



Short Communication

Description of *Enoplus minimus* n.sp. (Nematoda: Enoplida) from Mangrove Areas of Sandspit Backwater, Karachi, Sindh, Pakistan

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ABSTRACT

Enoplus minimus n.sp. of free-living marine nematodes of the family Enoplidae Dujardin, 1845, collected from the mangrove areas of Sandspit backwater, Karachi, Pakistan is being described and illustrated. The new species differs from all the other species of the genus *Enoplus* Dujardin, 1845 in having smallest body size (0.94-1.15 mm) in male and (0.93-1.15 mm) in female. *E. minimus* is characterized by its small body length; lip region slightly offset and wider than adjoin body; cephalic setae 0.6-0.7 head diameter; amphids at level of the posterior end of cephalic capsule; relatively short spicules 34-50 µm; gubernaculum 4-10 µm long, conico-cylindrical tail 32-44 µm long, first curved ventrally then slightly bent dorsally with three terminal setae. The new species comes close to *E. mammillatus* Timm, 1959 but differs in smaller body length (L= 0.94-1.15 vs 1.9-2.9 mm); in higher value of 'c' ratio (21.36-33.47 vs 9.5-16); in shorter spicules and supplement (Spi= 34-50 vs 112-125; Supp= 14-20 vs 55-60 µm). The new species is also similar to *E. sacculus* Gerlach, 1958 but differs in smaller body length (L= 0.94-1.15 vs 1.43 mm); in lower value of 'a', 'b' and higher value of 'c' ratio (a= 24.75-34.73 vs 43; b= 4.54-5.02 vs 6; c= 21.36-33.47 vs 15.1); in larger spicules (Spi= 34-50 vs 30-33 µm). The new species also resembles to *E. schulzi* Gerlach, 1952 but differs in shorter body and spicules length (L= 0.94-1.15 vs 1.93-2.0 mm; Spi= 34-50 vs 60-63 µm); in lower value of 'b' and 'c' ratio (b= 4.54-5.02 vs 5.3-5.8; c= 21.36-33.47 vs 37-43). An up-to-date list of 41 valid and one new species is also provided.

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Authors' Contribution

SW conducted the survey, sample collection, processing and prepared the manuscript. NK did identification of specimens and reviewed the manuscript. RMT supervised the research work.

Key words

Marine nematode, *Enoplus minimus* n.sp., Mangrove, Sandspit, Karachi, Pakistan

The genus *Enoplus* Dujardin, 1845 is represented by 41 valid species (WoRMS, 2023) and is one of the largest group of the family Enoplidae. Free-living marine species of this genus are widespread while few species are cosmopolitan in distribution (Fadeeva and Yushin, 1998).

Pakistan is very rich in mangrove area which occupied 250,000 ha therefore the Indus Delta is the sixth largest mangrove area in the world (Saifullah *et al.*, 1994). Mangroves are found mainly in subtropical and tropical intertidal regions of the world and are salt tolerant forests. They provide breeding, nursery ground and of great economic importance to mankind. The area is also important for shell, aquaculture and fish farming (Huda and Khan, 1996).

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The mangroves along the coastal areas of Pakistan are inhabited by a variety of free-living marine nematode fauna. They play important role in protection of hinterland against cyclones and the ingress of the sea water during tidal surge. They also stabilize coastal land mass against sea erosion (Shekhawat and Dixit, 2005).

The genus *Enoplus* Dujardin, 1845 is characterized by three solid mandibles, lips low, labial sensilla papilliform, teeth absent, eye spots present or absent, preloacal supplements present, body length 4-10 mm long. From Pakistan, studies on free-living marine nematodes associated with mangroves were reported by Nasira and Shahina (2007), Nasira *et al.* (2010), Nasira and Shahina (2012). Nasira and Shahina (2007) reported *Enoplus* sp. for the first time from mangrove areas of Sandspit backwater, Karachi.

During the present study a new species *Enoplus minimus* n.sp. collected from mangrove areas is being described and illustrated herein.

Materials and methods

Meiofaunal samples were collected from the

mangrove areas of Sandspit backwater and fixed in 4% Formalin and stained with Rose Bengal. Specimens were extracted by decanting and sieving method (Cobb, 1918). By using binocular microscope specimens were handpicked with a fine pipette and processed by placing in a solution of 1.5% aqueous glycerol in distilled water (Seinhorst, 1959), mounted permanently on glass slide, covered with cover slip, sealed by paraffin wax, supported by a glass rod and studied under compound microscope. Identification was made by Warwick *et al.* (1998). Line drawings were prepared with camera Lucida attached to Nikon compound microscope. For still photomicrography DS-L2 camera was used.

***Enoplus minimus* n.sp.**
(Figs. 1, 2)

Measurements

Measurements of new species are given in Table I.

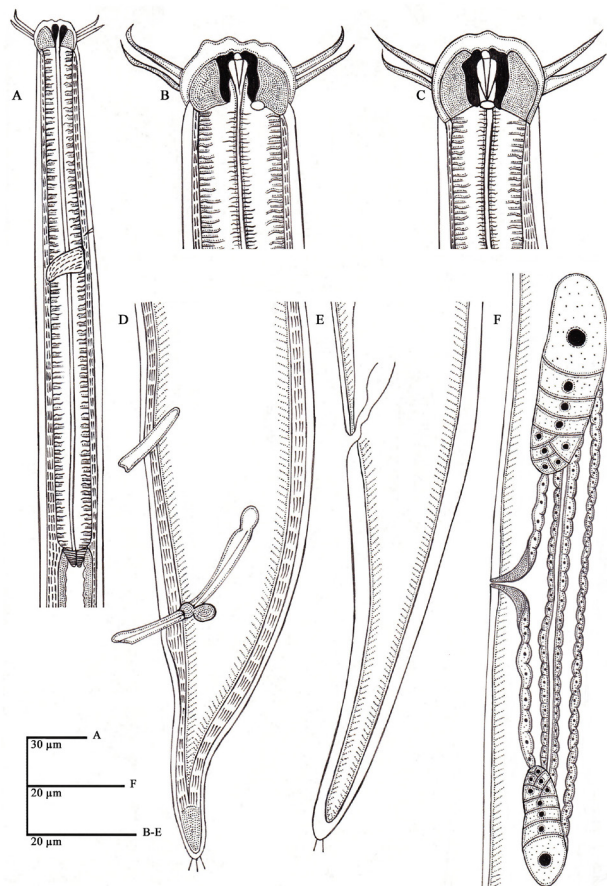


Fig. 1. *Enoplus minimus* n.sp. Male: A, Esophageal region; B, Anterior region; D, Tail region. Female: C, Anterior region; E, Tail region; F, Reproductive system.

Table I. Measurements (Mean $\pm$ SD, in μ m except L in mm) of *Enoplus minimus* n.sp. Ranges are given in brackets.

Characters	Holo-type male	Paratype males (n=10)	Paratype females (n=10)
L	1.09	1.03 $\pm$ 0.07 (0.94-1.15)	1.08 $\pm$ 0.06 (0.93-1.15)
a	31.14	30.98 $\pm$ 2.96 (24.75-34.73)	32.26 $\pm$ 1.73 (29.24-36.12)
b	4.54	4.72 $\pm$ 0.13 (4.54-5.02)	4.88 $\pm$ 0.20 (4.67-5.40)
c	25.64	27.45 $\pm$ 3.53 (21.36-33.47)	15.80 $\pm$ 2.67 (12.48-20.80)
$\dot{c}$	1.88	1.69 $\pm$ 0.14 (1.45-1.88)	3.23 $\pm$ 0.64 (2.0-4.15)
V%	-	-	54.87 $\pm$ 2.28 (50.38-57.31)
G ₁ %	-	-	7.05 $\pm$ 1.33 (4.76-9.03)
G ₂ %	-	-	7.21 $\pm$ 0.89 (5.87-8.51)
Head width	17.5	19.05 $\pm$ 1.10 (17.5-21)	19.4 $\pm$ 0.8 (18-20)
Body width at base of 30 esophagus		30.5 $\pm$ 3.77 (23-36)	30.5 $\pm$ 2.15 (26-33)
Body width at mid body	35	33.7 $\pm$ 3.52 (29-41)	33.9 $\pm$ 2.25 (30-37)
Body width at anus	22.5	22.55 $\pm$ 1.73 (20-27)	22.1 $\pm$ 1.64 (20-26)
Spicules length	36	40.9 $\pm$ 4.92 (34-50)	-
Gubernaculum length	9	7.8 $\pm$ 2.56 (4-10)	-
Supplement length	14	16.4 $\pm$ 2.28 (14-20)	-
Tail length	42.5	38.15 $\pm$ 3.75 (32-44)	70.8 $\pm$ 11.52 (52-91)

Description

Male

Body small stout, slightly tapers to the anterior end. Cuticle smooth and thick 1-2 μ m throughout the body. Head bluntly rounded. Six prominent inner labial papillae and outer circle of 10 (6+4) cephalic setae. Six longer cephalic setae 12-15 μ m, 68-71% of the head width. Four shorter setae 12-13 μ m. Cephalic capsule 13-14 μ m long. Maximum body width 29-41 μ m. Mandibles solid 8-12 μ m long about 45-57% of head diameter. Amphid 8-12 μ m

from anterior end, amphid opening small, rounded, situated at posterior edge of the cephalic capsule. Esophagus cylindrical, 200-240 μ m long. Cardia well developed, 10-14 μ m long. Nerve ring 110-116 μ m from anterior end, situated at 48-55% of esophageal length from anterior extremity of head. Ocellar pigments absent. Excretory pore of renette opening 90-110 μ m from head end, slightly anterior to nerve ring. Short setae in the anterior and caudal regions of males absent. Gonads opposed, outstretched. Spicules smooth symmetrical, curved 34-50 μ m long. Gubernaculum small, bifurcate distally and rounded lateral piece. Pre-cloacal supplement tubular shaped, 14-20 μ m long, 21-32 μ m anterior to cloacal opening. Tail conico-cylindrical, 32-44 μ m long, about 1.4-1.8 times of anal body diameter, with three terminal setae.

Female

Similar to male in general habitus. Cephalic setae 10-14 μ m. Body length 0.93-1.15 mm long. Mandibles 10-12 μ m long. Cephalic capsule 12-14 μ m long. Maximum body diameter 30-37 μ m. Reproductive system amphidelphic with two opposed reflexed ovaries. Vulva 522-650 μ m from anterior end, situated at 50-57% of total body length. Tail length 52-91 μ m long, about 2-4 times of anal body diameter.

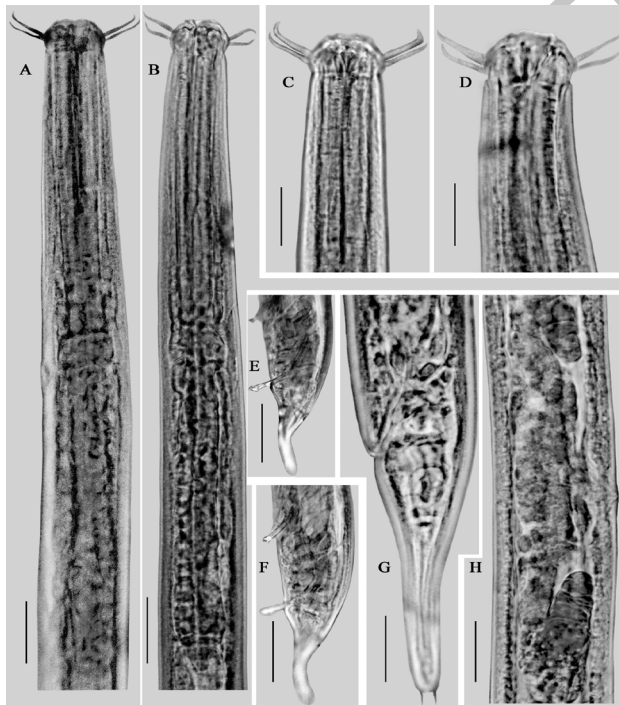


Fig. 2. *Enoplus minimus* n.sp. Male: A, Esophageal region; C, Anterior region; E-F, Tail region. Female: B, Esophageal region; D, Anterior region; G, Tail region; H, Reproductive system. Scale A- B=30 μ m; C-H=20 μ m.

Type locality

Specimens were collected from mangrove areas of Sandspit backwater, Karachi, Sindh, Pakistan.

Type specimens

Slides of holotype and paratype specimens are deposited in the Nematode Collection of National Nematological Research Centre, University of Karachi, Karachi-75270, Pakistan.

Etymology

The species name *minimus* is Latin meaning small and refers to small size of the body.

Differential diagnosis

Enoplus minimus n.sp., differs from all other species of the genus *Enoplus* Dujardin, 1845 in having smallest body size (0.94-1.15 mm) in male and (0.93-1.15 mm) in female. The new species is characterized by its small body length; lip region slightly offset and wider than adjoin body; cephalic setae 0.6-0.7 head diameter; amphids at level of the posterior end of cephalic capsule; relatively short spicules 34-50 μ m; gubernaculum 4-10 μ m long, conico-cylindrical tail 32-44 μ m long, first curved ventrally then slightly bent dorsally with three terminal setae.

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List of valid species of *Enoplus* Dujardin, 1845

Type species

Enoplus tridentatus Dujardin, 1845

Other species

Enoplus alatus Ssaweljev, 1912; *E. alpha* Inglis, 1971; *E. anisospiculus* Nelson, Hopper and Webster, 1972; *E. auriculatus* Ssaweljev, 1912; *E. behringicus* Filipjev, 1916; *E. benhami* Ditlevsen, 1930; *E. brachyuris* Ditlevsen, 1923; *E. brevis* Bastian, 1865; *E. communis* Bastian, 1865; *E. constrictus* Ditlevsen, 1926; *E. crassus*

Filipjev, 1916; *E. demani* de Man, 1886; *E. flagellicaudatus* Schuurmans Stekhoven, 1943; *E. geminivelatus* Hopper and Cefalu, 1973; *E. groenlandicus* Ditlevsen, 1926; *E. harlockae* Inglis, 1964; *E. heardensis* Mawson, 1958; *E. inermis* Bastian, 1865; *E. kurilensis* Fadeeva and Yushin, 1998; *E. leydigii* Eberth, 1863; *E. littoralis* Filipjev, 1918; *E. macrophthalmus* Eberth, 1863; *E. maeoticus* Filipjev, 1916; *E. mammillatus* Timm, 1959; *E. marinus* (Leidy, 1855) Walton, 1927; *E. meridionalis* Steiner, 1921; *E. michaelsoni* (von Linstow, 1896) de Man, 1904; *E. micrognathus* Allgén, 1947; *E. minimus* n.sp.; *E. obtusocaudatus* Eberth, 1863; *E. paralittoralis* Wieser, 1953; *E. paralpha* Fadeeva and Yushin, 1998; *E. polaris* Filipjev, 1946; *E. quadridentatus* Berlin, 1853; *E. sacculus* Gerlach, 1958; *E. schulzi* Gerlach, 1952; *E. serratus* Ditlevsen, 1926; *E. sphaericus* Kreis, 1928; *E. striatus* Eberth, 1863; *E. taipingensis* Zhang and Zhou, 2012; *E. tridentatus* Dujardin, 1845; *E. velatus* Wieser, 1959.

Statement of conflict of interest

The authors have declared no conflict of interest.

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