



Record of Butterflies of St. Martin's Island, Teknaf, Cox's Bazar, Bangladesh

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Abstract

St. Martin's Island (SMI) is an isolated Island in Bay of Bengale of Bangladesh. Its climate, weather and vegetation are more or less similar to mainland Teknaf, Cox's Bazar. In this study was survey, collection, and faunal record of butterflies in SMI. The surveys were conducted over two years in the months of November and January (winter season) by transects method. The present studies record the occurrence of 16 species belonging to 13 genera and representing 6 families of butterflies from SMI. Most of the species were recorded under family Pieridae (31.25%), and both Papilionidae and Satyridae contained lowest abundance (6.25%). Among those species 56.25% belonged to very common (VC), and 43.75% Common (C) categories with Cox's Bazar butterfly fauna. These species were influenced significantly by the habitats, because site-2 (shrub) showed the highest species (61.90%) where only (4.76%) species belonged at site-1 (trees). Previously in this area has not been any works on butterflies, though vegetation has been destroying day by day, so comparison of actual butterfly abundance with present data was impossible.

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Introduction

St. Martin's Island traditionally known as Narikel Jinjira which is situated on Bangladesh's southernmost tip, approximately between 20°34'1 and 20°39'1 N and 92°18'1 and 92°21'1 E. A strait, about 9 km wide, divides the island from the mainland (Hossain and Islam, 2006; Thompson and Islam, 2010). The island was first inhabited 250 years ago by Arabian sailors who gave it the name Jazeera. The island was known as St. Martin's Island while it was under British control. Rival claims to the island played a significant role in the First Anglo-Burmese War (1824–1826) between the British and Burmese empires. This island is known locally as Narikel jinjira, which means "Coconut Island," and by some as "Daruchini Dwip," which translates to Cinnamon Island (Alam *et al.*, 2015). The island is located 10 kilometers from Teknaf's Badarmokam and approximately 34 km from the Teknaf headquarters (Gain, 2009). At its broadest point, the SMI measures more than 1 km in width and 7.8 kilometers in length. At low tide, the island's surface area is around 8 km², whereas at high tide, it is approximately 5 km². SMI is rich in terrestrial and marine resources that are important to global biodiversity (Saha *et al.*, 2019; Tomascik, 1997). It is enhanced by a variety of animals, including mammals, reptiles, amphibians, mollusks, corals, and echinodermata. 187 different species of Mollusks (MoEF, 2001), There are seven crab species, nine species from eight genera in four classes under the phylum Echinodermata, and two hundred and thirty-four fish species (only sixteen freshwater species among the eighty-nine coral-associated species) (Ahamed, 1990; Tomascik, 1997), 29 species of reptile and 120 species of birds (77 resident species and 43 migratory species) as well as 19 species of mammals (Chowdhury and Islam, 2001; Gain, 2009) were identified from the island. However, the SMI butterfly community has not yet been the subject of any insect research. In contrast to other insects, butterfly populations are closely observed all around the world. Butterflies are particularly sensitive to changes in habitat and microclimate because they are well-suited for indirect measurements of environmental changes (Bobo *et al.*,

2006; Akite, 2008; Bonebrake, 2009) and their abundance and diversity are important indicators of biodiversity, and they play a major role in determining the redundancy of a forest or other place (Schulze *et al.*, 2004). These days, studies of biodiversity and programs that prioritize biodiversity conservation include butterflies (Gadgil, 1996).

Therefore, it is essential to know the exact number of butterflies species, their status, seasonal abundance etc. of a certain area or region. Objectives of the survey were to document the existing number of butterfly species of St, Martin Island that may be a crucial help to create a management plan for their conservation and existing faunal data of SMI will be enrich.

Materials and methods

Climate and weather

While SMI's climate is inside the tropical belt, Bangladesh's subtropical monsoonal climate has a significant impact on the island's climate. In SMI, the yearly average temperature is 25.7 °C. May is the hottest month of the year, with an average high temperature of 28.3°C. January has the lowest annual average temperature, which is approximately 20.9 °C. There is a 7.4°C variance in temperature throughout the year. The majority of the year's months are distinguished by heavy rainfall. Every year, about 4544 mm of precipitation fall. With an average of 2 mm, January has the least amount of precipitation. July has the highest average precipitation totals, averaging 1242 mm. Precipitation varies by 1240 mm between the wettest and driest months. The main travel season, which runs from November to February, usually has the greatest weather. Cyclones can occur between March and July. Therefore, St. Martin's Island's off-season for tourists runs from March to July.

Butterfly collection site

St. Martin's Island has not diverse vegetation because the remaining native species have been destroyed by human activities and not introduced considerable number of cultivated and other plant species.

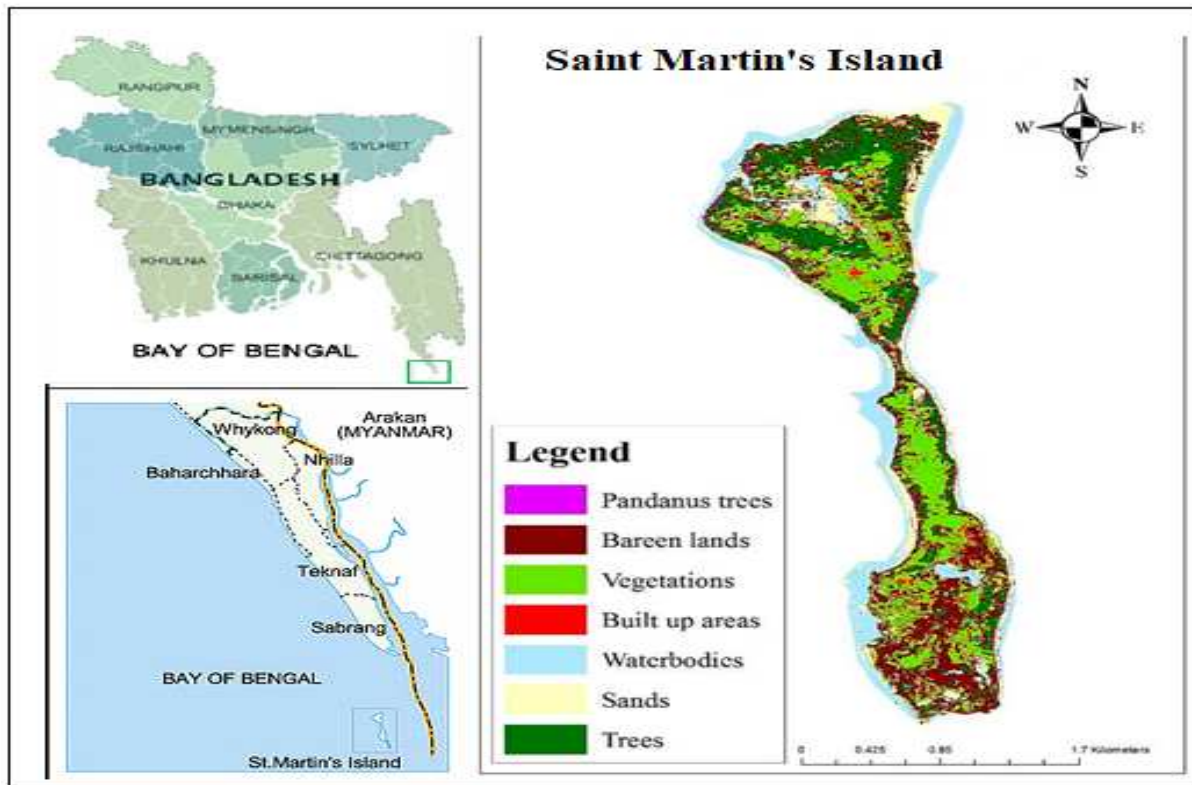


Fig. 1. Map of St. Martin's Island with focusing its vegetation sites that was study area of recorded butterflies.

The main vegetation of this island is coconut, betel nut and bamboo. Recent floral surveys recorded 260 plant species including 53 trees, 25 shrubs, 150 herbs, and 32 climbers belonging to 58 families (Zaman, 2006) (Fig.1.).

The butterfly samplings were done collected from 4 different vegetation sites:

Site-1: Vegetation's consist of this area are trees. Among the naturally occurring trees of this area, two species of Pandanus, namely the screw pines, *Pandanus fascicularis* (locally called keya) and *Pandanus foetidus* (locally known as keyawata) and one species of Streblus, *Streblus asper* (locally called shaora) dominate (Zaman, 2006). A number of trees such as coconut palms, *Cocos nucifera* (locally called Narikel) have been introduced and abundantly cultivated by the local inhabitants. The island is home to three other species of Palmae: Areca Nut Palm, Areca catechu (referred to as supari locally), Asian Palmyra Palm, *Borassus flabellifer* (referred to as taal locally), and Silver Date Palm, *Phoenix sylvestris* (referred to as khejur locally) (Zaman, 2006).

Site-2: This area is dominated by shrubs. It is abundant *Vitex trifolia* (locally known as nil nishinda) and *Vitex negundo*, both belonging to the Amiaceae family, and by some species of Leguminosae. The rattan, *Calamus guruba* (locally called jali bet) also occurs naturally on the Island.

Site-3: Herbs grow all throughout this place. The most noteworthy herb is Beach Morning Glory, also known as Goat's Foot *Ipomoea pes-caprae* (named Shagor lota locally). This creeping vine, which is part of the Convolvulaceae family, is very common. On the upper stretches of beaches, it grows.

Site-4: This part of the island is cultivated, with watermelon and chillies being the main crops grown there. There's also some indigenous small bulb onion cultivation, some small-scale chilli intercropping on maize, and some rainy-season transplanted Aman rice.

Butterfly collection and identification

The surveys were conducted two years in the month of November and January (winter season). Transects

by walking in different habitats of the islands were completely surveyed. It is possible to walk around the island in collecting time because it measures only about 8 km² (3 sq. mile), shrinking to about 5 km² (2 sq. mile) during high tide. Transects were walked between 09.00am and 1:00pm. A minimum of 2 days were spent for butterfly collection in each year whenever more species were encountered, the survey time was extended to collecting days. Butterflies seen within 5m on either side of the transect (Kunte, 1997) were recorded together with details on the habitat in which they occurred. The butterflies were caught by using handled aerial sweep nets and only few specimens of common species were collected. The specimens were identified to species, genus and family. Butterflies were collected and identified using the specimen book “Common butterflies in Bangladesh” (Islam *et al.*, 2007) and comparison with voucher specimens kept at the Radiation Entomology and Acarology Division at Institute of Food and Radiation Biology, Atomic Energy Research Establishment, Ganakbari, Ashulia, Savar, Dhaka.

Data analysis

One way ANOVA test has been done to find out significant level of species abundance under families and sites. To observe the interaction of families × habitats, and families × status with abundance, two-way ANOVA (GLM univariate procedure) has been done. In these analyses, families, habitats and status were inputted as independent variables and recorded species were inputted as dependent variables. The significant level was set at $P < 0.05$. IBM SPSS V. 21 was used as the statistical program for all data analysis.

Results and discussion

Abundance of butterfly

Our study enumerates the presence of 16 species (up to sub-species level) belonging to 13 genera and representing six families from SMI (Table 1, Fig. 2, Fig. 3, and Fig. 4). The recent past data on the butterflies of Saint Martin’s Island is from 2000 and 2002 survey, which estimated that 6 species of butterfly (Gain, 2009; Chowdhury and Islam, 2001).

Table 1. List of butterfly species with common name, scientific name, and their habitat and status.

Family	Common Name	Scientific Name	Habitat type	Status
Nymphalidae	Peacock Pansy	<i>Junonia almana almana</i> , (Linnaeus, 1758)	Site-2	VC
	Grey Pansy	<i>Junonia atlites atlites</i> , (Linnaeus, 1763)	Site-2	VC
	Common Castor	<i>Ariadne merione tapestrina</i> , (Moore, 1884)	Site-2	VC
	Common Sailer	<i>Neptis hylas kamarupa</i> , Moore, [1875]	Site-2	C
Pieridae	Painted Jezebel	<i>Delias hyparete indica</i> , (Wallace, 1867)	Site-1	C
	Striped Albatross	<i>Appias libythea olferna</i> , (Swinhoe, 1890)	Site-2	C
	Mottled Emigrant	<i>Catopsilia pyranthe pyranthe</i> , (Linnaeus, 1775)	Site-2	C
	Common grass yellow	<i>Eurema hecabe hecabe</i> , (Linnaeus, 1758)	Site-2	VC
	One-spot Grass Yellow	<i>Eurema andersoni sadanobui</i> , Shirôzu & Yata, 1982	Site-2	C
Danaidae	Plain Tiger	<i>Danaus chrysippus chrysippus</i> , (Cramer, [1779])	Site-2	VC
	Common Tiger	<i>Danaus genutia genutia</i> , (Cramer, [1779])	Site-2	VC
Papilionidae	Common Mormon	<i>Papilio polytes polytes</i> , Linnaeus, 1758	Site-2	VC
Satyridae	Common Evening Brown	<i>Melanitis leda leda</i> , (Linnaeus, 1758)	Site-2	VC
			Site-3	
Lycaenidae	Common Pierrot	<i>Castalius rosimon rosimon</i> , (Fabricius, 1775)	Site-2	VC
			Site-3	
			Site-4	
	Pea Blue	<i>Lampides boeticus boeticus</i> , (Linnaeus, 1767)	Site-2	C
			Site-3	
			Site-4	
	Lesser Grass Blue	<i>Zizina otis sangra</i> , (Moore, [1866])	Site-3	C
			Site-4	

The highest percentage of species were recorded under family Pieridae (31.25%) followed by Nymphalidae (25%), Lycaenidae (18.75%) and Danidae (12.5%), where Papilionidae and Satyridae belonged lowest number (6.25%) (Fig.5.Q).

These result were supported by the work of IUCN (2015) that recorded 305 butterfly species from whole

country, among them Nymphalidae and Lycaenidae were the second most abundance, and Pieridae and Lycaenidae were more available than other species. Another study that was done at Satang Besar Island in Malaysia where species under Nymphalidae were available because there was higher light intensity (Suraya *et al.*, 2022), and there weather condition is nearly similar with SMI.

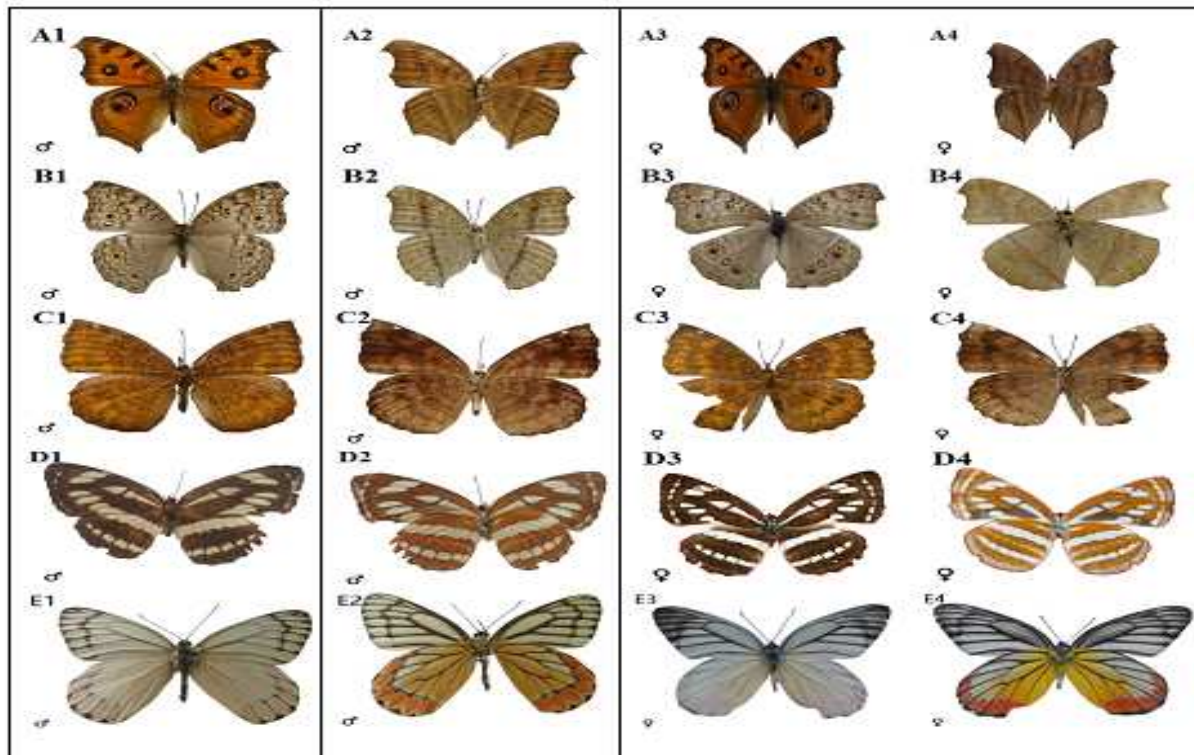


Fig. 2. Recorded butterflies at Sonadia Island, A1. *Junonia almana almana*, ♂, Upperside. A2. *Junonia almana almana*, ♂, Underside. A3. *Junonia almana almana*, ♀, Upperside. A4. *Junonia almana almana*, ♀, Underside. B1. *Junonia atlites atlites*, ♂, Upperside. B2. *Junonia atlites atlites*, ♂, Underside. B3. *Junonia atlites atlites*, ♀, Upperside. B4. *Junonia atlites atlites*, ♀, Underside. C1. *Ariadne merione tapestrina*, ♂, Upperside. C2. *Ariadne merione tapestrina*, ♂, Underside. C3. *Ariadne merione tapestrina*, ♀, Upperside. C4. *Ariadne merione tapestrina*, ♀, Underside. D1. *Neptis hylas kamarupa*, ♂, Upperside. D2. *Neptis hylas kamarupa*, ♂, Underside. D3. *Neptis hylas kamarupa*, ♀, Upperside. D4. *Neptis hylas kamarupa*, ♀, Underside. E1. *Delias hyparete indica*, ♂, Upperside. E2. *Delias hyparete indica*, ♂, Underside. E3. *Delias hyparete indica*, ♀, Upperside. E4. *Delias hyparete indica*, ♀, Underside.

Status of species

Overall 56.25% of those species were very common (VC), and 43.75% were common (C) categories (Table 1). Maximum number species of family Nymphalidae (75%), Danaidae, Papilionidae and Satyridae were very common, but Pieridae (80%) and Lycaenidae (66.67%) contained common species (Fig.6.S). Similar study that was observed by the most near

place of main land (Inani Reserve Forest of Cox's Bazar, Bangladesh), that showed (16%) as Very Common (VC) and (23.2%) as Common (C) species (Haidar *et al.*, 2017). It's indicates that those butterfly species of SMI is closely allied to that of Cox's Bazar species but very few species (16 species) observed in this Island due to lack of plant diversity with evergreen or deciduous forests.

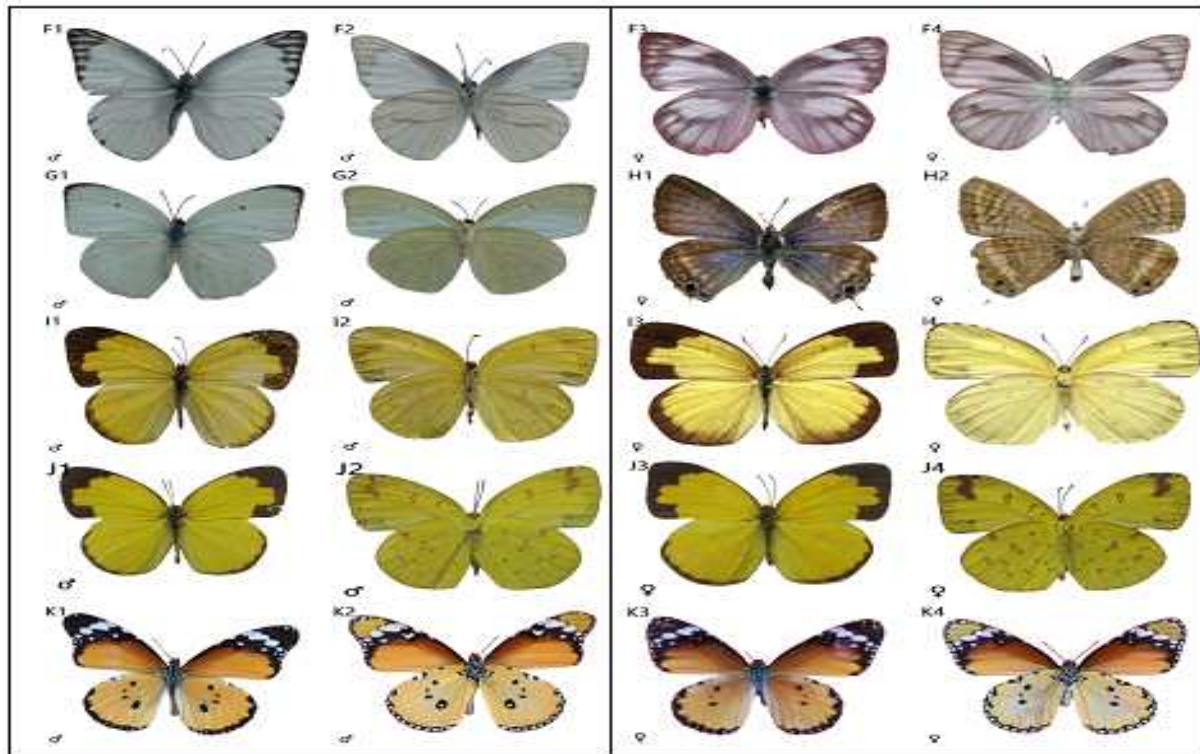


Fig. 3. Recorded butterflies at Sonadia Island, F1. *Appias libythea olfern*, ♂, Upperside. F2. *Appias libythea olfern*, ♂, Underside. F3. *Appias libythea olfern*, ♀, Upperside. F4. *Appias libythea olfern*, ♀, Underside. G1. *Catopsilia pyranthe pyranthe*, ♂, Upperside. G1. *Catopsilia pyranthe pyranthe*, ♂, Underside. H1. *Castalius rosimon rosimon*, ♀, Upperside. H2. *Castalius rosimon rosimon*, ♀, Underside. I1. *Eurema hecabe hecabe*, ♂, Upperside. I2. *Eurema hecabe hecabe*, ♂, Underside. I3. *Eurema hecabe hecabe*, ♀, Upperside. I4. *Eurema hecabe hecabe*, ♀, Underside. J1. *Eurema andersoni sadanobui*, ♂, Upperside. J2. *Eurema andersoni sadanobui*, ♂, Underside. J3. *Eurema andersoni sadanobui*, ♀, Upperside. J4. *Eurema andersoni sadanobui*, ♀, Underside. K1. *Danaus chrysippus chrysippus*, ♂, Upperside. K2. *Danaus chrysippus chrysippus*, ♂, Underside. K3. *Danaus chrysippus chrysippus*, ♀, Upperside. K4. *Danaus chrysippus chrysippus*, ♀, Underside.

Habitat of species

Most of the species (61.90%) were collected from the site-2 that contains shrub, but the vegetation site-1 (trees) showed lowest habitats (4.76%) of butterflies, and also site-3 (19.05%) and site-4 (14.29%) showed significantly importance ($P < 0.05$) with others (Fig.6.T). This data are supported by the work Haidar *et al.*, (2017) who reported that shrub is very important habitat for butterflies, that contains 88.7% of the their recorded species.

According to individual family, all species (100%) that belonged to Nymphalidae, Danaidae and Papilionidae were in site-2's habitat (Fig.5.R), while the species of Satyridae and Lycaenidae showed mixed vegetation but was not significantly difference, and one species (*Delias hyparete indica*) of Pieridae were recorded

from site-1, that showed totally difference than other species. Hossain (2023) reported that Lycaenidae butterflies have more adaptation than other families, that helps them to survive in various ecological niches. Though the two species of Lycaenidae family (*Castalius rosimon rosimon*, *Lampides boeticus boeticus*) were recorded from site-2, site-3 and site-4, other species (*Zizina otis sangra*) were founded in both site-3 and site-4, while all species of family Nymphalidae, Danaidae and Papilionidae were obtained from site-2 (Table 1). Otherwise, only one species (*Delias hyparete indica*) of family Pieridae was collected from site-1, and other species this family belonged to site-2, and the species of Satyridae family was observes in both site-2 and site-3 (Table 1). Islam *et al.*, (2011) reported that the numbers of butterfly species as well as their fauna vary greatly

depending on the floral and ecological conditions in

and around the study areas.

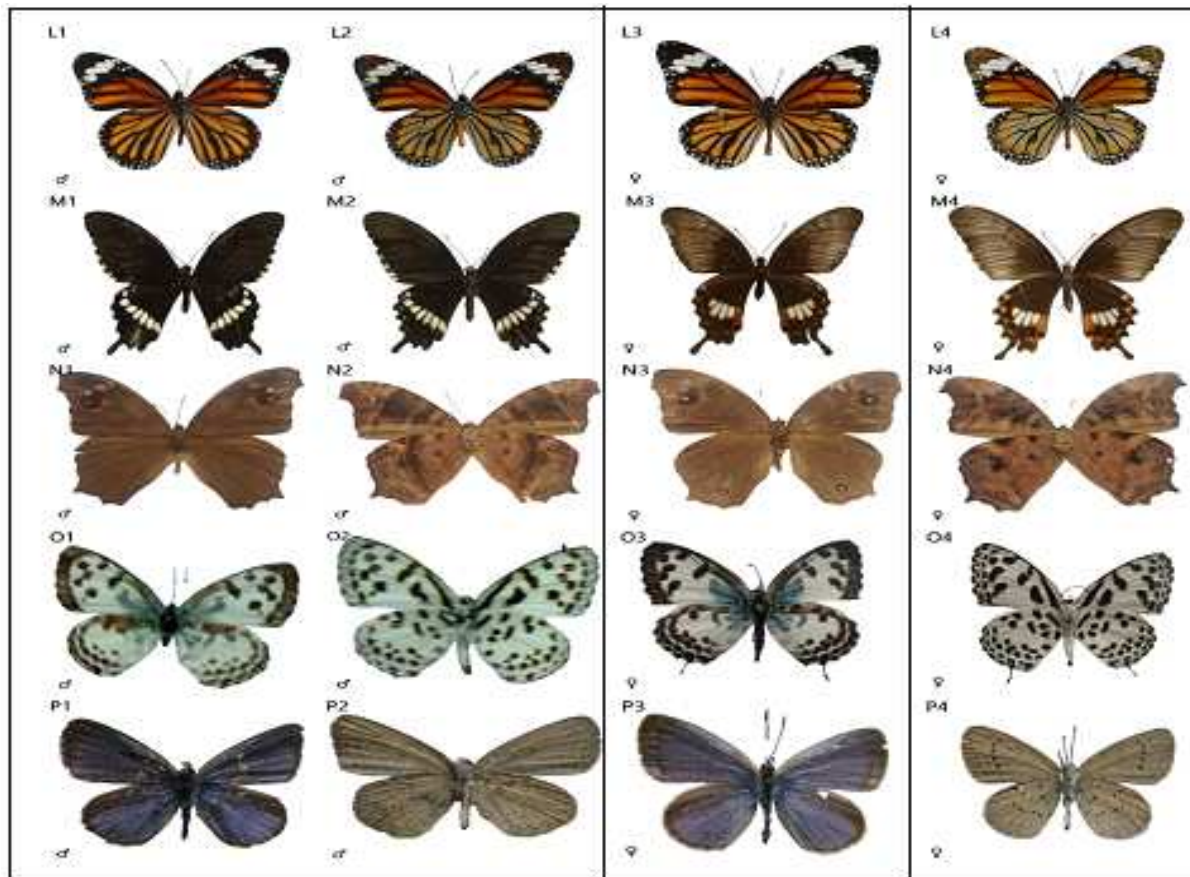


Fig. 4. Recorded butterflies at Sonadia Island, L1. *Danaus chrysippus chrysippus*, ♂, Upperside. L2. *Danaus chrysippus chrysippus*, ♂, Underside. L3. *Danaus chrysippus chrysippus*, ♀, Upperside. L4. *Danaus chrysippus chrysippus*, ♀, Underside. M1. *Papilio polytes polytes*, ♂, Upperside. M2. *Papilio polytes polytes*, ♂, Underside. M3. *Papilio polytes polytes*, ♀, Upperside. M4. *Papilio polytes polytes*, ♀, Underside. N1. *Melanitis leda leda*, ♂, Upperside. N2. *Melanitis leda leda*, ♂, Underside. N3. *Melanitis leda leda*, ♀, Upperside. N4. *Melanitis leda leda*, ♀, Underside. O1. *Lampides boeticus boeticus*, ♂, Upperside. O2. *Lampides boeticus boeticus*, ♂, Underside. O3. *Lampides boeticus boeticus*, ♀, Upperside. O4. *Lampides boeticus boeticus*, ♀, Underside. P1. *Zizina otis sangra*, ♂, Upperside. P2. *Zizina otis sangra*, ♂, Underside. P3. *Zizina otis sangra*, ♀, Upperside. P4. *Zizina otis sangra*, ♀, Underside.

It is one of the reasons that there few species observed. The vegetation of St. Martin's Island is comparable to that of the mainland because it is a sedimentary continental island that was just recently joined to the Teknaf peninsula's mainland around 6,000–7,000 years ago (Chowdhury, 2012; Warrick *et al.*, 1993).

But since the island was initially colonized in the 1880s, human efforts have drastically altered it that was then most likely covered in an evergreen forest with a large number of teak trees (Tomascik, 1997). Many of the once-abundant flora and fauna species of

the island have vanished as a result of additional changes to the vegetation and landforms brought about by the loss of the original forest, ongoing intense agriculture, and a recent rise in tourism. Now a day's deforestation is the major problem of the Island to survive terrestrial fauna not only that, deforestation has led to increased water turbidity and sedimentation, both of which affect coral development.

The use of wood for cooking and timber for constructing houses has been the main factors resulting in the deforestation of the Island.

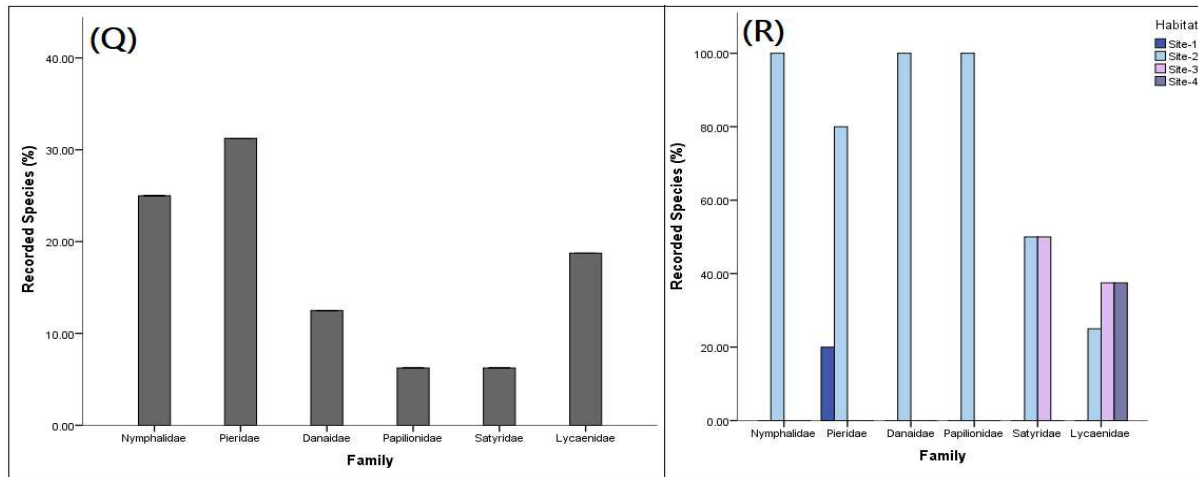


Fig. 5. The percentages of recorded butterfly species that belong in different families (Q) and comparative recorded species (%) from different habitats in each family (R).

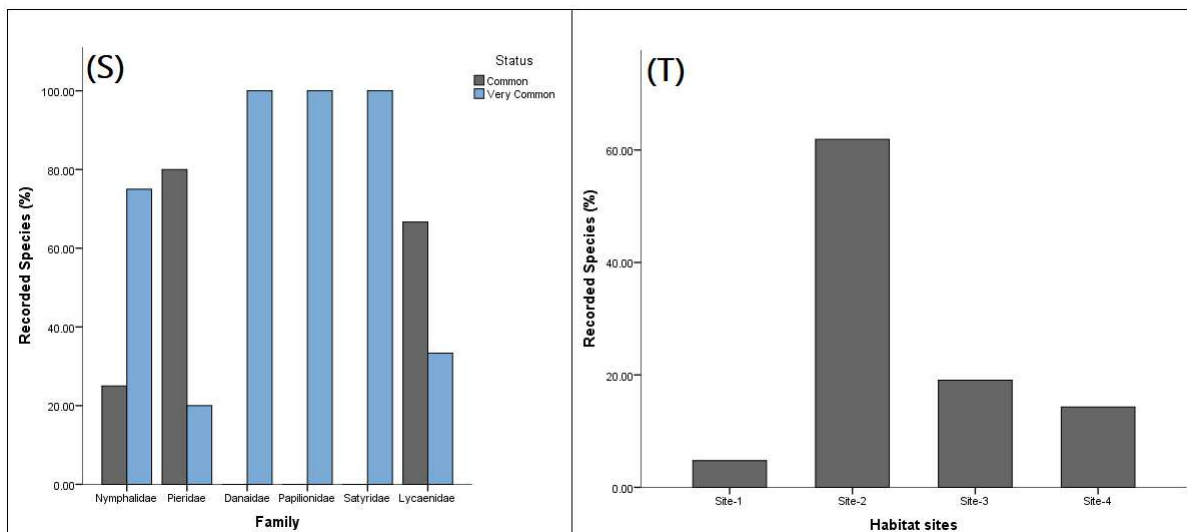


Fig. 6. Comparative status of recorded butterflies (%) in different families (S) and the percentages of recorded species from four sites (T).

The daily requirement of fuel-wood for a dense population of around 5,700 people are large (POUSH, 2006). The main threat to the natural flora and terrestrial fauna of the Island lies in construction. In particular substantial tourist resorts have recently been constructed by clearing natural vegetation.

But most of the butterfly species are very specific to the host plant, hence, the detailed study of butterflies and its inter-relationship with host plants is very much needed to preserve the biodiversity of the SMI. As a result of their frequent links to the particular plants that serve as their larval hosts, butterflies can serve as powerful markers for the existence of particular plant species (Sparrow *et al.*, 1994).

Conclusion

In Saint Martin Island, there was no previous data record of butterfly in Bangladesh. Not found any new species or endemic species in SMI without our collected and identified above 220 species from different areas of Bangladesh. This record could help as sustainable environmental index that would find out how land environment would has been ruined by human behaviors, because day by day butterfly habitats are destroyed in that areas.

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