

SEASONAL VARIATIONS OF ODONATE DIVERSITY IN SELECTED AREAS OF ELANJI GRAMAPANCHAYATH

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Abstract

The present work was conducted to study the seasonal variations of odonate diversity in selected areas of Elanji gramapanchayath. A one acre paddy field was selected for field work. Species were observed for six months from September to February, which is grouped into monsoon (Sept-Nov) and post-monsoon (Dec-Feb) periods. The most abundant species was identified on the basis of the results from the Abundance formula. By using Simpson's Diversity index, the diversity indices of each month was calculated and found that the monsoon period has a high index value (0.909) compared to the post-monsoon period (0.884). It indicates the high diversity of odonates during the monsoon period. The major contributing factors observed for the variation include water availability, lush vegetation cover and abundance of prey species like mosquitoes in the monsoon period.

Keywords : *Seasonal study, Odonate, Diversity index*

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INTRODUCTION

Odonates are one of the ancient groups of insects which has two sub orders Zygoptera (damselflies) and Anisoptera (dragonflies). They come under the order Odonata of class Insecta. They can be found in different fresh water ecosystems depending on the biotic and abiotic constraints. They can be found in both lentic and lotic ecosystems such as tree holes, large lakes, rivers etc. There are around 95 species of dragonflies identified in Kerala which comes under 54 genus in 6 families. The number of identified species of damselflies goes upto 59 under 28 genus and 8 families (Kiran and David.,2013). They are predaceous insects and bio-control agents of many harmful insects. Since the odonates are sensitive to the environmental changes they can be used as indicators of environmental changes like atmospheric temperature, water quality and the weather conditions (Tiple, 2012). Different seasons of a year cause a lot of changes in the environment and the diversity of odonates which are sensitive to the environmental changes would be different according to the seasons of a year.

In Kerala, the three major seasons are summer (February-May), monsoons (June-August and October-November) and winter (December-January) with a pleasant interval of mild weather between August and October (www.prokerala.com). Around September, cold wind sweeps down from the Himalayas and Indo-Gangetic Plain towards the vast spans of the Indian Ocean, south of the Deccan peninsula. This is known as the Northeast Monsoon or Retreating Monsoon (<http://en.wikipedia.org/>). For Cochin (Kochi), under which the study area falls, the rainfall distribution shows a steady increase from end of April, attaining a maximum at the June and then decreases steadily. The monthly distribution of rainfall for this station shows that the station receives maximum rainfall in June during the south-west monsoon season and in October during the north-east monsoon. (<http://shodhganga.inflibnet.ac.in/>). If a certain zone is studied for a period, it is possible to notice that the animals which inhabit that zone change from season to season (www.saburchill.com). Even though the taxonomy of Indian Odonata is well studied there are only few studies (Muthukumaravelet al., 2015) about the differences in the diversity of odonate according to the seasonal variation. Keeping in view this fact we have made an attempt to study the diversity and distribution of odonate according to the seasonal variations.

METHODOLOGY

One acre paddy field from Elanji Gramapanchayath under Ernakulam district was selected for the study The area was criss-crossed by a stream and its streamlets and it is surrounded by rubber, banana and tapioca plantations. Due to the abundance of water bodies, moderate climate and comparatively less pollution I have selected this area for the present study.

The survey was conducted from September to February 2014-15, which includes monsoon (Sep.-Nov) and post-monsoon (Dec-Jan) seasons of the year. Data collection was done from 9.30 am -12.00pm and the observed numbers of dragonflies and damselflies were recorded using tally marking system. Observations were made through naked eyes followed by photography. The recorded species were identified with the help of a field guide "Dragonflies and Damselflies of Kerala"-KeralathileThumbikal (Kiran and Raju, 2013). The diversity index of each month was calculated using Simpson's Diversity Index. The mean value for monsoon and post monsoon periods were calculated and compared. Species diversity and the abundance of the species for the two periods were calculated by using the following methods:

a) Simpson's Diversity Index

Simpson's Diversity Index is a measure of diversity which takes into account the number of species present, as well as the relative abundance of each species.

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

N = the total number of organisms of all species

1 -D = Simpson's Diversity Index

The value of D ranges between 0 and 1. With this index, 1 represents infinite diversity and 0, no diversity.

a) Species abundance

The abundance of a species estimates plentifulness of a species according to a pre-defined scale such as rare, infrequent, abundant etc. It is estimated by comparing the number of individuals of a certain species with a total number of individuals of all species in a study area. (Thomas, A.P., 2011).

$$\text{Abundance} = \frac{\text{Number of individuals of a certain species} * 100}{\text{Total number of individuals}}$$

OBSERVATIONS

A total of 21 species belonging to 5 different families namely Calopterygidae, Chlorociphidae, Coenagrionidae, Platycnemididae and Libellulidae were observed from the study area. The name of the odonates and the number observed in each month are given in table 1. The seasonal variations observed in the number of odonates are represented in Fig.1. Simpson's diversity index for each month and the mean values of Simpson's Diversity Index for the two seasons are showed in Figs. 2 & 3. The species abundance observed for the six months are represented in Fig. 4.

Table 1. Species observed during the study period

Sl. NO	Common name	Scientific name	No. of species observed					
			Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
			MONSOON			POST-MONSOON		
1	Black tipped forest glory	<i>Vestalis apicalis</i>	20	19	19	5	2	0
2	Clear winged forest glory	<i>Vestalis gracilis</i>	15	13	12	1	0	0
3	River helidor	<i>Libellago lineata</i>	2	3	2	0	2	3
4	White dartlet	<i>Agriocnemis pieris</i>	40	40	38	29	27	26
5	Pygmy dartlet	<i>Agriocnemis pygmaea</i>	10	7	8	2	2	3
6	Orange tailed marsh dart	<i>Ceriagrion cerinorubellum</i>	8	9	11	6	5	5
7	Blue grass dart	<i>Pseudagrion microcephalum</i>	3	2	3	5	2	0
8	Yellow Bush dart	<i>Copera marginipes</i>	4	6	8	8	6	5
9	Blue bush dart	<i>Copera vittata</i>	5	6	7	4	4	4
10	Rufous backed marsh hawk	<i>Brachydiplax chalybea</i>	4	5	3	3	2	1
11	Granite ghost	<i>Bradinopyga geminata</i>	4	3	4	2	2	1
12	Fulvous forest skimmer	<i>Neurothemis fulvia</i>	4	5	3	3	0	0
13	Pied paddy skimmer	<i>Neurothemis tullia</i>	25	22	20	9	10	13
14	Brown backed red marsh hawk	<i>Orthetrum chrysis</i>	5	6	3	3	3	4
15	Tricoloured marsh hawk	<i>Orthetrum luzonicum</i>	5	4	6	6	6	6
16	Crimson tailed marsh hawk	<i>Orthetrum pruinosum</i>	5	5	5	6	5	5
17	Green marsh hawk	<i>Orthetrum sabina</i>	6	6	7	5	4	5
18	Rufous marsh glider	<i>Rhodothemis rufa</i>	0	0	0	2	0	0
19	Common picture wing	<i>Rhyothemis variegata</i>	32	30	29	17	14	12
20	Crimson marsh glider	<i>Trithemis aurora</i>	5	4	6	3	0	0
21	Crimson glider	<i>Urothemis signata</i>	10	7	8	0	0	0
	TOTAL		212	202	203	119	96	93
	Simpson's Diversity Index (1-D)		0.91	0.91	0.91	0.90	0.88	0.87

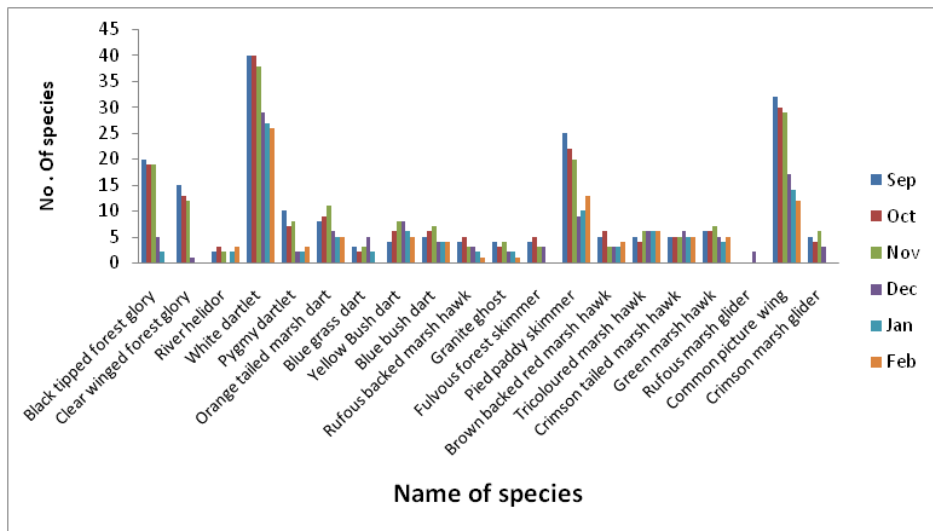


Fig. 1: Seasonal variation in the number of odonates observed during the study period

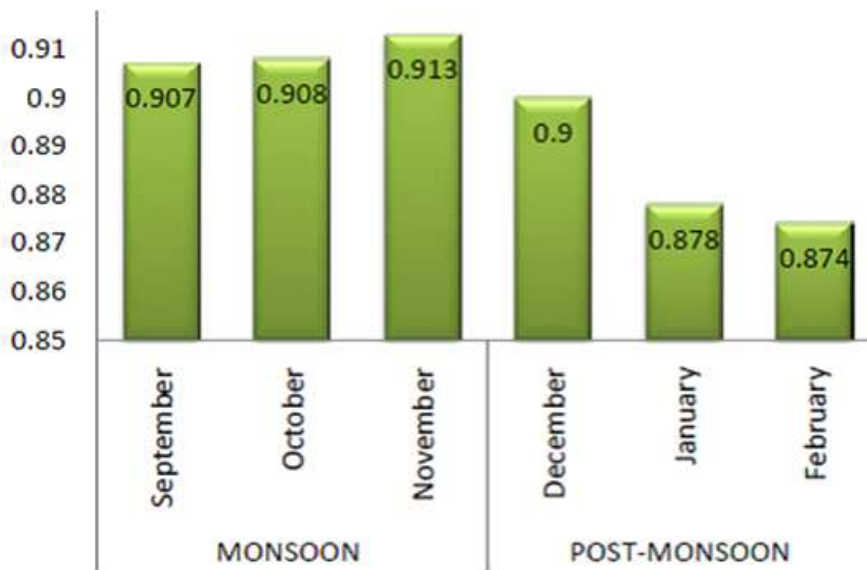


Fig. 2: Simpson's Diversity Index of odonates

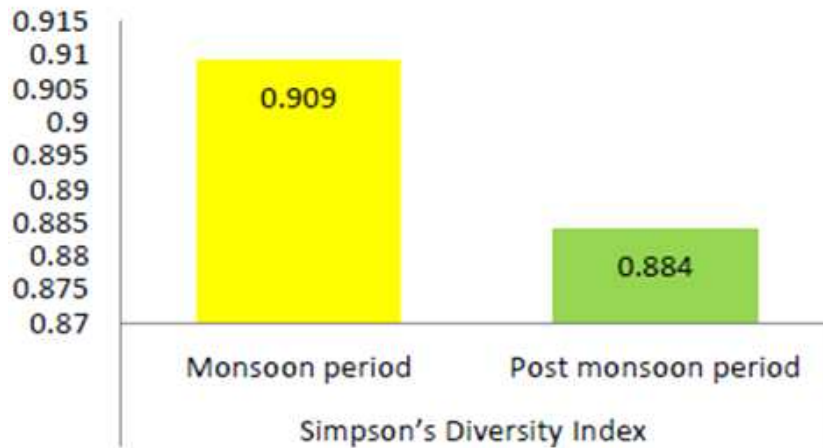


Fig. 3. Mean value of Simpson's Diversity Index of odonates in the Monsoon and Post -Monsoon period

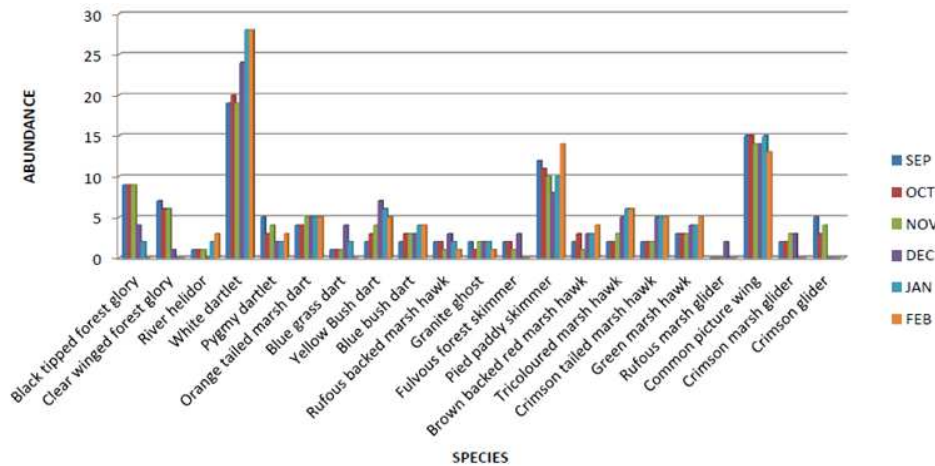


Fig. 4. Species abundance of odonates during the study period

RESULT AND DISCUSSION

In the present study, 'The Seasonal Diversity of Odonates of Selected areas of Elanji Gramapanchayath', the diverse fauna of odonates of the locality were observed. 21 species were identified during the study. The Simpson's Index value reveals that the biodiversity of odonate in the monsoon season (0.909) were greater than that of the post-monsoon (0.884) season. The Simpson's Index value for September, October, November, December, January and February were 0.907, 0.908, 0.913, 0.900, 0.878 and 0.874 respectively. The index value in monsoon (0.909) was more nearer to the value 'one' which means 'infinite diversity' i.e., monsoon period has more diversity of odonate.

The monsoon months were characterized by varying rainfall patterns. Odonates are delicate insects whose lifecycle is closely dependent on water. Their nymphs are aquatic and adults need water for egg laying. The abundance of water can be attributed as a factor for their diversity richness during the monsoon period. The post-monsoon period - with hot days and chilling nights in December and drying rivers in January-February - had little rainfall and the high temperature. Water level in streams began decreasing and was finally very low. So this might have been a contributing factor in the significant low index value during this period. So, variations in temperature and low water availability affect the odonate diversity.

Another important factor influencing the odonate diversity is the vegetation cover. Change in vegetation cover corresponds to the change in rainfall & temperature. This can in turn affect odonates since habitat preference for each of them is unique. The landscape was lush green in monsoon period while the greenery disappeared in the dry post-monsoon periods. According to Heckman (1974) most of the Odonate species are active in the rice fields and their larvae are found as soon as the environment is favorable for development. Interestingly, irrigation canals in the field can provide the necessary refuge for Odonate larvae during dryness conditions as the rice fields could be artificially or naturally dried. Grasses in the ambient environment of the rice fields offer shelter for the adult odonate to rest or mate. Another factor which is thought to affect them is the availability of prey species. According to Sahyaraj (2004), Horseflies and mosquitoes are some of the important preys of odonates. These are in turn dependent on water for their survival and are less in the dry period.

The most abundant species of the study area all throughout the period was *Agriocnemis pieris*, commonly known as white dartlet. The habitat type of this species is open grasslands and fields. It darts among vegetation and flies very close to the ground. Its abundance can thus be attributed to the similar habitat conditions in the study area which is a paddy field. The study of CheSalmah, Rawiet al. (2012) in a rice

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agro-ecosystem also has same results. *Ischnura* species was the most abundant. This study was done at The Experimental Rice Research Station at Bertram from 1996 - 1999.

CONCLUSION

The study shows that the monsoon period has more biodiversity richness than that of the post monsoon period. The water availability, grass cover and availability of prey species during the monsoon period have been the contributing factors for the high biodiversity during monsoon period. The post monsoon with its more or less dry conditions, variations in temperature, change in vegetation didn't provide ambient conditions for their survival.

The most abundant species in all the six months was '*Agriocnemis pieris*' belongs to the family '*Coenagrionidae*'. The habitat preferred by this species is open grasslands and fields. It darts among vegetation and flies very close to the ground. Its abundance can thus be attributed to the similar habitat conditions in the study area which is a paddy field.

It is evident from this study that there is strong habitat and land use association and seasonality in species richness which is responsible for shaping the odonate community of the region.

REFERENCES

1. Rawi, C.S., Salman, A., shami, A., Amir, S., Ruddin, S., Abu, H.A. and Azmi, M. (2012). Effect of herbicides on odonate communities in a rice agro-ecosystem. *Toxicological and environmental chemistry*, 94(6): 1188-1198
2. Heckman, C.W. (1974). The seasonal succession of species in a rice paddy in Vientiane Laos. *Internationale Revue der gesamten Hydrobiologie und Hydrographie*, 59(4): 489-507
3. Sahayaraj, K. (2004). *Indian Insect Predators in Biological Control*. Delhi: Daya Books
4. Kiran, C.G. and Raju, D.V. (2013). *Dragonflies and damselflies of kerala*: Green Leaf publications.
5. Muthukumaravel, K., Bose Raja, A. R., Amsath, S.P. and Chezian, Y. (2015). Seasonal variation of dragonflies diversity in Muthupet mangrove forest, Tamil Nadu, India. *International Journal of Pure and Applied Zoology*. 3(2): 188-192.

6. Thomas, A.P. (2011). Biodiversity: scope and challenges. Green Leaf publications.
- Tiple, A.D. (2012). Dragonflies and Damselflies (Odonata: Insecta) of the Achana kmarAmarkantak Biosphere Reserve, in Chhattisgarh and Madhya Pradesh, with their status in Central India. International journal of Biotechnology and Bioscience, 2(1): 97-102.

ELECTRONIC SOURCES:

7. 'Prokerala'. 'Kerala Climate - Climate in Kerala , Temperature, Monsoon Rainfall' Accessed on 20 February 2014. <<http://www.prokerala.com/kerala/climate.htm>>.
8. 'South-West monsoon rainfall of Kerala and its variability'. 24April2014 .Access edon20February2014 <http://shodhganga.inflibnet.ac.in/bitstream/10603/3654/5/05_chapter%201.pdf>
9. 'Animal migration'. Accessed on 20 February 2014 <http://www.saburchill.com/hfns02/chapters/chap011.htm>