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SHORT COMMUNICATION

OBSERVATIONS ON BUTTERFLIES OF NON-PROTECTED AREAS OF TITABAR, ASSAM, INDIA

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Observations on butterflies of non-protected areas of Titabar, Assam, India

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Abstract: This paper depicts the result of two years study from 2014 to 2016 in non-protected areas on butterflies of Titabar (26.588 N & 94.187 E), Assam, India. During the study period, a total of 158 species of butterflies distributed in six families were recorded, out of which 29 belong to the family Hesperidae, 17 to Pieridae, 11 to Papilionidae, 38 to Lycaenidae, two to Riodinidae, and 61 to Nymphalidae. Fourteen 'rare' species were recorded during the survey as per Evans (1932) such as *Athyma ranga*, *Arhopala paraganesa*, *Caltois cormasa*, and *Appias nero*. This indicates the importance of the study and the need for conservation of butterflies of non-protected area of Titabar subdivision in upper Assam.

Keywords: Conservation, diversity, Jorhat District, Lepidoptera, northeastern India, species.

Upper Assam, a biodiversity rich zone of the northeastern region is well known for butterflies, having over 400 species of which 1/3rd are endemic and 1/7th are protected under various schedules of the Wildlife (Protection) Act 1972 in India (Singh 2017). Notable works have been done in Panbari Reserve Forest (RF), Kaziranga-Karbi hills (Gogoi 2013b, 2015), Jeypore RF, Dehing-Patkai (Gogoi 2013), Gibbon Wildlife Sanctuary (WS) (Singh et al. 2015), Dangori RF (Boruah & Das 2017), and floodplains of Dibru Soikhuwa NP (Das et al.

2017) in upper Assam. Along with the protected areas (PA), other non PAs like different forests and village woodlands of Assam also provide habitat for different butterfly species. But due to anthropogenic pressures these non PAs are declining in number thus affecting tiny creatures like butterflies.

Doubleday (1865) worked on the butterflies of Jorhat District. Recently, Singh et al. (2015) and Neog (2015) listed the butterflies of Gibbon WS which is the only PA of Titabar subdivision, and Bhuyan et al. (2005) documented the butterflies of the Regional Research Laboratory Campus of Jorhat. Again Saikia et al. (2014) studied the butterfly diversity of the Sericultural Training Institute Campus of Titabar and Dutta (2013) recorded 40 species from Titabar Town area. Our study hasn't included the Gibbon WS. Emphasis has been made to document the butterfly diversity of non PAs of Titabar subdivision to show the significance of non PAs especially in upper Assam and their importance in butterfly conservation in the region.

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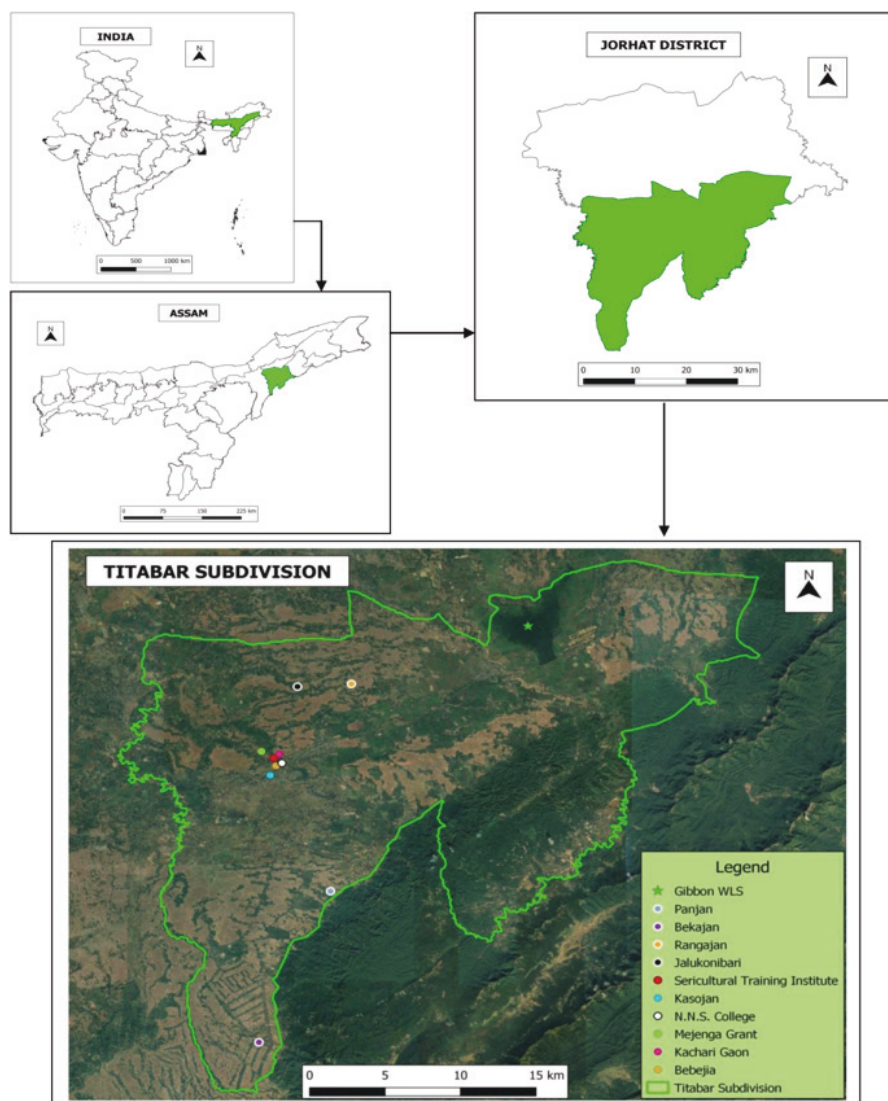


Figure 1. Map of Titabar subdivision showing the study locations.

METHODS

Study Area

Titabar subdivision (26.588 N & 94.187 E) is located in Jorhat District of Upper Assam. To the north of Titabar lies the Jorhat subdivision, the south is bordered by Nagaland, Sivasagar District is located in the east, and the west is bordered by Golaghat District. Titabar subdivision consists of two revenue circles: Titabar and Mariani. The altitude of Titabar is 172m above sea level, while the average temperature ranges from 17–28°C, the average humidity is in the range of 66.5–89.9% and the annual rainfall of the study area is 250cm. The climate here is humid in summer and dry and cold in winter. Titabar has one wildlife sanctuary, the Hollongapar Gibbon WS under Mariani revenue circle. The survey was conducted in 10 different places in Titabar-Nanda Nath Saikia College Campus (26.588 N & 94.177 E),

Sericultural Training Institute (26.592 N & 94.172 E), Bebejia (26.586 N & 94.173 E), Kachari Gaon (26.595 N & 94.175 E), Kasojan (26.58 N & 94.17 E), Mejenga Grant (26.597 N & 94.164 E), Bekajan (26.384 N & 94.162 E), Panjan (26.495 N & 94.21 E), Jalukonibari (26.645 N & 94.188 E), Rangajan (26.646 N & 94.223 E).

Survey methods

The survey of butterfly species was conducted in all the major seasons, i.e., pre-monsoon, monsoon, post-monsoon, and winter. The survey involved walking through different sites and visual search and photography were conducted on different forest trails, hill streams, village woodlands, grasslands, croplands, and tea gardens between 08.00 and 14.00 hr from May 2014 to June 2016. Some species were also recorded in the early mornings and evenings. The species were

photographed with a digital camera whenever possible.

Identification of all encountered butterflies was done to the species level. Though a few species were identified in the field, most of the species were identified from digital images taken with the camera in the field. The identification of butterflies was done by using the identification guides of Watson (1897), Evans (1932), Kehimkar (2008), research papers of Gogoi (2013b), Gogoi (2015), and Singh et al. (2015). No butterflies were caught with net or other equipment for identification.

RESULTS AND OBSERVATIONS

During the study period, a total of 158 species of butterflies were identified belonging to six families from the non PAs of Titabar subdivision. Out of the 158 species identified, Nymphalidae showed the maximum species richness, comprising 38.60% with 61 species, followed by Lycaenidae 24.05% with 38, Hesperidae 18.35% with 29, Pieridae 10.75% with 17, Papilionidae 6.96% with 11, and Riodinidae 1.26% with two species (Table 1, 2).

Twenty species found during the survey are new records for Titabar subdivision as they have not been recorded earlier by either Singh et al. (2015) or Neog (2015) from Gibbon WS. These are *Tirumalaseptentrionis*, *Elymnias malelas*, *Lexias pardalis*, *Pseudergolis wedah*, *Eurema brigitta*, *Appias nero*, *Curetis saronis*, *Iraota timoleon*, *Charana mandarinus*, *Arhopala paraganesa*, *Arhopala oenea*, *Caleta roxus*, *Taraka hamada*, *Bibasis jaina*, *Tagiades menaka*, *Pseudoborbo bevani*, *Halpe porus*, *Potanthus ganda*, *Telicota colon*, and *Caltoris cormasa*.

The species which have not been recorded by Singh et al. (2017) from eastern Assam found during the survey are *Elymnias malelas*, *Lexias pardalis*, *Pseudergolis wedah*, *Eurema brigitta*, *Appias nero*, *Charana mandarinus*, *Iraota timoleon*, *Arhopala paraganesa*, *Arhopala oenea*, *Caleta roxus*, *Tagiades menaka*, and *Telicota colon*.

Findings like *Arhopala oenea*, *Arhopala paraganesa*, *Appias nero*, and *Telicota colon* are significant as these species have not been recorded in recent times from the PAs of upper Assam by Gogoi (2013b, 2015), Neog (2015), Singh et al. (2015), Baruah & Das (2017), Singh (2017), and Das et al. (2017).

Fourteen species found during the survey are “rare” in occurrence as per Evans (1932). These are *Mycalesis malasarida*, *Athyma ranga*, *Neptis namba*, *Euthalia anosia*, *Appias albino*, *Appias libythea*, *Appias nero*, *Arhopala silhetensis*, *Arhopala bazaloises*, *Arhopala paraganesa*, *Arhopala oenea*, *Caltoris cormasa*,

Table 1. Overview of taxonomic diversity of butterflies of the Titabar subdivision.

Family	Number of subfamily	Number of genera	Number of species
Nymphalidae	10 (43.47%)	38 (35.18%)	61 (38.60%)
Papilionidae	1 (4.34%)	4 (3.70%)	11 (6.96%)
Pieridae	2 (8.69%)	9 (8.33%)	17 (10.75%)
Lycaenidae	6 (26.08%)	30 (27.77%)	38 (24.05%)
Riodinidae	1 (4.34%)	2 (1.85%)	2 (1.26%)
Hesperidae	3 (13.04%)	25 (23.14%)	29 (18.35%)
TOTAL: 6	23 (100%)	108 (100%)	158 (100%)

Doleschallia bisaltide, and *Iraota timoleon*. Twenty-two species found during the study are protected under various schedules of the Indian Wildlife (Protection) Act, 1972 (Schedule I—1 species, Schedule II—17 species, Schedule IV—4 species); however, results indicate poor habitat of butterflies in non PAs of Titabar as only 11 papilionids were recorded during the survey whereas 19 species of papilionids were recorded by Singh et al. (2015) from Gibbon WS.

Notes on ‘rare’ (Evans 1932) occurrence of the species

Plain Bushbrown *Mycalesis malsarida* Butler, 1868

One individual was encountered in a dense woodland in Bebejia on 28 October 2014 in the morning. In India, it is found only in the northeastern region. Except India it is recorded from Bangladesh (Larsen 2004), Bhutan, and Myanmar (Kehimkar 2016). We also encountered one individual from Gibbon WS in September, 2015. The species is protected under Schedule II of IOWPA, 1972.

Yellow Sailer *Neptis namba* Moore, 1858: Two individuals were encountered during the study period. One was recorded from Bebejia on 26 August 2014 in the morning and the other from Rangajan on 10 July 2015 in the afternoon. Both the individuals were encountered on a village road.

Blackvein Sergeant *Athyma ranga* Moore, 1858: One individual of this species was encountered from the Sericulture Training Institute campus on 15 March 2015 in the morning. The species ranges from Nepal to northeastern India, northeastern Bangladesh, and Myanmar. It is protected under Schedule II of IOWPA, 1972.

Grey Baron *Euthalia anosia* Moore, 1858: One individual was encountered mud puddling on a road surrounded by woodland in Jalukonibari on 28 October 2014. Protected under Schedule II of IOWPA, 1972. In India the species is restricted to the northeastern region

Table 2. List of butterflies recorded in Titabar, Jorhat, Assam during the study period (May 2014–June 2016).

Common name	Scientific name	Status (Evans, 1932)	IWPA, 1972
Family Nymphalidae			
Subfamily Danainae			
1. Striped Tiger	<i>Danaus genutia</i> Cramer, 1779	VC	
2. Plain Tiger	<i>Danaus chrysippus</i> Linnaeus, 1758	VC	
3. Glassy Tiger	<i>Parantica aglea</i> Stoll, 1782	C	
4. Common Crow	<i>Euploea core</i> Cramer, 1780	C	
5. Dark Blue Tiger	<i>Tirumala septentrionis</i> Butler, 1874	NR	
6. Striped Blue Crow	<i>Euploea mulciber</i> Cramer, 1777	C	Schedule IV
7. Magpie Crow	<i>Euploea radamanthus</i> Fabricius, 1793	NR	
Subfamily Morphinae			
8. Common Duffer	<i>Discophora sondaica</i> Boisduval, 1836	C	
9. Common Faun	<i>Faunis canens</i> Huebner, 1826	C	
10. Jungle Glory	<i>Thaumantis diores</i> Doubleday, 1845	NR	
Subfamily Charaxinae			
11. Tawny Rajah	<i>Charaxes bernardus</i> Fabricius, 1793	C	
12. Common Nawab	<i>Polyura athamas</i> Drury, 1773	C	
Subfamily Satyrinae			
13. Angled Red Forester	<i>Lethe chandica</i> Moore, 1858	NR	
14. Bamboo Treebrown	<i>Lethe europa</i> Fabricius, 1775	NR	
15. Common Fivering	<i>Ypthima baldus</i> Fabricius, 1775	VC	
16. Common Bushbrown	<i>Mycalesis perseus</i> Fabricius, 1775	VC	
17. Plain Bushbrown	<i>Mycalesis malsarida</i> Butler, 1868	R	Schedule II
18. Whitebar Bushbrown	<i>Mycalesis anaxias</i> Hewitson, 1862	NR	Schedule II
19. Dark Brand Bushbrown	<i>Mycalesis mineus</i> Linnaeus, 1758	VC	
20. Common Evening Brown	<i>Melanitis leda</i> Linnaeus, 1758	VC	
21. Dark Evening Brown	<i>Melanitis phedima</i> Cramer, 1780	C	
22. Common Palmfly	<i>Elymnias hypermnestra</i> Linnaeus, 1763	C	
23. Spotted Palmfly	<i>Elymnias malelas</i> Hewitson, 1863	NR	
24. Tiger Palmfly	<i>Elymnias nesae</i> Linnaeus, 1764	NR	
Subfamily Heliconinae			
25. Common Leopard	<i>Phalanta phalantha</i> Drury, 1773	C	
26. Cruiser	<i>Vindula erota</i> Fabricius, 1793	NR	
27. Large Yeoman	<i>Cirrochroa aoris</i> Doubleday, 1847	NR	
28. Vagrant	<i>Vagrans egista</i> Cramer, 1780	NR	
Subfamily Acraeinae			
29. Leopard Lacewing	<i>Cethosia cyane</i> Drury, 1773	NR	
30. Tawny Coster	<i>Acraea violae</i> Fabricius, 1793	C	
Subfamily Limenitinae			
31. Common Sailer	<i>Neptis hylas</i> Linnaeus, 1758	VC	
32. Yellow Sailer	<i>Neptis namba</i> Tytler, 1915	R	
33. Grey Count	<i>Tanaecia lepidea</i> Butler, 1868	NR	Schedule II
34. Commander	<i>Moduza procris</i> Cramer, 1777	NR	
35. Knight	<i>Lebadea martha</i> Fabricius, 1787	NR	
36. Common Sergeant	<i>Athyma perius</i> Linnaeus, 1758	C	

Common name	Scientific name	Status (Evans, 1932)	IWPA, 1972
37. Blackvein Sergeant	<i>Athyma ranga</i> Moore, 1858	R	Schedule II
38. Staff Sergeant	<i>Athyma selenophora</i> Kollar, 1844	NR	
39. Colour Sergeant	<i>Athyma nefte</i> Cramer, 1780	NR	
40. Common Lascar	<i>Pantoporia hordonia</i> Stoll, 1790	C	
41. Archduke	<i>Lexias pardalis</i> Moore, 1878	NR	
42. Dark Archduke	<i>Lexias dirtea</i> Fabricius, 1793	NR	Schedule II
43. Gaudy Baron	<i>Euthalia lubentina</i> Cramer, 1777	C	Schedule IV
44. Powdered Baron	<i>Euthalia monina</i> Fabricius, 1787	NR	
45. Common Baron	<i>Euthalia aconthea</i> Cramer, 1777	NR	Schedule II
46. Grey Baron	<i>Euthalia anosia</i> Moore, 1858	R	Schedule II
47. Common Earl	<i>Tanaecia julii</i> Lesson, 1837	C	
Subfamily Cyrestinae			
48. Common Map	<i>Cyrestis thyodamas</i> Boisduval, 1846	C	
49. Common Maplet	<i>Chersonesia risa</i> Doubleday, 1848	NR	
50. Tabby	<i>Pseudergolis wedah</i> Kollar, 1848	C	
Subfamily Biblidinae			
51. Common Castor	<i>Ariadne merione</i> Cramer, 1777	C	
52. Angled Castor	<i>Ariadne ariadne</i> Linnaeus, 1763	C	
Subfamily Nymphalinae			
53. Peacock Pansy	<i>Junonia almana</i> Linnaeus, 1758	C	
54. Yellow Pansy	<i>Junonia hierta</i> Fabricius, 1798	C	
55. Grey Pansy	<i>Junonia atlites</i> Linnaeus, 1763	NR	
56. Lemon Pansy	<i>Junonia lemonias</i> Linnaeus, 1758	C	
57. Chocolate Pansy	<i>Junonia iphita</i> Cramer, 1779	C	
58. Great Eggfly	<i>Hypolimnas bolina</i> Linnaeus, 1758	C	
59. Orange Oakleaf	<i>Kallima inachus</i> Boisduval, 1846	NR	
60. Common Jester	<i>Symbrenthia lilaea</i> Moore, 1875	C	
61. Autumn Leaf	<i>Doleschallia bisaltide</i> Cramer, 1777	R	
Family Papilionidae			
Subfamily Papilioninae			
62. Common Jay	<i>Graphium doson</i> C.&R. Felder, 1864	C	
63. Tailed Jay	<i>Graphium agamemnon</i> Linnaeus, 1758	C	
64. Common Mormon	<i>Papilio polytes</i> Linnaeus, 1758	VC	
65. Great Mormon	<i>Papilio memnon</i> Linnaeus, 1758	C	
66. Lime Butterfly	<i>Papilio demoleus</i> Linnaeus, 1758	VC	
67. Common Bluebottle	<i>Graphium sarpedon</i> Linnaeus, 1758	C	Schedule II
68. Common Mime	<i>Papilio clytia</i> Linnaeus, 1758	NR	
69. Yellow Helen	<i>Papilio nephelus</i> Boisduval, 1836	NR	Schedule II
70. Red Helen	<i>Papilio helenus</i> Linnaeus, 1758	C	
71. Common Raven	<i>Papilio castor</i> Westwood, 1842	NR	
72. Golden Birdwing	<i>Troides aeacus</i> C.&R. Felder, 1860	NR	
Family Pieridae			
Subfamily Coliadinae			
73. Small Grass Yellow	<i>Eurema brigitta</i> Stoll, 1780	VC	
74. Common Grass Yellow	<i>Eurema hecabe</i> Linnaeus, 1758	VC	



Common name	Scientific name	Status (Evans, 1932)	IWPA, 1972
75. Three Spot Grass Yellow	<i>Eurema blanda</i> Boisduval, 1836	C	
76. Tree yellow	<i>Gandaca harina</i> Horsfield, 1829	NR	
77. Common Emigrant	<i>Catopsilia pomona</i> Fabricius, 1775	C	
78. Mottled Emigrant	<i>Catopsilia pyranthe</i> Linnaeus, 1758	C	
Subfamily Pierinae			
79. Indian Cabbage White	<i>Pieris canidia</i> Linnaeus, 1768	VC	
80. Green Veined White	<i>Pieris melete</i> Menetries, 1857	NR	
81. Common Albatross	<i>Appias albina</i> Boisduval, 1836	R	Schedule II
82. Chocolate Albatross	<i>Appias lyncida</i> Cramer, 1777	C	
83. Striped Albatross	<i>Appias libythea</i> Fabricius, 1775	R	Schedule IV
84. Orange Albatross	<i>Appias nero</i> Fabricius, 1793	R	Schedule IV
85. Red-Base Jezebel	<i>Delias pasithoe</i> Linnaeus, 1767	NR	
86. Red-Spot Jezebel	<i>Delias descombesi</i> Boisduval, 1836	NR	
87. Lesser Gull	<i>Cepora nadina</i> Lucas, 1852	NR	
88. Great Orange Tip	<i>Hebomoia glaucippe</i> Linnaeus, 1758	C	
89. Psyche	<i>Leptosia nina</i> Fabricius, 1793	C	
Family Lycaenidae			
Subfamily Poritiinae			
90. Common Gem	<i>Poritia hewitsoni</i> Moore, 1866	NR	Schedule II
Subfamily Miletinae			
91. Apefly	<i>Spalgis epius</i> Westwood, 1852	NR	
Subfamily Curetinae			
92. Burmese Sunbeam	<i>Curetis saronis</i> Moore, 1877	NR	
Subfamily Lycaeninae			
93. Purple Sapphire	<i>Heliophorus epicles</i> Godart, 1824	C	
Subfamily Theclinae			
94. Fluffy Tit	<i>Zeltus amasa</i> Hewitson, 1865	NR	
95. Common Tit	<i>Hypolycaena erylus</i> Godart, 1824	C	
96. Orchid Tit	<i>Chliaria othona</i> Hewitson, 1865	NR	Schedule I
97. Yamfly	<i>Loxura atymnus</i> Stoll, 1780	C	
98. Common Imperial	<i>Cheritra freja</i> Fabricius, 1793	NR	
99. Common Acacia Blue	<i>Surendra quercetorum</i> Moore, 1858	C	
100. Common Onyx	<i>Horaga onyx</i> Moore, 1858	NR	Schedule II
101. Copper Flash	<i>Rapala pheretima</i> Hewitson, 1863	NR	
102. Sylhet Oakblue	<i>Arhopala silhetensis</i> Hewitson, 1862	R	Schedule II
103. Tamil Oakblue	<i>Arhopala bazaloides</i> Hewitson, 1878	R	Schedule II
104. Yellow Disc Tailless Oakblue	<i>Arhopala perimuta</i> Moore, 1858	NR	
105. Silverstreak Blue	<i>Iraota timoleon</i> Stoll, 1790	R	
106. Mandarin Blue	<i>Charana mandarinus</i> Hewitson, 1863	NR	
107. Dusky Bush Blue	<i>Arhopala paraganesa</i> de Niceville, 1882	R	Schedule II
108. Centaur Oakblue	<i>Arhopala centaurus</i> Fabricius, 1775	NR	
109. Hewitson's Dull Oakblue	<i>Arhopala oenea</i> Hewitson, 1869	R	Schedule II
Subfamily Polyommatainae			
110. Common Hedge Blue	<i>Acytolepis puspa</i> Horsfield, 1828	C	

Common name	Scientific name	Status (Evans, 1932)	IWPA, 1972
111. Plain Hedge Blue	<i>Celastrina lavendularis</i> Moore, 1877	NR	
112. Malayan	<i>Megisba malaya</i> Horsfield, 1828	NR	
113. Common Cerulean	<i>Jamides celeno</i> Cramer, 1775	C	
114. Dark Cerulean	<i>Jamides bochus</i> Stoll, 1782	C	
115. Pale Grass Blue	<i>Pseudozizeeria maha</i> Kollar, 1844	VC	
116. Lesser Grass Blue	<i>Zizina otis</i> Fabricius, 1787	C	
117. Lime Blue	<i>Chilades lajus</i> Stoll, 1780	C	
118. Tailless Lineblue	<i>Prosotas dubiosa</i> Semper, 1879	C	
119. Common Lineblue	<i>Prosotas nora</i> C.Felder, 1860	C	
120. Common Ciliate Blue	<i>Anthene emolus</i> Godart, 1824	C	
121. Zebra Blue	<i>Leptotes plinius</i> Fabricius, 1793	C	
122. Pea Blue	<i>Lampides boeticus</i> Linnaeus, 1767	C	Schedule II
123. Common Pierrot	<i>Castalius rosimon</i> Fabricius, 1775	C	
124. Elbowed Pierrot	<i>Caleta elna</i> Hewitson, 1876	NR	
125. Straight Pierrot	<i>Caleta roxus</i> Godart, 1824	NR	
126. Forest Pierrot	<i>Taraka hamada</i> Druce, 1875	NR	
127. Quaker	<i>Nepoithecops zalmora</i> Butler, 1870	C	
Family Riodinidae			
Subfamily Riodininae			
128. Punchinello	<i>Zemeros flegyas</i> Cramer, 1780	VC	
129. Tailed Judy	<i>Abisara neophron</i> Hewitson, 1861	NR	
Family Hesperidae			
Subfamily Coeliadinae			
130. Common Awl	<i>Hasora badra</i> Moore, 1858	NR	
131. Common Banded Awl	<i>Hasora chromus</i> Cramer, 1780	NR	
132. Orange Awlet	<i>Bibasis jaina</i> Moore, 1866	NR	
Subfamily Pyrginae			
133. Common Small Flat	<i>Sarangesa dasahara</i> Moore, 1866	C	
134. Fulvous Pied Flat	<i>Pseudocoladenia dan</i> Fabricius, 1787	C	
135. Indian Skipper	<i>Spialia galba</i> Fabricius, 1793	C	
136. Common Spotted Flat	<i>Celaenorrhinus leucocera</i> Kollar, 1844	C	
137. Suffused Snow Flat	<i>Tagiades jipetus</i> Stoll, 1781	NR	
138. Spotted Snow Flat	<i>Tagiades menaka</i> Moore, 1866	C	
139. Common Snow Flat	<i>Tagiades parra</i> Fruhstorfer, 1910	C	
Subfamily Hesperinae			
140. Tiger Hopper	<i>Ochus subvittatus</i> Moore, 1878	C	
141. Common Redeye	<i>Matapa aria</i> Moore, 1866	C	
142. Giant Redeye	<i>Gangara thyrus</i> Fabricius, 1775	NR	
143. Grass Demon	<i>Udaspes folus</i> Cramer, 1775	C	
144. Chocolate Demon	<i>Ancistroides nigrita</i> Latreille, 1824	C	
145. Restricted Demon	<i>Notocrypta curvifascia</i> C.&R. Felder, 1862	C	
146. Bevan's Swift	<i>Pseudoborbo bevanii</i> Moore, 1878	NR	
147. Small Branded Swift	<i>Pelopidas mathias</i> Fabricius, 1798	C	
148. Moore's Ace	<i>Halpe porus</i> Mabille, 1877	NR	

Common name	Scientific name	Status (Evans, 1932)	IWPA, 1972
149. Pigmy Scrub Hopper	<i>Aeromachus pygmaeus</i> Fabricius, 1775	NR	
150. Tufted Swift	<i>Caltoris plebeian</i> de Niceville, 1887	NR	
151. Grass Bob	<i>Suada swerga</i> de Niceville, 1884	NR	
152. Sumatran Dart	<i>Potanthus ganda</i> Fruhstorfer, 1911	—	
153. Common Dartlet	<i>Oriens gola</i> Moore, 1877	NR	
154. Common Palm Dart	<i>Telicota colon</i> Linnaeus, 1763	NR	
155. Chestnut Bob	<i>Iambrix salsala</i> Moore, 1866	C	
156. Coon	<i>Psolos fuligo</i> Mabilie, 1876	C	
157. Bush Hopper	<i>Ampittia dioscorides</i> Fabricius, 1793	C	
158. Full Stop Swift	<i>Caltoris cormasa</i> Hewitson, 1876	R	

VC—Very Common | C—Common | NR—Not Rare | R—Rare | IWPA—Indian Wildlife (Protection) Act, 1972.

only.

Orange Albatross *Appias nero* Fabricius, 1793: One individual was encountered on the bank of Kasojan sub-tributary in Kasojan Village on 10 August 2014 in the afternoon. The right forewing of the individual recorded was worn off (Image 66). The species is found in northeastern India and Myanmar. The species was recorded from Lumding, upper Assam by Parsons & Cantile (1948) and protected under Schedule IV of IWPA, 1972.

Common Albatross *Appias albina* Boisduval, 1836: One individual was encountered in a muddy patch on the boundary between Nanda Nath Saikia College and Kachari Gaon on 11 June 2014 in the morning. The species is protected under Schedule II of IWPA, 1972.

Striped Albatross *Appias libythea* Fabricius, 1775: Two individuals were encountered during the study period. One was from a roadside in Bebejia feeding on the nectar of *Lantena camera* on 09 July 2014 and the other individual was encountered in the flower garden of Nanda Nath Saikia College on 12 August 2014. This species is protected under Schedule IV of IWPA, 1972.

Sylhet Oakblue *Arhopala silhetensis* Hewitson, 1862: Two individuals were encountered on 14 March 2015 and 09 July 2015 in a forest in Rangajan. This species is distributed in the northeastern region of India, Bangladesh, and Myanmar. It is protected under Schedule II of IWPA, 1972.

Tamil Oakblue *Arhopala bazaloides* Hewitson, 1878: Two individuals were encountered during the study period. One was encountered from Rangajan on 15 March 2015 and the other from Bebejia on 02 August 2015. Both the individuals were encountered in a woodland in the morning. The species is protected under Schedule II of IWPA, 1972.

Centaur Oakblue *Arhopala centaurus* Fabricius, 1775: Two individuals were encountered during the survey, one from Bebejia on 12 June 2015 and the other from Kachari Gaon on 30 May 2016. Both the individuals were encountered from village woodlands. In India this species is found in Uttarakhand, Western Ghats, north-east, and West Bengal. The status of occurrence of this species is not rare (Evans 1932).

Hewitson's Dull Oakblue *Arhopala oenea* Hewitson, 1869: The species was encountered four times in a woodland in Bebejia Gaon on 30 May, 02, 09, & 18 June 2016. One individual was found laying eggs on *Castanopsis indica* plant and most probably it is the first record of its egg laying on this plant. The species is distributed from Garhwal to northeastern India (Khasi Hills and Nagaland), northeastern Bangladesh, and Myanmar. It is protected under Schedule II of IPWA, 1972.

Dusky Bushblue *Arhopala paraganesa* de Niceville, 1882: Only one individual was encountered in a woodland in Bebejia on 18 June 2016 in the morning. The species is restricted to the northeastern region in India. It's protected under Schedule II of IWPA, 1972. Except for this species and *A. oenea*, we observed all other *Arhopala* spp. recorded during the study period in Gibbon WS.

Autumn Leaf *Doleschallia bisaltide* Cramer, 1777: This species was encountered two times during the study period. One individual from Bebejia on 14 July 2015 and the other from Jalukonibari on 13 April 2016. Both the individuals were encountered near a bamboo patch puddling on stone and sand.

Full Stop Swift *Caltoris cormasa* Hewitson, 1876: One individual of this species was encountered in Bebejia on 05 April 2016 puddling on bird droppings in a small

open area between a bamboo patch and a woodland. It is restricted to the northeastern region of India.

Silverstreak Blue *Iraota timoleon* Stoll, 1790: One individual was encountered sitting on a dry leaf of *Dioscorea* sp. in a vegetable garden surrounded by a woodland in Bebejia on 25 February 2015.

Tabby *Pseudergolis wedah* Kollar, 1848: Though a common species as per Evans (1932), it was encountered only once in Panjan on 24 December 2014, found puddling on stones near a hill stream. The species is found in the north-east, Uttarakhand, and Himachal in India.

Forest Pierrot *Taraka hamada* Druce, 1875: One individual was encountered in a tea garden surrounded by village woodland in Mejenga Grant on 05 January 2015. The species is distributed from eastern Nepal to northeastern India, southeastern Bangladesh, and Myanmar. It is not rare as per Evans (1932).

Straight Pierrot *Caleta roxus* Godart, 1824: One individual was encountered near a hill stream in Bekajan on 18 January 2015 in the morning. The surrounding area of the spot where the individual was encountered was heavily disturbed by illegal coal mining and saw mills. The species is not rare as per Evans (1932).

Sumatran Dart *Potanthus ganda* Fruhstorfer, 1911: One individual of this species was encountered in a woodland in Rangajan on 15 March 2015 sitting on a fern in the morning. The species is considered extralimital in Evans (1932). It was identified on the basis of subapical spot. The subapical spot in space 8 is slightly smaller than that of the space 7 and 6 (Corbet et al. 1992; Ek-Amnuay 2012). It is distributed in the northeastern region in India and in Myanmar, Thailand, Laos, Vietnam, Malaysia, Sumatra and Java.

DISCUSSION

Titabar subdivision is rich in its biodiversity due to the edge effect of both plain and hilly areas and being located at the foothills of Nagaland. Gibbon WS is already well known for its floral and faunal diversity including butterflies. Singh (2015) recorded 211 species of butterflies from the sanctuary. Our study added 20 more species of butterflies from the non PAs to the total butterfly diversity of Titabar subdivision. The village woodlands with rich bamboo plantations serve as ideal habitat for the majority of animals, including butterflies. Though during the present survey a total of 158 species were recorded in the non PAs of Titabar subdivision, the final number of butterfly species occurring in the non PAs is more likely to be between 200–250 as some places of Titabar are still unexplored.

The significance of the area from the lepidopteran viewpoint lies in the fact that it harbors one species belonging to Schedule I, 17 species to Schedule II, and four species to Schedule IV of IWPA, 1972. Fourteen rare species, according to Evans (1932) were also recorded here. Again, many species listed as common by Evans (1932) were actually found to be uncommon or rare in this survey. This is probably because of different anthropogenic pressures. The major threat to the butterfly population in this area is the conversion of village woodlands to small and micro tea gardens. Pesticides, herbicides, and other chemicals used in these tea gardens may directly affect the number of butterflies by reducing their habitats. A number of illegal coal mining stations and saw mills in the Titabar-Nagaland border pose a big threat to the biodiversity, as well as the butterfly diversity of this area.

Still more work on the butterflies of this area regarding the host plants, habitat, and ecology are required. The results of our study form a baseline for future work on the diversity and conservation of butterflies in Titabar subdivision.

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Image 1. *Cethosia cyane*Image 2. *Mycalesis anaxias*Image 3. *Euthalia lubentina*Image 4. *Euthalia monina*Image 5. *Athyma nefte*Image 6. *Moduza procris*Image 7. *Chersonesia risa*Image 8. *Danaus chrysippus*Image 9. *Discophora sondaica*Image 10. *Lebadea martha*Image 11. *Doleschallia bisaltide*Image 12. *Tanaecia julii*Image 13. *Phalanta phalantha*Image 14. *Neptis hylas*Image 15. *Vindula erota*Image 16. *Tirumala septentrionis*Image 17. *Parantica aglea*Image 18. *Mycalesis mineus*Image 19. *Acraea violae*Image 20. *Cirrochroa aoris*Image 21. *Kallima inachus*Image 22. *Pseudergolis wedah*Image 23. *Neptis ananta*Image 24. *Euthalia anosia*



Image 25. *Mycalesis malasarida*



Image 26. *Cyrestis thyodamas*



Image 27. *Elymnias malelas*



Image 28. *Caleta elna*



Image 29. *Castalius rosimon*



Image 30. *Caleta roxus*



Image 31. *Taraka Hamada*

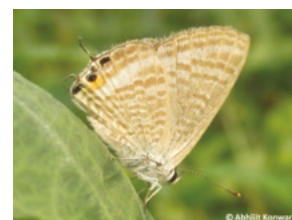


Image 32. *Lampides boeticus*



Image 33. *Spalgis epius*



Image 34. *Curetis thetis*



Image 35. *Acytolepis puspall*



Image 36. *Prosotas dubiosa*



Image 37. *Charana mandarinus*



Image 38. *Zeltus amasa*



Image 39. *Loxura atymnus*



Image 40. *Iraota timoleon*



Image 41. *Chliaria othona*



Image 42. *Rapala pheretima*



Image 43. *Arhopala silhetensis*



Image 44. *Arhopala perimuta*



Image 45. *Arhopala centaurus*



Image 46. *Arhopala oenea*



Image 47. *Arhopala paraganesa*



Image 48. *Heliophorus epicles*

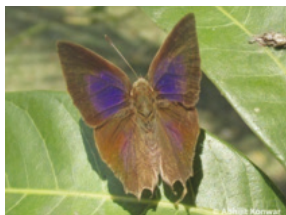
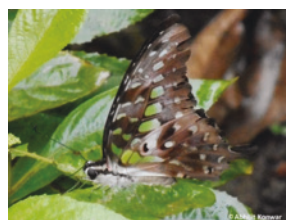
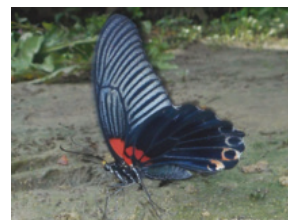
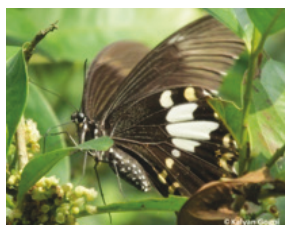
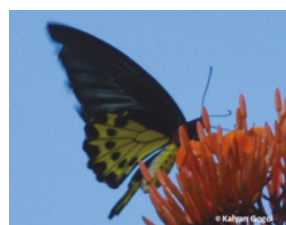
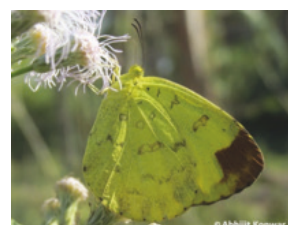
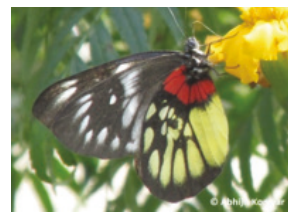
Image 49. *Cheritra freja*Image 50. *Surendra quercetorum* UPImage 51. *S. quercetorum* UNImage 52. *Horaga onyx*Image 53. *Leptotes plinius* UNImage 54. *L. plinius* UPImage 55. *Abisara neophron*Image 56. *Zemerus flegyas*Image 57. *Graphium doson*Image 58. *Graphium agamemnon*Image 59. *Papilio helenus*Image 60. *Papilio memnon*Image 61. *Papilio nephelus*Image 62. *Troides aeacus*Image 63. *Eurema brigitta*Image 64. *Eurema blanda*Image 65. *Gandaca harina*Image 66. *Appias nero*Image 67. *Appias libythea*Image 68. *Appias lycinda*Image 69. *Cepora nadina*Image 70. *Pieris melete*Image 71. *Hebomoia glaucippe*Image 72. *Delias pasithoe*



Image 73. *Delias descombesi*



Image 74. *Catopsilia Pomona*



Image 75. *Hasora badra*



Image 76. *Hasora chromus*

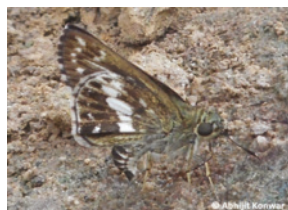


Image 77. *Halpe porus*



Image 78. *Telicota colon*



Image 79. *Potanthus ganda*

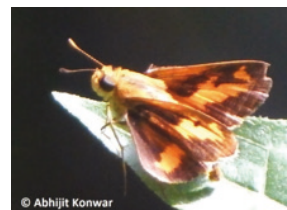


Image 80. *Oriens goloides*



Image 81. *Tagiades gana*



Image 82. *Tagiades japetus*



Image 83. *Tagiades menaka*



Image 84. *Suada swerga*



Image 85. *Iambrix salsala*



Image 86. *Notocrypta curvifascia*

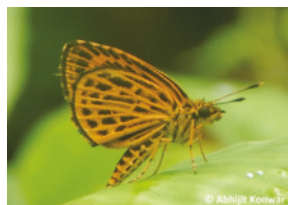


Image 87. *Ochus subvittatus*



Image 88. *Ampittia dioscorides*



Image 89. *Gangara thyrsis*



Image 90. *Aeromachus pygmaeus*



Image 91. *Udaspes folus*



Image 92. *Ancistroides nigrata*



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