

Paralongidorus bullatus n. sp. from Groundnut Soils in Niger and Comments on *Xiphinema parasetariae* Luc¹

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Abstract: *Paralongidorus bullatus* n. sp. from groundnut soils in Sadoré, Niger is described and illustrated. It is distinguishable from most species of the genus by its body and odontostyle lengths, knob-like head, and digitate ending of the protoplasmic region of the tail. Length of the female body is 4.4–5.5 mm, of the odontostyle 132–156 μm , and of the tail 32–44 μm . Tail terminus is conoid to broadly rounded. Uteri are well developed, without sperms. Males are not found. *Xiphinema parasetariae* Luc 1958, a *species inquirenda*, is validated and, based on measurements and tail structures, *X. attorodorum* Luc 1961 is proposed as a synonym of *X. parasetariae*. Additional measurements are given for its females and juveniles.

Key words: *Arachis hypogaea*, crop growth variability, groundnut, new species, Niger, *Paralongidorus bullatus*, peanut, taxonomy *Xiphinema attorodorum*, *X. parasetariae*.

During August and September 1988, the first author collected soil samples from the research farm (13°N, 2°E) at ICRISAT Sahelian Center near Say village, 45 km south of Niamey, Niger, to investigate the role of plant-parasitic nematodes in a groundnut (*Arachis hypogaea* L.) growth variability problem. A *Paralongidorus* sp. and *Xiphinema* sp. commonly were present in the rhizosphere of groundnut and, in some cases, in the root samples. Nematode populations were more numerous in the rhizosphere of stunted and chlorotic than healthy appearing plants (9). Detailed examination of *Paralongidorus* specimens revealed them to be a new species, described here as *Paralongidorus bullatus*. The *Xiphinema* sp. was identified as *X. parasetariae* Luc, 1958. This species was described from a single female in French Guinea (3) but later was considered to be a *species inquirenda* (6), probably because the type was lost. Our studies of *Xiphinema* populations in Niger indicated that *X. parasetariae* is a valid, well-described and illustrated species conspecific with *X. attorodorum*. In this paper, we supplement the measurements of the juvenile stages of *X. parasetariae* and

explain the reasons for proposing *X. attorodorum* as its synonym.

MATERIALS AND METHODS

Specimens were extracted from soil by decanting and sieving followed by modified Baermann funnels (7). Nematodes were killed and fixed in hot 4% formalin, processed to glycerine by the rapid method (8), and permanently mounted in dehydrated glycerine. Specimens were measured with the aid of a camera lucida.

SYSTEMATICS

Paralongidorus bullatus n. sp. (Fig. 1A–M)

Holotype (female): L = 5.39 mm; a = 145.6; b = 10.0; c = 122.5; c' = 1.5; V = 4.7–39.7^{-5.1}; odontostyle = 156 μm ; odontophore = 72 μm .

Paratypes (25 females): L = 4.43–5.52 (4.97 \pm 0.34) mm; a = 108–141 (128 \pm 9.91); b = 9–12 (10.4 \pm 0.93); c = 112–149 (131 \pm 10.1); c' = 1.1–1.6 (1.3 \pm 0.11); V = 38–44 (41.8 \pm 1.76); odontostyle = 132–156 (145 \pm 4.1) μm ; odontophore = 68–80 (74 \pm 3.6) μm ; total stylet = 210–229 (219 \pm 4.2) μm .

Female: Relaxed body posture an open spiral, anterior half less curved than posterior half. Cuticle of body 2.5–2.8 μm thick, 3.0 μm and 6.8 μm thick at anterior and tail regions, respectively, marked by superficial transverse striae 0.8–0.9 μm

Received for publication 28 November 1989.

¹ Journal Article No. 982 by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

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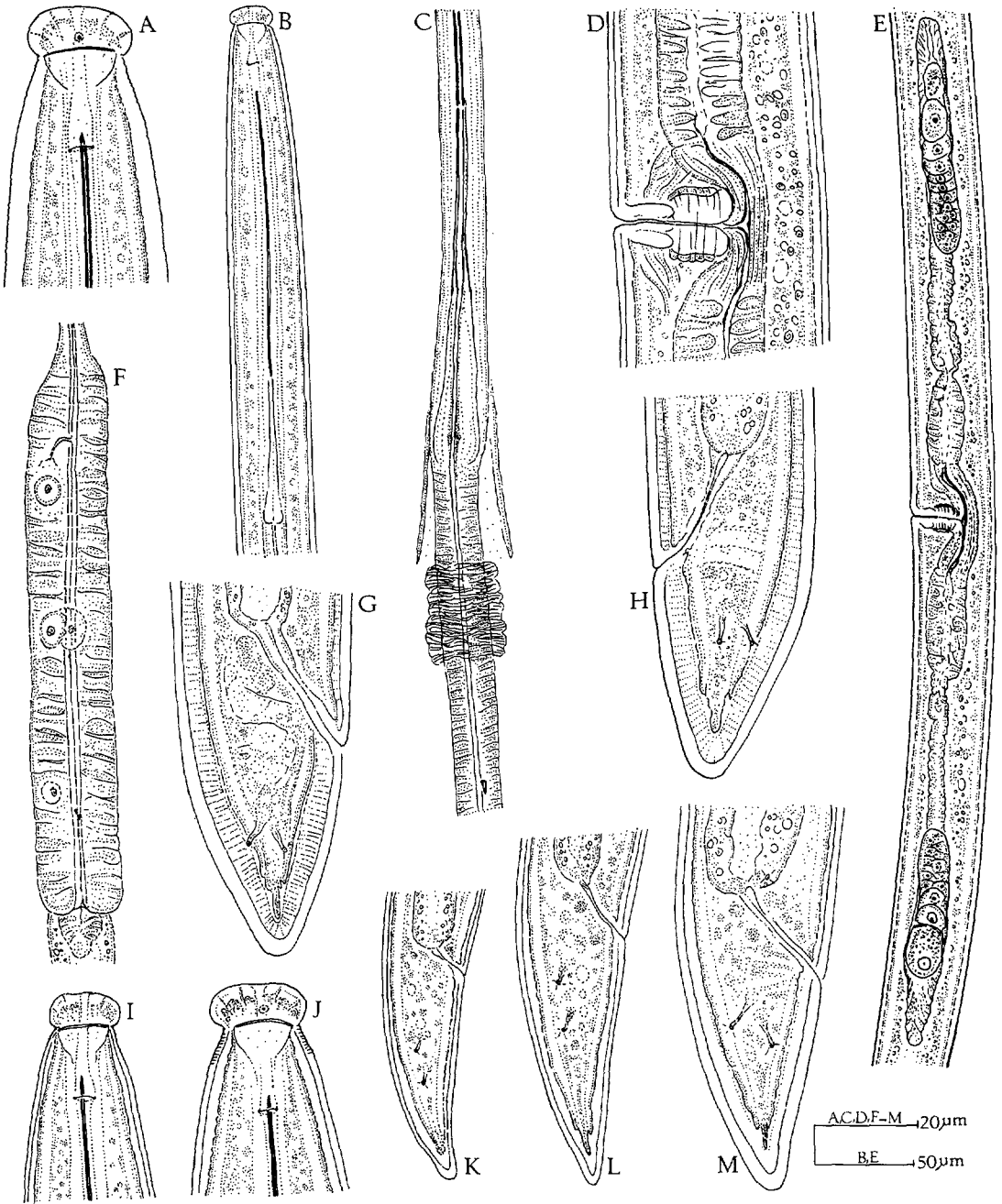


FIG. 1. *Paralongidorus bullatus* n. sp. A, B) Head end of female. C) Odontophore region of female. D) vulval region. (E) Reproductive system of female. F) Basal enlarged part of female esophagus. G, H) Tail ends of female. I) Anterior end of third-stage juvenile. J) Anterior end of fourth-stage juvenile. K, L, M) Tails of second-stage, third-stage, and fourth-stage juveniles, respectively.

apart. Hypodermis also striated. Lateral hypodermal chords about one-fourth of body width. Lateral body pores begin behind the cephalic region, first in a single, then double row; on tail, two pairs of lateral pores present.

Lip region is well set off by a deep constriction knob-like (hence the specific epithet), 19–21 μm wide, 8–10 μm high; body constricted immediately posterior. Amphidial fovea stirrup shaped, with conspicuous apertures about two-thirds of head

width in length. Stylet guiding ring single, 24–29 (26.8) μm , or 1.28–1.48 (1.36) head widths posterior to head end. Odontostyle thin, 132–156 (145) μm long, base smooth, not furcate. Odontophores slightly swollen at base, 68–80 (74) μm long. A small mucro, resembling tip of odontostyle, present behind odontophore, occasionally, as in holotype, occurring in odontophore lumen.

Esophagus normally 500–552 (530) μm long, length may be constricted to varying degrees. Nerve ring encircling esophagus 15–25 μm posterior to odontophore. Basal enlarged part of esophagus cylindrical, 95–115 (108) μm long, 17–22 (19.5) μm wide. Dorsal gland orifice near anterior end of enlarged part of esophagus, 11–14 μm anterior to dorsal gland nucleus. Anterior pairs of subventral gland nuclei and orifices located near middle of enlarged part of esophagus, orifices of posterior pair of subventral glands at 15–20 μm from esophageal base. Cardia large, conoid-rounded.

Vulva a transverse, depressed slit. Distance from anterior end of body to vulva 1,870–2,270 (2,075) μm . Vagina thick walled, extending about midway into body. Reproductive organs paired, symmetrical. Uteri well developed, without sperm; ovaries reflexed.

Prerectum 380–690 (460) μm long, rectum about one anal body width long. Tail conoid with broadly rounded terminus, often tapering more noticeably behind middle; 32–44 (38) μm or 1.1–1.6 (1.37) anal body widths long. Inner cytoplasmic region of tail conoid, terminating in finger-like projection about 8–10 μm anterior to tail terminus.

Juvenile (second, third, and fourth stages): Morphology (except for genital tract) similar to that of female (Fig. 1I–M). Measurements in Table 1.

Male: Not known. No spermatozoa seen in genital tract of females.

Type host and locality

Groundnut (*Arachis hypogaea* L.), research farm of the ICRISAT Sahelian Center, near Say village, 45 km south of Niamey, Niger, West Africa. Most specimens were from the rhizosphere of groundnut

TABLE 1. Average measurements (and range) of second-stage (J2), third-stage (J3), and fourth-stage (J4) juveniles of *Paralongidorus bullatus* n. sp. from Sadoré, Niger.

Character	J2 (n = 4)	J3 (n = 3)	J4 (n = 6)
L (mm)	1.25 (1.14–1.30)	1.95 (1.74–2.19)	3.42 (2.76–3.78)
Odontostyle (μm)	69.0 (65–70)	94.3 (93–96)	122.8 (116–129)
Odontophore (μm)	33.7 (32–35)	60.7 (56–66)	71.6 (69–75)
Stylet guiding ring (μm)	15.2 (15–16)	19.0 (18–21)	24.1 (22–25)
Tail length (μm)	37.5 (31–43)	45.7 (42–48)	45.5 (43–50)
a	60.8 (58–67)	73.0 (72–74)	103.0 (90–111)
b	4.5 (4.3–5.0)	6.9 (6.4–7.5)	8.2 (7.7–9.0)
c	31.2 (29–34)	42.8 (41–46)	75.6 (64–88)
c'	2.7 (2.6–2.9)	2.4 (2.3–2.5)	1.8 (1.6–2.1)

plants; a few were extracted from roots. Also found in samples collected from the rhizosphere of groundnut plants in areas of Bengou, Boureiri, Kowakore, Mahamandi and Maradi, Niger.

Type specimens

Holotype (female) collected by S. B. Sharma, September 1988. Slide no. T 144 a/5/1, deposited in the CAB International Institute of Parasitology Nematode Collection, 305 Hatfield Road, St. Albans, England, U.K. Paratypes (25 females) deposited as follows: 17 females, slide nos. T 144 a/5/2 to T 144 a/5/7, CAB Institute of Parasitology, St. Albans; 8 females, slide nos. 101/4/ISC and 102/4/ISC, Nematology Unit, Legumes Pathology, ICRISAT, Patancheru, Andhra Pradesh 502 324, India.

Diagnosis

Females of *P. bullatus* n.sp. are characterized by the lengths of the body (4.4–5.5 mm), odontostyle (132–156 μm) and odontophore (68–80 μm). Lip region set off from body by a constriction. Tail conoid to broadly rounded, 1.1–1.6 times anal body width long with cytoplasmic region

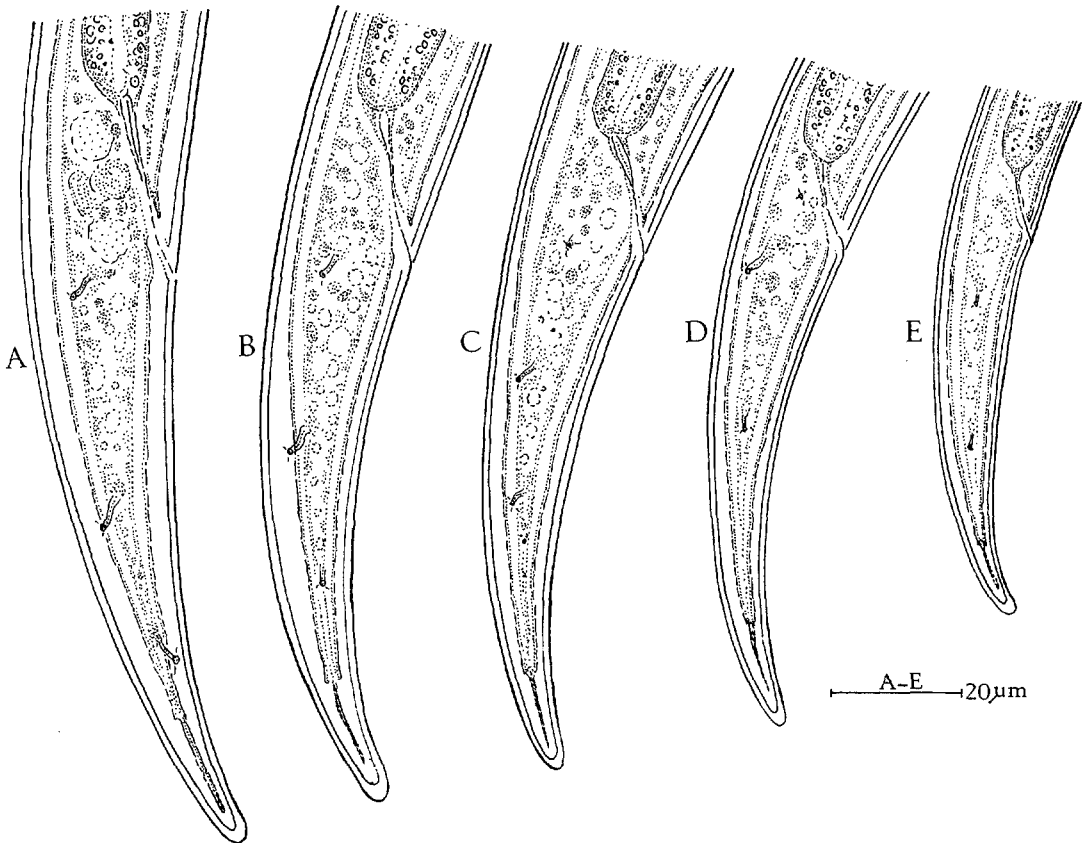


FIG. 2. *Xiphinema parasetariae* Luc, 1958 tails. A) Female. B) Fourth-stage juveniles. C) Third-stage juvenile. D) Second-stage juvenile. E) First-stage juvenile.

TABLE 2. Average measurements (and range) of first-stage (J1), second-stage (J2), third-stage (J3), and fourth-stage (J4) juveniles of *Xiphinema parasetariae* from Sadoré, Niger.

Character	J1 (n = 4)	J2 (n = 4)	J3 (n = 3)	J4 (n = 4)
L (mm)	0.84 (0.80-0.87)	1.21 (1.20-1.25)	1.65 (1.63-1.65)	2.12 (2.05-2.23)
Odontostyle (μm)	59.2 (57-62)	74.3 (73-75)	89.0 (88-91)	105.0 (102-107)
Odontophore (μm)	41.0 (39-43)	48.3 (48-49)	56.0 (54-57)	63.2 (63-64)
Stylet guiding ring (μm)	45.0 (44-46)	65.3 (65-66)	78.0 (77-79)	91.3 (88-95)
Tail length (μm)	65.7 (62-73)	76.6 (75-78)	84.0 (84)	84.0 (84)
a	40.5 (39-42)	47.3 (46-49)	50.2 (48-54)	58.7 (54-68)
b	3.9 (3.4-4.2)	4.7 (4.5-5.0)	5.8 (5.7-5.9)	5.8 (5.2-6.5)
c	13.1 (11.7-14.0)	16.1 (15.4-16.8)	20.1 (19.7-21.0)	26.6 (24.4-31.0)
c'	4.3 (4.1-4.8)	4.5 (4.4-4.8)	3.9 (3.7-4.0)	3.8 (3.7-4.0)

ending in a finger like projection 8–10 μm before the tail terminus. Males are absent and no sperms were found in the reproductive tracts of females.

Relationships

Paralongidorus bullatus n. sp. is close to *P. paramaximus* Heyns, 1965, *P. beryllus* Siddiqi & Husain, 1965, and *P. buchae* Lambert, Roca & Chinnapen, 1985. It differs from *P. paramaximus* in length of the female (4.43–5.52 mm vs. 5.64–9.81 mm in *P. paramaximus* [1,2]), in the lip region, which is set off by a constriction versus a wide groove, and in the body immediately posterior, which is constricted vs. not constricted. Inner protoplasmic content of the tail is pointed and finger-like in *P. bullatus* and broadly rounded in *P. paramaximus* (Fig. 1G, H). The tail has two pairs vs. three pairs of papillae in *P. paramaximus*. Males are about as many as females in *P. paramaximus*. *Paralongidorus bullatus* differs from *P. beryllus* in stylet length, (odontostyle length 145 μm vs. 84 μm in *P. beryllus*, and odontophore length 74 μm vs. 60 μm in *P. beryllus*), body behind head constricted vs. not constricted in *P. beryllus*, and in the position of vulva (41.8 vs. 48.0% in *P. beryllus*). It differs from *P. buchae* in having a longer odontostyle (132–156 vs. 114–124 μm in *P. buchae*), a longer tail with inner protoplasmic contents pointed versus broadly rounded. Stylet-guiding ring is located less than 1.5 lip region widths from anterior end, about 2.0 in *P. buchae*.

Xiphinema parasetariae Luc, 1958

Luc (3) described five new species of *Xiphinema* from West Africa. Of these species, *X. parasetariae* was described on the basis of one female, which Luc and Tarjan (6) later placed in *species inquirenda*. In 1961, Luc (4) described *X. attorodorum* from Togo, which was distinct in having a tail with a protoplasmic inner content in the tail nearly to the terminus. Luc et al. (5) stated that such a structure at the tail extremity is a good specific character, which is rare, and known only in *X. attorodorum* and *X. algeriense* Luc & Kostadinov, 1982. These au-

TABLE 3. Comparison of measurements of the holotype of *Xiphinema parasetariae* and females of *X. attorodorum* and *X. parasetariae* from Sadoré, Niger.

Character	<i>X. parasetariae</i> after Luc, 1958	<i>X. parasetariae</i> from Niger	<i>X. attorodorum</i> after Luc, 1961
L (mm)	2.94	2.70–3.02	2.49–2.81
Stylet length (μm)	187	186–194	184–193
a	70.1	65.0–81.0	51.8–73.3
b	7.4	6.9–7.5	6.1–8.5
c	36.3	32.0–41.0	29.4–44.4
c'	3.2	3.1–3.7	2.8–3.3
v	40.2	39.2–42.2	40.1–42.0

thors did not include *X. parasetariae* in this group, although this character is clearly seen in the original illustrations (3). Luc (4) did not compare the description of *X. parasetariae* with that of *X. attorodorum* from Togo. Measurements of their females do not differ (Table 3). *Xiphinema parasetariae* is properly described and well illustrated and cannot be considered as *species inquirenda* because it was described from a single specimen which was lost. It is a valid species, and we consider *X. attorodorum* its synonym. We found this species in areas of Bengou, Tara, Kabra, Boureiri, Milo, Mahamanedi, Kowakore, Maradi, and Yarriddi in Niger. All juveniles and females had tails with a protoplasmic inner content reaching almost to the tail tip (Fig. 2A–E). Measurements of juveniles and females are in Tables 2, 3.

Remarks

Paralongidorus bullatus and *X. parasetariae* are widely distributed in Niger and are associated with crop growth variability problems with groundnut. Populations of these species were found in soil to a depth of 60 cm. Their densities increase gradually from June, with highest levels attained in late September during the crop growth period.

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