

TWO NEW RECORDS OF DORYLAIMID NEMATODE (NEMATODA: DORYLAIMIDA) FROM INDIA

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ABSTRACT

Promuntazium pyxidorum Siddiqi, 1982 and *Nygotaimus brachyuris* (De Man, 1880) Thorne, 1930 have been reported for the first time from India. *Promuntazium pyxidorum* Siddiqi, 1982 have been observed both from the forest ecosystem of Bharatipura Hills, Keonjhar district, Odisha and Ramnabagan WLS, commonly known as Bardhaman Zoological Garden, Bardhaman district, West Bengal. *Nygotaimus brachyuris* (De Man, 1880) Thorne, 1930 has been reported from the island ecosystem of Hope Island, Coringa WLS, East Godavari dist, Andhra Pradesh. Soil samples have been processed following standard methods of Cobbs Sieving and Decantation method and modified Baerman funnel technique to extract the nematode specimens. *Promuntazium pyxidorum* was first described by Siddiqi in 1982 from the Colombian rainforest, and its distribution was later reported in Japan and South Korea. On the other hand, *Nygotaimus brachyuris* was first described as *Dorylaimus brachyuris* by De Man in 1880, based on specimens from the Netherlands and Norway. It was later transferred to the genus *Nygotaimus* by Thorne in 1930, with reports from Salem, Utah, with wide distribution in world. *Promuntazium pyxidorum* is characterized by a didelphic female genital system, a short, rounded tail, a fusiform odontostyle, and a distinctly sclerotized tip of the lip region. *Nygotaimus brachyuris* is characterized by comparatively feeble spear as long as width of lip region with rectum and prerectum somewhat longer than anal body diameter.

Keywords: Soil Nematoda, Dorylaimida, *Nygotaimus brachyuris*, New records, India.

INTRODUCTION

Nematodes are primitive, pseudo-coelomate invertebrates that play both beneficial and harmful roles in the soil microhabitat. Within agroecosystems, they are economically significant, as some species cause considerable crop losses worldwide. Conversely, nematodes also play a beneficial role in soil health by facilitating the decomposition of organic matter (Yeates & Coleman, 1982), promoting nitrogen mineralization, and supporting nutrient cycling, all of which are essential for sustaining a stable and healthy soil ecosystem. Based on their feeding behavior, nematodes can be classified as plant feeders, fungal feeders, bacterial feeders, predators, and omnivores (Yeates *et al.*, 1993). These categories are further refined into microbial feeders, predators, and parasites, depending on their feeding structures and strategies (Hodda, 2022). In the present study, *Promuntazium pyxidorum* Siddiqi, 1982, and *Nygotaimus brachyuris* (De Man, 1880) Thorne, 1930, both belonging

to the order Dorylaimida, are reported for the first time from India. *Promuntazium pyxidorum* was described as the type species of the genus *Promuntazium* by Siddiqi in 1982 from Columbian Rain Forest and later the species also found from Japan and South Korea. *Nygotaimus brachyuris* was originally described as *Dorylaimus brachyuris* by De Man in 1880, based on specimens from the Netherlands and Norway. It was later reclassified under the genus *Nygotaimus* by Thorne in 1930, based on specimens from Salem, Utah, and is widely distributed globally, with recent reports from Korea (Kim *et al.*, 2021). *Promuntazium pyxidorum* Siddiqi, 1982 has been reported from the forest ecosystem of Bharatipura Hills, Keonjhar district, Odisha, and Ramnabagan Wildlife sanctuary, commonly known as Bardhaman Zoological Garden, Bardhaman district, West Bengal while *Nygotaimus brachyuris* (De Man, 1880) Thorne, 1930 has been reported from the island ecosystem of Hope Island, located within the Coringa Wildlife Sanctuary, East Godavari district, Andhra Pradesh.

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Previous works on the genus *Promuntazium* from India is not very highlighted. The study of *Promuntazium indicum* Mustaq, Naz and Ahmad, 2007 has been studied previously from Jammu & Kashmir dist. with a comparative analysis to *Promuntazium pyxidorum* (Ahad, 2017). In the Indian context, research on *Nygotaimus brachyuris* has predominantly focused on its feeding behavior, particularly its potential role in the biological control of plant-parasitic nematodes, thereby highlighting its ecological significance in sustainable agriculture. (Bilgrami, Ahmad & Jairajpuri, 1986; Bilgrami & Jairajpuri, 1988; Bilgrami & Brey, 2005). The genus *Promuntazium* Siddiqi, 1982 currently comprises eight described species worldwide, whereas the genus *Nygotaimus* Cobb, 1913 includes thirty-six species, eight species of which are considered taxonomically uncertain at the generic level.

MATERIALS AND METHODS

Approximately 500 grams of soil were collected from the rhizosphere of plants of forest ecosystem at the specified localities using a hand shovel. Soil samples were collected in polythene bags and sealed with rubber bands to prevent moisture loss. Geographical coordinates of each sampling site were recorded using a GPS device. The samples were then transported to the laboratory for further processing. Nematodes were extracted following Cobb's sieving and decantation technique (Cobb, 1918), wherein the soil was sieved through a series of mesh sizes. The refined samples were then subjected to the modified Baermann funnel technique (Christie and Perry, 1951) to extract nematodes. The extracted nematodes were killed and fixed immediately using Seinhorst's method, employing hot formaldehyde-acetic acid (FA) solution, and preserved in the same fixative. Individual nematodes were handpicked and transferred to a glycerine-alcohol solution for gradual dehydration in a desiccator for a period of 4–6 weeks, depending on ambient humidity. Following complete dehydration, permanent slides were prepared for

microscopic examination. Specimens were studied and documented using a Nikon Eclipse Ni Differential Interference Contrast (DIC) microscope for taxonomic identification and photomicrography.

SYSTEMATIC ACCOUNT OF THE SPECIES

Phylum NEMATODA Rudolphi, 1808 (Lankester, 1877)

Order DORYLAIMIDA Pearse, 1942

Suborder DORYLAIMINA Pearse, 1936

Superfamily TYLENCHOLAIMOIDEA Filipjev, 1934

Family TYLENCHOLAIMIDAE Filipjev, 1934

Subfamily MUMTAZIINAE Andrassy, 1976

Genus *Promuntazium* Siddiqi, 1982

1. *Promuntazium pyxidorum* Siddiqi, 1982

Suborder NYGOLAIMINA Ahmad & Jairajpuri, 1979

Superfamily NYGOLAIMOIDEA Thorne, 1935

Family NYGOLAIMIDAE Thorne, 1935

Subfamily NYGOLAIMINAE Thorne, 1935

Genus *Nygotaimus* Cobb, 1913

2. *Nygotaimus brachyuris* (De Man, 1880) Thorne, 1930

Promuntazium pyxidorum Siddiqi, 1982 (Plate:1)

Material examined: 01 female. India, Odisha, Keonjhar dist., Bharatipura Hills, Lat 21°25'28" N and long 85°49'06" E; 11.vii.2021, Coll. S. Kumar, ZSI Registration number: ZSI/WN3418; 01 female. India, West Bengal, Bardhaman dist., Ramnabagan WLS, Lat 23°15.151N and long 87°51.108E; 12.ii.2021, Coll. D. Sen, ZSI Registration number: ZSI/WN4131/1.

Dimensions: Shown in Table 1.

Table 1. Morphometrics of *Promuntazium pyxidorum* Siddiqi, 1982 and *Nygotaimus brachyuris* (De Man, 1880) Thorne, 1930 All measurements in μm (except L and body ratios, L in mm).

	<i>Promuntazium pyxidorum</i>	<i>Nygotaimus brachyuris</i>
n	n = 02 Females	n = 01 Female
Characters	Minimum - Maximum	
L	0.72-1.14	1.61
a	27.8-35.2	42.4
b	3.5-4.5	3.3
c	42.5-49.5	0.9
c'	1.0-1.27	1.1
V %	61.4	54.4
G ₁ %	20.0	9.0
G ₂ %	22.4	9.6
Length of odontostyle	8.3-8.5	-
Length of odontophore	15.5-16.0	-
Guiding ring from anterior end	5.5-5.8	6.0

Maximum body width	26.0-32.3	38.0
Length of Pharynx	201.0-251.0	485.0
Length of Expanded Pharynx	85.0-118.0	267.0
Lip height	3.0-3.5	4.5
Lip width	8.5-9.5	15.5
Lip adjoining body width	9.5-11.5	16.5
Cuticle anterior end	1.5	1.5
Cuticle at mid body	1.5-2.0	1.0
Cuticle on tail	1.5-2.5	2.0
Vulva from anterior end	444.0	877.0
Length of vagina	08.0-12.0	19.0
Length of anterior gonad	133.0-145.0	146.0
Length of uterus	33.0-39.00	43.0
Length of oviduct	50.0-60.0	63.0
Length of ovary	44.0-52.0	49.0
Length of posterior gonad	Not distinct	155.0
Length of uterus	-	35.0
Length of oviduct	-	65.0
Length of ovary	-	46.0
Tail length	17.0-23.0	23.0
Anal body diameter	17.0-18.0	24.0
Length of prerectum	41.5-42.0	123.0
Length of rectum	24.5-27.0	34.0

Diagnosis: Female: Body slightly arcuate on fixation with faint radial elements in cuticle. Cuticle is thicker in tail region gradually from the anterior end. Lip region is offset by sudden expansion with slightly raised papillae. Lip region is slightly narrower than lip adjoining body or about 1/3 of maximum body width. Amphids small and pocket like. Odontostyle fusiform with sclerotized tip. Odontophore length double the odontostyle with simple and dorylaimoid structure. Guiding ring is 1.5 lip region width from anterior end. Pharynx muscular with broad lumen, expanded part of pharynx 1/2.5 pharyngeal length. Cardia small sub-digitate. Vulva transverse, slightly post-equatorial. Vagina about half of maximum body width, not

sclerotized. Female genital system didelphic-amphidelphic, ovaries reflexed, both genital branches developed. Posterior gonad is longer than anterior gonad. Prerectum 2.4 and rectum 1.5 anal body diameter long. Tail short convex with rounded terminus, one anal body width long.

Habitat and locality: Collected from soil around the roots of wild forest plant from Bharatipura hills, Keonjhar dist. Odisha, and Ramnabagan WLS, Bardhaman dist., West Bengal, India.

Distribution in world: Columbia, Japan, South Korea. (Figure 1).

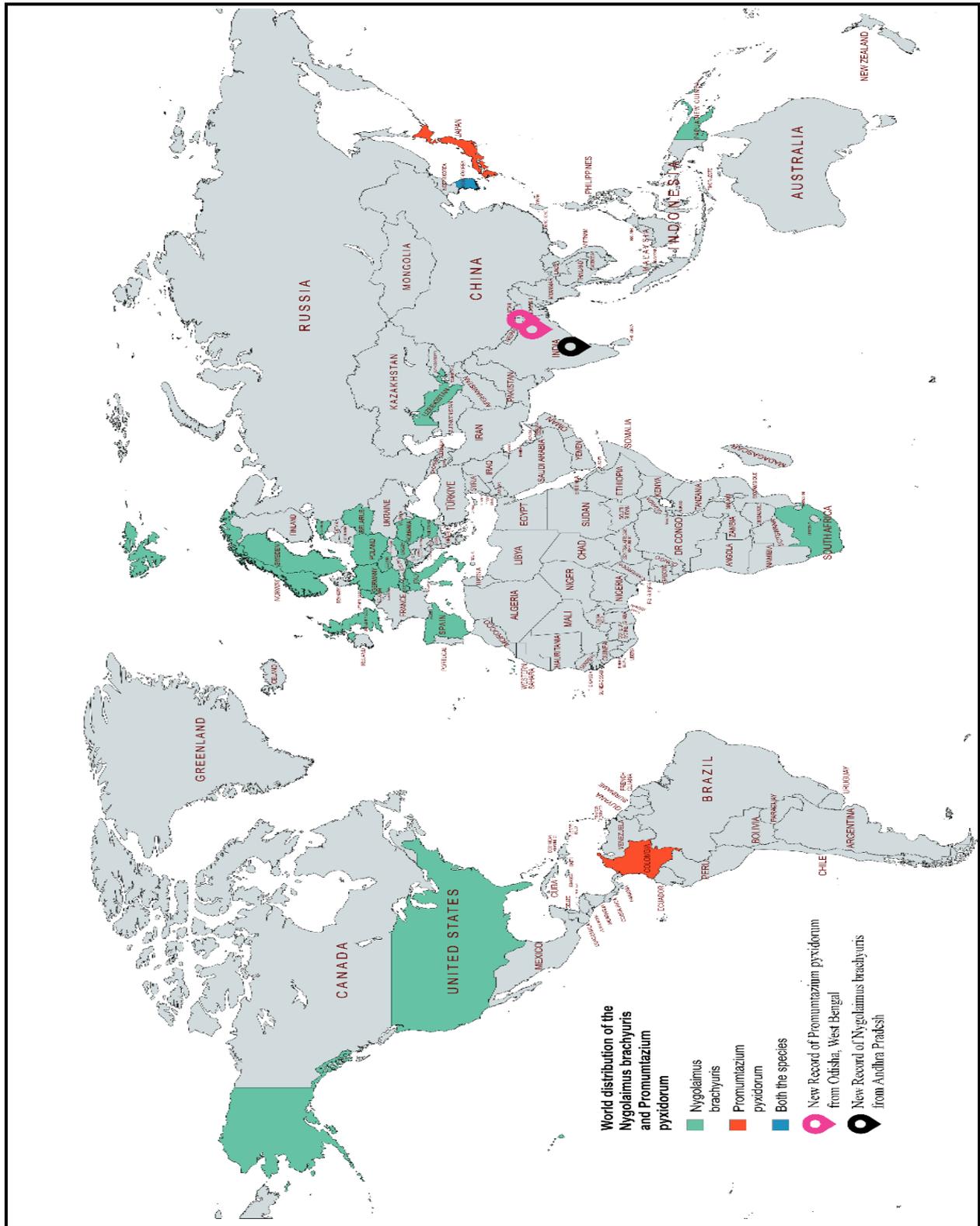


Figure 1. Distribution map of *Promuntazium pyxidorum* and *Nygolaimus brachyuris* in world and in India.

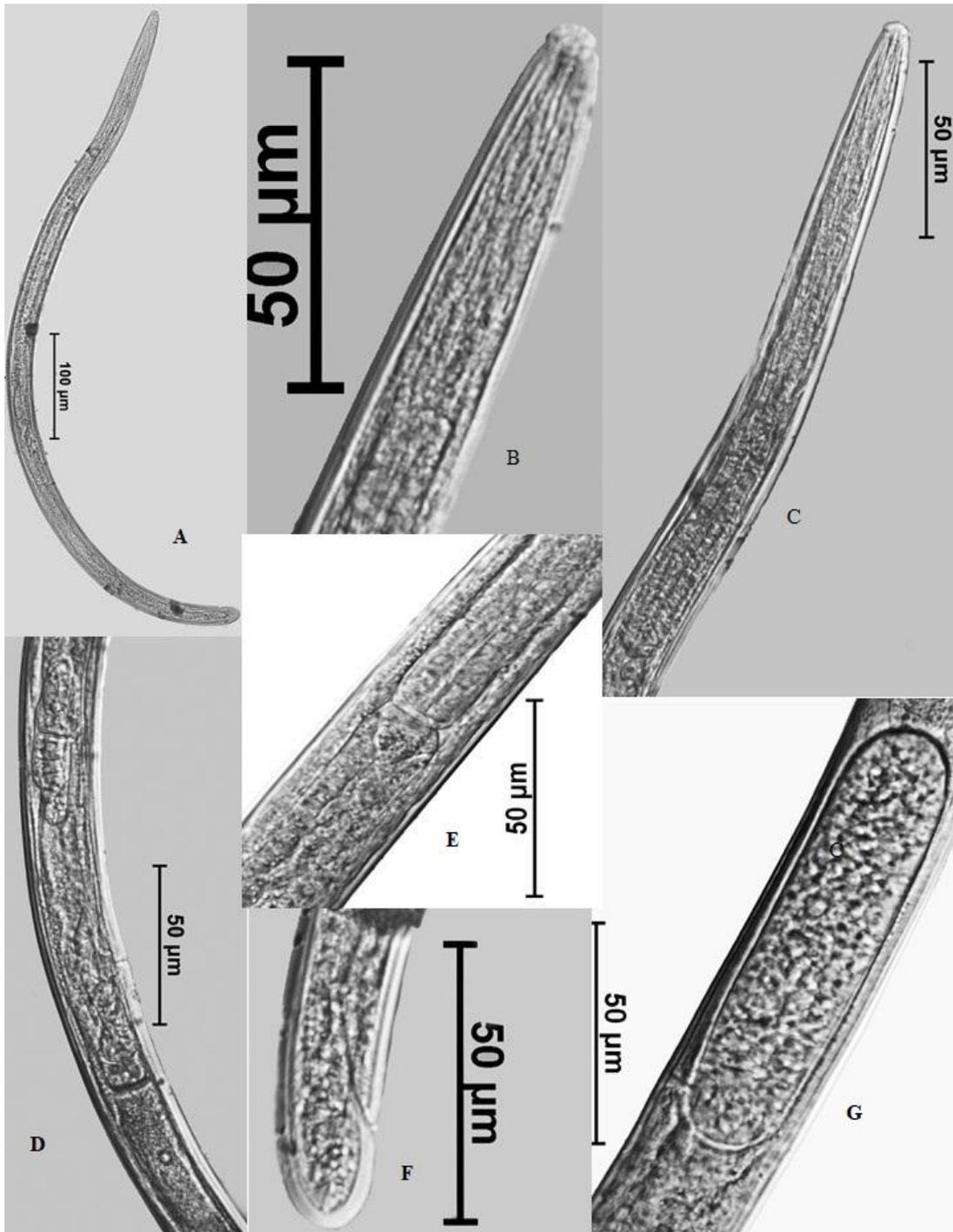


Plate 1 (A-G) . Photomicrographs of *Promuntazium pyxidorum* Siddiqi, 1982. A. Entire Female. B. Odontostyle. C. Pharynx. D. Vulva and Gonads. E. Cardia. F. Posterior end showing Tail. G. Intra-uterine egg.

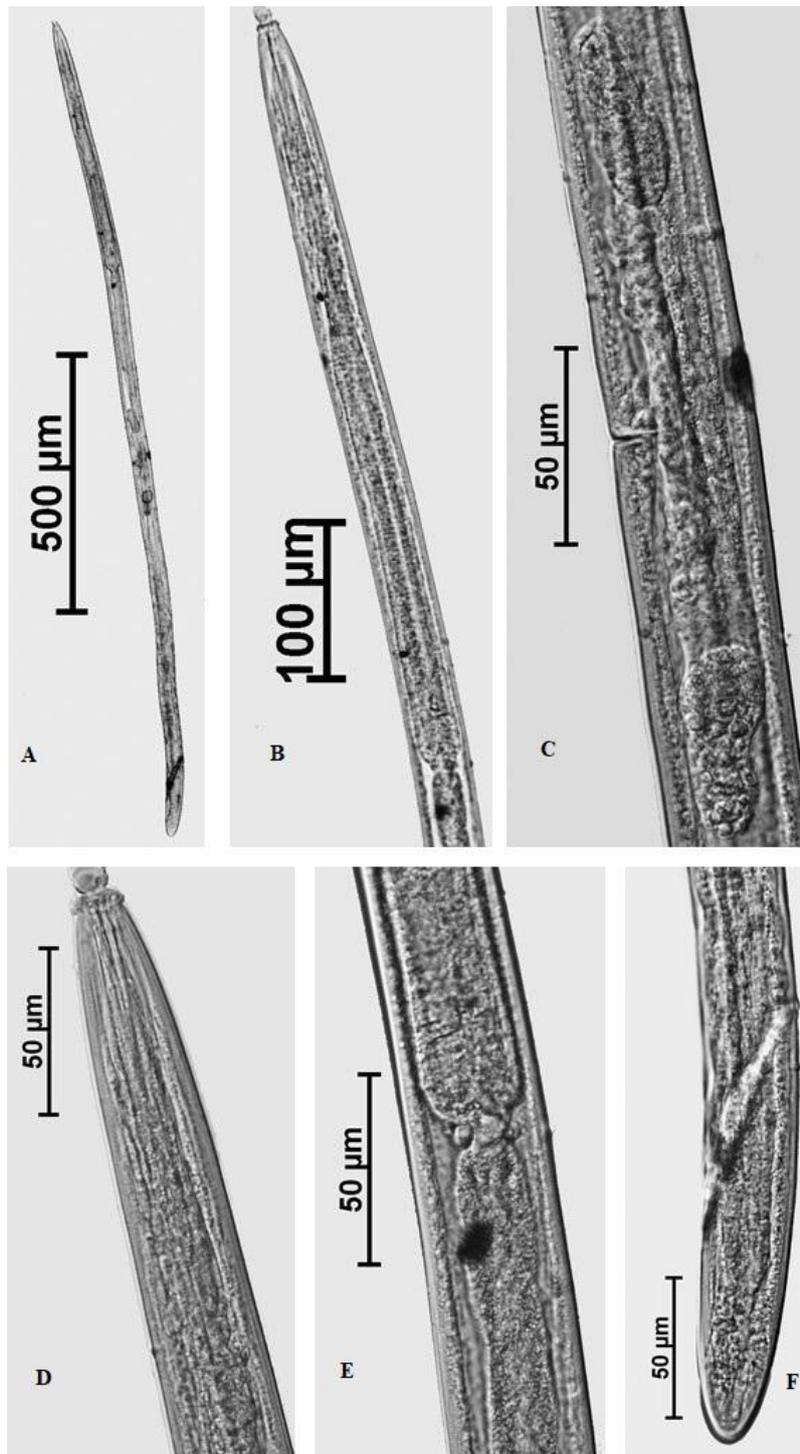


Plate 2 (A-F). Photomicrographs of *Nygolaimus brachyuris* (De Man, 1880) Thorne, 1930 1982. A. Entire Female. B. Pharynx. C. Vulva and Gonads. D. Mural Tooth. E. Cardia with glands. F. Posterior end showing Tail.

Remark: Promuntazium pyxidorum can be characterized by its elevated lip region with slight offset and the presence of fusiform odontostyle with sclerotized tip and wide lumen. This is the first record of the species from India.

Nygolaimus brachyuris (De Man, 1880) Thorne, 1930 (Plate: 2)

Material examined: 01 female. India, Andhra Pradesh, East Godavari dist., Coringa WLS, Hope Island, Lat 16°57'27" N and long 82°21'30" E; 07.ii.2020, Coll. D. Sen.

Dimensions: Shown in Table 1.

Diagnosis: Female: Body slender, almost straight upon fixation. Cuticle smooth and more or less uniformly thick throughout the body with little narrower in mid portion. Lip region set off by constriction and slightly less than the adjoining body, 4.5 µm high, 15.5 µm wide. Amphid obscure as wide as lip region diameter. Mural tooth comparatively feeble, 1/1.2 lip width. Slender anterior part of pharynx muscular, expanded part nearly half of the total pharyngeal length. Glandularium 1/1.4 total pharyngeal length. Pharyngeal gland nuclei located as follows: D = 54.2%, AS1 = 39.3%, PS1 = 70.1%, AS2 = 44.3%, PS2 = 71.4%. Cardiac glands rounded. Vulva transverse, nearly equatorial. Length of vagina about half of the corresponding body diameter. *Pars distalis* and *Pars refringens* vaginae nearly equal in size. Female genital system didelphic-amphidelphic. Both genital branches well developed, posterior gonad longer than anterior gonad. Ovaries reflexed up to oviduct-uterus junction. One female with an intra-uterine egg in the anterior genital branch measuring 104.5µm x 26.0µm. Prerectum 5.0 and rectum 1.4 anal body diameter long. Tail is slightly dorsally convex with rounded terminus nearly equal anal body diameter long.

Habitat and locality: Collected from soil around the roots of Casuarina (*Casuarina* sp.) from Coringa WLS, East Godavari dist., Andhra Pradesh, India.

Distribution in world: Belarus, Bulgaria, Czech, Estonia, Hungary, Germany, Italy, Korea, Mauritius, Netherlands, New Guinea, Norway, Poland, Romania, Sardinia, Slovenia, South Africa, Spain, Switzerland, Sweden, United Kingdom, United States, Uzbekistan. (Figure 1).

Remark: Nygolaimus brachyurisis is characterized by short tail, wider body and weak mural tooth. De Man described this species as *Dorylaimus brachyuris* which later Thorne transferred to *Nygolaimus*. This is the first report of the species from India.

The morphometrics of *Promuntazium pyxidorum* and *Nygolaimus brachyuris* specimens are shown in Table 1. The physical variation observed in *P. pyxidorum* is minimal between the two mature female specimens collected from West Bengal and Odisha, India. Although there are slight differences in their morphometric characteristics, these remain within the expected range for the species. In the case of *N. brachyuris*, no definitive conclusions can be drawn due to the limited number of specimens examined. The geographical distribution of both species, including

new records from India, is illustrated in Figure 1. *N. brachyuris* exhibits a predatory-omnivorous feeding behavior, whereas *P. pyxidorum* displays both bacterivorous and plant-parasitic feeding habits.

CONCLUSION

The morphometric analysis of *Promuntazium pyxidorum* and *Nygolaimus brachyuris* reveals limited intraspecific variation among the specimens studied, with *P. pyxidorum* showing consistent morphological traits across samples from West Bengal and Odisha. Although *N. brachyuris* data is insufficient for definitive conclusions, its inclusion adds valuable insight into its presence in the Indian subcontinent. The study contributes new distribution records for both species in India and highlights their distinct ecological roles *P. pyxidorum* as a bacterivore and plant parasite, and *N. brachyuris* as a predatory-omnivore emphasizing the ecological diversity within nematode communities.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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