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Dragonfly: Environment Indicator and Its Conservation

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Dragonflies belong to order Odonata in class insecta and reportedly have about 5680 species across the world. These hemi metabolous insects have three life stages. The nymphal stage aggressively and voraciously feeds on aquatic fauna and flora. Adult dragonflies are strong fliers which devour adult mosquitoes, the latter vector malaria and dengue diseases to humans. Due to industrialization, dragonfly habitats are shrinking at rapid rates that are affecting the survival of this important biocontrol agent. Taxonomists could identify local fauna which in turn may help in formulating collaborative efforts among industries, government agencies, academic institutions and NGOs should be undertaken to promote habitat conservation of these insects.

Introduction

With membranous reticulated wings, large globular compound eyes, robust, colorful aerodynamic bodies and unusual courtship behavior, dragonflies are unique, six legged arthropods. Dragonflies belong to the insect order Odonata: suborder Anisoptera. The name Odonata originated from the Greek word “odus” meaning tooth, and refers to the presence of teeth on dragonfly mandibles (Corbet, 1980). Dragonflies evolved 250-300 million years ago in the Carboniferous period. Fossils of the griffenfly, *Meganeuropsis permiana* Carperter, the largest insect that ever lived, have been recovered in France. The griffenfly’s wing span of 70 cm is about five times bigger than that of the largest present day dragonfly. Of the roughly 5680 species reported worldwide (Kalkman et al., 2008) about 470 of these species in 139 genera and 19 families inhabit the Indian subcontinent (Subramanian, 2009). Specialists in dragonflies are known as odonatologists.

Dragonfly

This insect group has three major life stages; egg, nymphal instars and an imago or adult. Airborn, gravid females drop or scatter fertilized eggs directly on ponds or other water bodies of water. This unique type of egg deposition is called “exophytic.” The eggs hatch into nymphs (larvae) with posterior tracheal gills, and are free-crawling. Generally, these nymphs have extendible jaws underneath the head that allow them to be voracious and aggressive feeders. The nymphs survive on aquatic plants, insect larvae, small fishes, frogs, etc. On average, nymphs moult for one to three years before attaining adulthood (Corbet, 1974; Richards and Davies, 1977). However, the migratory Wandering Glider completes its life cycle in just four weeks, while a few Asian species take about eight years.

Odonatans are known as “guardians of the watershed” and “wetland bio-indicators” (indicators of the health or sickness of a pond or river) (Samways and Steytler, 1996; Chovanec and Waringer, 2001;

Smith et al., 2007; Silva et al., 2010; Clausnitzer and Jödicke, 2004). Due to industrialization and pollution, water quality is gradually deteriorating. With the rapid expansion of cities, a number of water bodies have been on the decline; which in turn is drastically affecting the survival and threatening the existence of dragonflies.

Adult dragonflies are exceptionally large and diurnal (day flying) insects that possess unique mouthparts, powerful toothed mandibles which make them potent predators. Fortunately, they can not sting humans. Interestingly the adult's three pairs of legs can form a "basket" in which they can catch prey (Richards and Davies, 1977). During dusk, adult dragonflies are highly active, feeding on small moths, flies and many mosquito adults. Mosquitoes are notorious for transmitting diseases such as malaria, dengue, etc. in humans. The larvae of the skimmers or perchers from the dragonfly family Libellulidae are found to control the larvae of the mosquito, *Aedes aegypti* (Linnaeus), whose adults are vectors for dengue fever. Aquatic dragonfly nymphs are efficient larvicides that consume many mosquito larvae in standing water, thus making the dragonflies a very important mosquito biocontrol agent (Sebastian et al., 1990). In the USA, dragonflies are known to control a few biting flies viz. punkies, black flies, eye gnats, sand flies, midges, and stable flies. In 1944, Wright reported that aeshids predated upon the bee colonies nearby Mississippi River in Louisiana, USA. A severe attack by Regal Darner, *Coryphaeschna ingens* Rambur in Florida severely affected the queen rearing unsuccessful and impracticable in south-eastern USA (Corbet, 2004). Therefore, this species is named as "bee butcher" and it's the only dragonfly species in the world that is known as an economic pest (Simaika and Samways, 2008). Adult dragonflies also feed on beetles and may take longer to dent the horny elytra of few hard-shelled beetles before devouring them (Venable, 1985).

On a global scale, Odonata became the first insect Order to get representation on the Red List of Threatened Species™ (www.iucnredlist.org), International Union for Conservation of Nature (IUCN) in 2008. With the rapid decline of rainforests, dragonfly conservation has become a very urgent task, which can be accomplished through the establishment of new habitats with national parks, wildlife wetlands, nature reserves, and other aquatic ecosystems. Efforts can also be made to identify more mosquito killing dragonfly species so that their augmentation in new locations can be possible in various ecosystems. Some encouraging efforts are currently being undertaken throughout the globe. The Dragonfly Kingdom was established in 1987 at Nakamura, Japan for dragonfly conservation, and the Ashton Water Dragonfly Sanctuary was established to promote interest in dragonflies in Great Britain. The Tambopata National Reserve in Peru was established in 1990 and harbors over 150 dragonfly species (Moore, 1997). Mass production of the container-breeding Rock Dweller or Granite Ghost, *Bradinopyga geminata* (Rambur), is widely carried out in Thailand to help keep mosquito populations in check (Andrew et al., 2008; Subramanian, 2008).

Legislation to effectively control industrial pollution could help conserve and ultimately grow dragonfly habitats. Mass awareness of the need for dragonfly conservation could also be accomplished utilizing social media. Incorporation of programs/courses in curriculum such as "Nature in the Classroom" may help in creating greater awareness among students. Under the current Indian scenario, knowledge of dragonfly biology is very patchy. Further research in taxonomy, geographical distribution, and biology of various species should be encouraged (Moore, 1997). The dragonfly, as a predator, is needed for stabilizing and maintaining ecosystem balance and is also needed to help manage emerging insect pest species in the future.

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