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## Study of odonates diversity near Koradi Lake, Koradi, Nagpur, Maharashtra

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### Abstract

The prominent and colorful insects of wetlands are dragonflies and damselflies (Order: Odonata). These are prevalent near marshy areas, ponds, lakes, rivers, ditches, and other water bodies. They contribute significantly to the biological foundation of all terrestrial ecosystems as herbivores, pollinators, seed dispersers, predators, detritivores, and vectors. They also serve as effective environmental indicators and biocontrol agents. The objective of the present study was to determine the diversity of odonates in the area around Nagpur's Koradi Lake, which is home to a wide variety of birds and insects. Twenty species of Odonates from 15 genera and three families were discovered during the monitoring in the marked areas near the lake. In total, 1071 individual odonates have been observed in the Koradi region. Libellulidae had the most species (12), followed by Coenagrionidae (7 species), and Aeshnidae (1 species). It was noted that urbanisation and pollution could have a negative impact on the diversity of odonates in the Koradi region.

**Keywords:** Koradi Lake, Odonates (Dragonflies and Damselflies), Biocontrol agent, environmental indicators, urbanization

### Introduction

Damselflies and dragonflies are among the most beautiful and diverse groups of insects in the Order Odonata. One of the oldest and most amphibious insect orders, Odonates have been around since the Carboniferous period, or roughly 250 million years ago <sup>[1]</sup>. There are approximately 6,324 Odonata species known worldwide, with approximately 498 species found in India, nearly 186 species being endemic and almost all species relying on freshwater habitats for reproduction <sup>[2]</sup>. These can be found near ponds, lakes, rivers, ditches, and other marshy areas. They spend the majority of their lives in freshwater ecosystems. The larvae are carnivorous and voracious, while the adults are typically voracious insects. Due to their sensitivity to alterations in

habitat, temperature, and climate, Odonates make excellent environmental indicators <sup>[3]</sup>. They are important to many biological processes such as seed dispersal, pollination, and predation that are necessary to maintain the harmony of terrestrial and aquatic ecosystems <sup>[4]</sup>. Many Odonate species that live in agroecosystems act as biocontrol agents and are essential for regulating pest populations. The Maharashtra Odonata fauna is well-documented, with 134 species reviewed by Tiple and Koparde in 2015, but there are some local gaps. There are 85 Odonates in Maharashtra's eastern region (Vidarbha) <sup>[5]</sup>. The current research investigates the dragonfly and damselfly (Odonata) species of Koradi Lake in Nagpur, Maharashtra. Koradi is 15–18 kilometers from Nagpur and is well-known for its thermal power station.

### Materials and Method

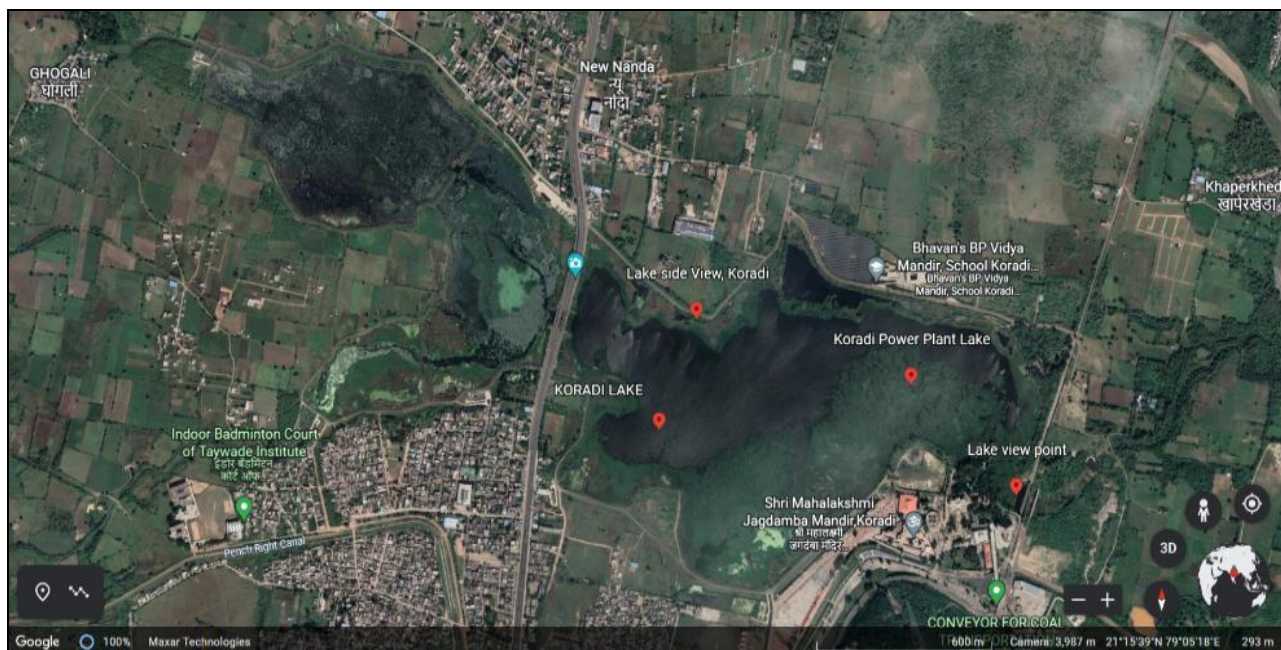
#### Study Area

The Koradi lake, which has a total area of 172.35 hectares, is located about 15-18 kilometers from Nagpur, Maharashtra, at a latitude of 21°15'39"N and a longitude of 79°05'18"E. There are three primary seasons in this region's tropical wet equitable climate: the wet monsoon of June- July and its aftermath from June through October; the chilly dry winter from October through November to February and March; and the hot dry season from April until the start of the rains. Kordia's temperature ranges from 120 -450 Celsius, and its relative humidity is between 15% - 95%. The lake is home to diverse species of birds and insects.

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The study location was chosen to be close to the lake. We chose four, 500-meter tenets each, where bio-monitoring of

the Odonates was done. Fig. 1 shows the location of Koradi lake in Nagpur.



**Fig 1:** Location of Study Area

### Survey and Identification of Odonates

Odonates were photographed at various Koradi lake locations with the Canon SX 60-HS, a 16.1 MP advanced digital camera with 65x optical zoom. Since most Odonates are active between 11 AM and 1 PM, the majority of the sampling was done during that time. Between July and August, a survey was carried out every week. Photographs of Odonates were taken in their natural habitat for documentation. There were no live specimens collected during the study.

### Data Analysis

The Handbook on Common Odonates of Central India by Andrew R.J. *et al.*, (2008) was used to identify the adult Odonates [6]. The species were divided into groups based on how common they were in the area around Koradi Lake. During the study period, the relative abundance (RA) of each Odonata species was calculated. The relative abundance (RA) values obtained were classified into four categories: rare (RA 0.5), not rare (RA > 0.5 to 1.5), common (RA >1.5 to 3.5), and very common (RA > 3.5).

### Results

In the present study, 20 species of Odonates from 15 genera and three families were found: Libellulidae (Suborder Anisoptera), Coenagrionidae (Suborder Zygoptera), and Aeshnidae (Suborder Anisoptera). Thirteen of these are dragonflies, while the remaining seven are damselflies. In total, 1071 Odonates individuals were observed in all four tenements near the lake. There were 12 species in the family Libellulidae, 7 in Coenagrionidae, and 1 in Aeshnidae. *Brachythemis contaminata* species (18.22), *Ischnura aurora* (11.8), and *Orthetrum sabina* are the odonates with the highest relative abundance (8.309). *Anax guttatus* had the lowest relative abundance (0.188), followed by *Tramea virginia* (0.755) and *Orthetrum pruinosum* (1.12). Out of the 20 Odonate species examined in this study, 13 are found to be extremely common, two are common, and five are neither rare nor uncommon. Fig. 2 shows the number of Odonata species and Fig. 3 shows the percentage of Odonata families found in the Koradi region. Table 1 provides a checklist of Odonates along with their relative abundance and local status (VC- Very Common, C- Common, NR- Not Rare, R- Rare). Plates 1 and 2 show photographs of Odonates found in the study area.

**Table 1:** Checklist of Odonates

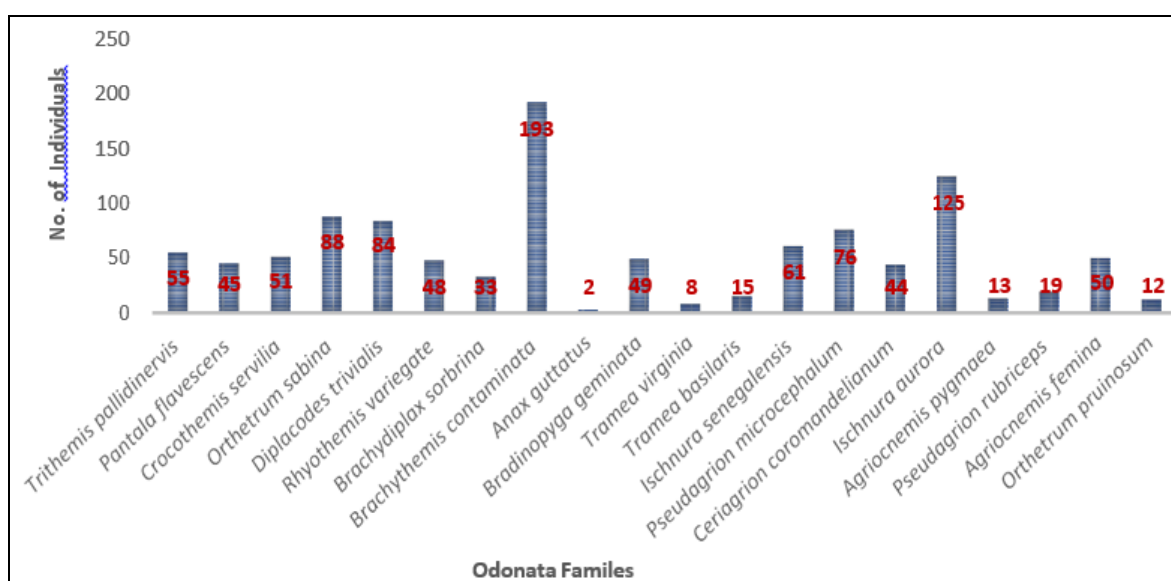
Order	Suborder	Family	Scientific Name	Common Name	Relative Abundance	Status
Odonata	Anisoptera	Libellulidae	<i>Tritthemis pallidinervis</i> (Kirby, 1889)	Long-legged marsh glider Dancing dropwing	5.194	VC
			<i>Pantala flavescens</i> (J. C. Fabricius, 1798)	The globe skimmer Glove wanderer Wandering glider	4.249	VC
			<i>Crocothemis servilia</i> (Drury, 1773)	The scarlet skimmer Ruddy marsh skimmer	4.815	VC
			<i>Orthetrum sabina</i> (Drury, 1770)	The slender skimmer Green marsh hawk	8.309	VC
			<i>Diplacodes trivialis</i> (Rambur, 1842)	Chalky percher Ground skimmer	7.932	VC
			<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Picture wing Variegated flutterer	4.533	VC
			<i>Brachydiplax sobrina</i> (Rambur, 1842)	Little blue marsh hawk	3.117	C
			<i>Brachythemis contaminata</i> (Fabricius, 1793)	Ditch jewel	18.22	VC
<i>Tramea basilaris</i> (Palisot de	Keyhole glider Red marsh trotter	1.417	NR			

Zygoptera	Aeshnidae	Beauvois, 1817)	Wheeling glider		
		<i>Bradinopyga geminate</i> (Rambur, 1842)	Granite ghost	4.628	VC
		<i>Tramea virginia</i> (Rambur, 1842)	Saddlebag glider	0.755	NR
	Coenagrionidae	<i>Orthetrum pruinosum</i> (Burmeister, 1839)	Crimson-tailed marsh hawk	1.12	NR
		<i>Anax guttatus</i> (Burmeister, 1839)	Lesser green emperor	0.188	NR
		<i>Ischnura senegalensis</i> (Rambur, 1842)	Common bluetail Ubiquitous bluetail African bluetail Senegal golden dartlet	5.76	VC
		<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Blue river damsel Blue sprite Blue grass dart	7.176	VC
		<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Coromandel dart Yellow waxtail	4.155	VC
		<i>Ischnura aurora</i> (Brauer, 1865)	Golden dartlet Aurora bluetail	11.8	VC
		<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Wandering midget Pygmy dartlet Wandering wisp	1.228	NR
		<i>Pseudagrion rubriceps</i> (Selys, 1876)	Saffron faced blue dart	1.795	C
		<i>Agriocnemis femina</i> (Brauer, 1868)	Pruinosed dartlet	4.722	VC

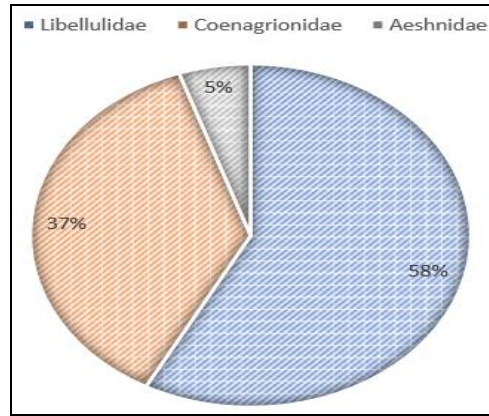
**Discussion**

The study of Odonate diversity has been conducted in many regions of Nagpur, but this is the first time it has been done in the Koradi region. As a result, 20 species from 15 genera and three families were identified. The Koradi region is dominated by two odonate families, the Libellulidae and the Coenagrionidae. The Libellulidae family contained the greatest number of Odonates, i.e., 12 species documented near the lake. Dragonflies such as *Brachythemis contaminata*, *Orthetrum sabina*, and *Diplacodes trivialis* are common in Koradi Lake. The Coenagrionidae (damselfly) family contained approximately 7 species, with *Ischnura aurora* being the most abundant, followed by *Pseudagrion microcephalum* and *Ischnura senegalensis*. The existence of these two families demonstrates that they are widespread species that rule uninhabited areas with stagnant water. Their presence in wetlands could be attributed to their shorter life cycle and widespread distribution [7]. Odonates are excellent model organisms for the study of urban ecosystems because they are sensitive to various stressors, including pollutants and temperature changes, making them an effective tool for determining the general state of the urban environment [8].

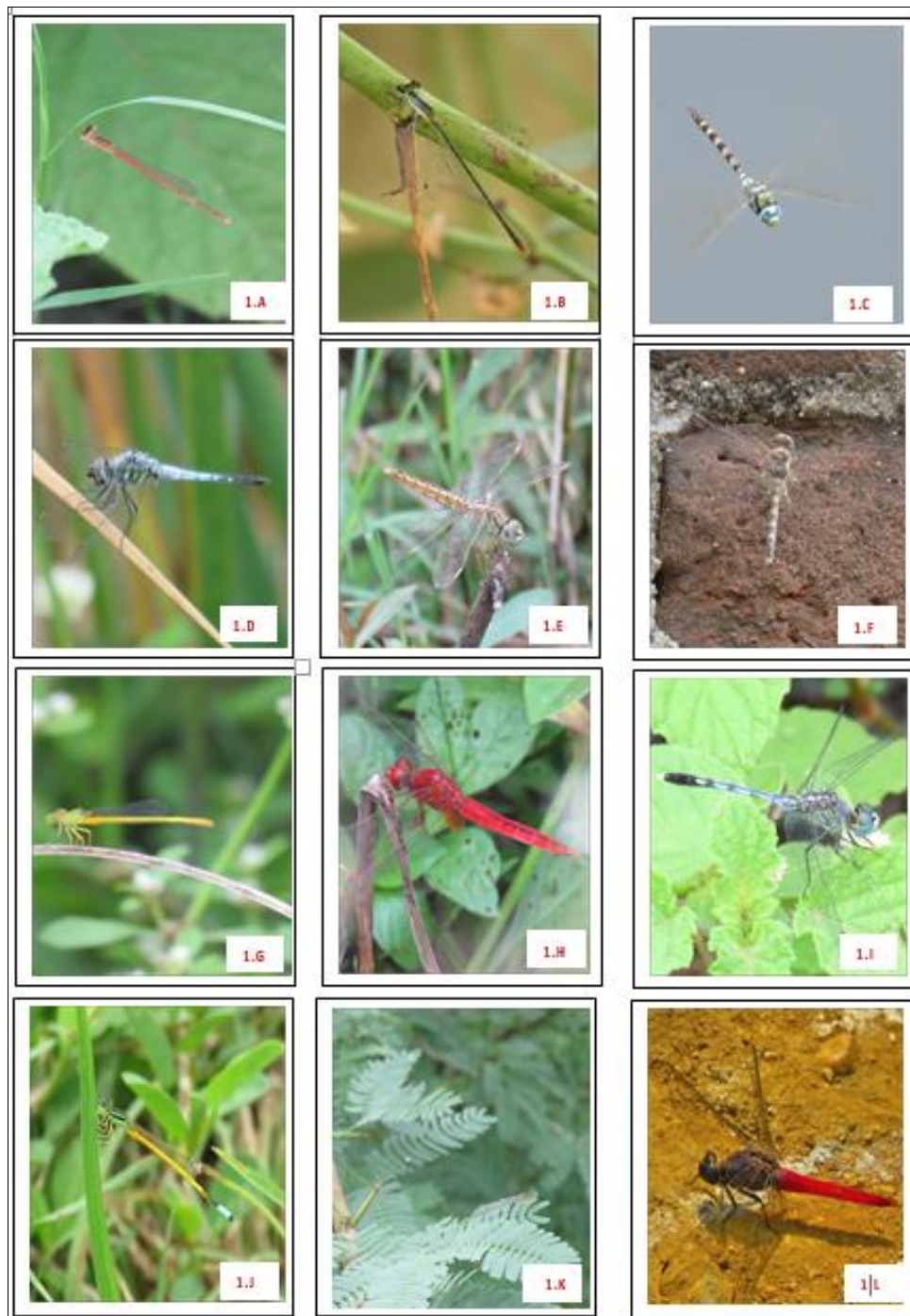
Different types of pollution may have had a negative impact on habitat quality because the expansion of urbanization resulted in the loss of Odonate species natural and semi-natural habitats as well as their remaining habitat quality [7]. The presence of *Brachythemis contaminata*, *Orthetrum sabina*, *Pantala flavescens*, *Ceriagrion coromandelianum*, and *Agriocnemis pygmaea* in Koradi's human settlement zones suggests that the water quality is contaminated. The Koradi thermal power plant (TPP), which is located near the lake, significantly contributes to air and water pollution. TPPs are a reliable source of electricity, but there are reports that they contribute to environmental degradation. Coal combustion produces fly ash and bottom ash, which cause physio-chemical changes in water bodies [9]. Due to the fact that fly ash lands on houses, automobiles, crops, and water supplies, the damage found in Odonates during the nymph stage is significantly greater. Odonata varies in their sensitivity to environmental change, and some individual species can indicate change [10]. This study also provides baseline information for future quantitative work on the diversity of Odonates in this particular study area.



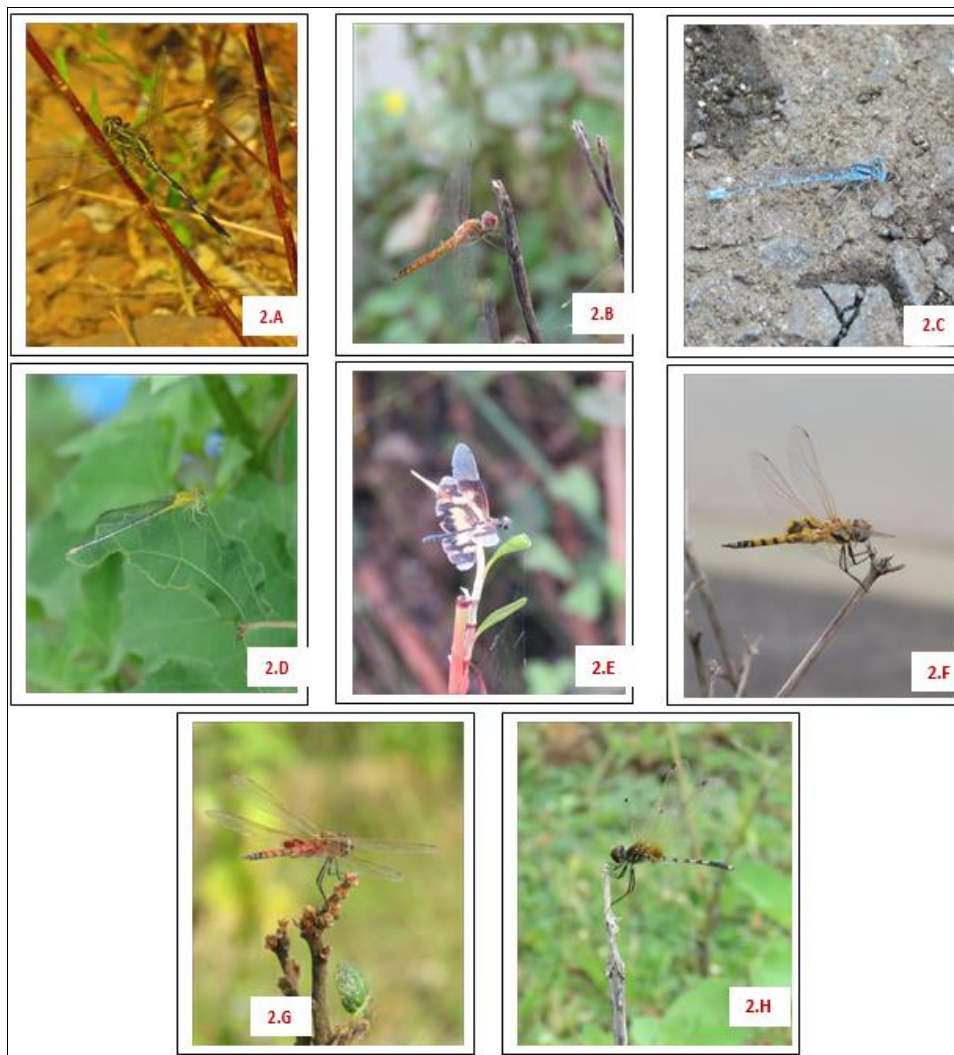
**Fig 2:** Species Abundance of Odonata



**Fig 3:** Family Abundance of Odonata



**Plate 1:** (1.A *Agricocnemis pygmaea*, 1.B *Agricocnemis femina*, 1.C *Anax guttatus*, 1.D. *Brachydiplax sobrina*, 1.E *Brachythemis contaminata*, 1.F *Bradinopyga geminata*, 1.G *Ceriagrion coromandelianum*, 1.H *Crocothemis servilia*, 1.I *Diplacodes trivialis*, 1.J *Ischnura aurora*, 1.K *Ischnura senegalensis*, 1.L *Orthetrum pruinosum*)



**Plate 2:** (2. A *Orthetrum sabin*, 2.B *Pantala flavescens*, 2.C *Pseudagrion microcephalum*, 2.D *Pseudagrion rubriceps*, 2.E *Rhyothemis variegata*, 2.F *Tramea basilaris* 2.G *Tramea virginia*, 2.H *Trithemis pallidinervis*)

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