



Ecological Insights into the Predatory Behaviour of *Condylostylus longicornis* in Agricultural Fields of Madurai District, India

**M. Pavunraj ^{a*}, K. Nagarajan ^b, R.Ramakrishnan ^c, S. Raja ^d,
P. Murali ^e, M. Baranitharan ^f and S. Rajeshkumar ^g**

^a Post Graduate & Research Department of Zoology, Vivekananda College, Tiruvedakam West, Madurai District – 625 234, India.

^b Department of Animal Science, Manonmaniam Sundaranar University, Tirunelveli – 627 012, India.

^c P.G.& Research Department of Zoology, Ayya Nadar Janaki Ammal College (Autonomous), Sivakasi West - 626 124, India.

^d Post Graduate & Research Department of Zoology, Kongunadu Arts and Science College, Coimbatore – 641029, India.

^e Department of Zoology, N.M.S. S. Vellaichamy Nadar College, Nagamalai, Madurai – 625019, India.

^f Department of Zoology, St. Joseph University, Chumoukedima, Nagaland – 797 115, India.

^g Nanobiomedicine Lab, Centre for Global Health Research, Saveetha Medical College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai – 602 105, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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*Corresponding author: Email: mpavunraj@gmail.com;

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ABSTRACT

Researchers affiliated with the Post Graduate and Research Department of Zoology at Vivekananda College in Tiruvedakam West, Madurai, Tamil Nadu, along with collaborators from other institutions, have observed a rare predatory behaviour of long-legged fly *Condylostylus longicornis* (Diptera: Dolichopodidae) in the agroecosystem of the Sholavandan region in Madurai District, Tamil Nadu. In general, *C. longicornis* favours environments that are close to marshes, streams, meadows, or forests and that are slightly shaded. *C. longicornis* is considered an optimal bio-indicator species for monitoring and conserving water quality. This article provides an overview of the history, behavioural characteristics, and ecological significance of *C. longicornis*.

Keywords: *Condylostylus longicornis*; bio-indicator; courtship behaviour; Madurai District.

1. INTRODUCTION

Insects are the major component of the world's biodiversity. By virtue of their vast numbers of both species and individuals, they are vital determinants of terrestrial ecological processes. Quantitatively, insects are important pointers for species-rich geographical areas. Qualitatively they are also important, whether the subjects of conservation themselves or as tools for identifying biotic areas with high endemism. In this report, researchers observed *C. longicornis*, commonly known as the long-legged fly; it belongs to the family Dolichopodidae. This family ranks among the largest in the Diptera order. The flies have a bright metallic green colour with blue and yellow hues; the majority of them are small, ranging from 5 to 10 mm long (Mason et al., 2002). The family Dolichopodidae that are approximately 1 mm in size. Adult flies have the ability to be predacious and move quickly from leaf to leaf on a plant.

While little is known about the larvae of dolichopodids are unknown, consensus reports suggest that they are predominantly predaceous. Laboratory and field observations of dolichopodids generally indicate that the larvae reside in environments that are either aquatic, muddy, or humid or mulched (Robinson and Vockeroth, 1981, Corpus, 1986, Gill et al., 2011, Decler et al., 2015). These flies' prey on smaller insects like mites, aphids, thrips, whiteflies, and other smallest insects and are found in humid sites due to their specific habitat requirements. Pest control has been deemed to be advantageous for them. Male flies typically have hair tufts on their feet during courtship displays. This courtship behaviour is needed in order to attract female flyers.

Both adults and larvae play a crucial role in the ecosystems in which they live, and they are also

reported to be predacious. The neotropical climate is found in southern Florida and the coastal portion of the Rio Grande Valley in South Texas in the United States. The present study deals with the documentation of the rare predatory insect in and around the Sholavandan, at Madurai District, Tamil Nadu. Situated in Madurai Kamaraj University near Vaigai River, bears quite an impressive amount of animal diversity, including both invertebrates, vertebrates and insects. Various trees and bushes associated with the field serves as a roosting place of the different species of insects at different times of the day. It also acts as a habitat for variety of insects like odonates, dipterans, orthopterans, lepidopterans and coleopterans. There is a medicinal plant garden at the left of the entrance gate which supports a wide variety of butterflies and birds. The window shades of the old building of the college serves as the resting place for the birds like the Common Myna and Indian rock pigeon.

2. MATERIALS AND METHODS

The fieldwork was carried out from June 2023 in and around Sholavandan of Madurai District of Tamil Nadu. The observations were made between 7:00 to 12:00 hours in the morning and 16:00 to 19:00 hours in the evening. Identification was also done with the help of websites, mobile applications and experts. The fly was photographed using Sony DSC-W310 12.1MP Digital Camera.

2.1 Study Area

Sholavandan is the municipal corporation in the Madurai city of Tamil Nadu, Indian state. Madurai has a tropical climate, specifically tropical wet and dry climate. The city lies on the Thermal Equator and is also the coast which prevents extreme variation in seasonal temperature. The

hottest part of the year is late April to early June, with maximum temperature 37°C (98.6)°F. The average rainfall of the district receives during Northeast monsoon (47%), Southwest monsoon (32%), summer (17%) and winter (4%). The survey was undertaken on June 2023. Observation, Sightseeing and Photo documentation were made at Sholavandan near Madurai Kamaraj University. The photo-documented insect species were identified using the field guide of Menon, 2003.

2.2 Equipment's and Materials used for Field Collection

List 1. The following table lists the equipment and materials utilized for data collection in the field

S. No	Name of the equipment's
1	Insect collection box
2	Insect cages
3	Plastic containers
4	Swiping net
5	Forceps
6	Camera (Sony) Model DSC-W310 12.1MP
7	Cotton and fine brush
8	Chemicals (Chloroform and formalin)

3. RESULTS AND DISCUSSION

In June 2023, visual assessments were conducted in the agricultural fields of Sholavandan, located in Madurai District, Tamil Nadu. Observations and photographs were taken of the long-legged flies (see Fig. 1). Be specific about what behaviours were monitored (e.g., hunting patterns, mating rituals, etc.). The predatory behaviours of these species are therefore different from those of other flies and dragonflies that have been previously described.

We saw that the flies slowly approached their intended target during a pursuit by using reactive navigation. During a pursuit, the target's steering was within 7–10 meters of reactive maneuvering.

Many species have a preference for being beneath trees and other vertical surfaces. It is clear that the larvae are likely to be in humid soil, leaves, moss, mud, under bark, tree holes, plant tissue, decaying seaweed, sap wounds, and algal mats. These are the species we are most acquainted with, the small one that favours a drier climate and grasslands or urban gardens. The rapid response of these small creatures to environmental changes makes them a useful tool for site quality assessment in conservation and planning and development.

These are incredibly uncommon and exotic wildlife species found in a very small number of places in Tamil Nadu, most notably the Western Ghats in the Tirunelveli District and Tharangambadi in the Nagapattinam District. According to recent research, *C. longicornis* have highly precise habitat requirements and respond swiftly to environmental changes, which could make them ideal environmental bio-indicators for the assessment and conservation of water quality.

Fly predation pressure in non-organic groves is likely comparable to that of spiders and other large predators, but it is important to acknowledge its role in agricultural ecosystems because fly predation belongs to a disruptive intraguild predation category that can lower biological control efficiency (Harvey and Eubanks, 2005). Lastly, enhancing the habitat in the vicinity of uncultivated area through the cultivation of plants that have nectaries that parasitoids are drawn to and feed on might enhance biological control agent establishment and survival (Patt and Rohrig, 2017).

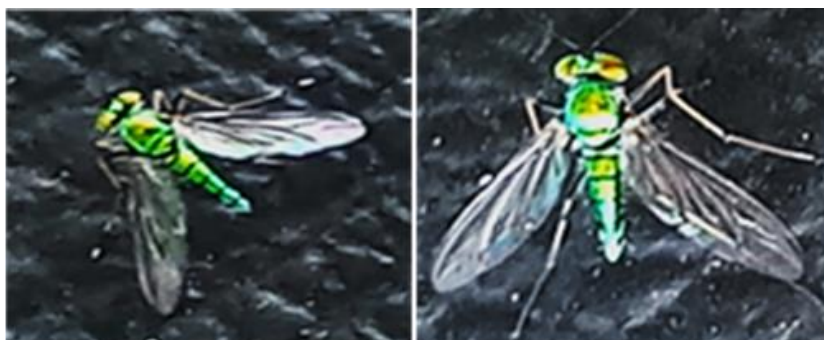


Fig. 1. Adult flies of *Condylostylus longicornis* (Fabricius) (Diptera: Dolichopodidae)

3.1 Ecological Significance

Most long-legged flies are predators, capable of hunting mosquitoes, bark beetles, and other insects that serve as agricultural pests and disease vectors (Laing and Welch, 1963, Beaver, 1966, Kautz, 2019). As such, these insects may be used as biological pest control agents. Additionally, it was proposed that Dolichopodidae could serve as reliable environmental quality indicators. Aside from their ecological role, long-legged flies have also garnered interest in scientific research on sensory organs and nervous system functionality (Buschbeck and Strausfeld, 1996). According to Ebadi *et al.* (2018), the constituent units (ommatidia) of compound eyes in certain dolichopodid species have an extremely unusual arrangement: orange-red and green-yellow corneal lenses form alternating vertical rows, and the photoreceptor cells that support the different-colored lenses exhibit distinct ultrastructures and divergent spectral properties.

3.2 Insects as Biodiversity Indicators

The focus on conservation of biodiversity has recently received attention. Various studies and protocols have been proposed to assess biodiversity patterns (Wilson, 1988, Enrich and Wilson, 1991). Vane Wright *et al.* (1991) proposed a hierarchical system to classify different levels of organization and groups of taxonomically related species. This system helps assess biodiversity conservation patterns. Certain insect species serve as indicators for assessing environmental conditions and detecting landscape changes (Harrington *et al.*, 1995). The use of indicator taxa in conservation efforts from pollution control to biodiversity has been the focus of attention (Landres *et al.*, 1988).

4. CONCLUSION

In conclusion, these findings enhance our understanding of insect ecology and behavior, particularly the importance of visual signals in resource acquisition among various species. This understudied aspect of fly biology could significantly improve our knowledge of fly behavior and its role in conservation efforts. The family Dolichopodidae, which incorporates long-legged flies, is striking for having an assortment of predatory species inside it. Since they prey on a variety of arthropods, Long-legged flies, as natural pest control agents, are vital to agroecosystems.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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