



## Observations on the diversity of damselflies (*Odonata: Zygoptera*) in Keoladeo National Park, Bharatpur, Rajasthan

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### Abstract

Bharatpur district, located in eastern Rajasthan, is internationally known for the Keoladeo National Park (KNP) famous for its avian diversity and is a designated world heritage site. It is a magnificent heronry of the world. Order *Odonata* (Class Insecta) is a primitive order whose history date back around 250 million years old. *Odonata* includes Dragonflies (Anisoptera) and Damselflies (*Zygoptera*). In the present investigation 12 species of Damselflies belonging to 2 families and 7 genera are being reported. In earlier report 41 species of Dragonflies have already been reported by the authors making the total *Odonata* to 53 species. Two species, *Lestes viridulus* and *Pseudagrion microcephalum* are being reported for the first time from this park.

**Keywords:** Keoladeo National Park, *Odonata*, *Zygoptera*, damselflies, diversity

### Introduction

Odonates are the most attractive insects on the earth that conquered aerial habitat. About 6324 species occur globally, of which 498 species are known from India. 186 species of them are endemic to India largely in two biodiversity hotspots, the western ghats and north east India (Joshi *et al.*, 2022). Being prominent and colourful, they provide aesthetic pleasure and their studies could be a valuable contribution towards health of the wetland ecosystem (Subramanian, 2009).

Damselflies inhabit aquatic environments such as ponds, lakes, streams and marshes, shallow or slow moving or stagnant. Aquatic vegetation is utilized for egg laying, resting and roosting. They are hemimetabolous and their life cycle passes through egg, naiad (nymph) and adult stage. The eggs are laid on emergent or floating vegetation. The naiads are carnivorous in habit and feeds on aquatic invertebrates, mosquitoes, midges, gnats and flies. They possess three prominent caudal gills at the tip of their abdomen for respiration and propulsion.

Damselflies act as potent agents of biocontrol and suppress insect-pest populations in aquatic and terrestrial ecosystems. The naiads respire through caudal gills and are sensitive to dissolved oxygen levels and temperature of water, pollution and habitat degradation, therefore, are indicators of water quality. They cannot regulate their body temperature and are thermoconformers, as their internal body temperature fluctuates with the ambient temperature of their habitats. They rely on behavioural thermoregulation by perching in specific microhabitats and body orientation exposed to light and shade. They exhibit narrow thermal tolerance, their body being

thin and delicate, gets warm up quickly and becomes more vulnerable to heat and temperature fluctuations.

The present communication aimed to enlist the *Zygopteran* diversity of Keoladeo National Park, Bharatpur, Rajasthan. *Zygoptera* currently consists of 4 superfamilies. Calopterygoidea (26 families, 112 genera, 892 species), Lestoidea (47 families, 21 genera, 201 species), Coenagrionoidea (3 families, 176 genera, 1921 species) and Platystictoidea (1 family, 10 genera, 283 species) (Laura *et al.*, 2025) [7]

Considerable work on the odonates of Rajasthan was done (Agarwal, 1957; Bose and Mitra, 1976; Thakur, 1985; Tyagi and Miller, 1991; Prasad, 1996; Trigunayat, 1997; Palot and Soniya, 2000; Koli and Bhatnagar, 2014 and Trigunayat and Trigunayat, 2022). [1, 2, 6, 8, 10, 15, 16, 17, 18]

### Material and Methods

#### a. Study Area

KNP is designated a world heritage site by UNESCO, is located between longitudes 77° 29' 5" to 77° 33' 9" E and latitudes 27° 7' 6" to 27° 12' 2" N. It has been extensively studied for its ecology and wildlife (Vijayan, 1991). To maintain the desired water level in different blocks of the park, 500mcft water is required where variety migratory ducks thrive well. As many as 96 species of aquatic plants are reported that provide ideal habitat for Damselflies too. Exhaustive studies were conducted by the authors from 2010 to 2013 and 2016-2017 thereafter opportunistic observations were made until 2019. In the present communication, an updated checklist of Damselflies is being reported. [19]

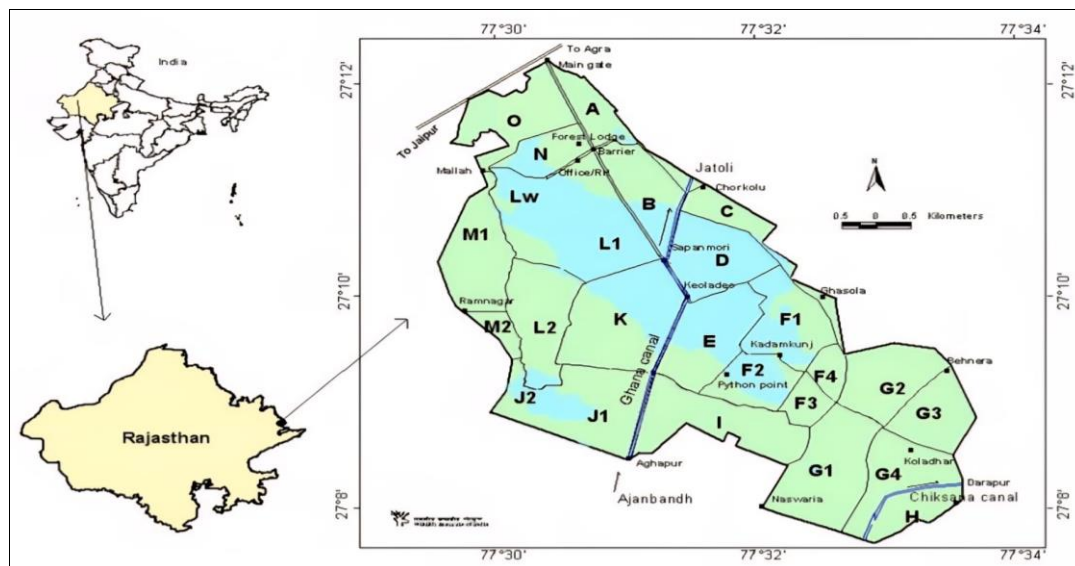


**Fig 1:** Keoladeo National Park Image Courtesy: Wildlife Institute of India

The total area of 29 sq. km of KNP is divided into 24 blocks (Fig.1.). Out of that, 11 sq. km is wetland. The centrally located 8.5 sq. km of this wetland area is aquatic mainly designated blocks D, E, K and L1.

#### b. Survey Methods

Observations were undertaken mainly from this aquatic area and their surrounding approach roads leading to KNP temple in the heart of the park. Regular observation and survey along a 100 meters line transect laid on the connecting roads of the said blocks with observation point at every 10 meters were made from July 2010 to Oct 2013 and from April 2016 to October 2017. Thereafter opportunistic observations were made by one author (KT) during her studies on Beetle diversity. Unidentified and doubtful specimens were collected through aerial net and brought to the laboratory for further examination. Morphological and anatomical (wherever necessary) observations were undertaken under Olympus stereomicroscope SZX 10 and SZX 16 models. Most of the specimens were set free back to their original habitat and unidentified specimens were spread, pinned, dried and kept in Insect Box for identifying later.

The identification was done using Fauna of British India (Fraser, 1933-36), Field guide Subramanian, 2009; Andrew *et.al.*, 2008, India Biodiversity portal, other online sources and data base and a final checklist was prepared. (Table -1) [3, 5, 13]

#### Result and Discussion

Since water is available round the year in some blocks that provides a rich habitat for Damselflies. In the present investigation 12 species from 2 families and 7 genera were recorded. 10 species belonging to family Coenagrionidae and remaining 2 species from family Lestidae (Table 1). In KNP, the percent composition

of the family *Lestidae* is about 21% as compared to 83 % of the family *Coenagrionidae* (Fig.2) and all of them are designated is the category least concern (LC) as per IUCN. The overall composition of the order *Odonata* is 79% (Anisoptera) and 21% (*Zygoptera*). Family Coenagrionidae include more than 1300 reported species of Damselflies globally and is the largest family of damselflies. Two species viz. *Pseudagrion microcephalum* and *Lestes viridulus* of the Coenagrionidae are being reported for the first time from this park.

Odonates are said to be important indicators of water quality and pollution level. Damselflies are important group in streams, lakes and pond ecosystem. They are often used as indicators of clean water. The quality of environment can be mentioned by Damselflies as their presence is strongly affected by different factors such as water flow, pollution and vegetation. The global assessment of more than 6000 species of *Odonata* showed that 16% are at the risk of extinction (Raman, 2022) due to habitat destruction by human activities. Wandering adults and naiads need proper wetlands for growth and development. Damselflies are sensitive to dissolved oxygen contents, pollution and temperature of water. Thus, the diversity of Damselflies in KNP is of immense importance as it is receiving water from more than one source. Since Govardhan canal is one such source which is likely to possess some chemicals used in dairy industry in its flowing route. It is mandatory, therefore, to monitor the diversity of odonates specially Damselflies as they are sensitive to pesticides and other chemicals too. The quality of water supplied to KNP, therefore, be closely monitored regularly. Otherwise it can negatively influence the avian diversity in the park Any alternation in quality of water can destruct fresh water habitats. Since Damselflies breeds in clean water, therefore, they are likely to be affected adversely along with other aquatic fauna. [14]

**Table 1:** List of Damselfies (*Zygoptera*) of KNP

| S.No. | Family   | Zoological Name                        | Common Name                | IUCN Category | Blocks of Occurrence               |
|-------|----------|----------------------------------------|----------------------------|---------------|------------------------------------|
| 1.    | Lestidae | <i>Lestes concinnus</i> – Hagen, 1862  | Dusky spread wing          | LC            | D, E blocks and approaching roads. |
|       |          | <i>Lestes viridulus</i> - Rambur, 1842 | Emerald striped spreadwing | LC            | D, E blocks and approaching roads. |

|    |                |                                                                           |                                                      |    |                                          |
|----|----------------|---------------------------------------------------------------------------|------------------------------------------------------|----|------------------------------------------|
| 2. | Coenagrionidae | <i>Agriocnanius pygmaea</i> - Rambur, 1842                                | Pygmy dartlet                                        | LC | D, E, K, L blocks and approaching roads. |
|    |                | <i>Ceragrion coromondelianus</i> - Fabricius, 1798                        | Coromondal marsh dart or yellow waxtail              | LC | D, K, L blocks and approaching roads.    |
|    |                | <i>Ceragrion olivaceum</i> - Laidlaw, 1914                                | Rusty marsh dart                                     | LC | D, E, K, L blocks and approaching roads. |
|    |                | <i>Enallagma parvum</i> - Selys, 1876 or <i>Amphiallagma parvum</i>       | Little blue or azure dartlet                         | LC | D, E, K blocks and approaching roads.    |
|    |                | <i>Ischnura aurora</i> - (Brauer, 1865)                                   | Golden dartlet or Aurora blue tail                   | LC | D, E, K, L blocks and approaching roads. |
|    |                | <i>Ischnura nursei</i> – Morton, 1907 (also, <i>Rhodischnura nursei</i> ) | Pixie bluetail                                       | LC | E, K, L blocks and approaching roads.    |
|    |                | <i>Ischnura senegalensis</i> - (Rambur, 1842)                             | Tropical blue tail or Marsh blue tail                | LC | KNP Temple Road                          |
|    |                | <i>Pseudagrion decorum</i> - (Rambur, 1842)                               | Three striped blue dart or elegant sprite            | LC | D, E, K, L blocks and approaching roads. |
|    |                | <i>Pseudagrion microcephalum</i> - (Rambur, 1842)                         | Black river damsel or Blue sprite or Blue grass dart | LC | D, E, K, L blocks and approaching roads. |
|    |                | <i>Paracercion malyanum</i> - (Selys, 1876)                               | Eastern Lily squatter                                | LC | D, E, K, L blocks and approaching roads. |

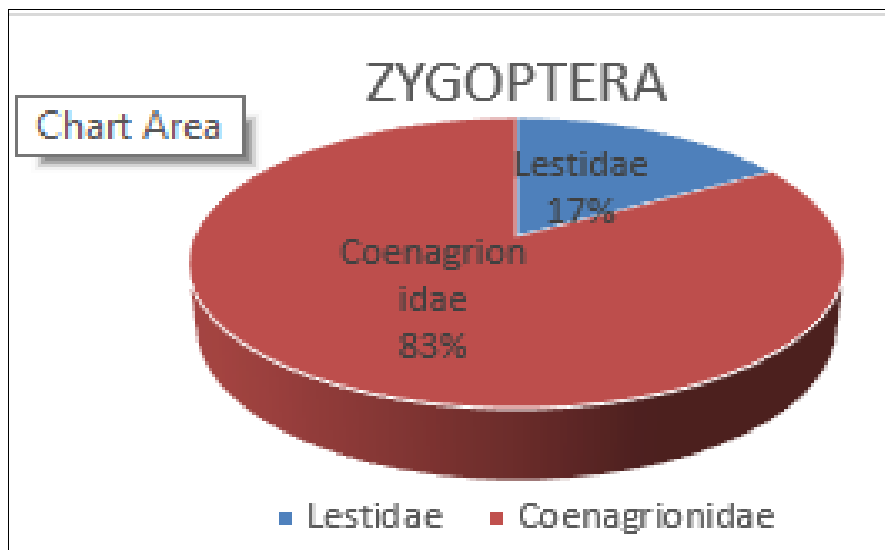


Fig 2: Showing Zygopteran diversity in KNP

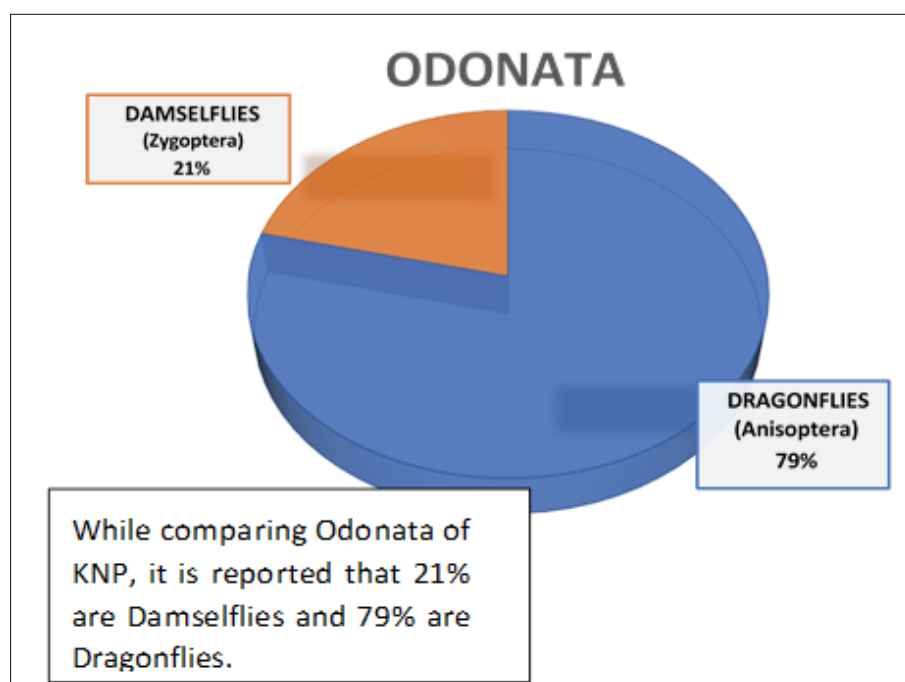


Fig 3: Showing composition of the Odonata in KNP

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