



Research Article

Diversity and population dynamics of Odonata (Insecta: Odonata) in rice growing area of central Gujarat

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ABSTRACT: Odonates diversity was studied in Paddy field of central Gujarat during 2012 to 2015. Total 39 species belonging to 25 genera, under six families and two suborders were recorded. Total 17 species of Zygoptera (damselflies) and 22 species of Anisoptera (dragonflies) were recorded. Community structure and population dynamics of adult odonates were studied at Lingda village during July to December, 2012 through monitoring their population by point count method on three microhabitats (paddy field, village pond and fish farm). Total seventeen species were encountered in the point count. Diversity index (H') was highest (2.13) for paddy fields followed by fish farm (2.07) and village pond (1.99). Evenness value of the odonates also ranged between 0.7 and 0.8. Total four species (*Viz.* Ditch Jewel (25.0%), Green Marsh Hawk (17%), Ruddy Marsh Skimmer and Coromandal Marsh Dart (16% each) were dominant species in all three microhabitats. Both the suborders Anisoptera (dragonfly) and Zygoptera (damselfly) showed similar trend of population fluctuation during the study. Relative abundance was higher and remained constant during 4th week of September to 2nd week of October.

KEY WORDS: Central Gujarat, damselfly, diversity, dragonfly, odonates, paddy crop (*Oryza sativa* L.), population dynamics

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INTRODUCTION

Globally 5,952 species of odonates are known and of this 474 species in 142 genera and 18 families exist in India (Subramanian, 2014). Information about the odonates of Gujarat state is documented by Prasad (2004), Rohmare *et al.* (2015) and Rathod *et al.* (2016a; 2016b; 2016c). Total 42 species of odonates are recorded from Central Gujarat and 80 from entire Gujarat state. Though the entire order is predacious and hence important biocontrol agents of insect pests (Rathod and Parasharya, 2014; 2015), there is no information (species list) available on the odonates available in the paddy crop agro-ecosystems in Gujarat. Even at national level, hardly something is known about the odonate diversity in paddy crop agroecosystem (Gunathilagaraj *et al.*, 1999; Kandibane *et al.*, 2003; 2005; Anbalagan *et al.*, 2013; Sathe and Shinde, 2014).

Several pests cause damage and yield loss on paddy crop (Datta and Khush, 2002). Pesticides can control many of the rice pests, but because of environmental risks, crop infection and killing of beneficial insects (natural enemies and pollinators) are not efficient and safe method (Khan *et al.*, 1991). There are several natural predators in the rice

fields that if conserved, can play an effective role in decreasing the pest population density (Mohyuddin, 1990; Bonhofet *et al.*, 1997). Larva and adults Odonata are considered efficient predators in the rice fields (Heinrichs, 1994; Alonso Mejia and Marquez, 1994). The carnivorous and voracious odonate larvae occupy at the apex of food chain of invertebrate life in aquatic ecosystem (Siregar *et al.*, 2010).

The quantitative field data necessary for understanding odonate population dynamics in paddy crop are scarce. To fill up the gaps in our knowledge about the diversity of Odonata in the paddy crop agro-ecosystems of Central Gujarat, the present study was planned. Anand district of Central Gujarat is having its rice fields irrigated by the canals of Mahi right bank canal system (MRBS) and associated storage tanks, should be very rich in odonate diversity. Paddy (*Oryza sativa*) crop agro-ecosystem is the ideal habitat for the dragonflies. Since the paddy is being grown in almost all the districts of Central Gujarat, odonate diversity was expected to be very high. Dragonflies are known as the predators of small insects and hence it was worth identifying each species occurring in paddy crop agroecosystem and their population dynamics during the crop period.

MATERIALS AND METHODS

This study was carried out in the agricultural landscape of Central Gujarat during July 2011 to December, 2015.

Study area

Anand District is situated between 22° 57' (N) Latitude and 72° 93' (E) Longitude in the central part of Gujarat State. The total area of the district is 2, 94,751 hectares which is 1.52 per cent area of Gujarat State. The district comprises of eight tahsils from the revenue record. Population dynamics of adult odonates was studied at Lingda village (22.700006N, 73.116694E) of Umreth tahsil in Anand district.

Kheda and Anand districts which are in the command area of MRBS lies between two major Rivers, Mahisagar on the eastern side and Sabarmati on the western side. The northern part of the district has common boundary with Kheda district. Ahmedabad district is on the western side of River Sabarmati and Vadodara on the eastern side of River Mahisagar. The southern fringe of Central Gujarat is attached to the Gulf of Khambhat. The Central Gujarat is plain land with some hilly area of Dahod and Panchmahal districts. The region has typical fertile soil popularly known as “*Goradu soil*” with loamy sand of alluvial origin. The sandy loam soil is known for its productivity. Irrigation facility through Mahi Right Bank Canal is available since 1960 in Kheda and Anand districts and hence, intensive cropping is practiced throughout the year. Complex network of irrigation canals and associated tanks, village ponds and paddy fields provide ideal habitats for the odonates. Irrigated paddy (*Oryza sativa* L.) is cultivated in 4,056 ha area of Anand district during Southwest monsoon (June to September). About 13,090 ha land cover of Anand district is under agriculture and no area is classified as protected or forest land. Umreth tahsil in which population dynamics of odonate was monitored, about 30% land was under paddy cultivation.

General inventory

This study was done during 2012 to 2015. Intensive surveys were done during South-West monsoon (July to November). Adult, free flying Odonates were collected from the shallow edge of the wetland using standard insect net. The specimens were preserved in 70% alcohol and kept separate by placing them in envelopes, labelled properly with details like species, date and place of collection. Extra specimens were preserved dry following standard procedure.

The specimens were identified with the help of photographic guides (Emiliyamma *et al.*, 2005; Subramanian, 2009; Nair, 2011) and a suitable taxonomic book (Fraser 1933, 1934, 1936). The scientific names are adopted from the revised nomenclature by Subramanian (2014). Identification of specimens was confirmed by Dr. S. S. Talmale at Zoological Survey of India, Jabalpur.

Population dynamics and diversity of odonates

Population dynamics is a study of changes in species composition and their number with reference to time interval. To study the changes taking place in their population and diversity over a time frame, “point count method” was adopted for sampling the area. Study was carried out by using the following census method during July to December 2012. A weekly point count were done at the edge of a (1) wetland (village pond), (2) fish farm and (3) across the paddy fields during the monsoon and post-monsoon periods (July to December 2012) following the protocol of Smallshire and Beynon (2010).

Odonates were counted at fifteen points in each microhabitat at weekly interval. At a fixed point, Adult Odonates observed within 3 m radius of visual field were observed and counted species wise minimum 10 m distance was maintained between two points. Odonate counts were taken during 9.00 to 12.00 hours in the morning (as they are known to be active during morning/ evening hours) on cloudless day, preferably on Sundays. Counts on all the microhabitats were done on same day. Visual identification was confirmed by collecting a few specimens. Changes taking place in the number of Odonates encountered during point count served as an index of population dynamics. Relative abundance (%) of the species and rate of encounter or frequency of occurrence (% O and % fi) were worked out to determine species dominance and Important Value Index (Tiple *et al.*, 2012; Obrtel and Holisova, 1974). Species diversity index using Shannon-Weiner formula (Shannon, 1948) and equitability worked out (Krebs, 1975) for each time period as well as entire cropping season.

RESULTS AND DISCUSSION

General inventory in paddy fields

Total 39 species belonging to 25 genera, under six families and two suborders were recorded from paddy crop in Central Gujarat. Total 17 species of Zygoptera (damselflies) and 22 species of Anisoptera (dragonflies) were recorded. This list does not include species which are habitat specialist occurring in streams, rivers, forest and salty wetland. Zygoptera was represented by three families and Anisoptera was represented by three families (Table 1).

Table 1. Odonata of rice growing areas of Central Gujarat

Taxon	Common name
Suborder: Zygoptera	
Superfamily :Lestoidea	
Family :Lestidae	
<i>Lestes thoracicus</i> Laidlaw, 1920	
<i>Lestes umbrinus</i> Selys, 1891	Brown spreadwing
<i>Lestes viridulus</i> Rambur, 1842	Emerald-striped spreadwing
Superfamily: Coenagrionoidea	
Family: Platycnemididae	
<i>Copera marginipes</i> (Rambur, 1842)	Yellow bush dart
<i>Elattonaura nigerrima</i> (Laidlaw, 1917)	
Superfamily: Coenagrionoidea	
Family: Coenagrionidae	
<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Pigmy dartlet
<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Coromandal marsh dart
<i>Enallagma cyathigerum</i> (Charpentier, 1840)	Common blue damselfly
<i>Ischnura aurora</i> (Brauer, 1865)	Golden dartlet
<i>Ischnura elegans</i> (Vander Linden, 1823)	Common blue tail
<i>Ischnura nursei</i> (Mortan, 1907)	Pixie dartlet
<i>Ischnura senegalensis</i> (Rambur, 1842)	Senegal golden dartlet
<i>Paracercion malayanum</i> (Selys, 1876)	Malay lily squatter
<i>Pseudagrion decorum</i> (Rambur, 1842)	Three- striped blue dart
<i>Pseudagrion hypermelas</i> Selys, 1876	Violet-striped blue dart
<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Blue grass dartlet
<i>Pseudagrion rubriceps</i> Selys, 1876	Saffron-faced blue dart
Suborder: Anisoptera	
Super family: Aeshnoidea	
Family: Aeshnidae	
<i>Anax guttatus</i> (Burmeister, 1839)	Blue-tailed green darner
<i>Anax immaculifrons</i> Rambur, 1842	Blue darner
Superfamily: Gomphoidea	
Family: Gomphidae	
<i>Ictinogomphus rapax</i> (Rambur, 1842)	Common clubtail
Superfamily: Libelluloidea	
Family: Libellulidae	
<i>Acisoma panorpoides</i> (Rambur, 1842)	Trumpet tail
<i>Brachydiplax sobrina</i> (Rambur, 1842)	Little blue marsh hawk
<i>Brachythemis contaminata</i> (Fabricius, 1793)	Ditch jewel
<i>Crocothemis servilia</i> (Drury, 1770)	Ruddy marsh skimmer
<i>Diplacodes lefebvrei</i> (Rambur, 1842)	Black ground skimmer
<i>Diaplacodes trivialis</i> (Rambur, 1842)	Ground skimmer
<i>Neurothemis tullia</i> (Drury, 1773)	Pied- paddy skimmer
<i>Orthetrum luzonicum</i> (Brauer, 1868)	Tricoloured marsh hawk
<i>Orthetrum pruinosum neglectum</i> (Rambur, 1842)	Crimson- tailed marsh hawk
<i>Orthetrum sabina</i> (Drury, 1770)	Green marsh hawk
<i>Orthetrum taeniolatum</i> (Schneider, 1845)	Taeniolate marsh hawk
<i>Pantala flavescens</i> (Fabricius, 1798)	Wandering glider
<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Common picture wing
<i>Tholymis tillarga</i> (Fabricius, 1798)	Coral-tailed cloud wing
<i>Tramea basilaris burmeisteri</i> Kirby, 1889	Red marsh trotter
<i>Trithemis aurora</i> (Burmeister, 1839)	Crimson marsh glider
<i>Trithemis pallidinervis</i> (Kirby, 1889)	Long-legged marsh glider
<i>Urothemis signata</i> (Rambur, 1842)	Greater crimson glider
<i>Zyxomma petiolatum</i> Rambur, 1842	Brown dusk hawk

Population dynamics, diversity and community structure of odonate

Paddy crop agro-ecosystem

Paddy is the only crop grown in the agricultural landscape of Lingda village during *Kharif* season. The fields were inundated with canal water in mid July for transplanting paddy saplings. Relative abundance of odonates on first week of observation was low compared to other two microhabitats. However, growth of the population size was relatively faster than other microhabitats. Relative abundance remained constant during 4th week of September to 2nd week of October (one month). After 3rd week of October; crash in population size was sharp. The paddy crop was harvested in mid November and as a result relative abundance of odonates was negligible. Thereafter, odonates abundance remained zero throughout study period (Table 2).

Village pond

Due to fresh rain in early July, the village pond was having full water and some odonates were present. During

initial six weeks, their abundance ranged between 2 to 4 percent but the abundance started increasing from 2nd week of September (R.A.7%) Relative abundance reached to its peak (12%) during 2nd week of October. It took twelve long weeks to reach the peak of population abundance but it crashed down to 1% within next five weeks. Odonate population remained below one percent during 3rd week of November to 4th week of December 2012 and then after they were totally missing from the village pond (Table 2).

Fish farm

On fish farm, total sixteen species were recorded. Trumpet Tail was a unique species. Odonates abundance was low in the initial three weeks but from 4th week (3rd week of August) it started increasing, highest relative abundance (10.31%) was recorded in 2nd week of October. This trend of population growth was similar to the trend observed on village pond. By 1st week of December, relative abundance became less than one percent. Contrasting to other two microhabitats, at least one odonate was encoun-

Table 2. Population dynamics of odonates at weekly interval expressed as Relative abundance (%) in paddy crop agroecosystem at Lingda, Anand district, Gujarat

Sr. No.	Weeks	Microhabitats							
		Paddy field		Village pond		Fish farm		Total	
		No.	%	No.	%	No.	%	No.	%
1	28-Jul-12	017	01.54	048	03.84	030	02.05	095	02.49
2	04-Aug-12	028	02.54	031	02.48	040	02.73	099	02.59
3	11-Aug-12	023	02.09	029	02.32	033	02.25	085	02.23
4	18-Aug-12	035	03.18	042	03.36	056	03.82	133	03.49
5	25-Aug-12	065	05.90	028	02.24	071	04.85	164	04.30
6	01-Sep-12	057	05.18	050	04.00	060	04.10	166	04.35
7	08-Sep-12	094	08.54	087	06.95	117	07.99	298	07.81
8	15-Sep-12	071	06.45	064	05.12	075	05.12	210	05.50
9	22-Sep-12	117	10.63	088	07.03	089	06.08	294	07.70
10	29-Sep-12	120	10.90	116	09.27	140	09.56	376	09.85
11	06-Oct-12	113	10.26	125	09.99	141	09.62	379	09.93
12	13-Oct-12	114	10.35	155	12.39	151	10.31	420	11.01
13	20-Oct-12	077	06.99	123	09.83	129	08.81	329	08.62
14	27-Oct-12	080	07.27	110	08.79	127	08.67	317	08.31
15	03-Nov-12	045	04.09	070	05.60	088	06.01	203	05.32
16	10-Nov-12	023	02.09	032	02.56	050	03.41	105	02.75
17	17-Nov-12	011	01.00	013	01.04	020	01.37	044	01.15
18	24-Nov-12	007	00.64	011	00.87	021	01.43	039	01.02
19	01-Dec-12	004	00.37	012	01.00	010	00.68	026	00.68
20	08-Dec-12	000	00.00	006	00.47	005	00.34	011	00.29
21	15-Dec-12	000	00.00	009	00.71	009	00.61	018	00.47
22	22-Dec-12	000	00.00	002	00.15	001	00.06	003	00.08
23	29-Dec-12	000	00.00	00	00.00	001	00.06	001	00.03
24	05-Jan-13	000	00.00	00	00.00	001	00.06	001	00.03
25	12-Jan-13	000	00.00	00	00.00	000	00.00	000	00.00
Total		1101		1251		1465		3816	

tered during point count and a few others were seen flying at distance, outside point count radius (Table 2).

Composite picture of population fluctuation of odonates at Lingda village

During twenty five week study, total 3816 adult odonates were recorded on three microhabitats. There was no water in the Paddy fields as well as Fish farm during preceding summer, however; some water was available in the village pond and irrigation canal. Hence, wetland habitats of the village were inundated only in mid July with onset of Southwest monsoon. The fish farm and paddy fields were also flooded in mid July for fish culture and paddy cultivation respectively. Hence, the odonates recorded during first observation (28th July 2012) can be considered as initial adult population. Their population slowly increased and reaches to about eight percent in seventh week (8th September 2012). It reached to its peak in 12th week (13th October 2012). A sharp decline in the population was recorded from 27th October (14th week) and it reached to just one percent by 17th November 2012. This sharp decline in the population was attributed to decline in the inundated area in all three microhabitats. Odonate population remained below one percent during December 2012 and January 2013. During February to April 2013, odonates were not encountered during point count but were present in small number in the environment (Table 2, Fig. 1).

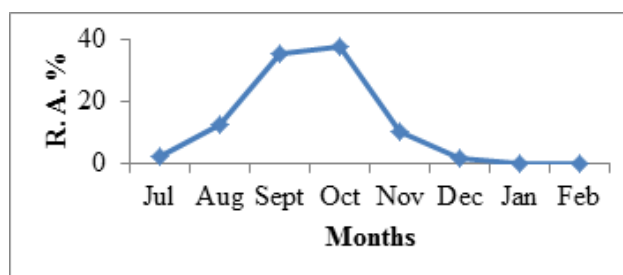


Fig. 1. Relative abundance of Odonates (Total) in the wetland landscape of Lingda.

An increase in Odonate population was positively correlated with flooding of the microhabitats because entire order is amphibious and requires aquatic habitat for breeding. The paddy dominated landscape remained inundated for more than three months which provided ideal breeding condition to the odonates.

Increase and decrease in odonate abundance followed similar trend in all three microhabitats. The paddy fields and fish-farms were drained and hence became dry by November. On the contrary, the village pond had sufficient water, but still showed similar decline in abundance.

Diversity and community structure of odonates

Diversity and community structure of odonates was studied at paddy growing area of Lingda village through

Table 3. Community structure of odonates species in paddy crop agroecosystem at Lingda, Anand district, Gujarat

Sr. No.	Species	Microhabitats							
		Paddy field		Village pond		Fish farm		Total	
		No.	%	No.	%	No.	%	No.	%
1.									
2.	<i>Ceriagrion coromandelianum</i>	171	12.00	199	16.00	240	16.00	610	15.98
3.	<i>Enallagma cyathigerum</i>	053	05.00	052	04.00	058	04.00	163	04.27
4.	<i>Ischnura aurora</i>	019	01.73	000	00.00	000	00.00	019	00.50
5.	<i>Ischnura elegans</i>	006	00.55	013	01.00	009	00.61	028	00.73
6.	<i>Ischnura senegalensis</i>	097	09.00	100	08.00	121	08.00	318	08.33
7.	<i>Pseudagrion microcephalum</i>	061	06.00	106	08.00	067	04.00	234	06.13
8.	<i>Pseudagrion rubriceps</i>	000	00.00	020	02.00	011	00.75	031	00.81
9.	<i>Ictinogomphus rapax</i>	000	00.00	002	00.15	004	00.29	006	00.16
10.	<i>Acisoma panorpoides</i>	000	00.00	000	00.00	039	03.00	039	01.02
11.	<i>Brachythemis contaminata</i>	198	18.00	379	30.00	368	25.00	945	24.76
12.	<i>Crocothemis servilia</i>	199	18.00	165	13.00	232	16.00	596	15.61
13.	<i>Diaplocodes trivialis</i>	030	02.72	002	00.16	012	00.82	044	01.15
14.	<i>Orthetrum luzonicum</i>	021	02.00	000	00.00	012	00.82	033	00.86
15.	<i>Orthetrum sabina</i>	201	19.00	180	14.00	244	17.00	625	16.37
16.	<i>Pantala flavescens</i>	005	00.46	012	01.00	008	00.55	025	00.65
17.	<i>Rhyothemis variegata</i>	006	00.55	000	00.00	005	00.34	011	00.29
18.	<i>Trithemis pallidinervis</i>	034	03.00	021	02.00	035	02.00	090	02.36
	Total	1101		1251		1465		3816	

monitoring their population dynamics on three microhabitats. Though, total 39 odonate species were recorded in paddy crop agroecosystem of Central Gujarat, only seventeen species were recorded in the point count method employed for this study. Sixteen species were recorded on fish farm, fourteen species were recorded on paddy fields whereas least number (13) of species richness was on village pond (Table 3). Trumpet Tail (*Acisoma panorpoides*) was a unique species recorded on fish pond. In paddy fields, Golden Dartlet (*Ischnura aurora*) was a unique species (Table 3).

Species diversity index reflects species richness and their relative abundance. In present study, diversity index was highest (2.13) for paddy fields followed by fish farm (2.07) and least on village pond (1.99). Evenness value of the odonates also ranged between 0.7 and 0.8 (Table 4). Overall diversity index (H') for paddy crop agroecosystem was 2.10 with 0.741 evenness (J).

Table 4. Diversity indices of Odonata on different microhabitats at Lingda

Microhabitats	Species Richness (S)	Species Diversity (H')	Evenness (E)
Fish Farm	16	2.07	0.731
Paddy Field	14	2.13	0.807
Village Pond	13	1.99	0.776
Over all	17	2.10	0.741

Community structure

Amongst sixteen species recorded on fish farm. Trumpet Tail was a unique species, which was not recorded on other two microhabitats. Only four species were dominant: Ditch Jewel (25.0%), Green Marsh Hawk (17%), Ruddy Marsh Skimmer and Coromandal Marsh Dart (16% each) (Table 3).

On paddy fields, total fourteen species were recorded. Golden Dartlet (1.73%) was a unique species in paddy fields. Unlike fish farm, the same four species were dominant, however, values of their relative abundance varied (Table 3).

Village pond had least species richness (13) compared to other two microhabitats. Here, absence of four species was more prominent feature than presence of any unique species. The same four species were dominant on village pond too but relative abundance of Ditch Jewel was thirty percent (30%); highest amongst three microhabitats (Table 3).

To get a composite picture of community structure of odonates within agricultural landscape of Lingda vil-

lage, data of all the microhabitats were merged and overall relative abundance of each species was worked out (Table 3). Though seventeen species were recorded during point count in the area, eight species were less than one percent in abundance. Amongst the four dominant species in the agriculture landscape (Fig. 2), Ditch Jewel was the most dominant (25% R. A.) whereas remaining three species were represented equally (Fig. 2). Other two notable species were Senegal Golden Dartlet (8.33%) and Blue Grass Dartlet (6.13%).

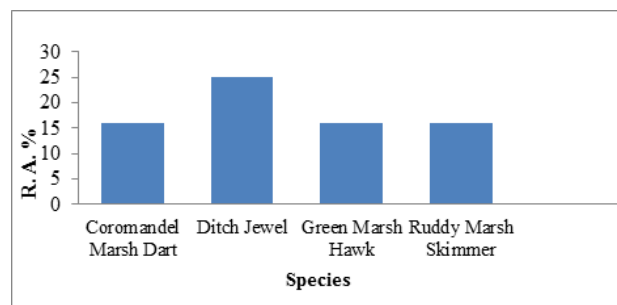


Fig. 2. Relative abundance of dominant Odonates species at Lingda.

Relative abundance (%) of two suborders of odonata at weekly interval

Both the suborders Anisoptera (dragonfly) and Zygoptera (damselfly) showed similar trend of population fluctuation during the study (Fig. 3). As both the suborders are season specific and have similar breeding requirement in wetlands, they showed similar trend of population fluctuations.

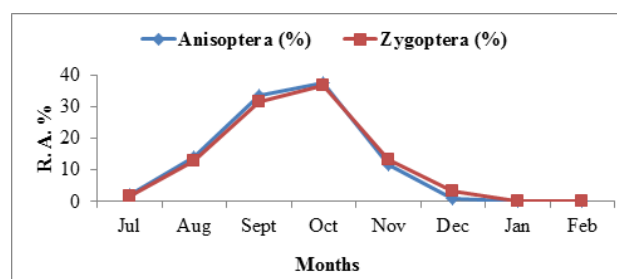


Fig. 3. Relative abundance (%) of two suborders of Odonata at monthly interval (Population fluctuations – Total number of Anisoptera -2348 and Zygoptera-1402 expressed as R.A. in paddy crop ecosystem).

Presence and index of importance of odonate species at Lingda

In twenty five weeks study, species like Coromandel Marsh Dart, Ditch Jewel, Green Marsh Hawk, Common Blue Damselfly and Senegal Golden Dartlet were present over eighty percent of time period. The Ruddy Marsh Skimmer was present in eighteen weeks (72%) period. Four spe-

cies were present for less than fifty percent of time period and the same also had low relative abundance. The species which showed presence over longer period also had high relative abundance value. Hence, index of importance (I %) for such species was also high. Based on the value of index of importance, each species was given rank (Table 5).

In the present, study families Libellulidae in Anisoptera and Coenagrionidae in Zygoptera were more diverse families in terms of the number of species. Similar findings have already been reported by some investigators. Ghahari *et al.* (2009) and Anbalagan *et al.*, (2013) have reported that families Libellulidae and Coenagrionidae were dominant in terms of number of species in rice fields in Iran and Tamilnadu, India, respectively. Kumar and Mitra (1998) reported that family Libellulidae was represented by high number of species (18 species) among a total collection of 42 species from Sahstradhara, Dehra Dun.

Several investigators have reported that dragonflies and damselflies are very common in rice agroecosystem. Kandibane *et al.*, (2003) have recorded 12 species of Odonata under three families in rice fields of Madurai, Tamil Nadu. In the present work the number of species and families recorded in rice fields were much higher compared to all earlier studies (Gunathilagaraj *et al.*, 1999; Kandibane *et al.*, 2003; 2005; Anbalagan *et al.*, 2013; Sathe and Shinde, 2014).

The diversity and distribution of insects may be influenced by type of ecosystems and climate. In the present study the species richness and total abundance of Odonata were high in fish farm compared to rice ecosystem and village pond. However, uniform population dynamics trend on three microhabitats prove the same. Similar result was published by Anbalagan *et al.* (2013).

This study has certainly improved our knowledge absent odonate diversity in paddy crop agroecosystem. Community structure and population dynamics are all together new studies and the results should be correlated with similar studies on insect pests of paddy (their prey).

In the present study the Shannon index was higher in rice field than fish farm and village pond. Anbalagan *et al.* (2013) reported that the Shannon index was higher in vegetable fields than rice fields. Climatic factors are also affects the odonates population. Odonate population increases with increases the temperature.

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Table 5. Presence (O %) and index of importance of odonate species on the aquatic environment of Lingda village

Sr. No.	Species	Present in 25 Weeks				% O	% R.A.	Index of Importance (I %)	Rank
		Paddy field	Village pond	Fish farm	Overall landscape				
1	<i>Ceriagrion coromandelianum</i>	18	21	21	22	88	15.98	51.99	02
2	<i>Enallagma cyathigerum</i>	10	08	13	16	64	04.27	34.13	07
3	<i>Ischnura aurora</i>	03	00	00	03	12	00.50	06.25	16
4	<i>Ischnura elegans</i>	02	02	03	04	16	00.73	08.36	14
5	<i>Ischnura senegalensis</i>	12	12	20	20	80	08.33	44.16	04
6	<i>Pseudagrion microcephalum</i>	09	14	12	16	64	06.13	35.06	06
7	<i>Pseudagrion rubriceps</i>	00	02	02	04	16	00.81	08.40	13
8	<i>Ictinogomphus rapax</i>	00	01	03	03	12	00.16	06.08	17
9	<i>Acisoma panorpoides</i>	00	00	07	07	28	01.02	14.51	09
10	<i>Brachythemis contaminata</i>	19	22	20	22	88	24.76	56.38	01
11	<i>Crocothemis servilia</i>	17	15	17	18	72	15.61	43.80	05
12	<i>Diaplacodes trivialis</i>	06	02	00	06	24	01.15	12.57	11
13	<i>Orthetrum luzonicum</i>	04	00	04	06	24	00.86	12.43	12
14	<i>Orthetrum sabina</i>	17	17	20	21	84	16.37	50.18	03
15	<i>Pantala flavescens</i>	02	05	03	07	28	00.65	14.32	10
16	<i>Rhyothemis variegata</i>	02	00	03	04	16	00.29	08.15	15
17	<i>Trithemis pallidinervis</i>	08	03	07	12	48	02.36	25.18	08

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