Three new species of *Xiphidorus* from Argentina, with comments on *Xiphinema sandellum* Heyns, 1966

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SUMMARY

Three new species of *Xiphidorus* are described. *X. balcarceanus* sp. nov. differs from the type species *X. yepesara* Monteiro, 1976 in shape of amphids, tail shape and in reproducing parthenogenetically. It differs from *X. parthenus* Monteiro, 1981 in having a longer spear, a more anterior vulva, and a larger number of lateral body pores. *X. tucumanensis* sp. nov. resembles most closely *X. balcarceanus* sp. nov. but is a gonochoristic species ; it also resembles *X. yepesara*, but has differently shaped amphids and tail, and longer spicules. *X. saladillensis* sp. nov. differs from the other species in its smaller size, shorter spear and shorter pharyngeal bulb ; it further differs from *X. yepesara* and *X. tucumanensis* sp. nov. in shape and length of the spicules and smaller number of supplements. The generic diagnosis is amended. Reexamination of the holotype and some paratypes of *Xiphinema sandellum* Heyns, 1966 revealed the faint but slit-like apertures of the amphids, the peculiar odontostyle base, the *Xiphidorus*-like guiding apparatus and pharyngeal gland pattern. The differences in amphid structure, odontostyle base and odontophore base exclude *X. sandellum* from *Xiphidorus* as at present defined. The inclusion of the species in *Brevinema* Stegarescu, 1980 is accepted, but not its synonymy with *B. pisi*.

RÉSUMÉ

Trois nouvelles espèces de Xiphidorus *d'Argentine, et commentaires sur* Xiphinema sandellum *Heyns, 1966*

Trois nouvelles espèces de *Xiphidorus* sont décrites. *X. balcarceanus* sp. nov. se différencie de l'espèce type *X. yepesara* Monteiro, 1976 par la forme des amphides et de la queue et par sa reproduction parthénogénétique. Il diffère de *X. parthenus* Monteiro, 1981 par un stylet plus long, la vulve en position plus antérieure et un nombre plus élevé de pores latéraux. *X. tucumanensis* sp. nov. ressemble le plus à *X. balcarceanus* sp. nov. mais est gonochorique ; il est aussi fort proche de *X. yepesara* mais en diffère par la forme des amphides et de la queue et par des spicules plus longs. *X. saladillensis* sp. nov. se différencie des autres espèces par sa taille plus petite, un stylet plus court et un bulbe pharyngien plus court ; il se sépare de plus de *X. yepesara* et de *X. tucumanensis* sp. nov. par la forme et la longueur des spicules et par un nombre plus petit de suppléments. La diagnose du genre est émendée. Le réexamen de l'holotype et de quelques paratypes de *Xiphinema sandellum* Heyns, 1966 a montré une ouverture amphidienne en fente peu prononcée, une base de l'odontostyle particulière et enfin un guide tubulaire ; les glandes pharyngiennes sont similaires à celles de *Xiphidorus*. Les différences dans la forme de l'amphide, de la base de l'odontostyle et de l'odontophore excluent *X. sandellum* des *Xiphidorus* comme définis présentement. L'appartenance de cette espèce à *Brevinema* est acceptée mais non sa synonymie avec *B. pisi*.

The genus *Xiphidorus* was erected by Monteiro in 1976 on the basis of specimens collected from soil around the roots of passion fruit in Brazil. It was considered to possess characters reminiscent of *Xiphinema* (guiding ring close to odontostyle base, forked odontostyle base, odontophore with basal flanges) as well as of *Longidorus* (amphid shape, oesophageal = pharyngeal gland pattern). The lip region of the type species, *X. yepesara* Monteiro, 1976, is swollen and in that respect similar to some *Paralongidorus* (or *Siddiqia*) and *Longidorus* species.

During a survey of the nematofauna from several regions in Argentina, we found three new species of this genus. Although two of the species were only represented by a few specimens their description was judged necessary to further characterize the genus and to amend the generic diagnosis on certain points.

The nematodes were collected mainly around the roots of potatoes and also around sugar cane and maize. They were fixed with hot 4% formaldehyde, extracted with a modified centrifugation-flotation technique and mounted in pure dehydrated glycerine with a modified Seinhorst's method.

Type specimens of *Xiphinema sandellum* Heyns, 1966 were compared with the *Xiphidorus* species.

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Xiphidorus balcarceanus sp. nov.
(Fig. 1 A-I, N-Q & 2)

DIMENSIONS

Females : see Table 1.

Juveniles : see Table 2.

Holotype (♀) : L = 3.5 mm ; a = 84.5 ; b = 11.2 ; c = 131.5 ; c′ = 0.96 ; V = 45.5 ; odontostyle = 101 µm ; odontophore = 47 µm ; total spear = 148 µm.

DESCRIPTION

Female : Body slender ; C-shaped or more strongly ventrally curved upon fixation ; tapering towards both ends, but more so anteriorly. Cuticle smooth, internally with faint transverse striae ; 1.5-2 µm thick except for the tail where its thickness increases to 4-7 µm on the dorsal side. Lateral organs and pores usually clearly visible throughout the body length, their number varying from 150 to 204, with 12-20 in the neck region. Dorsal and ventral body pores only visible in the anterior body region : three to four dorsal pores confined to the spear region and five to seven ventral pores anterior to the nerve ring. Lateral chords about one third to one fourth of the body width at mid-body. Lip region expanded and offset by a distinct depression ; 6-7 µm high and 13-14 µm wide ; with two circlets of small papillae (6 + 10). Amphids with a cup-shaped pocket (fovea) and a pore- or minute slit-like opening. The pocket extends anteriorly beyond the aperture along both sides of the lateral lip. The dendritic processes are highly convoluted inside the fovea. Fusus ("sensillar pouch") at 25-28 µm behind the opening. Spear similar to *Xiphinema* with forked odontostyle base and moderately developed flanges at the odontophore. Odontostyle slightly irregular in outline. Guiding ring far back, i.e. 65-92 µm ($\bar{x}$ = 80 µm, n = 21) from the anterior end. Dilatores buccae absent. The spear protractors as well as the

Table 1

Xiphidorus balcarceanus sp. nov. : Dimensions of females

	Type population	*Pop. a*	*Pop. b*	*Pop. c*	*Pop. d*	*Pop. e*
n	25	9	1	5	1	3
L (mm)	3.36 (2.9-3.7)	3.62 (3.4-3.8)	3.0	3.62 (2.9-4.1)	4.1	3.39 (3.2-3.5)
a	83.8 (73.5-91)	87.8 (81.5-93.5)	85.2	87.6 (81-94)	100.0	87.2 (85.5-89.5)
b	11.6 (10-16)	11.3 (10.5-16)	10.6	11.8 (11-12.5)	12.5	10.6 (10.5-10.7)
Tail (µm)	27.3 (22-30)	26.5 (25.5-28)	24	26.6 (24-28)	27	25.5 (24.5-26.5)
c	123.3 (109-143.5)	136.7 (129-144)	123.5	135.3 (120-145)	152.5	133.3 (126.5-140)
c′	0.97 (0.8-1.1)	0.99 (0.9-1.1)	0.9	0.96 (0.9-1)	1	0.97 (0.9-1)
V	46.4 (43.5-49.5)	46.5 (44-49)	51.5	47.8 (46.5-49.5)	45.5	47.0 (45-49.5)
Od. style (µm)	98 (92-102)	96.9 (93.5-101.5)	95	97.6 (88.5-102.5)	97.5	91.5 (90.5-93.5)
Od. phore (µm)	45.5 (40-49)	46.7 (46-49)	46.2	49.0 (43-53)	52.1	47.9 (46-50)
Spear (µm)	143.4 (137-149)	143.7 (141-149)	141	146.7 (131-153)	149.7	139.4 (136.5-144)

retractors agree with those of *Xiphinema*, and the third group of *Longidorus* (cf. Robertson & Taylor, 1975). The eight protractors are most prominent in the region of the anterior odontophore, further back they merge to a circular strand that attaches to the flanges. The retractors consist of four muscle bands that attach to the body wall near the junction of the slender and enlarged portions of the pharynx. Slender portion of pharynx apparently with radial muscles. Enlarged portion of pharynx (= pharyngeal bulb) 58.5-74.5 µm ($\bar{x}$ = 68 µm, n = 7) long and 15-19 µm ($\bar{x}$ = 16.9 µm, n = 7) wide. Nucleus (DN) and nucleolus of the dorsal pharyngeal gland very small (about 3.5 µm across), situated some 8-11.5 µm behind the outlet of the gland (DO). Ventrosublateral gland nuclei (SN) large, with large nucleolus, situated about halfway along the pharyngeal bulb ; ventrosublateral gland outlets (SO) in posterior part of bulb (Fig. 1 D ; Diagram 1). Locations :

DO = 9.8-14.3 ($\bar{x}$ = 11.8)% ; DN = 23.8-28.5 ($\bar{x}$ = 25.8)% ; RSN = 47.9-55 ($\bar{x}$ = 51.5)% ; RSO = 71.7-80.4 ($\bar{x}$ = 76.6)% ; LSN = 49.6-54.5 ($\bar{x}$ = 51.6)% ; LSO = 75.5-81 ($\bar{x}$ = 77.8)% ; DO-DN = 12.1-16.5 ($\bar{x}$ = 14.1)%.

Pharyngo-intestinal junction broadly flattened to hemispheroid (Fig. 1 D). Prerectum 237-539 µm long. Nerve ring at 151-184 µm ($\bar{x}$ = 170 µm, n = 15) from anterior end. Hemizonid 5-7 µm wide, 152-182 µm from anterior end ; hemizonion 1.5-2 µm wide, 188-242 µm from anterior end. Female reproductive system with equally well developed branches, situated either on the left or on the right side of the intestine. Each branch consisting of ovary, oviduct, sphincter and uterus ; the latter composed of two more or less distinct parts : a narrow proximal and a wider distal portion leading to the common vagina. Vulva a transverse slit. Several females were fully mature with large oocytes in ovaries and/or oviducts, one female even had an egg in one of the uteri. None of the females, however, contained sperm and reproduction probably occurs by parthenogenesis. Tail dorsally convex-conoid, with smoothly rounded

Table 2

Xiphidorus balcarceanus sp. nov. : Dimensions of juveniles (type population)

	J 1	*J 2*	*J 3*	*J 4*
n	5	2	6	13
L (mm)	0.85 (0.80-0.95)	1.16, 1.25	1.65 (1.33-1.83)	2.38 (1.90-2.68)
a	49.9 (47.5-54.0)	53, 57	64.9 (53.5-76.7)	72 (57.5-80)
b	5.0 (4.4-6.5) *	5.2, 5.2	6.6 (5.4-7.6)	8.9 (7.5-12.5)
c	29.5 (27.8-32.2)	39, 39.5	58 (49.5-67.2)	82 (65.5-98.5)
c′	2.3 (2.1-2.4)	1.9, 2.0	1.4 (1.3-1.6)	1.2 (1.0-1.4)
Tail (µm)	29.0 (26.0-33.0)	29.5, 32	28.5 (26-32)	29 (25-32)
Od. style (µm)	40.5 (39-42)	51, 51	65.8 (62-68)	79 (73-86)
Od. phore (µm)	28 (27-29) **	34, 46	37 (35-39)	42 (39-53)
Spear (µm)	69.5 (69-70) **	85, 87	102.6 (98.5-107)	121 (115-139)
Repl. od. style (µm)	49.5 (48-51)	61, 65	78 (73-80)	97 (90-104)

* n = 4 ; ** n = 2

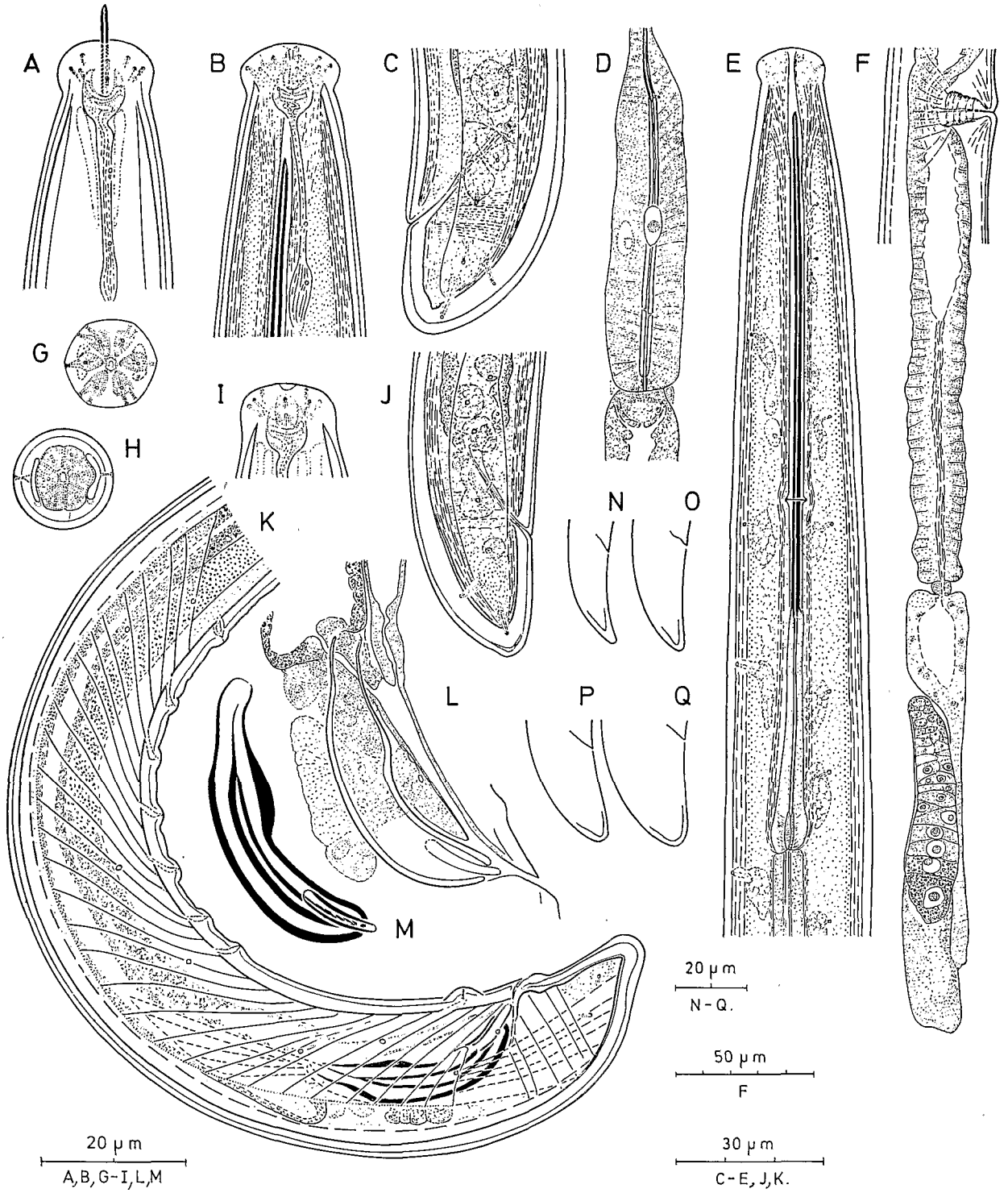

Fig. 1. *X. balcarceanus* sp. nov. A-B : Head region ; C : Female tail ; D : Pharyngeal bulb ; E : Spear region ; F : Female reproductive system (posterior branch) ; G : « En face » view ; H : Optical section at the level of the amphidial pouches ; I : Lip region. *X. tucumanensis* sp. nov. J : Female tail ; K : Male posterior end ; L : Cloacal region ; M : Spicule and lateral guiding piece. *X. balcarceanus* sp. nov. N : Tail J_1 ; O : Tail J_2 ; P : Tail J_3 ; Q : Tail J_4.

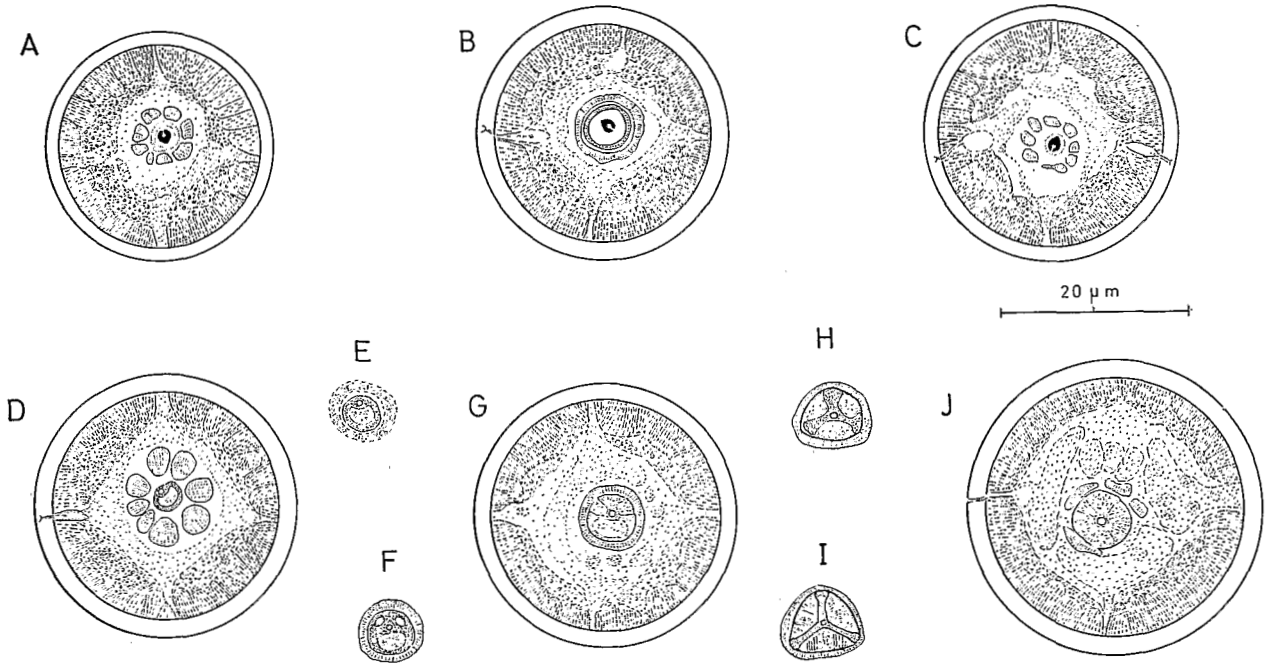

Fig. 2. *X. balcarceanus* sp. nov. Cross sections ; A : In front of guiding ring ; B : Level of guiding ring ; C : Odontostyle region behind guiding ring ; D-I : Anterior odontophore region + subsequent sections ; D-F : Closed portion ; G : Subdorsal sectors open, ventral sector closed ; H-I : portion with all sectors open, level of flanges ; J : Section through region of slender pharynx.

terminus. Inner cuticle with radial striations, interrupted or not at the terminus. Two or three caudal pores and an adanal pore present at each side.

Male : not found (see above).

Juveniles : Tail shape varying according to the juvenile stage, due to increase in tail width.

Type habitat and locality

Soil from a potato field, Estacion Experimental Regional Agropecuaria de Balcarce, province of Buenos Aires (25 females, 26 juv.), collected by E. Chaves on 23-1-78.

Other habitats and localities

Soil around potato plants in the province of Buenos Aires at the following localities : 1) "La Peregrina", Pdo. de Gral. Pueyrredon (population a, 9 fem., 22 juv.) ; 2) San Miguel, Pdo. de Gral. Alvarado (population b, 1 fem., 2 juv.) ; 3) Necochea (population c, 5 fem., 33 juv.) ; 4) "El Dorado", Pdo de Balcarce (population d, 1 fem. 4 juv.) ; 5) Cuartel IV, Pdo. de Gral. Alvarado (population e, 3 fem., 19 juv.). A single juvenile (J 4) was found around maize in Saladillo, in the same sample that contained *X. saladillensis* sp. nov.

Differential diagnosis

Xiphidorus balcarceanus sp. nov. is very similar to the type species, *X. yepesara* Monteiro, 1976 but has differently shaped amphids (bilobed in *X. yepesara*), wider and less conical and undigitated tail. Furthermore it clearly reproduces by parthenogenesis. In the latter respect *X. balcarceanus* sp. nov. resembles *X. parthenus*, but differs by its wider body (a = 96-108 in *X. parthenus*), shorter tail (c′ = 1.3-1.5 in *X. parthenus*), more anterior vulva (V = 51-55 in *X. parthenus*), slightly longer odontostyle (odontostyle 86-90 µm in *X. parthenus*) and in a larger number of lateral body pores (less than 100 in *X. parthenus*).

Type specimens

Distributed as follows : Holotype on slide nº 263 and 4 paratypes : Nematology Collection, Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium ; 2 female paratypes in each of the following institu-

tions : Nematology Collection, Rothamsted Experimental Station, Harpenden, Herts, England ; Nematology Collection, Landbouwhogeschool Wageningen, The Netherlands ; Nematology Collection, USDA, A.R.S. Northeastern Region, Beltsville, Maryland, U.S.A. ; Laboratoire des Vers, Muséum national d'Histoire naturelle, Paris, France. Other specimens with E. Chaves, INTA, Estacion Experimental Agropecuaria de Balcarce, Argentina.

Xiphidorus tucumanensis sp. nov.

(Fig. 1 J-M)

DIMENSIONS

Female (holotype) : L = 4.20 mm ; a = 118.5 ; b = 12.5 ; c = 161.5 ; c′ = 1.1 ; V = 48 ; odontostyle = 87 µm ; odontophore = 45 µm ; total spear = 132 µm.

Male (paratypes, n = 2) : L = 4.0, 4.0 mm ; a = 119, 127.5 ; b = 12, 12.5 ; c = 139.5, 142.5 ; c′ = 1.0, 1.1 ; odontostyle = 86.5, 87 µm ; odontophore = 45, 46 µm ; total spear = 131, 133 µm.

Female (paratype, n = 1) (posterior part missing) : odontostyle = 96.5 µm ; odontophore = 45 µm ; total spear = 141.5 µm.

DESCRIPTION

Female : Closely resembling that of the previous species, except for the slightly different tail shape (compare Fig. 1 C and J), more slender body, and the bisexual reproduction. In the two females sperm is present in the distal half of both uteri and in the pars dilatata oviductus, which apparently acts as a spermatheca.

Male : With six to seven medioventral supplements and an adanal pair. The anteriormost medioventral supplement occurs at 119-127 µm, the last at 58-63 µm in front of the cloacal opening. Spicules 44-46 µm along the arc ; lateral guiding pieces 11.5-12.5 µm long. Rectum short, merging with the vas deferens to form the cloaca in which the rectal glands open from the dorsal side. Tail with slight dorsal subterminal depression and swollen posterior cloacal lip.

Juveniles : Four juveniles, belonging to first, second and fourth stage were found. They agree in general respects with the females.

TYPE HABITAT AND LOCALITY

Soil from a potato field, Pozo Verde, Departamento de la Cocha, Province of Tucuman, collected by INTA at Famailla on 11-04-1979.

OTHER HABITAT AND LOCALITY

Soil around sugar cane, Concepcion, Province of Tucuman (4 juveniles).

DIFFERENTIAL DIAGNOSIS

Xiphidorus tucumanensis sp. nov. closely resembles *X. yepesara* and *X. balcarceanus* sp. nov. From the former it can be differentiated by the shape of the amphids and the longer spicules (spicules 31.5-39 µm long in *X. yepesara*) ; from the latter it differs in its more slender body and in being gonochoristic.

TYPE SPECIMENS

Holotype (female) and one male paratype on slide n° 244 deposited in the Nematode Collection of the Instituut voor Dierkunde, Rijksuniversiteit Gent. Other male and female paratype (without tail) deposited with E. Chaves in the Nematode Collection of INTA, Estacion Experimental Agropecuaria de Balcarce.

Xiphidorus saladillensis sp. nov.

(Fig. 3 A-I)

DIMENSIONS

Female : (holotype) : L = 2.18 mm ; a = 68 ; b = 8.5 ; c = 65 ; c′ = 1.5 ; V = 43.5 ; odontostyle = 71 µm ; odontophore = 36.5 µm ; total spear = 107.5 µm.

Male (paratype, n = 1) : L = 2.08 mm ; a = 75 ; b = 8.5 ; c = 52 ; c′ = 1.6 ; odontostyle = 71 µm ; odontophore = 37 µm ; total spear = 108 µm.

DESCRIPTION

Female : Body shape, cuticle, lip region, spear, guiding apparatus, position of pharyngeal glands and female reproductive system similar to those in the other species of the genus. Cuticle up to 3 µm thick in the tail region. Lip region 11-12 µm wide and 5.5-6 µm high. Fovea (amphidial pocket) a wide, symmetrical sac, with minute slit-like apertures (only observed in the male and two juveniles). Fusus small, situated at 30-33 µm behind the apertures. Guiding ring 61-64 µm from anterior end. Pharyngeal bulb 41-42 µm long and 15-16.5 µm wide. Pharyngeal gland nuclei and outlets as follows :

DO = 9.5-13.4% ; DN = 26.7-31% ; RSN = 55.8-57% ; RSO = 81.4-82.1% ; LSN = 51.2-58.1% ; LSO = 77.4-84.9% ; DO-DN = 13.3-21.5%.

Nerve ring at 143-145.5 µm from anterior end. Tail dorsally convex-conoid, with subdigitate terminus ; two caudal and one adanal pores present at each side.

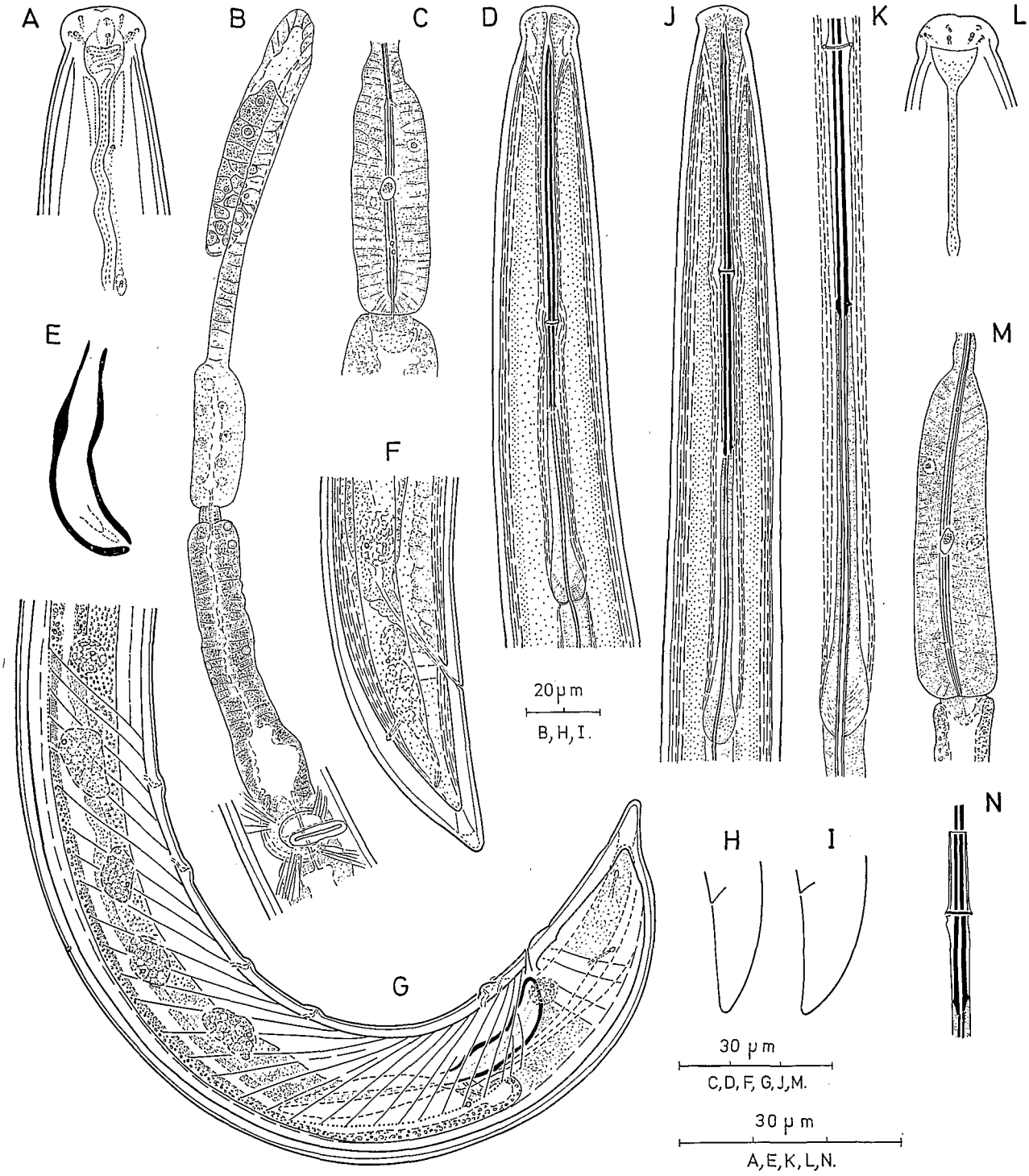

Fig. 3 A-I. *X. saladillensis* sp. nov. : A : Head region ; B : Female reproductive system (anterior branch) ; C : Pharyngeal bulb ; D : Spear region ; E : Spicule ; F : Female tail ; G : Male posterior end ; H : Tail J_3 ; I : Tail J_4. J-N : *B. sandellum* (Heyns, 1966) ; J : Spear region ; K : Posterior part of odontostyle and odontophore ; L : Head region ; M : Pharyngeal bulb ; N : Guiding apparatus when spear is protruded.

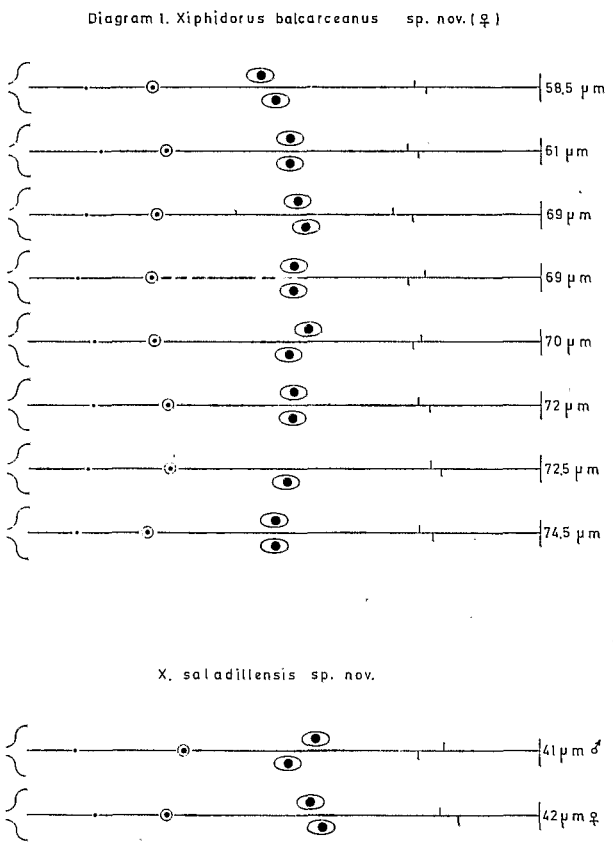

Fig. 4. Positions of pharyngeal gland nuclei.

Male : Spicules dorylaimoid 32 µm along the arc, without median sclerotized rib ; lateral guiding pieces obscure. Apart from the adanal pair, there are four medioventral supplements. The anteriormost of these occurs about 100 µm and the last 46 µm in front of the cloacal opening. Both supplements of the adanal pair are at a slightly different level.

Juveniles : Only third and fourth stage juveniles found, these are similar to females except for smaller size and more conical tail.

TYPE HABITAT AND LOCALITY

Soil around the roots of maize, Saladillo, Province of Buenos Aires, collected by E. Escande on 30-1-78.

DIFFERENTIAL DIAGNOSIS

Xiphidorus saladillensis sp. nov. can be differentiated from the other species of *Xiphidorus* by its shorter body length, spear length and pharyngeal bulb length. It further differs from *X. yepesara* and *X. tucumanensis* sp. nov. in the number of medioventral supplements in males (four against six to eight) and shape and length of the spicules. From *X. tucumanensis* sp. nov. it also differs in tail shape and from *X. yepesara* in the shape of the amphids (bilobed in *X. yepesara*).

TYPE SPECIMENS

Holotype (female) on slide n° 245 ; paratype (male) cut into three pieces on slides n° 246 a-c, deposited in the Nematode Collection of the Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

Xiphidorus Monteiro, 1976

DIAGNOSIS (after Monteiro, 1976, amended).

Longidoridae. Lip region expanded, offset by a depression. Amphidial fovea large, symmetrical, bilobed or not ; amphidial apertures small, slit- or pore-like. Odontostyle base forked. Odontophore with moderately developed basal flanges. Cheilostome long, hence guiding ring far backward ; guiding sheath not folded anterior to the guide ring when spear is in resting position. Dilatores buccae absent. Spear retractor system consisting of a muscular sheath around the slender part of the pharynx, passing through the nerve ring and then diverging as four muscle bands to the body wall. Pharyngeal gland pattern with small rounded dorsal nucleus, far behind the corresponding opening (DO-DN = 12-21.5% of bulb length). Female reproductive system with rather uniform uteri. Males with spaced ventromedian supplements, the last forming a large gap with the adanal pair. Tails similar in both sexes, convex-conoid to digitate.

REMARKS ON *Xiphinema sandellum* Heyns, 1966

The species described by Heyns in 1966 as *Xiphinema sandellum* resembles in several aspects the species of *Xiphidorus*, e.g. in the expanded lip region, the posterior position of the guiding ring, the moderately developed flanges and the tail shape.

Thanks to the kindness of J. Heyns we were able to study the holotype and three paratypes of *X. sandellum*. The holotype and one of the paratypes are in good condition and a reexamination revealed the presence of faint but wide slit-like amphidial apertures (Fig. 3 L). The spear guiding apparatus is the same as in *Xiphidorus* (Figs 3 K, N) and dilatores buccae are apparently absent. The pharyngeal gland pattern (Fig. 3 M) also resembles that of *Xiphidorus* except for the more posterior locations of SO. Locations in the holotype : DO = 12.1% ; DN =

30.3% ; SN (R and L) = 53% ; RSO = 84% ; LSO = 85.6%.

A difference with the hitherto known species of *Xiphidorus* is found in the odontostyle base. The latter is not really forked, but presents a minute triangular ridge or small swelling depending on its orientation (Fig. 3 K, N). A similarly structured odontostyle base can be observed in some *Longidorus* species (e.g. *L. goodeyi* Hooper, 1961 and *L. intermedius* Kozłowska & Seinhorst, 1979).

From the above it is clear that, despite the similar amphids, *X. sandellum* does not fit in *Xiphinema* as originally proposed, nor in *Longidorus* as proposed by Khan *et al.* (1978). As pointed out by Luc & Dalmasso (1975) and Khan (1978) it may represent a new genus with intermediate characters. *Xiphidorus* is such a genus and *X. sandellum* shares at least two derived characters with it : the guiding apparatus and the small, rounded dorsal gland nucleus. In its amphid shape it has a more primitive condition than hitherto known species of *Xiphidorus* and its odontostyle base is somewhat intermediate between that found in most Longidorinae and that found in *Xiphidorus* and Xiphineminae. The same applies to the odontophore base. This appears as moderately flanged as in *Xiphidorus* (compare Figs 3 D and 3 J, K) but the swollen base in *X. sandellum* is mainly due to the well developed oblique-radial muscles and it is not certain whether there are cuticular flanges as in *Xiphidorus* (cf. Fig. 2 I) and in *Xiphinema*. So it seems preferable to keep *X. sandellum* separate from *Xiphidorus*. It may represent a new genus intermediate between *Xiphidorus* and *Paralongidorus*. Such a genus was proposed by Stegarescu (1980) for *Longidorus siddiqii* Aboul-Eid, 1970 : *Brevinema*, but since Khan (1978) synonymized *L. siddiqii* with *L. pisi* Edward, Misra & Singh, 1964, the correct name for the type species should be *Brevinema pisi* (Edward, Misra & Singh, 1964) nov. comb. with *B. siddiqii* (Aboul-Eid, 1970) as its junior synonym. Stegarescu (1980) considered *X. sandellum* as a population of *L. siddiqii*. Khan (1978) has also proposed that *L. pisi* and *X. sandellum* should be placed in a new genus. Brown Hooper and Saka (1982) studied the variability of *L. pisi* and would agree with a new genus when further observations show that the basal flanges are a consistent feature. These authors illustrated the amphideal fovea as a wide and long pocket with irregular base. In previous descriptions of the species (Siddiqi, 1959 ; Edward *et al.*, 1964) the amphid aperture was described as minute. This is at variance with our observations on the amphid structure of *X. sandellum*. In this respect the latter species more closely resembles *Paralongidorus xiphinemoides* Heyns, 1965 and pending further information on the amphid structure the synonymy of *B. pisi* and *X. sandellum* cannot be accepted. At present the genus *Brevinema* is poorly defined, but its main characteristics seem to be the posteriorly located single guiding ring, unforked odontostyle base and "muscular" instead of "sclerotised" flanges. For the time being *X. sandellum* can be included in the genus as *Brevinema sandellum* (Heyns, 1966) Stegarescu, 1980, but the type species and other longidorid species with the above mentioned characteristics should be critically re-examined with regard of their amphid structure.

Discussion

The genus *Xiphidorus* Monteiro, 1976 possesses a number of characters that, taken separately relate it either to the Longidorinae or to the Xiphineminae. A critical evaluation of these characters leads to the conclusion that *Xiphidorus* belongs to Longidorinae rather than to Xiphineminae. The shape of the amphidial fovea and that of the aperture are less important in this discussion since the primitive (plesiomorph) as well as the derived (apomorph) condition occurs in Longidorinae. The guiding apparatus superficially resembles *Xiphinema* in the posterior position of the guide ring. However some species of Longidorinae also have a posteriorly located guide ring, viz. *Brevinema pisi*, *Paralongidorus xiphinemoides* and *B. sandellum*. In these species as well as *Xiphidorus* the guiding apparatus shares two features with other Longidorinae : (1) the guiding sheath is never folded when the spear is in resting position, so that the guiding ring is "single" ; (2) there are no dilatores buccae. The odontostyle of *Xiphidorus* has a forked base as in *Xiphinema*, but this represents a plesiomorphic character state inside the Dorylaimoidea and is therefore not important here since symplesiomorphies are no indicators of close relationship. The odontophore with flanges on the other hand is an apomorph character shared by *Xiphinema* and *Xiphidorus*. At present it is not clear whether this is a synapomorphy (indicating a secondary reduction in Longidorinae) or the result of parallel evolution.

The spear retractor system in *Xiphidorus* is the same as in *Xiphinema* and some *Longidorus* (group 3 of Robertson & Taylor, 1975). Although this system is in itself already derived compared to other Dorylaimoidea, it seems to be the most primitive one inside the Longidoridae and apparently originated in the common ancestor of the group in relation with the elongated spear. Inside the Longidorinae it was later on modified and occasionally supplemented with a second set of retractors.

The pharyngeal gland pattern of *Xiphidorus* is essentially that of Longidorinae with a small and rounded dorsal nucleus far behind the outlet. The small dorsal nucleus is clearly an apomorphic character (but the large distance between DO and DN is a plesiomorphic condition (Loof & Coomans, 1970 ; 1972). In the species of *Xiphidorus* so far known DN is rounded, whereas it is usually elongate in Longidorinae, but rounded ones occur.

In conclusion, there seem to be more arguments to put *Xiphidorus* close to Longidorinae than to Xiphineminae. At present it is difficult to decide whether *Xiphidorus* should be placed in the Longidorinae or as a separate subfamily (Khan *et al.*, 1978 even proposed a separate family). It is however clear that any taxonomic change proposed should be amply discussed and should be based on evaluation of several characters. Especially if one relies mainly on one or two characters, e.g. the amphid (shape and aperture) or shape of lip region (as did Khan *et al.*, 1978), their character state should be defined. Only reliable synapomorphies can be used. Therefore important taxonomic changes should only be proposed after a thorough comparative study of all important characters. This does not mean that the subdivisions proposed by Khan *et al.* (1978) are wrong, but that other characters should be included and evaluated in order to check their proposals. At the same time the taxonomic rank of all the subdivisions as well as of the whole group should be critically considered and compared with other dorylaim groups. For these reasons we have here treated the longidorids still as a family composed of two subfamilies Longidorinae and Xiphineminae, the former comprising *Longidorus* (+ *Longidoroides*), *Paralongidorus* (+ *Siddiqia* + *Inagreius*), *Brevinema* and for the time being *Xiphidorus;* the latter subfamily containing only *Xiphinema.*

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