



HANDBOOK

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HANDBOOK ON ODONATA-WATCH PROTOCOL



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1. AN OVERVIEW

1.1 Introduction

Dragonflies and Damselflies (Odonates) are an ancient family of insects. They have been around for 300 million years. There are more than 5,000 different species of Dragonflies and they can be found on every continent except Antarctica. There are 2,942 known species of Damselflies. Both species require healthy environments to thrive and serve as environmental indicators of both healthy and unhealthy ecosystems.



1.2 Description

Each Odonate has six legs, four wings, a head, thorax and abdomen. The four gossamer wings move independently of one another, giving them the ability to fly forward, backward, and sideways, or to just hover in place. The abdomen is divided into ten segments. Their eyes are compound – they consist of 24,000 ommatidia (or tiny eyes). It provides 360-degree stereovision, allowing them the ability to spot insects in any direction without turning or moving their heads. Many Dragonflies are beautifully colored with green, red, yellow and blue.

1.3 Dragonflies and Damselflies

Within the order of Odonata, there are two suborders – Dragonflies and Damselflies.

The most obvious difference between them is the way their wings lay when at rest – a Dragonfly’s wings will be held separately down at their side while a Damselfly will hold its wings together over their back. Other differences include the body shape (Dragonflies have thicker bodies than the slender Damselflies) and their eyes (Damselflies have two distinct eyes while the eyes of Dragonflies typically almost meet in the middle of their head). Damselflies are better adapted to cooler temperatures than Dragonflies.



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1.4 Diet

Both Dragonflies and Damselflies, often, but not exclusively feed on insects. Nymphs also consume freshwater invertebrates, tadpoles, and even small fish. Adult Odonates capture their insect prey in flight, taking advantage of their extraordinary vision and flight. The major stimulus for detecting prey is movement. They are considered beneficial organisms to humans since mosquitoes form a major part of their diet thereby playing a major role controlling it's population.



1.5 Life Cycle

An Odonate's life cycle is an example of incomplete metamorphosis. Eggs are laid in or near water. Nymphs hatch from the eggs. Dragonflies spend most of their life as a nymph in the water where they molt anywhere from six to fifteen times. Eventually, the nymph sheds its final exoskeleton and an adult emerges, leaves the water, and flies away. The larval stage lasts up to 2-3 years in the water and lives as an adult for about 6-8 weeks, outside of water.



Conserving Dragonflies and their habitat must be a Priority because they are valuable environmental indicators.

1.6 Threats

The health of the wetlands directly dictates the diversity and population of Odonates. Therefore destruction of these waterbodies is also a threat to the Odonates. These wetlands are under pressure due to intensive anthropogenic activities like extensive reclamation for residential, transportation, commercial and industrial purposes, over-extraction of water. Similarly, water is polluted by letting out untreated sewage and industrial effluents, dumping of municipal solid waste, widespread use of broad-spectrum insecticides resulting in artificial eutrophication and spread of invasive alien species of plants and animals in the wetlands. Extreme weather conditions like excessive rainfall and drought is another major threat to the survival of Odonates.



1.7 Conservation

A better understanding of both the terrestrial and aquatic habitat factors on which the Odonate's lifecycle depends, is necessary for proper management and conservation of this species. It is therefore important to focus on conservation efforts on both riparian and aquatic habitats simultaneously. Aquatic factors that influence Odonates are temperature, pH, dissolved oxygen etc. and the terrestrial factors include riparian vegetation and its diversity, canopy cover, slope of wetland etc. Regular water quality monitoring and control of invasive alien species (both plants and animals) is critical for the conservation of Odonate habitat.

2. WETLAND BIO-MONITORING

2.1 Citizen Science

Citizen Science is the practice of public participation and collaboration in scientific research to increase scientific knowledge. Through Citizen Science, people share and contribute to data monitoring and collection programs. It is defined as the non-professional involvement of volunteers in the scientific process, commonly in data collection, analysis and interpretation. Citizen Scientists can be of all age groups and education levels. It is also known as Community Science, Crowd Science, Crowd-sourced Science, Civic Science, or Volunteer Monitoring.

Environmental data collection becomes cost-effective and is useful in providing early warnings about environmental trends and specific problems. At the same time, it increases awareness and empowers people. Hence, it becomes a powerful tool for public engagement and empowerment in policy-making and for raising awareness of environmental issues and policies.



2.2 Bio-monitoring

Biomonitoring is the method by which the health of a biotic environment is assessed by studying the organisms that function as sensors / indicators of the quality of the ecosystems that they survive in. The responses of these organisms on various factors can be monitored to indicate effects on the ecosystem.

The co-existence and abundance of certain species at specific locations and time can indicate whether and how that habitat has been altered. The species richness / diversity of an area is dependent on the availability of food, climate, evolutionary history and predation pressure. So, there will be more diversity in habitats with better water quality as compared to polluted waters.

Odonates are excellent bio-indicators of water health. Their entire lifespan is dependent on water, which means they need good water quality to survive to adulthood. They are susceptible to high levels of pollution from garbage, chemicals, fertilizer runoff etc., which can cover and suffocate eggs and nymphs.

Brachythemis contaminata or Ditch Jewel is able to tolerate some degree of pollution. This species is very common along sewage canals, tanks, ponds and ditches. Sometimes huge congregations gather in sewage treatment ponds.



Neurothemis fulvia or Fulvous Forest Skimmer is a Dragonfly of wet forests and needs marshes associated with forest streams and rivers to breed. If these streams are polluted or if the riparian vegetation is damaged, this species becomes absent in that ecosystem.



3. ODONATA WATCH PROTOCOL

3.1 Getting Started

3.1.1 Basics

Study area: Wetlands - Pond, lake, stream-side, river bank, waterfalls and other wetlands

Vegetation: Forest/shrubs/grasses in the vicinity of water bodies

Time of day: Between 9:00 AM to 4:00 PM (When the weather is sunny and warm)

Seasonality: May (Pre-monsoon), June - Aug (Monsoon), Sep - Oct (Post-monsoon)

3.1.2 Team constitution

1 Expert, 1 Photographer, 3-4 Observers

3.1.3 Materials to bring

Notebook, Pen/pencil, Mobile phone (for GPS and Photography), Camera, Water Quality Testing Kit, Sampling bottles, Binoculars, Field guide

3.1.4 Dress Code

It is advisable to wear clothing which are either camouflage colors or dark colors in the shades of blue, green, brown or black.

Use appropriate footwear considering the terrain.

It helps to carry a hat to protect yourself from the sun.

3.1.5 Self Care

Always carry drinking water and some snacks.

3.1.6 Do's and Don'ts

Stay alert and Stay on track

Tread carefully and do not disturb the biodiversity/wildlife under any circumstances.

Silence is the key to observing Odonates in the field.

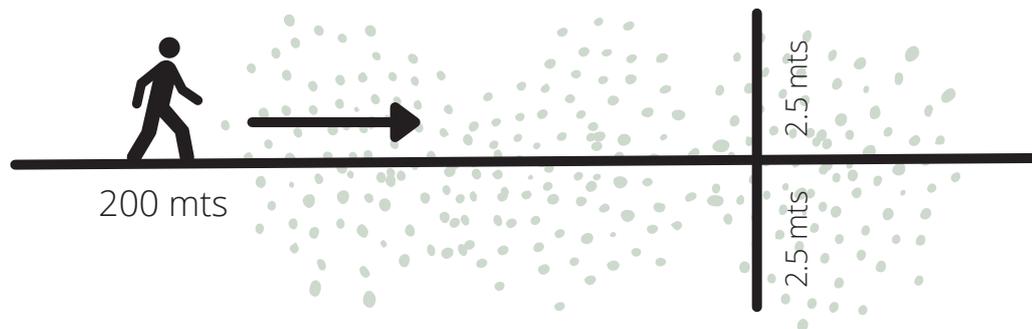
Small groups are ideal for Odonata-Watch.

Do not litter in the environment.

3.2 Methodology for field survey

3.2.1 Line Transect

1. A transect of 200 m x 2.5 m is established in the study area (Predetermined, based on habitat type and diversity, preferably on side of water bodies or bisecting wetlands).
2. The transects will be surveyed on foot at a constant speed (100m/15min).
3. An observer must record all the species seen within 2.5 m on either sides of the 200 meter transect. No Odonates behind the observer should be counted to avoid repetition.
4. The species will be recorded based on direct sighting. Binoculars can be used for better sighting and taking photographs is encouraged.



3.2.2 Water Quality Testing

The diversity and population of Odonate species are directly dependent on the water quality of the wetlands. Hence, it is ideal to carry out water quality assessment simultaneously along with Odonata watch.

The parameters tested are: Temperature, Color, pH, Turbidity, Total Dissolved Salts (TDS) and Electrical Conductivity. (using testing kit)

Hardness, Acidity, Alkalinity, Chloride, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Phosphate and Potassium (at Lab)

1. Observe whether there are plastic and/or other non-biodegradable matter polluting the wetland.
2. Use a portable water quality testing kit and follow the instruction given.
3. Additionally, water samples from the wetland can be collected in small bottles and given to a testing lab for more in-depth and accurate results.

3.3 Format for Data Collection

| | | | | | | | |
|--|-------------|--|-------|---------------------------|--|------------------------------|-----------------------------|
| Date: | | | | | | | |
| Name(s) of observer(s): | | | | | | | |
| Location: | | District | | Place | | Location | |
| Transect name: | | GPS coordinates | From: | | To: | | |
| Weather: (✓) all that applies | | Clear sky, Sunny, Cloudy, Rain, Overcast | | | | | |
| Habitat Type | | | | | | | |
| Habitat (favorable/unfavorable) | | | | | | | |
| Water Quality (use Kit) | | Temp | Color | pH | Turbidity | Electrical Conductivity (EC) | Total Dissolved Salts (TDS) |
| | | | | | | | |
| Invasive Species (Plants and animals) | | | | | | | |
| SL No | Time | Species | | No. of Individuals | Remarks (Male/Female, Behavior etc) | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |

3.3.1 Field Notes

Remarks: - *Behavior:* Perching (resting on any surface), Copulating (mating/breeding), Foraging (feeding), Flight, Ovipositing (egg laying), Territorial dispute (fighting between same species)

Habitat: Type and Conditions

Type - Pond, lake, stream, river, paddy field, wasteland

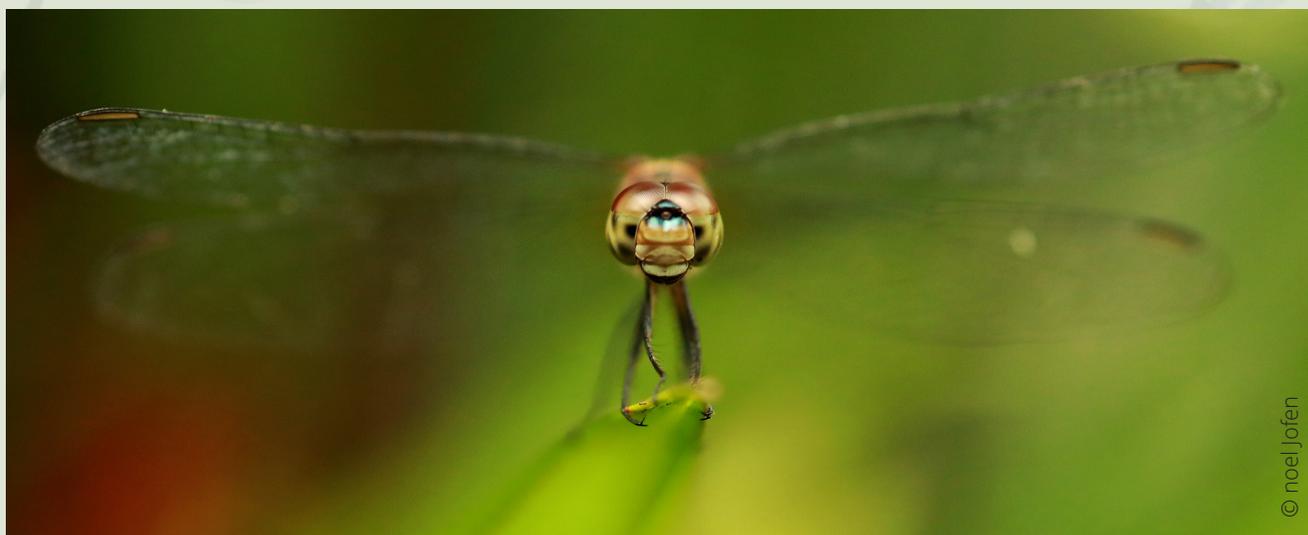
Habitat: Favorable or unfavorable for Odonates -

Favorable habitat conditions - Clear and cold water, high oxygen content, well shaded, low nutrients, undisturbed areas, presence of macrophytes, shady trees, reeds etc.

Unfavorable habitat conditions - Low levels of DO, High water temperature, High amounts of sediment in water, Nutrient enrichment, Toxic chemicals and heavy metals, Invasive species of plants and aquatic animals.

Water quality: Results from the testing kit can be noted: Temperature, pH, Turbidity, Conductivity, Dissolved Oxygen (DO).

Water samples collected can be sent to a lab for further water quality tests like Color, TDS, Coliforms etc.



3.4 Photographic documentation

Odonates: Take the lateral, dorsal and frontal views wherever possible and close up of anal appendages.

Habitat: One photo on each visit, photo of the transect and the vegetation.

Camera: Using Macro Lenses for DSLR cameras give good results.

Mobile cameras can be used for taking close-up photos of Odonates using the macro option or by moving close to the subject without disturbing it.

GPS location: Mobile apps or GPS or GPS trackers (Take Screenshots)

Map: Use Google maps or other apps like Gaia GPS/GPS Logger/ViewRanger to record the location and the track of the transect.

Download the App on your phone. When you start a transect, turn on the 'location' of your device, then open the App and note the GPS coordinates. . Record the transect also using the App. (Take a screenshot of the location and the track)

3.5 Field Guide

Introduction to Odonata with Identification Keys for Dragonflies & Damselflies commonly found in Kerala - eBook by Society for Odonate Studies (SOS).

<https://odonatesociety.org/downloads/>

Pictorial Handbook on Common Dragonflies and Damselflies of Kerala - K. G. Emiliyamma, C. Radhakrishnan (Zoologist), Muhamed Jafer Palot- Published by Zoological Society of India (ZSI)

<http://faunaofindia.nic.in/PDFVolumes/hpg/024/index.pdf>

3.6 Citizen Science Portals

The observations can be uploaded on online portals like:

iNaturalist - <https://www.inaturalist.org/>

Or download the iNaturalist App on your phone

&

India Biodiversity Portal - <https://indiabiodiversity.org/>

The logo for iNaturalist, featuring a stylized green bird icon to the left of the text "iNaturalist".

Notes



Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.panda.org

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