

Diversity of Odonata (Dragon flies and Damsel flies) Fauna of Khanapur Tehsil, Dist. Sangli (M.S.) India

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Abstract:

The Present paper deals with a study of diversity of odonate of Khanapur Tehsil Dist. Sangli (M.S.), India. The study is conducted during two years from Jan.2016 to Feb.2018. Total 10 stations are randomly selected as study sites. Total 719 individuals of odonates belonging to 06 families, 23 genera and 34 species were recorded during the study period. The family Libellulidae with 17 species is the most dominant among the anisoptera (dragon fly) followed by Aeshnidae (03 spe.) and Gomphidae (02 spe.). Among the Zygoptera (damsel flies), the family Coenagrionidae with 09 species was the most dominant than family Lestidae (02 spe.) and family Platycnenididae (02 spe.). The richness index (Margalef's index) shown that the species richness is maximum in the site S1,Vita City area (5.728).Minimum richness is found in site S10, Banurgad village area (1.800). Among all the species of odonates the *Pantala flavescens* is found to be abundant (22.80%).The results are analyzed with present available literature.

Key words- Khanapur Tehsil, odonates, diversity, richness, abundance.

Introduction:

Dragon flies and damsel flies collectively called 'odonates', are one of the most ancient of winged insect, dating back well into the Permian period. Odonata are divided into three suborders anisoptera, zygoptera and aniso-zygoptera. The odonates are playing crucial role in ecosystem, functional as biological indicators of environmental quality. They also play important role in the food web as herbivorous, carnivorous and detritivorous (Strong *et al.*, 1984). Larvae of odonata are the predators of aquatic food chain and the adult odonates are the predators of various insects which act as the crop pests.

About 6000 species of odonates are described all over the world. In India 536 species and subspecies are recorded. In Maharashtra total 101 species of odonates are recorded (Kulkarni *et al.*,2012). The diversity of different animals has been studied from Sangli district, but odonates are not properly explored. Therefore, the present study is conducted to explore the abundance, species richness, species evenness and diversity of odonates in Khanapur Tehsil, District Sangli (M.S.), which is important group of food chain.

Materials and Methods:

1) Study area-

Khanapur Tehsil comes under the west zone of Maharashtra state and lies between 17° 15'40" north latitude and 74°42'6" east longitude. It is bounded by Tasgaon Tehsil towards south-east, Atpadi Tehsil

towards north-east and Kadegaon Tehsil towards south-west. The Khanapur Tehsil has moderate climate with hot summer, short monsoon and cold winter season. During summer the maximum temperature is 41°C and minimum is 28°C. In Khanapur Tehsil 50 natural water resources especially river, lakes, streams etc. are present. The Revansidha forest in Khanapur Tehsil has many water resources and good plant diversity. Such type of climate is favorable to normal development of odonates.

2) Data collection-

The odonates sampling is carried out for two years from month of January 2016 to February 2018 in ten different sites of Khanapur Tehsil. It is carried out in 03 km. area around each site. The observations are carried out by weekly visit during morning and evening time. Species were photographed by using Nikon camera (1120) and identified in their natural habitat. When it was difficult to assess, then specimen are captured for their further identification and after identification they are released in their natural habitat immediately.

The collection of specimens is carried out by using sweep net. The specimens are observed and collected from herbs, shrubs and ponds in 10 different study sites. The identification is done by the standard identification key prescribed by Subramanian (2014) and Andrew *et al.* (2010).

3) Data analysis-

- **Relative abundance is calculated by using formula**

$$\text{RA. (\%)} = \frac{\text{Total number of one species}}{\text{Total number of individuals}} \times 100$$

- **Diversity is calculated by using Shannon-Weaver index (H').**

$$\text{Formula- } H' = - \sum P_i \ln P_i$$

Where, $P_i = S/N$

S = Numbers of individuals of one species

N = Total number of all individuals

\ln = Logarithm to base e.

- **Species richness is calculated by using Margalef's index**

$$\text{Formula- Margalef's index} = S - 1/ \ln N$$

- **Evenness of the species is calculated by using Pielou's evenness index.**

The evenness index ranges from zero to one, where zero signifying no evenness and one as complete evenness.

$$\text{Formula-e} = H/ \ln S$$

Where, H = Shannon- Weaver index.

Result:

Total 719 individuals of odonates belonging to 34 species under 06 families are recorded during the study period (Table No.01 and 02). Among the Anisoptera, the family Libellulidae was the most dominant family with 17 species followed by Aeshinidae (03 spe.) and Gomphidae (02 spe.). The family Coenagrionidae with 09 species was the most dominant than family Lestidae (02 spe.) and family Platycnenididae (02 spe.) among the Zygoptera (Fig. No. 02). *Pantala flavescens* was abundantly (22.80%) recorded from all sampling sites (Table No.03 and Fig. No.01). It might be due to the post monsoon mass emergence and yearly aggregation before migration. Among the 10 sites, site S1 (Vita city area) recorded highest species diversity (Shannon Index-2.843), species richness (Margalef's Index- 5.728). However, site S10 (Banurgad village area) recorded lowest species diversity (Shannon Index-1.815), species richness (Margalef's Index- 1.800). The species evenness was found to be highest in site S9 (Balwadi village area-Pielou's evenness index- 0.964) and lowest in site S4 (Pare village area - 0.609)(Table No. 04). The different species of odonata observed during study period are given in Plate No. 01.

Discussion:

Total 34 species of dragonfly belonging to 06 families have been reported in the present study. The family Libellulidae was found to be highest species diversity among all families of Odonata (Aeshinidae, Gomphidae, Coenagrionidae, Lestidae, Platycnenididae). Subramanian (2009) reported 11 families of dragonfly with Libellulidae (972 spe.) and Gomphidae (958spe.) as major families containing maximum species throughout the world.

Tiple (2012) recorded 64 species of odonata belonging to 41 genera and 09 families. The checklist adds 23 new records for Tadoba national park. From 64 species 23 were abundant or very common, 24 were common, 12 were rare and 05 were very rare in occurrence. Atanu *et al.* (2014) recorded 33 species of odonates including 24 species of Anisoptera (dragonflies) and 09 species of Zygoptera (damselflies) from the Indian Council of Agriculture Research (ICAR) campus of Umiam, Meghalaya State. Priyanka *et al.*(2014) recorded 33 species of odonates belonging to 22 genera and 06 families from the different gardens of Pune city, Maharashtra State. Dayakrishna *et al.* (2015) reported 420 individuals of odonates belonging to 19 species under 04 families from Corbet Tiger Reserve, Uttarakhand, India. On the basis of total number of species Libellulidae was the most abundant family with 15 species followed by Coenagrionidae (02 spe.). Anita *et al.* (2016) reported 20 species of odonate. During her study she recorded maximum number of species in the post monsoon season. She conclude that the family Libellulidae is the most dominant family comprising 75% of species having most abundant species of *Diplacodes trivialis*. Our results are in good agreement with the findings of Tiple (2012),Atanu *et al.* (2014),Priyanka *et al.* (2014),Dayakrishna *et al.* (2015) andAnita *et al.* (2016).

Table No. 01: List of odonates (Anisoptera) recorded in study area (10 sites)

Sr.No.	Family	Species
1.	Libellulidae	01. <i>Brachythemis contaminata</i> 02. <i>Bradinyopyga geminata</i> 03. <i>Crocothemis servilia</i> 04. <i>Diplocode trivialis</i> 05. <i>Neurothemis fulvia</i> 06. <i>Neurothemis tullia</i> 07. <i>Orthetrum luzonicum</i> 08. <i>Orthetrum pruinosum</i> 09. <i>Orthetrum sabina</i> 10. <i>Pantala flavescens</i> 11. <i>Rhyothemis variegata</i> 12. <i>Tramea basilaris</i> 13. <i>Trithemis aurora</i> 14. <i>Trithemis festiva</i> 15. <i>Trithemis pallidinervis</i> 16. <i>Urothemis signata</i> 17. <i>Zyxomma petiolatum</i>
2.	Gomphidae	01. <i>Ictinogomphus rapax</i>
3.	Aeshnidae	01. <i>Anax guttatus</i> 02. <i>Anax immaculifrons</i> 03. <i>Gynacantha bayadera</i>

Table No. 02: List of odonates (Zygoptera) recorded in study area (10 sites)

Sr.No	Family	Species
1.	Coenagrionidae	01. <i>Agriocnemis pygmaea</i> 02. <i>Aciagrion pallidum</i> 03. <i>Ceriagrion coromandelianum</i> 04. <i>Ischnura aurora</i> 05. <i>Ischnura senegalensis</i> 06. <i>Pseudagrion decorum</i> 07. <i>Pseudagrion microcephalum</i> 08. <i>Pseudagrion rubriceps</i> 09. <i>Rhodischnura nursei</i>
2.	Lestidae	01. <i>Lestes elatus</i> 02. <i>Lestes umbrinus</i>
3.	Platycnenididae	01. <i>Copera marginipes</i> 02. <i>Copera vittata</i>

Table No. 03. The distribution and abundance of the odonates in study area (10 sites)

Sr. No.	Name of species	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Total	RA %
01	<i>Brachythemis contaminata</i>	25	20	05	00	04	12	03	05	03	00	77	10.70
02	<i>Bradinopyga geminate</i>	02	02	00	03	00	00	00	00	00	00	07	0.97
03	<i>Crocothemis servilia</i>	09	15	02	01	00	09	03	01	03	00	43	5.98
04	<i>Diplocode trivialis</i>	25	30	03	08	03	06	05	03	03	05	91	12.65
05	<i>Neurothemis fulvia</i>	03	01	00	00	01	00	00	00	00	00	05	0.69
06	<i>Neurothemis tullia</i>	02	02	00	00	00	00	00	00	00	00	04	0.55
07	<i>Orthetrum luzonicum</i>	02	02	00	00	00	00	00	00	00	00	04	0.55
08	<i>Orthetrum pruinosum</i>	08	08	03	03	00	02	01	03	00	02	30	4.17
09	<i>Orthetrum sabina</i>	09	05	02	03	08	05	02	01	02	03	40	5.56
10	<i>Pantala flavescens</i>	08	04	50	50	20	03	09	08	06	06	164	22.80
11	<i>Rhyothemis variegata</i>	03	02	00	00	00	00	00	00	00	00	05	0.69
12	<i>Tramea basilaris</i>	00	03	00	02	00	00	00	00	00	00	05	0.69
13	<i>Trithemis aurora</i>	10	18	05	02	05	05	05	02	03	05	60	8.34
14	<i>Trithemis festiva</i>	05	02	03	01	03	03	02	02	02	01	24	3.33
15	<i>Trithemis pallidinervis</i>	01	03	02	00	00	00	00	00	00	00	06	0.83
16	<i>Urothemis signata</i>	00	00	03	00	00	00	00	00	00	00	03	0.41
17	<i>Zygomma petiolatum</i>	01	01	00	00	00	00	00	00	00	00	02	0.27
18	<i>Ictinogomphus rapax</i>	01	01	00	00	00	00	00	00	00	00	02	0.27
19	<i>Anax guttatus</i>	02	00	01	00	00	00	00	00	00	00	03	0.41
20	<i>Anax immaculifrons</i>	01	00	00	01	00	00	00	00	00	00	02	0.27
21	<i>Gynacantha bayadera</i>	02	02	00	00	00	00	00	00	00	00	04	0.55
22	<i>Agriocnemis pygmaea</i>	02	02	00	00	00	00	00	00	00	00	04	0.55
23	<i>Aciagrion pallidum</i>	03	00	00	01	00	00	00	00	00	00	04	0.55
24	<i>Ceriagrion coromandelianum</i>	14	12	05	03	02	06	02	04	05	06	59	8.20
25	<i>Ischnura aurora</i>	02	02	01	00	00	00	00	00	00	00	05	0.69
26	<i>Ischnura senegalensis</i>	03	00	00	03	00	00	00	00	00	00	06	0.83
27	<i>Pseudagrion decorum</i>	00	00	02	02	00	00	00	00	00	00	04	0.55
28	<i>Pseudagrion microcephalum</i>	02	02	00	01	00	00	00	00	00	00	05	0.69
29	<i>Pseudagrion rubriceps</i>	00	00	02	01	00	00	00	00	00	00	03	0.41
30	<i>Rhodischnura nursei</i>	01	01	00	00	01	00	00	00	00	00	03	0.41
31	<i>Lestes elatus</i>	02	01	00	00	00	00	00	00	00	00	03	0.41
32	<i>Lestes umbrinus</i>	03	02	00	00	00	00	00	00	00	00	05	0.69
33	<i>Copera marginipes</i>	05	06	06	00	03	02	02	02	04	00	30	4.17
34	<i>Copera vittata</i>	02	00	02	02	00	00	00	01	00	00	07	0.97
	Total No. of individuals	158	149	97	87	50	53	34	32	31	28	719	100
	Total No. of Species	30	26	17	17	10	10	10	11	09	07		

S1: Vita city area; **S2:** Nevari village area; **S3:** Karve village area; **S4:**Pare village area; **S5:** Lengare village area; **S6:** Khanapur city area; **S7:** Mahuli village area; **S8:** Devehindi village area; **S9:** Balawadi village area; **S10:** Banurgad village area. **RA (%):** Relative Abundance in percentage.

Table No.04: Biodiversity indices in the 10 sampling sites

Sr. No.	Community	No. of species	No.of individuals	Shannon index	Margalef's index	Pielou's evenness index
1	S1	30	158	2.843	5.728	0.835
2	S2	26	149	2.632	4.997	0.807
3	S3	17	97	1.944	3.498	0.686
4	S4	17	87	1.727	3.583	0.609
5	S5	10	50	1.879	2.300	0.816
6	S6	10	53	1.991	2.267	0.864
7	S7	10	34	2.101	2.552	0.912
8	S8	11	32	2.171	2.886	0.905
9	S9	09	31	2.12	2.330	0.964
10	S10	07	28	1.815	1.800	0.933

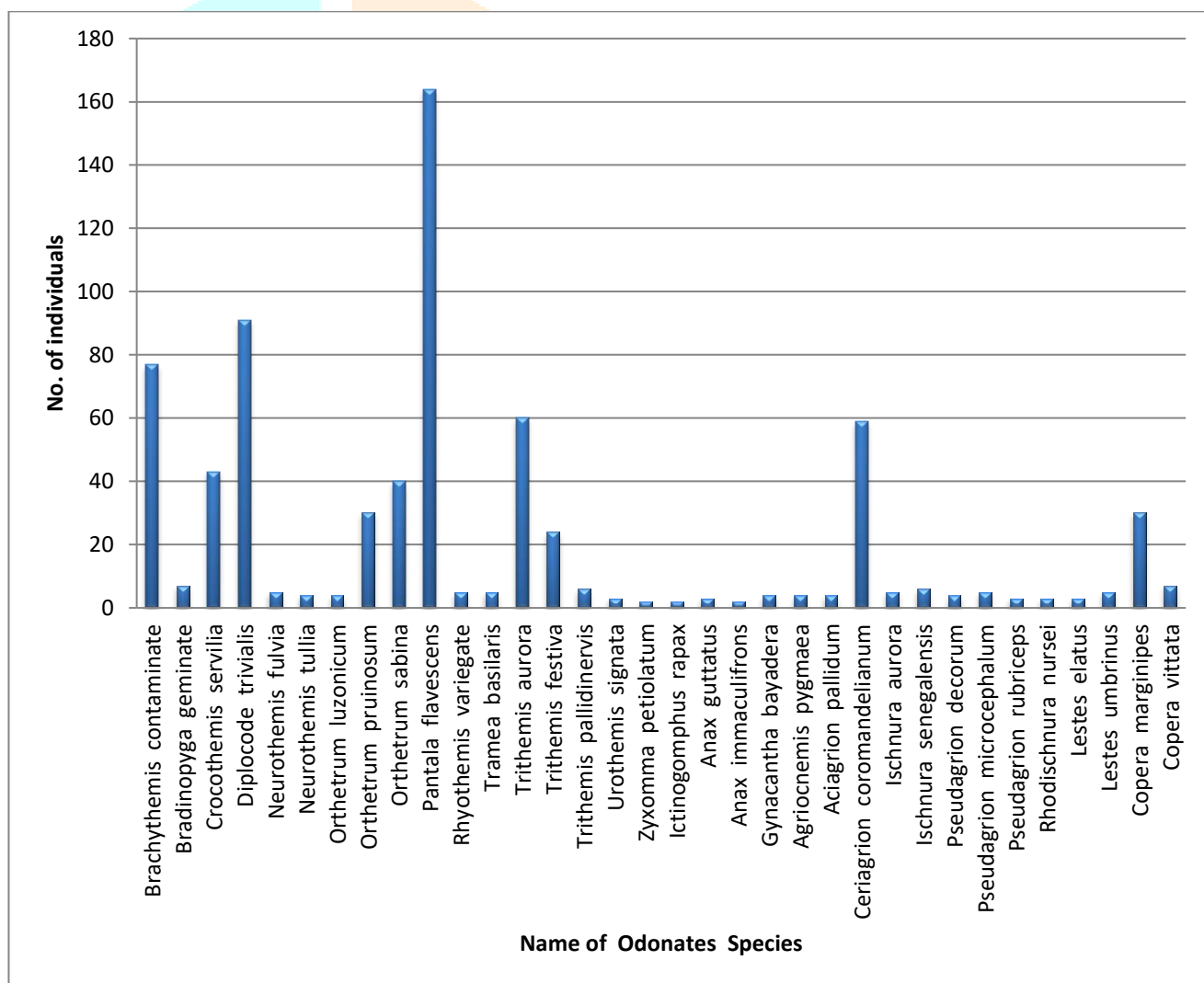


Fig. 1. Abundance of different odonate species in study area

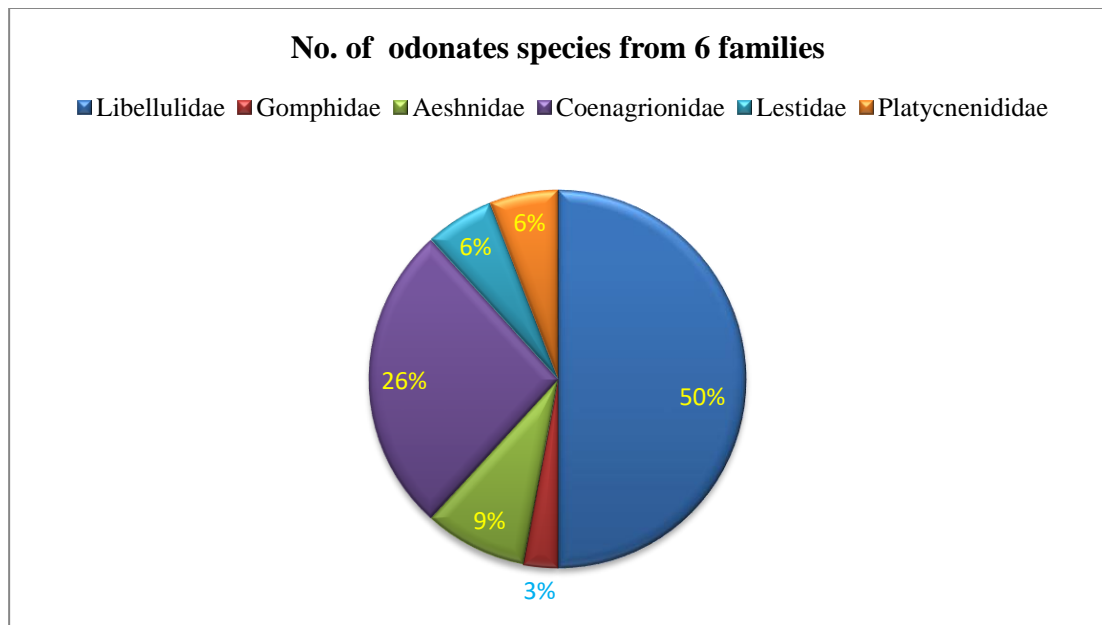
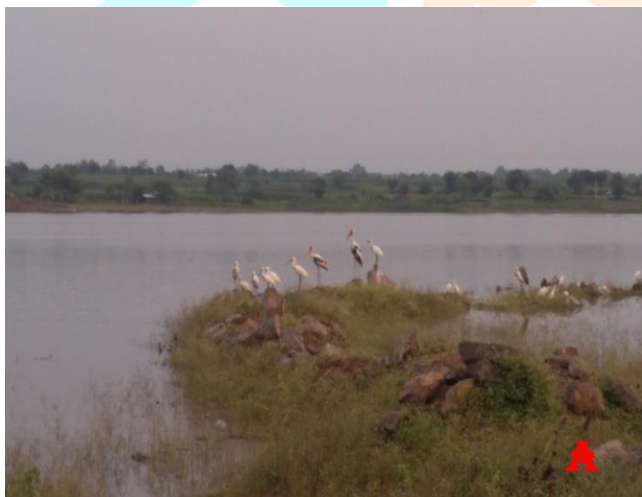


Fig. 2. Species richness per family



A. Site S1: Vita city area

B. Site S6: Khanapur city area

C. Site S4: Pare village area

D. Site S2: Nevari village are

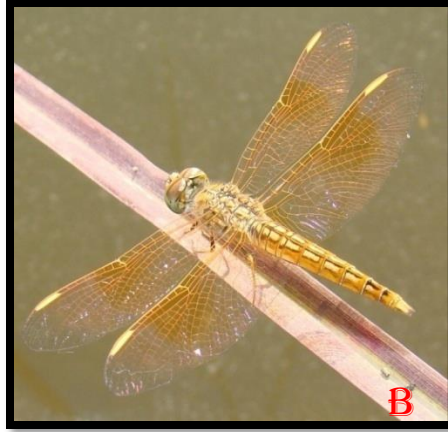


Plate No :- 02 A: *Anax immaculifrons* (Rambur), B: *Brachythemis contaminata* (Fabricius)
 C: *Orthetrum sabina*, D: *Trithemis aurora* (Burmeister), E: *Ceriagrion coromandelianum*,
 F: *Coper marginipes* (Rambur), G: *Pseudagrion microcephalum* (Rambur), H. *Rhodischnura nursei*.

Conclusion:

In the present study total 34 species of dragonflies belonging to 06 families are recorded. The diversity of odonates is found to be high at the west region of Khanapur because of the high number of water resources like river, lakes, stream etc. as compare to other regions. The west region of Khanapur Tehsil consist of site S1 (Vita city area), site S2 (Nevari village area), Site S3 (Karve village area) and site S4 (Pare village area). Diversity of odonates is found to be very low in the east region of Khanapur Tehsil because of drought prone area and less number of water resources. The east region of Khanapur consist site S10 (Banurgad village area), site S9 (Balwadi village area) and Site S8 (Devekhindi village area). The moderate diversity is found in central region of Khanapur Tehsil. This region are consist site S5 (Lengare village area), site S6 (Khanapur city area) and Site S7 (Mahuli village area).

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