

Study of the genus *Xiphidorus* Monteiro, 1976 (Nematoda : Longidoridae)

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Summary – An extensive survey of longidorids in Argentina resulted in the collection of numerous populations pertaining to various species of *Xiphidorus*. Their study provides additional information on each of them and thus enlarges our knowledge of intraspecific variation. Nematodes studied are : *X. amazonensis*, *X. balcarceanus*, *X. saladillensis*, *X. yepesara*, *X. achalae*, and *X. minor*. *X. tucumanensis* is proposed as a junior synonym of *X. balcarceanus* and *X. parthenus* as a subspecies, *X. yepesara parthenus* n. grad., besides *X. yepesara yepesara*. A key to the species and subspecies is given.

Résumé – Étude sur le genre *Xiphidorus* Monteiro, 1976 (Nematoda : Longidoridae) – Une enquête étendue concernant les Longidorides d'Argentine a permis de recueillir de nombreuses populations appartenant à diverses espèces de *Xiphidorus*. Leur étude a fourni des données complémentaires sur chacune d'entre elles et permis de préciser leur variabilité intraspécifique. Ont ainsi été étudiés : *X. amazonensis*, *X. balcarceanus*, *X. saladillensis*, *X. yepesara*, *X. achalae* et *X. minor*. *X. tucumanensis* est proposé comme synonyme mineur de *X. balcarceanus* et *X. parthenus* comme une sous-espèce, *X. yepesara parthenus* n. grad., à côté de *X. yepesara yepesara*. Une clé des espèces et sous-espèces est proposée.

Key-words : nematodes, *Xiphidorus*.

The genus *Xiphidorus* Monteiro, 1976 was created to accommodate a Brazilian species of longidorid which shares some characters with *Xiphinema*, and others with *Longidorus sensu lato*. In addition to the type species, *X. yepesara* Monteiro, 1976, the genus *Xiphidorus* contains at the moment seven other species : *X. achalae* Luc & Doucet, 1984, *X. amazonensis* Uesugi, Huang & Cares, 1985, *X. balcarceanus* Chaves & Coomans, 1984, *X. minor* Rashid, Coomans & Sharma, 1986, *X. parthenus* Monteiro, Lordello & Nakasono, 1981, *X. saladillensis* Chaves & Coomans, 1984 and *X. tucumanensis* Chaves & Coomans, 1984.

Xiphidorus has been independently rediagnosed by Chaves and Coomans (1984) and Luc and Doucet (1984). Its distribution is, at the moment, restricted to Brazil and Argentina.

Despite the small number of species in the genus, the specific determination is not always easy, mostly because of the small number of available characters. Also, only a small number of specimens are known for the majority of species, which prevents a correct knowledge of the intraspecific variability.

The most frequently used differentiating characters (present in more than half of the species diagnoses) are,

from most to less frequent : amphid shape (= fovea), odontostyle length, tail shape, and body length. Various other characters used are : "a" value, type of reproduction, "V" value, etc. Moreover, interesting observations made by Kruger and Heyns (1990) on the female genital tract revealed some interspecific differences. In any case, intraspecific variability of most characters is small. Furthermore, almost all the species are known so far by their type population only (*X. yepesara*, *X. achalae*, *X. amazonensis* *, *X. parthenus*, *X. saladillensis*) or by two populations (*X. minor*, *X. tucumanensis*). The number of specimens in each population described was generally low with the exception of *X. balcarceanus* for which the type population contained 25 specimens while fourteen specimens from five other populations were also reported. Moreover, Heyns and Chaves (1988), while describing the only male found, produced metric data on a population containing fifteen females.

During a national survey of Argentinian longidorids (Luc & Doucet, 1990) several populations of *Xiphidorus*

* For that species information is only given on the type population although nineteen other "hosts" are listed in the same publication.

were recorded. This material provided additional data on the species observed, and more information on their intraspecific variability. In addition, some slides from an earlier sampling made by Dr. E. Chaves have been examined.

List of the Argentinian populations of *Xiphidorus* sampling localities.

Pop. 1 : Villa Olivati, Ituzaingo Department, Corrientes Province; rhizosphere of *Eucalyptus* sp.

Pop. 2 : Camino San Juan, Partido de Loberia, Buenos Aires Province; potato field.

Pop. 3 : Miramar, Partido General Alvarado, Buenos Aires Province; potato field.

Pop. 4 : La Ballenera, Partido General Alvarado, Buenos Aires Province; potato field.

Pop. 5 : Barrow, Partido Tres Arroyos, Buenos Aires Province; rhizosphere of *Acacia* sp.

Pop. 6 : Parque Nacional "El Palmar", Colón Department, Entre Rios Province; rhizosphere of *Poa* sp.

Pop. 7 : Cinco Saltos, General Roca Department, Rio Negro Province; rhizosphere of onions.

Pop. 8 : Rafaela, Castellano Department, Santa Fe Province; rhizosphere of maize.

Pop. 9 : Santa Rosa, Capital Department, La Pampa Province; rhizosphere of grasses.

Pop. 10 : General Paz, Colón Department, Córdoba Province; rhizosphere of maize.

Pop. 11 : Manfredi, Rio Segundo Department, Córdoba Province; rhizosphere of soybean.

Pop. 12 : Tres Pozos, Rio Cuarto Department, Córdoba Province; rhizosphere of soybean.

Pop. 13 : Jesus Maria, Colón Department, Córdoba Province; rhizosphere of *Vitis* sp.

Pop. 14 : Canals, Union Department, Córdoba Province (*rec. et leg.* E. Chaves).

Pop. 15 : Tala Cañada, Pocho Department, Córdoba Province; rhizosphere of *Tritinax campestris*.

Pop. 16 : Estancia Brunelli, Rio Primero Department, Córdoba Province; rhizosphere of *Festuca* sp. and *Poa* sp.

Pop. 17 : Fico, Capital Department, Córdoba Province; rhizosphere of *Opuntia* sp.

Pop. 18 : Las Vizcacheras, G. Cordillo Department, La Rioja Province; rhizosphere of *Larrea* sp.

Pop. 19 : La Palmira, San Martin Department, Mendoza Province; rhizosphere of *Vitis* sp.

Pop. 20 : Capilla Sitón, Tulumba Department, Córdoba Province; rhizosphere of *Setaria* sp.

Pop. 21 : Catamarca, Capital Department, Catamarca Province; rhizosphere of *Cercidium australe*.

Pop. 22 : Sauce Bajada, La Banda Department, Santiago del Estero Province; rhizosphere of *Capsicum annuum*.

Pop. 23 : Los Colorados, Independencia Department, Salta Province; rhizosphere of *Aspidosperma* sp.

Pop. 24 : Pedro Luro, Buenos Aires Province (*rec. et leg.* E. Chaves).

***Xiphidorus achalae* Luc & Doucet, 1984**

Since the original description, no additional specimens of that species have been found.

Observations in light microscopy by Kruger and Heyns (1990) confirmed the presence of uterine spines, mostly situated in the proximal portion of the uterus, adjacent to its *pars dilatata*. According to these authors "each spine seems pointed at both ends and does not appear to be attached to the uterine wall by a base". This statement is contrary to the observation reported in the original description. TEM observations are necessary to solve the problem.

X. achalae shares some characters with *X. amazonensis*: *i*) greater body length in the genus (4.78-6.33 and 4.85-6.03 mm, respectively) only some individuals of *X. parthenus* and *X. yepesara* overlap the inferior values above, but mean values of L are quite different in the two groups of two species (see Table 1); *ii*) fovea large, not lobed; *iii*) amphidian aperture pore-like; *iv*) presence of prominent uterine spines (thinner in *X. amazonensis*).

X. achalae is easily differentiated from *X. amazonensis* by several other characters: V value (49-59 *vs* 40-46), stylet length (163 *vs* 138 mm, mean value), and also, with some restrictions, absence *vs* presence of males and of sperm in the female genital tractus.

***Xiphidorus amazonensis* Uesugi, Huang & Cares, 1985** (Fig. 1)

Through the courtesy of Dr. D. J. Raski we were able to observe male, female and juvenile paratypes. Detailed drawings were made to supplement the original illustration.

The following observations either confirm the original description or supplement it. Female reproductive system with sperm in uterus and spermatheca; uterus with fine spiny inclusions; vagina shorter than half the corresponding body diameter. Male with testes paired, opposed; spicules with median sclerotized rib; lateral guiding pieces present but rather obscure; postcloacal lip swollen; tail convex-conoid with slight dorsal subterminal depression; three caudal pores on each side; six or seven ventromedian supplements.

In contradiction with the original description, the large amphidial pouch does not appear as two asymmetric lobes but as one large pouch with an anterior shallow indentation opposite the minute pore-like amphid aperture.

Table 1. *Xiphidorus balcarceanus* (= *X. tucumanensis*). Dimensions of females (all measurements in mm).

	Type pop.*	Holotype** (paratype)**	Pop. 2	Pop. 3	Pop. 5	Pop. 15	Pop. 16	Pop. 17	Pop. 18	Pop. 19
n	25	1 (1)	1	7	3	1	6	1	10	1
L	3360 (2900-3700)	4200	3850	3410 (3160-3630)	3435 (3240-3580)	3760	3835 (3605-4080)	3940	3670 (3135-4270)	4590
a	83.8 (73.5-91)	118.5	75	73 (61-96)	79 (71-90)	96	107 (96-116)	127	125 (98-152)	111
b	11.6 (10-16)	12.5	11.0	11.2 (10.6-12.2)	10.7 (10-11.4)	11.7	13.2 (10.5-17.0)	13.1	13.2 11.6-15.9	15.8
Tail	27.5 (22-30)	26	25	24 (22-26)	28 (26-32)	20	22.5 (20-26)	20	22 (19-24)	25
c	123.3 (109-143.5)	161.5	154	144 (133-155)	122 (109-137)	188	171 (144-204)	197	167 (136-198)	183
c'	1.0 (0.8-1.1)	1.1	0.8	0.8 (0.7-1.0)	1.0 (0.9-1.0)	0.8	0.9 (0.9-1.0)	0.9	1.1 (1.0-1.2)	1.0
V	46.4 (43.5-49.5)	48	44.5	48 (46.5-50)	48.2 (46.5-49.5)	48	47 (46-49)	51.5	48 (46-52)	47
Odontostyle	98 (92-102)	87 (96.5)	104	98 (95-103)	100 (98-102)	93	92 (84-97)	86	84 (77-90)	82
Odontophore	45.5 (40-49)	45 (45)	51	48 (46-49)	50 (49-52)	49	44 (42-45)	42	40 (37-43)	45
Stylet	143.4 (137-149)	132 (141.5)	155	146 (142-152)	151 (150-152)	142	136 (126-141)	128	124 (117-131)	127
L. phar. bulb.	68 (58.5-74.5)		73	60 (48-65)	71 (65-77)	59	65 (54-80)	60	60 (53-72)	55
Head width.	13-14		14	11-14	14-15	12.7	12.5-13.5	12	11.5-12	13.1
Ant. gen. br.	-	-	226	177-293	352	-	309-387	331	218-324	
Post. gen. br.	-	-	218	205-285	252	-	309-359	324	192-328	

* Type population of *X. balcarceanus*.** Holotype and paratype (broken) of *X. tucumanensis*.

As stated above, *X. amazonensis* is, with *X. achalae*, the largest species in the genus and so can be easily distinguished from other species. The shape of the fovea resembles that of *X. yepesara* (large with anterior shallow depression) which seems to be the most closely related species. However, there are no uterine spiny inclusions in *X. yepesara*.

***Xiphidorus balcarceanus* Chaves & Coomans, 1984**

= *X. tucumanensis* Chaves & Coomans, 1984,
n. syn.
(Figs 2, 3)

OBSERVATIONS

X. tucumanensis was described on a very small number of specimens (two females, one of which lacking post-

erior part, and two males). Description is brief. No data or illustrations were given on the anterior part because these were the same as in *X. balcarceanus*.

Characters used in the diagnosis to separate *X. tucumanensis* from the nearest species, *X. balcarceanus*, were a more slender body (ratio "a" in female = 118.5 vs 73.5 - 100) and presence of male (absent in *X. balcarceanus*).

However, Heyns and Chaves (1988) described an Argentinian population designated as *X. balcarceanus* in which one male was present. This male was said to be rather similar to males of *X. tucumanensis* but differing by three characters: *i*) a less slender body ($a = 84$ vs 119-127.5), *ii*) a more bluntly rounded tail, and *iii*) a greater number of supplements (9 vs 6, 7). Ratio "a" is not a very reliable character, mainly when comparisons are based on a low number of specimens (here : three);

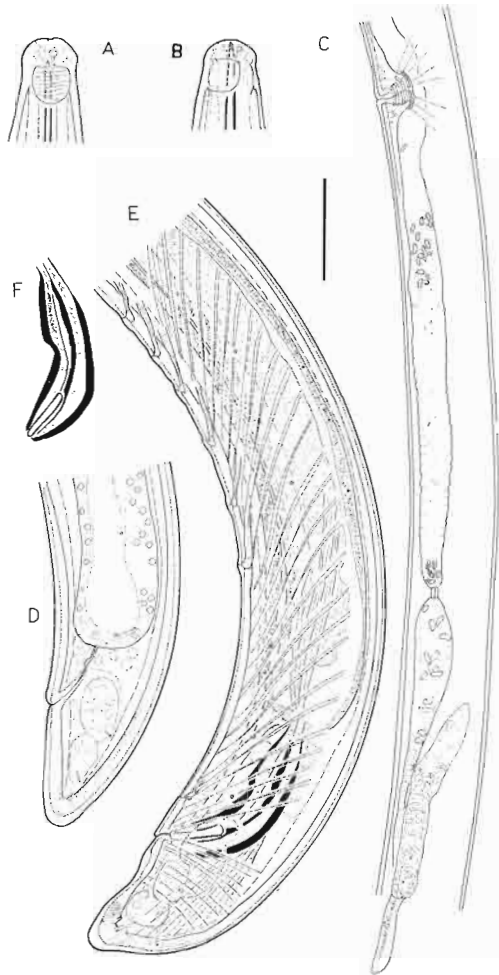


Fig. 1. *Xiphidorus amazonensis* Uesugi, Huang & Cares, 1985. A : Head region (male); B : Head region (female); C : Posterior female genital branch; D : Tail (female); E : Male posterior body part; F : Spicule. (Bar equivalent : A, B, D, E, F = 20 mm; C = 40 mm).

male tail shape has been observed to be very variable in Argentinian populations (see Fig. 3 G-M) and the number of male ventromedian supplements also can be very variable as observed in *X. yepesara* where, depending on populations, it can vary from four to nine (see below). Therefore, the only male of *X. balcarceanus* appears to be not too different from males of *X. tucumanensis*.

If we consider that ratio "a" is not very reliable, as it can considerably vary inside the same species, and that at least one population attributed to *X. balcarceanus* had males, however rare, no differences between *X. balcarceanus* and *X. tucumanensis* appear to have a sufficient weight to support their status as separate species. Consequently, *X. tucumanensis* is proposed as a junior synonym of *X. balcarceanus*, following the rule of preceden-

ce (both species have been described in the same article, where *X. balcarceanus* has page precedence over *X. tucumanensis*). This proposal is reinforced by the structure of the amphids, of the narrow type, a character present only in these two species and in *X. saladillensis* which is quite different mainly by its longer and conical tail and the male copulatory apparatus (see below).

Kruger and Heyns (1990) recorded (their Table I) *X. balcarceanus* as having uterine spines and *X. tucumanensis* as being devoid of these structures. However, in the text of this article, the authors are not so affirmative: "several objects resembling uterine spines are present in... *X. balcarceanus*." Fig. 1 G, H confirms the presence of some spine-like structures, but, according to the authors "not anchored to the uterine wall". Therefore, presence of true uterine spines appears doubtful, and cannot be taken into consideration to separate *X. balcarceanus* from *X. tucumanensis*.

MATERIAL

Pop. 1 (1 male, 4 juv.), Pop. 2 (1 fem.), Pop. 3 (7 fem., 1 juv.), Pop. 4 (3 juv.), Pop. 5 (3 fem., 7 juv.), Pop. 15 (1 fem., 4 males), Pop. 16 (6 fem., 4 males, 9 juv.), Pop. 17 (2 males, 7 juv.), Pop. 19 (1 fem.).

MEASUREMENTS

Females : see Table 1.
Males : see Table 2.
Juveniles : see Table 3.

MORPHOLOGY

The head region was studied in more detail by face view and transverse optical sections, using light microscopy and SEM photographs. "En face" views show the typical arrangement of the anterior sensilla in *Xiphidorus* with two circlets of respectively 6 and 10 (6+4) labial and cephalic papillae. Lip region expanded, offset by a distinct constriction, with some variability, for example pronounced lips and raised labial papillae (probably due to fixation). Anterior body striation finer. Amphidial fovea narrow, pocket-shaped with a pore-like aperture, observed as a refringent dot just posterior to the outer lateral labial papilla; fovea extending more or less anteriorly beyond the amphidial aperture inside the lateral lip. In transverse optical section, the lip region is rounded-hexagonal: two lateral refringent structures (cephalic reinforcements?) are present between the cheilostoma wall and the innervation of the inner labial papillae; they are also clearly visible in lateral view. An amphidial aperture could not be observed beyond doubt in SEM pictures.

A small to minute vestigium was observed in several male and female specimens ventrally in the narrow anterior part of the pharynx at variable distance from the base of the stylet: 37 (16-61) mm.

Table 2. Xiphidorus balcarceanus (= X. tucumanensis). Dimensions of males (all measurements in mm).

	Type pop.*	Type pop.**	Pop. 1	Pop. 15	Pop. 16	Pop. 17	Pop. 18
n	1	2	1	4	4	4	8
L	3690	4000,4000	3790	4495 (4210-4740)	3880 (3480-4225)	3680 (3710-4005)	3610 (3260-3910)
a	84	119,127,5	102	125 (118-147)	113 (105-118)	126 (106-141)	130 (117-150)
b	11.5	12,12.5	13.4	14.1 (13.7-14.9)	12.0 (10.5-14.5)	13.7 (11.2-19.8)	13.9 (12.6-17.7)
Tail	26.5	28.6,31.3	39	26 (22-27)	24 (23.5-24.5)	25 (22-28)	23 (21-26)
c	142	139.5,142.5	97	177 (155-220)	160 (142-176)	150 (132-182)	155 (132-179)
c'	0.88	1.0,1.1	1.3	0.9 (0.8-1.0)	1.0 (1.0-1.1)	1.0 (0.9-1.2)	1.1 (1.0-1.3)
Odontostyle	104	86.5,87	104	94 (87-103)	87 (83-91)	84 (80-89)	83 (80-87)
Odontophore	47	45,46	51	50 (48-54)	45 (38-48)	40 (38-41)	37 (31-41)
Stylet	151	131,133	155	144 (140-151)	131 (123-138)	124 (120-127)	121 (111-125)
L. phar. bulb.			45	71 (62-83)	65 (52-76)	61 (59-66)	60 (52-65)
Spicules	47	44,46	47.3	52 (50-54)	44 (40-47)	42 (38-44.5)	40 (39.5-41.5)
Ventromed. suppl.		6,7	7	7 (6-8)	7 (6-8)	7 (7-8)	6 (5-8)

* Type population of *X. balcarceanus*.** Type population of *X. tucumanensis*.**Table 3.** Xiphidorus balcarceanus (= X. tucumanensis). Dimensions of juveniles (all measurements in mm).

	Pop. 16	Pop. 3	Pop. 4	Pop. 5	Pop. 1	Pop. 3	Pop. 4	Pop. 5	Pop. 15	Pop. 16
	J2	J3		J4						
	1	2	1	3	4	5	2	3	1	8
L	1335	1625,1810	2060	1790-1975	2355 (2260-2420)	2470 (2270-2595)	2120,2130	2250-2835	3260	2890 (2570-3110)
a	66	67.0,67.7	64	61-68	77.0 (76.6-77.8)	74.9 (64.1-83.0)	66.66	72-77	85.7	93 (80-111)
b	6.0	-	9.6	6.5-8.1	8.8 (7.9-9.6)	-	7.7,8.7	7.3-9.2	-	9.6 (8.3-11.8)
Tail	32	29,30	29	27.5-28	43 (40-46)	26.5 (24-30)	25,27	28-32	28	26.5 (22-29)
c	41.7	56.0,60.3	71	65-71	55 (49-58)	93.1 (83.5-103.7)	84.78	88-92	116	108 (96-136)
c'	1.8	1.5,1.5	1.5	1.3-1.4	1.9 (1.7-2.0)	1.2 (1.1-1.3)	1.0,1.2	1.1-1.2	1.0	1.2 (1.0-1.4)
Odontostyle	47	69,64	65	72-78	83 (80-84)	82 (78-85)	79,79	84-90	85	75 (71-80)
Odontophore	30	37,39	27	39-40	43 (37-46)	40 (30-45)	43,36	44-48	-	38 (35-44)
Stylet	77	106,103	92	111-118	125 (121-130)	122 (112-130)	122,115	128-138	-	113 (111-118)
Repl. od.style	66.5	81	80	81-86	103 (99-107)	100 (96-102)	92,97	101-102	95	94 (91-97)
Genit. primord.	26	-	-	-	35 (32-39)	-	-	-	63	59 (50-82)

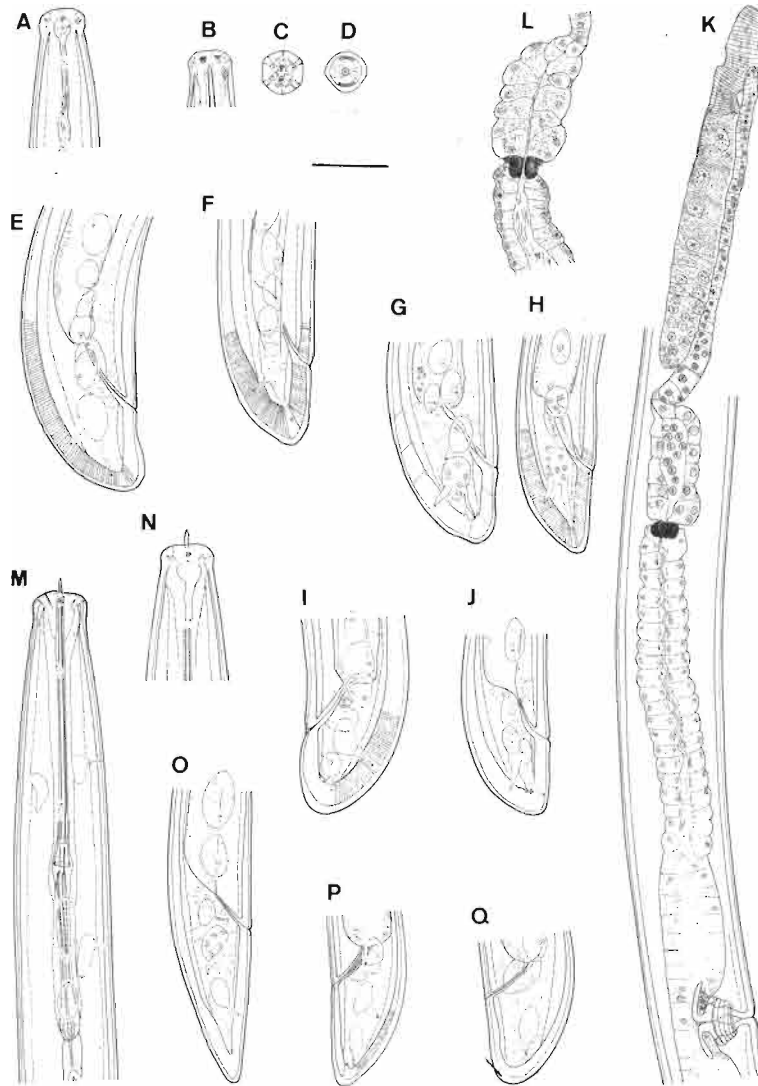


Fig. 2. *Xiphidorus balcarceanus* Chaves & Coomans, 1984 (= *X. tucumanensis* Chaves & Coomans, 1984 n. syn.). Female. A, B : Head region; C : Head, en face view; D : Transverse section at level of anterior border of the fovea; E-J : Tail; K : Anterior genital branch; L : Detail of uterus and pars dilatata oviductus - juveniles. M, N : Head region (J4); O - Q : Tail (J2, J3 and J4, respectively). (Bar equivalent : A-H, L-Q = 20 μ m; K = 40 μ m).

Female genital system with equally developed branches (anterior branch 218-324 μ m long, posterior branch 192-328 μ m long), both situated either on the left or on the right side of the intestine, or anterior branch right, posterior branch left and ventrally of the intestine; often the ovejector, uterus and spermatheca are observed on one side e.g. left side of the intestine, while the reflexed ovary is on the other side, e.g., right side of the intestine. Each branch consisting of a 27-49 μ m long part of the ovejector, relatively well separated from the longer proximal part of the uterus (73-130 μ m long); a well devel-

oped sphincter muscle (4.5-5.7 μ m wide) separates the uterus from the *pars dilatata oviductus* which functions as a spermatheca (21-67 μ m long); the oviduct consists of a series of disc-like cells, is 38-127 μ m long and joins the ovarian sac at 11-31 μ m from the terminus; reflexed ovary, 62-116 μ m long, with a 21-45 μ m long blind sac surrounded by transversely striated connective tissue.

The new populations studied show a large variability in the spicule length. The specimens from population 15 have longer spicules than specimens from the other populations including the type population with a mean value

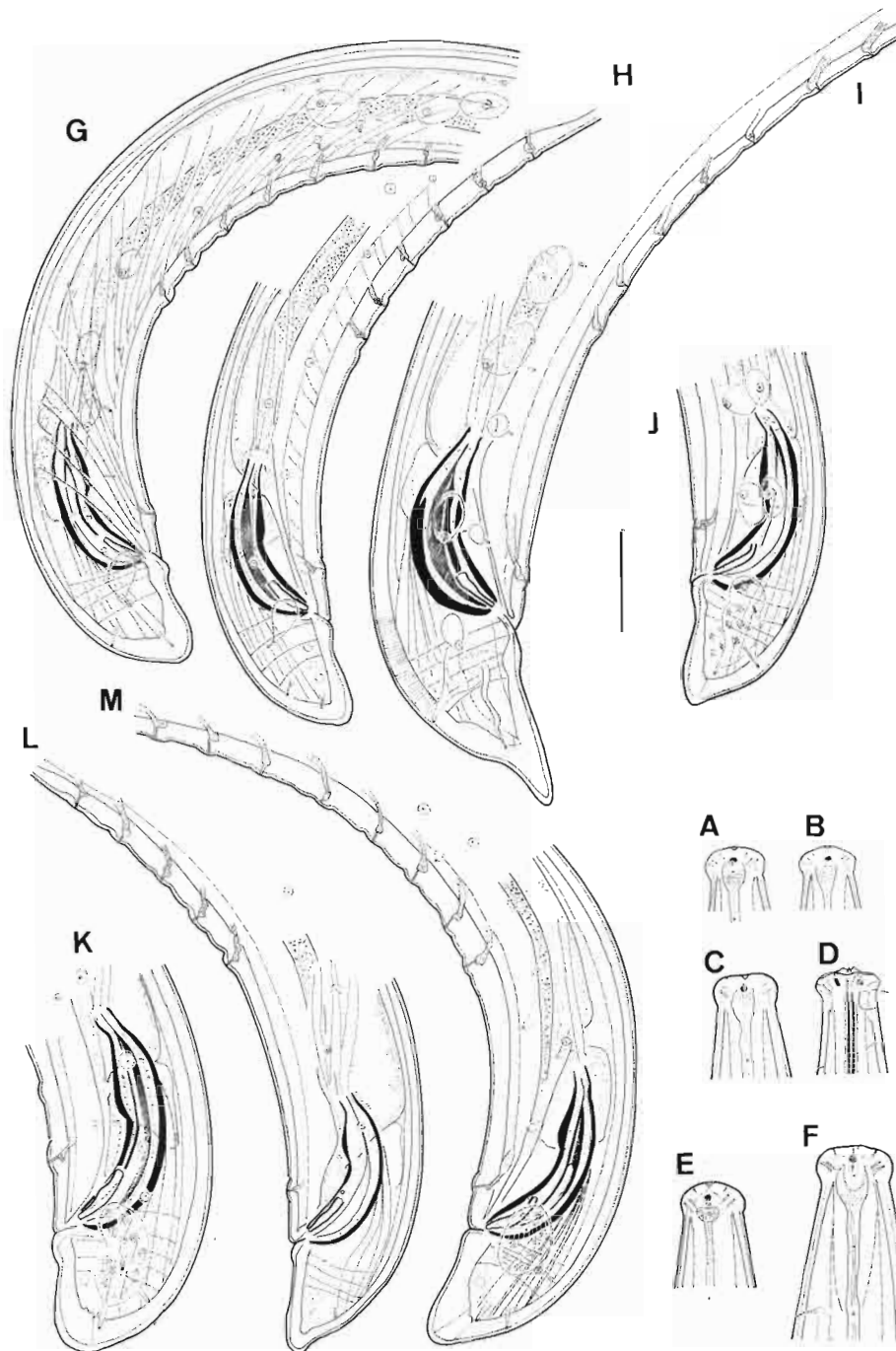


Fig. 3. *Xiphidorus balcarceanus* Chaves & Coomans, 1984 (= *X. tucumanensis* Chaves & Coomans, 1984 n. syn.). Males. A-F: Head region, lateral (except D: oblique dorsal); G-M: Posterior part. (Bar = 20 μ m).

of 52 vs 40, 42, 44, 45, and 47 μ m (male from X. "balcarceanus" population; Heyns & Chaves, 1988); the specimens of population 15 are also the longest specimens with a mean body length of 4.495 vs 3.610-

4.000 μ m (range of mean values for the other populations). The spicules are rather slender with ratio "spicule length/maximum width of spicule shaft" varying between 4.2 and 6.5 (range of mean values between

5.3 and 5.5 for new populations except single male from population 1 with ratio = 4.3) and ratio = 5.0 in paratype male with 46 μm long spicules.

There are from five to eight ventromedian precloacal supplements *vs* six and seven in type specimens and nine in the male in Heyns and Chaves (1988); these supplements are not always evenly distributed, and they may be arranged irregularly, for example, in two groups.

The tail shape in the male is dorsally convex-conoid, mostly with a slight dorsal subterminal depression, a minor postcloacal ventral indentation, and a usually smoothly rounded, but rarely narrowly rounded tail tip. Ratio c' is quite variable, with a wide range: $c' = 0.8\text{--}1.3$ in male and female *vs* 1.0–1.1 and 1.1 in male and female type specimens, respectively. Females have a tail similar in shape to that of males (except for subdigitate shape), but a dorsal subterminal depression is rarely observed.

CHARACTERISATION AND RELATIONSHIP

X. balcarceanus is characterized mostly by the shape of the amphids, with a narrow pocket-shaped fovea and a pore-like aperture, similar to *X. saladillensis*. However, the latter species is quite different by its relatively long and regularly conical tail ($c' = 1.3\text{--}2.1$) and the shape of the copulatory apparatus. Note that, depending on the population, males are present or absent in *X. balcarceanus*.

Xiphidorus minor Rashid, Coomans & Sharma, 1986

(Fig. 4)

No material of *X. minor* was available, apart from two slides with type specimens. The original description and illustration do not need to be supplemented.

X. minor differs from all other species of the genus by the very short female genital system with short uteri devoid of sperm, and without spiny or crystalline structures, the smallest body length in the genus (less than 2 mm), the narrow lip region offset only by a demarcation and by the large cup-shaped amphidial fovea. No males are known.

Xiphidorus saladillensis Chaves & Coomans, 1984

(Fig. 5)

MATERIAL

Pop. 10 (5 fem.), pop. 11 (14 fem., 10 juv.), pop. 12 (5 fem., 4 juv.), pop. 13 (2 fem., 1 juv.), pop. 14 (1 fem.).

MEASUREMENTS

Females and males: see Table 4.

Juveniles: see Table 5.

MORPHOLOGY

X. saladillensis was described from a single female, a single male and juvenile specimens from soil around the roots of maize, Saladillo, Buenos Aires Province, Argen-

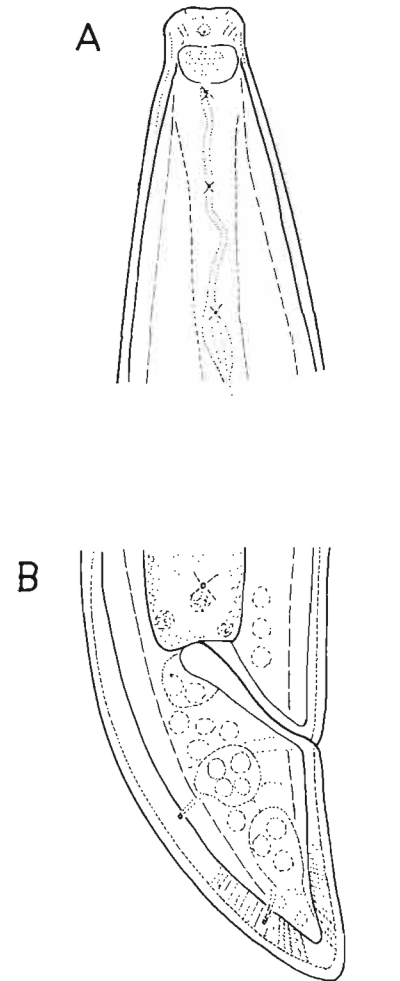


Fig. 4. *Xiphidorus minor* Rashid, Coomans & Sharma, 1986 (Female holotype). A: Anterior body part; B: Tail. (Bar = 20 μm).

tina. The additional Argentinean populations with female and juvenile specimens, give an idea of the possible range of variation of morphometric and morphological features. As in the holotype female, the body length of the other females is medium (2.110–2.720 *vs* 2.180 mm in holotype); the odontostyle (68–76 *vs* 71 μm in holotype) and the stylet (106–119 *vs* 107.5 μm) are comparable to the original description. The amphidial fovea is narrow cup-shaped, with anterior extensions in the lateral lips; the latter may be obscure. The amphidial aperture, described as a minute slit in the original description, could not be seen clearly.

A minute (up to 1 mm) narrow triangular vestigium was observed in all female specimens in the narrow anterior part of the pharynx, 18–45 μm posterior to the stylet base. The two branches of the female genital system are equally developed or one branch (usually the posterior one) is shorter. Usually both genital branches are located

Table 4. *Xiphidurus saladillensis*. Dimensions of females and one male paratype (all measurements in mm).

	Holotype	Paratype male	Pop. 10	Pop. 11	Pop. 12	Pop. 13	Pop. 14
n	1	1	5	14	5	2	1
L	2180	2080	2260 (2130-2430)	2525 (2180-2720)	2360 (2110-2695)	2240,2450 -	2265
a	68	75	73 (60-82)	68 (53-73)	62 (55-67)		83
b	8.5	8.5	9.7 (9.0-11.0)	10.8 (6.4-13.6)	9.8 (7.5-12.8)	10.0,10.0	9.0
Tail	33.5	40	35 (32-37)	35 (27-38.5)	31 (29-36)	36,36	34
c	65	52	64 (57-70)	77 (65-87)	75 (70-81)	62,62	66
c'	1.5	1.6	1.8 (1.8-2.0)	1.8 (1.3-1.9)	1.5 (1.3-1.7)	1.5,1.5	2.1
V	43.5	-	48.5 (47-50.5)	47.5 (46-50)	(47.5-48)	52,47	47.5
Odontostyle	71	71	72 (70-75)	73 (69-76)	72 (68-75)	73,75	72
Odontophore	36.5	37	36 (34-38)	41.5 (34-43)	40 (36-44)	36,36	40
Stylet	107,5	108	108 (107-110)	115 (106-119)	112 (108-117)	109,106	112
L. phar. bulb.	41	-	55 (52-59)	44 (39-52)	46 (44-50)	39,39	47
Ant. end/ guid. ring	61	-	60 (58-62)	59 (51-63)	59 (56-61)	53,58	64
Head width	11	-	11.5 (10.5-12)	11.5 (11-12)	11 (11-12)	-	11
Spicules	-	32	-	-	-	-	-
Ant. gen. br.	-	-	218 (169-302)	178 (132-236)	192 (168-218)	-	150
Post. gen. br.	-	-	202 (141-326)	171 (115-220)	185 (140-259)	-	103

on the left side of the intestine, rarely both branches are on the right side; in one female, the anterior branch is at the left and the posterior one at the right of the intestine. The uterus is rather short and the ovejector not always clearly demarcated. Uterus is devoid of spines or crystalloids; no sperm was observed. The tail is dorsally convex-conoid, with or without a subdigitate terminus.

No male specimens were found, apart from a single fourth stage juvenile male with incompletely formed copulatory apparatus.

Juveniles of the second, third and fourth (male) stage were observed.

DISCUSSION

X. saladillensis is characterized by the conical female tail, the medium body length (only slightly longer than *X. minor*, the smallest species of the genus), the cup-shaped amphidial fovea (as in *X. balcarceanus*), the absence of spines or crystalloids in the female genital system (as in *X. minor*), and, in males, by a spicule of dorylaimoid type without median sclerotized rib and by only four precloacal ventromedian supplements, but this last character is known to be rather variable (see *X. yepesara*) and it was observed in a single male only.

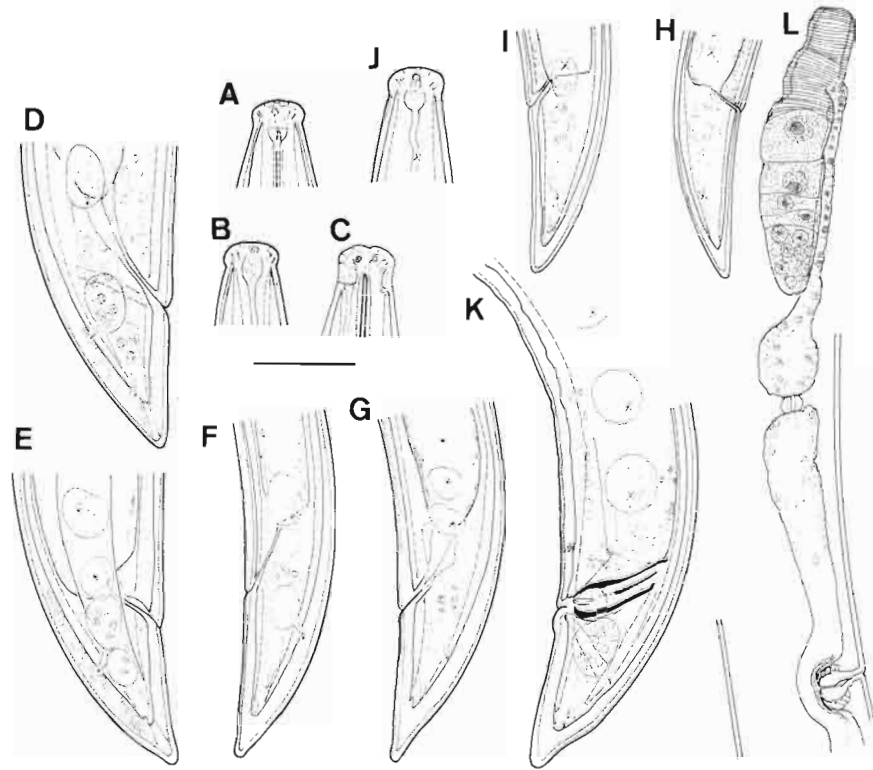


Fig. 5. *Xiphidorus saladillensis* Chaves & Coomans, 1984 - Female. A-C : Head region (C : paratype); D-G : Tail; L : Anterior genital branch - juveniles : H, I : Tails (♂ 2 and ♀ 3, respectively); J : Head region (♀ 3); K : Posterior part (male ♂ 4). (Bar equivalent : A-K = 20 µm; L = 40 µm).

***Xiphidorus yepesara yepesara* Monteiro, 1976
and *X. yepesara parthenus* Monteiro, Lordello &
Nakasono, 1981, n. grad.**

= *X. parthenus* Monteiro, Lordello & Nakasono, 1981

Xiphidorus yepesara Monteiro, 1976, the type species of the genus *Xiphidorus*, was originally described from soil around passion fruit tree, at Pernambuco State, Brazil. Since then, it has only been recorded from Argentina (Luc & Doucet, 1990).

Xiphidorus parthenus Monteiro, Lordello & Nakasono, 1981 was the second described species, from soil of a sugar-cane plantation at Sao Paulo State, Brazil. It has not been recorded since its description.

The latter species was said to differ from the former by the following characters : *i*) absence *vs* presence of male; *ii*) different tail shape (conical-rounded *vs* conoid to digitate); *iii*) posterior position of the vulva (V = 51-53 *vs* 48-52); *iv*) small number of lateral pores (100 *vs* about 200); and *v*) shorter odontostyle (85-90 *vs* 93-103 µm).

Due to the small number of specimens (eight females

for *X. yepesara* and seven for *X. parthenus*) characters such as length of odontostyle (similar) and V (partly overlapping) are of little value; the tail shape appears rather variable in *X. yepesara* (cf. orig. Fig. 1D, E, F) and often close to that of *X. parthenus* (cf. orig. Figs 1F and 1D, respectively). Consequently, both species appear to be very close to each other, mainly distinguished by the presence *vs* absence of males and the number of lateral body pores. The resemblance is reinforced by the similar body length (3.00-3.60 *vs* 3.2-3.8 mm), the same strong curvature in C shape or spiral of the fixed specimens, a similar lip region shape ("low, rounded, separated by a deep depression" as described for both species) and amphids in both cases described using the same terms ("amphid pouches large, aperture hardly visible as a minute slit"); note that the amphid was illustrated only for *X. yepesara*.

Several new Argentinean populations studied here were at first identified as one or the other of both species following the presence or the absence of males. However, this study revealed that *i*) all the main metric characters were identical or largely overlapping (cf. Table 1) in both species; *ii*) the female tail shape was quite variable in both species from conoid-rounded to subdig-

Table 5. *Xiphidorus saladillensis*. Dimensions of juveniles from populations 11 and 13 (all measurements in mm).

	J2	J3	J4 (male)
n	2	9	1
L	1150,1360	1710 (1480-1900)	2350
a	50.0,50.0	55.0 (50-59.4)	63
b	5.9,5.9	8.5 (6.0-9.6)	7.1
Tail	36,37	35 (29-38)	33
c	31.0,37.7	50.9 (45.5-59.4)	7.1
c'	2.6,2.3	1.9 (1.6-2.2)	1.4
Odontostyle	47,47	60 (57-64)	72
Odontophore	31,32	33 (30-38)	43
Stylet	78,79	93 (80-100)	115
Repl. od. style	59,60	72 (67-74)	77
Genit. primord.	14,14	32 (28-36)	-
L. phar. bulb.	37,37	37 (31-44)	44
Spicules	-	-	21

itate; *iii*) the amphids were similar, as the anterior indentations of the fovea can be more or less pronounced in both species and the longitudinal marking present or not in the so-called *X. yepesara*. The head shape is roughly the same but in *X. yepesara* the anterior profile is often not smooth but marked by a slight protrusion of the papillae. The female genital tract is similar, being devoid of spiny structures; only some sparse cristalloid structures are visible. However, the ojector is longer in *X. parthenus* than in *X. yepesara* (140-172 vs 77-128 mm). As noted above, there are twice as many lateral body pores in *X. yepesara* than in *X. parthenus*.

In these conditions, it is considered better to recognize only one species, with two subspecies: *X. yepesara yepesara* Monteiro, 1976 and *X. yepesara parthenus* Monteiro, Lordello & Nakasono, 1981, n. grad.

***Xiphidorus yepesara yepesara* Monteiro, 1976**
(Figs 6, 7)

MATERIAL

Pop. 20 (7 fem., 5 males, 5 juv.), pop. 21 (4 fem., 1 male), pop. 22 (8 fem., 5 males, 3 juv.), pop. 23 (1 fem., 1 male, 1 juv.), pop. 24 (1 fem.).

MEASUREMENTS

Females : see Table 6.

Males : see Table 7.

Juveniles : see Table 8.

MORPHOLOGY

The head region was studied in more detail in face views and optical sections by light microscopy, and by SEM. "En face" views show the typical arrangement of the anterior sense organs in an inner circlet of six slightly raised papillae and an outer circlet of ten lower papillae at the lip region border. In transverse optical section two small rounded triangular refractive pieces can be observed laterally, lying obliquely in between the stoma wall and the innervations of the inner lateral papillae in all specimens (also observed in all other species of the genus).

The amphidial pouch was originally described as "large, lobed, practically encircling the corresponding head width". Luc and Doucet (1984) confirmed it to be bilobed, with very thin transverse striae, and divided into two parts (see original drawing) by a conspicuous refringent longitudinal line. The amphid aperture was observed as a small, curved, transverse slit. Based upon a few type specimens and the Argentinean material, we agree with the former descriptions of the amphidial fovea as a wide pouch. It has a low and wide anterior indentation at the level of the minute amphidial pore and its posterior border may show a small median bend at the beginning of the *canalis*, but usually obscure. The dendritic processes are convoluted inside the fovea and seen as thin transverse striae. In the male paratype specimen examined, the amphidial pouch is laterally provided with a refringent longitudinal discontinuous line probably due to a fold in the fovea inducing a more pronounced (bilobed) indentation of the posterior fovea border but less marked than in the original drawing. The amphidial fovea shows a slight variability in size and shape according to the specimens. In transverse optical section by light microscopy, the amphidial aperture is visible as a dot, dorsally from and just behind the outer lateral papillae. However, no amphidial pores were observed on SEM photographs of male and female specimens from two Argentinean populations. SEM photographs show an expanded lip region, offset from the body by a distinct constriction, with anterior striation fine (female) to very fine (male) over a short distance (about as long as twice the lip region height), followed by more widely spaced striations.

Table 6. *Xiphidurus yepesara yepesara*. Dimensions of females (all measurements in mm).

	Type pop.	Pop. 20	Pop. 21	Pop. 22	Pop. 23	Pop. 24
n	7	6	4	6	1	1
L	3500 (3200-3800)	3240 (2780-3880)	3730 (3520-4000)	4100 (3440-4850)	3835	4420
a	96 (91-108)	105 (91-118)	108 (94-121)	104 (96-107)	98	157
b	12.6 (11.0-13.9)	10.3 (9.2-15.5)	12.4 (11.4-14.8)	14.2 (12.5-16.2)	17.1	13.1
Tail	30*	22.5 (20-25)	27 (23-29)	29 (26-31.5)	30	24
c	117 (103-145)	145 (111-194)	140 (126-153)	141 (116-169)	127	184
c'	1.4 (1.1-1.6)	1.1 (0.9-1.4)	1.2 (1.1-1.3)	1.2 (1.1-1.2)	1.4	1.3
V	49 (48-52)	52 (49-55)	47.5 (46-50)	48 (45-50)	44	49
Odontostyle	98 (93-103)	85 (80-87)	94 (91-97)	92 (84-103)	77	102
Odontophore	43 (41-44)	39 (36-44)	43 (42-44)	44 (42-48)	49	47
Stylet	142 (136-143)	123 (118-128)	137 (135-139)	136 (126-151)	126	149
Length phar. bulb.	–	52**	60 (54-64)	57 (49-71)	44	61
Head width	–	10.5 (9.5-12)	12 (11.5-12.5)	13.5 (12-15)	11	11
Ant. genit. br.	–	223**	350 (342-362)	295 (249-354)	329	290
Post. genit. br.	–	325**	352 (316-428)	325 (255-411)	293	263

* Mean.

** n = 1.

Table 7. *Xiphidurus yepesara yepesara*. Dimensions of males (all measurements in mm).

	Type pop.	Pop. 20	Pop. 21	Pop. 22	Pop. 23
n	6	5	1	5	1
L	3400 (3200-3700)	3255 (3050-3740)	3090	4175 (3710-4535)	3730
a	99 (89-108)	120 (112-129)	104	108 (86-121)	128
b	12.6 (10.7-14.5)	14.6 (11.1-16.8)	12.2	15.6 (11.3-18.1)	14.5
Tail	–	24 (22-28)	28	29 (26.5-30.5)	23.5
c	108 (94-120)	139 (108-170)	110	145 (123-161)	158
c'	1.3 (1.1-1.4)	1.2 (1.0-1.4)	1.3	1.1 (1.0-1.2)	1.1
Odontostyle	98 (96-100)	80 (77-84)	86	90 (85-96)	84
Odontophore	42 (40-43)	37 (36-38)	41	43 (41-45)	37
Stylet	140 (137-141)	117 (113-122)	127	133 (126-142)	121
L. phar. bulb.	–	50 (39-57)	52	56 (50-65)	50
Spicules	35.7 (31.4-38.6)	34.5 (33-37)	36	43 (40-45)	39

Table 8. Xiphidorus yepesara yepesara. Dimensions of juveniles (all measurements in mm).

	Pop. 20	Pop. 24	Pop. 20	Pop. 23	Pop. 24	Pop. 20	Pop. 24
	J2		J3		J4		
n	1	3	4	2	7	6	2
L	1250	1165 (1130-1225)	1795 (1590-1960)	1925*	2225 (2030-2430)	2395 (2205-2625)	2710,3710
a	73.5	72.5 (72-73)	76 (65-87)	83.7*	104 (94-113)	99.5 (96-103)	132*
b	7.3	3.8-3.9	9.3 (7.7-11.0)	9.0*	10.9*	9.3 (6.0-12.1)	11.9*
Tail	30	32 (24-37)	28 (24-31)	33*	36 (32-40)	27 (26-28.5)	32,34
c	41.6	37.2 (31.6-47)	63 (60-67)	58*	62 (50-75)	87 (77-98)	84,109
c'	2.7	3.1 (2.4-3.7)	1.8 (1.7-2.1)	2.1*	2.2 (1.9-2.6)	1.5 (1.3-1.7)	1.8,1.6
Odontostyle	52	52 (49-54)	62.5 (60-65)	55,59	72.5 (64-78)	73 (70-74)	86,37
Odontophore	31	31 (30-32)	33 (31-35)	32,30	35 (31-38)	36 (34-38)	39,40
Stylet	83	82.5 (81-84)	95.5 (91-98)	87,89	107 (95-112)	108 (106-110)	125,127
Repl. od.style	64	63.5 (63-64)	71 (70-73)	78,73	82 (76-90)	85 (82-90)	98,105
Genit. primord.	20	18 (13-20)	31 (25-40)	32*	—	58 (36-87)	65

* n = 1.

In several specimens, a small vestigium was observed in the narrow cylindrical part of the pharynx (at 12 mm posterior to the stylet base in the paratype female).

Female genital system is as described in original description and in Luc and Doucet (1984), i.e., a well developed ovejector (77-128 mm long), a short uterus without *pars dilatata*, a long oviduct with a differentiated *pars dilatata*; no spiny structures present in the uterus but some rare cristalloids. Both genital branches often located left of the intestine, as in the paratype female, or right of the intestine, or with the branches on different sides of the intestine (total branch or partly).

The male tail shape, originally described as "conoid to digitate, longer than anal body diameter" is rather variable, for example in population 20: the tail is dorsally convex-conoid with a fine digitate or subdigitate tip or a narrow rounded end with a slight dorsal subterminal depression in some males, while in other males the tail is dorsally convex-conoid with smoothly rounded end. Females have more slender dorsally convex-conoid tails

with narrow rounded tip or broad tails with smoothly rounded end. The broad tail shape with smoothly rounded end was not described for the type population.

The range for the number of ventromedian precloacal supplements (six to eight in the type population) extends from four to nine for all the populations together; it differs according to the populations: four or five in population 20 specimens, seven or nine in specimens from population 22; the other populations were represented by a single male with, six (pop. 21) and seven (pop. 23) supplements, respectively.

Three different juvenile stages (second, third and fourth) have been observed.

Xiphidorus yepesara parthenus
Monteiro, Lordello & Nakasono, 1981 n. grad.
 (Fig. 8)

MATERIAL

Pop. 6 (2 fem., 1 juv.), pop. 7 (2 fem., 19 juv.), pop. 8 (3 fem., 1 juv.), pop. 9 (2 fem., 13 juv.).

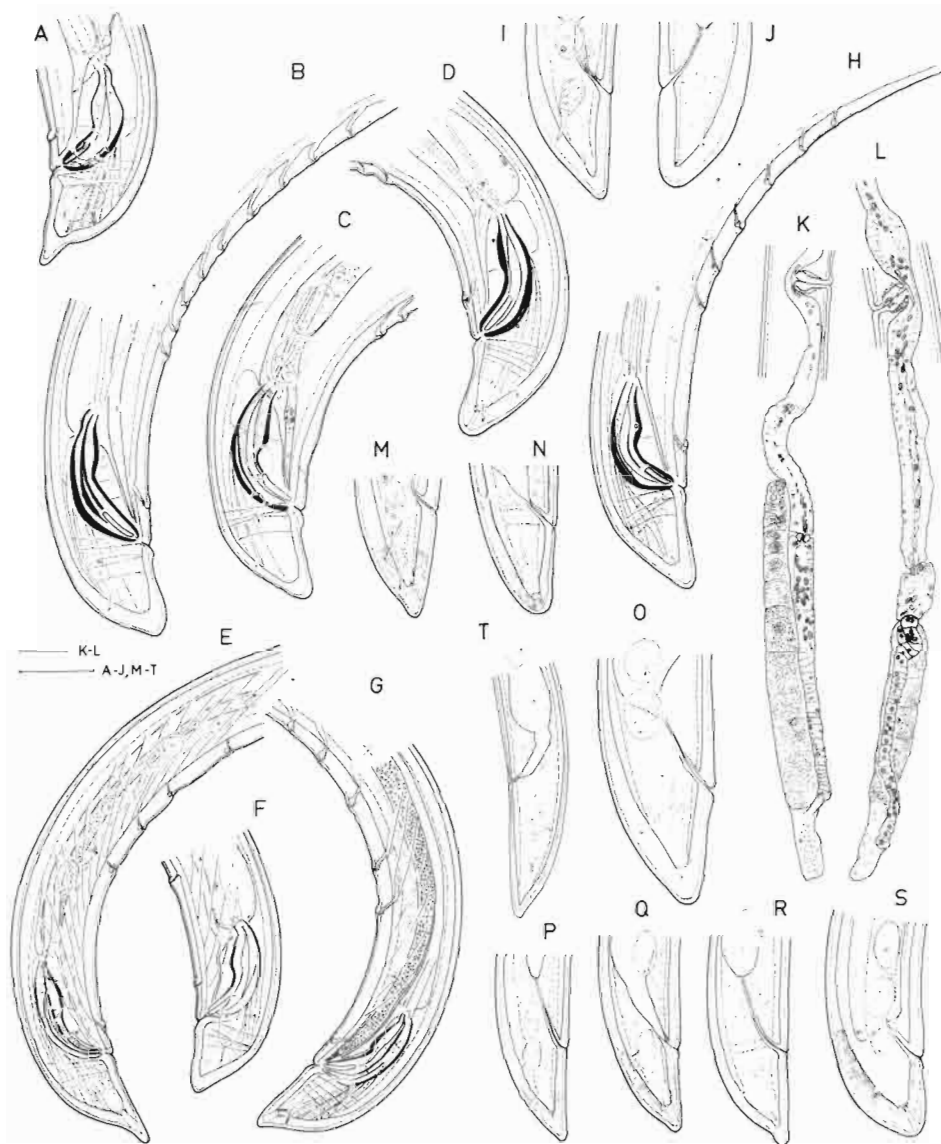


Fig. 6. *Xiphidorus yepesara yepesara* Monteiro, 1976 - A-H : Male posterior part (A : paratype); I, J, M-S : Female tails; K, L : Female posterior genital branch; T : Tail of J 3. (Bars = 20 μ m).

MEASUREMENTS

Females : see Table 9.

Juveniles : see Table 10.

MORPHOLOGY

Head well constricted, low, usually with flattened anterior end. Amphidial fovea pouch-shaped, anterior limit straight or with a shallow depression as in *X. yepesara yepesara*, with or without a minute indentation of the posterior border (shape not clearly observed laterally in specimens from pop. 7); amphidial aperture appearing

as a dot in side view, often obscure. Triangular refringent structures present in the lateral lips (see above).

Arrangement and number of body pores as in type specimens, but laterally apparently more numerous in specimens from pop. 7. In the narrow anterior part of the pharynx a vestigium was observed in all specimens as described for some of the type specimens; it varied in size from minute to 1.5 μ m, and in distance from the stylet base [35 (16-59 μ m)] in females from pop. 7.

Female genital system with about equally well developed branches with variable position in respect to the intestine. Both genital branches may be either entirely

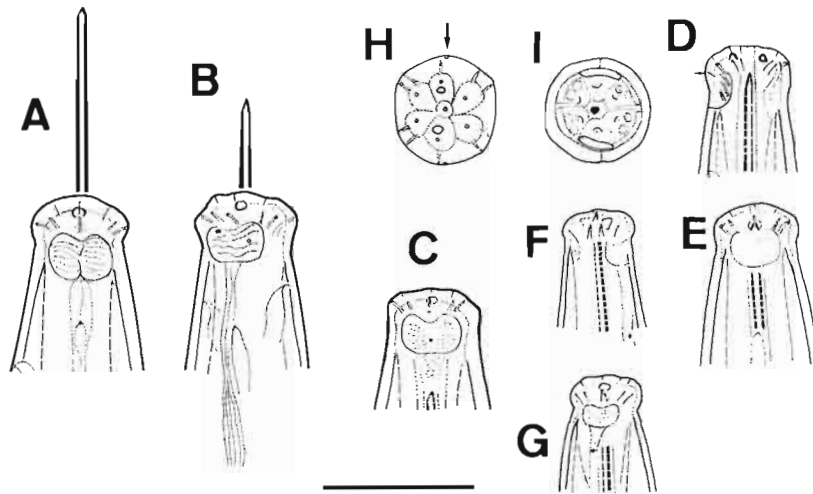


Fig. 7. *Xiphidorus yepesara yepesara* Monteiro 1976. Head region. A: Male paratype; B: Female paratype; C, D, E: Females; F: Male; G: ♂ 3; H: Female, en face view; I: Optical section at level of ampidual aperture. (Bar = 20 mm).

Table 9. *Xiphidorus yepesara parthenus*. Dimensions of females (all measurements in mm).

	Type pop.	Pop. 6	Pop. 7	Pop. 8	Pop. 9
n	6	2	7	3	2
L	3376 (2990-3593)	2775 2680,2870	4420 (3990-4675)	3050 (2895-3145)	3635,4920
a	103 (96-108)	92,106	153 (133-169)	94 (83-105)	139,185
b	11.8 (9.5-13.4)	12,1,9,5	12.5 (11.6-13.9)	11.8 (9.9-13.6)	11.9,18.2
Tail	-	22,21	28 (25-30)	27 (25-28)	26,27
c	127 (115-134)	121,136	158 (142-174)	114 (107-124)	139,182
c'	1.3 (1.3-1.1)	1.2,1.1	1.3 (1.1-1.5)	1.2 (1.1-1.2)	1.2,1.5
V	53 (51-55)	53,54	52.5 (51-55)	54.5 (54-55)	49.5,47
Odontostyle	89 (86-90)	85,84	100 (95-106)	88 (87-89)	91,93
Odontophore	44 (43-46)	42,42	43 (41-45)	45 (44-47)	41,42
Stylet	-	127,126	142 (138-151)	133 (131-136)	132,135
Head width	-	9.5,9.5	11 (10.5-12)	10	10.8,10.4
L. phar. bulb.		56,56	68 (63-76)	59 (56-64)	73,63

left or right of the intestine, or the anterior branch on the right and the posterior branch on the left (the reverse occurring more rarely); in some specimens the posterior branch appears partly left switching caudally towards the right side of the intestine. The ovejector (140-172 mm long) may be half to almost twice as long as the uterus and is clearly demarcated. Uterus with sparse crystalline structures, no spines observed; no sperm present; narrow part of the oviduct 23-57 mm long, with 22-28 disc-like cells joining the ovarial sac at 11.5-26 mm from its terminus in specimens from pop. 6.

Tail in female dorsally convex-conoid with narrow rounded end, with or without dorsal subterminal indentation or rarely subdigitate; two subdorsal caudal pores on both sides.

Three juveniles stages (second, third and fourth) were observed among the Argentinean populations. The tail shape differs according to the juvenile stage due to an increase in tail diameter.

REMARKS

X. yepesara parthenus differs from *X. yepesara yepesara* by: *i*) the longer ovejector (140-172 vs 77-128 mm), *ii*) the lesser number of lateral body pores (*ca* 100 vs 200), and *iii*) by the absence vs presence of males, as far as this character is reliable.

Xiphidorus sp. (Fig. 9)

Two females and one juvenile of 4th stage have been found in samples from locality 1, together with *X. tucumanensis*.

Table 10. *Xiphidorus yepesara parthenus*. Dimensions of juveniles (all measurements in mm).

	Pop. 7	Pop. 9	Pop. 7	Pop. 9	Pop. 7	Pop. 9
	J2		J3		J4	
n	7	2	1	4	9	7
L	1050 (1005-1135)	1175,1430	3390	2320 (2130-2460)	2995 (2570-3370)	3415 (2880-4055)
a	68 (64-71)	65,92	161	123 (118-131)	122 (104-150)	152 (144-162)
b	4.9 (4.3,6.4)	5.8,5.9	12.8	8.5 (6.8-9.7)	10.1 (7.9-13.8)	11.2 (10.2-12.8)
Tail	35.5 (34-39)	29,32	29	35 (34-37)	33 (27-41)	31 (28-35)
c	29.5 (28.7-31.1)	40.5,44.6	116	65 (60-72)	93 (63-116)	109 (87-125)
c'	3.2 (2.9-3.9)	2.2,2.6	1.9	2.5 (2.4-2.6)	1.7 (1.5-2.4)	1.7 (1.6-1.9)
Odontostyle	51 (47-55)	48,60	71	70 (65-73)	82 (78-85)	77.5 (69-82)
Odontophore	26.5 (24-28)	31,29	30	35 (34-36)	38 (35-40)	37 (31-39)
Stylet	79 (75-84)	79,89	101	105 (100-107)	120 (115-125)	114 (100-120)
Repl. od.style	59 (53-64)	55,63	75	78 (76-80)	94.5 (85-100)	92 (88-95)
Genit. primord.	18.5 (16-21)		33	25 (22-29)	50 (33-83)	46 (37-56)

MEASUREMENTS

Females (n = 2) : L = 6.25, 6.36 mm; a = 142, 159; b = 15.2, 15.8; tail = 29, 31 mm; c = 205, 215; c' = 1.0, 1.0; V = 48, 49; odontostyle = 134, 135 mm; odontophore = 53, 57 mm; stylet = 188, 191 mm.

Juvenile st. 4 (n = 1). L = 4.525 mm; a = 129; b = 12.9; tail = 42 mm; c = 107; c' = 1.6; odontostyle = 115 mm; odontophore = 48 mm; stylet = 163 mm; repl. odontostyle = 133 mm.

MORPHOLOGY

Body slightly ventrally curved in fixed specimens, long, slender, gradually tapered anteriorly but more posteriorly. Cuticle thin (2.3 mm at mid-body) only slightly thickened at base of lip region, weakly transversely striated. Lateral chord at mid-body 10 mm wide, i.e., 25 % of corresponding body diameter. Cervical pores fine, four dorsal, six ventral. Lip region area low, anteriorly flattened, slightly demarcated. Anterior sensory organs in two circlets of respectively six and ten papillae; two lateral refringent structures present between the cheilostoma wall and the innervation of the

inner labial papillae. Amphids pouch-like, large, not lobed; amphidial aperture a small pore. Hemizonid poorly developed, just anterior to the nerve ring and to a ventral pore. Nerve ring 10 mm wide, located 23 mm posterior to the base of the retracted stylet. Odontostyle very retractive, odontophore with poorly developed basal flanges. Guiding ring at 113-122 mm from anterior end. Pharyngeal bulb 80-94 × 16 mm. Cardia well developed, more or less pyriform. Two genital branches of the same structure, the anterior branch somewhat shorter (266 vs 305 mm, fem. 1; 304 vs 469 mm, fem. 2). Vulva a transverse slit; vagina about half the corresponding body diameter; a long uterus in relation to a short ovejector (116-134 vs 27-28 mm); uterus with long spines (8 mm); sphincter between uterus and oviduct well developed; *pars dilatata oviductus* containing sperm; ovary reflexed; ovary sac 26-48 mm long. Tail short, 29-31 mm long, convex-conoid; cuticle thick, 10-11 mm at tail end, with fine radial striations of inner layers. Two caudal pores on each side : on left side, one posterior lateral pore and one subdorsal pore about halfway on the tail; on right side, one posterior subventral

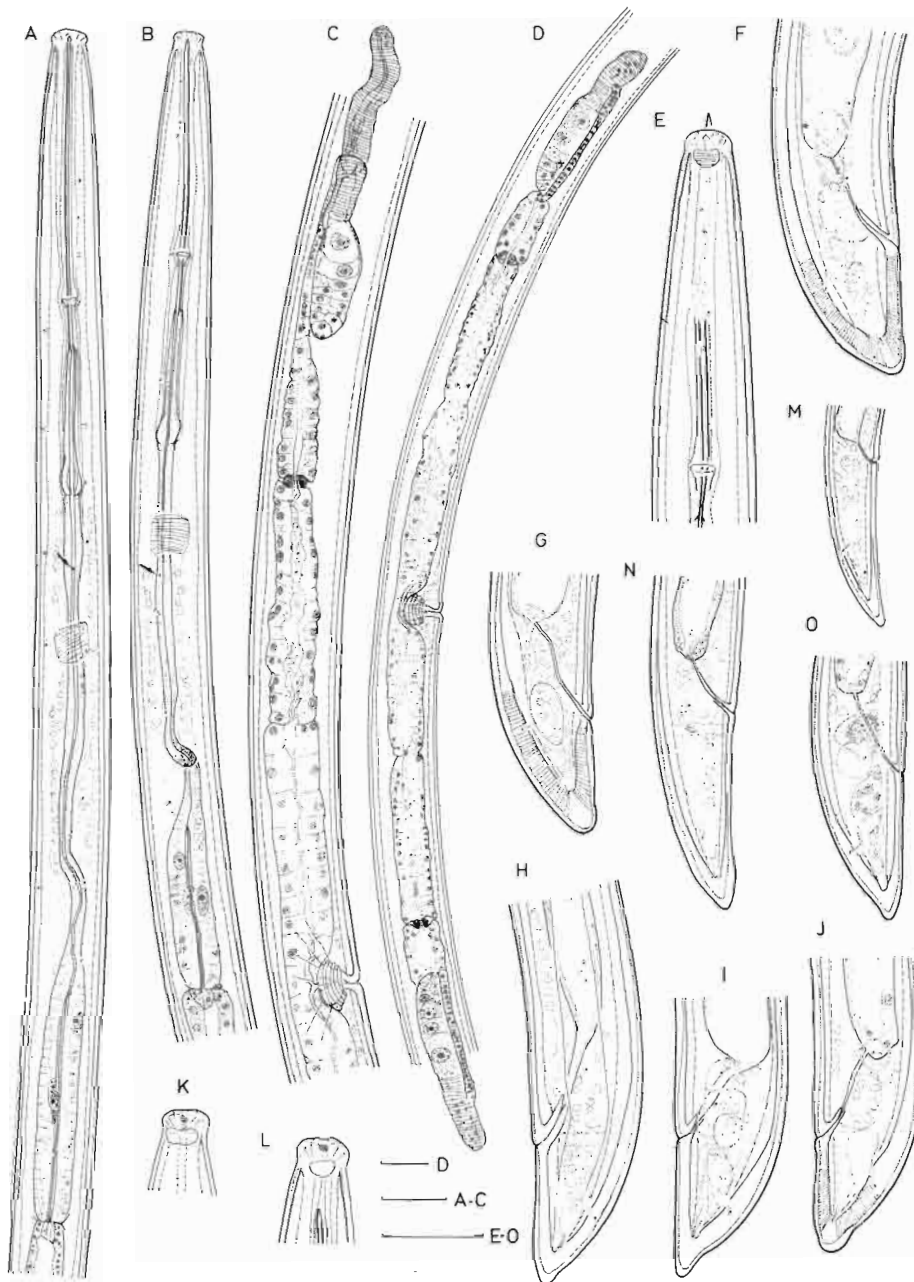


Fig. 8. *Xiphidorus yepesara parthenus* Monteiro, Lordello & Nakasono, 1981 nov. grad. A, B : Pharyngeal region (females); C : Anterior female genital branch; D : Whole female genital tractus; E : Anterior body part; F-J : Tail (females); K, L = Head region (females); M, N, O : Juvenile tails (J 2, J 3, J 4 respectively). (Bars = 20 μ m).



Fig. 9. *Xiphidorus* sp. A, B: Anterior body part (female); C: Posterior genital branch; D: Vulva region and associated muscles; E: Pharyngeal region (♂ 4); F: Head region (♂ 4); G: Tail (♂ 4); H: Tail (female); I: Detail of uterus, with spines. (Bars = 20 µm).

pore and one pore laterodorsally at about one third of the tail length from the tip.

REMARKS

The two females resemble *X. achalae* in many respects. However, they show a number of differences: more slender body (a = 142, 159 vs 104-130), longer odontostyle and stylet (134, 135 vs 106-120 mm and 188, 191 vs 156-179 mm, respectively), longer pharyngeal bulb (80, 94 vs 64-76 mm). But the main differences are related to the female genital system: the uterus is longer than the short ovejector (it is the opposite in *X. achalae*), uterine spines are thinner and more regularly distributed than in *X. achalae*, and sperm is present in a well developed *pars dilata oviductus* apparently functioning as a spermatheca, whereas in *X. achalae* no sperm has been detected in the female genital system. Moreover, the vulva is notably more posteriorly situated (V = 48.49 vs 39.3-45.6).

These two females also resemble *X. amazonensis* in the fine spiny structures in the uterus and in the presence of sperm in female genital tractus (males are known for *X. amazonensis*). However, their stylet is considerably longer (188, 191 vs 138.5 mm, mean value).

Due to the low number of specimens, it seems preferable not to attribute these specimens to one of the above mentioned species or to propose a new species in the hope that, in the future, additional material will solve the problem of their identification.

Key to the species and subspecies of *Xiphidorus* (females)

- 1 - L < 2 mm *minor*
- L > 2 mm 2
- 2 - Amphidial pouch narrow (i.e. < 50 % of corresp. diam.) . 3
- Amphidial pouch large (i.e. > 50 % of corresp. diam.) .. 4
- 3 - L ≤ 2.5 mm; tail conical pointed *saladillensis*
- L ≥ 2.9 mm; tail conical rounded *balcarceanus*
- 4 - Stylet > 150 mm (mean = 163 mm); long uterine spines *achalae*
- Stylet < 150 mm (mean = 134, 139 mm); no uterine spines (crystalloids may be present) 5
- 5 - L > 4.85 mm (mean = 5.30 mm) *amazonensis*
- L < 4.92 mm (mean = 3.70, 3.67 mm) 6

- 6 - Ovejector medium sized (71-128 mm) .. *yepesara yepesara*
- Ovejector long (140-172 mm) *yepesara parthenus*

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