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NEMATODES FROM WEST BENGAL (INDIA) I. ON THE VARIATIONS IN TWO SPECIES OF DORYLAIMIDAE AND REDESCRIPTION OF *BELONDIRA NEORTHA* SIDDIQI, 1964 (BELONDIRIDAE).

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(With 3 Text-figures)

INTRODUCTION

During November-December, 1975 a survey was made to collect the soil samples from around roots of fruit trees, paddy and tea in the following three districts of West Bengal, *viz.* Cooch Behar, Jalpaiguri and Darjeeling. The analysis of these samples showed a wide variety of tylenchid, dorylaimid, mononchid and other soil inhabiting nematodes.

In this first paper on the series "Nematodes from West Bengal (India)", *Thornenema cavalcantii* (Lordello, 1955) Andrassy, 1959 and *Oriverutus sundarus* (Williams, 1964) Siddiqi, 1971 belonging to the family Dorylaimidae have been redescribed in detail and intraspecific variations have been noted. In one population of *Thornenema cavalcantii* the abnormal development of anterior sexual branch has also been reported. Since the original description of *Belondira neortha* Siddiqi, 1964 belonging to the family Belondiridae is based on a single female and a male, it was considered necessary to redescribe this species in detail.

For the sake of study of variations, three specimens of *Thornenema cavalcantii* from Sikkim (India) have also been included in the present study.

The nematodes were fixed in hot 4% formalin, transferred in glycerine-alcohol, dehydrated slowly in desiccator and mounted in anhydrous glycerine.

Thornenema cavalcantii (Lordello, 1955) Andrássy, 1959
(Text-fig. 1)

1955. *Dorylaimus cavalcantii* : Lordello, *Rev. Bras. Biol.*, **15** : 216
1964. *Thornenema cavalcantii* : Loof, *Nematologica*, **10** : 266
1965. *Thornenema cavalcantii* : Siddiqi, *Labdev J. Sci. Tech.*, **3** : 131

Measurements :

Matigrah population : Normal ♀ ♀ (4) : L = 0.99—1.12 mm; a = 27 — 32; b = 4.0 — 4.6; c = 11 — 12; V = $^{1.0-1.5}$ 41 — 45$^{11-12}$.

Abnormal ♀ ♀ (2) : L = 1.00 — 1 10 mm; a = 29 — 30; b = 4.2; c = 12; V = $^{6.5-7.5}$ 46 — 48 ^{12}.

Reang Testa population : ♀ ♀ (5) : L = 0.92 — 1.09 mm; a = 24 — 30; b = 4.0 — 4.6; c = 11 — 15; V = $^{1.2-1.8}$ 43 — 45 $^{13-16}$.

Lebong population : ♀ (1) : L = 1 16 mm; a = 28; b = 4.5; c = 12; V = $^{1.8}$ 44 ^{13}.

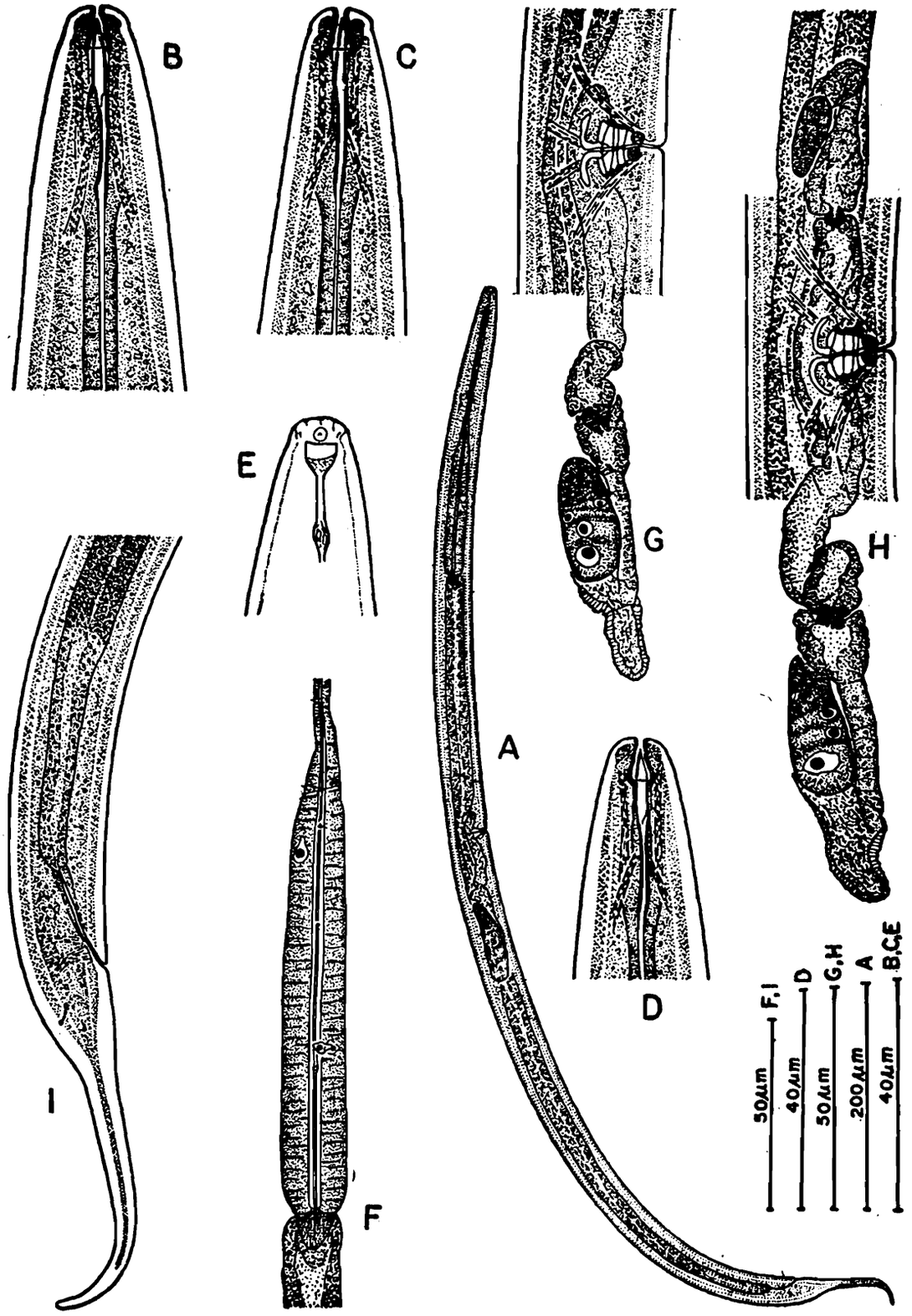
Sikkim population : ♀ ♀ (3) : L = 0.99 — 1.09 mm; a = 31 — 33; b = 3.9—4.3; c = 11 — 16; V = $^{1.3-2.1}$ 43 — 46 $^{11-14}$.

Description : Body slightly ventrally curved upon fixation, tapering somewhat towards both extremities. Cuticle finely striated transversely; its thickness 2 μm in mid-body and 4-5 μm at tail. Lateral chords granular, 1/7th — 1/5th of the body-width near middle. In some specimens the lateral glandular organs distinct, 14 — 22 in number, irregularly spaced, starting before base of oesophagus up to anus. Ventral, dorsal and lateral body pores not distinct.

Lip region usually marked with slight depression (Text-fig. 1, B), sclerotized, rounded, lips amalgamated; appears slightly offset when the specimen is in subdorso-lateral position (Text-fig. 1, C); continous with body in Sikkim population (Text-fig. 1, D); 1/3.6 — 1/3.0 of body-width at base of oesophagus. Amphids stirrup-shaped; apertures occupying 4 — 5 μm or 40-45% of the corresponding body-width and 4—5 μm from anterior extremity. Sensillar pouches 16-17 μm from amphidial apertures.

Odontostyle 11-13 μm or 1 1 — 1.2 lip region-width long; thickness about equal to corresponding body cuticle; aperture 4-5 μm or 35-42% of odontostyle length. Guiding ring 7-8 μm or 0.6-0.8 lip region-width from anterior extremity. Odontophore 15-18 μm or 1.2 — 1 5 times the odontostyle length. The anterior slender part of oesophagus gradually expands to form the basal expanded portion. The basal expanded portion of oesophagus occupying 46-49% of the neck region. The nuclei of first subventral pair of oesophageal glands are indistinct. Locations of oesophageal gland nuclei and their orifices as follows :

DO = 56.7—59.4 S_1O_1 = 68-72 S_2N = 81—82
DN = 60.0—62.8 S_2O = 83—84
DO—DN = 2.8—3.4



Text-fig. 1. *Thornenema cavalcantii.* A. Entire female. B. Anterior end in lateral view. C. Anterior end in subdorsolateral view. D. Anterior end in lateral view (Sikkim Population). E. Surface view of anterior end. F. Basal expanded part of oesophagus, oesophageal gland nuclei and their orifices. G. Normal female gonad. H. Abnormal development of anterior gonad. I. Posterior region.

Nerve ring 92-98 μm or 38-40% of neck region from anterior end. Cardia conoid with rounded tip, 8-11 μm long, enveloped by intestinal tissue. Prerectum 43-78 μm or 2.1-3.4 anal body-width long. Rectum 21-29 μm or 1.0—1.4 anal body-width long.

Vulva a transverse slit. Vagina extending inward 16-18 μm or about 1/2 of corresponding body-width, surrounded by sphincter, with moderately sclerotized distal region. Normally mono-opisthodelphic gonad. Anterior uterine sac rudimentary, 13-21 μm or about 1/3rd—2/3rd of corresponding body-width. Uterus and oviduct separated by sphincter; oöcytes arranged in a single row, except at growth region. Two abnormal specimens in Matigarh population are amphidelphic in which anterior sexual branch is also typical but reduced in size and length (Te. t-fig. 1, H). Sperm not seen. Egg 87-91 × 27-31 μm.

Tail elongate-conoid, posterior third bent dorsally with rounded terminus, 66-102 μm or 3.1—5.0 anal body-width long, with two caudal pores on each side.

Male: Not found.

Localities and habitats: Matigarh population: From soil around roots of Banana at Matigarh, 6 km from Siliguri on Siliguri-Darjeeling Road, District Darjeeling, West Bengal. Reang Testa population : From soil around roots of Banana at Reang Testa, District Darjeeling, West Bengal. Lebong population : From soil around roots of Banana at Lebong, District Darjeeling, West Bengal. Sikkim population: From soil around roots of Maize at Suntali, on the road to Singtom, Sikkim.

Remarks : Lordello (1955) originally described this species as *Dorylaimus cavalcantii* on a single female from Brazil. Andrássy (1959) transferred this species under his newly proposed genus *Thornenema* because of its amalgamated lip region, mono-opisthodelphic gonad and long tail. Loof (1964) reported two females from Venezuela and noted the following variations: longer and slender body (L = 1 15 — 1.25 mm against 0.99 mm and a = 35—36 against 26 in former), slightly offset lip region and not wholly rounded, wider lateral chords with the glands bulging less strongly and the absence of a constriction between oviduct and uterus. These differences were regarded by Loof (l.c.) as intraspecific variations. Siddiqi (1965) reported three females from India having more resemblance with the specimens from Venezuela except for the rounded and continuous lip region, thinner lateral chords (1/8th of body-width against 1/6th) and a constriction between uterus and oviduct.

The present study which is based on a larger number of specimens from 4 different localities reveals that the lip region is smoothly rounded, usually marked from the body by a slight depression or rarely continuous with body. The depression appears slightly deeper when the

specimen lies in subdorso-lateral position. The body length varies from 0.92—1 16 mm. The lateral chords vary from 1/7th—1/5th of body-width near middle, sometimes bearing irregularly spaced distinct lateral glandular organs. The uterus and oviduct are always separated by a well developed sphincter. Vagina is always moderately sclerotized distally, such sclerotization has hitherto not been described. The excretory pore, as reported by Loof (1964), could not be seen.

The amphidelphic condition of gonads in Matigarh population is being treated as an abnormality which does not warrant an emendation of diagnosis of the genus *Thornenema*.

Oriverutus sundarus (Williams, 1964) Siddiqi, 1971
(Text-fig. 2)

1964. *Eudorylaimus sundarus* : Williams, *Nematologica*, **10** : 319

Measurements : ♀♀ (3) : L = 0.88—0.98 mm; a = 24—28; b = 3.4—3.5; c = 19—21; V = $^{0.8}39 - 41^{12-16}$.

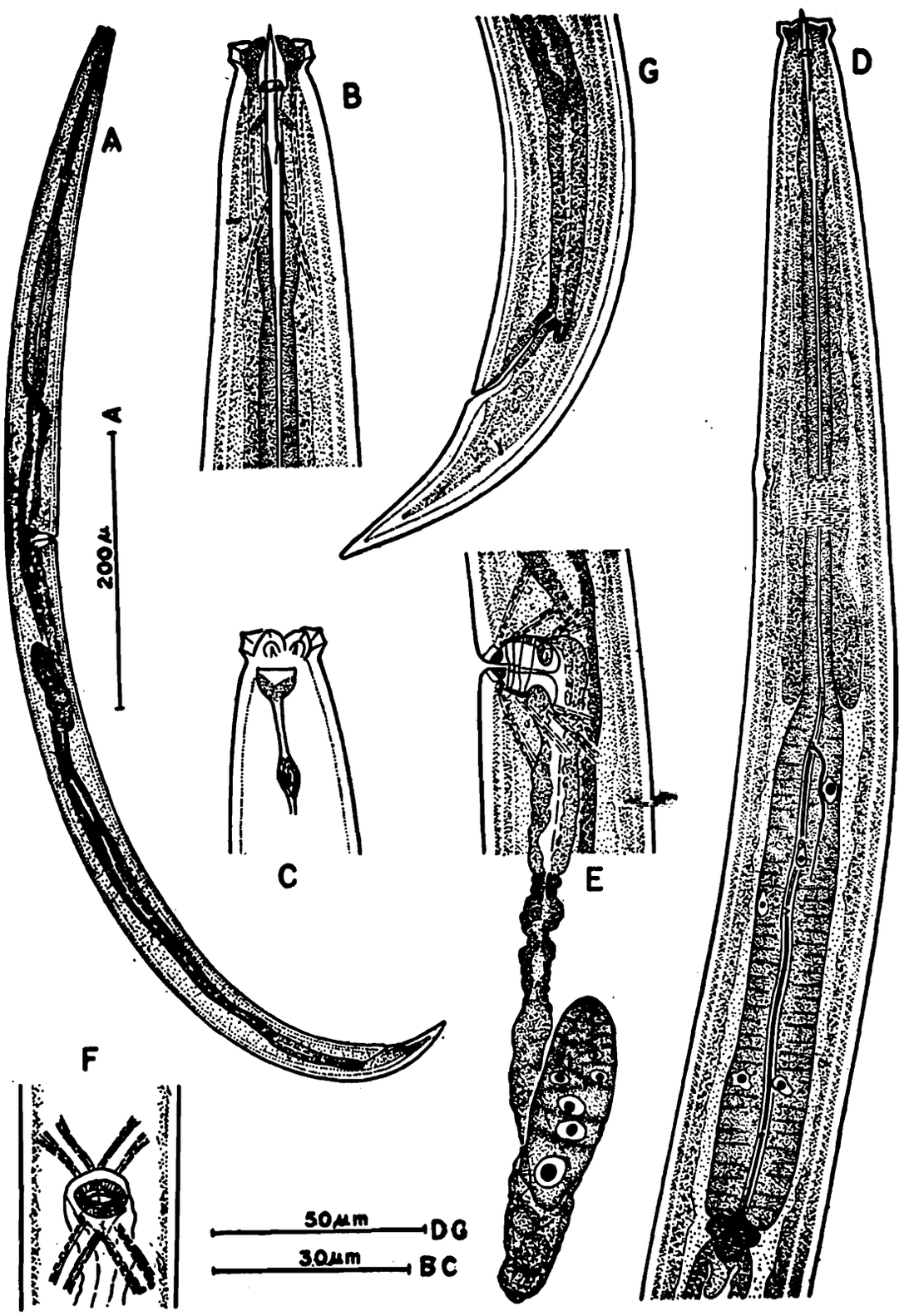
Description: Body ventrally curved in posterior half upon fixation, tapering gradually towards both extremities. Cuticle finely striated transversely; its thickness 2-3 μm in mid-body and 4-6 μm at tail. Lateral chords 1/9th—1/8th of body-width near middle. Ventral, dorsal and lateral body pores not distinct.

Lip region wider than adjoining body, marked by a distinct constriction from body, about 1/3rd of body-width at base of oesophagus; lip distinct, large, subangular. Amphids stirrup-shaped; apertures occupying 5-6 μm or 45-50% of the corresponding body-width, 5-6 μm from anterior extremity. Sensillar pouches 15-16 μm from amphidial apertures.

Odontostyle cylindrical, 16-17 μm or 1.4—1.5 lip region-width long, thickness slightly less than corresponding cuticle-width; aperture about 3 μm or 17-19% of odontostyle length. Guiding ring about 7 μm or 0.6 lip region-width from anterior extremity. Odontophore 19-21 μm or about 1.2—1.4 times the odontostyle length. The basal expanded part of oesophagus occupying 42-44% of neck region. Locations of oesophageal gland nuclei and their orifices as follows:

DO = 57.8—60.1	S_1N_1 = 68—70	S_2N = 88—91
DN = 61 7—64.1	S_1N_2 = 73—75	S_2O = 90—93
DO—DN = 3.9—4.0		
K = 54—59		K′ = 65-70

Distinct hemizonid present at 35-38% of neck region from anterior end. Nerve ring 102-106 μm or 35-41% of neck region from anterior end. Cardia with three lobes, enveloped by intestinal tissue. Prerectum 51-62 μm or 2.5—3.3 anal body-width long, with a lobe extending



Text-fig. 2. *Oriverutus sundarus*. A. Entire female. B. Anterior end. C. Surface view of anterior end. D. Neck region. E. Female gonad. F. Vulva in ventral view. G. Posterior region.

behind prerectum-rectum junction. Rectum 20-23 µm or 1.0—1.2 anal body-width long.

Vulva a transverse slit. Vagina extending inward 16-17 µm or slightly less than 1/2 of the corresponding body-width, moderately sclerotized distally. Mono-opisthodelphic gonad. Uterus and oviduct

separated by sphincter; oöcytes arranged first in single row, then in double rows and in multiple rows at growth region. Sperm not seen.

Tail ventrally curved, conoid, horn-shaped in profile with narrow blunt terminus, 47-48 μm or 2.3—2.5 anal body-width long with one caudal pore on each side.

Male: Not found.

Locality and habitat: From soil around roots of Tea at Mohargaon Tea Estate, District Darjeeling, West Bengal.

Remarks: The present specimens closely resemble with the original description of *O. sundarus* (Williams, 1964) except in having lips without prominent teat-like papillae, narrow and differently shaped amphids, distinct hemizonid, and tail with blunt terminus and not dorsally curved slightly near terminus. After Williams (1964) : Lips with prominent teat-like papillae, amphids occupying more than half (55% in Text-fig. 1, C) of corresponding body-width and are deeper, hemizonid not reported, and tail with sharply pointed terminus and slightly bent dorsally near terminus. Williams (l.c.) illustrated and described the position of guiding ring slightly less than one lip region-width from anterior end but Siddiqi (1971) illustrated the position of guiding ring from one of the paratypes at 0.65 lip region-width from anterior end. It is, therefore, evident that the position of guiding ring is also variable in the type specimens. The tail in the present population seems very similar in shape to that of type specimens except in the absence of a slight dorsal bent near the terminus which also does not appear to be prominent.

Except the shape of amphids and the lips without prominent teat-like papillae, the other characters are always variable within the species. Since there is no other justification to describe our specimens as new species, we prefer to consider all these differences as intraspecific variations.

Siddiqi (1971), while proposing the genus *Oriverutus*, stated that amphids are abnormally large and nucleus of dorsal oesophageal gland is comparatively smaller in size in all the species of this genus. Since amphidial apertures are about 50% of the corresponding body-width and the nucleus of dorsal oesophageal gland is of normal size in the present population of *O. sundarus*, Siddiqi's statement in the diagnosis of the genus *Oriverutus* may be emended.

This species is reported for the first time from India.

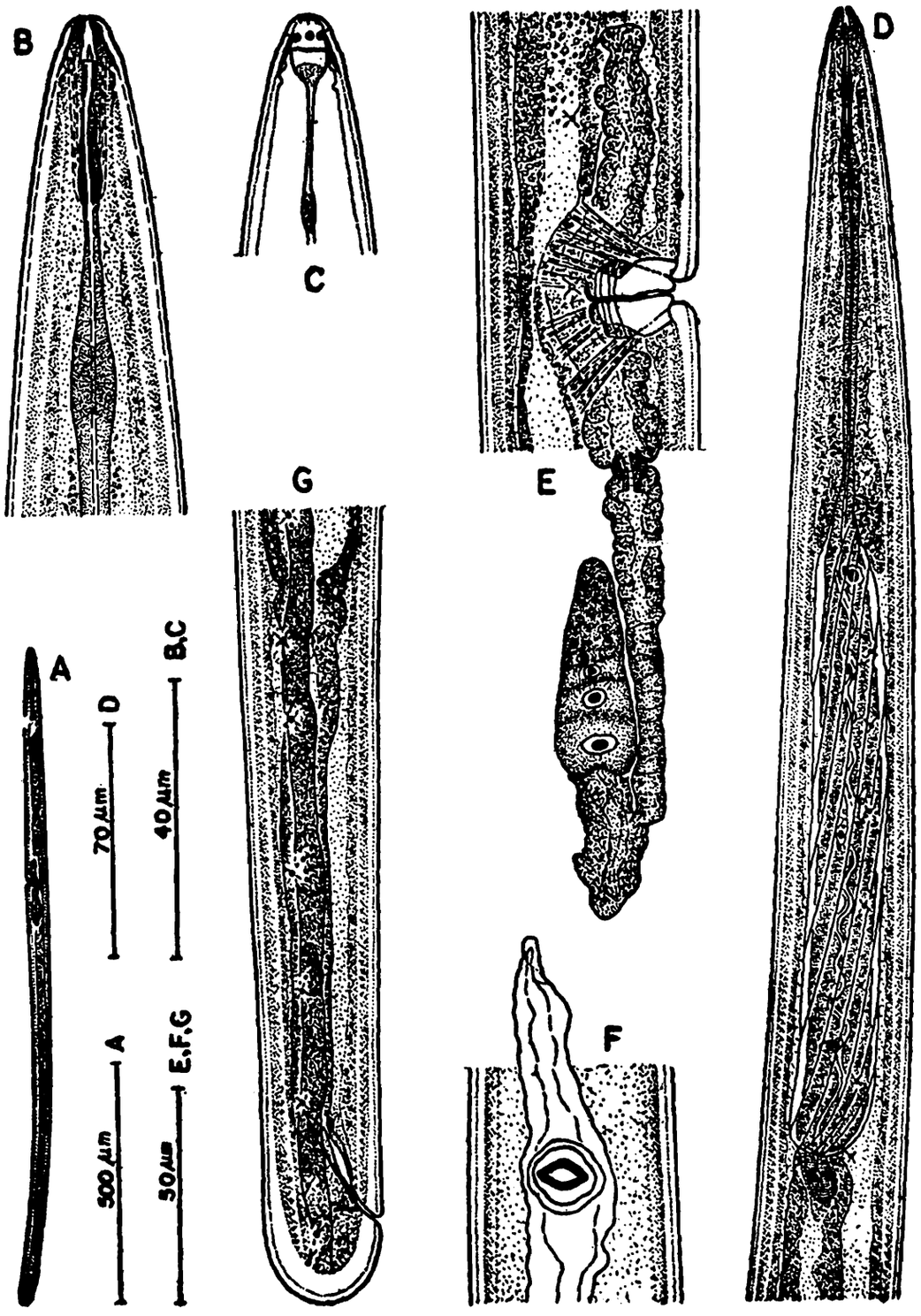
Belondira neortha Siddiqi, 1964
(Text-fig. 3)

1964. ***Belondira neortha***: Siddiqi, *Labdev J. Sci. Tech*, **2** : 39.

Measurements :

Matigarh population: ♀ ♀ (8) : L = 1.36—1.51 mm; a = 27—33; b = 4.0—4.3; c = 68—78; V = $^{3.4-4.2}$ 35—38 $^{8-10}$.

Dagapur population: ♀ ♀ (3) : L = 1.22—1.39 mm; a = 26—34; b = 3.8—4.0; c = 70—72; V = $^{3.4-4.0}$ 36—39 $^{10-11}$.



Text-fig. 3. *Belondira neortha.* A. Entire female. B. Anterior end. C. Surface view of anterior end. D. Neck region. E. Female gonads. F. Vulva in ventral view. G. Posterior region.

Description: Body nearly straight or curved slightly ventrally upon fixation, tapering rapidly at anterior end while gradually towards posterior end. Cuticle marked with fine striae transversely; its thickness 2-3 μm in mid-body and 5-7 μm at tail tip (thickest). Cuticle forming two pairs of prominent notches in odontostyle region. Lateral chords narrow in middle, 1/17th — 1/12th of body-width near middle. Prominent irregularly spaced lateral glandular organs distinct in posterior fourth of body but these are less distinct in the rest of body; one lateral body pore present at each lateral glandular organ. Lateral body pores 43-52 in number of which 10-13 in oesophageal region, 24-31 in intestine region, 5-7 in prerectum-rectum region, and 2 in tail region. Dorsal and ventral body pores not distinct.

Lip region rounded with amalgamated lips, narrower than body, 1/5.5-1/6.5 of body-width at base of oesophagus. Amphids stirrup-shaped; apertures occupying 4-5 μm or 52-57% of corresponding body-width, 4-5 μm from anterior extremity. Sensillar pouches 19-21 μm from amphidial apertures.

Odontostyle 6-7 μm or 0.8—1.0 lip region-width long, its thickness slightly less than corresponding cuticle-width; aperture about 3 μm or 42-46% of odontostyle length. Guiding ring 5-6 μm or 0.7—0.8 lip region-width from anterior end. Odontophore 12-15 μm or about 1.9—2.2 times the odontostyle length. A typical swelling present in the anterior part of oesophagus a little behind its commencement. Anterior slender part of oesophagus non-muscular while enlarged part with strong musculature like that of *Axonchium*. Basal expanded portion of oesophagus occupying 51-57% of the neck region, enveloped by a sheath of dextral spiral muscle bundles. Locations of all oesophageal gland and their orifices distinct only in two specimens as follows:

DO = 44.5—46.8	S_1N_1 = 69—74	S_2N = 90—91
DN = 46.5—49.6	S_1N_2 = 72—76	S_2O = 91—92
DO—DN = 2.0—2.8		
K = 87—98	K′ = 89—98	

Nerve ring 92-100 μm or 26-29% of neck region from anterior end. Cardia 11-12 μm or 1/4th-1/3rd of corresponding body-width long, tongue-shaped, enveloped by intestinal tissue. Prerectum offset by a constriction from intestine, 92-129 μm or 3.6—5.0 times the anal body-width.

Vulva transverse and oval, situated in a deep depression. Vagina extending inward 17-23 μm or about 1/3-1/2 of the corresponding body-width. Anterior sexual branch rudimentary, 38-58 μm or 1.0—1.4 as long as corresponding body-width. Posterior sexual branch

normal, typical. Uterus and oviduct separated by a sphincter; oöcytes arranged in a single row except at growth region. Sperm not seen.

Tail hemispherical without expansion of outer cuticle, 17-21 μm or 0.7—0.8 anal body-width long, with two caudal pores on each side.

Male : Not found.

Localities and habitats: Matigarh population : From soil around roots of Banana at Matigarh, 6 km from Siliguri on Siliguri-Darjeeling Road, District Darjeeing, West Bengal. Dagapur population: From soil around roots of Tea at Dagapur Tea Estate on Siliguri-Darjeeling Road, District Darjeeling, West Bengal.

Remarks: Siddiqi (1964) described this species on a single female and a male from Kathmandu, Nepal. Now we have got two populations with eleven females. It was, therefore, considered necessary to give a detailed description of females. Unfortunately, males were not available to be included in the present study.

Our specimens fit well with the original description of *B. neortha* except that the body length and anterior rudimentary sexual branch are longer (after Siddiqi, (1964) : L = 1 17 mm; anterior rudimentary sexual branch less than one vulvar body-width long). Siddiqi (l. c.) did not mention the presence of distinct cuticular notches in odontostyle region, the arrangement of spiral muscle bundle at basal expanded part of oesophagus, location of oesophageal gland nuclei and their orifices, and the constriction between intestine-prerectum junction.

This species is reported for the first time from India.

Summary

Variations have been noted in *Thornenema cavalcantii* (Lordello, 1955) Andràssy, 1959 and *Oriverutus sundarus* (Williams, 1964) Siddiqi, 1971 belonging to the family Dorylaimidae. The abnormal development of anterior sexual branch in *Thornenema cavalcantii* has also been reported. *Belondira neortha* Siddiqi, 1964 belonging to the family Belondiridae has been redescribed in detail, since the original description is based on a single female and male. *Oriverutus sundarus* and *Belondira neortha* have been reported for the first time from India.

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