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Faunistic study of Odonata (Dragonfly & Damselfly) in some selected regions of Bangladesh

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ABSTRACT

A study was conducted to investigate the species diversity of Odonata (dragonfly and damselfly) in five selected areas of Bangladesh viz. Dhaka, Moulvibazar, Bandarban, Chuadanga and Khulna during July' 2009 to June' 2010. A total of 3350 individuals belonging to 48 species under 8 families were observed during the study period. Among them, 25 species were dragonflies under the families; Libellulidae (22), Aeshnidae (2) and Gomphidae (1), whereas the remaining 23 species were damselflies under five families; Coenagrionidae (16), Platycnemididae (4), Calopterygidae (1), Lestidae (1), Protoneuridae (1). The highest and lowest number of species was observed in Dhaka (31) and Bandarban (23), respectively. Libellulidae was the dominant family, whereas few species were found under the family Gomphidae, Lestidae, Calopterygidae and Protoneuridae. Species composition was highest in the family Libellulidae (45.8%) followed by the family Coenagrionidae (33.3%). Post-monsoon represented by 45 species was the optimum season for Odonata. The present surveillance yielded one new species of Dragonfly, *Gynacantha dravida* and five Damselfly species: *Aciagrion pallidum*, *Ceriagrion praetermissum*, *Lestes elatus*, *Copera chantaburii* and *Copera ciliata* in the perspective of Bangladesh. The above results indicate that the study of Odonate species in other regions of the country would provide insight in updating the checklist of Odonate species in the country, and know their ecology, and their relative importance for the successful conservation strategy and the impact of climate change on this group of insects.

Keywords: Bangladesh, Damselflies, Dragonflies, Odonata, Survey.

1. Introduction

Bangladesh, the former eastern part of Pakistan is bordered by the Indian states of West Bengal, Meghalaya, Assam, Mizoram and Tripura and Burma to the east and by the Bay of Bengal to the south. Bangladesh spans from 20°34' N to 26° 38' latitude and from 88° 1' E to 92° 41". The country is divided into two halves by the tropic of cancer; the northern half is between the tropical and humid sub-tropical regions characterized by humid mesothermal climate, and the southern half are a tropical wet and dry regions characterized by tropical rainy climate. Hence, Bangladesh is of enormous interest in terms of Zoogeography as well as a very suitable place for breeding of odonates. The order Odonata is one of the earliest as well as most popular hemimetabolous, paleopterous and amphibiotic insect groups occurring on all continents except Antarctica [1, 2]. The majority of these insects inhabits the tropical and subtropical climate zones [3]. A total of 5,740 species of Odonates under 600 genera have been reported globally [4, 5]. Adult Odonates are terrestrial and are found near water, whereas the immature stages are aquatic and inhabit all types of freshwater habitats ranging from permanent running waters and lakes to small temporary rain pools [6, 7, 1]. Many species are limited to some particular habitats, both during larval and adult life stages especially the stenotopic species. However, their specificity to aquatic habitats makes them an ideal model for monitoring the health of freshwater ecosystems [8, 9, 5]. All stages of their life cycle are predaceous and feed on various insects like mosquitoes, blackflies, bloodsucking flies and acting as an important biocontrol agent of many harmful insects and playing a crucial role in controlling pest populations of agroecosystems. The adults are harmless and their beautiful color pattern raised strong aesthetic sense to human being. People in some countries also take the adult dragonflies as a minor food item [10, 11, 12, 13, 14, 15]. Odonate nymphs are important components of most fresh water habitats, intermediate links in aquatic food webs, functioning as both prey and predators. Nymphs are food for birds, fish, bugs [7]. Despite their utmost economic significance, relatively few studies on Odonates have been carried out in Bangladesh. Total number Odonate species found in Bangladesh are yet unknown and their importance and conservation strategy remains ignored.

So far only faunistic surveys in some selected areas of Bangladesh have been carried out [16, 17, 10, 18, 19]. Hence the present study was conducted to know the status of dragonflies and damselflies in different locations of Bangladesh which might be helpful to pave the way for future research and formulation of an effective strategy for conservation of this important group of insects.

2. Materials and Methods

2.1 Study Areas

The survey was conducted in five selected regions of Dhaka, Moulvibazar, Bandarban, Chuadanga and Khulna districts of Bangladesh during July, 2009 to June 2010.

Dhaka: Dhaka district is situated at the central region of Bangladesh and geographically located at 23°42' 0"N latitude and 90°22'30" E longitudes. Selected spot consisted of wetlands, lakes and ponds, grasslands, cultivated lands, bushes, woodlands and human settlements, i.e. houses, academic and administrative buildings.

Moulvibazar: Moulvibazar is a semi hilly region with most of the tea estates in Bangladesh and is geographically located at 24°18'30"N latitude and 91°44'0"E longitude. It is surrounded by Sylhet District in the north, Habiganj District in the west and the Indian States of Assam and Tripura in the east and south respectively. The collection was performed beside lakes and streams, ponds and in the tea estates.

Bandarban: Bandarban is a hilly region; consisting of deep forest and bushy area with many streams. It is bordered by Cox's Bazaar, Chittagong, Rangamati and Khagrachari districts of Bangladesh. Geographically, it is at 22°27'0" N latitude and 92°38'24" E longitude. Streams, ponds and forest constitute this study site.

Chuadanga: Chuadanga is situated in the west part of Bangladesh and adjacent to the Indian border and is geographically located at 23°38'24" N latitude 88°51'35" E longitude. It is plain land characterized by the rainy, humid summer and cool winter. Lakes and ponds, forest and rice field were the habitat criteria of this spot.

Khulna: Khulna is the third largest city in Bangladesh. It is located on the banks of the Rupsha and Bhairab rivers. Geographically, it is located at 22°49'0" N latitude and 89°33'0" E longitude. It lies south of Jessore and Narail, East of Satkhira, West of Bagerhat and North of the Bay of Bengal. The study area was subdivided into lakes and ponds, forest and rice field.

2.2 Collection, identification, and preservation

Adult Odonates were collected and observed thrice in a year (monsoon, pre and post-monsoon) from the study areas. February to May were considered as Premonsoon, June to September as Monsoon and October to January as Postmonsoon. Collections and observations were made at sunny midday and specific routes were followed to observe the individuals and counted by putting a tally mark for the respective species of each location. Adults were collected by using sweeping net of 30 cm diameter. Specimens were killed by putting them in a jar with CCl₄. Then the specimens were carefully preserved in small triangular paper envelopes and finally kept in plastic pots. Naphthalene and silica gel were kept into the pots with the tissues to protect the specimens from other insectivores and mould to grow.

The collected specimens were brought to the IRES (Insect Rearing and Experimental Station), Department of Zoology, Jahangirnagar University for identification. Identification was facilitated with the help of a taxonomic key provided by [20, 21, 22, 23, 24, 25, 26, 27, 28, 5]. As the colors of the adults may be faded or changed after preservation,

so photographs of the adults, were taken either just after collection or in the field by using Olympus and Canon 50D digital cameras. Available research articles on Odonate fauna, published at home and abroad related to surveys conducted in Bangladesh were reviewed. Our findings were compared with previous results with an eye to find new species and asterisks marks on the right corner of the species name (Table 1 & 2) indicate our newly recorded species.

3. Results

Altogether forty eight (48) species of Odonates were recorded, among them were twenty five species of dragonflies under three families: Libellulidae (22), Aeshnidae (2) and Gomphidae (1) belonging to nineteen genera and twenty three species of damselflies under five families: Coenagrionidae (16), Calopterygidae (1), Lestidae (1), Protoneuridae (1) and Platycnemididae (4) belonging to twelve genera (Table 1&2).

The highest number (31) of Odonate species was recorded from Dhaka region. Among them, twenty species were dragonflies under three families: Libellulidae, Aeshnidae and Gomphidae and eleven species were damselflies under three families: Coenagrionidae, Protoneuridae and Platycnemididae. Twenty six species of Odonata were recorded from Moulvibazar. Out of these, 15 species were dragonflies belonging to three families: Libellulidae, Aeshnidae and Gomphidae and eleven species were damselflies belonging to four families: Coenagrionidae, Calopterygidae, Lestidae and Platycnemididae. The lowest of 23 species of Odonates was identified from Bandarban. Among them, dragonflies consisted of 14 species under three families: Libellulidae, Aeshnidae and Gomphidae and damselfly consisted of 9 species belonging 2 families: Coenagrionidae and Platycnemididae. In the Chuadanga region, the number of Odonate species was 29; 17 species were dragonflies under two families: Gomphidae and Libellulidae, and 12 species were damselflies under three families: Lestidae, Coenagrionidae, and Protoneuridae. The number of Odonate species recorded in the Khulna region was twenty four, including thirteen species of dragonflies under two families: Libellulidae and Gomphidae and eleven species of damselflies under two families: Coenagrionidae and Lestidae (Table 1 & 2).

The species diversity was highest under the family Libellulidae with 22 species, whereas the families Lestidae, Gomphidae, Protoneuridae and Calopterygidae had the lowest number of species each of which was represented by only 1 species (Table 1 & 2). Percentage of species composition was highest in the Libellulidae family (45.8%) followed by Coenagrionidae (33.3%). The lowest percentage (2.1%) of species was recorded in Gomphidae, Calopterygidae, Lestidae, and Protoneuridae (Fig. 1). It was also observed that the maximum species diversity was found during the season of post-monsoon, represented by 45 species, and pre-monsoon and post-monsoon represented 32 and 42 species, respectively (Table-3).

The present study yielded one species of Dragonfly, *Gynacantha dravida* and five species of Damselflies: *Aciagrion pallidum*, *Ceriagrion praetermissum*, *Lestes elatus*, *Copera chantaburii* and *Copera ciliata* which are new records in Bangladesh. At present, a total of 179 species (90 species of Dragonflies and 89 species of Damselflies) of Odonata in Bangladesh has been recorded including the 6 new species.

Table 1: List of dragonfly species recorded from the study areas during the study period (July '09 to June '10)

S. No.	Common Name	Scientific Name	Family	Distribution				
				DH	MV	BB	CD	KH
1.	Trumpet Tail	<i>Acisoma panorpoides</i>	Libellulidae	√	×	×	√	√
2.	Scarlet Marsh Hawk	<i>Aethriamanta brevipennis</i>		√	×	×	√	√
3.	Ditch Jewel	<i>Brachythemis contaminata</i>		√	√	√	√	√
4.	Skimmer	<i>Brachydiplax chalybea</i>		√	×	×	√	√
5.	Common Skimmer	<i>Brachydiplax sobrina</i>		×	×	√	×	×
6.	Common Skimmer	<i>Brachydiplax farinosa</i>		√	×	√	×	×
7.	Emerald banded Skimmer	<i>Cratilla lineata</i>		√	×	×	√	×
8.	Ruddy Marsh Skimmer	<i>Crocothemis servilia</i>		√	√	×	√	√
9.	Ground Skimmer	<i>Diplacodes nebulosa</i>		×	×	√	×	√
10.	Ground Skimmer	<i>Diplacodes trivialis</i>		√	√	×	√	√
11.	Fulvous Forest Skimmer	<i>Neurothemis fulvia</i>		√	√	√	√	×
12.	Pied Paddy Skimmer	<i>Neurothemis tullia</i>		√	×	×	√	√
13.	Green Marsh Hawk	<i>Orthetrum sabina</i>		√	√	√	√	√
14.	Crimson Tailed Marsh Hawk	<i>Orthetrum pruinosum</i>		√	√	×	√	×
15.	Red Faced Skimmer	<i>Orthetrum chrysis</i>		×	√	√	×	×
16.	Blue Tailed Yellow Skimmer	<i>Palpopleura sexmaculata</i>		×	√	×	×	×
17.	Wandering Glider	<i>Pantala flavescens</i>		√	√	√	√	√
18.	Yellow Tailed Ashy Skimmer	<i>Potamarcha congener</i>		√	√	×	√	×
19.	Common Picture Wing	<i>Rhyothemis variegata</i>		√	√	×	√	√
20.	Skimmer	<i>Rhodothemis rufa</i>		√	×	√	√	×
21.	Coral Tailed Cloud Wing	<i>Tholymis tillarga</i>		√	√	√	√	×
22.	Long-legged Marsh Glider	<i>Trithemis pallidinervis</i>		√	×	×	√	√
23.	Brown Darner	<i>Gynacantha dravida*</i>		Aeshnidae	√	√	√	×
24.	Blue-tailed Green Darner	<i>Anax guttatus</i>	×		√	√	×	×
25.	Common Clubtail	<i>Ictinogomphus rapax</i>	Gomphidae	√	√	√	√	√

(DH= Dhaka, MV=Moulvibazar, BB=Bandarban, CD=Chuadanga, KH=Khulna, √= presence of dragonfly species, ×= absence of dragonfly species)

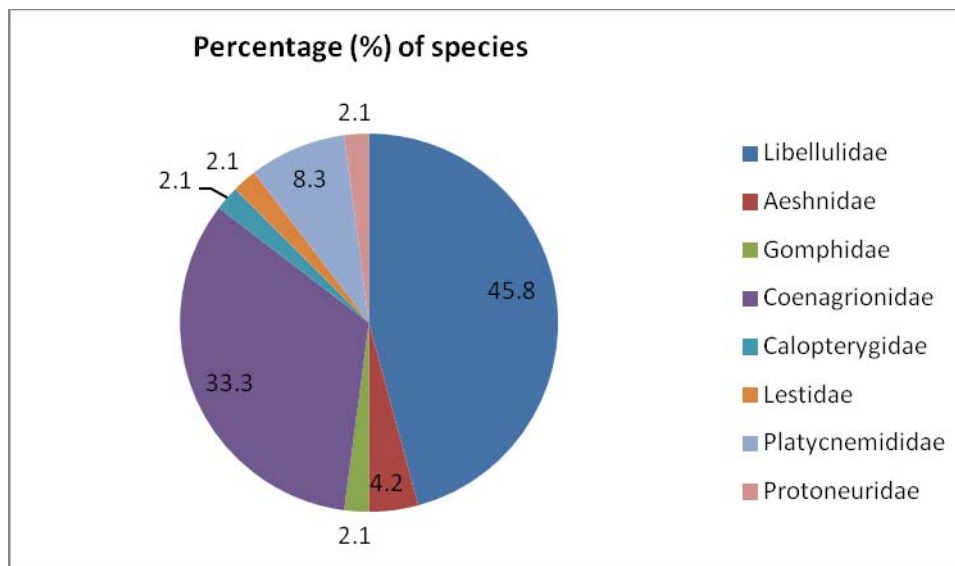
Table 2: Damselfly species recorded from the study areas during the study period (July '09 to June '10)

S. No.	Common Name	Scientific Name	Family	Distribution				
				DH	MV	BB	CD	KH
1.	Pigmy Darlet	<i>Agriocnemis pygmaea</i>	Coenagrionidae	√	√	√	√	√
2.	Narrow-winged damselfly	<i>Agriocnemis femina</i>		√	√	√	√	√
3.	Narrow-winged damsel fly	<i>Agriocnemis pieris</i>		√	×	√	×	√
4.	Pale Slender Dartlet	<i>Aciagrion pallidum*</i>		×	×	×	√	×
5.	Orange-tailed Marsh Dart	<i>Ceriagrion cerinorubellum</i>		√	√	√	√	√
6.	Coromandel Marsh Dart	<i>Ceriagrion coromandelianum</i>		√	√	√	√	√
7.	Rusty Marsh Dart	<i>Ceriagrion olivaceum</i>		√	×	×	×	√
8.	Praetermissan Marsh Dart	<i>Ceriagrion praetermissum*</i>		×	×	×	√	×
9.	Buff Striped Keelback	<i>Enallagma parvum</i>		×	×	×	×	√
10.	Golden Dartlet	<i>Ischnura aurora</i>		×	×	×	√	√
11.	Senegal Golden Dartlet	<i>Ischnura senegalensis</i>		√	×	×	√	√
12.	Narrow-winged damselfly	<i>Onychargia atrocyana</i>		√	×	×	×	×
13.	Saffron-faced Blue Dart	<i>Pseudagrion rubriceps</i>		√	√	√	√	√
14.	Common Blue Dart	<i>Pseudagrion decorum</i>		×	×	×	×	√
15.	Yellow Stripped Blue Dart	<i>Pseudagrion indicum</i>		×	×	√	×	×
16.	Narrow-winged damselfly	<i>Rhodischmura nursei</i>		×	×	×	√	√
17.	Stream Glory	<i>Neurobasis chinensis</i>	Calopterygidae	×	√	√	×	×
18.	Emerald Spreadwing	<i>Lestes elatus*</i>	Lestidae	×	√	×	√	√
19.	Yellow Bush Dart	<i>Copera marginipes</i>	Platycnemididae	×	√	×	×	×
20.	Blue Bush Dart	<i>Copera vittata</i>		×	√	√	×	×
21.	Brown Bush Dart	<i>Copera chantaburii*</i>		√	√	×	×	×
22.	Common Bush Dart	<i>Copera ciliata*</i>		√	√	×	×	×
23.	Bamboo tail	<i>Prodasineura autumnalis</i>	Protoneuridae	√	×	×	√	×

(DH= Dhaka, MV=Moulvibazar, BB=Bandarban, CD=Chuadanga, KH=Khulna, √= presence of dragonfly species, ×= absence of dragonfly species)

Table 3: List of families under Odonata (Dragonflies & Damselflies) and their abundance during Pre-monsoon, monsoon and post-monsoon periods from sampling areas

S. No.	Suborder	Family name	Pre-monsoon		Monsoon		Post-monsoon	
			No.	%	No.	%	No.	%
1.	Anisoptera	Libellulidae	16	50	22	52.4	20	44.4
2.		Aeshnidae	01	3.1	02	4.8	01	2.2
3.		Gomphidae	01	3.1	01	2.4	01	2.2
4.	Zygoptera	Coenagrionidae	12	37.5	10	23.8	16	35.6
5.		Calopterygidae	00	0.0	01	2.4	01	2.2
6.		Lestidae	01	3.1	01	2.4	01	2.2
7.		Platycnemididae	01	3.1	04	9.5	04	8.9
8.		Protoneuridae	00	0.0	01	2.4	01	2.2
		Grand total	32		42		45	

**Fig 1:** Abundance of different families of Odonata (Dragonflies & Damselflies) in sampling areas during July'09 to June'10

4. Discussion

In our study, out of 48 species recorded, 25 species were dragonflies belonging to three families: Aeshnidae, Libellulidae, and Gomphidae; 23 species were damselflies under five families: Coenagrionidae, Calopterygidae, Lestidae, Protoneuridae, and Platycnemididae.

A previous study by Alam ^[16] recorded a total of 94 species of Odonata in Bangladesh comprising 46 species of dragonflies under four families: Aeshnidae, Libellulidae, Gomphidae and Cordulegastridae and 48 species of damselflies under ten families: Chlorocyphidae, Calopterygidae, Euphaeidae, Platycnemididae, Coenagrionidae, Protoneuridae, Platystictidae, Lestidae, Philopotamidae, and Synlestidae. Another study by Nomura and Alam ^[18] identified 17 species of Odonates under the families Libellulidae and Coenagrionidae. A total of 96 species of Odonates from the eastern region of Bangladesh was recorded by Chowdhury and Mohiuddin ^[19] among which 49 species were dragonflies under the families Libellulidae, Aeshnidae, and Gomphidae, and 47 species were damselflies belonging to the families Lestidae, Coenagrionidae, Protoneuridae, Calopterygidae, and Platycnemididae. However, we did not find any species under the families Agriidae, Euphaeidae, Chlorocyphidae, Cordulegastridae, and Philopotamidae.

Our study showed highest species diversity in Dhaka region (31) and least species diversity (23) in Bandarban region, whereas Chuadanga region had the moderate species diversity (29). The

underlying reason for this variability of species diversity among different regions might be the differences in prevailing environmental factors among the habitats, since habitat specificity is regarded as one of the most important factors influencing the regional distribution of dragonflies ^[29]. Similar explanation regarding the species diversity of Odonates was also presented in works by Harp and Harp ^[30] where they postulated that species richness results from the diversity of aquatic habitats like lakes, ponds, rivers, springs, seeps, and creeks. Whereas the adult Odonates are terrestrial and usually found near water bodies, the larval and pupal stages are aquatic inhabiting all forms of freshwater habitats ranging from permanent running waters and lakes to small temporary rain pools ^[6, 7, 11]. Many species, particularly stenotopic species are confined to specific habitats, both during immature and adult life stages ^[9, 5].

In dragonflies, a total of 25 species under three families were recorded from all sampling areas. On the basis of number of identified species Libellulidae was the dominant family represented by 22 species (45.8% of total identified Odonate species) and other 2 families: Aeshnidae and Gomphidae constituted 2 species and 1 species, respectively. A total of 46 species of dragonflies was reported under 4 families by Alam ^[16], among which Libellulidae was the dominant family including 20 species. Libellulidae represented by 33 species was found as the dominant family by Chowdhury and Aktaruzzaman ^[17] also who recorded a total of 37 species of dragonflies from southern hilly regions of Bangladesh.

Chowdhury and Mohiuddin ^[19] also reported Libellulidae as the dominant dragonfly family representing 33 species out of 49 species of dragonflies.

In our survey, we found Coenagriidae as the dominant family of damselflies consisting of 16 (33.3% of total identified odonate species) species out of 23 species. Similar results were reported by Chowdhury and Mia ^[10] where they mentioned Coenagriidae as the dominant damselfly family in Bangladesh, representing twenty seven species out of 31 species. A survey conducted on damselfly fauna in Bangladesh described a total of thirty one species of damselflies. In the present study, the diversity of Odonate species was highest during post-monsoon period represented by 45 species, followed by the pre-monsoon and monsoon period represented by 32 species and 42 species, respectively. Since the abundance, distribution, and richness of insect species are known to be influenced by the climate, vegetation and their interactions ^[31, 32, 33, 34, 35] and food resources and climate conditions vary in space and time, directly affecting the diversity and distribution of insect populations ^[36, 37, 38, 39] these factors might be a cause of differences in diversity of the Odonate species in our study.

The present surveillance yielded one species of dragonfly, *Gynacantha dravida* and five species of damselflies: *Aciagrion pallidum*, *Ceriagrion praetermissum*, *Lestes elatus*, *Copera chantaburii* and *Copera ciliata* which are new records in Bangladesh. At present, a total of 179 species (90 species of dragonflies and 89 species of damselflies) of Odonata in Bangladesh has been reported including the new 6 species. The above results indicate that further study in other areas might discover more species. The significance of Odonates should not be squandered as the value of all life on earth is recognized. Till today very few areas of Bangladesh have been explored to discover Odonate fauna. Hence, continuous and extensive expedition is needed for awaited discovery and enriching our knowledge regarding their ecology and action plan for conserving Odonata.

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