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## Influence of water on Odonates in the paddy fields of Kannur district, Kerala

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### ABSTRACT

*Three Rice fields in Kannur district were selected for the Odonate study. They were (1) Okra Vayal at Cheruthazham (FWPF), (2) Mundapuram Vayal at Cherukunnu (CPF), and (3) Haritha Sangam Paddy field at Madayippara (MLHPF).*

**Keywords**—Fresh Water Paddy Field (FWPF), Coastal Paddy Field (CPF), Midland Laterite Hillock Paddy Field (MLHPF), Naiad, Odonates, Dragonflies, Damselflies

### 1. INTRODUCTION

Paddy fields are the silent victims of the so-called developmental boom in Kerala, especially in Kannur district. The area under paddy cultivation in Kerala during the agricultural year 2011-12 was 2, 08,160 Hectare. It has decreased by 5027 Hectare (2%) than the previous year 2010-11. Kannur contributed 2.76% to the state total with rice cultivation spread over 5740 Hectare. On analyzing the area of the state for the last 10 years, paddy cultivation was high during the agricultural year 2002-03 and the area was 3,10,521 Hectare. Paddy accounted to 7.82 % of the total cropped area in the state during 2011-12. (Agricultural Statistics 2011-2012, Department of Economics and Statistics, Thiruvananthapuram, Kerala State, February-2013). The paddy fields serve as an important habitat for Odonata due to the fact that they would hold water for a few months in a year due to the monsoon.

The information on the Odonata (Insecta) fauna of Kerala state has been confined to the works of Fraser (1933, 1934 and 1936) from Kerala part of the southern Western Ghats, Peters (1981) from the Thiruvananthapuram district, Rao and Lahiri (1982) from the Silent Valley National Park, Mathavan *et al.* (1989) from the Periyar Tiger Reserve and Emiliyamma and Radhakrishnan (2000) from the Parambikulam Wildlife Sanctuary. Rice fields in Kerala are excellent habitats for the study of odoantes as such areas are ideal foraging grounds, with more open environs, providing a large number of insect pests (prey-population) for the odonates to predate upon. Fraser (1933, 1936) mentioned 3 species of odonates from paddy fields of Bangalore. Kumar and Prasad (1977) recorded 10 species from the paddy fields of Dehradun Valley. Krishnaswamy *et al.* (1984) reported 8 species of odonates predaceous on known insect pests of paddy from Assam. Recently Gunathilagaraj *et al.* (1999) listed 16 species from the rice fields of Coimbatore. Asaithambi and Manikarasagam (2002) recorded *Thoiymis tillarga* (Fabricius) from paddy field near Annamalai University area in Tamil Nadu. Talmale and Kulkarni (2003) have reported 19 species of odonata from the paddy field of Bhandara district of Maharashtra.

Emiliyamma *et al.* 2005; Emiliyamma, 2005, Jafer *et al.*, 2002; Jafer and Soniya, 2004, Jafer *et al.*, 2005; Mitra, 2002, 2003 and 2006; Kandibane *et al.*, 2005; Prasad and Kulkarni 2000; Subramanian and Sivaramakrishnan. 2002, Subramanian 2007 and 2009 revealed that 470 taxa of odonates occur in India, of which 169 species and subspecies under 82 genera and 14 families are known from the southern Western Ghats.

Members of the order Odonata include some of the most ancient and lovely insects that ever roamed the earth (Sharma, 2007). Dragonflies and Damselflies are the prominent and colourful insects in tropical landscapes which are considered as a crucial component of the freshwater ecosystem as well as good indicators of ecosystem health (Adarsh, 2014). Habitat specificity and prey abundance play a major role in the distribution and ecology of Odonates. They lay their eggs in a wide range of aquatic habitats ranging from small tanks to rivers. Most of the Odonates are active during the mid-day and some species are nocturnal. Odonate as a predator plays a significant role in biological control of insect pests. In addition to providing aesthetic pleasure, studying Odonates give valuable insight about ecosystem health especially of wetlands (Subramanian, 2005). The other prominent works from this region included Kiran and Raju (2011, 2013). Of late, multiple attempts have been made to study the Odonata diversity of Kerala outside the protected areas (Nair 2015) and these studies have clearly indicated that considerable diversity of Odonata can occur outside the protected areas also.

Odonates of Southern Western ghats were studied and 169 species of odonates were reported. (Emiliyamma, 2014). A total of 82 species were recorded from Salim Ali Bird Sanctuary, Thattekkad (Varghese et. al. 2014). Odonate diversity of Kerala Agricultural University campus, Thrissur was well documented (Adarsh et.al. 2014) and 52 species of odonates were recorded. Odonate diversity of Chinnar wildlife sanctuary was recorded as 48 species (Adarsh et. al. 2015). Dragonflies in Kuttanad were documented by Manu Rani Paul (2015). Dragonfly diversity of Irinjalakkuda was studied by Gigi et. al. (2016) and reported 12 species of dragonflies. 36 species of Odonates were reported from a riparian ecosystem, Meenachil river basin, Kottayam (Vincy et.al. 2016). Odonata diversity of Agroecosystem in Palallad was studied by Muhamed Sherif K (2016). 68 species of odonates were reported from Varadoor, Kannur (Nair, 2017).

## 2. STUDY AREA

The insect pests of paddy, the natural enemy complex in the paddy field and the associated fauna and flora occurring in three different paddy ecosystems (fresh water, coastal and midland laterite hillock paddy ecosystem) of Kannur were surveyed for the entire crop period and classified into vegetative, reproductive and grain filling phases. Insect pests and birds were separately recorded for the three stages. The study was carried out in 3 different paddy field stations in Kannur district each having an area of approximately 0.5 hectares in extent.

Okra Vayal (Fresh Water Paddy Field) is located in the Cheruthazham Village at 12° 04' N and 75° 15' E, about 25 km north of Kannur town. The altitude of the Okra Vayal is about 10m above sea level.

Mundapuram Vayal (Coastal Paddy Field) is located in Cherukunnu Village at latitude 11°59'N and longitude 75°17'E about 17 km north of Kannur town. The altitude of the Mundapuram Vayal is about 3m above sea level. It is a coastal area.

Madayippara (Midland Laterite Hillock Paddy Field) is located in the Madayi village, at latitude 12°03' N and longitude 75°15'E, about 21 km north of Kannur town, the district headquarters of Kannur district in Kerala. The altitude of the Madayippara ranges from a minimum of 40 m to a maximum of 47m above sea level.

## 3. OBJECTIVES OF THE STUDY

The present study is an attempt to study the Odonata fauna occurring in the paddy field habitat in Kannur district, Kerala.

## 4. METHODS

The paddy field proper (including nursery) was sampled once every two weeks for five months. Sampling was done in the morning. At each sampling site, invertebrate animals on the soil surface, vegetation and water were collected manually. Flying insects and those on vegetation were caught using a sweep net (mesh size: 1 mm). The diameter of the ring of the net was 30 cm and its circumference was 94.2 cm. Length of the net was 73 cm. Malay trap was also used for trapping insects. The insect capture was done from the vegetative growth phase (germination-panicle initiation), and reproductive phase (panicle development-flowering) to grain filling phase (milk grain-mature grain). Quadrat method was used for studying the population size and population density of insect fauna and weeds. 2m<sup>2</sup> quadrats were used for studying the insect fauna

## 5. RESULTS

The retention of water up to a certain extent in the field of CPF and FWPF during the South-West Monsoon favoured the completion of the aquatic stage (Naiad) of Odonates (Dragonflies and Damselflies). Hence the number of species of Odonates was higher in CPF and FWPF. But in Midland Laterite Hillock Paddy Field (MLHPF), the number of species of Odonates was very less because there was no retention of water here. A number of species of odonate were high (5) in CPF and FWPF and lowest (1) in MLHPF.

The dragon fly species observed In the coastal paddy field (CPF) ecosystem were 1) Pied paddy skimmer (*Neurothemis tullia*) 2) Fulvous forest skimmer (*Neurothemis Fulvia*) 3) Green marsh hawk (*Orthetrum Sabina*) and 4) Ruddy marsh skimmer (*Crocothemis servilia*). One species of damselfly called Golden dartlet (*Ischnura aurora*) was also noticed.

The dragonfly species observed from the fresh water paddy field (FWPF) ecosystem included 1) Pied paddy skimmer (*Neurothemis tullia*), 2) Fulvous forest skimmer (*Neurothemis Fulvia*), 3) Green marsh hawk (*Orthetrum Sabina*) and 4) Brown backed red marsh hawk (*Orthetrum chrysis*). Damselfly species included Pigmy dartlet (*Agriocnemis pygmaea*). Naiads of odonates were observed in this Fresh Water Paddy Field.

Among predators, odonates were found as major general predators. They worked as natural enemies of paddy pests.

**Table 1. Odonates in different Paddy regions**

| S no. | Odonates found in Paddy Field | Scientific name             | CPF | FWPF | MLHPF |
|-------|-------------------------------|-----------------------------|-----|------|-------|
| 1     | Pigmy dartlet                 | <i>Agriocnemis pygmaea</i>  | -   | +    | -     |
| 2     | Ruddy marsh skimmer           | <i>Crocothemis servilia</i> | +   | -    | -     |
| 3     | Golden dartlet                | <i>Ischnura aurora</i>      | +   | -    | -     |
| 4     | Fulvous forest skimmer        | <i>Neurothemis fulvia</i>   | +   | +    | -     |
| 5     | Pied paddy skimmer            | <i>Neurothemis tullia</i>   | +   | +    | +     |
| 6     | Brown backed red marsh hawk   | <i>Orthetrum chrysis</i>    | -   | +    | -     |
| 7     | Green marsh hawk              | <i>Orthetrum Sabina</i>     | +   | +    | -     |
| Total |                               |                             | 5   | 5    | 1     |

+ = Present, - = Absent, CPF= Coastal Paddy Field, FWPF= Fresh Water Paddy Field, MLHPF= Midland Laterite Hillock Paddy Field.

## 6. DISCUSSION

The inundation of water in the field of CPF and FWPF during the South-West Monsoon favoured the completion of the aquatic stage (Naiad) of Odonates (Dragonflies and Damselflies). Hence the number of species of Odonates was higher in CPF and FWPF. But in MLHPF, the number of species was very less.

Biological monitoring methods using aquatic insects have been developed and reliably tested in both temperate and tropical aquatic systems (Foote and Hornung, 2005). The inundated paddy fields are responsible for the presence of more diversity among dragonflies. Sharma et al. (2007) established more diversity of odonates in diversified habitats.

Odonates, being predators both at larval and adult stages, play a significant role in the wetland ecosystem. Adult odonates feed on mosquitoes, blackflies, and other blood-sucking flies and act as an important biocontrol agent of these harmful insects. In the urban areas of Thailand, larvae of the container breeding dragonfly, Granite ghost (*Bradinopyga geminata*) was successfully used to control *Aedes* mosquito, an important vector of the dengue and Chikungunya fever. Many species of odonates inhabiting in agro ecosystems play a crucial role in controlling insect pest populations. (Subramanian.K.A. 2009).

In addition to the direct role of predators in the ecosystem, their value as indicators of quality of the biotope is now being increasingly recognized. For example, in South Africa, it has been shown how species assemblages of dragonflies change with levels of human disturbance. Dragonflies found at undisturbed habitats with good riparian vegetation were specialists with a narrow distribution. On the other hand, species recorded at industrial land or urban areas with disturbed riparian vegetation were generalists with wide habitat preference and distribution. These studies also show that dragonflies are sensitive not only to the quality of the wetland but also to the major landscape changes, especially changes in the riparian zone. Recent studies on dragonfly ecology from the Western Ghats indicate families like Bambootails, Reedtails, Glories, Torrent darts, Torrent Hawks and Clubtails are good indicators of the health of the riverine ecosystem. (Subramanian.K.A. 2009).

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