Species

Butterfly diversity along a short trekking route inside Buxa Tiger Reserve (National Park), West Bengal, India

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ABSTRACT

The present study was undertaken to enlist the butterfly diversity along a forest trekking route inside Buxa Tiger Reserve (National Park), West Bengal, India. The study was conducted on 28 May 2018 covering a span of four hours. All the butterflies observed during the present study were identified following suitable literature. A total of 90 different individuals belonging to 25 genera and six families were recorded during the present study. Plain Tiger (*Danaus chrysippus*) was noted as the most abundant species with 12 individuals. The least abundant species, recorded only once during the present study were Angled sunbeam (*Curetis acuta*), Tawny Rajah (*Charaxes bernardus*), Common Map (*Cyrestis thyodamas*), Banded Tree brown (*Lethe confuse*), Common Earl (*Tanaecia julii*), Grey Count (*Tanaecia lepidea*) and Common Bluebottle (*Graphium sarpedon*). The most abundant butterfly family recorded during the present study was Nymphalidae, represented by 15 different genera (60%) while the least abundant butterfly families were Hesperiidae, Lycaenidae, and Riodinidae (represented by 1 genus each). Butterfly diversity from the present study location is rich and it was also reflected in the study of diversity indices where the Shannon Weiner Diversity score was recorded as 2.95 while Margalef's Richness Index score was recorded as 5.33. However, the present study location is not devoid of anthropogenic intervention and needs attention from the concerned authorities.

Keywords: Butterfly diversity, Buxa Tiger Reserve (National Park), diversity indices, forest trekking route, rapid survey

1. INTRODUCTION

A marked decline in global biodiversity has been recorded because of both direct and indirect human activities (Primack, 2014). Tropical forests that support almost two-thirds of the world's flora and fauna are no exception in this regard (Mulatu et al., 2017). Hughes et al., (1997) have reported that in tropical forests on average 1800 populations are destroyed per hour while 16 million annually! Therefore, monitoring biodiversity for preparing the framework of policymaking leading to biodiversity conservation has attained its highest priority in the last decades. However, a holistic inventory of biodiversity requires nearly impossible

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levels of time and effort (Lawton et al., 1998). Insects, representing the majority of animal species (ranging anywhere from 5-30 million) are a perfect example of these challenges (Godfray et al., 1999). Consequently, insects remain mostly undiscovered and are frequently omitted from conservation assessments (Leather et al., 2008). Butterflies represent an opportunity in this respect, in that many species can typically be sampled and identified in a short time and provide an indication of habitat or conservation value as well (Brown, 1997). India is rich in butterfly diversity and hosts over 1,300 species (Varshney and Smetacek, 2015).

Buxa Tiger Reserve (BTR) is in the Jalpaiguri District of West Bengal. It was established as the 15th Tiger Reserve in the country in 1983. The area of the BTR encompasses 760.87 Km^2 having a sanctuary of 269 Km^2 and a National Park of 117.01 Km^2 of pristine forests and is situated in the transition zone between Biome–8 and Biome–12. The altitude of this reserve mounts up to 1800 m and it is crisscrossed by numerous rivers and rivulets. The reserve falls under the Moist Tropical Forest category which has been subdivided into eight sub-types by Champion and Seth, (1968). This forest chiefly comprises trees like Sal (*Shorea robusta*), Gamar (*Gmelina arborea*), Simul (*Bombax ceiba*) and Chikrasi (*Chukrasia tabularis*) while most notable animals include Asian Elephant (*Elephas maximus*), Tiger (*Panthera tigris*), Gaur (*Bos gaurus*), Wild boar (*Sus scrofa*) and Sambar (*Rusa unicolor*).

Apart from big charismatic species this reserve also harbours numerous other animals which include birds and insects. Among insects, butterflies are the most notable ones due to their size, shape and colouration. Studies on butterfly diversity are well on record from different parts of the Indian subcontinent (Mason and Niceville, 1886; Doherty, 1889; Evans, 1932; Talbot, 1939, 1947; Wynter-Blyth, 1957; Varshney and Chanda, 1971; Haribal, 1992; Kunte, 2000; Tiple and Khurad, 2009; Sujitha et al., 2019). BTR has been proposed to harbour more than 550 species of butterflies (Sanctuary Asia, 2015). The present study was carried out along a stretch of a 5 Km trekking route located inside BTR to enlist the available butterfly species.

2. STUDY AREA AND METHODOLOGY

Study Area

The present study was conducted along a forest trekking route to ''Buxa fort'' inside Buxa Tiger Reserve (26°39′N, 89°34′48″ E) located in the Jalpaiguri District of West Bengal on 28 May 2018 (Figure 1). The 'Buxa fort' serves as an important tourist destination and is situated at an Elevation of 2,844 ft. (867 m) from the sea level. The present study was conducted while trekking from Santlabari up to 'Buxa fort' (5 Km) and back. The terrain was mostly rocky with shrubs and scattered vegetation covering the sidewalks. The trekking path itself is picturesque and can lead one's mind to serenity (Figure 2). 'Buxa fort' has a rich historical standing as there has been a struggle for possession this area between the Kings of Bhutan and The Britishers during the Bhutan war. Later in correspondence to the treaty of Sinchula, the fort was handed over to the British who turned the preceding wooden framework into a stone-built structure. The 'Buxa fort' earlier was also known for its remote location and this served as the jail for the then freedom struggle brave hearts of India (Figure 3).

Butterfly survey

The trekking started at 10:00 hrs and ended at 14:30 hrs with a break of 30 minutes at 'Buxa fort'. Butterflies found during this four-hour span along the trekking path were recorded and were identified directly in the field or in difficult cases by photography and identification following Haribal, (1992) and Kehimkar, (2008). No capture or collections were made during the present study.

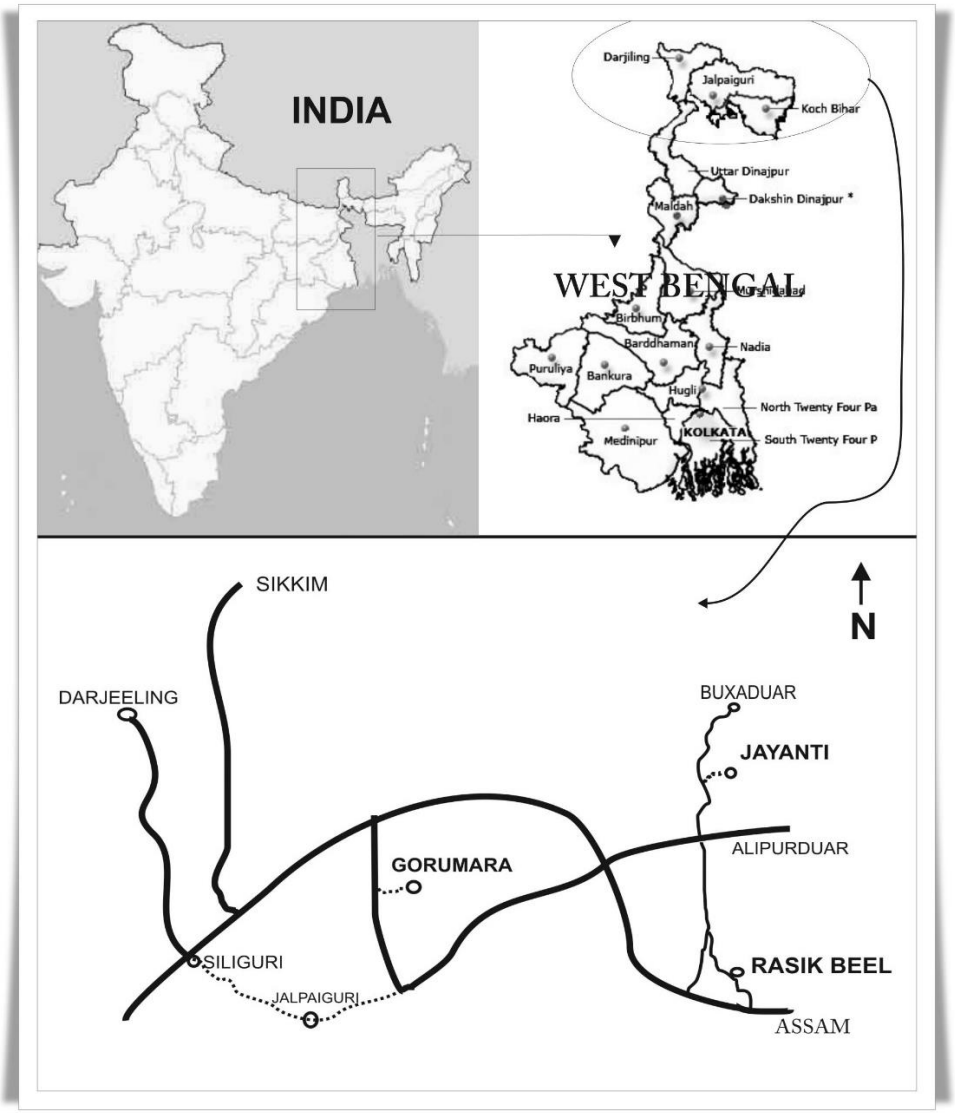

Figure 1 Map of the present study area at Buxa Tiger Reserve (National Park) located in the Jalpaiguri District of West Bengal, India.

Figure 2 The picturesque trekking route inside Buxa Tiger Reserve (National Park) surveyed during the present study (Photo: Utpal Singha Roy).

Figure 3 Glimpse of the remnants of historical 'Buxa fort' (Photo: Utpal Singha Roy).

3. RESULTS AND DISCUSSIONS

A total of 90 individual butterflies were observed during the present study (Table 1). It was really encouraging to encounter and note a butterfly in less than every three minutes on average during the trekking! Since the holistic inventory of forest faunal diversity requires an enormous amount of time and effort, during last few decades emphasis has been given to rapid studies (Anon, 1993; Roberts, 1991), frequently focusing on individual taxa (Noss, 1990; Pearson, 1994; Ryti, 1992), or by concentrating on habitat types (Colwell and Coddington, 1994; Hammond, 1994; Kiester et al., 1996). Butterfly diversity has been found to be influenced by the availability of larval host plants and vegetation cover of herbs, shrubs and trees for nectaring of butterflies (Karmakar et al., 2018). Several different flowering plants were noticed during the present trekking where butterflies were found nectaring.

Table 1 Butterfly diversity as recorded in the present study along a forest trekking route inside Buxa Tiger Reserve (National Park).

Family	Scientific name	Common name	Total number of butterflies observed
Hesperiidae	*Sarangesa dasahara*	Common Small Flat	02
Lycaenidae	*Curetis acuta*	Angled sunbeam	01
Nymphalidae	*Acraea terpsicore*	Tawny Coster	08
	Cirrochroa tyche mithila	Bengal Common Yeoman	03
	Cethosia cyane	Leopard lacewing	02
	Charaxes bernardus	Tawny Rajah	01
	Cyrestis thyodamas	Common Map	01
	Danaus chrysippus	Plain Tiger	12
	Danaus genutia	Striped Tiger	08
	Euploea core	Common Crow	05
	Euploea midamus	Blue-spotted Crow	06
	Lethe confusa confusa	Himalayan Banded Tree brown	01
	Tanaecia julii	Common Earl	01
	Tanaecia lepidea lepidea	Himalayan Grey Count	01
	Phalanta phalantha	Common Leopard	03

	Ypthima baldus	Common Five-ring	02
	Ypthima huebneri	Common Four-ring	02
Papilionidae	*Graphium sarpedon*	Common Bluebottle	01
	Pachliopta aristolochiae	Common Rose	03
	Papilio polytes	Common Mormon	06
Pieridae	*Appias libythea*	Striped Albatross	07
	Appias lyncida	Chocolate Albatross	05
	Catopsilia pomona	Common Emigrant	03
	Catopsilia pyranthe	Mottled Emigrant	02
Riodinidae	*Zemeros flegyas*	Punchinello	04

The butterflies recorded during the present study belonged to 25 different genera under six families (Table 1). The most abundant species recorded during the present study was Plain Tiger (*Danaus chrysippus*) followed by Tawny Coster (*Acraea terpsicore*) and Striped Tiger (*Danaus genutia*) represented by eight individuals from each genus. Seven different butterfly species belonged to the least abundant category, recorded only once during the total trekking. These were Angled sunbeam (*Curetis acuta*), Tawny Rajah (*Charaxes bernardus*), Common Map (*Cyrestis thyodamas*), Banded Tree brown (*Lethe confuse*), Common Earl (*Tanaecia julii*), Grey Count (*Tanaecia lepidea*) and Common Bluebottle (*Graphium sarpedon*) (Figures 4 – 16). Nymphalidae was the most abundant butterfly family represented by 15 different genera (60%) while the least abundant butterfly families were Hesperiidae, Lycaenidae and Riodinidae (4% each) (Figure 17). The present finding of Nymphalidae as the most dominant butterfly family corroborates well with previous studies made by various researchers from different habitat types throughout India (Kunte, 1997; Arun, 2002; Eswaran and Pramod, 2005; Kumar et al., 2007; Verma, 2009; Singh, 2010; Kunte et al., 2012; Sengupta et al., 2014; Mandal, 2016; Samanta et al., 2017). The lower abundance of Riodinidae and Hesperiidae recorded in the present study is in line with observations made by Singh, (2010) and Samanta et al., (2017). However, it should be mentioned here that the present study was done on a rapid inventory basis and there was every chance of missing the less conspicuous and cryptic species.

Figure 4 Common Small Flat (*Sarangesa dasahara*) (Photo: Utpal Singha Roy).

Figure 5 Bengal Common Yeoman (*Cirrochroa tyche Mithila*) (Photo: Utpal Singha Roy).

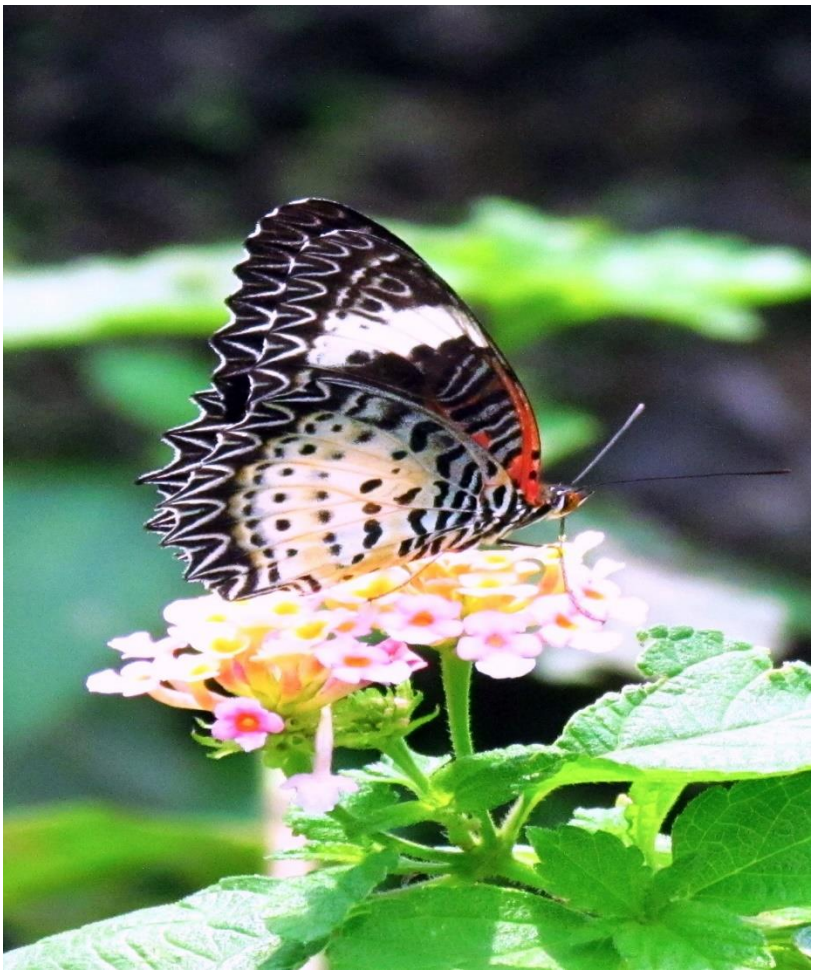

Figure 6 Leopard lacewing (*Cethosia cyane*) (Photo: Utpal Singha Roy).

Figure 7 Tawny Rajah (*Charaxes bernardus*) (Photo: Utpal Singha Roy).

Figure 8 Common Map (*Cyrestis thyodamas*) (Photo: Utpal Singha Roy).

Figure 9 Blue-spotted Crow (*Euploea midamus*) (Photo: Utpal Singha Roy).

Figure 10 Himalayan Banded Tree brown (*Lethe confusa confuse*) (Photo: Utpal Singha Roy).

Figure 11 Himalayan Grey Count (*Tanaecia lepidea lepidea*) (Photo: Utpal Singha Roy).

Figure 12 Common Five-ring (*Ypthima baldus*) (Photo: Utpal Singha Roy).

Figure 13 Common Four-ring (*Ypthima huebneri*) (Photo: Utpal Singha Roy).

Figure 14 Common Bluebottle (*Graphium sarpedon*) (Photo: Utpal Singha Roy).

Figure 15 Common Rose (*Pachliopta aristolochiae*) (Photo: Utpal Singha Roy).

Figure 16 Chocolate Albatross (*Appias lyncida*) (Photo: Mainak Chakarborty).

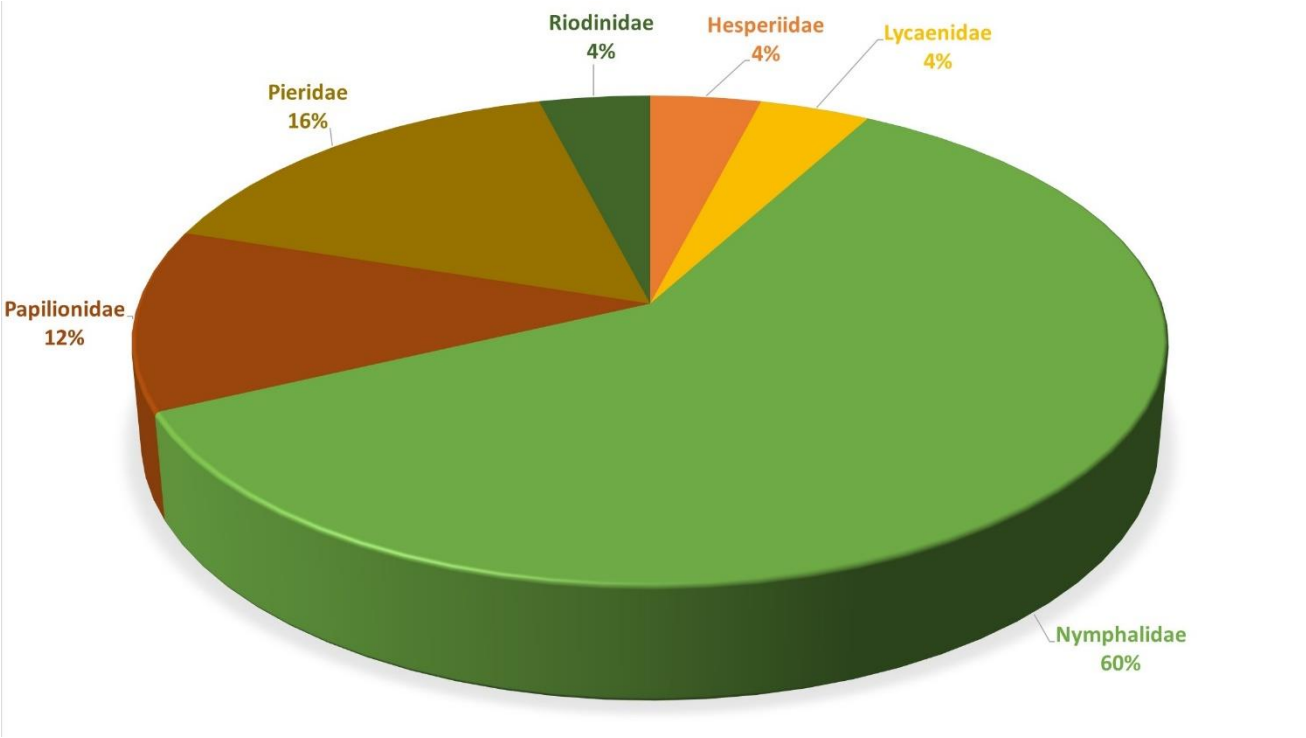

Figure 17 Occurrence pattern of different butterfly families as recorded in the present study.

The study of diversity indices was interesting to note (Table 2). Shannon Weiner Diversity score was recorded as 2.95 which indicates a handsome diversity. Higher diversity was also supported by Margalef's Richness Index score (5.33). Butterflies recorded in the present study were evenly distributed among different genera and have been reflected in Pielou's Evenness Index (0.76). This was also evident from the Simpson's Dominance Index score (0.06) which was very low indicating that were no dominant species recorded in the present study. Mention may be made that both Shannon measures (H') and Simpson's index (D_{SIMP}) consider the proportional abundance of species. However, H' is more sensitive to rare species, whereas D_{SIMP} puts emphasis on the common species (Roy et al., 2012).

Table 2 Diversity indices of butterfly species recorded during the present study.

Diversity Indices	Scores
Shannon Weiner Diversity	2.95
Simpson's Dominance Index	0.06
Pielou's Evenness Index	0.76
Margalef's Richness Index	5.33

4. CONCLUSION

The present findings are encouraging. However, like most other parts of the country, the present study location is also suffering from habitat conversion and unplanned tourist pressure. Hence, needs attention from the concerned authorities.

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Ethical approval

Butterfly species inside Buxa Tiger Reserve were studied during the present study. Applicable Animal ethical guidelines were followed in the study for species observation and identification.

Informed consent

Not applicable.

Conflicts of interests

The authors declare that there are no conflicts of interests.

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Data and materials availability

All data associated with this study are present in the paper.

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