



Research Paper

**ENTOMOFAUNAL DIVERSITY OF BHIBHUTI BHUSAN WILD LIFE
SANCTUARY, WEST BENGAL**

Bulganin Mitra¹, Joyjit Ghosh¹, Udipta Chakraborti¹, Olive Biswas¹, Sankarsan Roy¹ and Arjan Basu Roy²

¹Zoological survey of India,M Block, New Alipore.Kolkata-53.

² NATURE MATES , NATURE CLUB 4/10A, Bijoygarh. Jadavpur, Kolkata-700032.

Abstract

Bhimbhuti Bhusan Wild Life Sanctuary is a protected area of West Bengal, having an area of approximately 0.64 square kilometer. A total of 241 species of 197 genera under 49 families belonging to seven orders (Collembola, Odonata, Hemiptera, Coleoptera, Diptera, Lepidoptera and Hymenoptera) are reported in this present communication. Of these, Lepidoptera shares maximum species (79) followed by Hemiptera (45), Coleoptera (33), Diptera (31), Odonata (27), Collembola (16) and Hymenoptera (10 species).

Key words: Wildlife Sanctuary, West Bengal, Hymenoptera, Diptera, Lepidoptera, Coleoptera.

INTRODUCTION

Forest insects constitute the great majority of all species associated with forests which include all life of communities, ranging from invisible forest soil micro-fauna to higher group of insects. But very little effort has been given to study the less charismatic insect groups of protected areas in India.

Bibhutibhusan Wildlife Sanctuary is one of the protected areas of West Bengal, located in between 23°11' South Latitude and 88°46' East Longitude on the banks of Ichhamati River with an area of 0.64 sq km, belongs to the North 24 Parganas Forest Division in the North 24 Parganas District of West Bengal State. Nothing has been known on the insect faunal diversity of Bibhuti Bhusan Wildlife Sanctuary except the recent publication on Diptera by [1], [2], Collembola by [3] [4] and aquatic Coleoptera by [5].

Altogether, 241 species pertaining to 197 genera under 49 families and seven orders of insects were recorded from this sanctuary. The order Lepidoptera is found as the most dominant group with 79 species followed by Hemiptera (45 species), Coleoptera (33 species), Diptera (31 species), Odonata (27 species), Collembola (16 species) and Hymenoptera (10 species).

MATERIALS AND METHODS

The forest of Bibhuti Bhusan Wildlife Sanctuary is two storied mostly open canopy but closed in some places. Thick bamboo bushes and tall grasses are found bordering the river and the core area of the sanctuary. The tall trees of *Dalbergia sisso Roxb.*, *Morus alba Linnaeus*, *Terminalia arjuna* (Roxb.) Wight & Arn., *Trewia nudiflora* Linnaeus, *Bombax ceiba* Linnaeus, *Albizia lebbek* (L.) Benth. and several others are the mainstay of the forest, while the undergrowth is thick and dense comprising of mostly ferns, tall grasses, and arum bushes.

The river often floods its banks and overflow into the sanctuary's buffer area in the monsoon and during heavy rains spills into the core area.

A total of 205 floral species were reported under 60 families of which 94 species herbs, 35 species shrubs, 22 species creepers/climbers and 60 species trees. The dominant plant species of this sanctuary are *Polyalthia suberosa* Roxb., *Terminalia arjuna* (Roxb.) Wight & Arnand *Senna siamea* (Lam.) Irwin et Barneby [1].

Tropical monsoon climate with four distinct seasons viz., summer, monsoon, winter and autumn. Annual temperature ranges from 43° C to 9°C. Average annual rainfall is 1400mm. Area is primarily a river plain with alluvial soil profile. Altitude is average 6 meter. [1]

Survey of insects was made at different areas of this sanctuary including core areas during 2007-2010 (four surveys in one year with a span of 5-6 days in each trip). The insects were randomly collected at day time between 6.00 a.m. to 5.00 p.m. by sweeping, beating vegetation and hand picking method. The nocturnal insects were collected between 6.00 p.m. to 9.00 p.m. by using light trap (a white screen and an 80 Watt CFL lamp operated by Honda mini generator). The collected specimens were identified by the Scientists of Zoological Survey of India, Kolkata.

RESULTS

Altogether, 241 species pertaining to 197 genera under 49 families and seven orders of insects were recorded from this sanctuary. Of them, order Lepidoptera represented by 79 species (table: 6) followed by Hemiptera with 45 species (table: 3), Coleoptera with 33 species (table: 4), Diptera with 31 species (table: 5), Odonata with 27 species (table: 2), Collembola with 16 species (table: 1) and Hymenoptera with 10 species (table: 7).

Among the 49 families of insects reported from this sanctuary, order Diptera has shared maximum families (29%) followed by Coleoptera (19%) and Hemiptera (16%), Lepidoptera (12%), Odonata and Collembola each shared 10% and the lowest number of families represented by order Hymenoptera (4%). (Fig: 1)

Considering the diversity in generic level, Lepidoptera has shared maximum genera (31%), followed by Hemiptera (18%), Diptera and Coleoptera each shared 14%, Order Odonata (11 %), Collembola (7%) and Hymenoptera with only 5 percent. (Fig: 2)

Like the generic diversity, Lepidoptera is also more diversified in terms of species diversity and shared 33% of total species of this sanctuary, followed by Hemiptera (19%), Coleoptera (14%), Diptera (13%), Odonata (11%), Collembola (6%) and Hymenoptera (4%). (Fig: 3)

Considering the number of species (family-wise) reported from this sanctuary, the maximum number of species is represented by Nymphalidae of Lepidoptera (28), followed by Aphididae (23) of Hemiptera (Fig.4). Only single species was represented by twenty families, namely, Gomphidae, Lestidae of the order Odonata; Scolytidae, Cicindelidae, Carabidae and Hydrophilidae of the order Coleoptera; Riodinidae of the order Lepidoptera; Limoniidae, Stratiomyidae, Tabanidae, Bombyliidae, Dolichopodidae, Platystomatidae, Sciomyzidae, Micropezidae of the order Diptera; Hypogastruridae, Onychiuridae of the order Collembola; Membracidae, Tachardiidae, Cerococcidae (Hemiptera) (table.2) and Apidae of the order Hymenoptera (Fig.4). Rest of the families shared in between 2- 19 species (Fig.4).

DISCUSSION

Natural forests, particularly virgin evergreen forests, constitute the major store house of biodiversity, because they always represent more than one floral species of different age, class, canopy and undergrowth vegetation. Therefore, it is always interesting to study the biodiversity of protected areas where the forest remained virgin and mostly undisturbed.

BBWLS is one of the protected areas amongst 5 NP and 15 WLS of West Bengal. Occurrence of over 200 floral species in these small protected areas (0.64 sq km) like BBWLS

indicated a probable rich insect faunal diversity. A total of 241 species of 197 genera under 49 families and seven order of insects support the above view.

In many regions of the world, Lepidoptera are widely accepted as ecological indicators of ecosystem health [6], [7], [8], [9]. Lepidopterans are predominantly phytophagous and pollinators. In this study, the order Lepidoptera is found predominant group of insects in terms of generic and species diversity. This definitely reflects the availability of suitable habitats and ecologically favourable condition.

Hemiptera are highly abundant in forest systems worldwide. Although best known as plant -dwellers, But they are not exclusive to this microhabitat, but are present in all forest strata. Herbivorous hemipteran assemblages are often determined partially by the plant species present [10]. They are the second most dominant group of this sanctuary after the order Lepidoptera in terms of generic and species diversity. This also indicates the availability of food plants and assemblage of rich floral diversity in this sanctuary.

The Diptera is the third dominant group in this sanctuary with highest number of families. The reported dipterans are mostly flower visitors/pollinators, some are predators and very few are act as pest. But there are certain families, namely Muscidae, Calliphoridae and Sarcophagidae have developed a close relationship with human settlements and human beings. Therefore, their presence indicate the human interference in this sanctuary.

During the present study, the reported species of the Order Coleoptera are mostly phytophagous, ground-dwellers and predators. The members of the family Cicindellidae or tiger beetles have become a significant biological indicators for determining local biodiversity. Presence of large population of tiger beetles and the spring tails also indicate the rich ground biodiversity of this sanctuary. Odonate diversity is also rich due to riverine ecosystem and temporary water-logged areas of this sanctuary. Among the hymenopterans, ants are the predominant groups and the presence of honey bee, *Apis dorsata* indicate that the sanctuary is having more flower bearing plant species.

It is also very interesting to know, that only with 0.76% of the total land of West Bengal, this sanctuary is having almost 5% of the total insect fauna of the state [11]. Among them, this sanctuary is representing with 64% (16 of 25 species), 14.6% (27 of 185 species), 4.66% (45 of 966 species), 2.1% (33 of 1570 species), 4.55% (31 of 681 species), 6.96% (71 of 1020 species), 2.32% (10 of 430 species) of the total Collembola, Odonata, Hemiptera, Coleoptera, Diptera, Lepidoptera and Hymenoptera fauna of this state respectively (Fig.5).

Table 1: List of Collembola reported from BBWLS

No	Family	Scientific name
1	Hypogastruridae	<i>Xenylla obscura</i> Imms, 1912
2	Onychiuridae	<i>Allonychiurus indicus</i> (Choudhuri, 1965) Pomorski, R. J., 2002
3	Isotomidae	<i>Isotomurus balteatus</i> (Reuter, O.M, 1876) Handschin, 1929
4	Isotomidae	<i>Hemisotoma thermophila</i> (Axelson, 1900) Bagnall, 1949
5	Isotomidae	<i>Isotomiella minor</i> (Schaeffer, 1896) Yosii, 1939
6	Isotomidae	<i>Cryptopygus thermophilus</i> (Axelson, 1900)
7	Isotomidae	<i>Ballistura bengalensis</i> Yosii, 1966
8	Entomobryidae	<i>Lepidocyrtus (Ascocytus) magnificus</i> Carpenter, 1924
9	Entomobryidae	<i>Lepidocyrtus (Cinctocyrtus) medius</i> Schaeffer, C., 1898
10	Entomobryidae	<i>Lepidocyrtus exploratorius</i> Carpenter, 1924
11	Entomobryidae	<i>Seira indica</i> Ritter, 1911
12	Entomobryidae	<i>Homidia cingula</i> (Borner, C, 1906) Yosii, 1959
13	Entomobryidae	<i>Cyphoderus javanus</i> Borner, 1906
14	Paronellidae	<i>Salina bengalensis</i> Mitra, 1973
15	Paronellidae	<i>Sphaeridia pumilis</i> (Krausbauer, 1898), Agrell, 1934
16	Paronellidae	<i>Sphyrotheca gangetica</i> Yosii, 1966

Table 2: List of Odonata reported from BBWLS

No	Family	Scientific name
1.	Gomphidae	<i>Ictinogomphus rapax</i> (Rambur, 1842)
2	Aeshnidae	<i>Anaciaeschna jaspidea</i> (Burmeister, 1839)
3	Aeshnidae	<i>Gynacantha dravida</i> Lieftinck, 1960
4	Libellulidae	<i>Neurothemis fulvia</i> (Drury, 1773)
5	Libellulidae	<i>Acisoma panorpoides</i> Rambur, 1842
6	Libellulidae	<i>Aethriamanta brevipennis</i> (Rambur, 1842)
7	Libellulidae	<i>Brachythemis contaminata</i> (Fabricius, 1793)
8	Libellulidae	<i>Bradinopyga geminate</i> (Rambur, 1842)
9	Libellulidae	<i>Crocothemis servilia</i> (Drury, 1770)
10	Libellulidae	<i>Diplacodes trivialis</i> (Rambur, 1842)
11	Libellulidae	<i>Lathrecista asiatica</i> (Fabricius, 1798)
12	Libellulidae	<i>Neurothemis tullia</i> (Drury, 1773)
13	Libellulidae	<i>Orthetrum sabina</i> (Drury, 1770)
14	Libellulidae	<i>Orthetrum triangulare</i> (Selys, 1878)
15	Libellulidae	<i>Orthetrum glaucum</i> (Brauer, 1865)
16	Libellulidae	<i>Orthetrum pruinosum</i> (Burmeister, 1839)
17	Libellulidae	<i>Pantala flavescens</i> (Fabricius, 1798)
18	Libellulidae	<i>Rhyothemis variegata</i> (Linnaeus, 1763)
19	Libellulidae	<i>Tholymis tillarga</i> (Fabricius, 1798)
20	Libellulidae	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)
21	Coenagrionidae	<i>Agriocnemis pygmaea</i> (Rambur, 1842)
22	Coenagrionidae	<i>Ceriagrion cerinorubellum</i> (Brauer, 1865)
23	Coenagrionidae	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)
24	Coenagrionidae	<i>Ischnura aurora</i> (Brauer, 1865)
25	Coenagrionidae	<i>Ischnura senegalensis</i> (Rambur, 1842)
26	Coenagrionidae	<i>Pseudagrion microcephalum</i> (Rambur, 1842)
27	Lestidae	<i>Lestes elatus</i> Hagen in Selys, 1862

Table. 3: List of Hemiptera reported from BBWLS

No	Family	Scientific name
1	Cercopidae	<i>Poophilus costalis</i> (Walker,1851)
2	Cercopidae	<i>Ptyelus nebulosus</i> (Turton, 1802)
3	Cercopidae	<i>Clovia bipunctata</i> Kirby, 1891
4	Cicadellidae	<i>Cofana mimica</i> (Distant,1908)
5	Cicadellidae	<i>Nephrotettix nigropictus</i> (Stal, 1870)
6	Cicadellidae	<i>Amritodus atkinsoni</i> (Lethierry, 1889)
7	Cicadellidae	<i>Leptocentrus carinatus</i> Anantha subramanian, 1980
8	Membracidae	<i>Gargara robusta</i> Distant, 1908
9	Psyllidae	<i>Trioza hirsuta</i> (Crawford,1912)
10	Psyllidae	<i>Trioza fletcheri</i> Crawford, 1912
11	Psyllidae	<i>Trioza sp.nr fletcheri</i>
12	Aphididae	<i>Aphis citricola</i> Van der Goot, 1912
13	Aphididae	<i>Aphis craccivora</i> Koch, 1854
14	Aphididae	<i>Aphis fabae</i> Scopoli 1763
15	Aphididae	<i>Aphis glossypii</i> Glover, 1877
16	Aphididae	<i>Aphis nasturtii</i> Kaltenbach, 1843
17	Aphididae	<i>Toxoptera aurantii</i> (Boyer de Fonscolombe, 1841)
18	Aphididae	<i>Toxoptera citricidus</i> (Kirkaldy, 1907)
19	Aphididae	<i>Toxophora odinae</i> (van der Goot, 1917)
20	Aphididae	<i>Hysteroneura setariae</i> (Thomas, 1877)
21	Aphididae	<i>Melanaphis sacchari</i> (Zehntner 1897)
22	Aphididae	<i>Rhopalosiphum maidis</i> (Fitch, 1856)
23	Aphididae	<i>Rhopalosiphum rufiabdominalis</i> (Sasaki, 1899)
24	Aphididae	<i>Acyrthosiphon pisum</i> (Harris, 1776)
25	Aphididae	<i>Aulacorthum solani</i> (Kaltenbach, 1843)
26	Aphididae	<i>Bachycaudus helichrysi</i> (Kaltenbach, 1843)
27	Aphididae	<i>Brevicoryne brassicae</i> (Linnaeus, 1758)
28	Aphididae	<i>Hyadaphis coriandri</i> (Das, 1918)
29	Aphididae	<i>Lipaphis erysimi</i> (Kaltenbach, 1843)
30	Aphididae	<i>Macrosiphoniella sanborni</i> (Gillette, 1908)
31	Aphididae	<i>Macrosiphum(Sitobion) rosaeformis</i> (Das, 1918)
32	Aphididae	<i>Myzus ornatus</i> Laing, 1932
33	Aphididae	<i>Myzus persicae</i> (Sulzer, 1776)
34	Aphididae	<i>Neomyzus circumflexus</i> (Buckton, 1876)
35	Tachardiidae	<i>Kerria fificifi</i> (Green, 1903)
36	Pseudococcidae	<i>Birendracoccus accharifolii</i> (Green, 1908)
37	Pseudococcidae	<i>Brevennia rehi</i> (Lindinge, 1943)
38	Pseudococcidae	<i>Ferrisia virgata</i> (Cockerell, 1893)
39	Pseudococcidae	<i>Maconellicoccus hirsutus</i> (Green, 1908)
40	Pseudococcidae	<i>Novonilacoccus oryzae</i> Ghosh & Ghosh, 1987
41	Pseudococcidae	<i>Planococcus lilacinus</i> (Cockerell, 1905)
42	Pseudococcidae	<i>Planococcoides bengalensis</i> Ghosh & Ghosh, 1988
43	Pseudococcidae	<i>Rastrococcus iceryoides</i> (Green, 1908)
44	Pseudococcidae	<i>Saccharicoccus sacchari</i> (Cockerrell,1895)
45	Cerococcidae	<i>Cerococcus indicus</i> (Maskell, 1897)

Table. 4: List of Coleoptera reported from BBWLS

No	Family	Scientific name
1	Chrysomelidae	<i>Pachnephorus lewisii</i> Baly, 1878
2	Chrysomelidae	<i>Galerucella placida</i> Baly, 1878
3	Chrysomelidae	<i>Oides flava</i> (Oliver, 1807)
4	Chrysomelidae	<i>Hoplasoma unicolor</i> (Illiger, 1800)
5	Chrysomelidae	<i>Aulacophora foveicollis</i> (Lucas, 1849)
6	Chrysomelidae	<i>Medythia nigrobilineata</i> (Motschulsky 1860)
7	Chrysomelidae	<i>Monolepta orientalis</i> Jacoby, 1889
8	Chrysomelidae	<i>Monolepta bifasciata</i> (Hornstedt, 1788)
9	Chrysomelidae	<i>Monolepta signata</i> (Oliver, 1808)
10	Chrysomelidae	<i>Aspidomorpha miliaris</i> (Fabricius, 1775)
11	Chrysomelidae	<i>Aspidomorpha indica</i> Boheman, 1854
12	Chrysomelidae	<i>Cassida enervis</i> Boheman, 1862
13	Chrysomelidae	<i>Cassida circumdata</i> Herbst, 1799
14	Scolytidae	<i>Euwallacea fornicates</i> (Eichhoff, 1860)
15	Cicindelidae	<i>Cicindela sexpunctata</i> Fabricus, 1775
16	Carabidae	<i>Pachytrachelus oblongus</i> (Dejean, 1831)
17	Scarabaeidae	<i>Glycosia tricolor</i> (Olivier, 1789)
18	Scarabaeidae	<i>Phyllognathus Dionysius</i> (Fabricus, 1792)
19	Coccinellidae	<i>Brumus suturalis</i> (Fabricus, 1798)
20	Coccinellidae	<i>Rodolia fumida</i> Mulsant, 1850
21	Coccinellidae	<i>Pseudaspidimerus trinotatus</i> (Thunberg, 1781)
22	Coccinellidae	<i>Coccinella transversalis</i> Fabricus, 1781
23	Coccinellidae	<i>Menochilus sexmaculata</i> (Fabricus, 1781)
24	Coccinellidae	<i>Micraspis discolor</i> (Fabricius, 1798)
25	Coccinellidae	<i>Afidenta misera</i> (Weise, 1901)
26	Coccinellidae	<i>Epilachna dodecastigma</i> (Wiedemann, 1823)
27	Coccinellidae	<i>Epilachna septima</i> Dieke, 1947
28	Meloidae	<i>Mylabris cichorii</i> (Linnaeus, 1764)
29	Meloidae	<i>Mylabris phalerata</i> (Pallas, 1781)
30	Dytiscidae	<i>Canthydrus laetabilis</i> (Walker, 1858)
31	Dytiscidae	<i>Laccophilus anticatus</i> anticatus Sharp, 1890
32	Dytiscidae	<i>Laccophilus flexuosus</i> Aube, 1890
33	Hydrophilidae	<i>Amphiops pedestris</i> Sharp, 1890

Table. 5: List of Diptera reported from BBWLS

No	Family	Scientific name
1	Limoniidae	<i>Conosia irrorata</i> (Wiedemann, 1828)
2	Stratiomyidae	<i>Oplodontha minuta</i> (Fabricius, 1794)
3	Tabanidae	<i>Tabanus sp.</i>
4	Asilidae	<i>Philodicus femoralis</i> Ricardo, 1921
5	Asilidae	<i>Michotamia aurata</i> (Fabricius, 1794)
6	Asilidae	<i>Astochia longistylus</i> (Wiedemann, 1828)
7	Bombyliidae	<i>Petrorossia ceylonica</i> (Brunetti, 1909)
8	Dolichopodidae	<i>Chrysosoma vittatum</i> vittatum (Wiedemann, 1819)
9	Syrphidae	<i>Asarkina ericetorum</i> (Fabricius, 1781)
10	Syrphidae	<i>Lathyrophthalmus arvorum</i> (Fabricius, 1787)
11	Syrphidae	<i>Lathyrophthalmus obscuritarsis</i> (de Meijere, 1908)

12	Syrphidae	<i>Lathyrophthalmus obliquus</i> (Wiedemann, 1824)
13	Syrphidae	<i>Serratoparagus serratus</i> (Fabricius, 1805)
14	Syrphidae	<i>Melanostoma orientale</i> (Wiedemann, 1824)
15	Syrphidae	<i>Eoseristalis arbustorum</i> (Linnaeus, 1758)
16	Syrphidae	<i>Episyrphus balteatus</i> (De Geer, 1776)
17	Platystomatidae	<i>Plagiostenopterina</i> (<i>Plagiostenopterina</i>) <i>aenea</i> (Wiedemann, 1819)
18	Tephritidae	<i>Dacus</i> (<i>Bactrocera</i>) <i>dorsalis</i> (Hendel, 1912)
19	Tephritidae	<i>Carpomya nr. vesuviana</i> Costa, 1854
20	Sciomyzidae	<i>Sepedon ferruginosa</i> Wiedemann, 1824
21	Micropezidae	<i>Mimegralla albimana</i> (Doleschall, 1856)
22	Muscidae	<i>Musca</i> (<i>Musca</i>) <i>domestica</i> Linnaeus, 1758
23	Muscidae	<i>Neomyia indica</i> (Robineau-Desvoidy, 1830)
24	Muscidae	<i>Neomyia lauta</i> (Wiedemann, 1830)
25	Muscidae	<i>Stomoxys calcitrans</i> (Linnaeus, 1758)
26	Calliphoridae	<i>Calliphora vicina</i> Robineau- Desvoidy, 1830
27	Calliphoridae	<i>Chrysomya megacephala</i> (Fabricius, 1794)
28	Calliphoridae	<i>Stomorhina discolor</i> (Fabricius, 1794)
29	Calliphoridae	<i>Lucilia cuprina</i> (Wiedemann, 1830)
30	Sarcophagidae	<i>Bercea cruentata</i> (Meigen, 1826)
31	Sarcophagidae	<i>Parasarcophaga</i> (<i>Parasarcophaga</i>) <i>albiceps</i> (Meigen, 1826)

Table. 6: List of Lepidoptera reported from BBWLS

No	Family	Scientific name
1	Papilionidae	<i>Pachliopta aristolochiae</i> Fabricius, 1775
2	Papilionidae	<i>Graphium doson</i> (Felder, 1864)
3	Papilionidae	<i>Graphium agamemnon</i> (Linnaeus, 1758)
4	Papilionidae	<i>Papilio polytes</i> Linnaeus, 1758
5	Papilionidae	<i>Papilio polymnestor</i> Cramer, 1775
6	Papilionidae	<i>Papilio crino</i> Fabricius,1793
7	Papilionidae	<i>Papilio clytia</i> (Linnaeus, 1758)
8	Papilionidae	<i>Papilio demoleus</i> (Linnaeus,1758)
9	Pieridae	<i>Catopsilia pomona</i> (Fabricius,1775)
10	Pieridae	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)
11	Pieridae	<i>Eurema hecabe</i> (Linnaeus, 1758)
12	Pieridae	<i>Eurema brigitta</i> (Cramer, 1780)
13	Pieridae	<i>Delias eucharis</i> (Drury, 1773)
14	Pieridae	<i>Leptosia nina</i> (Fabricius, 1793)
15	Pieridae	<i>Cepora nerissa</i> (Fabricius, 1775)
16	Pieridae	<i>Pareronia valeria</i> (Cramer, 1776)
17	Pieridae	<i>Appias libythea</i> (Fabricius, 1775)
18	Pieridae	<i>Anaphaeis aurota</i> Fabricius, 1793
19	Nymphalidae	<i>Melanitis leda</i> (Linnaeus, 1758)
20	Nymphalidae	<i>Mycalesis perseus</i> (Fabricius, 1775)
21	Nymphalidae	<i>Mycalesis mineus</i> (Linnaeus, 1758)
22	Nymphalidae	<i>Ypthima huebneri</i> Kirby, 1871
23	Nymphalidae	<i>Ypthima baldus</i> (Fabricius, 1775)
24	Nymphalidae	<i>Phalanta phalantha</i> (Drury, 1773)
25	Nymphalidae	<i>Neptis hylas</i> (Linnaeus, 1758)

26	Nymphalidae	<i>Neptis jumbah</i> Moore, 1857
27	Nymphalidae	<i>Limenitis procris</i> (Cramer, 1779)
28	Nymphalidae	<i>Euthalia aconthea</i> (Cramer, 1777)
29	Nymphalidae	<i>Ariadne ariadne</i> (Linnaeus, 1763)
30	Nymphalidae	<i>Ariadne merione</i> (Cramer, 1779)
31	Nymphalidae	<i>Junonia lemonias</i> (Linnaeus, 1758)
32	Nymphalidae	<i>Junonia atlites</i> (Linnaeus, 1763)
33	Nymphalidae	<i>Junonia almana</i> (Linnaeus, 1758)
34	Nymphalidae	<i>Junonia iphita</i> (Cramer, 1782)
35	Nymphalidae	<i>Hypolimnas bolina</i> (Linnaeus, 1758)
36	Nymphalidae	<i>Hypolimnas misippus</i> (Linnaeus, 1764)
37	Nymphalidae	<i>Tirumala limniace</i> (Cramer, 1775)
38	Nymphalidae	<i>Parantica aglea</i> (Stoll, 1781)
39	Nymphalidae	<i>Danaus chrysippus</i> (Linnaeus, 1758)
40	Nymphalidae	<i>Danaus genutia</i> (Cramer, 1779)
41	Nymphalidae	<i>Elymnias hypermnestra</i> (Linnaeus, 1763)
42	Nymphalidae	<i>Euploea core</i> (Cramer, 1870)
43	Nymphalidae	<i>Acraea violae</i> (Fabricius, 1775)
44	Nymphalidae	<i>Euploea klugii</i> Moore, 1857
45	Nymphalidae	<i>Discophora sondaica</i> Boisduval, 1836
46	Nymphalidae	<i>Lethe europa</i> (Fabricius, 1775)
47	Riodinidae	<i>Abisara echerius</i> Stoll, 1790
48	Lycaenidae	<i>Castalius rosimon</i> (Fabricius, 1775)
49	Lycaenidae	<i>Tarucus nara</i> Kollar, 1848
50	Lycaenidae	<i>Zizeeria karsandra</i> (Moore, 1865)
51	Lycaenidae	<i>Pseudozizeeria maha</i> (Kollar, 1848)
52	Lycaenidae	<i>Zizula hylax</i> (Fabricius, 1775)
53	Lycaenidae	<i>Catochrysops strabo</i> (Fabricius, 1793)
54	Lycaenidae	<i>Chilades lajus</i> (Stoll, 1780)
55	Lycaenidae	<i>Jamides celeno</i> (Cramer, 1775)
56	Lycaenidae	<i>Jamides bochus</i> (Stoll, 1782)
57	Lycaenidae	<i>Spindasis vulcanus</i> (Fabricius, 1775)
58	Lycaenidae	<i>Rathinda amor</i> (Fabricius, 1775)
59	Lycaenidae	<i>Neopithecops zalmora</i> (Butler, 1870)
60	Lycaenidae	<i>Loxura atymnus</i> (Stoll, 1780)
61	Lycaenidae	<i>Rapala manea</i> (Hewitson, 1863)
62	Lycaenidae	<i>Acytolepis puspa</i> (Horsfield, 1828)
63	Lycaenidae	<i>Megisba malaya</i> (Horsfield, 1828)
64	Lycaenidae	<i>Chilades pandava</i> (Horsfield, 1829)
65	Lycaenidae	<i>Satadra atrax</i> (Hewitson, 1862)
66	Lycaenidae	<i>Anthene emolus</i> (Godart, 1823)
67	Hesperiidae	<i>Spialia galba</i> (Fabricius, 1793)
68	Hesperiidae	<i>Iambrix salsala</i> (Moore, 1865)
69	Hesperiidae	<i>Udaspes folus</i> (Cramer, 1775)
70	Hesperiidae	<i>Taractrocera maevius</i> Fabricius, 1793
71	Hesperiidae	<i>Telicota ancilla</i> (Herrich-Schäffer, 1869)
72	Hesperiidae	<i>Matapa aria</i> (Moore, 1865)
73	Hesperiidae	<i>Borbo cinnara</i> (Wallace, 1866)
74	Hesperiidae	<i>Baoris farri</i> (Moore, 1878)
75	Hesperiidae	<i>Oriens goloides</i> (Moore, 1881)
76	Hesperiidae	<i>Suastus gremius</i> (Fabricius, 1798)
77	Hesperiidae	<i>Sarangesa dasahara</i> Moore, 1865

78	Hesperiidae	<i>Sarangesa purendra</i> Moore,1882
79	Hesperiidae	<i>Tagiades japetus</i> (Stoll,1782)

Table. 7: List of Hymenoptera reported from BBWLS

No	Family	Scientific name
1	Formicidae	<i>Anoplolepis gracilipes</i> F. Smith, 1857
2	Formicidae	<i>Myrmicaria brunnea</i> Saunders, 1841
3	Formicidae	<i>Camponotus compressus</i> (Fabricius, 1787)
4	Formicidae	<i>Oecophylla smaragdina</i> (Fabricius, 1775)
5	Formicidae	<i>Tetraponera rufonigra</i> (Jerdon, 1851)
6	Formicidae	<i>Leptogenys sp.</i>
7	Formicidae	<i>Solenopsis geminata</i> (Fabricius, 1804)
8	Formicidae	<i>Diacamma sp.</i>
9	Formicidae	<i>Bothroponera rufipes</i> (Jerdon, 1851)
10	Apidae	<i>Apis (Megapis) dorsata dorsata</i> Fabricius, 1793

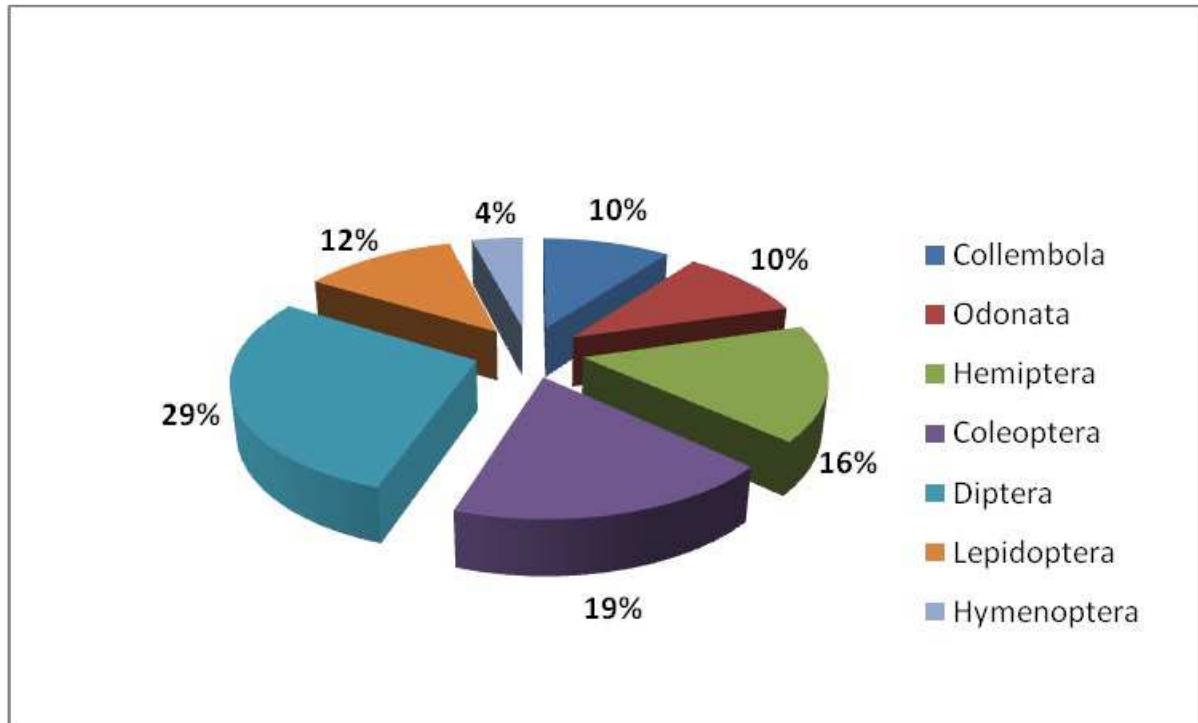


Fig. 1. Family diversity (%) in each order

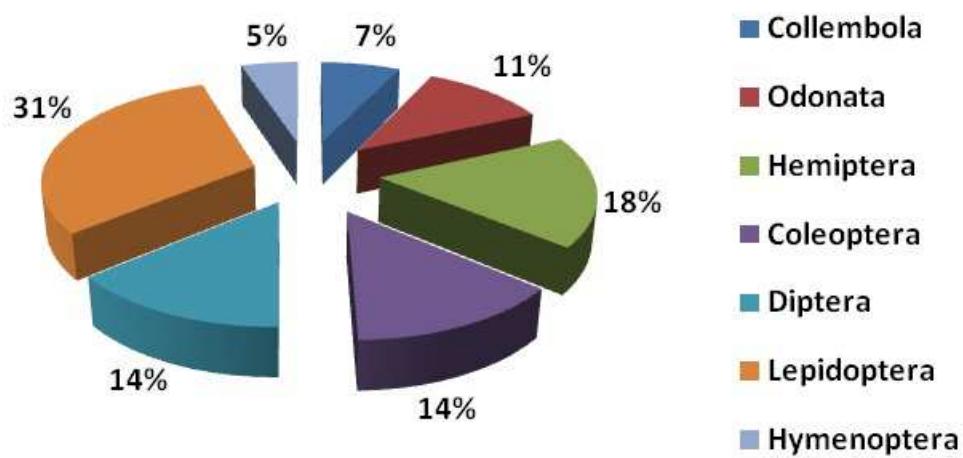


Fig. 2. Generic diversity (%) in each order

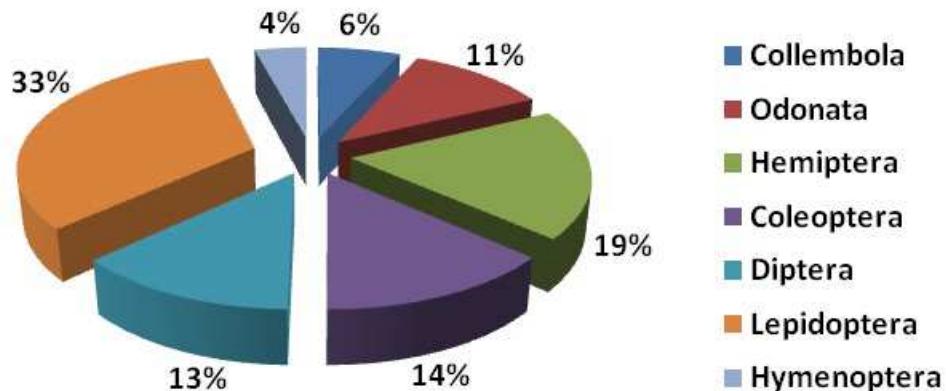


Fig.3. Species diversity (%) in each order

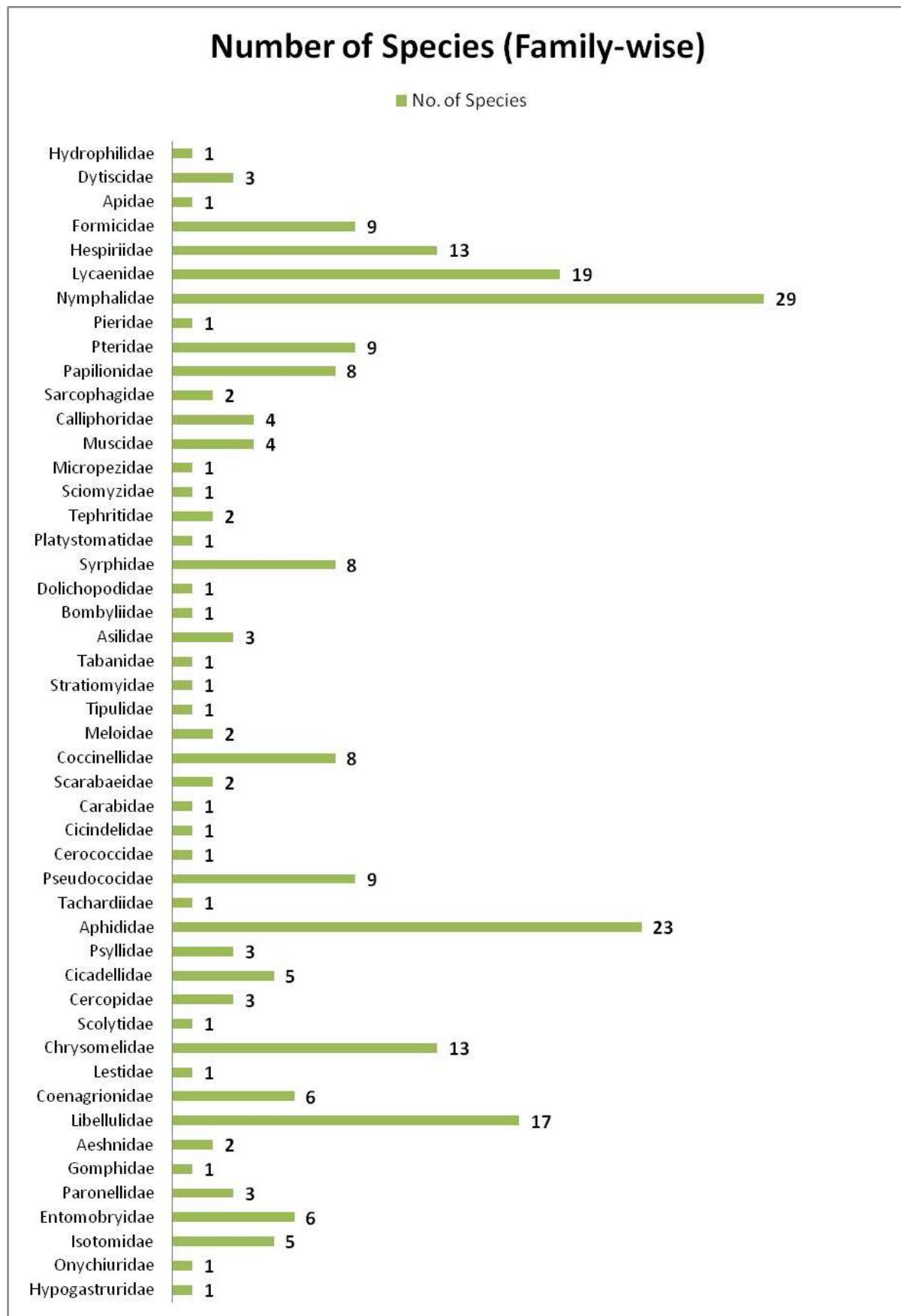


Fig.4. Number of species (Family-wise) in BBWLS

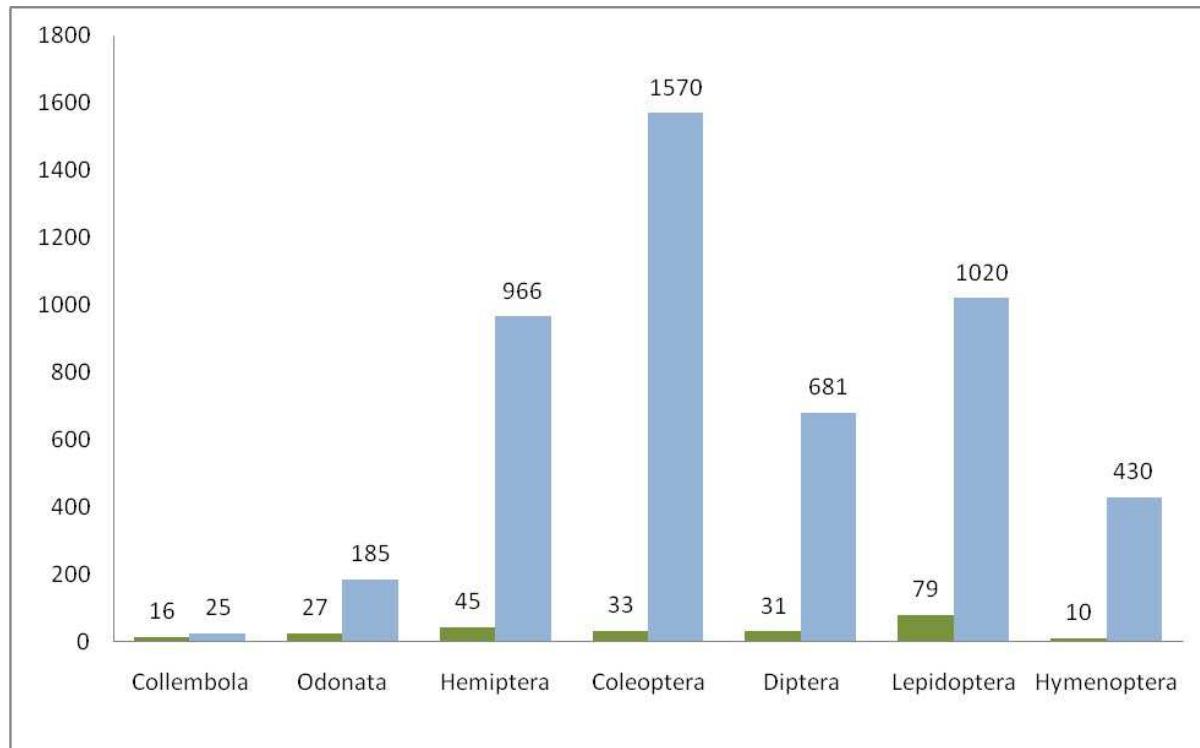


Fig.5. A comparative chart on the basis of reported species in BBWLS and the State of West Bengal

ACKNOWLEDGEMENTS

Authors are thankful to Dr. Kailash Chandra, Director-in- charge, Zoological Survey of India, for the necessary permissions, encouragement and also thankful to Mr. P. Parui (Retd. Scientist), Mr. Biswabrato Biswas, Mr. Sujit Kr. Ghosh and Mr. Suresh Kr. Shah , Scientists of Zoological Survey of India, Kolkata for their help and support. Authors are also grateful to Divisional Forest Officer (DFO) and official staffs of BBWLS, North 24 Parganas for their help and constant support during the survey.

REFERENCES

- [1] Mitra, B., and Parui, P., 2012, Diversity of True flies (Diptera: Insecta) in the Bhubhuti Bhusan Wildlife sanctuary, West Bengal, Rec. Zool. Surv. India, 112(2), 57-64.
- [2] Mitra, B., Banerjee, D., and Mridha, R.S., 2011. A report on the bio ecology of the Giant Red bug (*Macrocera (Lohita) grandis* (Gray) (Family Pyrrhocoridae) and its conservation in the Bhubhuti Bhusan wildlife sanctuary, Parmadan, West Bengal, The Indian Forester, 137 (6), 739-743
- [3] Mandal, G.P., 2011, Collembola (Hexapoda) fauna from Bibhuti Bhushan Wild life Sanctuary, Parmadan, West Bengal, India, Rec Zool. Surv. Ind,111 (2), 61-66.
- [4] Mandal, G.P., Suman, K. K., and Hazra, A. K., 2011, Studies on diversity and distribution of Collembola in the forest Ecosystem at Bibhuti Bhushan Wild life Sanctuary, Parmadan, North 24 pgs District, West Bengal,Rec. Zool. Surv. India, 111 (4), 41-63.
- [5] Ghosh, S., Ghosh, P., and Mitra, B.,2011, On a collection of aquatic beetles from Bhubhuti BhusanWildlife Sanctuary, West Bengal, Bugs R All, Newsletter, 17, 9-10.
- [6] Rosenberg, D.M., Hanks, H.V., Lehmkuhl, D.M., 1986, Importance of insects in environmental impact assessment, Environmental Management,10 , 773-783.

- [7] New, T.R., Pyle, R.M., Thomas, J.A., Thomas, C.D., Hammond, P.C., 1995, Butterfly conservation management, Annual Review of Entomology, 40, 57–83.
- [8] Beccaloni, G.W., and Gaston, K.J., 1995, Predicting the species richness of neotropical forest butterflies: Ithomiinae (Lepidoptera: Nymphalidae) as indicators, Biological Conservation 71: pp.77–86.
- [9] Oostermeijer, J.G.B., and Swaay, C.A.M. van.,1998, The relationship between butterflies and environmental indicator values: a tool for conservation in a changing landscape, Biological Conservation , 86, 271-280.
- [10] Moir, M. L., Brennan, K. E. C., Koch, J. M., Majer, J. D., and Fletcher, M. J., 2005b,Restoration of a forest ecosystem: The effects of vegetation and dispersal capabilities on the reassembly of plant-dwelling arthropods, Forest Ecology and Management, 217, 294-306.
- [11] Chandra, K., 2013, Insect species diversity in Indian states and Union territories: An Introduction, West Bengal Biodiversity Board E-Newsletter, 4(2): 11-18