

Article

## Butterflies of Gosekhurd region of Godavari basin across Waingangā River, Central India

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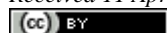
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### Abstract

Waingangā river valley hosts major part of lush green landscape; which is ecologically one of the most significant regions of peninsular India. Gosekhurd reservoir is one of the largest irrigation projects of central India, geographically located 20.8738154°N 79.6081781°E on Waingangā River. This region consists of rich and diverse ecosystems of flora and fauna. The investigations on butterfly diversity in relation to their ecological status have been carried out for a period of three year from April 2014 to March 2017. A total of 122 species of butterflies are recorded belonging to 5 families and 76 genera. Out of total 122 butterfly species 45.90% (56), 40.98% (50) and 13.11% (16) are common, occasional and rare respectively. Maximum number, i.e., 40 species from 23 genera, are reported in family Nymphalidae. Family Lycaenidae represents 38 species from 24 genera. Family Pieridae consisting of 20 species belonging to 12 genera. Family Hesperidae reporting 17 species from 14 genera and minimum 7 species represent 3 genera from family Papilionidae. 20 rare butterfly species specifically reported during this study.

**Keywords** butterfly; Lepidoptera; biodiversity; Gosekhurd Dam; Indira Sagar; Waingangā River.

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### 1 Introduction

Butterflies are one of the rapid indicators of habit quality and are sensitive to climatic change (Ramana, 2010). Thomas et al. (2004) compared species losses of British butterflies, birds, and plants and found that loss of butterfly species has been greater than that of birds and plants; current rates of species disappearance represent the sixth major extinction event through time. Amongst 19,238 species of the world (Heppner, 1998), about 1,504 species of butterflies are documented in Indian Subcontinent (Smetacek, 1992; Gaonkar, 1996). In central India, about 177 species of butterflies were reported in the Central Provinces (Vidarbha, Madhya Pradesh and Chattisgarh) by D'Abreau (1931). Tiple (2011) compiled 167 species of butterflies belonging to 90 genera representing 5 families in Vidarbha.

Waingangā River valley of Eastern Vidarbha occupies more than 50% of forest of Maharashtra. The average annual rainfall in this region of East Vidarbha ranges from 900 mm to 1200 mm received during the South-West monsoon from June to October. The temperature ranges from minimum 7°C and maximum 13°C in the winter. While in summer the maximum temperature ranges from 39°C to 47°. May is the peak of summer while December- January is the peak of winter.

Gosekhurd Reservoir (Indira Sagar) is one of the largest irrigation project of central India (JI00481) located 20.8738154°N 79.6081781°E near Pauni of Bhandara district, Maharashtra on Waingangā river. This reservoir regulates irrigation water throughout the year to some parts of Chandrapur, Bhandara and Nagpur districts of Eastern Maharashtra; the reservoir occupies the total surface area of 222 km<sup>2</sup> (86 sq. mi.) and the catchment area of 34,862 km<sup>2</sup> (13,460 sq. mi.).

The Gosekhurd reservoir region of Waingangā basins consists of rich and diverse floral ecosystems viz., aquatic submerged and floating vegetation; grasslands; herbs and bush lands; trees and forests and agroecosystems of mainly paddy fields etc. This provides good environment, shelter, feeding and nesting grounds for a broad range of faunal species. The area includes very rich diversity of aquatic and terrestrial arthropods, amphibians, reptiles, aves, mammalian wildlife, etc.

Waingangā Valley (Fig. 1) is of critical importance for Maharashtra to preserve its forests, wildlife, and tribal population dependent on it. It is the good habitat for diverse range of fauna species. Present investigation carried out to prepare an inclusive checklist and ecological status of butterfly species of this region.

The Waingangā River originates at the foothills of Satpuda Mountains in Mundhara village of Seoni District of Madhya Pradesh and traverses a length of 635.40km till its confluence with Wardha River at Shivni Village in Chandrapur District of Maharashtra; to form River Pranahita which is one of the biggest tributaries of Godavari. The total catchment area of Waingangā river up to its confluence with river Wardha is 51000 Sq. Km. The basin spreads across over five districts of Maharashtra and three districts of Madhya Pradesh. The five districts of Maharashtra state which form southern two third portion of the Waingangā Valley viz., Nagpur, Bhandara, Gondia, parts of Chandrapur and Gadchiroli are the largest forested areas of the state accounting for more than half (55.5%) of the total state forest area. Four out of total six tiger reserves of Maharashtra lie in these five districts. 30% of the total tribal population of the state stays in these five districts.

After originating Waingangā flows in a wide half circle, meandering among the spurs of the hills from the west to the east of the Seoni District it turns to the South. After flowing for a total length of 274 km in Seoni and Balaghat districts of Madhya Pradesh, it forms the boundary between Madhya Pradesh and Maharashtra for about 32 km. It then continues to flow towards south in Maharashtra for another 303 km till it is joined by the Wardha.

## 2 Material and Methods

The investigations have been carried out for a period of three year from April 2014 to March 2017. The observations were made with the aid of binocular, digital cameras and handycam. Butterfly watching and recording has been done during Sunday and holidays. A fixed-route walk (transect) which is established at a site on which butterflies are recorded along the route on a regular basis under reasonable weather conditions. Observations were made through walking transects (Pollard, 1993; Caldas and Robbins, 2003) of 0.5 km to 0.7 km length with 2 m to 5 m on either side. The present study is based on 6 line transects to study the butterfly population. The sites were visited in morning and evening hours to record maximum possible species of butterflies and monitor their activities. The recorded species are identified with the help of photographs and by using reference books, guides catalogs and publications etc. (Antram, 1924; Kunte, 2000; Kehimkar, 2008;

Varshney and Smetacek, 2015). Six line transects are namely Gosekhurd dam area, Adyal region, Kharada, Ambhora, Korambhi and Kardha.

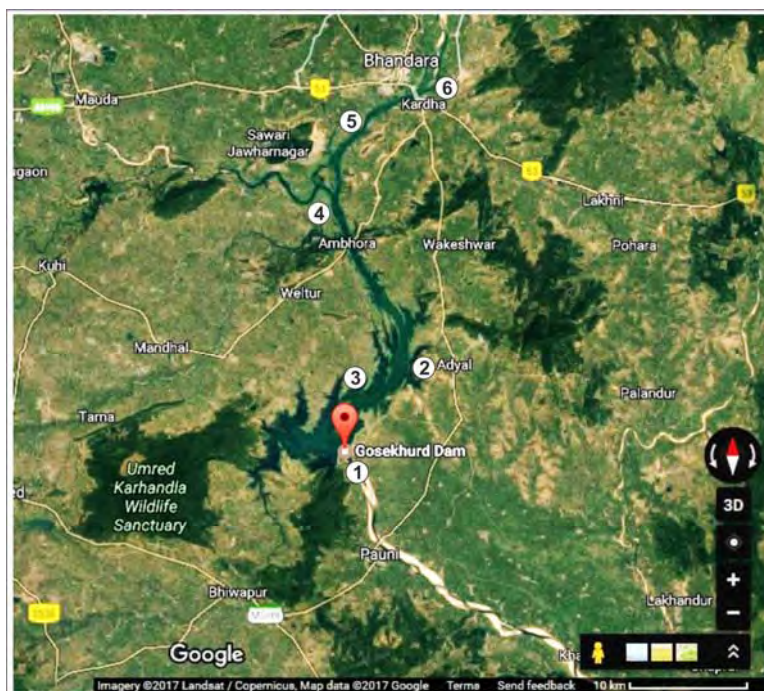


Fig. 1 Waingangā Valley.

### 3 Results

A total of 122 species of butterflies are documented from Gosekhurd Reservoir region belonging to 5 families (viz., Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae) and 76 genera. It is observed that amongst 122 recorded butterflies 45.90 % are common, 40.98% are occasional and 13.11% are rare species (Fig. 2 and 3). 23 genera and 40 species are reported belongs to family Nymphalidae. 24 genera and 38 species are reported from family Lycaenidae. Family Pieridae is represented by 12 genera and 20 species; while family Hesperidae is consisting of 14 genera and 17 species. Family Papilionidae represented a minimum of 3 genera and 7 species (Tables 1-3).

Species richness is reported in the months of rainy and winter season from July to January and its number decline from late March to last week of June of summer season. The butterfly species are adapted for specific floral ecosystems like tree-woods, bushes, herbs, grasses, wetlands, etc.

Butterfly species viz., *Colias eurytheme* (Orange Sulphur butterfly), *Gandaca harina* (Tree Yellow), *Leptosia nina* (Psyche), *Pareronia hippia* (Indian Wanderer) belongs to family Pieridae; *Heteropsis malasara* (White line bush brown) from family Nymphalidae; *Ambliopochia anita dina* (Indian purple leafblue), *Arhopala amantes* (Large oakblue), *Azanus ubaldus* (Velvet-spotted Blue), *Catochrysops panormus* (Silver Forget me not), *Curetisthetis* (Indian Sunbeam), *Freyeria putli* (Oriental Grass Jewel), *Hypolycaena erylus* (Common Tit), *Jamides caeruleus* (Royal Cerulean), *Tarucus balkanicus* (Little Tiger Pierrot), *Tarucus callinara* (Spotted Pierrot), *Tarucus venosus* (Veined Pierrot), *Rapala nissa* (Common Flash), *Surendra quercetorum* (Common acacia blue) from family Lycaenidae and *Parnara guttatus* (Straight Swift), *Pelopidas sinensis* (Chinese Branded Swift) belonging to family Hesperidae are specifically reported in the study area.

#### 4 Discussion

Butterflies, the magnificent insects with attractive color patterns have great aesthetic value (Patil and Shende, 2014; Khan et al., 2016; Patil et al., 2017). They are natural pollinators and have close relationship with flowering plants. They value as ecological indicators, as being more sensitive to ecology and environment. They show changes in different climatic conditions as dark to pale or other varied color, markings or patterns. Butterflies play a significant role in the food chain, being mainly herbivores on one hand and prey to their predators like amphibians, reptiles, birds and mammals, on the other (Gupta and Mondal, 2005; Bonebrake et al., 2010).

In the present investigation, a total of 122 species of butterflies are documented which belongs to 5 families; Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae and 76 genera. Earlier D'Abreu (1931) documented 91 butterfly species in Nagpur city; Pandharipande (1990-1991) recorded 61 species of butterflies in Nagpur city of central India. Tiple and Khurad (2009) recorded total 145 species of butterflies in and around Nagpur City. The highest number of butterflies was recorded belonging to the Nymphalidae (51 species) followed by Lycaenidae (46 species), Hesperidae (22 species), Pieridae (17 species) and Papilionidae 9 species). The above studies agreed the present investigation regarding occurrence of species richness in a family and reporting season of butterflies.

The study revealed that Nymphalidae was most dominant family with a highest number of species and most butterfly species were observed from the monsoon to early winter but thereafter declined in early summer (Kunte, 1997). From the Seshachalam Biosphere Reserve of Eastern Ghats Andhra Pradesh of peninsular India, Guptha et al. (2012) recorded a total of 50 species of butterflies belonging to 5 families. The family Nymphalidae (20 species) was found dominant followed by Lycaenidae (12 species), Pieridae (11 species), Papilionidae (5 species) and Hesperidae (2 species).

In eastern part of Western Ghats, Murugesan and Muthusamy (2013) surveyed 103 individual butterfly species belonging to 5 families namely Nymphalidae (32), Pieridae (23), Lycaenidae (19), Hesperidae (15) and Papilionidae (14), which revealed that Nymphalidae and Pieridae are the rich dominant families, while Hesperidae and Papilionidae are less dominant; similar to the present observations. High incidences of butterfly population with wide distribution were observed during the months of March-April and the monsoon seasons (September - November) which diminish during December-January. All the observations are similar with the present observations, except species richness season in eastern part of Western Ghats, may be due to geographic and climatic variations.

Patil and Shende (2014) recorded totally 84 species of butterflies belonging to 53 genera and 5 families from Gorewada International Bio Park, Nagpur of central India. A maximum number of species were recorded, belong to family- Nymphalidae (33) followed by Lycaenidae (22), Pieridae (12), Hesperidae (10) and minimum number of species were noted in family- Papilionidae (7). These 5 families were contributed 53 genera. The largest number of genera were reported in family- Nymphalidae (19) followed by Lycaenidae (16), Hesperidae (8), Pieridae (7), and minimum number of genera (7) were reported in family- Papilionidae. They observed the Species richness in rainy and winter months while the number decline in the summer. Ankalgi and Jadesh (2014) examine a total of 31 butterfly species belonging to 5 families of order Lepidoptera were recorded during 2012-2013. The family Nymphalidae represented by 11 species was the most dominant followed by 10 species of Pieridae, 5 species of Lycaenidae, 4 species of Papilionidae and 1 species Hesperidae. During the study period the Shannon wiener diversity of family Nymphalidae (2.2078) was more followed by Pieridae (1.9598), Lycaenidae (1.4842) and Papilionidae (0.9980).

The butterfly diversity of Rawanwadi dam and reservoir which is situated in the vicinity of Waingangā valley has been investigated (Patil et al., 2017). They recorded 84 species from 5 families and 54 genera. The family Nymphalidae consist maximum number of 32 species from 19 genera followed by family Lycaenidae with 19 genera and 26 species. Family Pieridae consist of 13 species of 7 genera and Hesperidae consist 7 species of 6 genera. Minimum number of 6 species of 3 genera were recorded belongs to family Papilionidae. The abundance of butterflies was observed where the vegetation was dense with majority of host and larval plants. Most species from Lycaenidae were found near water body. An inventory of butterfly species in relation to food sources and climatic factors influencing their diversity and richness was studied by Husan et al. (2018) from March 2015 to February 2017 in Satchari National Park. They recorded 195 butterfly species representing 125 genera under 21 subfamilies and 6 families. Nymphalidae was the more dominant family contributed 32.8% of the total species followed by Lycaenidae (25.7%), Hesperidae (24.6%), Pieridae (8.2%), Papilionidae (7.7%) and Riodinidae (1.0%).

Report of species particularly *Colias eurytheme* (Orange Sulphur butterfly), *Gandaca harina* (Tree Yellow), *Leptosia nina* (Psyche), *Pareronia hippia* (Indian Wanderer) belongs to family Pieridae; *Heteropsis malasara* (White line bushbrown) from family Nymphalidae; *Ambliopochia anita dina* (Indian purple leafblue), *Arhopala amantes* (Large oakblue), *Azanus ubaldus* (Velvet-spotted Blue), *Catochrysops panormus* (Silver Forget me not), *Curetis thetis* (Indian Sunbeam), *Freyeria putli* (Oriental Grass Jewel), *Hypolycaena erylus* (Common Tit), *Jamides caeruleus* (Royal Cerulean), *Tarucus balkanicus* (Little Tiger Pierrot), *Tarucus callinara* (Spotted Pierrot), *Tarucus venosus* (Veined Pierrot), *Rapala nissa* (Common Flash), *Surendra quercetorum* (Common acacia blue) from family Lycaenidae and *Parnara guttatus* (Straight Swift), *Pelopidas sinensis* (Chinese Branded Swift) belonging to family Hesperidae during the study indicates the healthy and vary ecological habitats that attracts the diverse range of butterflies and other insects in this region.

**Table 1** Butterflies of Gosekhurd Reservoir (Indira Sagar) region of Waingangā River Basin.

S. N.	Family	Generic Name	Common Name	Status
1.	Papilionidae (3 genera; 7 species)	<i>Graphium Agamemnon</i> (Linnaeus)	Tailed jay	C
		<i>Graphium doson</i> (Felder)	Common jay	C
		<i>Pachliopta aristolochiae</i> (Fabricius)	Common rose	C
		<i>Pachliopta hector</i> (Linnaeus)	Crimson rose	O
		<i>Papilio demoleus</i> (Linnaeus)	Lime butterfly	C
		<i>Papilio polymnestor</i> (Cramer)	Blue mormon	O
		<i>Papilio polytes</i> (Linnaeus)	Common mormon	O
2.	Pieridae (12 genera; 20 species)	<i>Appias albino</i> (Boisduval)	Common albatross	O
		<i>Appias libythea</i> (Fabricius)	Eastern stripped albatross	O
		<i>Belenois aurota</i> (Fabricius)	Indian Pioneer	C
		<i>Colias eurytheme</i> (Boisduval)	Orange Sulphur butterfly	R
		<i>Colotis danae</i> (Fabricius)	Indian Crimson-tip	C
		<i>Colotis etrida</i> (Boisduval)	Small Orange tip	C
		<i>Catopsilia Pomona</i> (Fabricius)	Common emigrant	C
		<i>Catopsilia pyranthe</i> (Linnaeus)	Mottled emigrant	C
		<i>Cepora nerissa</i> (Fabricius)	Common gull	C
		<i>Delias eucharis</i> (Linnaeus)	Common jazelbel	R
		<i>Eurema andersonii</i> (Moore)	One spot grass yellow	C
		<i>Eurema blanda</i> (Boisduval)	Three spot grass yellow	O
		<i>Eurema brigitta</i> (Cramer)	Small grass yellow	C
		<i>Eurema hecabe</i> (Linnaeus)	Common grass yellow	C
		<i>Eurema laeta</i> (Boisduval)	Spotless Grass Yellow	O
<i>Gandaca harina</i> (Horsfield)	Tree Yellow	O		



		<i>Leptosia nina</i> (Fabricius)	Psyche	O
		<i>Pareronia hippia</i> (Fabricius)	Indian Wanderer	O
		<i>Pareronia valeria</i> (Cramer)	Common wanderer	C
		<i>Prioneris sita</i> (C. & R. Felder)	Painted Sawtooth	O
3.	Nymphalidae (23 genera; 40 species)	<i>Acraea violae</i> (Fabricius)	Tawny coster	C
		<i>Ariadne ariadne</i> (Linnaeus)	Angled castor	C
		<i>Ariadne merione</i> (Cramer)	Common castor	C
		<i>Athyma perius</i> (Linnaeus)	Common sergeant	O
		<i>Byblia ilithyia</i> (Drury)	Joker	R
		<i>Charaxes solon</i> (Fabricius)	Black Rajah	O
		<i>Danaus chrysippus</i> (Linnaeus)	Plain tiger	C
		<i>Danaus genutia</i> (Cramer)	Striped tiger	C
		<i>Elymnias hypermnestra</i> (Linnaeus)	Common palmfly	R
		<i>Euploea core</i> (Cramer)	Common indian crow	C
		<i>Euthalia aconthea</i> (Cramer)	Common baron	O
		<i>Euthalia nias</i> (Forster)	Baronet	C
		<i>Heteropsis malasara</i> (Moore)	White line bushbrown	O
		<i>Hypolimnas bolina</i> (Linnaeus)	Great eggfly	C
		<i>Hypolimnas misippus</i> (Linnaeus)	Danaideggfly	O
		<i>Junonia almanac</i> (Linnaeus)	Peacock pansy	C
		<i>Junonia atlites</i> (Linnaeus)	Grey pansy	C
		<i>Junonia hierta</i> (Fabricius)	Oriental Yellow Pansy	C
		<i>Junonia iphita</i> (Cramer)	Chocolate pansy	C
		<i>Junonia lemonias</i> (Linnaeus)	Lemon pansy	C
		<i>Junonia orithya</i> (Linnaeus)	Blue pansy	C
		<i>Lethe europa</i> (Fabricius)	Bamboo tree brown	R
		<i>Melanitis leda</i> (Linnaeus)	Common Evening brown	C
		<i>Melanitis phedima</i> (Cramer)	Dark Evening brown	O
		<i>Melanitis zitenius</i> (Herbst)	Great Evening Brown	C
		<i>Moduza procris</i> (Cramer)	Commander	C
		<i>Mycalesis mineus</i> (Linnaeus)	Dark branded bushbrown	O
		<i>Mycalesis perseus</i> (Fabricius)	Common bushbrown	C
		<i>Mycalesis visala</i> (Moore)	Long brand bushbrown	O
		<i>Neptis hylas</i> (Linnaeus)	Common sailer	C
		<i>Parantica aglea</i> (Stoll)	Glassy tiger	O
		<i>Phaedyma columella</i> (Cramer)	Short-banded Sailor	O
		<i>Phalanta phalantha</i> (Drury)	Common leopard	R
		<i>Symphhaedra nais</i> (Forster)	Baronet	C
		<i>Tirumala limniace</i> (Cramer)	Blue tiger	C
		<i>Tirumala septentrionis</i> (Butler)	Dark blue tiger	O
		<i>Ypthima asterope</i> (Klug)	Common three ring	R
		<i>Ypthima baldus</i> (Fabricius)	Common five ring	R
		<i>Ypthima heubneri</i> (Kirby)	Common four ring	R
		<i>Ypthima inica</i> (Hewitson)	Lesser three ring	O
4.	Lycaenidae (24 genera; 38 species)	<i>Acytolepis puspa</i> (Horsfield)	Common hedge blue	C
		<i>Amblypodia anita dina</i> (Fruhstorfer)	Indian purple leafblue	R
		<i>Arhopala amantes</i> (Hewitson)	Large oakblue	O
		<i>Azanus ubaldus</i> (Stoll)	Velvet-spotted Blue	O
		<i>Castalius rosimon</i> (Fabricius)	Common pierrot	C
		<i>Catochrysops panormus</i> (C. & R. Felder)	Silver Forget me not	O
		<i>Catochrysops Strabo</i> (Fabricius)	Oriental Forget me not	C
		<i>Celastrina lavendularis</i> (Moore)	Plain hedge blue	C
		<i>Chilades laius</i> (Stoll)	Lime blue	O
		<i>Chilades pandava</i> (Horsfield)	Plains cupid	C
		<i>Chilades parrhasius</i> (Fabricius)	Small cupid	O
		<i>Chilades putli putli</i> (Kollar)	Eastern Grass Jewel	C

	<i>Chilades trochylus</i> (Freyer)	Grass jewel	C	
	<i>Curetis thetis</i> (Drury)	Indian Sunbeam	R	
	<i>Euchrysops cnejus</i> (Fabricius)	Gram blue	O	
	<i>Freyeria putli</i> (Kollar)	Oriental Grass Jewel	O	
	<i>Freyeria trochylus</i> (Freyer)	Grass Jewel	O	
	<i>Hypolycaena erylus</i> (Godart)	Common Tit	R	
	<i>Jamides bochus</i> (Stoll)	Dark cerulean	R	
	<i>Jamides caeruleus</i> (Druce)	Royal Cerulean	O	
	<i>Jamides celeno</i> (Cramer)	Common cerulean	C	
	<i>Lampides boeticus</i> (Linnaeus)	Pea blue	O	
	<i>Leptotes plinius</i> (Fabricius)	Zebra blue	C	
	<i>Prosotas dubiosa indica</i> (Evans)	Tailless Line Blue	O	
	<i>Prosotas nora</i> (Felder)	Common line blue	C	
	<i>Pseudozizeeria maha</i> (Kollar)	Pale grass blue	R	
	<i>Rapala nissa</i> (Kollar)	Common Flash	R	
	<i>Spialia galba</i> (Fabricius)	Indian Grizzled Skipper	O	
	<i>Spindasis vulcanus</i> (Fabricius)	Common Silverline	O	
	<i>Surendra quercetorum</i> (Hewitson)	Common acacia blue	O	
	<i>Tarucus balkanicus</i> (Freyer)	Little Tiger Pierrot	O	
	<i>Tarucus callinara</i> (Butler)	Spotted Pierrot	O	
	<i>Tarucus nara</i> (Kollar)	Rounded pierrot	C	
	<i>Tarucus venosus</i> (Moore)	Veined Pierrot	O	
	<i>Virachola Isocrates</i> (Fabricius)	Common guava blue	R	
	<i>Zizeeria karsandra</i> (Moore)	Dark grass blue	C	
	<i>Zizina otis</i> (Fabricius)	Lesser grass blue	C	
	<i>Zizula hylax</i> (Fabricius)	Tiny grass blue	C	
5.	Hesperiidae (14 genera; 17 species)	<i>Baoris farri</i> (Moore)	Paint brush swift	O
		<i>Barbo cinnara</i> (Wallace)	Rice swift	C
		<i>Caltoris canaraica</i> (Moore)	Kanara Swift	O
		<i>Caltoris kumara</i> (Moore)	Blank Swift	C
		<i>Lambrix salsala</i> (Moore)	Chestnut bob	O
		<i>Matapa aria</i> (Moore)	Common red eye	O
		<i>Oriens goloides</i> (Moore)	Common dartlet	O
		<i>Parnara guttatus</i> (Bremer & Grey)	Straight Swift	O
		<i>Pelopidas mathias</i> (Fabricius)	Small Branded swift	C
		<i>Pelopidas sinensis</i> (Mabille)	Chinese Branded Swift	O
		<i>Pelopidas subochracea</i> (Moore)	Large Branded swift	C
		<i>Polytremis lubricans</i> (Herrich-Schäffer)	Contiguous Swift	C
		<i>Potanthus pseudomaesa</i> (Moore)	Common Dart	C
		<i>Saustus gremius</i> (Fabricius)	Indian palm bob	O
		<i>Telicota ancilla</i> (Herrich-Schäffer)	Dark palm dart	C
		<i>Telicota colon</i> (Fabricius)	Pale palm dart	O
		<i>Udaspes folus</i> (Cramer)	Grass demon	O
<b>Families: 5</b>		<b>No. of genera: 76</b>	<b>No of species: 122</b>	

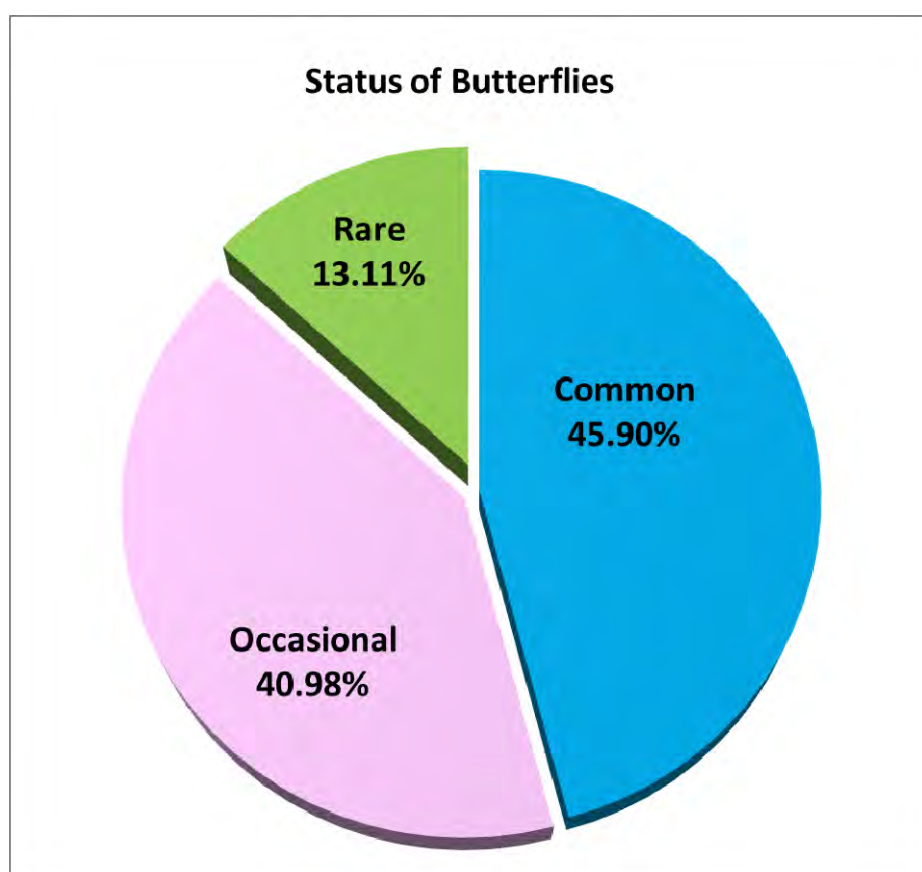
Abbreviations: C- Common; O- Occasional; R- Rare

**Table 2** Status of butterflies of Gosekhurd Reservoir (Indira Sagar) region of Waingangā River Basin.

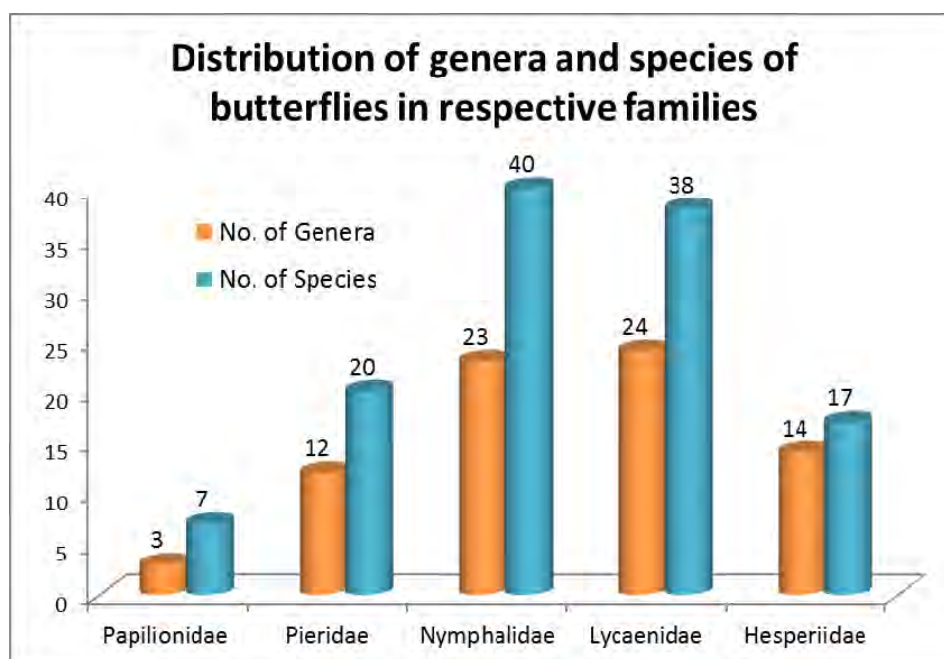
S.N.	Status	No. of species	% of species
1.	Common	56	45.90
2.	Occasional	50	40.98
3.	Rare	16	13.11
		<b>122</b>	<b>100.00</b>

**Table 3** Distribution of genera and species of butterflies in respective families.

S.N.	Family	No. of Genera	No. of Species
1.	Papilionidae	03	07
2.	Pieridae	12	20
3.	Nymphalidae	23	40
4.	Lycaenidae	24	38
5.	Hesperiidae	14	17
	<b>05</b>	<b>76</b>	<b>122</b>

**Fig. 2** Status of butterflies.





**Fig. 3** Distribution of genera and species of butterflies in respective families.

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