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Freshwater oligochaetes (Annelida) from Western Ghats and the west coast of Karnataka (India)

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Abstract: A survey on freshwater oligochaetes was conducted between October 2011 and June 2013 in selected wetlands of the Dakshina Kannada, Udupi, and Shimoga districts of Karnataka, India. In this study, 260 wetlands were sampled and examined for the presence of microdriles. Sixteen species of aquatic oligochaetes were recorded. Of these, 10 species belonged to the family Naididae (monophyletic) and 6 species to the family Pristinidae. The species' distribution patterns in different water bodies and habitat specificity (if any) in the study area are presented.

Key words: Clitellata, macroalgae, Naididae, wetland ecosystem

The fauna of aquatic oligochaetes (microdriles) of Karnataka, India is poorly known. The aim of the present survey was to prepare the preliminary checklist of microdrile worms present in the freshwater bodies of Western Ghats and the west coast of Karnataka. The wetland ecosystems are mostly perennial and host a large number of species. However, they are exposed to various environmental factors including rainfall, changes in chemicals, pH, growth of macroalgae and macrophytes, decay of plant and animal materials, and human activities such as fishing. The aquatic oligochaetes are the most important microinvertebrates, adapted to every kind of water such as saltwater, brackish water, and freshwater, including small streams, large rivers, marshes, ponds, lakes, springs, and groundwater. They are found in algae, aquatic vegetation, floating rotting material, and bottom mud (Wetzel et al., 2000). They are an important food source for some invertebrate and fishes. They can be of importance in water management because of their potentially high densities (Brinkhurst and Jamieson, 1971), their wide distribution, and their indicator value (Milbrink, 1973; Chapman et al., 1982; Särkkä, 1994). They display a great diversity in aquatic bodies, including over 1700 species. Of these, about 1100 species are freshwater species and others are primarily terrestrial, belonging to the family Enchytraeidae (Martin et al., 2007). The ecological value of oligochaetes includes their importance in aquatic food chains, their impact on sediment structure and water–sediment exchanges, their long history of use in pollution monitoring and assessment, their wide distribution, and their indicator value (Milbrink, 1973; Chapman et al., 1982; Lafont, 1984; Smith, 1991; Särkkä, 1994; Finogenova, 1996; Undi and Radujkovi, 2012).

Stephenson (1931) published several papers on the aquatic and terrestrial oligochaetes of India (*Fauna of British India: Oligochaetes*). Aiyer (1929) reported on aquatic oligochaetes collected in and around Trivandrum. Mehra (1925) published some papers on this group from collections made in and around Agra. Extensive work has been done since 1960 by Brinkhurst and others. Naidu (2005) recorded 72 species of microdriles from different parts of the Indian subcontinent. Kathireswari et al. (2005) listed a total of 124 species of oligochaetes belonging to 44 genera of 10 families from Tamil Nadu. Twenty-seven aquatic oligochaetes were reported by Nesemann et al. (2004). The latest compendium by Naveed (2010) describes 9 naidids and 4 tubificids from the Chennai and Thiruvallur districts of Tamil Nadu.

Even though records on Indian microdrile worms have been available since 1917, data on microdriles from any aquatic bodies have not been reported from Karnataka. Hence, a preliminary attempt has been made to identify the aquatic oligochaete species distributed in Western Ghats and on the west coast of Karnataka.

The study was conducted in selected freshwater bodies of the Western Ghats and the west coast of Karnataka.

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The Indian state of Karnataka is located at 11°30′N and 74°E–78°30′E. Karnataka is situated in the Deccan Plateau and is bordered by the Arabian Sea to the west. Moodabidri is 140 m above sea level. The other study areas' elevations above sea level are as follows: Gurupura, 24 m; Udupi, 55 m; Alike, 87 m; Sagar, 579 m; and Linganamakki, 554 m.

The sampling areas are located in the districts of Dakshina Kannada (Gurupura: 12°53′10″N, 74°52′47″E; Alike: 12°47′49″N, 74°55′56″E; Moodabidri: 13°4′12″N, 74°59′44″E), Udupi (Karkala: 13°11′9″N, 74°59′44″E), and Shimoga (Linganamakki: 14°11′19″N, 74°47′10″E; Sagar: 14°9′57″N, 75°1′36″E; Ananthpur: 14°4′26″N, 75°12′50″E) (Figure).

A total of 260 freshwater bodies were surveyed. However, microdriles were present in only 25 freshwater bodies in 3 districts of the study area. These include some of the perennial wetlands (tanks) and rice fields. The wetlands of Gurupura, Karkala, Sagar, and Ananthpur are considerably larger, with dimensions varying from 1 ha to a few hectares. The water in these lentic habitats is turbid and filled with detritus. The edges of these ponds are overgrown with grasses and macrophytes. Filamentous algae, e.g., *Nostoc*, *Oscillatoria*, *Spirogyra*, *Hydrilla*, and *Nitrilla*, are the main aquatic plants in these ponds. The temperatures usually range between 22 and 28 °C, and the range of pH was 6.5–8.0. The survey was carried out between October 2011 and June 2013, with one sampling in each month.

The sampling was done in different freshwater bodies like ponds and tanks, and also in rice fields. Four different sampling points were chosen, and 1 L of water along with floating macroalgae and rotting surface materials was collected. Microdrile worms were collected using droppers and then preserved in 4% formalin solution. The voucher specimens were deposited in the museum of the Department of Applied Zoology, Mangalore University, India, for future reference. Specimens were temporarily mounted using Amman's lactophenol (phenol, lactic acid, glycerol, and water in the ratio of 1:1:2:1). Two to 4 specimens were placed on 2–3 drops of medium on a glass

Figure. Map showing the sampling localities in Karnataka State, India.

Table. Localities and habitat types of species collected. DK: Dakshina Kannada; UDP: Udupi; SHG: Shimoga; R: rice field; T: tank; P: pond.

Species	DK			UDP			SMG		
	R	T	P	R	T	P	R	T	P
Family: NAIDIDAE									
Aulophorus furcatus (Müller, 1773)	x	x		x	x			x	x
Aulophorus vagus Leidy, 1880	x	x	x				x		
Aulophorus moghei Naidu & Srivastava, 1980								x	x
Dero digitata (Muller, 1773)	x			x					x
Dero sawayai Marcus, 1943			x						x
Dero dorsalis Ferroniere, 1899		x	x		x	x		x	x
Allonais paraguayensis (Michaelsen, 1905)		x	x		x	x		x	x
Allonais gwaliorensis (Stephenson, 1920)								x	x
Nais barbata Muller, 1773			x						
Chaetogaster sp. Sperber, 1948									x
Family: PRISTINIDAE									
Pristina longiseta Ehrenberg, 1828		x	x		x	x		x	x
Pristina proboscidea Beddard, 1896		x	x		x	x			x
Pristina synclites Stephenson, 1925									x
Pristina breviseta Bourne, 1891								x	x
Pristina jenkinae (Stephenson, 1931)								x	x
Pristina menoni (Aiyer, 1929)									x

slide and covered with a cover slip. They were examined under a compound microscope, and microphotographs were taken to study morphometric details for identification. The species were identified using the keys of Naidu (2005).

A total of 16 species of microdrile belonging to 6 genera were recorded for the first time in the study area. Of these, 10 species belonging to the family Naididae (monophyletic) and 6 species belonging to the family Pristinidae were recorded. The species' distribution patterns and habitat specificity are given in the Table.

The present survey records the species *Aulophorus furcata*, *Aulophorus vagus*, and *Dero digitata* in wetlands richly covered by macroalgae. The worms of the family Naididae can live on a considerable range of substrates, including aquatic macrophytes (Glowacka et al., 1976; Mastrantuono, 1986), mosses, liverworts (Vlckva et al., 2002), and filamentous algae (Armendariz, 2000). Three to 5 individuals of *Aulophorus vagus* were found in tubular nests of 1–2 cm in length. *Dero sawayai* and *D. dorsalis* were found in the decaying materials of some wetlands. The species *Chaetogaster limnaei*, *Dero righii*, and *Nais communis* were found from mollusks of the genus *Biomphalaria* (Gorni and Alves, 2006; Martins and Alves, 2008). The species *Allonais paraguayensis*, *Nais barbata*, *Pristina longiseta*, *P. proboscida*, and *Aulophorus moghei* were found to be abundant in rotting materials from the surface of the freshwater bodies; this is in accordance with previous findings (Wetzel et al., 2000). *Pristina synclites* was collected from the humus soil at the bottom of the pond. *Allonais gwaliorensis*, *Pristina breviseta*, *Pristina menoni*, and *Pristina jenkinae* were the most abundant species in the wetlands during the postmonsoon season.

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