

# ON SOME TYLENCHID NEMATODES FROM ORISSA

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(With 1 Plate)

## INTRODUCTION

Soil samples for the nematodes described in this paper were collected by two survey parties of the Zoological Survey of India. Except where specifically mentioned, these samples were collected by the first author and his party when they undertook a survey of the plant parasitic nematodes of paddy and other crops in Orissa.

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## SYSTEMATIC ACCOUNT

### Family TYLENCHIDAE

#### 1. *Tylenchus (Filenchus) filiformis* Bütschli

1873. *Tylenchus filiformis* Bütschli, *Nova Acta Acad. Nat. Curios.*, 36 (5): 37.

*Material*.—6♀, 2♂, Cuttack, Central Rice Research Institute, rhizosphere of paddy, banana tree, sugarcane, and okra; 21, 24 & 26.xii.1970; 1♀, 1♂, Cuttack, Patha, State Agricultural Farm, rhizosphere of paddy and potato; 23.xii.1970; 2♀; Kalupara Ghat (nr. Chilka Lake), rhizosphere of paddy; 7.i.1971; *K. N. Nair* Coll.

*Measurements*.—9♀: Length = 0.66–0.76 mm;  $a = 38-43$ ;  $b = 6.7-7.2$ ;  $c = 5.8-8.3$ ;  $V = 66-75$ ; stylet = 12.8  $\mu\text{m}$ .

3♂: Length = 0.55–0.63 mm;  $a = 35-47$ ;  $b = 6-7$ ;  $c = 3.9-5.6$ ; stylet = 9.8  $\mu\text{m}$ ; spicula = 15.4–18.2  $\mu\text{m}$ ; gubernaculum = 4.2  $\mu\text{m}$ .

*Description*.—Female: Body slender, head not offset, tail long and subulate, curved ventrally in some specimens. Cuticle finely striated. Lateral fields marked with four incisures. Stylet fine, knobs poorly developed and sloping backwards. Ovary single, outstretched, oöcytes arranged in a single row. Postvulvar sac slightly more than one body width long.

Male: Similar to female. Spicules tylenchoid, gubernaculum small and thick. An adanal bursa, 21–33  $\mu\text{m}$  in length, about thrice the anal body width long.

## 2. *Tylenchorhynchus elegans* Siddiqi

1961. *Tylenchorhynchus elegans* Siddiqi, *Z. ParasitKde.*, **21**: 52.

*Material.*—1♀; Bhubneshwar, University of Agriculture & Technology Farms, rhizosphere of paddy; 22.xii.1970; 1♀, 1♂, 2 juveniles; Cuttack, Central Rice Research Institute, rhizosphere of paddy, potato and sugar-cane; 21–23.xii.1970.

*Measurements.*—2♀: Length = 0.66–0.67 mm;  $a = 26$ –27;  $b = 5.1$ –5.3;  $c = 15$ ;  $V = 54$ ; stylet = 18.0–19.6  $\mu\text{m}$ .

1♂: Length = 0.53 mm;  $a = 24$ ;  $b = 4.9$ ;  $c = 14$ ;  $T = 41\%$ ; stylet = 16.8  $\mu\text{m}$ ; spicula = 19.6  $\mu\text{m}$ ; gubernaculum = 11  $\mu\text{m}$ ; bursa = 52  $\mu\text{m}$ .

*Description.*—Female: Tail digitiform, 42  $\mu\text{m}$  long, with 18–21 annulations, ending in a broadly rounded unstriated terminus. Cuticle coarsely striated transversely. Lateral fields marked by four incisures, outer incisures crenate. Lip region continuous with 3–4 annules. Stylet well-developed. Nerve ring at 71–84  $\mu\text{m}$  from anterior end; excretory pore 6–8  $\mu\text{m}$  posterior to nerve ring. Phasmids distinct at about two-fifths to one-third of tail length down the anus. Spermatheca present.

Male: Tail conical, 38  $\mu\text{m}$  long, provided with a crenate bursa which extends up to the tail tip. Phasmids and their ducts very distinct at about two-fifths down the cloaca. Of the four incisures, only one continues along the whole length of the tail, one ends near the beginning of the bursa, the other slightly posterior to it and the fourth near the cloaca.

### Family HETERODERIDAE

## 3. *Meloidogyne graminicola* Golden & Birchfield

1965. *Meloidogyne graminicola* Golden & Birchfield, *Proc. helminth. Soc. Wash.*, **32**: 228.

1968. *Meloidogyne graminicola*: Whitehead, *Trans. zool. Soc. Lond.*, **31** (3): 332.

*Material.*—3♀, 10 juveniles; Cuttack, Central Rice Research Institute, roots of paddy seedlings; 22 & 26.xii.1970.

*Measurements.*—3♀: Length = 0.57–0.66 mm; width = 0.27–0.30 mm;  $a = 2.1$ ; stylet = 14–15  $\mu\text{m}$ ; width of knob = 3.2  $\mu\text{m}$ ; interphasmidial distance = 16–19  $\mu\text{m}$ .

10 juveniles: Length = 0.42–0.46 mm;  $a = 27.2$ –27.5;  $c = 6.6$ –7.6; stylet = 12.6–14.0  $\mu\text{m}$ ; width of knob = 1.6–2.4  $\mu\text{m}$ .

5 eggs: 79.2–92.4  $\times$  36.3–42.9  $\mu\text{m}$ .

*Description.*—Female: Body pear-shaped. Head not offset. Stylet knobs rounded, their anterior margins sloping backward. Dorsal oesophageal gland duct opening 3.2–4.6  $\mu\text{m}$  behind stylet base. Vulva and anus at posterior end of body. Posterior cuticular pattern rounded, composed of closely spaced, fine, smooth striae. Striae form complete circle from dorsal to ventral sector. Dorsal arch slightly raised. Anal fold present. Lateral field and incisures absent. Multiple knots generally. Single knots in finer roots and root hairs.

Juvenile: Head not offset, with three annules. Stylet knobs rounded with their anterior margins sloping backward. Lateral field with four incisures. Tail terminus rounded.

*Remarks.*—This species has been found only at the seedling stage in the nursery. When the seedlings are uprooted for transplantation, probably the root knots are broken off from the roots and remain in the soil.

#### 4. *Meloidogyne arenaria* (Neal)

1889. *Anguillula arenaria* Neal, *Bull. U.S. Bur. Ent.*, No. 20: 27.

1949. *Meloidogyne arenaria*: Chitwood, *Proc. helminth. Soc. Wash.*, 16: 92.

1968. *Meloidogyne arenaria*: Whitehead, *Trans. zool. Soc. Lond.*, 31 (3): 303.

*Material.*—3♀; Cuttack, Central Rice Research Institute, roots of banana tree near staff quarters; 26.xii.1970.

*Measurements.*—Complete specimens not preserved, used up for the study of perineal patterns. Interphasmidial distance = 28  $\mu\text{m}$ .

*Description.*—Female perineal pattern: striae smooth, round; dorsal arch low and slightly compressed on either side. Some striae directed towards vulva. Lateral line marked faintly.

*Remarks.*—*M. arenaria* has a wide host range.

#### 5. *Meloidogyne incognita* (Kofoid & White)

(Plate I, 1–3)

1919. *Oxyuris incognita* Kofoid & White, *J. Am. med. Ass.*, 72: 567.

1949. *Meloidogyne incognita*: Chitwood, *Proc. helminth. Soc. Wash.*, 16: 91.

1949. *Meloidogyne incognita* var. *acrita* Chitwood, *Proc. helminth. Soc. Wash.*, 16: 91.

1968. *Meloidogyne incognita*: Whitehead, *Trans. zool. Soc. Lond.*, 31 (3): 336.

*Material.*—3♀; Bhubneshwar, University of Agriculture & Technology Farm, roots of Brinjal; 22.xii.1970; 5♀; Cuttack, Patha, State Agricultural Farm, roots of tomato; 23.xii.1970.

*Measurements.*—3♀ (Bhubneshwar brinjal population): Length = 0.59–0.89 mm; width = 0.30–0.33 mm;  $a$  = 2–3 (other structures obscured by contents); eggs = 33–40  $\times$  13–20  $\mu\text{m}$ .

5♀ (Patha tomato population): Length = 0.80–0.93 mm; width = 0.46–0.48 mm; stylet = 19.8  $\mu\text{m}$ ; width of knob = 3.3  $\mu\text{m}$ ; excretory pore = 39–48  $\mu\text{m}$ , from anterior end; interphasmidial distance 22–26  $\mu\text{m}$ ;

dorsal oesophageal orifice = 24  $\mu\text{m}$ ; behind stylet base; embryonated eggs = 82–89  $\times$  30–33  $\mu\text{m}$ .

*Description.*—Female: Brinjal population: Body pear-shaped. Perineal pattern: striae wavy, inner ones fine and outer and middle coarse, closely spaced; dorsal arch high and rounded; lateral line present. Details as in plate 11. Multiple knots.

*Tomato population.*—Body pyriform. Base of stylet sloping. Perineal pattern pyriform i.e., ventral arch round and dorsal arch high and flattened (making angle on two sides). Lateral line seen in some specimens, but not so conspicuous. Details as in plate I, 2. Multiple knots.

*Remarks.*—The specimens from brinjal come close to *M. incognita* (*incognita* type) in all respects except that the middle striae appear coarse.

Most of the specimens from tomato come close to *M. incognita* (*acrita* type) as regards their perineal pattern (cf. Whitehead, 1968) but the size of the stylet is bigger in the present specimens. In one of the specimens the striae are very fine and the dorsal arch is high but only slightly flattened. Still in another specimen the striae are drawn sideways (plate I, 3.) as in *M. thamesi* Chitwood. Either, as Whitehead (*loc. cit.*) has shown, the perineal patterns of this species are very variable, or it is a case of mixed infection, or that *M. thamesi* is a synonym of *M. incognita*. As it is, a number of authors recognise two distinct varieties, viz. *incognita* and *acrita* under this species.

#### Family HOPLOLAIMIDAE

### 6. *Hoplolaimus indicus* Sher

1963. *Hoplolaimus indicus* Sher, *Nematologica*, 9 : 284.

*Material.*—7♀, 5♂; Cuttack, Patha, State Agricultural Farm, rhizosphere of potato and brinjal plants; 23.xii.1970. Cuttack, Central Rice Research Institute, rhizosphere of banana tree; 26.xii.1970.

*Measurements.*—7♀; Length = 1.16–1.17 mm; *a* = 31–33; *b* = 7–9, *b'* = 6.2–6.6; *c* = 58–59; *V* = 54–55; *o* = 16–20; stylet = 36–39  $\mu\text{m}$ ; anterior phasmid not seen; posterior phasmid = 78–82.

5♂; Length = 0.76–0.87 mm; *a* = 25–28; *b* = 5.5–9.2; *b'* = 5–7; *c* = 28–33; *o* = 12–14; stylet = 33–39  $\mu\text{m}$ ; anterior phasmid = 33–35; posterior phasmid = 74–76; spicules = 35–39  $\mu\text{m}$ ; gubernaculum 16–17  $\mu\text{m}$ .

*Description.*—Female: Tail round with 10–12 annules. Lip region with 3–4 annules. Single incisure, indistinct on most of body. Stylet knobs with anterior surfaces irregularly pointing anteriorly. Oesophageal glands with 4–6 distinct nuclei, others obscure. Excretory pore located above the level of oesophago-intestinal valve, a little posterior to the nerve ring. Posterior phasmid on the left side of the body. Overlapping of rectum by intestine not very clear. Two outstretched ovaries, oöcytes arranged in single row, round spermatheca present,

Male: Lip region rounded, with 3–4 annules, Spear knobs rounded with anteriorly projecting processes. Oesophageal glands with 4–5 nuclei. Excretory pore located above oesophago-intestinal valve. Single indistinct incisure. Anterior phasmid on left side of body, posterior phasmid on right side.

*Remarks*—The specimens appear to be slightly smaller than those described by Sher (1963). The species has been recovered from different plant hosts by various workers.

### 7. *Helicotylenchus multincinctus* (Cobb)

1893. *Tylenchus multincinctus* Cobb, *Agric. Gaz. N. South Wales*, **4** (10): 52.  
 1922. *Tylenchorhynchus multincinctus*: Micoletzky, *Arch. Natur.*, **87**(A): 608.  
 1936. *Rotylenchus multincincta*: Filipjev, *Proc. helminth. Soc. Wash.*, **3**: 81.  
 1940. *Anguillulina multincincta*: T. Goodey, *J. Helminth.*, **18**: 22.  
 1951. *Rotylenchus multincinctus*: T. Goodey, *Soil and freshwater nematodes*: 112.  
 1956. *Helicotylenchus multincinctus*: Golden, *Bull. Md. agric. Stn.*, **1**.  
 1966. *Helicotylenchus multincinctus*: Sher, *Nematologica*, **12**: 8.

*Material*.—1♀, 1♂; Cuttack, Central Rice Research Institute, rhizosphere of banana tree; 26.xii.1970.

*Measurements*.—1♀: Length = 0.50 mm;  $a = 22$ ;  $b = 5.6$ ;  $b' = 4.3$ ;  $c = 44$ ;  $V = 68$ ; stylet = 24  $\mu\text{m}$ .

1♂: Length = 0.38 mm;  $a = 21$ ;  $b = 4.5$ ;  $b' = 3.5$ ;  $c = 26$ ; stylet = 21  $\mu\text{m}$ ; spicula = 16  $\mu\text{m}$ ; gubernaculum = 7  $\mu\text{m}$ .

*Description*.—Female: Body curved ventrally. Lip region hemispherical with 4 indistinct annules. Stylet knobs rounded, flattened anteriorly. Excretory pore almost at the level of the anterior oesophageal glands. Hemizonid not clear. Phasmids two annules anterior to anus level. Tail terminus hemispherical, 11 annules. Two ovaries, outstretched, oocytes arranged in single row. Spermatheca present.

Male: Body much less curved than in female; almost straight. Tail covered with a bursa extended up to the tail tip. General structure similar to that of female.

*Remarks*.—The male specimen is smaller than those described by Sher (1966).

Minz *et al.* (1961) and Zuckerman and Strich-Harari (1963) have shown that *H. multincinctus* completes its life cycle within the roots of banana and causes heavy losses to the plantations.

### 8. *Pratylenchus coffeae* (Zimmermann)

1898. *Tylenchus coffeae* Zimmermann, *Meded. Plantentuin.*, **27**: 16.  
 1919. *Tylenchus musicola* Cobb, *West Ind. Bull.*, **17**: 179.  
 1920. *Tylenchus mahogani* Cobb, *J. Parasit.*, **6**: 188.  
 1941. *Pratylenchus coffeae*: Filipjev & Steckhoven, *Manual of Agr. Helm.*,: 242.  
 1953. *Pratylenchus coffeae*: Sher & Allen, *Univ. Calif. Publ. Zool.*, **57**: 448.  
 1960. *Pratylenchus coffeae*: Loof, L.E.B, *Fonds*, No. 39: 57.

*Material.*—2 juveniles (vulva just visible in one specimen); Kalupara Ghat (grassy patch nr. R. Kusma); 7.i.1971; K. N. Nair Coll.

*Measurements.*—2 juveniles: Length = 0.49–0.61 mm;  $a = 23.3$ – $27.8$ ;  $b = 5.5$ – $7.0$ ;  $b' = 4.5$ – $5.6$ ;  $c = 12.7$ – $12.9$ ;  $V = 77$ ; stylet =  $17$ – $19 \mu\text{m}$ .

*Description.*—Cuticular annulation conspicuous. Lateral field with four incisures, outer two incisures more crenate than the inner ones. Lip region of two annules. Anterior margin of apical annule convex-flattened. Tail conoid; tip rounded to rounded with an indentation on one side only. Phasmids slightly anterior to middle of tail.

*Remarks.*—The tail tip is fairly similar to the figure given by Loof (1960) for *P. neglectus* (Rensch). However, there are no transverse striae in the lateral fields.

As the specimens are juvenile, no reliance can be placed on the de Manian formula. The length of the stylet ( $19 \mu\text{m}$  in the less developed and smaller specimen) exceeds that hitherto described even for adult specimens.

### 9. *Hirschmanniella gracilis* (de Man)

1880. *Tylenchus gracilis* de Man, *Tijdschr. Nederl. Dierk. Vereen*, **5** : 71.

1925. *Tylenchorhynchus gracilis*: Micoletzky, *K. Danske Vidensk. Selsk. Skr.*, (8) **10** : 257.

1932. *Anguillulina gracilis*: T. Goodey, *J. Helminth.*, **10** : 140.

1955. *Radopholus gracilis*: Hirschmann, *Zool. Anz.*, **154** : 288.

1961. *Radopholus gracilis*: Thorne, *Principles of Nematology*: 236.

1962. *Hirschmannia gracilis*: Luc & Goodey, *Nematologica*, **7** : 197.

1963. *Hirschmanniella gracilis*: Luc & Goodey, *Nematologica*, **9** : 471.

*Material.*—1♀, 1♂; Bhubneshwar, University of Agriculture & Technology Farms, rhizosphere and roots of paddy; 23.xii.1970; 2♀, 1 juvenile; Cuttack, Central Rice Research Institute, rhizosphere of paddy, 21 & 26.xii.1970.

*Measurements.*—3♀: Length = 0.96–1.14 mm;  $a = 45$ – $49$ ;  $b = 8.8$ – $9.8$ ;  $c = 13.5$ – $14.0$ ;  $V = 49$ – $52$ ; stylet =  $16$ – $17 \mu\text{m}$ .

1♂: Length = 1.11 mm;  $a = 52$ ;  $b = 11.6$ ;  $c = 15$ ; stylet =  $17 \mu\text{m}$ ; spicula =  $21 \mu\text{m}$ ; gubernaculum =  $7 \mu\text{m}$ ; bursa =  $49 \mu\text{m}$ . (Specimen crushed after examination).

1 juvenile: Length = 0.71 mm;  $a = 46$ ;  $b = 9.2$ ;  $c = 13$ .

*Description.*—Female: Lateral fields with four incisures extending to almost tail end. Head not offset, with 4–5 annules; low, rounded, lip region. Cephalic framework developed, basal plates curved posteriorly about two annules. Stylet about as massive as sketched by Thorne (1961) for *R. gracilis*. Basal knobs of stylet strong, directed backward. Isthmus shorter than neck diameter. Hemizonid at the level of the junction of oesophageal lumen and intestine, three annules wide. Excretory pore slightly posterior. Tail elongate-conoid with sub-cylindroid end and a terminal mucro. Phasmids at or just behind the middle of the tail. A prominent spermatheca in each uterus.

Male: Dorsal incisure extends almost to the tail terminus. Phasmids located somewhat anterior to the middle of the tail. Bursa rising well anterior to spicula and extending to about half the tail length. Tail and other general structures as in female.

*Remarks.*—Hirschmann (1955) synonymized *H. oryzae* (v. Breda de Haan) with *H. gracilis*. This action has not been accepted by Thorne (1961) and Luc and Goodey (1962) who have found it advisable to retain the two species, but on different grounds. Thorne (*loc. cit.*) has distinguished *H. gracilis* from *H. oryzae* “by the low truncate lip region, less massive spear, more angular spear knobs, and longer isthmus. Lateral incisures extend farther back on the tail. Phasmids are near the mid-tail region. The longer tail with subcylindroid ends are especially distinctive” (p. 237). Analyzing these differences, it will be noticed that the present specimens resemble *H. gracilis* in as much as that the lips are low and stylet less massive; the lateral incisures extend further back on the tail; phasmids are near the mid-tail region and the tails are long with subcylindroid ends. The lips, however, are rounded; the stylet knobs directed backward, and the isthmus is shorter as in the case of *H. oryzae*. Further, as Hirschmann (*loc. cit.*) has shown, the shape of the tail and its terminus are variable. Luc and Goodey (*loc. cit.*) reject the synonymy on the basis that the original description and figures of *H. gracilis* make no mention of spermathecae and in the male, bursa surrounds the tail. Thorne (*loc. cit.*), after re-examining specimens loaned by Hirschmann (probably collected from type locality of *H. gracilis*), and those collected from Java (topotype specimens for *H. oryzae*) found that the spermathecae were present in both the species. It is just possible that either these structures were missed in *H. gracilis* by de Man or that the specimens were probably not fully mature, or ‘un-mated’ The extent of bursa on the tail is again a variable character as shown by Hirschmann (*loc. cit.*) and Thorne (*loc. cit.*). In any case an examination of the types as well as of long series of both the species is called for before a final decision can be arrived at.

This leaves only one character, viz. the position of phasmids relative to the tail—which may be a fairly constant character towards identification of the two species.

Sher (1968) has revised the genus *Hirschmanniella*.

Incidentally, one of female specimens was heavily infected with a sporozoan, as has also been described by Thorne (*loc. cit.*).

#### Family APHELENCHIDAE

#### 10. *Aphelenchus avenae* Bastian

1865. *Aphelenchus avenae*: Bastian, *Trans. Linn. Soc. Lond.*, **25** : 122.

1963. *Aphelenchus avenae*: Goodey, *Soil and freshwater nematodes*: 134.

1965. *Aphelenchus avenae*: Goodey & Hooper, *Nematologica*, **11** : 55.

*Materials.*—8♀, 1♂: Cuttack, Central Rice Research Institute, rhizosphere of pea, spinach, masur, chaulai; 24.xii.1970. 2♀, 2 juveniles; Cuttack, Patha, State Agricultural Farm, rhizosphere of potato and tomato plants, 23.xii.1970.

*Measurements.*—9♀: Length = 0.73–0.98 mm;  $a = 25$ –32;  $b = 6$ –8;  $c = 23$ –31;  $V = 72$ –78; stylet = 11.2–17.6  $\mu\text{m}$ ; eggs = 49.5–56.1  $\times$  16.5–19.8  $\mu\text{m}$ .

1♂: length = 0.59 mm;  $a = 36$ ;  $b = 5.7$ ;  $c = 22$ ; stylet = 16.5  $\mu\text{m}$ ; spicula = 33  $\mu\text{m}$ ; gubernaculum = 16  $\mu\text{m}$ .

*Description.*—Female: Body tapering anteriorly. Cuticle finely striated. Lateral field marked by 10–12 incisures, occupying 1/3–1/4 of body diameter. Head slightly offset, without striations. Tail cylindrical, short with a rounded terminus. Phasmid not seen. Ovary single, outstretched; oöcytes in single row. Postvulvar sac 2–3 times the body-width.

Male: Body tapering towards extremities. General structure similar to that of female. Tail conical, provided with a bursa supported by 4 pairs of ribs. Phasmids not seen.

*Remarks.*—The species is polyphagous.

#### Family APHELENCHOIDIDAE

### 11. *Aphelenchoides astero-caudatus* Das

1960. *Aphelenchoides astero-caudatus* Das, *Z. ParasitKde.*, 19 : 592.

*Material.*—2♀; Cuttack, Patha, State Agricultural farm, rhizosphere of paddy (IR-8); 23.xii.1970.

*Measurements.*—2♀: Length = 0.55–0.63 mm;  $a = 38$ –45;  $b = 7.3$ –8.6;  $c = 15$ –17;  $V = 69$ –70; stylet = 11.0–12.5  $\mu\text{m}$ .

*Description.*—Lateral field marked by two incisures, the latter discernible clearly behind the median oesophageal bulb. Head very slightly offset from the body. Basal knobs of stylet poorly developed and not very distinct. Nerve ring at 74  $\mu\text{m}$  (one body width behind the median bulb) and excretory pore at 77–78  $\mu\text{m}$  from the anterior end. Single ovary extending nearly to the posterior end of oesophageal gland. Post-vulvar sac slightly more than three times the body diameter. Tail tip with a star-shaped process of three mucros.

*Remarks.*—The nematode is probably polyphagous.

### 12. *Aphelenchoides saprophilus* Franklin

1957. *Aphelenchoides saprophilus* Franklin, *Nematologica*, 2 : 309.

*Material.*—1♀; 1♂; Cuttack, Central Rice Research Institute, rhizosphere of banana tree, 26.xii.1970.

1♀; Cuttack, Central Rice Research Institute, rhizosphere of spinach, 24.xii.1970.

*Measurements.*—2♀: Length = 0.35–0.62 mm;  $a = 26$ .37;  $b = 7.4$ –8.9;  $c = 15$ –16;  $V = 71$ –72; stylet = 9.9–11.2  $\mu\text{m}$ .

1♂: Length = 0.47;  $a = 25$ ;  $b = 7.5$ ;  $c = 13$ ;  $T = 67\%$ ; stylet = 11.2  $\mu\text{m}$ ; spicula = 19  $\mu\text{m}$ .



*Description.*—Female: Body slender with offset lips. Lateral field marked with four incisures and occupying about 1/5th the body diameter. Tail somewhat arcuate, conoid, bearing a terminal mucro. Stylet very slender, basal knobs very small, represented by mere thickenings; Oesophageal glands form a lobe overlying the intestine dorsally, about three body-widths long. Nerve ring about one body-width behind the valves of the median bulb. Excretory pore approximately at the same level. Post-vulvar sac reaching to about half the distance to anus.

Male: Tail slightly arcuate, conoid, bearing a terminal mucro and three pairs of papillae. Spicula aphelenchoid, dorsal limb 19  $\mu\text{m}$  long, ventral limb 11  $\mu\text{m}$  long, transverse bar 6.5  $\mu\text{m}$  long with a protuberance at the dorsal end.

*Remarks.*—The species is being recorded from India for the first time.

#### SUMMARY

Twelve species of tylenchid nematodes are recorded from paddy and other crops in Cuttack and Bhubneswar. Of these, five species, viz. *Tylenchus filiformis*, *Tylenchorhynchus elegans*, *Meloidogyne graminicola*, *Hirschmanniella gracilis* and *Aphelenchoides asterocaudatus* have been recovered either from rhizosphere or roots of paddy or from both. One species, *Aphelenchoides saprophilus*, is recorded from India for the first time.

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