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## Status, diversity and conservation threats of Odonates in Kundavada Lake, Davanagere district, Karnataka, India

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### Abstract

A study on diversity of odonates was conducted at Kundavada Lake located in Davanagere District of Karnataka. The study was conducted to explore status, diversity and conservation threats of Odonata from October 2010 to September 2011. During the study period, a total of 32 species of Odonates in 24 genera belonging to 6 families have been reported. Among them the order-Anisoptera (Dragonflies) dominated with 23 (72%) species, followed by the Zygoptera (damselflies) with 9 (28%) species. The family Libellulidae dominated with 19 species among the Anisoptera. Among the Zygoptera, the family Coenagrionidae was found to be the dominant with 6 species and least by the Lestidae with 1 species. Based on the frequency of occurrence of odonates, 37% of the species were common, 22% were occasional, 19% were very common, 16% were rare and 6% were very rare. The study highlights the importance of odonates and threats in their habitat due to different anthropogenic activities and also provides the baseline data on Odonate diversity of some major wetlands of Davanagere District of Karnataka state for research on their biology and the conservation.

**Keywords:** Status, dragonflies, damselflies, diversity of odonates, Zygoptera, Anisoptera, Kundavada Lake

### 1. Introduction

Odonates serve as an umbrella species in biodiversity conservation [1, 2] and represent specific biotic wetland assemblages. Globally 5740 species of odonates are known from the world, of which 474 species in 142 genera and 18 families exist in India [3]. Dragonflies have been proposed as indicators to assess the ecosystem health of freshwater wetlands [4] and also play a vital role as prey and predator to maintain the balance of trophic levels of food chain [5, 6].

Odonates survive in a wide range of aquatic habitats i.e., from flowing and stagnant water bodies, some have adapted to urban areas and exploit man-made water bodies [7, 8]. Even though most species of odonates are highly specific to a habitat are susceptible to habitat alterations induced by human activities [8]. Odonates, being predators both at larval and adult stages, play a significant role in the wetland ecosystem [8]. Besides, being important elements of the food chain; they predate on mostly of the harmful insects of crops, orchards and forest, other small insects like mosquitoes, moths, butterflies and thus have a regulatory impact on agro-forestry [7, 9].

For the first time study was to conduct a preliminary survey on odonate species assemblages in selected wetland of Kundavada Lake, Davanagere District in order to understand the nature of odonate species assemblages with reference to the habitat characters.

### 2. Material and Methods

#### 2.1 Study Area

The Kundavada Lake is a spectacular site famous for wetland migratory avifaunal diversity; the lake is about 243.27 acres and is located between 14° 27' 30" N latitude and 75° 53' 39" E longitude. This wetland provides water for drinking to Davanagere city, irrigation to surrounding agricultural lands and for aquaculture practice. The lake is situated just near to the Pune-Bangalore highway. Most importantly the lake has recreational and ecological significance as an attracting sight for many wetland and wetland dependent local and migratory birds. The lake has a water connection from the Channel of River Tungbhadra. Lake is free from sewage and agricultural drainage.

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## 2.2 Sampling Method

Odonata sampling was carried out from October 2010 to September 2011. Adult Odonata sampling was done by direct counts made while observing habitats on hourly basis. Data collection was conducted between 09:00 am and 01:00 pm when insects were most active (i.e., during low wind, warm and sunny weather). During the course of the survey Odonates were observed in the field and photographed by using digital cameras (Canon 400D, Canon 70D and Panasonic DMC-FZ70). Identification was done by using identification keys provided by [10, 11]. The taxonomic and nomenclature has been followed as per [3]. The odonates were categorized into five groups such as, very common (80-100%), common (60-80%), occasional (40-60%), rare (20-40%) and very rare (below 20%) based on their abundance during the study period [12].

## 3. Results and Discussion

A total of 32 species of Odonates in 24 genera belonging to 6 families have been reported. During the study, the order-Anisoptera which includes dragonflies was found to be more diverse and predominant with 23 species belonging to 3 families, contributed 72%, followed by the order-Zygoptera which includes damselflies was found to be less diverse with 9 species belonging to 3 families, contributed 28% composition of total odonates recorded from Kundavada Lake, Davanagere District, Karnataka (Table 1, Figure 1). Among the Order-Anisoptera, on the basis of the family wise species distribution, the family Libellulidae was found to be widely distributed and dominated with high percentage composition i.e., 82% (n=19), whereas, the family Aeshnidae and Gomphidae were found to be more or less equally distributed with percentage composition i.e., 9% (n=2) each respectively (Table 1, Figure 2). However, among the Order-Zygoptera, the family Coenagrionidae was found to be dominated with highest percentage composition i.e., 67% (n=6), followed by the family Platycnemididae with 22% (n=2) and least by the Lestidae with 11% (n=1) of total species recoded from the study area (Table 1, Figure 3). The status of odonates based on the frequency of occurrence shown that 37% (n=12) species were common, 22% (n=7) were occasional, 19% (n=6) were very common, 16% (n=5) were rare and 6% (n=2) were very rare respectively (Table 1,

Figure 4). According to IUCN categorization all the odonate species recorded from the study area comes under 'Least Concern' (LC) category (Table 1).

During the present investigation, it was revealed that Anisoptera (dragonflies) was found to be abundant; this similar pattern of predominance was also reported from other wetlands of same district i.e., from Komaranahalli Lake [6] and Kondajji Lake [7] of Davanagere district, Karnataka, this might be due to their high dispersal ability and adaptability to wide range of habitats [13, 14]. Less abundance of Zygoptera (damselflies) was may be due to their limited dispersal ability and changing environment [13, 15, 16] and partial or absence of shade cover [17] afforded by the temporary water bodies. The encounter of damselflies in study area could be attributed to the existence of shade over the habitat from the trees present around the water bodies and also to the occurrence of aquatic vegetation. The study also revealed that shade and aquatic vegetation could favour the Zygoptera more than the Anisoptera [10].

During the present investigation, the record of abundant Libellulidae (Anisoptera) and Coenagrionidae (Zygoptera) in study area might be due to their shorter life cycle and widespread distribution and tolerant to wide range of habitats [18, 19, 20]. The maximum diversity of Odonata in Kundavada Lake might be due to their larger size. The size of the water bodies also becomes an important factor to determine the species richness and diversity of Odonata [6, 7, 13, 21, 22].

However, during the study it has been found that, the odonates and their habitats are under threat due to intensive anthropogenic activities, like, movement of heavy vehicles around the wetland, presence of predators, habitat alterations such as construction of roads, conversion of larger agricultural plots into residential sites etc leads to habitat fragmentation and other threats includes, pollution and eutrophication etc., not only affecting the assemblage of Odonata population in temporary water bodies but also cause local extinctions [6, 7, 18, 23, 24]. The data recorded in the present study may give valuable information about odonate fauna of Kundavada Lake as a baseline data for assessing the changes of environmental conditions in the area, thereby helping in formulating future conservation measures to preserve the wetland habitats and to maintain the ecosystem health [24].

**Table 1:** Systematic list of Odonates along with their conservation status at Kundavada Lake, Davanagere District, Karnataka.

Sl. No	Common name	Scientific name	Status	IUCN
<b>Order: Anisoptera (Dragonflies)</b>				
<b>1. Family: Aeshnidae</b>				
1	Blue-tailed Green Darner	<i>Anax guttatus</i>	O	LC
2	Parakeet Darner	<i>Gynacantha bayadera</i>	O	LC
<b>2. Family: Gomphidae</b>				
3	Common Clubtail	<i>Ictinogomphus rapax</i> (Plate.1)	VC	LC
4	Common Oartail or Hooktails	<i>Paragomphus lineatus</i>	O	LC
<b>3. Family: Libellulidae</b>				
5	Trumpet Tail	<i>Acisoma panorpoides</i>	C	LC
6	Little Blue Marsh Hawk	<i>Brachydiplax sobrina</i>	C	LC
7	Ditch Jewel	<i>Brachythemis contaminata</i>	VC	LC
8	Ruddy Marsh Skimmer	<i>Crocothemis servilia</i>	C	LC
9	Scarlet Marsh Hawk	<i>Aethriamanta brevipennis</i>	C	LC
10	Granite Ghost	<i>Bradinyopyga geminata</i> (Plate.1)	VC	LC
11	Ground Skimmer	<i>Diplacodes trivialis</i> (Plate.1)	VC	LC
12	Pied Paddy Skimmer	<i>Neurothemis tullia</i>	O	LC
13	Brown-backed Red Marsh Hawk	<i>Orthetrum chrysis</i>	VR	LC
14	Blue Marsh Hawk	<i>Orthetrum glaucum</i> (Plate.1)	O	LC
15	Crimson-tailed Marsh Hawk	<i>Orthetrum pruinosum</i> (Plate.1)	C	LC
16	Green Marsh Hawk	<i>Orthetrum Sabina</i> (Plate.1)	VC	LC
17	Wandering Glider	<i>Pantala flavescens</i> (Plate.1)	C	LC

18	Common Picture Wing	<i>Rhyothemis variegata</i> (Plate.1)	O	LC
19	Crimson Marsh Glider	<i>Trithemis aurora</i>	C	LC
20	Black Stream Skimmer	<i>Trithemis festiva</i>	C	LC
21	Black Marsh Trotter	<i>Tramea limbata</i>	C	LC
22	Red Marsh Trotter	<i>Tramea basilaris</i>	VR	LC
23	Coral-tailed Cloud Wing	<i>Tholymis tillarga</i> (Plate.1)	R	LC
<b>Order: Zygoptera (Damselflies)</b>				
<b>4. Family: Coenagrionidae</b>				
24	Pygmy Dartlet	<i>Agriocnemis pygmaea</i>	O	LC
25	Coromandel Marsh Dart	<i>Ceriagrion coromandelianum</i> (Plate.1)	C	LC
26	Golden Dartlet	<i>Ischnura aurora</i>	C	LC
27	Senegal Golden Dartlet	<i>Ischnura senegalensis</i>	VC	LC
28	Elegant Sprite	<i>Pseudagrion decorum</i>	R	LC
29	Blue Grass Dartlet	<i>Pseudagrion microcephalum</i>	C	LC
<b>5. Family: Lestidae</b>				
30	Emerald Spreadwing	<i>Lestes elatus</i>	R	LC
<b>6. Family: Platynemididae</b>				
31	Blue Bush Dart	<i>Copera vittata</i>	R	LC
32	Yellow Bush Dart	<i>Copera marginipes</i>	R	LC

VC-Very common; C-Common; O-Occasional, VR-Very Rare and R-Rare, LC- Least concern, \*- Endemic to Western Ghats; \*\*-Endemic to Peninsular India and Sri Lanka

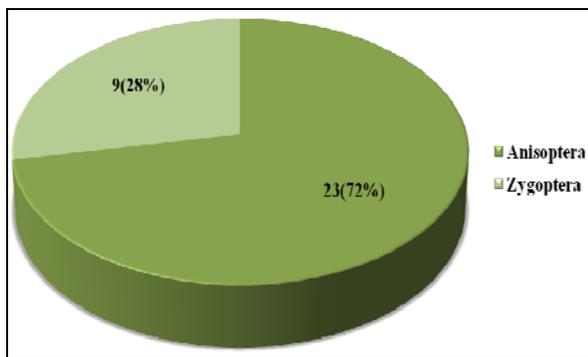


Fig 1: Percentage composition of Odonates (Order: Anisoptera and Zygoptera) at Kundavada Lake.

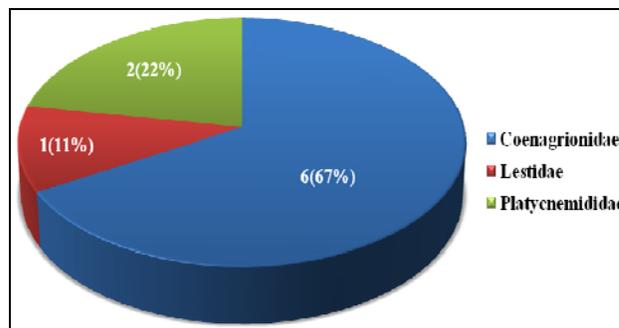


Fig 3: Family wise percentage composition of Damselfly (Zygoptera) at Kundavada Lake

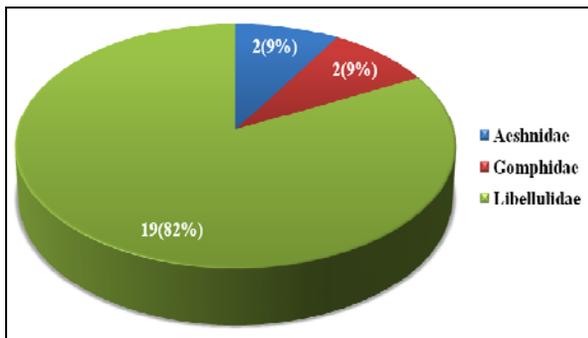


Fig 2: Family wise percentage composition of Dragonfly (Anisoptera) at Kundavada Lake

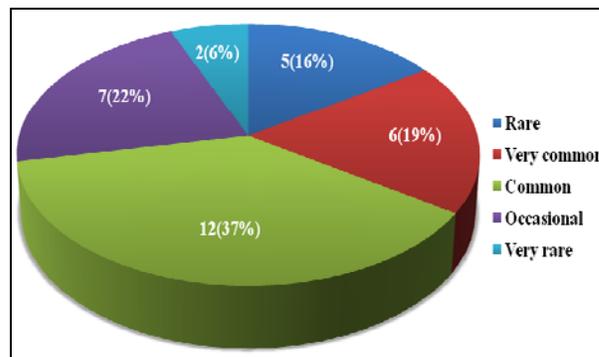


Fig 4: Status of Odonates based on the frequency of occurrence at Kundavada Lake





**Plate 1:** Photographs of some selected Odonates recorded during the study

#### 4. Conclusion

The study revealed the rich Odonates diversity indicating that the study area still provides some favorable ecological conditions and potential habitats for this declining population of odonates, which made this study area as one of the rich and unique habitat. Disturbances in the form of anthropogenic activities such as, construction of roads, conversion of larger agricultural plots into residential sites and movement of heavy vehicles etc., can leads to the habitat fragmentation, and loss

of Odonates population and cause local extinctions. It is recommended that long term monitoring and conservation of habitat helps to protect the biodiversity which can be achieved through strict vigilance and study.

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