



Diversity, Distribution and Abundance of Damselfly (Zygoptera) of Kapla Beel, Wetland of Barpeta District; Assam, India

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Abstract

The order Odonata is one of the ancient groups of the class insecta, consists of dragonflies and damselflies. The adults of both the groups are terrestrial while the larvae are aquatic. The Species of both the groups are highly specific to particular aquatic habitat. This habitat specificity makes them an ideal candidate for monitoring health of freshwater ecosystems. The studies on the Odonata of India is well documented since the time of Linnaeus but a very little or fragmentary work was completed to have information of the diversity and abundance of these species from Northeast India. The present study was done with an objective to study the diversity and abundance of damselflies of the "KAPLA BEEL" near "Sarthebari" in the district of Barpeta, Assam. This study has been carried out for one year from June 2013 to May 2014. In this study total 26 species of damselflies belonging to 3 families and 11 genera were identified and recorded. It is observed that out of the total 26 species, 88.46% are of family Coenagrionidae followed by Platynemididae while Calopterygidae showed very less species diversity. This is the primary record of damselflies diversity from the Kapla Beel, Barpeta, Assam, (India). Datas recorded from different months of the study period were compared and Shannon H', Shannon Hmax, Shannon J', Simpsons Diversity (D), Simpsons Diversity (1/D), Richness were calculated by using Biodiversity pro software 2.0. It was observed that in September there was highest value of Shannon H' which is 1.398 and the least is seen in the April which is 1.302.

Keywords: Odonata, dragonfly, damselfly, kapla, barpeta, Assam.

Introduction

Damselflies belongs to a primitive and ancient insect order Odonata, with fossil records dating back to the Permian era of about 230 - 280 million years ago. This group represents the second largest aquatic insect order in the animal kingdom. Odonata are classified into three suborders, namely Anisoptera (8 living families), Zygoptera (17 living families) and Anisozygoptera¹. Damselflies are predaceous, hemimetabolous and amphibiotic insects presents of all kinds of freshwater bodies^{2,3}. Damselflies have narrow rectangular heads with their eyes separated. The hind wings and forewings of damselfly similar in shape, size and venation. Wings narrow towards the base, forming a 'stalk' in some families. When alive, wings held together over the slender abdomen or only separated slightly. Damselflies are good indicators of environmental changes as they are sensitive to changes in the habitats, atmospheric temperature and weather conditions^{4,5}. Identifying habitat types based on species abundance has potential applications both in terms of choosing and assessing the species as indicators⁶.

Damselflies are important bio-control agents. Many species of odonates inhabiting in agro ecosystems plays a crucial role in controlling pest populations. There are about 6,000 species of Odonates where subspecies belonging to 630 genera in 28 families were documented worldwide⁷. India accounts of 470 species under 139 genera and 19 families⁸. The taxonomy of

adults is well worked out and descriptions are available for almost all the reported species⁹⁻¹³. In 1758, Linnaeus described the first damselfly, *Neurobasis chinensis* from India. Laidlaw¹⁴ described 20 species of dragonflies and damselflies from Assam and Burma. No regional specific study was carried out thereafter. Subramanian¹⁵ reported two damselfly species (*Ceriagrion olivaceum* and *Prodasineura verticalis*) from Northeast India. Lahiri¹⁶ confirmed the species (*Hydrobasileus croceus*) distribution in Assam and Meghalaya, which Fraser reported earlier that species found only Western and Southern India.

Material and Methods

Study area: The "KAPLA BEEL" is situated near "Sarthebari" in the district of Barpeta, Assam. It is a beautiful perennial freshwater aquatic pool of Assam which harbours large groups of piscean and avian fauna. This beel is a capital source for the local fishermen to earn money for their daily life. The beel directly acts as the perspective spawning ground of the large growing river fishes particularly the Indian Major Carps (IMCs).

Location: The Kapla Beel lies in between Doulasala and Sarthebari town, east from Barpeta district at a distance of 25 km from the northern bank of mighty river Brahmaputra. The average depth of the aquatic pool was 7-9 feet in 1995 but

presently in 2015 the average depth was 4.5- 6 feet. The total area of the “Kapla Beel” is about 91 hectares. It extends between latitude of 26°18'12" to 26°25'7" N and between longitude 91° 08'42" to 91°14'50" E. It is almost 2 KM far in southern side from Sarthebari¹⁷.

The Boundary of the Beel is as follows: East: Haldhibari and Kaldipathar. West: Barkapla Gaon. North: Kamarpara Gaon. South: Mara Sawal Khowa River and Salmara Gaon.

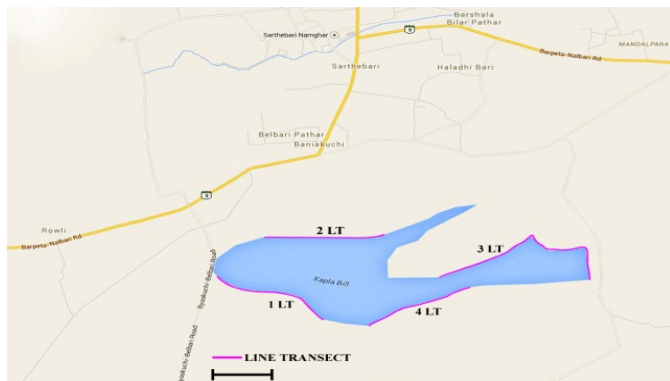


Figure-1
 Line transects along the Kapla Beel



Figure-2
 Photograph showing ecology of Kapla Beel

Climate: Mesothermal and humid climatic conditions surrounds the study area around the Brahmaputra Valley. Winter is the coldest season (8°C-19°C) but heavy rainfall (>295.5 cm) and temperature rising (29.8°C -35.5°C) during Summer or Monsoon. The total climatic conditions of this area could be divided into four seasons viz. Pre-monsoon (March-May), Monsoon (June- Sept.), Repeating monsoon (October-November) and Winter (December-February).

Observations: The present study was done for one year from June 2013 to May 2014. The survey period was designed in such a way that there was at least one visit in each line transect in a week for a period of one year from June 2013 to May 2014. Observations were made by walking through the transects (1 km to 1.5 km length with 2m to 5 m wide from the line). Results

were recorded by visualizing the species throughout the transect and after that summarization of all transects were done.

Damselflies were observed in field with careful observations and records on their habitats. For diversity and abundance, each species were counted by visual observations. The species were identified after Subramanian and Andrew¹⁸. Adult Odonates were collected and observed thrice in a year (monsoon, pre and post-monsoon) from the study areas. 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 sweep net of 30 cm diameter. Specimens were killed using CCl₄. The specimens were carefully preserved in small triangular paper envelopes and finally kept in plastic jars. Naphthalene and silica gel were kept into the jars with the tissues to protect the specimens from pests and mould. The unidentified specimens were analysed in the laboratory using Binocular microscope and by using literature after Fraser.

Data analysis: Diversity indices like Shannon H', Simpsons Diversity (D), Simpsons Diversity (1/D), Richness were calculated using Biodiversity Pro software version 2.0.

Results and Discussion

In the present investigation 929 individuals of 26 species of order Odonata belonging to 11 genera and three families were recorded. The families are Coenagrionidae, Platycnemididae and Calopterygidae. The most dominant family in present study is Coenagrionidae which comprises 9 genera (81.82% of total genera) and 23 species (88.46% of total species). The taxonomic composition and abundance of each species from different months in the study area during the study period was given in the table -1. We also calculated species richness, species diversity which is also shown in table-3.

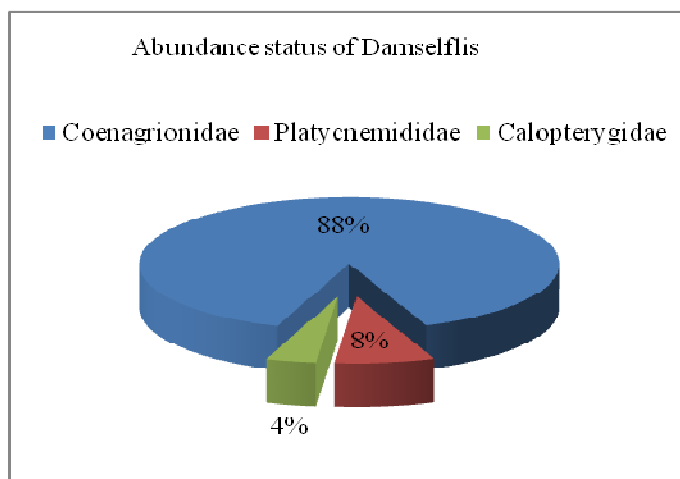


Figure-3
 Percentile distribution According to the species with Abundance of particular family of Damselflies from Kapla Beel wetland, Barpeta, Assam

Table-1
Species list of damselflies found in Kapla Beel in Barpeta District, Assam with taxonomic composition and month wise abundance of each species. (June 2013 to May 2014; *Very Rare, ** Rare,* Common)**

Sr No	Name of Species	Month (June 2013 to May 2014)												No of Species	Status
		JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY		
Family : Coenagrionidae															
1	<i>Agriocnemis lacteola</i> (Selys,1877)	4	3	2	4	3	2	1	2	1	2	2	4	30	**
2	<i>Agriocnemis femina</i> (Brauer,1868)	2	1	1	2	1	1	1	-	1	-	-	2	12	*
3	<i>Agriocnemis splendidissima</i> (Laidlaw,1919)	3	2	2	4	2	1	2	2	1	2	2	4	27	**
4	<i>Agriocnemis kalinga</i>	1	2	2	4	3	2	1	-	2	2	1	2	22	**
5	<i>Agriocnemis pygmaea</i> (Rambur,1842)	2	2	2	4	5	6	6	4	2	1	2	2	38	***
6	<i>Ceriagrion coromandelianum</i> (Fabricius,1798)	6	8	8	10	8	6	4	6	6	7	4	3	76	***
7	<i>Ceriagrion calamineum</i>	4	5	3	4	2	2	1	-	2	-	3	2	28	**
8	<i>Ceriagrion rubiae</i> (Laidlaw,1916)	2	2	3	2	4	2	-	2	1	2	-	1	21	**
9	<i>Ceriagrion fallax cerinomas</i> (Lieftinck1927)	2	4	2	2	6	4	3	2	1	2	2	4	34	**
10	<i>Ceriagrion olivaceum</i> (Laidlaw,1914)	2	2	3	5	6	4	6	2	2	-	2	1	35	**
11	<i>Ceriagrion cerinorubellum</i> (Brauer,1865)	6	7	6	5	8	6	3	2	3	4	1	1	52	**
12	<i>Ischnura aurora</i> (Brauer,1865)	2	3	4	5	5	4	5	3	2	4	2	3	42	**
13	<i>Ischnura rufastigma</i> (Selys,1876)	2	3	2	3	2	2	3	2	1	-	1	2	23	**
14	<i>Ischnura selegalensis</i> (Rambur, 1842)	2	4	4	6	4	5	3	2	4	2	1	2	39	***
15	<i>Pseudagrion rubiceps</i> (Selys,1876)	6	5	4	6	5	4	5	7	4	4	3	3	55	***
16	<i>Pseudagrion decorum</i> (Rambur,1842)	4	4	5	5	4	6	3	4	4	3	3	2	47	***
17	<i>Pseudagrion microcephalum</i> (Rambur,1842)	3	2	8	8	6	7	6	5	2	6	4	4	61	***
18	<i>Paracercion malayanum</i> (Selys,1876)	4	6	4	5	2	3	6	2	4	3	4	4	47	***
19	<i>Paracercion calamorum</i> (Ris,1916)	4	3	3	4	2	3	4	4	3	3	2	1	35	***
20	<i>Onychargia atrocyana</i> (Selys,1865)	6	8	4	5	4	2	4	3	3	4	3	3	49	***
21	<i>Rhodischnura nursei</i> (Morton,1907)	1	1	2	2	3	1	-	1	-	-	1	1	13	*
22	<i>Enallagma parvum</i> (Selys,1876)	2	2	2	3	1	2	1	2	2	-	1	-	18	*
23	<i>Aciagrion hisopa</i> (Selys,1876)	2	1	2	4	2	2	3	2	1	2	3	2	26	**
Family: Platynemididae															
24	<i>Copera vittata</i> (Selys,1863)	2	4	6	5	4	4	5	3	2	4	3	2	44	***
25	<i>Copera marginipes</i> (Rambur,1842)	2	3	2	4	6	3	4	6	4	2	2	3	41	***
C. Family: Calopterygidae															
26	<i>Neurobasis chinensis</i> (Linnaeus,1758)	-	2	2	2	1	1	1	-	1	1	1	2	14	*

Table -2
Distribution of genera and species of different families of damselflies in Kapla beel, Barpeta (Assam)

Family	Genera	Species	Total Count	% of Species
Coenagrionidae	9	23	830	88.46
Platynemididae	1	2	85	7.69
Calopterygidae	1	1	14	3.84
Total	11	26	929	-

Table- 3
Diversity indices for different months of the study period in Kapla Beel wetland, Barpeta , Assam

Index	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Shannon H	1.351	1.372	1.374	1.398	1.387	1.370	1.361	1.348	1.328	1.307	1.302	1.306
Shannon Hmax	1.415	1.415	1.415	1.415	1.415	1.415	1.415	1.398	1.415	1.395	1.394	1.395
Shannon J	0.955	0.969	0.971	0.988	0.980	0.968	0.961	0.964	0.938	0.936	0.934	0.936
Simpsons Diversity(D)	0.036	0.041	0.038	0.035	0.039	0.037	0.042	0.037	0.036	0.047	0.049	0.045
Simpsons Diversity (1/D)	27.778	24.390	26.315	28.571	25.641	27.027	23.809	27.027	27.778	21.276	20.250	22.258
Richness	25	26	26	26	26	26	24	22	25	20	24	25



Figure-4
Agriocnemis splendidissima (Laidlaw,1919)



Figure-8
Ceriagrion calamineum



Figure-5
Pseudagrion decorum (Rambur, 1842)



Figure-9
Ceriagrion coromandelianum (Fabricius,1798)



Figure-6
Ischnura rufastigma(Selys,1876)



Figure-10
Ceriagrion fallax cerinomelas(Lieftinck1927)



Figure-7
Onychargia atrocyana(Selys,1865)



Figure-11
Ceriagrion olivaceum(Laidlaw,1914)



Figure-12
Pseudagrion microcephalum(Rambur,1842)



Figure-16
Ischnura selegalensis(Rambur,1842)



Figure-13
Rhodischnura nursei(Morton,1907)



Figure-17
Agriocnemis lacteola(Selys,1877)



Figure-14
Neurobasis chinensis(Linnaeus,1758)



Figure-18
Ceriagrion cerinorubellum(Brauer,1865)



Figure-15
Ischnura aurora(Brauer,1865)



Figure-19
Agriocnemis pygmaea(Rambur,1842)



Figure-20
Aciagrion hisopa(Selys,1876)



Figure-24
Agriocnemis kalinga



Figure-21
Ceriagrion rubiae (Laidlaw, 1916)



Figure-25
Copera marginipes(Rambur,1842)



Figure-22
Paracercion malayanam(Selys,1876)



Figure-26
Copera vittata(Selys,1863)



Figure-23
Pseudagrion rubiceps (Sely,1876)



Figure-27
Agriocnemis femina(Brauer,1868)



Figure-28
Paracercion calamorum(Ris,1916)



Figure-29
Enallagma parvum(Selys,1876)

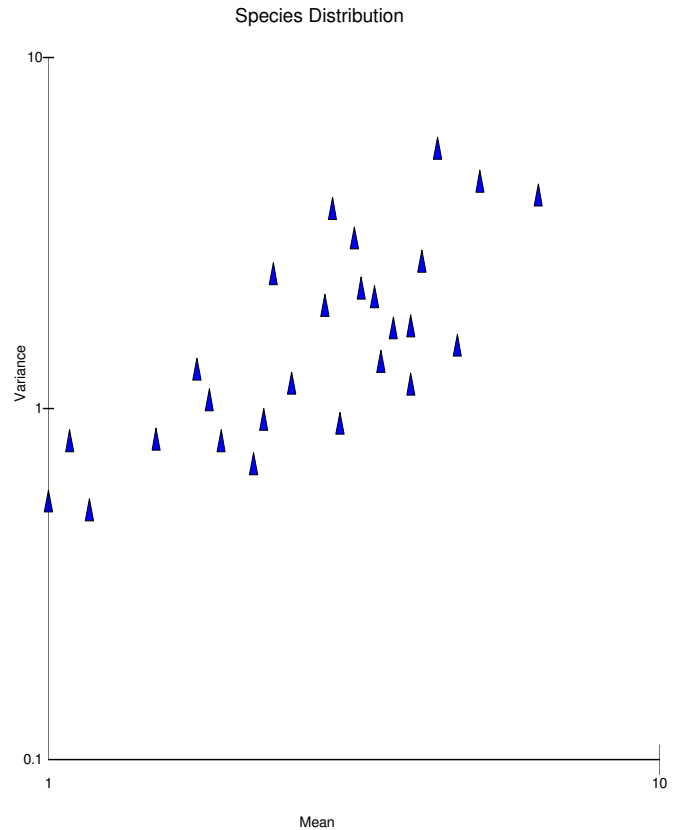


Figure-31
 Species Distribution plot for different months of the study period

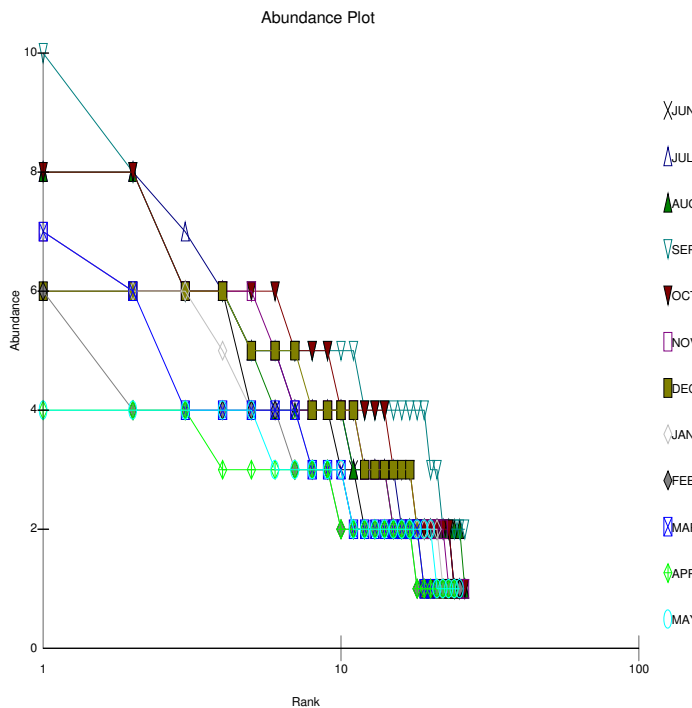


Figure-30
 Species rank Abundance plot for different months of the study period.

Discussion: In this study 26 species of damselflies belonging to three families and 11 genera were recorded. It is observed that out of total species recorded 88.46% are of family Coenagrionidae followed by Platycenemididae and Calopterygidae showed less species diversity with only one species (*Neurobasis chinensis*, Linnaeus, 1758). The abundance of the family Coenagrionidae is an important biological aspect for certain environmental aspect like pollution free part of the wetland. In this study different microhabitat wise status of each species was investigated, in a few microhabitat have very much diverse, some species are found abundantly in one habitat, but few species are reported some restricted site only.

Neurobasis chinensis, *Ceragrion rubiae*, *Rhodischnura nursei*, *Ischnura senegalensis*, *Ischnura rufastigma*, *Agriocnemis femina* are missing from the commercial zones of the study area. Species like *Ceragrion coromandelianum* and *Pseudagrion microcephalum* are more dominating species recorded during the study. During the present investigation, Damselflies from different months of the study period were compared and Shannon H', Shannon Hmax, Shannon J', Simpsons Diversity(D), Simpsons Diversity(1/D), Richness were calculated by using Biodiversity pro software 2.0. It was seen that in September there is highest value of Shannon H' which is 1.398 and least is seen in the April which is 1.302. The value

Simpsons index(D), which is very small in all months of the study period indicate that the present study area contain high diversity, higher values of Simpsons Diversity index(1/D) and Shannon J' also indicates the same overview. According to its abundance the different species were ranked and Species Distribution plot for different months of the study period was shown in the figure-30 and figure-31 respectively.

The order Odonata is an ideal model taxon for the investigation due to the closed linked to certain specific aquatic habitats making them indicators of wetland health and scenario. The observations recorded in the present study would be valuable as fundamental information for assessing the ecological status of the wetland of Kapla aquatic pool. The present study also helps for the measure of the global warming and climate change due to its tropical evolutionary history and adaptations to temperate climates^{19,20}. From the above discussion it is inferred that the diversity and abundance near water bodies and its distribution represents a suitable ecosystem proportional to the status of the wetland.

Conclusion

From the above investigation we conclude that the Kapla Beel of Barpeta District, Assam is very much rich with the diversity of Damselflies. This rich diversity of Kapla Beel due to less encroachment of human activities. But indeed some protection plans must be implemented to protect and build up the diversity of these valuable creatures. This study encourages the conservation of a wide range of indigenous damselfly species in the study area.

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