



Preliminary checklist of butterfly (Insecta, Lepidoptera, Papilionoidea) species around Haringhata dairy farm, Nadia district, West Bengal including range extension of *Prosotas bhutea* (de Niceville, [1884]) for southern West Bengal, India.

Catálogo preliminar de las especies de mariposas (Insecta, Lepidoptera, Papilionoidea) de los alrededores de la granja lechera de Haringhata, distrito de Nadia, Bengala Occidental, incluida la ampliación del área de distribución conocida de *Prosotas bhutea* (de Niceville, [1884]) para el sur de Bengala Occidental, India.

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ABSTRACT

The aim of this paper is to investigate and produce an updated and exhaustive checklist of butterfly species recorded around Haringhata Dairy Farm till December 2020. This list is intended to serve as a basis to prepare conservation strategies and generate awareness among the local people. The checklist comprises a total of 106 butterfly species belonging to 06 families, 19 subfamilies, and 74 genera. It includes the range extension of *Prosotas bhutea* into the lower Gangetic plains of South Bengal.

Key words: Insect; Biodiversity; Checklist; Barajaguli; *Prosotas bhutea*.

RESUMEN

El objetivo de este documento es investigar y producir una lista de verificación actualizada y exhaustiva de las especies de mariposas registradas alrededor de la granja lechera Haringhata hasta diciembre de 2020. Esta lista tiene el propósito de servir de base para preparar estrategias de conservación y generar concienciación entre la población local. La lista de verificación comprende un total de 106 especies de mariposas pertenecientes a 06 familias, 19 subfamilias y 74 géneros. Incluye la extensión del rango de *Prosotas bhutea* en las llanuras del Ganges inferior de Bengala del Sur.

Palabras clave: Insecta; Biodiversidad; Catálogo; Barajaguli; *Prosotas bhutea*.

INTRODUCTION

Butterflies are flying beauty which act as climate change indicators and are sensitive to environmental degradation (Kehimkar, 2008). Around us, many of the butterfly species are cryptically coloured (Noort & Stone, 1999). Some of the species are pests of agricultural crops and economically important plants (Nair *et al.*, 2018). India has one of the richest and most diverse butterfly faunas in the world. Due to their attractiveness and omnipresence, they have acquired a niche in the prose and poetry of various cultures (Kunte, 2000). India has 1,501 species, of which 321 are Skippers, 107 Swallowtails, 109 Whites and Yellows, 521 Brush-footed, and 443 Blues (Kehimkar, 2008). In the state of West Bengal, 452 species of butterflies (Dasgupta, 2010) are recorded. Several studies on butterflies have been conducted throughout the state to date (Moore, 1882; De Niceville, 1885; Sanders, 1944; Ghosh and Siddique, 2005; Chowdhury and Chowdhury, 2006; Chowdhury and Das, 2007; Chowdhury and Soren, 2011; Roy, 2011; Chowdhury, 2014; Nair *et al.*, 2014; Sengupta *et al.*, 2014; Dwari and Mandal, 2015, 2020; Mukherjee *et al.*, 2015; Mitra *et al.*, 2015; Mukhopadhyaya and Chattopadhyaya, 2015; Mukherjee *et al.*, 2016; Biswas *et al.*, 2016; Ghosh and Saha, 2016; Dey *et al.*, 2017; Dwari *et al.*, 2017; Samanta *et al.*, 2017; Das *et al.*, 2019; Sinha *et al.*, 2019; Mukherjee and Mondal, 2020). Dey and Ghosh (2016) and Chakraborty *et al.*, (2018) compiled 33 species and 26 species of butterflies respectively from Nadia district. There is no previously published checklist of butterfly species from Haringhata. Hence the present work was initiated. Nadia is situated between 22°53' and 24°11' North Latitude and 88°09' & 88°48' East Longitude, this district is longitudinal in shape with an orientation of North-South. The tropic of cancer (23.5° N) divides the district into two parts.

STUDY SITE

The present study was conducted in area adjacent to the Haringhata Dairy Farm (HDF), situated in the lower Gangetic plains at an altitude of 13

m. Also known as Haringhata Butterflying Zone (22.949533° N and 88.541389° E) (Fig.1), this site in Barajaguli (also simply known as Jaguli), is located around 48 kilometres north of Kolkata, in the southernmost fringe of Nadia district in West Bengal, India. In 1950-51, the Government of West Bengal had installed the dairy plant (HDF), the first of its kind in the state, with vision of urban milk supply schemes. To develop fodder for the animal resources, various species of grasses were planted in the study site. The invasive trees on the grassland's habitat have forming marshes in and around HDF. The climate is characterized by hot summer, high humidity, and well-distributed rainfall (annual average rainfall 1419 mm). The average daily temperature is 31.8° C, and the minimum temperature is 21.3° C. January is the coldest month when the minimum temperature often drops to 6-7° C. The study area is thus in a hot humid zone where summer starting from March to June, monsoon from July to October, and winter come from November to February. In the summer season, the maximum temperature generally varies from 28° C to 35° C. On a sunny day, the temperature may go up to 40° C.

MATERIALS AND METHODS

Author regularly carried out extensive field survey in the different landscape elements like remnants of secondary deciduous forest, shrubs, paddy fields, and marshes region from January 2014 to December 2020. The field visits were conducted randomly, with a frequency of at least twice a month in the area. This survey compiles data from observations studied through walking for approximately four hours (8:30 AM to 12:30 PM) on each field visit. Based on their relative abundances, the species were ranked into four categories, i.e. Very Frequent (VF) = More than 100 days of sightings, Frequent (F) = 50-100 days of sightings, Infrequent (IF) = 10-50 days of sightings and Rare (R) = 1 to 10 days of sightings. Days of sightings means the number of days during the entire study periods in which the particular species was observed on field trips. Identification of the photographs taken in the field was done with the help of Evans (1949); Kehimkar (2016);

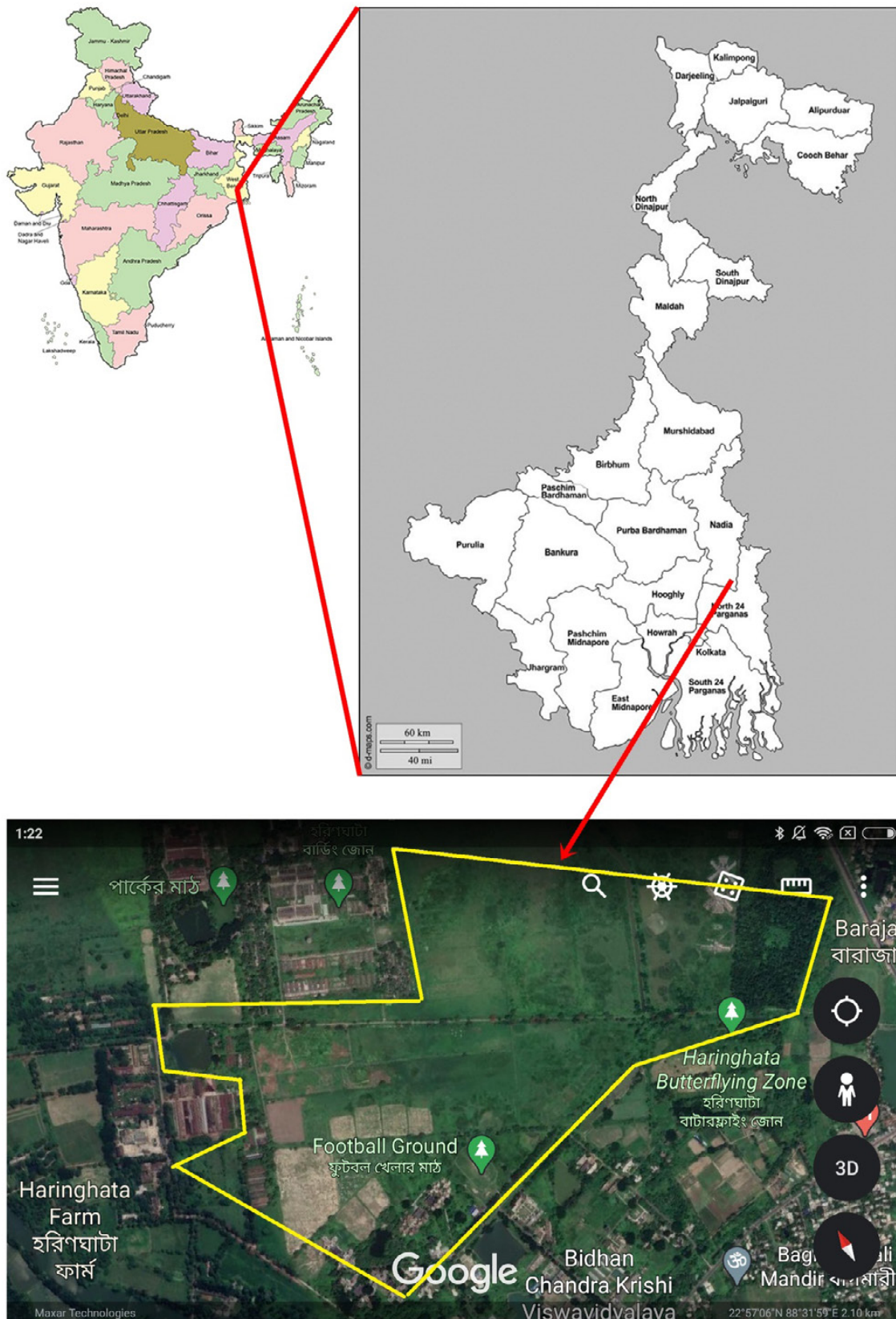


Figure 1: Study area map showing around Haringhata Dairy Farm green zone.

and Ek-Amnuay (2012). All scientific and English common names follow the catalogue by Varshney & Smetacek (2015). Photographic documentation was done by the author using DSLR camera (model no. Nikon D7000) with 18-55 mm VR II kit and 70-300 mm VR ED lens (Nikkor make) for capturing the maximum species image.

RESULTS

This study reports 106 species belonging to 74 genera distributed in 6 families (Table 2). Lycaenidae was the most diverse family (35 species under 27 genera and averaging 33,02% species richness), followed by Nymphalidae (30 species, 17 genera; 28,30%) (Table 1).

Table 1: Overview of the taxonomic diversity of butterfly species of survey area:

Family	Subfamily	Genera	Species
Papilionidae	01 (5,26%)	03 (4,05%)	09 (8,49%)
Nymphalidae	08 (42,11%)	17 (22,97%)	30 (28,30%)
Pieridae	01 (5,26%)	09 (12,16%)	12 (11,32%)
Lycaenidae	05 (26,32%)	27 (36,49%)	35 (33,02%)
Hesperiidae	03 (15,79%)	17 (22,98%)	19 (17,92%)
Riodinidae	01 (5,26%)	01 (1,35%)	01 (0,94%)
Total: 06	19 (100%)	74 (100%)	106 (100%)

It was interesting to note the presence of *Prosoptas bhutea* two times in the study site (23.XI.2018 and 25.XII.2018). The taxon was first sighted and photographed from this area, as well as South Bengal in January 2015 (Anonymous, 2020). *Megisba malaya thwaitesi*, *Megisba malaya sikkima*, *Zesius chrysomallus*, and *Pieris canidia* were also recorded, which can be considered as uncommon species to the lower Gangetic plains (southern part of the West Bengal state). Out of the 106 butterfly species reported from around HDF, 16 species are protected under the Wildlife (Protection) Act, 1972 enacted in

India (Table 2). Among those sixteen, three species are protected under Schedule I, 10 species under Schedule II, and three species under Schedule IV. (Table 2). However, it is also pleasing to note that King Crow, Striped Albatross, Common Gull and Pointed Ciliate Blue were observed frequently (F) (between 50 and 100 sightings). Another three species namely Common Mime, Common Lineblue and Common Pierrot are also scheduled under this Wildlife (Protection) act but are very common in this area (VF) (Table 2)

FO: Frequency of Occurrence, VF: Very Frequent, F: Frequent, IF: Infrequent, R: Rare. WPA: Wildlife (Protection) Act

Sl. No.	Subfamily	Common name	Bionomial name	FO	WPA schedule
	Papilionidae (03 genera, 09 species)				
1.	Papilioninae	Common Jay	<i>Graphium doson</i> (C. & R. Felder, 1864)	F	
2.		Tailed Jay	<i>Graphium agamemnon</i> (Linnaeus, 1758)	VF	
3.		Spot Swordtail	<i>Graphium nomius</i> (Esper, 1799)	R	
4.		Common Rose	<i>Pachliopta aristolochiae</i> (Fabricius, 1775)	F	
5.		Common Mime	<i>Papilio clytia</i> (Linnaeus, 1758)	VF	I
6.		Common Mormon	<i>Papilio polytes</i> (Linnaeus, 1758)	VF	
7.		Blue Mormon	<i>Papilio polymnestor</i> (Cramer, 1775)	F	
8.		Common Lime	<i>Papilio demoleus</i> (Linnaeus, 1758)	F	
9.		Common Banded Peacock	<i>Papilio crino</i> (Fabricius, 1793)	IF	
	Nymphalidae (17 genera, 30 species)				
10.	Danainae	Blue Tiger	<i>Tirumala limniace</i> (Cramer, 1775)	F	
11.		Common Tiger	<i>Danaus genutia</i> (Cramer, 1779)	F	
12.		Plain Tiger	<i>Danaus chrysippus</i> (Linnaeus, 1758)	VF	
13.		Common Crow	<i>Euploea core</i> (Cramer, 1758)	VF	
14.		King Crow	<i>Euploea klugii kollari</i> (C. & R. Felder, 1865)	F	IV
15.	Charaxinae	Black Rajah	<i>Charaxes solon</i> (Fabricius, 1793)	F	
16.	Satyrinae	Common Palmfly	<i>Elymnias hypermnestra</i> (Linnaeus, 1763)	F	
17.		Common Evening Brown	<i>Melanitis leda</i> (Linnaeus, 1758)	F	

18.		Common Bushbrown	<i>Mycalesis perseus</i> (Fabricius, 1775)	IF	
19.		Dark-brand Bushbrown	<i>Mycalesis mineus</i> (Linnaeus, 1758)	F	
20.		Long-brand Bushbrown	<i>Mycalesis visala</i> (Moore, 1857)	R	
21.		Common Fivering	<i>Ypthima baldus</i> (Fabricius, 1775)	VF	
22.		Common Fouring	<i>Ypthima huebneri</i> (Kirby, 1871)	VF	
23.	Acraeinae	Tawny Coster	<i>Acraea violae</i> (Fabricius, 1793)	F	
24.	Heliconinae	Common Leopard	<i>Phalanta phalantha</i> (Drury, 1773)	F	
25.	Limenitinae	Commander	<i>Moduza procris</i> (Cramer, 1777)	F	
26.		Common Sailer	<i>Neptis hylas</i> (Linnaeus, 1758)	F	
27.		Chestnut-streaked Sailer	<i>Neptis jumbah</i> (Moore, 1858)	VF	
28.		Common Baron	<i>Euthalia aconthea</i> (Cramer, 1777)	F	
29.	Biblidinae	Common Castor	<i>Ariadne Ariadne</i> (Linnaeus, 1763)	VF	
30.		Angled Castor	<i>Ariadne merione</i> (Cramer, 1777)	F	
31.	Nymphalinae	Painted Lady	<i>Vanessa cardui</i> (Linnaeus, 1758)	IF	
32.		Blue Pansy	<i>Junonia orithya</i> (Linnaeus, 1758)	R	
33.		Chocolate Pansy	<i>Junonia iphita</i> (Cramer, 1779)	F	
34.		Grey Pansy	<i>Junonia atlites</i> (Linnaeus, 1763)	VF	
35.		Peacock Pansy	<i>Junonia almana</i> (Linnaeus, 1758)	VF	
36.		Lemon Pansy	<i>Junonia lemonias</i> (Linnaeus, 1758)	VF	
37.		Yellow Pansy	<i>Junonia hierta</i> (Fabricius, 1798)	R	
38.		Great Eggfly	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	F	
39.		Danaid Eggfly	<i>Hypolimnas misippus</i> (Linnaeus, 1764)	R	I

	Pieridae (09 genera, 12 species)				
40.	Coliadinae	Common Grass Yellow	<i>Eurema hecabe</i> (Linnaeus, 1758)	VF	
41.		Three-spot Grass Yellow	<i>Eurema blanda</i> (Boisduval, 1836)	F	
42.		Common Emigrant	<i>Catopsilia pomona</i> (Fabricius, 1775)	VF	
43.		Mottled Emigrant	<i>Catopsilia pyrenthe</i> (Linnaeus, 1758)	VF	
44.		Yellow Orange Tip	<i>Ixias pyrene</i> (Linnaeus, 1764)	IF	
45.		Common Wanderer	<i>Pereronia valeria</i> (Cramer, 1776)	F	
46.		Striped Albatross	<i>Appias libythea</i> (Fabricius, 1775)	F	IV
47.		Common Albatross	<i>Appias albina</i> (Boisduval, 1836)	R	II
48.		Indian Cabbage White	<i>Pieris canidia</i> (Linnaeus, 1768)	R	
49.		Common Gull	<i>Cepora nerissa</i> (Fabricius, 1775)	F	II
50.		Common Jezebel	<i>Delias eucharis</i> (Drury, 1773)	F	
51.		Psyche	<i>Leptosia nina</i> (Fabricius, 1793)	VF	
	Lycaenidae (27 genera, 35 species)				
52.	Curetinae	Indian Sunbeam	<i>Curetis thetis</i> (Drury, 1773)	F	
53.	Miletinae	Apefly	<i>Spalgis epius</i> (Westwood, 1852)	F	
54.	Aphnaeinae	Common Silverline	<i>Spindasis vulcanus</i> (Fabricius, 1775)	F	
55.		Scarce-shot Silverline	<i>Spindasis elima</i> (Moore, 1877)	IF	II
56.	Polyommatinae	Ciliate Blue	<i>Anthene emolus</i> (Godart, 1824)	F	
57.		Pointed Ciliate Blue	<i>Anthene lycaenina</i> (Felder, 1868)	F	II
58.		Common Lineblue	<i>Prosotas nora</i> (C. Felder, 1860)	VF	II
59.		Bhutya Lineblue	<i>Prosotas bhutea</i> (de Niceville, 1884)	R	

60.		Tailless Lineblue	<i>Prosotas dubiosa</i> (Semper, 1879)	VF	
61.		Dark Cerulean	<i>Jamides bochus</i> (Stoll, 1782)	F	
62.		Common Cerulean	<i>Jamides celeno</i> (Cramer, 1775)	F	
63.		Forget me not	<i>Catochrysops Strabo</i> (Fabricius, 1793)	F	
64.		Pea blue	<i>Lampides boeticus</i> (Linnaeus, 1767)	IF	II
65.		Zebra Blue	<i>Leptotes plinius</i> (Fabricius, 1793)	IF	
66.		Common Pierrot	<i>Castalius rosimon</i> (Fabricius, 1775)	VF	I
67.		Black-spotted Pierrot	<i>Tarucus balkanicus</i> (Freyer, 1844)	IF	
68.		Striped Pierrot	<i>Tarucus nara</i> (Kollar, 1848)	F	
69.		Dark Grass Blue	<i>Zizeeria karsandra</i> (Moore, 1865)	F	
70.		Lesser Grass Blue	<i>Zizina otis</i> (Fabricius, 1787)	F	
71.		Pale Grass Blue	<i>Pseudozizeeria maha</i> (Kollar, 1844)	VF	
72.		Tiny Grass Blue	<i>Zizula hylax</i> (Fabricius, 1775)	F	
73.		Quaker	<i>Neopithecops zalmora</i> (Butler, 1870)	VF	
74.		Malayan	<i>Megisba malaya</i> (Horsfield, 1828)	F	II
75.		Gram Blue	<i>Euchrysops cnejus</i> (Fabricius, 1798)	F	II
76.		Plains Cupid	<i>Chilades pandava</i> (Horsfield, 1829)	IF	
77.		Lime Blue	<i>Chilades lajus</i> (Stoll, 1780)	F	
78.	Theclinae	Falcate Oakblue	<i>Mabathala ameria</i> (Hewiston, 1862)	F	II
79.		Redspot	<i>Zesius chrysomallus</i> (Hubner, 1819)	R	
80.		Peacock Royal	<i>Tajuria cippus</i> (Fabricius, 1798)	IF	II
81.		Broadtail Royal	<i>Creon cleobis</i> (Godart, 1824)	R	

82.		Yamfly	<i>Loxura atymnus</i> (Stoll, 1780)	IF	
83.		Monkey Puzzle	<i>Rathinda amor</i> (Fabricius, 1775)	F	
84.		Common Guava Blue	<i>Virachola isocrates</i> (Fabricius, 1793)	R	
85.		Slate Flash	<i>Rapala manea</i> (Hewitson, 1863)	VF	
86.		Red Flash	<i>Rapala iarbus</i> (Fabricius, 1787)	F	
Riodinidae (01 genera, 01 species)					
87.	Riodininae	Twospot Plum Judy	<i>Abisara bifasciata</i> (Moore, 1877)	R	
Hesperiidae (17 genera, 18 species)					
88.	Coeliadinae	Common Banded Awl	<i>Hasora chromus</i> (Cramer, 1780)	IF	
89.	Pyrginae	Common Snow Flat	<i>Tagiades japetus</i> (Stoll, 1781)	F	
90.		Indian Skipper	<i>Spialia galba</i> (Fabricius, 1793)	VF	
91.	Hesperiinae	Bush Hopper	<i>Ampittia dioscorides</i> (Fabricius, 1793)	F	
92.		Moore's Ace	<i>Halpe porus</i> (Mabille, 1877)	R	
93.		Chestnut Bob	<i>Iambrix salsala</i> (Moore, 1866)	VF	
94.		Indian Palm Bob	<i>Suastus gremius</i> (Fabricius, 1798)	F	
95.		Tree Flitter	<i>Hyarotis adrastus</i> (Stoll, 1780)	IF	IV
96.		Common Redeye	<i>Matapa aria</i> (Moore, 1866)	F	
97.		Ceylon Swift	<i>Parnara bada</i> (Moore, 1878)	VF	
98.		Evans' Swift	<i>Parnara ganga</i> (Evans, 1937)	R	
99.		Rice Swift	<i>Borbo cinnara</i> (Wallace, 1866)	VF	
100.		Obscure Branded Swift	<i>Pelopidas agna</i> (Moore, 1866)	VF	
101.		Variable Swift	<i>Pelopidas mathias</i> (Fabricius, 1798)	IF	

102.		Common Grass Dart	<i>Taractrocera maeuius</i> (Fabricius, 1793)	R	
103.		Common Dartlet	<i>Oriens gola</i> (Moore, 1877)	VF	
104.		Dark Palm Dart	<i>Telicota bambusae</i> (Moore, 1878)	F	
105.		Plain Palm Dart	<i>Cephrenes acalle</i> (Hopffer, 1874)	IF	
106.		Grass Demon	<i>Udaspes folus</i> (Cramer, 1775)	F	

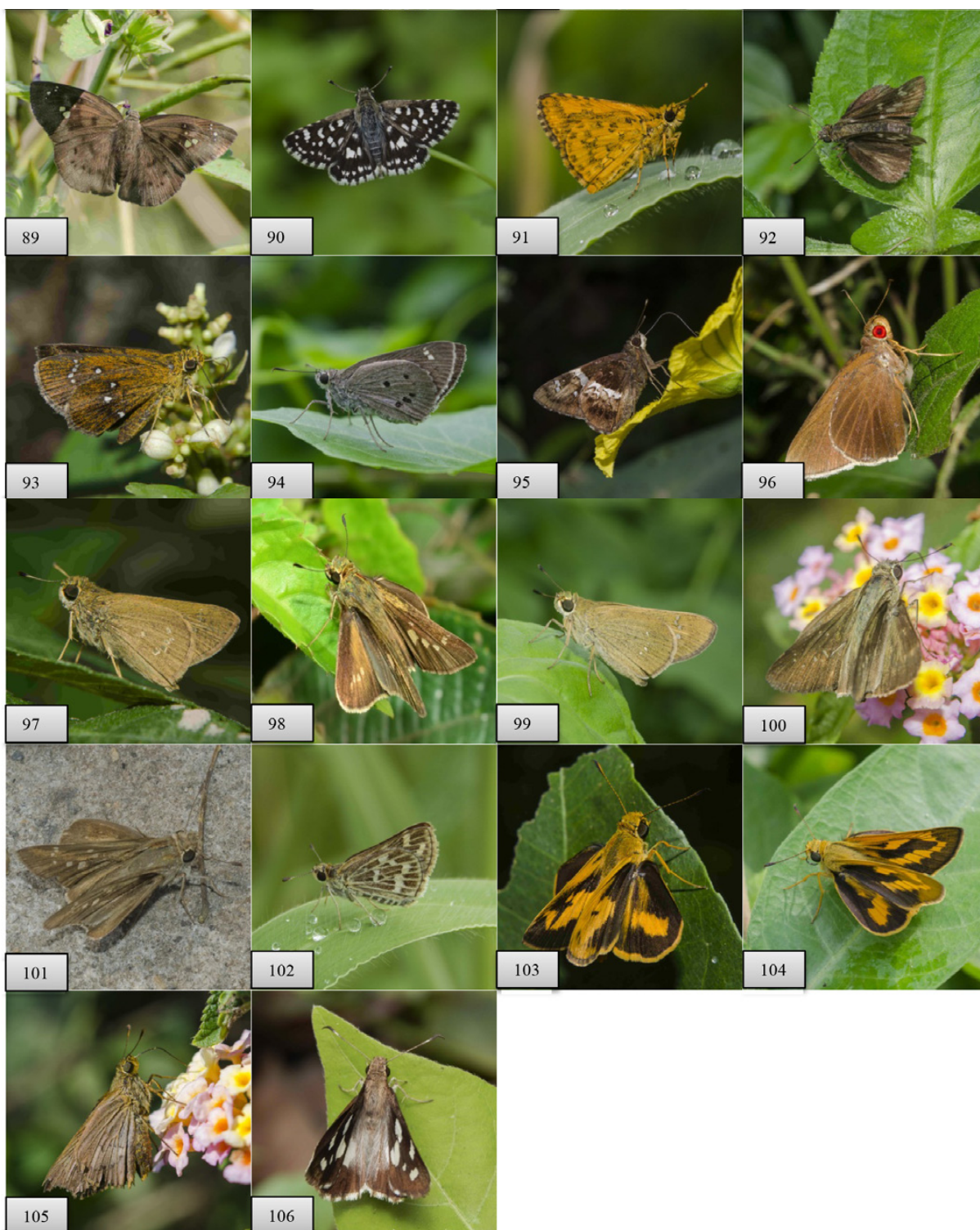
Figure 2: The number on the left of each photograph correspond to the numbering on the species in Table 2.











DISCUSSION

The aforementioned data indicate that this study area is a butterfly hotspot. But this area is increasingly threatened by demographic pressure and the establishment of transport godown, garbage dumping, seasonal picnic, fuel wood extraction, unplanned urbanization which are destroying the biological balance at a very rapid pace. The range extension of *Prosotas bhutea* into southern part of West Bengal highlights the importance of this kind of extensive surveys at un-explored sites. Since the study area harbours several protected species and *Prosotas bhutea*, the importance of conserving the butterfly fauna of this area is highlighted. Also, this species checklist may be used as an ecological indicator of this area.

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