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DIVERSITY OF ODONATES IN THE NIMATIGHAT AREA OF JHANJIMUK-KOKILAMUKH IBA SITE OF JORHAT DISTRICT (ASSAM), NORTHEAST INDIA

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ABSTRACT

Both dragonflies and damselflies are important component of both terrestrial and aquatic environments providing various ecosystem services. The odonate fauna of India have been studied in details by various workers but still the knowledge on local assemblage pattern is inadequate, especially in the upper Assam region of Northeast India. The present investigation was carried out in a wetland rich Important Bird Area of Upper Assam during 2019, which revealed 56 species of dragonflies (30 species) and damselflies (26 species) under 35 genera and 8 families. The family Libellulidae (28 species) and Coenagrionidae (18 species) were dominant followed by families Platycnemididae, Chlorocyphidae, Lestidae, Aeshnidae, Calopterygidae, Gomphidae each represented by three or less number of species. This higher diversity is supported by various temporary and perennial water bodies abundant with the aquatic macrophytes. No major threats to odonate in the present area were detected during the study period. However, long term survey considering influences of environmental factors is required for better understanding seasonality, population dynamics and community services of dragonflies, damselflies or other insects.

Keywords: dragonfly, damselfly, diversity, Jorhat, Northeast India, IBA site

INTRODUCTION

Dragonflies and damselflies, together known as Odonates, belong to a dominant Arthropod Order- Odonata which occupyboth aquatic and terrestrial habitats. They are predatory insects regulating population of pests and disease vector mosquito population **[1, 2]**, act as bio-indicator of water pollution **[3]**, serve as food for birds **[4]**, and also considered as a component of ecotourism **[5]**. There are

6322 species of odonate worldwide **[6]** of which 477 species are reported from India belonging to 142 genera and18 families **[7]**. However, new species are being discovered till recently **[8, 9]** indicating the need of inventorization of odonate fauna in different corners of the country. Along with the mainland India and other Northeast Indian states **[10-16]**, few studies were also carried out in different parts of the state of Assam that include the reports of **[17]** for Gauhati University Campus, **[18]** for Barpeta District, **[19]** for Bodoland University and its vicinity, **[20]** for Deeporbeel wetland of Assam, **[21]** for Madan- Kamdev Temple areas of ofKamrup (rural) District of Assam. In central Assam, **[22]** studied the odonates of Kaziranga- Karbi Hillsarea while the Barak Valley of southern Assam was investigated by **[23]**. In upper Assam, **[24]** reported dragonflies of Margherita region of Tinsukia District and **[25]** studied dragonflies of Sivsagar District. In 2016, **[26]** documented the composition of odonates in rice ecosystem of Titabor area of Jorhat district. The knowledge on diversity, distribution, species assemblage, seasonality, threats, ecosystem services etc. of odonate fauna are poor in Assam, especially in the upper Assam region. So, the present investigation was carried out to gather baseline data on the dragonflies and damselflies in a riparian area of Jorhat district of upper or eastern Assam.

MATERIALS AND METHODS

Study area: Present investigation was carried out in the Nimatighat area of Jorhat District **(Figure 1)** of Assam, Northeast India which is located by the river Brahmaputra at a distance of about 15 km north to Jorhat town. It is a part of 2500 ha sized Jhanjimukh – Kokilmukh Important Bird Area (IBA) of Birdlife International. Annual rainfall of the area is about 2000 mm, height from MSL is about 90m and during rainy season, a major portion of this area is flooded. The area comprises river Brahmaputra, riparian habitats, perennial wetlands and paddy fields.

Survey Method: All possible habitats were randomly surveys during daytime to find out the odonates. Two field visits were conducted each month from February 2019 to November 2019 and odonates were observed using a pair of binoculars (Celestron 42x8). Photographs were taken whenever possible in their natural habitat using digital camera (Nikon Coolpix P900, 83x optical zoom). The common and distinguishes species are identified with the help of photographic guide book **[27, 28]** whereas the species with similar appearances were confirmed from recorded photographs following taxonomic keys of **[29-31]**. No specimens were preserved during the study.

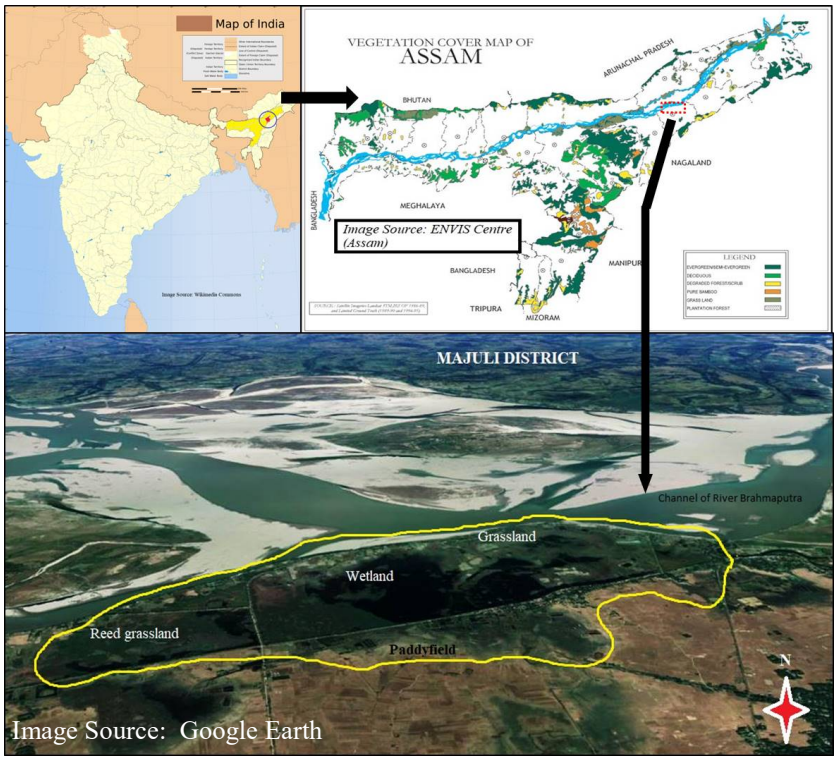

Figure 1: Study area showing location and habitat characteristics

RESULT AND DISCUSSION

During present study, a total of 56 (fifty six) odonate species belonging 35 genera and 8 Families were recorded **(Table 1)**. Total species observed under Suborder-Zygoptera (Damselflies) was 26 and that under Anisoptera (Dragonflies) was 30. Family wise composition of species and genus are summarized in **Figure 2**. The dominance order of the recorded families was Libellulidae (50%) > Coenagrionidae (32.14%) >Platycnemididae (5.36%) >Chlorocyphidae (3.57%) = Lestidae (3.57%) > Aeshnidae (1.78%) = Calopterygidae (1.78%) = Gomphidae (1.78%) in which a combined 82.14% came from the first two families.

In the Family Libellulidae, the genera *Brachydiplax* (4 species), *Orthetrum* (4 species), *Neurothemis* (3 species), *Diplacodes* (2 species), and *Trithemis* (2 species) were richer in species composition compared to the remaining 15 genera which were represented by single species **(Table 1)**. In the other speciose Family - Coenagrionidae, the genus *Ceriagrion* and *Agriocnemis* contained 4 species each followed by *Aciagrion* and *Pseudagrion* (3 species), *Ischnura* (2 species), *Enallagma* (1 species), and *Paracercion* (1 species). Under the family Platycnemididae, three species were spotted whereas family Lestidae contained two species under genus *Lestes* **(Table 1)**. Similarly, Chlorocyphidae also contained two species (*L. lineata.* and *R. biforata*). On the other hand, the remaining families were found to monospecific where *Anaxguttatus*

represented Aeshnidae, *Ictinogomphus rapax* represented Gomphidae and *Neurobasi schinensis* represented the Family Calopterygidae.

This preliminary study revealed that the studied area is rich in dragonflies and damselflies. Similar observation on the dominance of Libellulidae and Coenagrionidae as along with less or no species under Platycnemididae, Lestidae, Chlorocyphidae, Calopterygidae, Aeshnidae, Gomphidae and Calopterygidae were also reported by workers in mainland India **[10, 12]**, Northeast India **[13, 14, 16]** and Assam **[18, 19, 22, 32]**. In earlier investigation from the Jorhat district, **[26]** found 7 species of Libellulidae and equal number under Coenagrionidae in rice field ecosystem while **[33]** noted 17 species representing Libellulidae, Coenagrionidae, Gomphidae and Aeshnidae. In the bordering district Sivsagar, **[22]** reported 34 species under 4 Families (Libellulidae, Coenagrionidae, Gomphidae, Calopterygidae). Similarly **[21]** reported 39 odonate species belonging to Libellulidae (25 species), Coenagrionidae (9 species), Aeshnidae (2 species) and one species each of Gomphidae, Calopterygidae, Lestidae from Borgolai area of Tinsukia district, upper Assam. However, **[19]** 2016 recorded 82 species under 51 genera and 10 families from Karizanga – Karbi hills located west to the present location, which include more diverse habitat types including altitudinal variation, forests, and torrential streams along with wetlands and other such water bodies.

Habitat complexity increases species richness **[34, 35]**. The habitat diversity of the studied site which include fraction of the river Brahmaputra and mosaic distribution of perennial wetlands, temporary water bodies, amphibious plants, shrubs, tall grasses, large trees provide all the favourable breeding, feeding and foraging ground for different dragonfly and damselfly species. The habitat richness and potentiality of IBA site for consideration as a Ramsar Site was also highlighted by **[36]** while **[37]** reported ant diversity from the campus of a nearby educational institute with some addition to the state myrmecofauna showing the overall species richness and need of further investigations in the region. Additionally, the area is almost free of industrial or urban pollutions which also contributed to maintain a healthy environment for odonates and other flora and fauna. However, factors like human encroachment in wetlands, use of synthetic pesticides in the seasonal cultivations practices, excess development of water hyacinth in water bodies many influence the community structure and species richness in near future. Preliminary studies like the present one may be helpful for understanding distribution at regional

scale, for further studies on different aspects as well as developing conservations strategies for varies groups of organisms.

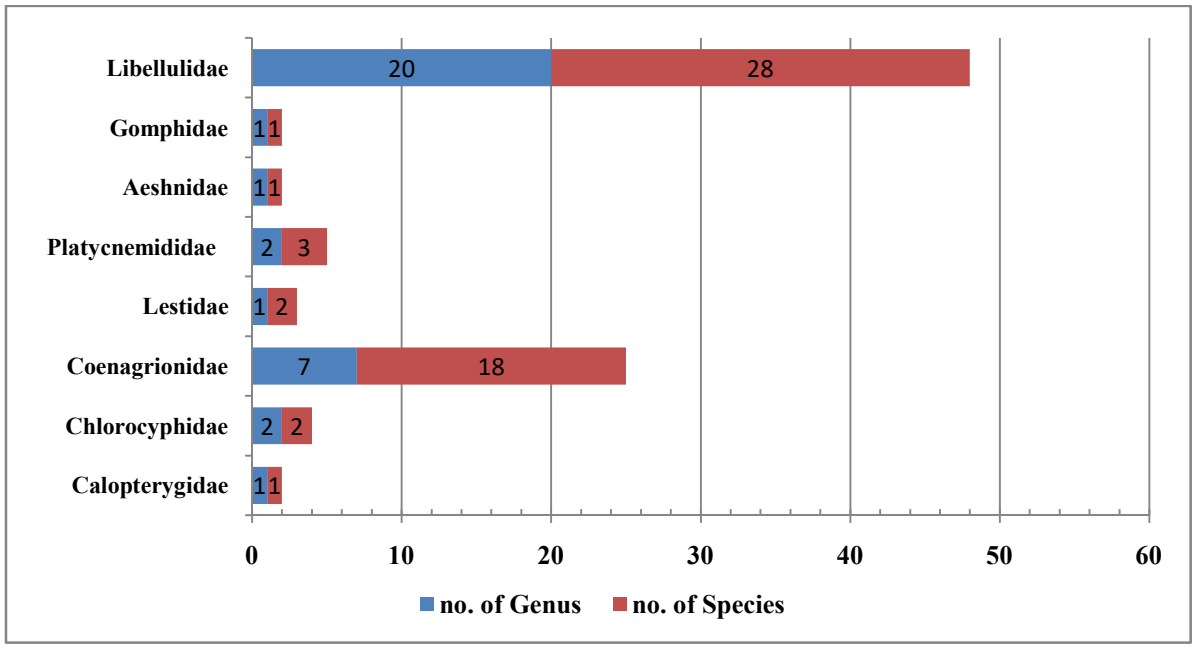

Figure 2: Number of Genus and Species belonging to different Families of Odonata

Table 1: List of dragonfly and damselfly species recorded during the study.

S. No.	Taxonomic Category and Scientific Name	Common Name
	Suborder: Zygoptera Family: Calopterygidae	
1	*Neurobasis chinensis* Linnaeus, 1758	Stream Glory
	Suborder: Zygoptera Family: Chlorocyphidae	
2	*Libellago lineate* Burmeister, 1839.	River Heliodor
3	*Rhinocypha biforata* Selys, 1859	Not available
	Suborder: Zygoptera Family: Coenagrionidae	
4	*Aciagrion hisopa* Selys, 1876	Slim Blue
5	*Aciagrion occidentale* Laidlaw, 1919	Green-striped Slender Dartlet
6	*Aciagrion pallidum* Selys, 1891	Pale Slender Dartlet
7	*Agriocnemis femina* Brauer, 1868	PruinosedDartlet
8	*Agriocnemis kalinga* Nair & Subramanian 2015	Indian Hooded Dartlet
9	*Agriocnemis lacteola* Selys, 1877	Milky Dartlet
10	*Agriocnemis pygmaea* Rambur, 1842	Pigmy Dartlet
11	*Ceriagrion cerinorubellum* Brauer, 1865	Orange-tailed Marsh Dart
12	*Ceriagrion coromandelianum* Fabricius, 1798	Coromandel Marsh Dart
13	*Ceriagrion olivaceum* Laidlaw, 1914	Rusty Marsh Dart
14	*Ceriagrion rubiae* Laidlaw, 1916	Orange Marsh Dart
15	*Enallagma parvum* Selys,1876	Azure Dartlet
16	*Ischnura aurora* Brauer, 1865	Golden dartlet
17	*Ischnura senegalensis* (Rambur, 1842)	Senegal Golden Dartlet
18	*Paracercion malayanum* Selys, 1876	Malayan Lilly-Squatter
19	*Pseudagrion decorum* Rambur, 1842	Three lined dart
20	*Pseudagrionmicrocephalum* Rambur, 1842	Blue Grass Dart
21	*Pseudagrionrubriceps*(Selys, 1876)	Saffron-faced Blue Dart
	Suborder: Zygoptera Family: Lestidae	
22	*Lestes praemorsus* Hagen in Selys, 1862	
23	*Lestes viridulus* Rambur, 1842	Emerald-striped Spreadwing

	Suborder: Zygoptera Family: Platycnemididae	
24	***Copera ciliate* Selys, 1863**	**Pied Bush Dart**
25	***Copera vittata* Selys, 1863**	**Blue Bush Dart**
26	***Onychargia atrocyana* Selys, 1865**	**Black Marsh Dart**
	Suborder: Anisoptera Family: Aeshnidae	
27	***Anax guttatus* Burmeister 1839**	**Lesser Green Emperor**
	Suborder: Zygoptera Family: Gomphidae	
28	***Ictinogomphus rapax* Rambur, 1842**	**Common Clubtail**
	Suborder: Zygoptera Family: Libellulidae	
29	***Acisoma panorpoides* Rambur, 1842**	**Trumpet Tail**
30	***Aethriamanta brevipennis* (Rambur, 1842)**	**Scarlet Marsh Hawk**
31	***Brachydiplax chalybea* Brauer, 1868**	**Rufous-backed Marsh Hawk**
32	***Brachydiplax sobrina* (Rambur, 1842)**	**Little Blue Marsh Hawk**
33	***Brachythemis contaminata* (Fabricius, 1793)**	**Ditch Jewel**
34	***Bradinopyga geminate* Rambur, 1842**	**Granite Ghost**
35	***Camacinia gigantea* (Brauer, 1867)**	**Giant Forest Skimmer**
36	***Crocothemis servilia* (Drury, 1770)**	**Ruddy Marsh Skimmer**
37	***Diplacodes nebulosa* (Fabricius, 1793)**	**Black-tipped Ground Skimmer**
38	***Diplacodes trivialis* Rambur, 1842**	**Ground Skimmer**
39	***Hydrobasileus fulus* (Brauer, 1867)**	**Amber-winged Marsh Glider**
40	***Lathrecista asiatica* Fabricius, 1798**	**Asiatic Bloodtail**
41	***Lyriothemis acigastra* (Selys, 1878)**	**Not Available**
42	***Neurothemisfulvia* Drury, 1773**	**Fulvous Forest Skimmer**
43	***Neurothemis intermedia* Rambur, 1842**	**Paddyfield parasol**
44	***Neurothemis tullia* (Drury, 1773)**	**Pied Paddy Skimmer**
45	***Orthetrum glaucum* Brauer, 1865**	**Blue Marsh Hawk**
46	***Orthetrum pruinosum* (Burmeister, 1839)**	**Crimson-tailed Marsh Hawk**
47	***Orthetrum sabina* (Drury, 1770)**	**Green Marsh Hawk**
48	***Orthetrum triangulare* (Selys, 1878)**	**Blue-Tailed Forest Hawk**
49	***Pantala flavescens* Fabricius, 1798**	**Wandering Glider**
50	***Potamarcha congener* (Rambur, 1842)**	**Yellow-tailed Ashy Skimmer**
51	***Rhodothemis rufa* Rambur, 1842**	**Rufous Marsh Glider**
52	***Rhyothemis variegata* Linnaeus, 1763**	**Common Picture Wing**
53	***Tholymi stillarga* Fabricius, 1798**	**Coral-tailed Cloud Wing**
54	***Trithemis aurora* (Burmeister, 1839)**	**Crimson Marsh Glider**
55	***Trithemis pallidinervis* (Kirby, 1889)**	**Long-legged Marsh Glider**
56	***Urothemis signata* Rambur, 1842**	**Greater Crimson Glider**

CONCLUSION

Riparian zones of rivers provide habitats for different flora and fauna. Through this preliminary investigation, a considerably higher number of dragonflies have been recorded. This finding can be used as baseline data for further studies on odonates or other ecological investigations in similar ecologically important areas of Brahmaputra floodplain in Assam or elsewhere.

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