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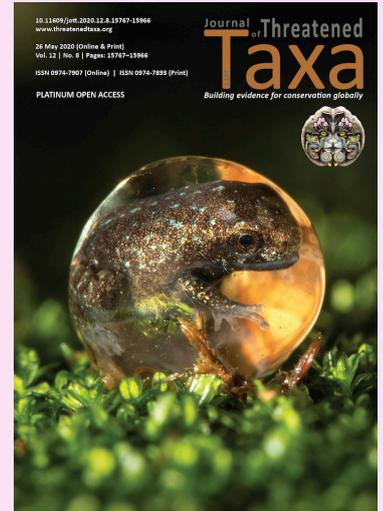
## SHORT COMMUNICATION

### A PRELIMINARY SURVEY OF SOIL NEMATAFAUNA OF BHAGWAN MAHAVEER WILDLIFE SANCTUARY, GOA, INDIA

Kiran Gaude & I.K. Pai

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## A preliminary survey of soil nemafauna of Bhagwan Mahaveer Wildlife Sanctuary, Goa, India

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**Abstract:** Nematological research in India is primarily focussed on major crops and animal parasitic groups, while ignoring free living groups in forest ecosystems. In the present study, soil nemafauna of Bhagwan Mahaveer Wildlife Sanctuary, Goa, India was assessed. A total of 18 genera, 14 families, and five orders were recorded. Among four orders, Dorylaimida was the most dominant one, which consists of 12 genera and nine families. Among the 18 genera *Sicaguttur*, *Qudsinema*, *Microdorylaimus*, *Longidorella*, *Paralongidorus*, *Xiphidorinae*, *Fuscheila* and *Chrysonema* are reported for the first time from the state. More such intensive survey will add more numbers of nematode species.

**Keywords:** Invertebrate, Nematoda, protected area, underground biota.

Nematodes are one of the important groups of invertebrate in both terrestrial and freshwater ecosystems (Hanel 1999). They are small, worm-like animals (Yeast 1979; Yeast & Bonger 1999), diverse (Ettema 1998), and ubiquitous inhabitants (Bernard 1992; Bloemers et al. 1997; Bonger & Ferris 1999) in nature. A total of 1,000,000 species of nematodes is estimated globally (Hugot et al. 2001); nearly 30,028 species are known. Around 2,900 species of nematodes are identified from India (MoEF 2014) which is 9.66% of the total described species. Nematological research in India predominantly focuses on plant and animal

parasitic groups. The parasitic association of nematodes with all the major crops of India has been reported in earlier literature. Little work has been done on the free living groups in forest ecosystems as they do not have a direct connection with agriculture or livestock (Pradhan & Dash 1987; Baniyamuddin et al. 2007; Vaid et al. 2014).

Goa, a small state with an area of 3,702km<sup>2</sup>, in the Western Ghats and on the coast of the Arabian Sea, contributes a rich biodiversity (Alvares 2002). Extensive faunal studies, in general, have been done in Goa but the underground biota (Nematoda) has been neglected in most cases. In South Goa District, 52 species of nematodes are reported which is about 0.01% of total species in India (Lizanne & Pai 2014). These sanctuaries are part of the Western Ghats and may incorporate a wide diversity of soil nematodes.

### STUDY AREA

Bhagwan Mahaveer Wildlife Sanctuary (Image 1) is a 240km<sup>2</sup> protected area located at 15.319° & 74.288°. It contains several temples and the Dudhsagar Fall. This sanctuary is famous for its snakes particularly the King Cobra. Vegetation is classified as west coast tropical evergreen forests, west coast semi-evergreen forests, and moist deciduous forests (Alvares 2002). The

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**Competing interests:** The authors declare no competing interests.

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Image 1. Bhagwan Mahaveer Wildlife Sanctuary, the study area, in South Goa

predominant species are *Terminalia*, *Lagerstroemia*, *Xylia*, *Strobilanthus*, and *Dalbergia*. The forest canopy is almost closed, pH of soil samples from Bhagwan Mahaveer Sanctuary is slightly acidic (pH6.12) and has high deposits of Phosphorous (88.5 Kg/Ha) and macronutrient viz., Iron (29.908 ppm), Zinc (4.1002ppm), Copper (5.584ppm) and Manganese (29.984ppm) (Soil Testing Laboratory, Ela, Old Goa)

## MATERIALS AND METHODS

**Soil collection and processing** for nematode extraction and identification was as per Lizanne & Pai (2014) and Vaid et al. (2014). Ten soil samples were collected randomly in a self-sealing plastic bag. Each soil sample comprises 20 sub-samples. These sub-samples were combined to make one composite sample. The soil samples were processed using modified Cobb's sieving and decantation and modified Baermann's funnel techniques for the extraction of nematodes (Ravichandra 2015). A small amount of water suspension from a funnel was drawn into a cavity block through a rubber tubing. The nematodes thus isolated were collected for counting, fixing, and processed for making permanent slides. For counting nematodes, water was added to the extracted nematode suspension to make

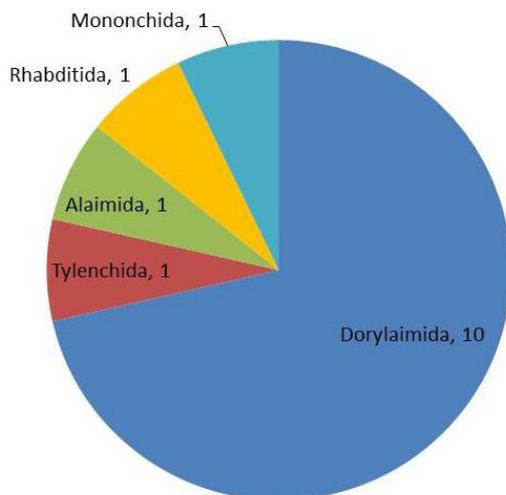
its volume 25ml. The suspension was stirred thoroughly and then 5ml volume was sucked by a pipette to pour in a Syracuse dish. Counting was done thrice for each sample and finally the mean was calculated. Individuals belonging to a genus were counted separately. Counted nematodes were then killed and fixed in 4% formalin and dehydrated in glycerine-alcohol (Seinhorst 1959). Dehydrated nematodes were mounted in anhydrous glycerine. Permanent slides of the specimens were prepared using paraffin wax ring method and were studied under Olympus BX51 microscope. The identification of nematodes was done consulting relevant literature (Jairajpuri & Ahmad 1992; Lamberti et al. 2002; NEMAPLEX, Nema Species Masterlist).

## RESULTS AND DISCUSSION

A total of 18 genera, 14 families and five orders of nematodes were reported from Bhagwan Mahaveer Wildlife Sanctuary (Table 1) (provide photographs/images if available for publication). Among four orders Dorylaimida is the most dominant order (Figure 1) consisting of 13 genera and 10 families followed by Mononchida consisting of two genera and one family. Dominance of order Dorylaimida is due to fewer disturbances in this region. Dorylaims are found in every

**Table 1. Soil nematode genera from Bhagwan Mahaveer Wildlife Sanctuary.**

Orders	Families	Genera	Feeding type
Dorylaimida	Swangeriinae	<i>Oxydirus</i> Thorne, 1939	Plant parasite
	Dorylaimidae	<i>Dorylaimus</i> Dujardin, 1845	Omnivore
		<i>Sicaguttar</i> Siddiqi, 1971	-
	Quadsianematidae	<i>Qudsinema</i> Jairajpuri, 1965	-
		<i>Microdorylaimus</i> Andrassy, 1986	Omnivore
	Nordiidae	<i>Longidorella</i> Thorne, 1939	Omnivore
	Aporcelaimidae	<i>Aporcelaimium</i> Loof & Coomans, 1970	Predator
	Actinolaimidae	<i>Hexactinolaimus</i> Yeates, 1973	Predator
	Longidoridae	<i>Longidorus</i> Micoletzky, 1922	Plant parasite
		<i>Paralongidorus</i> Siddiqi, Hooper & Khan, 1963	Plant parasite
	Xiphinematidae	<i>Xiphinema</i> , Cobb, 1913	Plant parasite
	Thornematidae	<i>Fuscheila</i> Siddiqi, 1982	-
	Crateronematidae	<i>Chrysonema</i> Thorne, 1929	Not known
Tylenchida	Tylenchidae	<i>Tylenchus</i> Bastian, 1865	Plant parasite
Alaimida	Alaimidae	<i>Alaimus</i> de Man, 1880	Bacterivore
Rhabditida	Rhabditidae	<i>Mesorhabdtis</i>	Bacterivore
Mononchida	Monochidae	<i>Clarkus</i> Jairajpuri, 1970	Predator
		<i>Monochus</i> Bastian, 1865	Predator



**Figure 1. Dominance of orders of soil nematodes**

conceived type of habitat and usually dominate both in numbers and in species over all other soil-inhabiting nematodes (Jairajpuri & Ahmad 1992). Dorylaimids and mononchids are more sensitive to disturbance (Forge & Simard 2001), therefore, they are used as indicators of environmental disturbances (Thomas 1978; Sohlenius & Wasilewska 1984). All these 18 genera are reported for the first time from this protected area. Genus *Dorylaimus* Dujardin was the most dominant among

all (Figure 2) followed by *Xiphinema* Cobb, *Tylenchus* Bastian, *Longidorus* Micoletzky, and *Longidorella* Thorne. Genera like *Sicaguttar* Siddiqi, *Qudsinema* Jairajpuri, *Microdorylaimus* Andrassy, *Longidorella* Thorne, *Paralongidorus* Siddiqi, *Fuscheila* Siddiqi, and *Chrysonema* Thorne are reported for the first time from the state. Lizanne & Pai (2014) reported 69 species belonging to 48 genera. The addition of these eight genera will take the tally to 56 genera for the state of Goa. On assigning 18 genera to the trophic grouping using secondary data collected (Neher & Weight 2013; Vaid et al. 2014), trophic groups reported were plant parasites, predators, and omnivores (Table 1). Plant parasites were the most dominant (five genera) followed by predators (four genera), omnivore (three genera), and bacterivores (two genera). In terms of number, omnivores dominated the area (Figure 3) followed by predators. According to Vaid et al. (2014), the abundance of predators is uncommon in forest ecosystems and is clearly due to the absence of anthropogenic activities.

**CONCLUSION**

This is a preliminary study on this forest, more such intensive survey in the sanctuary will yield more species of nematodes.

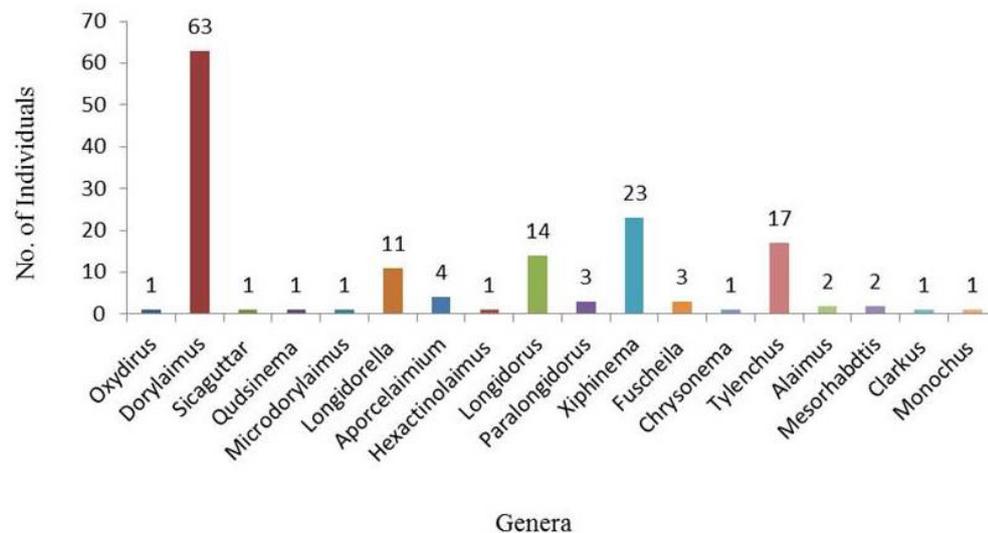


Figure 2. Genera-wise dominance of soil nematodes

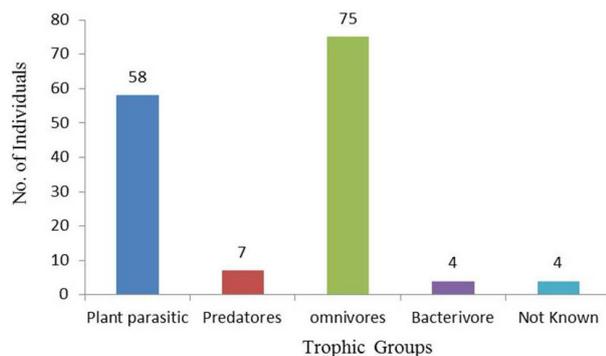


Figure 3. Number of individuals of soil nematodes as per trophic groups

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