



Studies on Diversity of Butterfly and its Relationship with Plant Species in Javadhu Hills, Thiruvannamalai District, Tamil Nadu

C Kanimozhi¹, V Ramesh¹ and K Kousalya²

¹Department of Zoology,

Nehru Memorial College (Bharathidasan University), Puthanampatti - 621 007, Tamil Nadu, India

²Department of Zoology, Adhiyaman Arts and Science College for Women, Uthangarai - 635 306, Tamil Nadu, India

Received: 12 May 2020; Revised accepted: 30 June 2020

ABSTRACT

During the present study a total of 40 species of butterflies were recorded from different study sites of Javadhu Hills, which belonged to five families i.e. Nymphalidae (15 species), Papilionidae (05 species), Hesperidae (03 species) Lycaenidae (06 species) and Pieridae (11 species). The larval host plants of 149 were identified, most of butterfly species were monophagous 33 butterfly species feeds on one plant genus and 7 butterfly species feeds on more than one plant genus were polyphagous. The plants belonging to family capparaceae 9 were widely used by butterfly larvae. Over 4 species of butterfly were used Poaceae, Acanthaceae, Fabaceae and 3 species of butterfly used Moraceae and 2 species of butterfly used Aristolochiaceae, Rutaceae, Rubiaceae, Rhamnaceae, Anacardiaceae, Meliaceae in Javadhu Hills.

Key words: Butterfly, Diversity, Lepidoptera, Plant species, Host plant

Butterflies are essential part of any natural ecosystem as their adults performs pollination. They are highly mobile organism and are able to maintain connectivity between the fragmental habitats. The larval stage is herbivorous and cause economic damage but adult is beneficial as pollinators of several trees and herbaceous flora. They are vulnerable to changes in flower supply resulting from deforestation and environmental pollution hence they are the biological indicators of pollution. They are adding brilliance to these surroundings, and also pollinating flowers and habitual the healthiness of our communities. Butterflies are one of the most admired insects, because they present brilliant patterns of coloration, metamorphic birth and sticking reproduction, nutritional behavior and death (Kumar 2011). Around, 17,200 species of butterfly found all over the world, of which 1,501 butterfly species are known from India (Kunte 2000). Many species of butterflies were become very rare and some are on urge of extinction due to habitat destruction, use of pesticides and weedicides (Sharma and Joshi 2009).

Butterfly population is mostly determined by the larval

host plants (Kitahara 2004, Barua 2007, Kitahara *et al.* 2008, Sengupta *et al.* 2014), nectar plants (Barua 2007, Sengupta and Ghorai 2013), plant species richness, herb and shrub density (Bhardwaj *et al.* 2012), tree species richness and density (Chettri 2010, Acharya and Vijayan 2015). Habitat specialist species confined to NFS were mostly from Papilionidae and Hesperidae families. Papilionids have been reported as very sensitive to loss of primary forest habitat and land use change (Barua *et al.* 2010).

MATERIALS AND METHODS

The Javadhu Hills (also Javadhu, Jawadhu Hills) are an extension of the Eastern Ghats spread across parts of Vellore and Tiruvannamalai districts in the northern part of the state of Tamil Nadu in southeastern India. The maximum altitude of the hills is 3647' feet above the mean Sea Level. The radius of the hills is 80 kilometers from the eastern side to the western side and 176 kilometers from the northern side to the southern side. The hills are surrounded by Polur on the east, Alangayam on the west, Chengam on the south and

*Corresponding author: C. Kanimozhi, Department of Zoology, Nehru Memorial College (Bharathidasan University), Puthanampatti - 621 007, Tamil Nadu

e-mail: cpkani510@gmail.com

Vellore on the north. In the Jawadhu hills, there are several canals and streams. The climatic and the soil conditions are favourable to raise various crops like vegetables and the forest-based products are raised in different parts of the hills.



The Little Millet (samai) is grown predominantly in this area under rainfed conditions, apart from finger millet (ragi), Horse gram (kollu), Niger (Payellu), Maize (makkacholam) and other crops. Under irrigated conditions paddy is grown as the main crop. The people living here are Malayali tribes to grow Proso millet (Pani Varagu) and Kodo millet (varagu) also before two decade which are not cultivated at present. In the Jawadhu Hills, sandal wood is grown in more areas of the forests. In addition, tamarind, bamboo, Jack

fruit and plants of herbal medicine are also raised in the forest.

The adults of the butterflies were collected with the help of insect collection net (circumference 93 cm, handle length 87cm and bag depth 77cm) sweeping method while exploring different localities of the Jawadhu Hills. The collected adult specimens were killed with the killing agent like ethyl acetate, charged in the killing bottle. After killing, the dead specimens were kept in the relaxing jar for making the specimens soft. They were pinned using different size entomological pins (38mm×40mm; 38mm×55mm), and then stretching of dead specimens were done in the spreading board boxes (40cm×30cm×10cm).The stretched specimens were tagged with the labels carrying information such as name of collector, locality, altitude, date of collection, and then placed in the well fumigated (with naphthalene balls) air tight wooden showcases placed in the movable racks for storage. For wings slide preparation, the method proposed by Common (1970) and advocated by Zimmerman (1978) has been followed. Specimens of butterflies were caught and photographed by using butterfly nets and camera. Preliminary survey was carried out during the day from 7am to 12pm for a period of 6 months extending from August 2019-January2020 with weekly intervals.

Observation

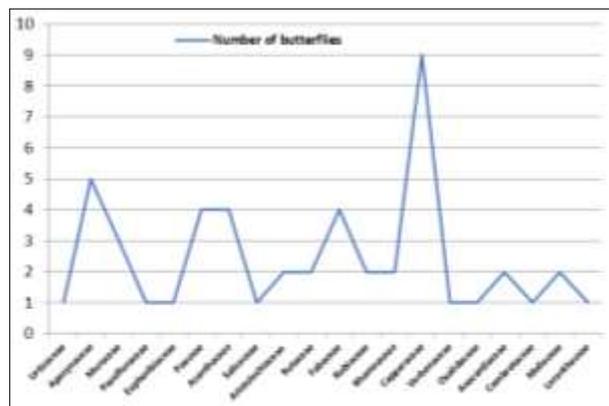
The overall insect abundance fluctuated much the peak abundance was shown in monsoon (i.e. October-December) there is a gradual decrease in the post monsoon. List of observed butterflies are given in (Table 1).

Table 1 Diversity and distribution of butterflies in Javadhu Hills, Tamil Nadu

Common Name	Name of Butterflies	Family	
Great Egg Fly	<i>Hypolimnas bolina</i> (Linnaeus 1758)	Nymphalidae	
Common Crow	<i>Euploea core</i> (Cramer 1780)		
Yellow Pansy	<i>Junonia hierta</i> (Fabricius 1798)		
Plain Tiger	<i>Danaus chrysippus</i> (Linnaeus 1758)		
Striped Tiger	<i>Danaus genutia</i> (Cramer 1779)		
Common Evening Brown	<i>Melanitis ieda</i> (Linnaeus 1758)		
Common Sailer	<i>Neptis hylas</i> (Linnaeus 1758)		
Common bush brown	<i>Mycalasis perseus</i>		
Lemon Pansy	<i>Junonia lemonias</i>		
Dark blue tiger	<i>Tirumala septentrionis</i>		
Common Leopard	<i>Phalanta phalantha</i> (Drury 1773)		
Chocolate Pansy	<i>Junonia iphita</i> (Cramer 1779)		
Blue Pansy	<i>Junonia orithya</i> (Linnaeus 1758)		
Tawny coster	<i>Acraea terpsicore</i>		
Blue tiger	<i>Tirumala limniace</i>		
Common Rose	<i>Pachliopta aristolochiae</i> (Fabricius 1775)		Papilionidae
Crimson Rose	<i>Pachliopta hector</i> (Linnaeus 1758)		
Common Mormon	<i>Papilio polytes</i> (Linnaeus 1758)		
Lime butterfly	<i>Papilio demoleus</i> (Linnaeus)		Hesperiidae
Common jay	<i>Graphium doson</i>		
Chestnut Bob	<i>Lambrixsalsala</i> (Moore 1866)		
Rice Swift	<i>Borbo cinnara</i> (Wallace 1866)		
Grass Dart	<i>Taractrocera maevius</i> (Fabricius, 1793)		
Common Silverline	<i>Spindasis vulcanus</i> (Fabricius 1775)		
Common Pierrot	<i>Castalius rosimon</i> (Fabricius 1775)		
Pale Grass Blue	<i>Pseudozizeeria maha</i> (Kollar 1844)		
Monkey Puzzle	<i>Rathinda amor</i> (Fabricius 1775)		

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Indian Cupid	<i>Everes lacturnus</i> (Godart 1824)	Pieridae
Silver line	<i>Spindasis schistacea</i> (Moore 1881)	
Small Orange Tip	<i>Colotis etrida</i> (Boisduval 1836)	
Small Grass Yellow	<i>Eurema blanda</i> (Boisduval 1836)	
Common Gull	<i>Cepora nerissa</i> (Fabricius 1775)	
Crimson Tip	<i>Colotis danae</i> (Fabricius 1775)	
White Orange Tip	<i>Ixias Marianne</i> (Cramer 1779)	
Mottled Emigrant	<i>Catopsilia pyranthe</i> (Linnaeus 1758)	
Psyche	<i>Leptosia nina</i> (Fabricius 1793)	
Indian Wanderer	<i>Pareronia hippia</i> (Fabricius 1787)	
Common jezebel	<i>Delias eucharis</i> (Drury 1773)	
Yellow orange tip	<i>Ixias pyrene</i> (Linnaeus 1764)	
Great orange tip	<i>Hebomoia glaucippe</i> (Linnaeus 1758)	



Graph 1 Plant families and insect abundance

Larval host plant database

During the present study a total of 40 species of butterflies were recorded in Javadhu Hills, the larval host plants of 149 were identified. Host plant list for butterfly is provided in (Table 2) and host plant families and number of butterflies were recorded in (Graph 1).

Most of butterfly species were monophagous 33 butterfly species feeds on one plant genus and 7 butterfly species feeds on more than one plant genus were polyphagous. The plants belonging to family capparaceae 9 were widely used by butterfly larvae. Over 4 species of butterfly were used Poaceae, Acanthaceae, Fabaceae and 3 species of butterfly used Moraceae and 2 species of butterfly used Aristolochiaceae, Rutaceae, Rubiaceae, Rhamnaceae, Anacardiaceae, Meliaceae.

Table 2 Butterfly species larval host plants and their specificity

Common name	Larval host plant	Families	Host plant specificity
Great Egg Fly	<i>Leportia interrupta</i>	Urticaceae	M
Common Crow	<i>Nerium oeleander,</i>	Apocynaceae	P
	<i>Hemidesmus indicus</i>	Apocynaceae	
	<i>Ficus benghalensis,</i>	Moraceae	
	<i>Ficus racemosa,</i>	Moraceae	
	<i>Ficus religiosa</i>	Moraceae	
Towny coster	<i>Adenia hondala,</i>	Passifloraceae	M
	<i>Passiflora foetida,</i>	Passifloraceae	
	<i>Turnera subulata,</i>	Passifloraceae	
	<i>Acraea terpsicore</i>	Passifloraceae	
Plain Tiger	<i>Asclepias curassavica,</i>	Apocynaceae	M
	<i>Tylophora dalzelli,</i>	Apocynaceae	
	<i>Ceropegia media,</i>	Apocynaceae	
	<i>Colotropis gigantea,</i>	Apocynaceae	
	<i>Pergularia daemia,</i>	Apocynaceae	
	<i>Caralluma umbellata</i>	Apocynaceae	
	<i>Holostemma annulare,</i>	Apocynaceae	
Striped Tiger	<i>Ceropegia media,</i>	Apocynaceae	M
	<i>Asclepias curassavica,</i>	Apocynaceae	
	<i>Oxystelma esculentum</i>	Apocynaceae	
	<i>Ceropegia attenuata</i>	Apocynaceae	
	<i>Sorghum halepensis,</i>	Poaceae	
Common Evening Brown	<i>Paspalidium cf. gerinatum,</i>	Poaceae	M
	<i>Brachiaria mutica</i>	Poaceae	
	<i>Axonopus compressus,</i>	Poaceae	
	<i>Eleusine indica</i>	Poaceae	
	<i>Bambusa arundinacea</i>	Poaceae	

Chestnut-Streaked Sailer	<i>Mallotus philipensis</i>	Euphorbiaceae	M
Lemon Pansy	<i>Barlaria cristata</i> ,	Acanthaceae	M
	<i>Barlaria prionitis</i> ,	Acanthaceae	
	<i>Hygrophila auriculata</i>	Acanthaceae	
	<i>Barlaria buxiflora</i>	Acanthaceae	
Dark blue tiger	<i>Cosmosigma racemosum</i> ,	Apocynaceae	M
	<i>Vallaris solanaceae</i> ,	Apocynaceae	
	<i>Wattakaka volubilis</i>	Apocynaceae	
Common Leopard	<i>Salix tetrasperma</i> ,	Salicaceae	M
	<i>Flacourtia mantana</i> ,	Salicaceae	
	<i>Flacourtia indica</i> ,	Salicaceae	
	<i>Populus derdoites</i>	Salicaceae	
Chocolate Pansy	<i>Barlaria cristata</i> ,	Acanthaceae	M
	<i>Hygrophila auriculata</i> ,	Acanthaceae	
	<i>Diperacanthus prostratus</i>	Acanthaceae	
Blue Pansy	<i>Justicia procumbens</i>	Acanthaceae	M
	<i>Barleria cristata</i> ,	Acanthaceae	
	<i>Barleria cuspidata</i>	Acanthaceae	
Yellow pansy	<i>Barlaria cristata</i> ,	Acanthaceae	M
	<i>Barlaria cuspidata</i>	Acanthaceae	
Blue tiger	<i>Asclepias curassavica</i> ,	Apocynaceae	M
	<i>Caltropis procera</i> ,	Apocynaceae	
	<i>Tylophora dalzelli</i> ,	Apocynaceae	
	<i>Cosmosigma racemosum</i> ,	Apocynaceae	
	<i>Vallaris solanaceae</i>	Apocynaceae	
Common Rose	<i>Arisalochia indica</i>	Aristolochiaceae	M
	<i>Thottea sivarajanii</i> ,	Aristolochiaceae	
	<i>Thottea tagala</i> ,	Aristolochiaceae	
	<i>Arisalochia braceolate</i>	Aristolochiaceae	
Crimson Rose	<i>Arisalochia braceolate</i> ,	Aristolochiaceae	M
	<i>Arisalochia indica</i> ,	Aristolochiaceae	
	<i>Thottea silliquosa</i>	Aristolochiaceae	
Common Mormon	<i>Citrus medica</i> ,	Rutaceae	M
	<i>Citrus latifolia</i>	Rutaceae	
	<i>Murraya koenigii</i> ,	Rutaceae	
	<i>Murraya paniculata</i>	Rutaceae	
Lime butterfly	<i>Psoralea corilyfolora</i> ,	Fabaceae	P
	<i>Ziziphus maritiana</i> ,	Rhamnaceae	
	<i>Chloroxylon swidenia</i> ,	Rutaceae	
	<i>Citrus medica</i> ,	Rutaceae	
	<i>Clausena dentata</i> ,	Rutaceae	
	<i>Limonioca acidissima</i> ,	Rutaceae	
	<i>Murraya koenigii</i>	Rutaceae	
Common jay	<i>Annona glabera</i>	Annonaceae	M
	<i>Milliusa tomentosa</i>		
	<i>Polyalthiya longifolia pendula</i>		
Chestnut Bob	<i>Setaria</i> ,	Poaceae	M
	<i>Barbata</i> ,	Poaceae	
	<i>Bambusa</i> ,	Poaceae	
	<i>Mimosa</i>	Poaceae	
Rice Swift	<i>Sorghum halepensis</i> ,	Poaceae	M
	<i>Arundodonax</i> ,	Poaceae	
	<i>Penisetum glaucum</i> ,	Poaceae	
	<i>Setaria verticillata</i> ,	Poaceae	
	<i>Brachiaria mutica</i> ,	Poaceae	
	<i>Sorghum vulgare</i> ,	Poaceae	
	<i>Axonopus compressus</i> ,	Poaceae	
	<i>Setaria glauca</i> ,	Poaceae	
	<i>Sorghum nitidum</i> ,	Poaceae	

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Common grass Dart	<i>Oryza sativa</i>	Poaceae		
	Grasses	Poaceae	M	
Common Silverline	<i>Oryza sativa</i>	Poaceae		
	<i>Pentas lanceolata</i> ,	Rubiaceae	P	
	<i>Ziziphus maritiana</i> ,	Rhamnaceae		
	<i>Cadaba fruticosa</i> ,	Capparaceae		
	<i>Ziziphus oenoplia</i> ,	Rhamnaceae		
	<i>Ziziphus jujuba</i> ,	Rhamnaceae		
	<i>Clerodentrum inerme</i> ,	Verbenaceae		
	<i>Cassia fistula</i> ,	Fabaceae		
Common Pierrot	<i>Carissa carandas</i>	Apocynaceae		
	<i>Ziziphus maritiana</i> ,	Rhamnaceae	M	
	<i>Ziziphus oenoplia</i> ,	Rhamnaceae		
	<i>Ziziphus jujuba</i> ,	Rhamnaceae		
Pale Grass Blue	<i>Ziziphus nummularia</i>	Rhamnaceae		
	<i>Oxalis corniculata</i>	Oxalidaceae	M	
Monkey Puzzle	<i>Mongifera indica</i>	Anacardiaceae	P	
	<i>Ixora brachiala</i> ,	Rubiaceae		
	<i>Ixora coccinea</i> ,	Rubiaceae		
	<i>Ixora malabarica</i>	Rubiaceae		
Large Oak Blue	<i>Terminalia elliptika</i>	Combretaceae	M	
	<i>Cadaba fruticosa</i>	Anacardiaceae	P	
Small Orange Tip	<i>Maerua obelangiifolia</i>	Capparaceae		
	<i>Mazoneuron cucullatum</i> ,	Fabaceae	P	
Three Spot Grass Yellow	<i>Caesalpinia bonduc</i> ,	Fabaceae		
	<i>Albizia chinensis</i> ,	Fabaceae		
	<i>Chamaecrista mimosoides</i> ,	Fabaceae		
	<i>Toona ciliata</i> ,	Meliaceae		
	<i>Delonix regia</i> ,	Fabaceae		
	<i>Calliandra emarginata</i> ,	Fabaceae		
	<i>Albizia lebbek</i> ,	Fabaceae		
	<i>Bauhinia purpurea</i> ,	Fabaceae		
	<i>Caesalpinia sappan</i>	Fabaceae		
	Common Gull	<i>Cadaba fruticosa</i> ,	Capparaceae	M
		<i>Capparis zeylanica</i>	Capparaceae	
<i>Capparis spinosa</i>		Capparaceae		
<i>Maerua oblangiofolia</i>		Capparaceae		
Crimson Tip	<i>Cadaba fruticosa</i> ,	Capparaceae	M	
	<i>Maerua oblangiofolia</i>	Capparaceae		
White Orange Tip	<i>Capparis divaricata</i> ,	Capparaceae	M	
	<i>Capparis decidua</i> ,			
	<i>Capparis sp</i> ,			
	<i>Maerua oblangiofolia</i>			
Mottled Emigrant	<i>Senna alata</i> ,	Fabaceae	M	
	<i>Sesbania bispinosa</i> ,	Fabaceae		
	<i>Senna tora</i> ,	Fabaceae		
	<i>Senna occidentails</i> ,	Fabaceae		
	<i>Cassia fistula</i>	Fabaceae		
Psyche	<i>Capparis zeylanica</i> ,	Capparaceae	M	
	<i>Creatava magna</i> ,	Capparaceae		
	<i>Capparis spinosa</i>	Capparaceae		
Indian Wanderer	<i>Capparis zeylanica</i>	Capparaceae	M	
	<i>Azardichta indica</i> ,	Meliaceae	P	
Common jezebel	<i>Dendrophthoe falcata</i>	Loranthaceae		
	<i>Capparis divaricata</i>	Capparaceae	M	
Yellow orange tip	<i>Capparis separia</i>	Capparaceae		
	<i>Capparis divaricata</i> ,	Capparaceae	M	
Great orange tip	<i>Capparis separia</i>	Capparaceae		
	<i>Capparis separia</i>	Capparaceae	M	



Common Gull
Cepora nerissa



Danaid Eggfly
Hypolimnas misippus



Yellow Pansy
Junonia hierta



Blue Tiger
Tirumala limniace



Plain tiger
Danaus chrysippus



Small Grass Yellow
Eurema blanda



Crimson Tip
Colotis danae



Chocolate Pansy
Junonia iphita



Lime Butterfly
Papilio demoleus



Tawny Coster
Acraea terpsicore



Common Mormon
Papilio polytes



Mottled Emigrant
Catopsilia pyranthe



Common Evening Brown
Melanitis idea



Great Orange Tip
Hebomoia glaucippe



Crimson Rose
Pachliopta hecetar



Common Crow
Euploea core



Lemon Pansy
Junonia lemonias



Indian Cupid
Everes lacturnus



Common Sailor
Neptis hylas



Blue Pansy
Junonia orithya



Common Rose
Pachliopta aristolochiae



Common Leopard
Phalanta phalantha



Common Jezebel
Delias eucharis

Plate 1 Shows the butterfly diversity in Jawadhu Hills, Tiruvannamalai district

During the survey a total of 40 species belonging to 5 families have been identified from Jawadhu Hills, Thiruvannamalai District, and Tamil Nadu. Among the 5 families Nymphalidae were found to be dominant with 15 species (37.50%), followed by Pieridae with 11 species (27.50%), followed by Lycaenidae with 6 species (15%), followed by Papilionidae with 5 species (12.50%), followed by Hesperidae with 3 species (7.50%) the availability of butterflies is associated with larval host plants and availability of adult nectar plants. The study area is dominated by plant species belonging to the families Salicaceae, Euphorbiaceae, Pasifloraceae, oxalidaceae, Moraceae, Acanthaceae, Meliaceae etc. *Ficus benghalensis*,

Ficus racemosa, *Ficus religiosa*, *L. interrupta*, *Adenia hondala*, *passiflora foetida*, *Turnera subulata*, *Acraea terpsicore*, *Mallotus philipensis*, *Barlariacristata*, *Barlaria prionitis*, *Hygrophila auriculata*, *Barlaria buxiflora* and grasses which provide diverse habitat, food and breeding sites for butterflies. Likewise, Kanimozhi *et al.* (2019) reported 50 species belonging to 35 genera of 5 families of butterflies were recorded from Nehru Memorial College Campus from Oct-2016 to Dec-2017. The college premises include flower gardens, grassy land and also lot of trees. The recorded butterflies belonging to Nymphalidae (19 species) followed by Pieridae (15 species), Papilionidae (07 species), Lycaenidae (06 species) and Hesperidae (03 species).

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