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Checklist of Free-living marine Nematodes (Class: Chromadorea) from Nizampatnam Bay, Bay of Bengal

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The present study provides a checklist of free-living marine nematode species from 64 subtidal sites located at Nizampatnam Bay. Nematoda represented by 62 species belonging to 39 genera and 20 families and constituted an overwhelming 65% of the total meiofauna in terms of numerical abundance.

[**Keywords**: Marine nematodes, Nizampatnam Bay, Bay of Bengal.]

Introduction

Marine benthic communities have a very high diversity. This is especially true of meiofauna, the small metazoans living in or on sediments, other animals and plants on hard substrates such as rocks. The meiofauna is defined on a methodological basis as all metazoans retained on a sieve of 42 μm[19]. Meiofauna occur in freshwater and marine habitats, although most ecological studies on meiofauna have been performed in the marine environment. The meiofauna is defined on a methodological basis as all metazoans retained on a sieve of 42 μm[19]. Meiofauna occur in freshwater and marine habitats, although most ecological studies on meiofauna have been performed in the marine environment.

In terms of abundance, diversity, and distribution, the nematodes are the most important meiofaunal group in the majority of marine meiobenthic habitats[15]. According to many authors, they could account for up to 90% of total meiofauna abundance. Nematodes are usually followed by harpacticoid copepods. The dominance of other meiofaunal taxa was observed only occasionally [1, 3, 5, 6, 7, 20&24.]

Free-living marine nematodes play key role in decomposition of organic matter, recycling of nutrients as well as serving as a food

source for higher trophic groups[9, 23]. Additionally, marine nematodes can be effectively used as bioindicators for environmental stress and pollution across the marine realms[10 & 21.] Despite their ecological importance, studies of marine nematodes are largely neglected because their identification, which is predominantly based on morphological characters, requires taxonomic expertise[11, 12&17]. The understanding of an ecosystem depends not only on holistic synthesis of all components, but also on how the individual components work. Therefore, the accuracy of the identification is fundamental to our understanding of ecological attributes of any organism in its environment. Certain papers have identified the specimens at the genus level only, or used the operational taxonomic unit, which hampers further comparison between species lists from different sources. Although the nematodes comprise a large fraction of marine benthic communities, only little information is available on check list from Indian waters [4&12.] This work aims to provide a list of free-living marine nematode species found in the Nizampatnam Bay, Bay of Bengal, which will help in expanding our knowledge on marine benthic faunal biodiversity of Indian coastlines.

Materials and Methods

The present study is aimed at obtaining a comprehensive account of meiobenthos off Nizampatnam Bay located in Southern vicinity of Andhra Pradesh in terms of species composition representing sub-tidal (<50 m) area from 10-30 m depth of the shallow bay. During the investigation, four cruises were conducted onboard using fishing trawler FKKD *Koti* through two successive Post-Monsoon seasons (October 2006 and November 2007) and two Pre-Monsoon seasons (March 2007 and 2008) between latitudes 15° 28' to 15°48' N and

longitudes 80° 17' to 80°47' E in the province of Nizampatnam Bay (Fig. 1).

Sediment samples were collected during four seasons, pre – monsoon I, October, 2006 (N=80), post- monsoon I, March 2007(N = 48), pre-monsoon II, November, 2007(N =60) and post- monsoon II, March 2008(N=60) between latitudes 15° 28' to 15° 48' N and longitudes 80° 17' to 80°47' E in the province of Nizampatnam Bay were used in the study. GARMIN E-Trex GPS (Global Positioning System), USA was used for navigation onboard.

Biological observations included collection of quantitative meiobenthic samples. A van Veen grab (0.1 m^2 Hydrobios, Kiel, Germany) was used to collect the infaunal samples. At each station, a glass corer (3.6 cm inner diameter) was used for collecting sediment samples of 10 cm long cores from grab (van Veen grab, 0.1m²) hauls. The van Veen grab has an opening lid at the top, which facilitates the core sample to be taken out without disturbing the sediment. Replicate sub samples were collected from each haul. Samples were in Toto transferred to polythene containers, labeled and material preserved in 70% alcohol for further examination.

Sediment samples were then processed through a set of two sieves with 500 µm and 42 µm mesh size. Residue retained on the 42 µm sieve was stored in glass container and preserved in 4% buffered formalin. Rose Bengal was used as stain prior to sorting and enumeration. Meiobenthos was counted on higher taxonomic level using a binocular microscope. Total number of organisms in the sample represented by different phyla was expressed in individuals per 10 cm^{-2}. Taxonomic classification of constituent species was carried out based on standard literature[14&16.] Nematode specimens were picked using a fine needle and transferred into pure glycerine (method proposed by[30]and mounted on Cobb slides[13]. Nematodes were identified, using mainly the NeMys online identification key[31] and other relevant literature[26, 27&32].

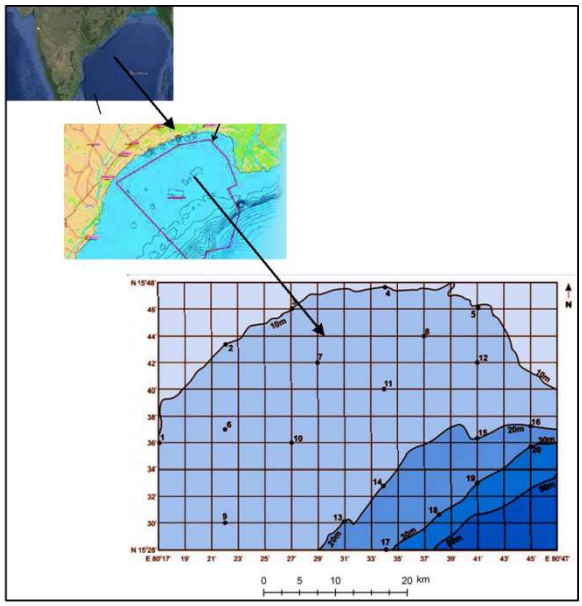

Fig. 1 -- Sampling locations along Nizampatnam Bay

Results and Discussion

Nematoda represented by 62 species belonging to 39 genera and 20 families and constituted an overwhelming 65% of the total meiofauna in terms of numerical abundance. During the post monsoon, I, 16 families were encountered of which the dominant families were Comesomatidae, Chromadoridae, and Linhomoeidae accounting for 50% of the population. During the pre-monsoon I**,** 15 families were encountered of which the dominant families were Comesomatidae and Chromadoridae accounting for 50% of the population. During the post-monsoon II, 17 families were encountered of which the dominant families include Comesomatidae, Linhomoeidae and Chromadoridae accounting for more than 50% of the population. During the pre-monsoon II, 19 families were encountered of which the dominant families were Comesomatidae and Linhomoeidae accounting for 50% of the population. Phanodermatidae, Ethmolaimidae and Ceramonematidae were exclusively found in this season (Table 1a). Some families were found to be depth specific - Phanodermatidae, Ethmolaimidae and Ceramone-matidae were restricted only to <15m depth.

During post-monsoon, I, 1492 individuals belonging to 42 species and 28 genera were encountered. The most dominant species, *Dorylaimopsis punctata*, *Sabatieria punctata Spilophorella euxina*, *Metalinhomoeus longiseta*, *Daptonema vicinum* were accounting for 50% of the population. *Richtersia discorda* was exclusively found in this season.

During pre-monsoon I, 818 individuals belonging to 45 species and 27 genera were encountered. The most dominant species, *Dorylaimopsis punctata, Sabatieria punctata*, *Metalinhomoeus longiseta*, *Spilophorella euxina*, *Spilophorella candida* were accounting for 50%. *Daptonema tenuispiculum* and *Metalinhomoeus filiformis* were exclusively found. During post monsoon II, 969 individuals belonging to 47 species and 31 genera were encountered.

Table 1a. List of nematode species collected at four seasons (1=post monsoon I (October 2006), 2 = pre monsoon I (March 2007), 3= post monsoon II (November 2007), 4 = pre monsoon II, March 2008; **x- present, - absent**).

Nematodes	1	2	3	4
Thoracoatomopsidae Filipjev, 1927				
Enoploides sp.	x	-	x	x
Enoplolaimus vulgaris (De Man, 1983)	-	-	x	x
Phanodermatidae Filipjev, 1927				
Phanoderma sp.	-	-	-	x
Oxystominidae Chitwood, 1935				
Oxystomina asetosa (Southern, 1914)	x	x	x	x
Oncholaimidae Filipjev, 1916				
Viscosia cobbi (Filipjev, 1918)	x	x	x	x
Enchelidiidae Filipjev, 1918				
Belbolla teisseri (Luc and De Coninck, 1959)	x	x	x	x
Paraeurystomina scilloniensis (Warwick, 1977	x	-	-	-
Chromadoridae Filipjev, 1917				
Rhips paraornata (Platt and Zhang, 1982)	x	x	x	x
Spilophorella euxina (Filipjev, 1918)	x	x	x	x
Spilophorella candida (Gerlach, 1951)	x	x	x	x
Comesomatidae Filipjev, 1918				
Sabatieria lyonessa (Warwick, 1977)	x	x	-	x
Sabatieria elongata (Jayasree and Warwick, 1977)	-	-	x	x
Setosabatieria sp.	x	-	-	x
Ethmolaimidae Filipjev and Stekhoven, 1941				
Neotonchus sp.	-	-	-	x
Cyatholaimidae Filipjev, 1918				
Pomponema debile (Lorenzen, 1972)	-	-	-	x
Pomponema teseelatum (Wieser and Hopper, 1967	-	-	x	-
Nannolaimoides sp.	x	-	x	x
Paracanthonchus caecus (Micoletzky, 1924)	-	-	-	x
Selachinematidae Cobb, 1915				
Halichoanolaimus dolichurus (Ssaweljev, 1912)	x	-	x	x
Richtersia discorda (basis of record)	x	-	-	-
Desmodoridae Filipjev, 1922				
Desmodora pilosa (Ditlevsen, 1926)	x	x	x	x
Desmodora sp.	x	x	-	-
Desmodorella sp.1.	x	x	x	-
Desmodorella sp.2	x	x	-	x
Onyx sp.	-	x	x	-
Monoposthia sp.	x	-	x	x
Ceramonematidae Cobb, 1933				
Ceramonema sp.	-	-	-	x
Xylidae Chitwood, 1951				
Daptonema invagiferoum (Platt, 1973)	x	x	x	x
Daptonema vicinum (Riemann, 1966)	x	x	x	x
Theristus acer (Bastain, 1865)	-	x	x	x
Sphaerolaimidae Filipjev, 1918				
Sphaerolaimus macrocirculus (Filipjev, 1918)	x	x	x	x
Parasphaerolaimus sp.	x	x	x	x
Linhomoeidae Filipjev, 1922				
Terschellingia gourbaultae (Austen, 1989)	x	x	x	-
Axonolaimidae Filipjev, 1918				
Axonolaimus spinosus (Bütschli, 1874)	x	x	x	x

Table 1b. List of nematode species collected at two depths < 15m and > 15m; x-present, - absent).

Nematodes	<15m	>15m
Thoracoatomopsidae Filipjev, 1927		
Enoploides sp.	x	-
Enoplolaimus vulgaris (De Man, 1983)	x	-
Phanodermatidae Filipjev, 1927		
Phanoderma sp.	x	-
Oxystominidae Chitwood, 1935		
Oxystomina asetosa (Southern, 1914)	x	x
Oncholaimidae Filipjev, 1916		
Viscosia cobbi (Filipjev, 1918)	x	x
Enchelidiidae Filipjev, 1918		
Belbolla teisseri (Luc and De Coninck, 1959)	x	x
Paraeurystomina scilloniensis (Warwick, 1977	x	-
Chromadoridae Filipjev, 1917		
Rhips paraornata (Platt and Zhang, 1982)	x	x
Spilophorella euxina (Filipjev, 1918)	x	x
Spilophorella candida (Gerlach, 1951)	x	x
Comesomatidae Filipjev, 1918		
Sabatieria lyonessa (Warwick, 1977)	x	x
Sabatieria elongata (Jayasree and Warwick, 1977)	x	x
Setosabatieria sp.	x	x
Ethmolaimidae Filipjev and Stekhoven, 1941		
Neotonchus sp.	x	-
Cyatholaimidae Filipjev, 1918		
Pomponema debile (Lorenzen, 1972)	x	x
Pomponema teseelatum (Wieser and Hopper, 1967	x	x
Nannolaimoides sp.	x	x
Paracanthonchus caecus (Micoletzky, 1924)	x	x
Selachinematidae Cobb, 1915		
Halichoanolaimus dolichurus (Ssaweljev, 1912)	x	-
Richtersia discorda (basis of record)	-	x
Desmodoridae Filipjev, 1922		
Desmodora pilosa (Ditlevsen, 1926)	x	x
Desmodora sp.	x	x
Desmodorella sp.1.	x	-
Desmodorella sp.2	x	x
Onyx sp.	-	x
Monoposthia sp.	x	-
Ceramonematidae Cobb, 1933		
Ceramonema sp.	x	-
Xylidae Chitwood, 1951		
Daptonema invagiferoum (Platt, 1973)	-	x
Daptonema vicinum (Riemann, 1966)	x	x
Theristus acer (Bastain, 1865)	-	x
Sphaerolaimidae Filipjev, 1918		
Sphaerolaimus macrocirculus (Filipjev, 1918)	x	x
Parasphaerolaimus sp.	x	x
Linhomoeidae Filipjev, 1922		
Terschellingia gourbaultae (Austen, 1989)	x	x
Axonolaimidae Filipjev, 1918		
Axonolaimus spinosus (Bütschli, 1874)	x	x

The most dominant species, *Metalinhomoeus longiseta*, *Sabatieria punctata*, *Dorylaimopsis punctata*, *Axonolaimus paraspinosus*, *Spilophorella euxina* and *Sphaerolaimus balticus* accounting for 50%. *Pomponema tesselatum* was exclusively found in this season**.**

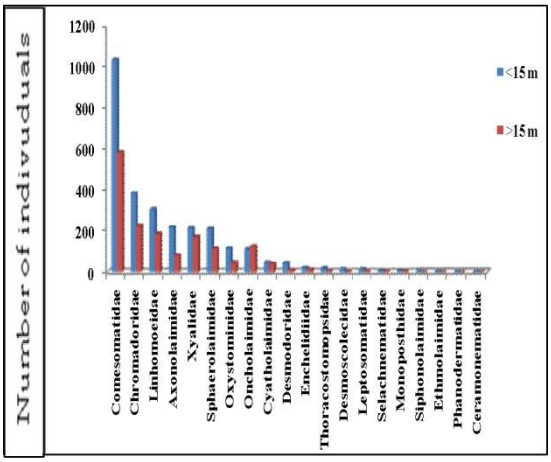

Fig. 2 -- Relative abundance of dominant nematode families at different depths

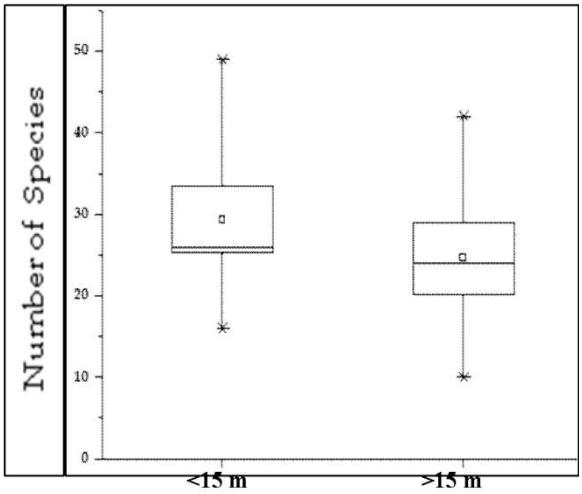

Fig. 3 -- Number of species at different depths.

During pre-monsoon II, 1145 individuals belonging to 53 species and 36 genera were encountered. The most dominant species, *Dorylaimopsis punctata*, *Sabatieria punctata*, *Metalinhomoeus longiseta*, *Paracomesoma dubium* and *Axonolaimus paraspinosus* accounting for 50%. *Phanoderma* sp., *Neotonchus* sp., *Paracanthonchus caecus*, *Ceramonema* sp. and *Parodontophora* sp**.** were exclusively found.

Overall, the most dominant families were Comesomatidae, Linhomoeidae and Xyalidae accounting for 60% of the population. High abundance and dominance of families such as Comesomatidae and Xyalidae have been reported on the Western continental shelf of India [28,29]; Palk Bay, south east cost of India[2]; and south east continental shelf of India.[5]

Highest number of nematode species was recorded in <15m depth (58 species) followed by >15m depth

(54 species) (Table 1b and Figs 2 & 3). Present observations of decline in abundance and number of species with decreasing depth are in agreement with the earlier reports [8, 18, 22, 25, 28]

Conclusions

Biodiversity investigations aim to integrate species checklists and the compilation of databases that represent a regional and global benefit for researchers worldwide. Furthermore, the monitoring of biodiversity over time is of great importance for planning conservation actions, which seems to be more urgent these days, especially in vulnerable coastal systems. This study represents the first survey of the marine nematodes and harpacticoid copepods in the Nizampatnam Bay, Bay of Bengal.

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