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SHORT COMMUNICATION

A CHECKLIST OF BUTTERFLY FAUNA OF BANKURA TOWN, WEST BENGAL, INDIA

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A checklist of butterfly fauna of Bankura Town, West Bengal, India

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Abstract: The present study on butterflies was conducted in different habitat types in Bankura Town along the banks of Gandheswari and Dwarakeswar rivers for 24 months from January 2017 to December 2018. The results of the study recorded the presence of 1,273 individuals of butterflies belonging to 57 species and 42 genera in six families. The study recorded 20 species of butterflies under Nymphalidae, 14 species under Lycaenidae, 10 species under Pieridae, eight species under Hesperidae, six species under Papilionidae, and only one species under Riodinidae. The present study provides a preliminary report on the butterfly diversity of Bankura Town which in turn may generate awareness among the local people and government about the importance of these essential pollinators and their conservation.

Keywords: Diversity, Dwarakeswar, Gandheswari River, Lepidoptera, Nymphalidae, pollinator, riverside vegetation.

Bankura, the fourth largest district of West Bengal is located in the western part of the state. It covers an area of 6,882km² and is bounded by Paschim Medinipur and Hooghly districts in the east, Purulia District in the west, and Bardhaman District in the north and east. The town is well-connected with its surrounding districts by two state (SH-2, SH-9) and two national highways (NH-14 and NH-314). Two rivers, Gandheswari and Dwarakeswar flow from the north-east to the south-west in courses roughly parallel to one another.

Being very frequent visitors of a wide variety of

flowers, butterflies constitute an effective and potential pollinator group along with other insect pollinators of the world. These beautiful floral visitors contribute to the pollination of more than 75% of the leading global food crops and thereby saving US\$235–577 billion per year (Breeze et al. 2016; Grooten & Almond 2018).

In recent times several authors have reported on the diversity of butterfly population in different ecosystems under many districts of West Bengal (Chowdhury 2014; Mandal 2016; Samanta et al. 2017). No comprehensive report on butterfly diversity from any part of Bankura District, however, has been reported to date. The present study was conducted in the municipality areas of Bankura Town and several villages located near the river banks Gandheswari and Dwarakeswar of Bankura I community development block (Fig.1).

STUDY AREA

Bankura Town (23.25N & 87.07E) with an average elevation of 78m, is located in Bankura District and has a narrow alluvial strip along the lateritic and red soils (Ghosh & Guchhait 2015). Bankura District belongs to a tropical savannah climate that represents a hot summer (April–May), monsoon (June–September) and winter (November–February). The town experiences a hot and

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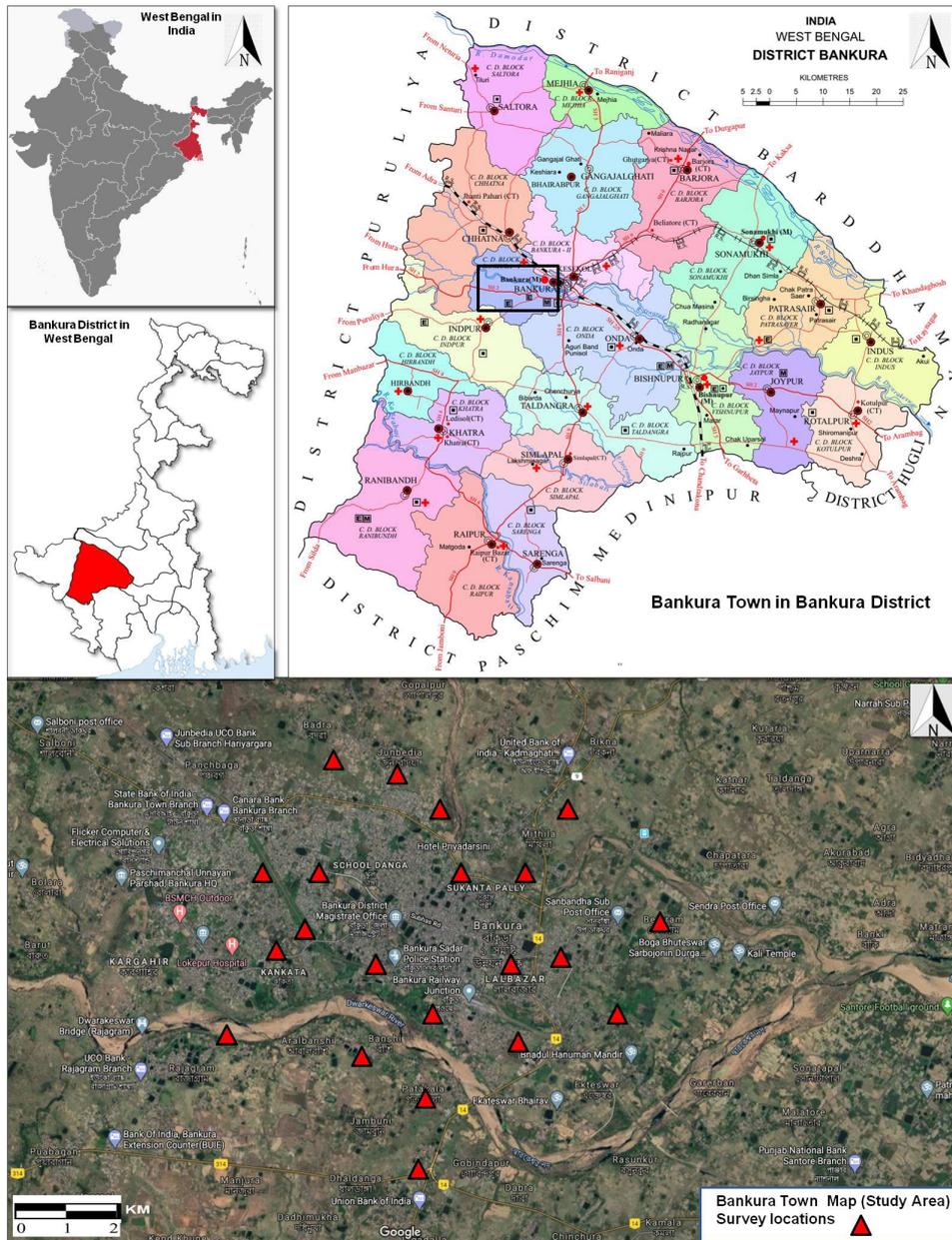


Figure 1. Geographical location of the study area: Bankura Town and adjoining areas (Map data: India and West Bengal from Wikipedia; Bankura District from Census of India 2011, Govt of India; Bankura Town @2019 Google).

humid weather except during the three months of winter. In summer the temperature rises to a maximum of 48°C and in winter the temperature barely goes below 7°C. Relative humidity is generally high throughout the year.

The study area encompasses a heterogeneous landscape characterized by diverse patches of aquatic and terrestrial ecosystems including riverside vegetations of the two rivers, roadside plantations, habitats on railway embankments, grasslands, barren lands, bushes of weeds, gardens, agricultural lands, ponds, two rivers, and different forms of human habitation which ranges from a single settlement to densely populated city areas

(Image 1 and 2).

Riverside vegetation: It includes a wide variety of natural flora of the river basin (e.g., wild sugarcane, *Acacia* sp., *Solanum xanthocarpum*, *Calotropis gigantea*), scrubland (e.g., *Calotropis gigantea*, *Datura metel*, *Justicia adhatoda*) and trees (e.g., *Alstonia scholaris*, *Azadirachta indica*, *Terminalia arjuna*, *Ficus benghalensis*) along the riverbanks, agro-ecosystems (e.g., paddy field and other crop plants) and plantations by human habitations (e.g., *Carica papaya*, *Cocos nucifera*, *Moringa oleifera*, *Psidium guajava*).

Roadside plantations: These are characterized by



Image 1. Dwarakeswar River and adjoining areas near Bankura Town, one of the study sites. © Ananya Nayak.



Image 2. Gandheswari River and adjoining areas near Bankura Town. © Ananya Nayak

distinct vegetation assemblages dominated by weedy plant species (e.g., *Argemone mexicana*, *Cuscuta reflexa*, *Lantana camara*, *Parthenium hysterophorus*) and other trees like *Albizia lebbek*, *Azadirachta indica*, *Bombax ceiba*, *Borassus flabellifer*, *Butea monosperma*, *Cassia fistula*, *Phoenix sylvestris*, *Tamarindus indica*, *Acacia auriculiformis*, and *Eucalyptus tereticornis*.

Railway embankments: These artificial habitats around the railway tracks harbour species-rich plant communities including various flowering plants and invasive plant species (e.g., *Parthenium hysterophorus*, *Lantana camara*, *Hyptis suaveolens*) that constitute an important part of biodiversity in the urban landscape.

Home garden: These habitats are represented by several ornamental plants (e.g., *Catharanthus roseus*, *Chrysanthemum indicum*, *Clitoria ternatea*, *Combretum indicum*, *Hibiscus rosa-sinensis*, *Ixora coccinea*, *Rosa* sp., *Tagetes erecta*, *T. patula*) and a number of common ethnomedicinal and fruit plants (e.g., *Aloe barbadensis*, *Ocimum sanctum*, *Mentha spicata*, *Annona squamosa*, *Mangifera indica*, *Punica granatum*, *Psidium guajava*)

Open grassland: These are naturally occurring areas where the vegetation is dominated by different types of grasses along with sedges and other herbaceous plants. Most of the abandoned agricultural lands near Bankura Town are examples of this type of habitat.

Some of the places that were visited for data collection are Palastola, Bhairabsthan, Krishi Vaban, Machantala, Satighat, Kenduadihi, Junbedia, Arabindanagar, Nutanchati, Lalbazar, Lokepur, Gobindanagar, Katjuridanga, Keranibandh, Kesiakole, Pratapbagan, Kamrarmath, Doltala, Dhaldanga, Heavy More, Sanbandha, Railway station and five kilometres along the railroad that traverse the town. Besides these several villages in the suburban areas of the town and the river banks were also visited.

METHODS

Bankura Town was surveyed for 24 months between January 2017 and December 2018. In order to estimate the number of individuals of each butterfly species and to record all the species each study site was visited twice a month and more than four hours were spent at each site from dawn to dusk.

Butterfly counts were done from 10.00h to 15.00h, using binoculars (Olympus 10×50) and species were identified and counted. Most of them were photographed using DSLR Camera with zoom lens to support further identification. Butterflies were identified based on physical features with the help of field guides and reference books viz. (Kehimkar 2016; Shihan 2016;

Kasambe 2018) and previously published works (viz., Sondhi et al. 2013; Chowdhury 2014; Mandal 2016; Samanta et al. 2017) and website on Indian butterflies (ifoundbutterflies.org). Surveys were conducted in all possible types of butterfly habitats mentioned in the study area. The study has classified the encounter rates of each species in four groups- Very Common (number observed >30), Common (15–30), Uncommon (8–14), and Rare (1–7). We analysed our data with Microsoft Office Excel, 2010. None of the species was captured or killed during the entire period of the study.

RESULTS

The present study has observed a total of 1,273 butterflies belonging to 57 species and 42 genera in different habitats of Bankura Town and adjoining areas (Images 3–8). The results showed that Nymphalidae was the most abundant family followed by Lycaenidae, Pieridae, Papilionidae, Hesperidae and the least abundant family, Riodinidae (Fig. 2). The study has observed 12 genera and 20 species under the family Nymphalidae, 14 genera and 14 species under the family Lycaenidae, six genera and 10 species under the family Pieridae, six genera and six species under the family Hesperidae, three genera and six species under the family Papilionidae and only one species under the family Riodinidae (Table 1). Depending on the occurrence of these species during the study period they can be grouped into four broad classes namely very common, common, uncommon, and rare. The study found 12 very common, 31 common, eight uncommon and six rare species of butterflies in the study area (Table 2). The most abundant species encountered in the study was Common Castor *Ariadne merione* (Cramer, 1777) followed by Common Evening Brown *Melanitis leda* (Linnaeus, 1758), Plain Tiger *Danaus chrysippus* (Linnaeus, 1758), Common Emigrant *Catopsilia pomona* (Fabricius, 1775), Psyche *Leptosia nina* (Fabricius, 1793), and Grey Pansy *Junonia atlites* (Linnaeus, 1763). The study, however, has also been able to detect the presence of some of the rare butterfly species of southern Bengal like Purple Leaf Blue *Amblypodia anita* (Hewitson, 1862), Plum Judy *Abisara echerius* (Stoll, 1790), Apefly *Spalgis epius* (Westwood, 1851), Common Tit *Hypolycaena erylus* (Godart, 1824), Common Baron *Euthalia aconthea* (Cramer, 1777), and Slate Flash *Rapala manea* (Hewitson, 1863). The study has also tried to assess the habitat-wise occurrence of these species in the total study area. The highest number of species was observed in the riverside vegetations followed by roadside plantations, railway embankments, home gardens and open grasslands (Fig.

Table 1. Subfamily-wise diversity of the butterflies of Bankura town and adjoining areas.

Family	Subfamily	Number of Genera	Number of Species
Hesperiidae	Hesperiinae	6	6
Papilionidae	Papilioninae	3	6
Pieridae	Coliadinae	2	6
	Pierinae	4	4
Lycaenidae	Theclinae	4	4
	Polyommatae	9	9
	Miletinae	1	1
Nymphalidae	Danainae	2	3
	Satyrinae	3	5
	Heliconiinae	2	2
	Limenitinae	2	2
	Biblidinae	1	2
	Nymphalinae	2	6
Riodinidae	Nemeobiinae	1	1
Total: 6	14	42	57

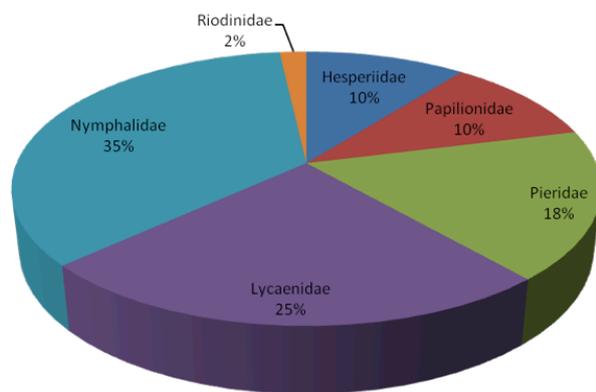


Figure 2. Family-wise abundance of butterflies found in and around Bankura Town.

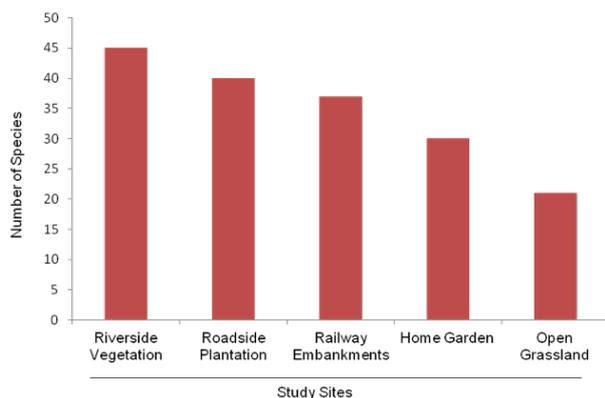


Figure 3. Habitat-wise abundance of butterfly species found in and around Bankura Town.

3). A total of 45 species were recorded from different types of habitats near the river banks of Gandheswari and Dwarakeswar rivers (data not shown). These rivers are rain-fed followed by the drying up to a perennial stream throughout the cold and hot seasons. The maximum habitat diversity of the riverine landscape encompassing the town, may be a key factor behind the existence of a large number of butterfly species in these regions. The study has observed a large number of species in different habitats along roadsides. A number of main roads including national and state highways have passed through the town with a wide range of habitats harbouring these species. A large number of species besides the railway track were recorded. Railway embankments, built of crushed stone or different sized gravel, are linear habitats that are warmer at the top of the embankment and colder and wetter at the bottom (Moroñ et al. 2014). The study also noticed that the density of some of the species was much more in these man-made altered ecosystems having a higher number of natural vegetations that serve as host plants for these species. This observational evidence is also consistent with some of the studies reported earlier (Moroñ et al. 2014; Kalarus & Bąkowski 2015). This can be explained by the fact that the railway track encompasses an area containing numerous nectar plants that thrive there in an undisturbed landscape without human intervention for a long time.

DISCUSSION

Bankura District like some other southern Bengal districts has an almost entirely tropical climate. Most of the flowering plants essential for human nutrition and survival are pollinated by insects and other animals. Studies have shown that the proportion of animal-pollinated wild plant species rises from an average of 78% in temperate-zone communities to 94% in tropical communities (Ollerton et al. 2011; Grooten & Almond 2018). The role of butterflies as a pollinator is more important in a drought prone district like Bankura where chances of pollination may make the difference between a good and poor production of some of the principal crops of the area.

In the process of rapid urbanization several species have lost their habitats. For example, this study has revealed that a number of butterflies prefer their host plants as bushy weeds which are annihilated during the course of building construction or other processes of urbanization. The study has noticed similar destruction of the host plants during the process of trenching and widening of shallow Gandheswari River near Satighat

Table 2. Detailed checklist of the butterflies of Bankura Town and adjoining areas.

	Scientific name	English name	Relative Abundance	Number of individuals Observed	Schedule Species -WPA, 1972
Family: Hesperidae					
Subfamily: Hesperinae					
1	<i>Parnara</i> sp.		Common	18	
2	<i>Telicota bambusae</i> (Moore, 1878)	Dark Palm Dart	Very Common	39	
3	<i>Udaspes folus</i> (Cramer, 1775)	Grass Demon	Common	19	
4	<i>Suastus gremius</i> (Fabricius, 1798)	Indian Palm Bob	Common	24	
5	<i>Borbo cinnara</i> (Wallace, 1866)	Rice Swift	Common	21	
6	<i>Pelopidas mathias</i> (Fabricius, 1798)	Small Branded Swift	Common	28	
Family: Papilionidae					
Subfamily: Papilioninae					
7	<i>Graphium doson</i> (Felder & Felder, 1864)	Common Jay	Uncommon	14	
8	<i>Papilio demoleus</i> (Linnaeus, 1758)	Common Lime	Common	28	
9	<i>Papilio clytia</i> (Linnaeus, 1758)	Common Mime	Common	13	
10	<i>Papilio polytes</i> (Linnaeus, 1758)	Common Mormon	Common	23	
11	<i>Graphium agamemnon</i> (Linnaeus, 1758)	Tailed Jay	Common	17	
12	<i>Pachliopta aristolochiae</i> (Fabricius, 1775)	Common Rose	Common	19	
Family: Pieridae					
Subfamily: Coliadinae					
13	<i>Catopsilia pomona</i> (Fabricius, 1775)	Common Emigrant	Very Common	44	
14	<i>Eurema hecabe</i> (Linnaeus, 1758)	Common Grass Yellow	Very Common	32	
15	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	Mottled Emigrant	Common	29	
16	<i>Eurema andersonii</i> (Moore, 1886)	One-spot Grass Yellow	Uncommon	14	
17	<i>Eurema brigitta</i> (Stoll, 1780)	Small Grass Yellow	Common	16	
18	<i>Eurema blanda</i> (Boisduval, 1836)	Three-Spot Grass Yellow	Uncommon	12	
Subfamily: Pierinae					
19	<i>Cepora nerissa</i> (Fabricius, 1775)	Common Gull	Very Common	31	
20	<i>Pareronia hippia</i> (Fabricius, 1787)	Common Wanderer	Common	27	
21	<i>Leptosia nina</i> (Fabricius, 1793)	Psyche	Very Common	41	
22	<i>Appias libythea</i> (Fabricius, 1775)	Striped Albatross	Common	23	Sch IV
Family: Lycaenidae					
Subfamily: Theclinae					
23	<i>Spindasis vulcanus</i> (Fabricius, 1775)	Common Silverline	Uncommon	8	
24	<i>Hypolycaena erylus</i> (Godart, 1824)	Common Tit	Rare	6	
25	<i>Amblypodia anita</i> (Hewitson, 1862)	Purple Leaf Blue	Rare	5	
26	<i>Rapala manea</i> (Hewitson, 1863)	Slate Flash	Rare	7	
Subfamily: Polyommatae					
27	<i>Jamides celeno</i> (Cramer, 1775)	Common Cerulean	Uncommon	11	
28	<i>Castalius rosimon</i> (Fabricius, 1775)	Common Pierrot	Very Common	31	
29	<i>Zizeeria karsandra</i> (Moore, 1865)	Dark Grass Blue	Common	27	
30	<i>Catochrysops strabo</i> (Fabricius, 1793)	Forget-Me-Not	Common	24	
31	<i>Zizina otis</i> (Fabricius, 1787)	Lesser Grass Blue	Common	27	
32	<i>Chilades lajus</i> (Stoll, 1780)	Lime Blue	Common	26	
33	<i>Tarucus balkanicus</i> (Freyer, 1844)	Little Tiger Pierrot	Uncommon	12	

	Scientific name	English name	Relative Abundance	Number of individuals Observed	Schedule Species -WPA, 1972
34	<i>Pseudozizeeria maha</i> (Kollar, 1844)	Pale Grass Blue	Uncommon	14	
35	<i>Tarucus nara</i> (Kollar, 1848)	Striped Pierrot	Uncommon	12	
Subfamily: Miletinae					
36	<i>Spalgis epius</i> (Westwood, 1851)	Apefly	Rare	6	
Family: Nymphalidae					
Subfamily: Danainae					
37	<i>Euploea core</i> (Cramer, 1780)	Common Crow	Common	25	
38	<i>Danaus chrysippus</i> (Linnaeus, 1758)	Plain Tiger	Very Common	44	
39	<i>Danaus genutia</i> (Cramer 1779)	Striped Tiger	Common	21	
Subfamily: Satyrinae					
40	<i>Mycalesis perseus</i> (Fabricius, 1775)	Common Bushbrown	Very Common	33	
41	<i>Melanitis leda</i> (Linnaeus, 1758)	Common Evening Brown	Very Common	48	
42	<i>Elymnias hypermnestra</i> (Linnaeus, 1763)	Common Palmfly	Common	15	
43	<i>Melanitis phedima</i> (Cramer, 1780)	Dark Evening Brown	Common	19	
44	<i>Mycalesis mineus</i> (Linnaeus, 1758)	Dark-branded Bushbrown	Common	17	
Subfamily: Heliconiinae					
45	<i>Phalanta phalantha</i> (Drury, 1773)	Common Leopard	Common	19	
46	<i>Acraea terpsicore</i> (Linnaeus, 1758)	Tawny Coster	Common	18	
Subfamily: Limenitidinae					
47	<i>Euthalia aconthea</i> (Cramer, 1777)	Common Baron	Rare	6	
48	<i>Neptis hylas</i> (Linnaeus, 1758)	Common Sailer	Common	20	
Subfamily: Biblidinae					
49	<i>Ariadne ariadne</i> (Linnaeus, 1763)	Angled Castor	Very Common	33	
50	<i>Ariadne merione</i> (Cramer, 1777)	Common Castor	Very Common	55	
Subfamily: Nymphalinae					
51	<i>Junonia orithya</i> (Linnaeus, 1758)	Blue Pansy	Common	15	
52	<i>Junonia iphita</i> (Cramer, 1779)	Chocolate Pansy	Common	17	
53	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Great Eggfly	Common	20	
54	<i>Junonia atlites</i> (Linnaeus, 1763)	Grey Pansy	Very Common	40	
55	<i>Junonia lemonias</i> (Linnaeus, 1758)	Lemon Pansy	Common	28	
56	<i>Junonia almana</i> (Linnaeus, 1758)	Peacock Pansy	Common	27	
Family: Riodinidae					
Subfamily: Nemeobiinae					
57	<i>Abisara echerius</i> (Stoll, 1790)	Plum Judy	Rare	5	

WPA, 1972—Wildlife Protection Act (1972).

of Bankura Town. In recent times several unauthorized constructions on Gandheswari river banks have also resulted in a rapid decline of a number of native flora, essential for the survival of some butterfly species. Rapid urbanization of both the river bank areas is a leading cause for the production of massive amounts of household and industrial wastes which in turn causes pollution of the riverbank soil and vegetations.

Another matter of concern regarding loss of

butterfly diversity was observed in Dwarakeswar River. Unauthorized excessive instream sand mining has resulted in the partial or complete destruction of the river bed which in turn causes the erosion of the river banks leading to increased flooding and causing a severe threat to butterfly host plants and affect riverine ecology.

Although known for its dry and drought areas, in the past few years several places of Bankura have experienced a tremendous flood situation and the flood



Image 3. Butterflies representing the family HesperIIDae in and around Bankura Town: a—*Parnara* sp. | b&c—*Telicota bambusae* | d—*Udaspes folus* | e—*Suastus gremius* | f—*Borbo cinnara* | g&h—*Pelopidas mathias*. © Ananya Nayak.

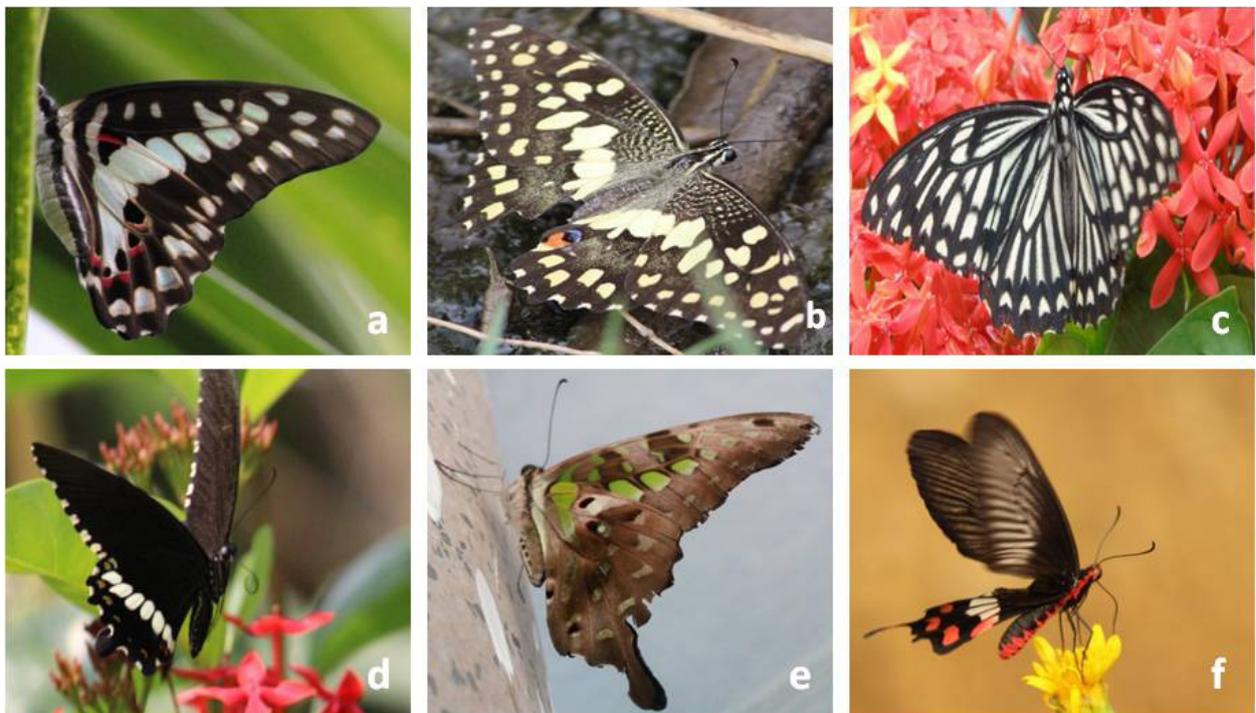


Image 4. Butterflies representing the family Papilionidae in and around Bankura Town: a—*Graphium doson* | b—*Papilio demoleus* | c—*Papilio clytia* | d—*Papilio polytes* | e—*Graphium agamemnon* | f—*Pachliopta aristolochiae*. © Ananya Nayak.

season occurs during the months of June, July, August and September. Generally, it happens during the months of July and August. Sudden cloudbursts and shallow riverbeds of Dwarakeswar and Gandheswari are the two major causes of this flood situation. In most of the places including Bankura town it does not last long. But when the flood comes, it destroys a large part of the biodiversity

particularly in the ecosystems of the river banks leading to an annihilation of a large number of flora and fauna.

CONCLUSION

The investigations presented in this study address several significant and previously unreported aspects of butterfly population and their diversity in the study

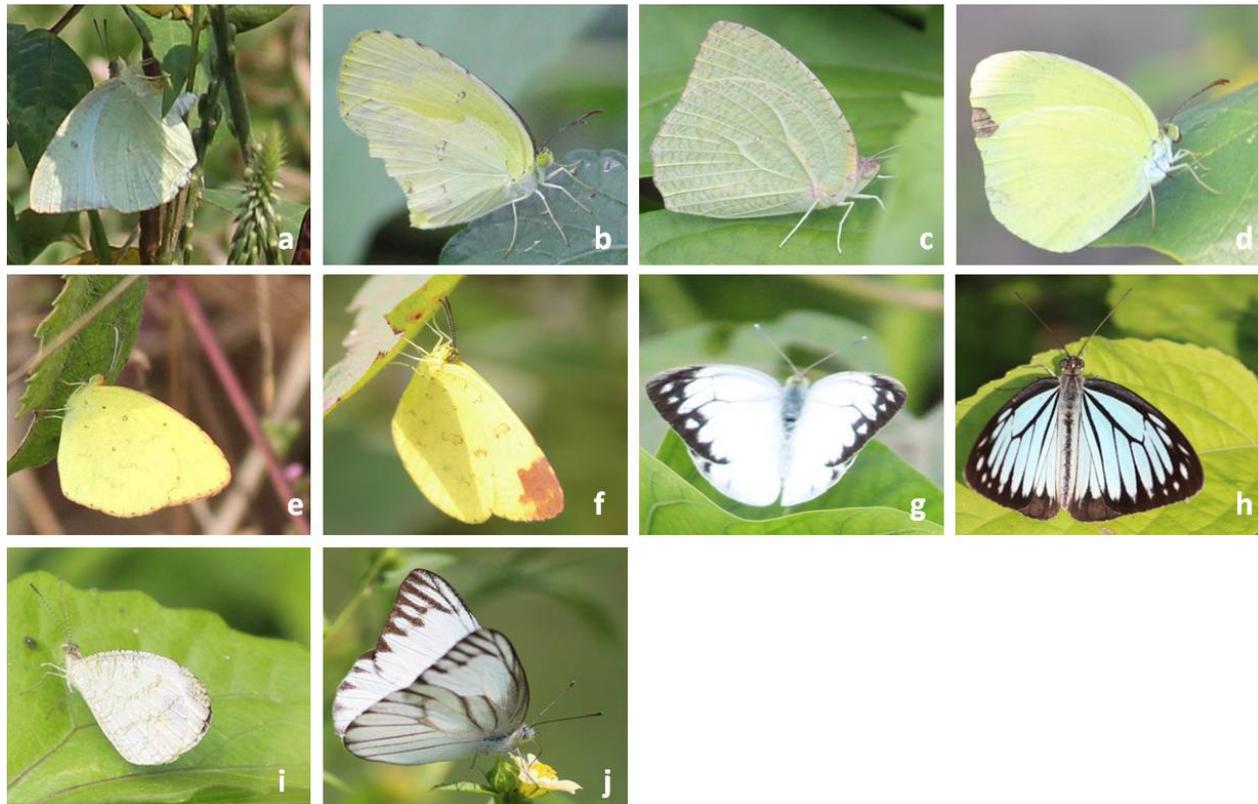


Image 5. Butterflies representing the family Pieridae in and around Bankura Town: a—*Catopsilia pomona* | b—*Eurema hecabe* | c—*Catopsilia pyranthe* | d—*Eurema andersonii* | e—*Eurema brigitta* | f—*Eurema blanda* | g—*Cepora nerissa* | h—*Pareronia hippia* | i—*Leptosia nina* | j—*Appias libythea*. © Ananya Nayak.

area. The present study also identified a number of anthropogenic factors which directly or indirectly cause destruction or alteration of the natural habitat. The study was conducted in a very small area in comparison to the whole district. More surveys and research are needed to unveil the actual status of butterfly diversity in other parts of the district with a vast range of landscapes. This in turn will deepen our understanding of their conservation status and will help us to stop and reverse the decline of many insect species and create a healthier environment.

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Image 6. Butterflies representing the family Lycaenidae in and around Bankura Town: a—*Spindasis vulcanus* | b—*Hypolycaena erylus* | c—*Amblypodia anita* | d—*Rapala manea* | e&f—*Jamides celeno* | g—*Castalius rosimon* | h—*Zizeeria karsandra* | i—*Catochrysops strabo* | j—*Zizina otis* | k—*Chilades lajus* | l—*Tarucus balkanicus* | m—*Pseudozizeeria maha* | n—*Tarucus nara* | o—*Spalgis epius*. © Ananya Nayak.



Image 7. Butterfly representing the family Riodinidae in and around Bankura Town: *Abisara echerius*. © Ananya Nayak.



Image 8. Butterflies representing the family Nymphalidae in and around Bankura Town: a—*Euploea core* | b—*Danaus chrysippus* | c—*Danaus genutia* | d—*Mycalesis perseus* | e—*Melanitis leda* | f—*Elymnias hypermnestra* | g—*Melanitis phedima* | h—*Mycalesis mineus* | i—*Phalanta phalantha* | j—*Acraea terpsicore* | k—*Euthalia aconthea* | l—*Neptis hylas* | m—*Ariadne ariadne* | n—*Ariadne merione* | o—*Junonia orithya* | p—*Junonia iphita* | q—*Hypolimnys bolina* | r—*Junonia atlites* | s—*Junonia lemonias* | t—*Junonia almana*. © Ananya Nayak.





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