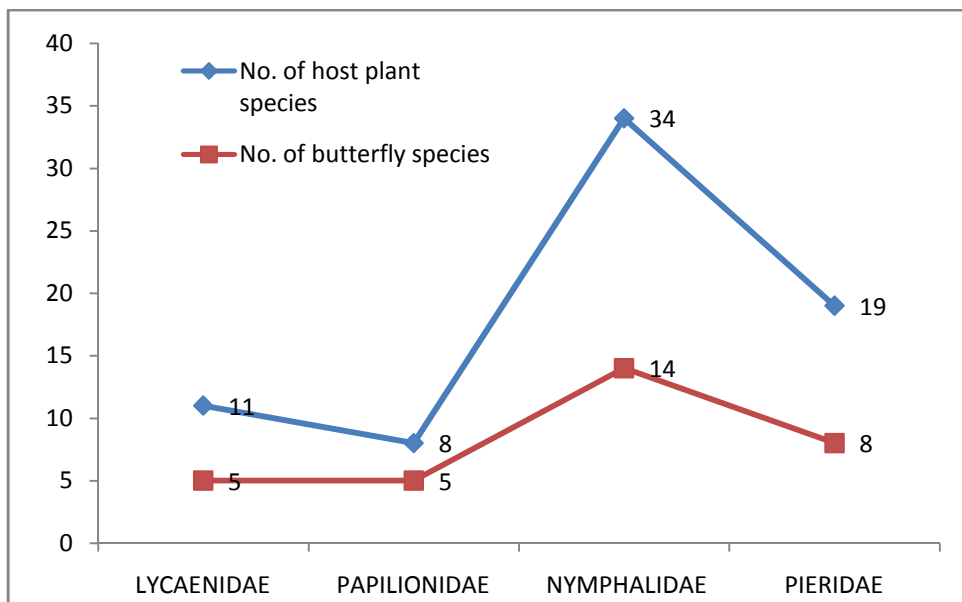


Fig. 3. Number of host plants and species of butterfly.

Some of plants of Acanthaceae (Barleria, and Sida) family and Asclepiadaceae family (Calotropis) have medicinal values (Sankhwal *et. al.*, 2013). This can conclude that some of butterfly species use medicinal plants as a host plants this could be due to presence of oil, latex, and obvious smell of their leaves which may provide nutritional value to their life. Pieridae group used 19 different plant species representing 6 different families. Papilionidae members sustains on 8 species representing 5 different families. Amongst them lime butterfly (Papiliodemoleus) use citrus plant as a host plants (Table 1), similar type of finding was reported by Patel *et. al.*, (2017) where *Citrus limon* (Rutaceae, family) was the most preferred host plant for egg laying by lemon butterfly. *Cassia fistula*, *Cassia tora*, *Cadaba*, *Capparis*, have medicinal value (Shah *et. al.*, 2017) preferred by butterfly of Pieridae family. Further. *Maerua* and *Acacia* species of plants are used as a host plants by Common Grass Yellow (*Euremahegabe*) and Common Emigrant *Catopsilia Pomona* butterflies. This type of observation is also reported by Ravikanthachari *et. al.* (2018). This also indicates that smell, latex, oil which is secreted from the leaves of the plants, are important to complete the life cycle of the butterfly. The possible reason could be due to presence of chemicals in the leaves is least preferred by herbivore animals and the foliage is not browsed upon, therefore safe guarding the eggs. Further, *Loranthus*, *Dendrophthoe Loranthaceae* family are used as a host plant by butterfly of Pieridae family. Both these families possess alkaloids, flavonoids, glycosides, reducing sugar, saponin, terpenoids, tannins and steroids (Shashikanth *et. al.* 2014; Baheti *et al.* 2010). However, butterfly of this family derive their food from mud puddling (Sreekumar and Balakrishnan, 2001; Sharma and Sharma, 2013).

Fabaceae was found to be most important plant family and about 14 host plant species is present in the study area. Further, Common Grass Yellow (*Euremahegabe*) butterfly is very common at most of the habitat like village and urban environment.

Lycaenidae members use 11 plant hosts belonging to 8 plant families. All these plants were recorded at study site but only 5 species of butterfly were recorded in this family. Members from family Lycaenidae largely feed on grasses (Chandekar *et al.* 2013) and cattle grazing affected their diversity and abundance of adults. During present study there are total 23 species of grasses were recorded of Poaceae family which provide the food for butterfly but we did not get any specific species

of butterfly which directly depends on grasses of Poaceae family same like for Anacardiaceae family. According to Padhye *et.al* (2012) Nymphalidae, Lycaenidae and Hesperidae occurred in evergreen forests and deciduous habitat.

CONCLUSIONS

The conclusion of the study is that present study areas lies in the northern most end of Western Ghats and therefore the species diversity represents both the Western Ghats (*Strobilanthes callosus*, *Dalechampia scandens*, *Aechynomene indica* and others) and Dangs region of Gujarat (*Buchanania lanzan*, *Holarrhena pubescens* and others). Further, the study reveals that butterflies preferred host plant with medicinal values. This could be an adaptive mechanism to protect stages of life cycle from predators and get nutrition from the medicinal plants.

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