

First report of *Ptycholaimellus macrodentatus* (Timm, 1961) (Nematoda: Chromadorida) from Indian coast

Tridip Kumar Datta¹, Susanta Kumar Chakraborty¹ and Anil Mohapatra^{2*}

¹Department of Zoology, Vidyasagar University, Midnapore (West), India

²Marine Aquarium and Regional Centre, Zoological Survey of India, Digha, West Bengal, India; anil2k7@gmail.com

Abstract

The first reporting of *Ptycholaimellus macrodentatus* from Indian coast is being made given due importance on the comparative morphometrics. The specimens under the present study have been found to attain a maximum length up to 1111 μm , are endowed with a long s-shaped dorsal tooth, collar enclosing the labial rugae, a groove at the base and double oesophageal bulb. All the specimens studied had a long ventral gland originated far behind of the oesophagus and opened into a small slit. This species was previously reported from the coastal Bangladesh and off the Kenyan water.

Keywords: Bay of Bengal, Hypodontolaiminae, Intertidal, Tajpur

Introduction

Benthic fauna have long been studied for monitoring marine ecosystems (Gesteira *et al.*, 2003; Sun *et al.*, 2014). Meiofauna, and in particular free-living marine nematodes, form an important component of the benthic domain both in abundance and biomass, and are closely related to other organisms playing a key role in trophic webs (Giere, 2009). The Phylum, Nematoda was proposed as an indicator for assessing the ecological quality of marine ecosystems according to the European Water Framework Directive (WFD), Directive 2000/60/EC (Moreno *et al.*, 2011; Semprucci *et al.*, 2014). By virtue of their dominance and universality, free-living nematode taxonomy represents an important aspect of ecological studies. After the discovery of the first species of the genus *Ptycholaimellus* by Cobb in 1920 so far twenty valid species have been recognized worldwide (Chunming *et al.*, 2015). In 1961, Timm described *Hypodontolaimus macrodentatus* from the coastal Bangladesh. The species was redescribed as *Ptycholaimellus macrodentatus* by Muthumbi and Vincx in 1998 from the Indian Ocean off the Kenyan coast. According to Jensen and Nehring (1992) the genus differs from other related genera viz. *Dichromadora*, *Hypodontolaimus*, *Megodontolaimus*,

Panduriphrynx etc. by having a collar enclosing the labial rugae, a groove at the base of that collar and a large s-shaped dorsal tooth. Jensen and Nehring (1992) also stated that the position of the ventral gland opening and the size of the gland could be additional generic characters but required further investigation. Here we are presenting the report of the occurrence of *P. macrodentatus* for the first time from the Indian coastal area.

Material and Methods

The sediment samples were collected from the coastal tract of Tajpur, Purba Medinipur, West Bengal (21°38'53"N, 87°38'10"E and 21°38'48"N, 87°38'4"E) (Figure 1.) on 23.ii.2014 with the help of a hand corer of 3.75 cm. internal diameter. Sediment samples were sieved by decantation procedure (Platt and Warwick, 1983) with two brass sieves, upper one of 500 μm pore size and lower one of 63 μm pore size (Coull, 1973). Nematodes were fixed in 4% neutral formalin solution and transferred to a solution of glycerol - alcohol (90 parts 70% alcohol and 10 parts glycerin) which were then placed in desiccators for three to seven days. The solution slowly evaporated to anhydrous glycerol. Specimens were mounted on glass slides in anhydrous glycerol supported by paraffin wax

* Author for correspondence

ring (De Grisse, 1969). Sorting and preliminary study of the sediment samples were done by OLYMPUS CH20i microscope (Olympus Opto Systems India Pvt. Ltd., New Delhi, India) while all the measurements and drawings were made with NIKON Eclipse 80i microscope equipped with NIKON DS-Fi1 camera (Nikon Instruments Inc., Melville, NY, U.S.A.). Temperature, Salinity and pH of Tajpur were measured by SYSTRONICS water analyser model no. 371 (SYSTRONICS INDIA LIMITED (SIL), Ahmedabad, Gujarat, India). Studied specimens were deposited in the museum collection of Marine Aquarium and Regional Centre, Zoological Survey of India, Digha, West Bengal. All the measurements except ratios are taken in μm (micron meter).

Abbreviations used

a = total body length / maximum body diameter; abd = anal body diameter; b = total body length / pharynx length; c = total body length / tail length; c' = tail length / anal body diameter; cs = length of cephalic sensilla; Gub = Gubernaculum; Hd = Head diameter; HV = distance of vulva from anterior end; L = total body length; lpb = Length of double pharyngeal bulb; lte = Lateral differentiation absent from tail end; mbd = maximum body diameter; n = number of specimens; NR (%) = position of nerve ring from anterior end in respect to pharynx; Ov1 = Length of Ovary1; Ov2 = Length of Ovary2; Ov1 (%) and Ov2 (%) = Length of respective ovary with total body length $\times 100$;

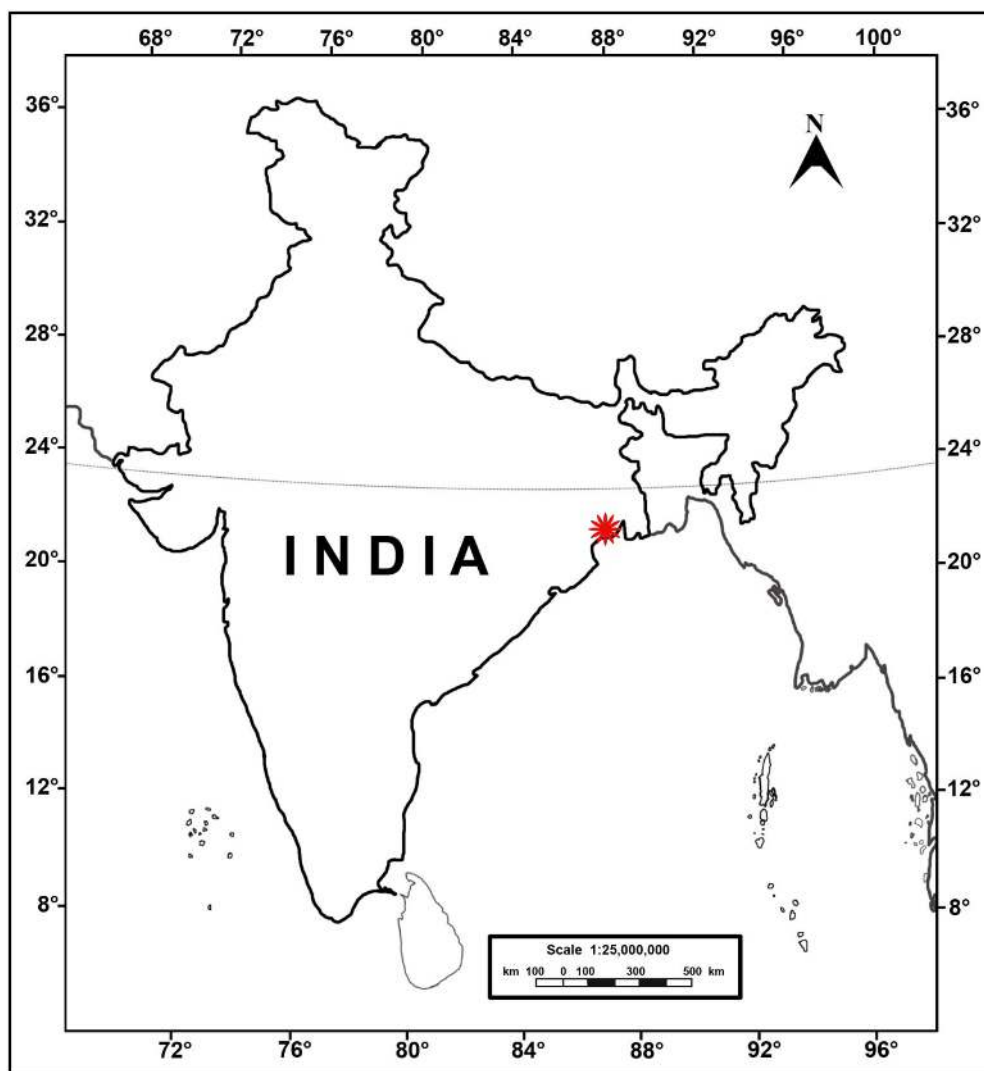


Figure 1. Collection locality.

P = length of pharynx; Spic = Spicule; T = tail length; V = (distance from head end to vulva / total body length) × 100; V' = (distance from head end to vulva / distance from head end to anus) × 100; VA = distance of anal opening from Vulva.

Results

Systematics

Class CHROMADOREA Inglis, 1983
 Subclass CHROMODORIA Adamson, 1987
 Superorder CHROMADORICA Hodda, 2007
 Order CHROMADORIDA Chitwood, 1933
 Suborder CHROMADORINA Filipjev, 1929
 Superfamily CHROMADOROIDEA Filipjev, 1917
 Family CHROMADORIDAE Filipjev, 1917
 Subfamily HYPODONTOLAIMINAE De Coninck, 1965

Genus *Ptycholaimillus* Cobb, 1920

P. macrodentatus (Timm, 1961) Muthumbi & Vincx, 1998

Synonym: *Hypodontolaimus macrodentataus* Timm, 1961

Specimens examined: Male: Reg. No. MARC/ZSI/N4131, L: 915 µm; Reg. No. MARC/ZSI/N4132, L: 805 µm; Reg. No. MARC/ZSI/N4133, L: 791 µm.

Female: Reg. No. MARC/ZSI/N4134, L: 978 µm; Reg. No. MARC/ZSI/N4135, L: 900 µm; Reg. No. MARC/ZSI/N4136, L: 999 µm; Reg. No. MARC/ZSI/N4137, L: 1111 µm; Reg. No. MARC/ZSI/N4138, L: 946 µm.

Description (Figure 2-4 and Table 1 & 2)

Body cylindrical with bluntly rounded anterior end. Amphid indistinct, possibly situated at the head end as elongated aperture. Four cephalic sensilla about 8-10 µm in males and 10-13 µm in females. Head diameter varying 6-12 µm, measured at the level of cephalic sensilla. Cephalic sensilla little short or equal of head diameter. Outer labial sensilla papilliform originated little above the level of cephalic sensilla. Two small cervical setae present at subventral and subdorsal region of the anterior part. Head region separated by constriction (collar) surrounded by fine membrane. Large 'S' shaped hollow dorsal tooth at the groove with a dorsal apophysis. Nerve ring present at 44%-57% to the anterior of pharynx. Pharynx cylindrical with double bulb. Anterior one smaller. Double bulb 46-55 µm (i.e. 32%-36% of pharynx) in male and 57-62 µm (34%-37% of pharynx) in female. Ventral gland bulky and opens into a small slit at the anterior part. Cardia

small, flattened. Body with moderate striation. Lateral alae extending full body length, bordered by larger dots and connected by cross-linking bars. No prelocal supplements in male. Male monorchic. Testis 17%-21% of the body length. Spicules smooth, equal and arcuate (40-44 µm), 1-2 of anal body diameter. Gubernaculum short, 15-18 µm, distal end being broader than proximal end and corrugated. Female reproductive system didelphic with reflexed ovaries. Anterior ovary 73-137 µm is larger than Posterior ovary, 71-135 µm. Female reproductive system covers 48.6%-50.2% of total length. Tail conical, narrowed down with tapering end and finger like spinneret. abd is broader in male than female. Lateral alae absent from the tail end at 8-10 µm in male and 13-16 µm in female.

Habitat: Specimens were collected from sandy intertidal belt (99.18% sand, 0.67% silt and 0.15% clay) with 0.23% organic carbon content at Tajpur, Midnapore (East), West Bengal, India. The coastal area is flat and broad having gentle sloping. At the time of collection the temperature, salinity and pH of the sea water were 27.3°C, 23.7 ppt and 7.91 respectively.

Discussion

Morphometric similarities with the description of Timm (1961) and Muthumbi and Vincx (1998) suggest that the present specimens are undoubtedly *P. macrodentatus*. First time it was discovered from the coastal Bangladesh, Eastern part of the Bay of Bengal and later it was found from the Indian Ocean off the Kenyan coast. Hence this new finding from the western part of Bay of Bengal also suggest that the possible range of the species matches with the previous distributional range. The original type population was shorter in length (see Table 2) that was also notified by Muthumbi and Vincx, 1998. The specimens recorded during the present study were larger than the original but support the findings of Muthumbi and Vincx, 1998. In the female specimens, the ovaries were found little smaller compared to the Timm, 1961 in the present study. On the other hand spicules were found larger than the original description of Timm, 1961, but almost in the same range of Muthumbi and Vincx, 1998. It was also observed that the base of the tooth of the present specimen had slight knob like swelling that was found in the description of Timm, 1961. The ratio of cephalic sensilla to head diameter also support the previous description, but in the present specimens

Table 1. Morphometric measurements of present specimens of *Ptycholaimellus macrodentatus* (Timm, 1961) collected from northern part of east coast of India. All except ratios are in μm .

Characters	Male (n=3)				Female (n=5)					
	N4131	N4132	N4133	Average \pm Stdev	N4134	N4135	N4136	N4137	N4138	Average \pm Stdev
L	914.7	805.2	790.9	836.9 \pm 67.7	977.8	900.1	999.4	1111.0	945.9	986.8 \pm 78.9
P	156.8	143.6	142.5	147.6 \pm 8.0	157.0	159.5	165.6	172.1	169.0	164.6 \pm 6.3
mbd	35.7	32.1	27.5	31.8 \pm 4.1	36.2	32.2	37.6	40.8	32.7	35.9 \pm 3.6
T	102.3	85.1	80.1	89.2 \pm 11.7	106.5	90.9	105.4	122.3	99.5	104.9 \pm 11.5
abd	25.7	22.4	20.8	23.0 \pm 2.5	20.9	19.2	21.4	25.4	20.8	21.5 \pm 2.3
NR (%)	49.8	48.5	56.9	51.7 \pm 4.5	53.0	52.2	49.6	48.3	44.3	49.5 \pm 3.5
cs	10.4	9.4	7.5	9.1 \pm 1.5	11.3	11.9	12.3	12.9	10.3	11.7 \pm 1.0
Hd	10.0	8.9	6.3	8.4 \pm 1.9	10.4	11.4	11.7	11.8	10.0	11.1 \pm 0.8
HV	-	-	-	-	475.6	451.9	489.2	555.2	469.8	488.4 \pm 39.7
VA	-	-	-	-	382.3	347.7	409.5	433.8	371.6	389.0 \pm 33.4
Spic	43.9	42.8	40.2	42.3 \pm 1.9	-	-	-	-	-	-
Gub	18.3	16.7	15.2	16.7 \pm 1.6	-	-	-	-	-	-
Testis	194.7	160.3	137.3	164.1 \pm 28.9	-	-	-	-	-	-
Ov1	-	-	-	-	109.6	72.9	111.8	137.0	79.1	102.1 \pm 26.2
Ov2	-	-	-	-	101.2	71.4	108.5	134.5	77.0	98.5 \pm 25.5
lte	10.4	10.4	8.3	9.7 \pm 1.2	13.5	14.6	13.5	15.6	13.5	14.1 \pm 0.9
lpb	55.0	51.8	45.8	50.9 \pm 4.7	56.6	59.1	60.9	58.2	61.9	59.3 \pm 2.1
a	25.6	25.1	28.8	26.5 \pm 2.0	27.0	28.0	26.6	27.2	28.9	27.5 \pm 0.9
b	5.8	5.6	5.6	5.7 \pm 0.2	6.2	5.6	6.0	6.5	5.6	6.0 \pm 0.4
c	8.9	9.5	9.9	9.4 \pm 0.5	9.2	9.9	9.5	9.1	9.5	9.4 \pm 0.3
c'	4.0	3.8	3.9	3.9 \pm 0.1	5.1	4.7	4.9	4.8	4.8	4.9 \pm 0.1
V	-	-	-	-	48.6	50.2	49.0	50.0	49.7	49.5 \pm 0.7
V'	-	-	-	-	55.4	56.5	54.4	56.1	55.8	55.7 \pm 0.8

Table 2. Morphometric comparison of present specimens with the specimens of Timm (1961) and Muthumbi & Vincx (1998).

Characters	Present Specimens		Muthumbi and Vincx, 1998		Timm, 1961	
	Male (n=3)	Female (n=5)	Male (n=7)	Female (n=6)	Male	Female
L	790.9-914.7	900.1-1111.0	708-991	732-1053	621-670	796-823
a	25.1-28.8	26.6-28.9	22.1-29.1	22.9-28.2	21.4-26.8	21.7-27.5
b	5.6-5.8	5.6-6.5	5.7-6.0	5.4-6.5	5.3	6.4-6.7
c	8.9-9.9	9.1-9.9	8.9-9.7	8.0-9.9	9.7-10.5	9.6-11.7
c'	3.8-4.0	4.7-5.1	4.1-5.2	5.4-5.9	3.4-3.6	4.4-5.2

V	-	48.6-50.2	-	44-48	-	31.4
Ov1 (%)	-	8.1-12.3	-	-	-	15.8
Ov2 (%)	-	7.9-12.1	-	-	-	15.6
Spi	40.2-43.9	-	35-42	-	37	-
Gub	15.2-18.3	-	18-22	-	19	-
cs	7.5-10.4	10.3-12.9	6-8		8	

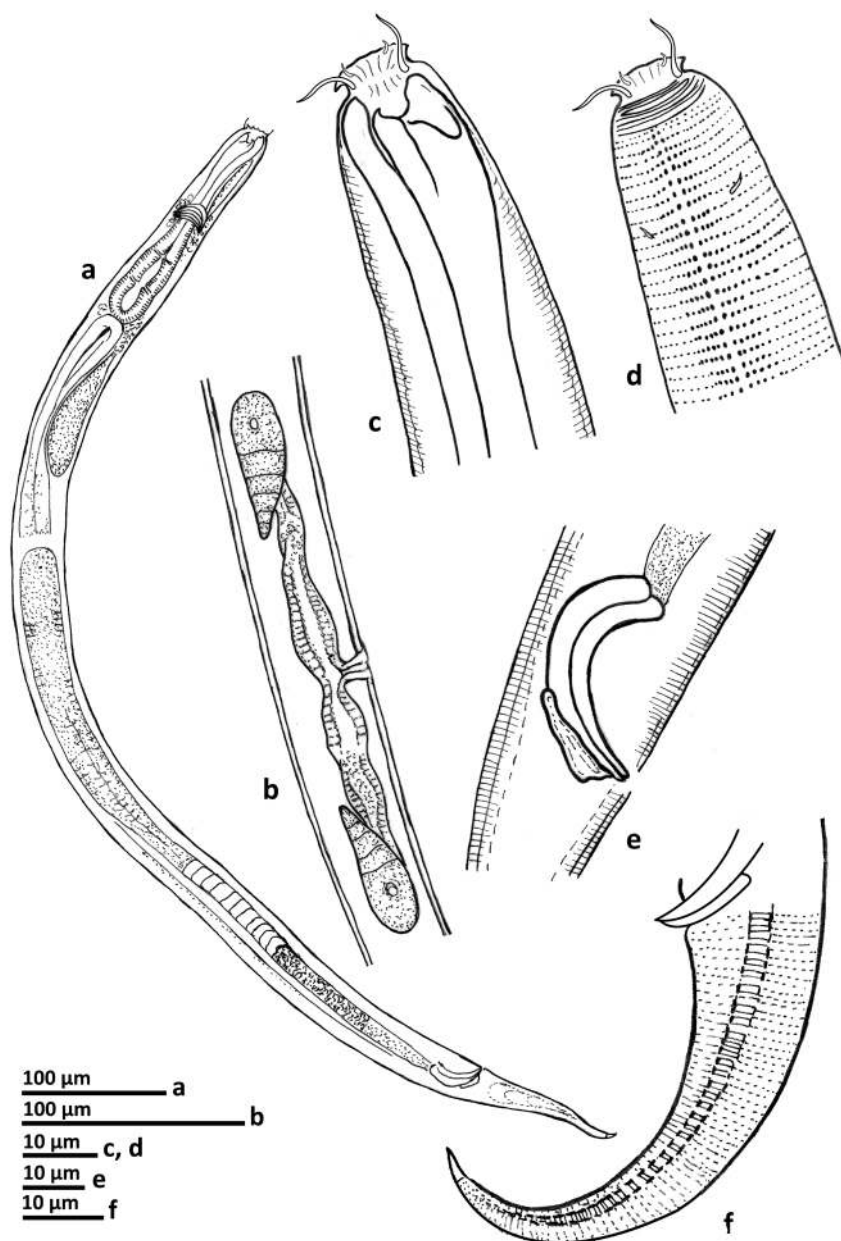


Figure 2. *Ptycholaimellus macrodentatus* illustrated micrograph of (a) entire male lateral view, (b) female reproductive organ, (c) anterior portion, (d) cuticle of anterior part, (e) spicules and gubernaculum, (f) cuticle of posterior part.

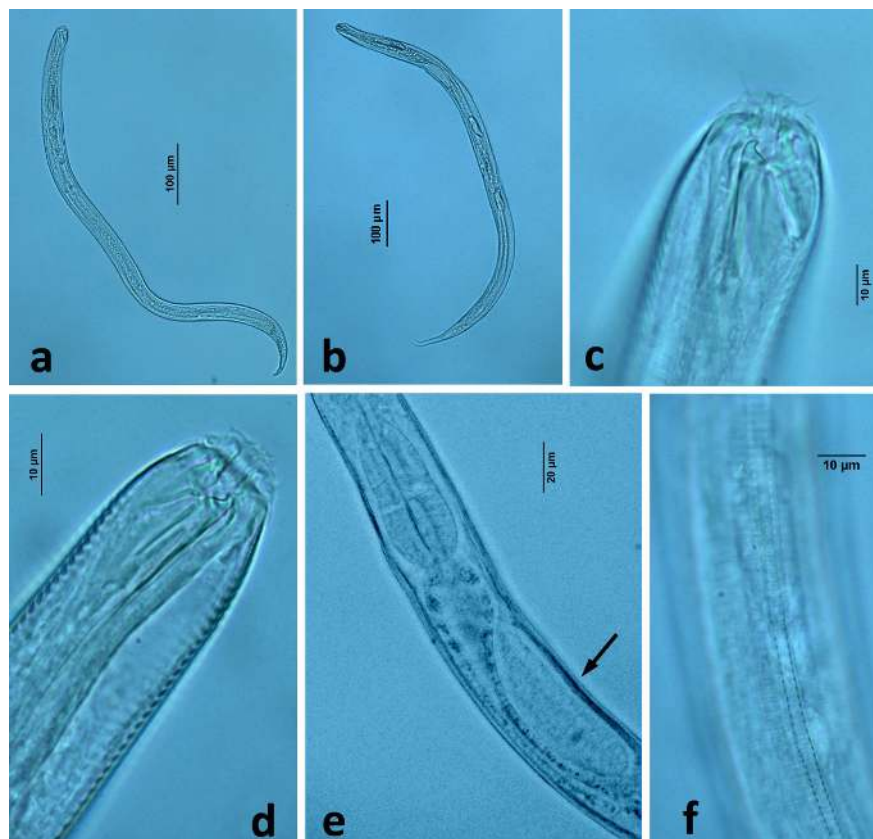


Figure 3. *Ptycholaimellus macrodentatus* (a) male, (b) female, (c) cephalic sensilla, papilliform labial sensilla and dorsal tooth, (d) anterior portion of head and dorsal tooth, (e) double pharyngeal bulb and ventral gland (arrow), (f) lateral alae.

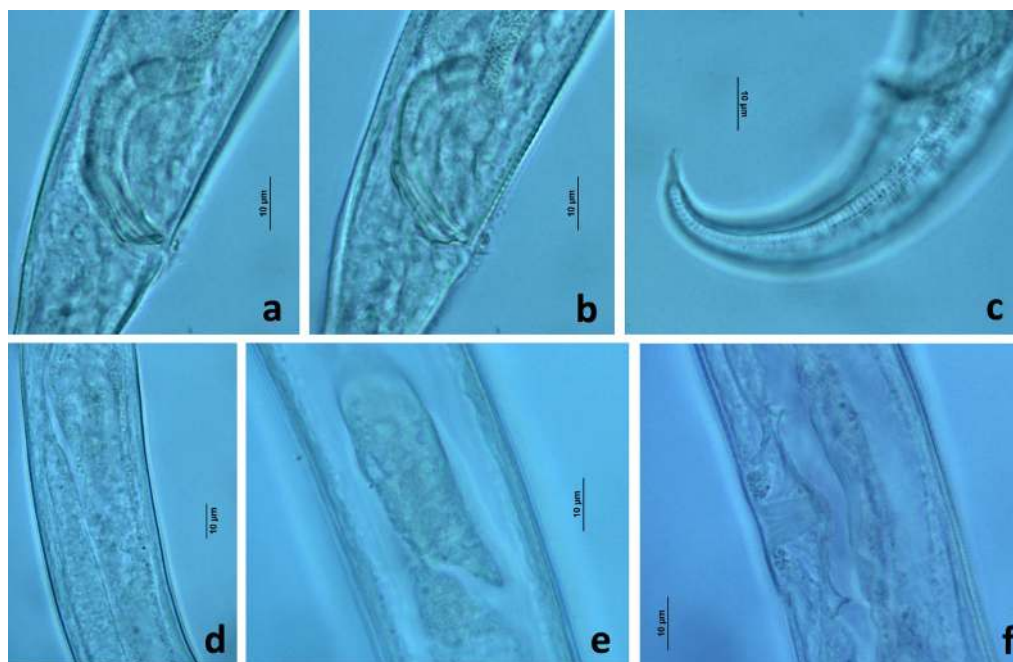


Figure 4. *Ptycholaimellus macrodentatus* (a) spicules, (b) gubernaculum, (c) tail, (d) testicular part, (e) Anterior ovary, (f) vulva.

ratio of double pharyngeal bulb with total pharynx recorded little bigger than the previous description. Several chromadorid genera like *Hypodontolaimus* and *Ptycholaimellus* were listed as predators/omnivores (2B) in Wieser's (1953) original classification because of their large tooth and pronounced muscular pharynx, but the few available observations suggest that they are actually epistrate-feeders (2A type) (Nehring, 1992; Moens and Vincx, 1997). The record of free-living marine Nematode from the coastal India is scanty. Therefore this new finding will significantly add importance in the

distributional data of the species as well as enrich the national faunal inventory.

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