

Cheironchus paravorax n.sp. and *Cheironchus vorax* COBB, 1917 from the Campeche Sound, an oil producing zone in the Gulf of Mexico (Nemata : Selachinematidae)

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Abstract

A new species *Cheironchus paravorax* n.sp. is described from the oil producing zone of Campeche Sound in the Gulf of Mexico. It closely resembles *C. vorax* COBB, 1917 but differs by its more slender habitus, different tail shape with blister, shorter and slightly stouter spicules and finer buccal armature. SEM studies provide additional information on the body cuticle, the head region and buccal armature, and in male on the precloacal supplements and gubernaculum. *C. vorax* COBB, 1917 is redescribed based on specimens from the Gulf of Mexico

Keywords : taxonomy, morphology, *Cheironchus*, Gulf of Mexico.

Résumé

Cheironchus paravorax sp.n. et *C. vorax* COBB, 1917 d'une zone pétrolière, du plateau continental au large de Campeche, Golfe du Mexique (Nemata : Selachinematinae).

Le genre *Cheironchus* COBB, 1917 est signalé d'une zone pétrolière du plateau continental au large de Campeche dans le Golfe du Mexique. Description de *Cheironchus paravorax* sp.n., proche de *C. vorax* COBB, 1917 mais qui s'en distingue par son corps plus mince, par la forme différente de la queue pourvue d'une vésicule, par les spicules plus courts et plus trapus. L'étude au M.E.B. donnent des informations supplémentaires sur la cuticule, la région céphalique et l'armature buccale, et du mâle sur les suppléments préanaux et le gubernaculum. Redescription de *C. vorax* COBB, 1917.

Mots-clés : taxonomie, morphologie, *Cheironchus*, Golfe du Mexique.

Introduction

From 1986 to 1990, many samples of marine sediments were collected, twice a year, from near oil platforms in the Campeche Shelf Zone, Gulf of Mexico.

About 200 genera of free-living marine nematodes were identified and some new species have been described (CASTILLO-FERNANDEZ & LAMBSHEAD, 1990). Specimens of the genus *Cheironchus* were found in all samples taken from the grey jelly-like clay sediments at three stations in the surroundings of Cayo Arcas, the main loading point for oil tankers. The two species

found : *Cheironchus vorax* COBB, 1917 and a new species *C. paravorax* n.sp. are described.

Material and methods

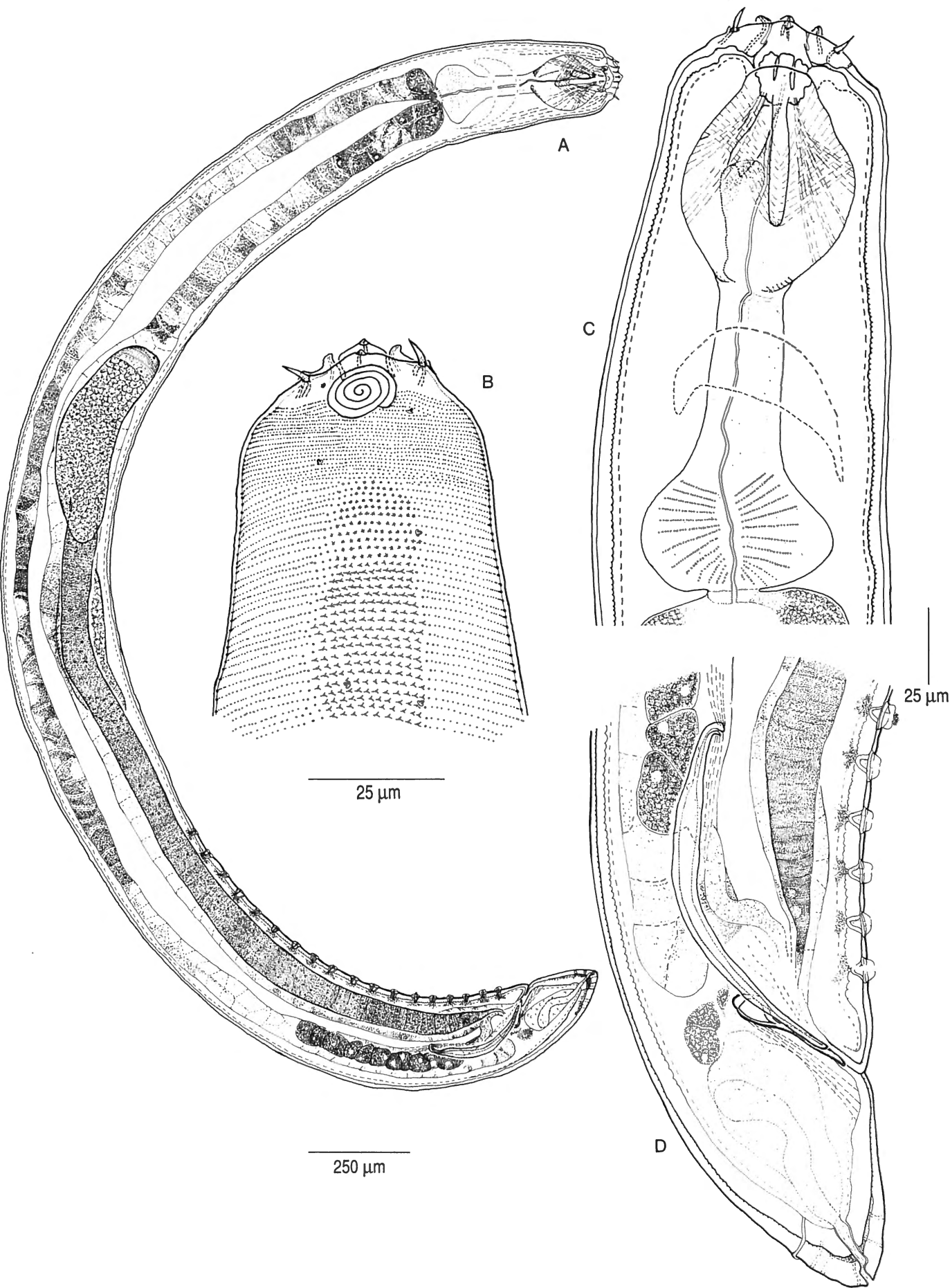
The marine sediment samples were collected by the first author on board of oceanographic vessels, using Van Veen and Shipeck grabs. Each sample was taken from the upper 5 cm of the dredge with 2.5 inch diameter core. The samples were fixed *in situ* with T.A.F. The extraction of nematodes was proceeded by the sugar flotation technique. The nematodes were mounted in anhydrous glycerin. Drawings were made with the aid of a camera lucida of a Leitz Dialux 20.

For SEM, glycerin embedded nematodes were transferred to a drop of glycerin in a small embryo dish and then distilled water was added drop by drop until nematodes were in pure distilled water. Any debris adhering to the specimens was removed by exposure the specimens to ultrasound for approximately 2 min. The nematodes were dehydrated in a series of ethanol concentrations from 30, 50, 75, 95 to 100 % ethanol; the last concentration repeated twice at hourly intervals. The standard critical point drying procedure was used with CO₂ as a drying liquid. Finally, the nematodes were coated with gold and put on stubs for SEM examination with a Philips SEM 515.

The *Cheironchus* material was found at three stations :

- station 14 : 20 07' N, 91 44' W, 38 m depth : *C. paravorax* n.sp. (1 ♀);
- station 22 : 19 25' N, 91 50' W, 39 m depth : *C. paravorax* n.sp. (5 ♂♂, 2 ♀♀, 3 juveniles);
- station 55 : 20 13' N, 91 51' W, at 40,9 m depth : *C. vorax* (2 ♂♂) and *C. paravorax* n.sp. (9 ♂♂, 10 ♀♀, 10 juveniles).

Specimens are deposited in the Nematode Collection of the Royal Belgian Institute of Natural Sciences (slides RIT 400-406) and at the Centro de Investigacion y Estudios Avanzados del Instituto Politecnico Nacional, Unidad Merida, Mexico.



Systematic descriptions

Cheironchus vorax COBB, 1917 (Fig. 1A-D, 2A-B, Table 1)

MATERIAL

2 male specimens.

LOCALITY

Station 55, see material and methods.

MEASUREMENTS

See Table 1.

DESCRIPTION

Males

Body cylindrical and robust, with bluntly rounded to slightly pointed head end and short broad conical tail. Cuticle punctated from level of mid-amphidial fovea to tail. Punctuation fine, homogeneous, arranged in transverse rows, and differentiated laterally in a coarser punctuation with dots more dispersed (Fig. 1B). Just beneath the surface, those larger dots appear three- to six-rayed. Cuticle three-layered in longitudinal optical section with a thin smooth outer layer (partly ripped off in one of the specimens), a second wider median layer: finely annulated and striated, and a thin basal layer with brownish granules underneath. The outer and median layer diverge in posterior tail region. Body pores with minute setiform sensilla arranged in 12 longitudinal rows in the cervical region; posteriorly, pores more dispersed and arranged in eight longitudinal rows, the sublateral rows flanking the lateral field being most obvious; pores and inner canal well marked in the thickened outer cuticular layer in posterior tail region.

Head with six lips, the lateral ones large and raised; the other lips reduced. Labial sensorial organs arranged in an inner crown of six papillae (2 µm high) at the lip apex, and an outer crown of six outer labial papillae (3 µm) and four cephalic setae (6.5-7.5 µm long) at the base of the lipregion. All papillae well developed with distinct inner canals and nerves. Amphidial fovea sublabial, multispiral (4-5 turns) and ventrally wound, with about a circular outline; its diameter 45 % of the corresponding head width. Base endocupola (cephalic capsule) near lip base, with attachment of somatic muscles.

Buccal cavity with two prominent subventral mandibles and a reduced dorsal one. Each subventral man-

dible with a long (58 µm) cylindrical median part anteriorly hooked and two lateral branches (15 µm) along the anterior 1/4th of its length. The lateral parts, each bearing 4 to 5 knobs on their inner surface; the long median appendage with a row of 7 denticles on the inner side of the apical part. Reduced dorsal mandible weakly sclerotized, formed by a relative long median part with tooth-like apical end and on each side flanked by two minute denticles (Fig. 2A). Stoma anteriorly wide, embracing the apical tripartite "claw" of both mandibles and the dorsal tooth of the reduced mandible protruding at its base. Powerful muscles are attached to the mandibles. The buccal armature is largely enveloped by a strongly developed muscular bulb. Strong longitudinal muscles are attached to the stomatal bulb. Pharynx anteriorly with a prominent buccal bulb, then narrow cylindrical, ending on a strong terminal bulb, wider (62 µm) than long (42 µm) and slightly protruding into the intestine. Nerve ring embracing narrow isthmus about halfway down its length. Dorsal pharyngeal gland apparently debouching near base of dorsal mandible. No well developed cardia. Intestine with large, swollen cells, with numerous dark granules; its lumen often filled with parts of nematodes and/or their undigestible structures such as spicules. Intestine dorsally partly overlapping rectum (Fig. 1D); anterior end of rectum surrounded by a sphincter muscle. Rectal glands present subdorsally from the intestine as a series of 10 cells on both sides of the body and debouching ventrally in rectum. Ventral excretory gland cell not observed.

Reproductive system diorchic with opposed testes, largely ventrally to intestine; vas deferens may be partly right, partly left of intestine. Posterior testis reflexed to the left side. Two long spicules, 113-177 µm long, slightly ventrally curved. Manubrium narrow, straight or hooked at tip; spicule shaft distally tapered to a pointed tip. Spicular protractor muscles extend from the manubrium to the ventral body wall at level cloaca, spicular retractor muscles from the dorsal wall of the manubrium to the lateral body wall. Gubernaculum, 34.5 µm long, with two well sclerotized lateral parts connected by a median arched cuneus ventrally in between the spicules. Gubernaculum protractor muscles extend dorsally from anterior end of gubernaculum to the ventral body wall just posterior the cloacal opening. Copulatory muscles well developed, anteriorly reaching to the anteriormost supplement. Eighteen large precloacal supplements present, well sclerotized. Each supplement connected with a small cell.

Tail with three prominent caudal glands, debouching by a well marked spinneret (Fig. 1D).

◁ Fig. 1. – *Cheironchus vorax* COBB, 1917, male specimen from Bay of Mexico. A. Total view of male in longitudinal optical section. – B. Surface view of anterior body region. – C. Pharyngeal region. – D. Copulatory apparatus and tail region.

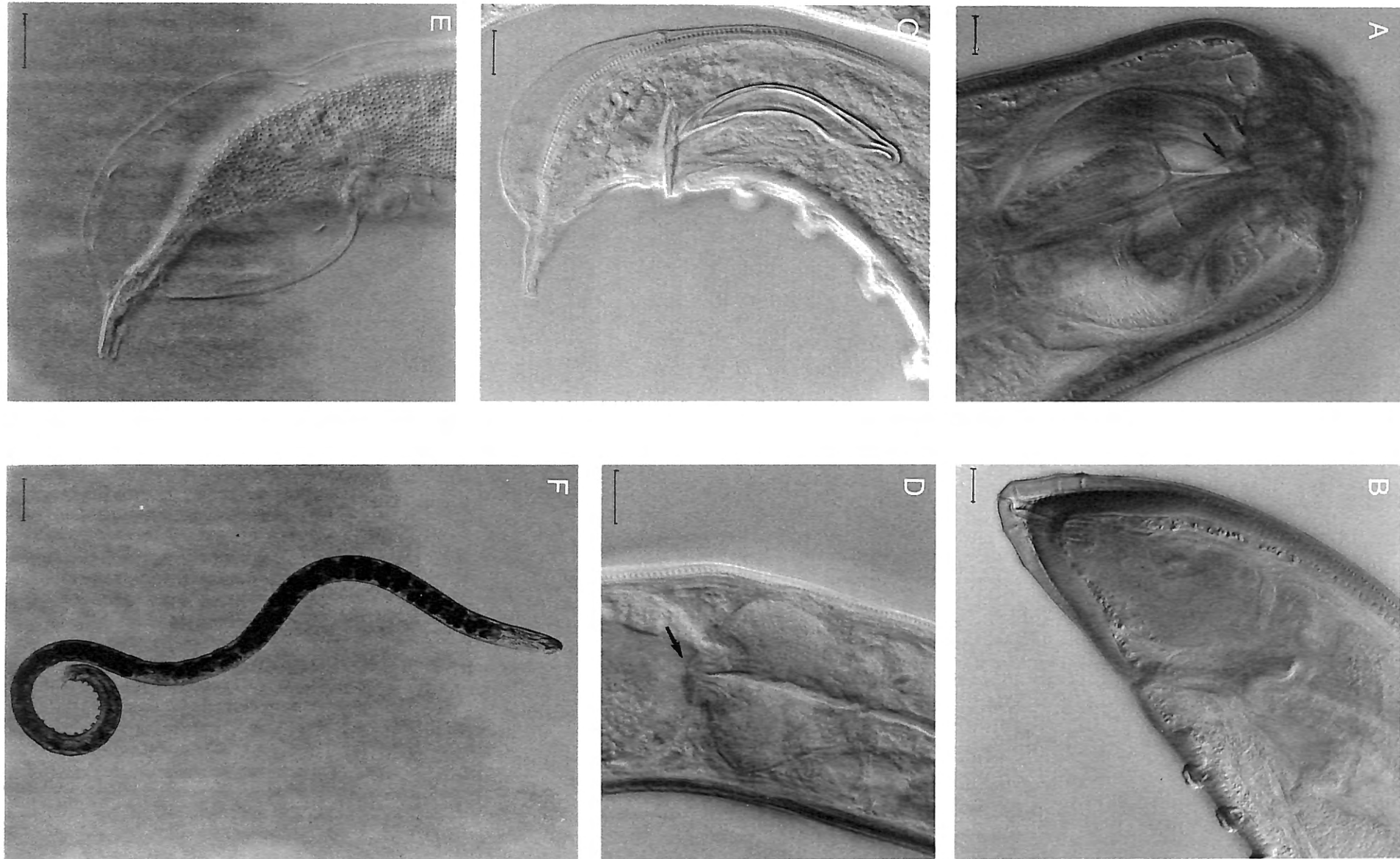


Fig. 2. – *Cheironchus vorax* COBB, 1917. Males. A. Head region and stomatal bulb with indication of reduced dorsal mandible. – B. Tail region in longitudinal optical section. C. *paravorax* n.sp. Males. – C. Tail and copulatory apparatus. – D. Pharyngo-intestinal junction with indication of cardia region. – F. Total specimen. – Female. E. Tail with blister in surface view.

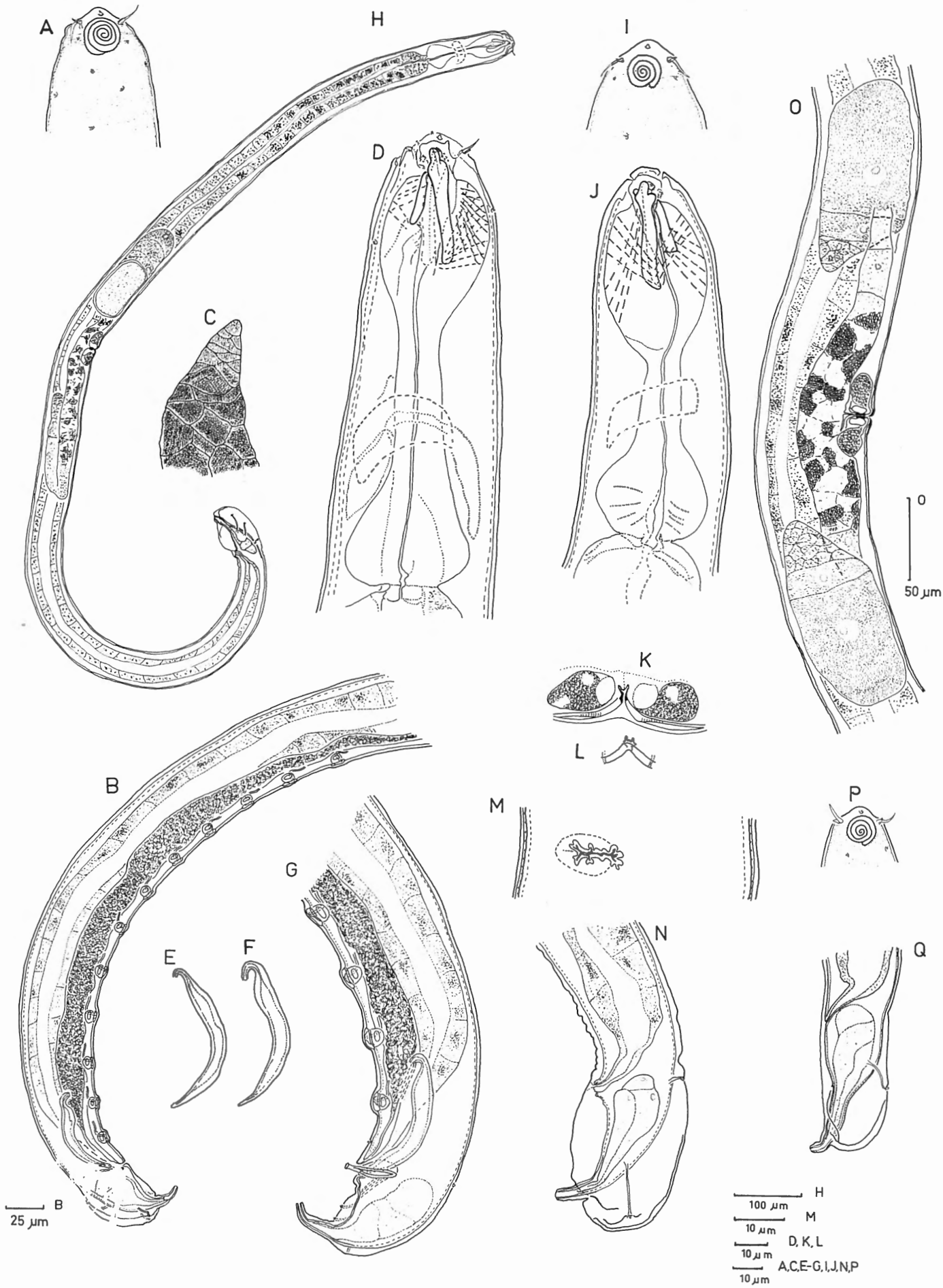
Table 1. Morphometric data of Cheironchus vorax and synonymized species, according to the literature and based on Mexican specimens.

	Males					Females		
	Cobb (1917)	Gerlach (1964)	Gerlach (1964a)	Stekhoven (1950)	Present study		Cobb (1917)	Filipjev, (1918)
	Atlantic coast	Malediven	Red Sea	Mediterranean	Mexico male 1	male 2	Atlantic Coast	Black Sea
L	2000	1643	1990	2560	1730	1485	2300	4340
a	19.23	20	32	30.5	15	14	18.18	40
b	9.09	9.9	13.3	12.8	9.3	9.3	10.3	19.0
c	28.57	37?	31	32	28	24	45.09	56
c'	1.06		1.3	1.28	1.02	1.00	0.79	
Length subventral mandibles			30-33		58	61		60
Length pharynx	220	165	150	200	185	159	223	300
– width anter. bulb			36		55	56		80
– width post. bulb			41		66	51		
Tail	51	53	64	80	61.5	61.5	70	77.5
Cephalic setae		7	13		6.5	7.5		
Width amphid		15	20		20.5	18		30
Headwidth at base stoma	86	42	35	48	50	42.5	87.4	
% amphid		35	46	54	45	45		33
Spicule		89	68	84	113	117		
Gubernaculum		34	27		34.5	34.5		
Number precloacal supplements	–	16	13	12	18	15		
V%							50	56

Discussion

Cheironchus vorax is known from a few specimens only: 1 ♀ and 1 ♂ type specimen from the Atlantic coast of USA (COBB, 1917 in CHITWOOD, 1951) 1 ♀ from the Black Sea (FILIPJEV, 1918), 1 ♂ and 1 juv. from the Mediterranean (SCHUURMANS STEKHOFEN, 1950), 1 ♂ and 1 juv. from the Malediven (GERLACH, 1964a), 1 ♂ from the Red Sea (GERLACH, 1964) and from the Bermuda (COULL, 1968 in GERLACH & RIEMANN, 1974). In the Mexican samples, only two male specimens were found. Although rare, Cheironchus vorax seems a cosmopolitan species. However, the limited number of specimens, the usually scanty descriptions and the schematic drawings make it difficult to identify all former species as C. vorax beyond doubt. All specimens considered as Cheironchus vorax have a similar labial region with high lateral lips, the same arrangement of the anterior sensorial organs (6 + 10), an amphidial fovea with 3.5-4.5 turns: 33-54 % of the corresponding head width, a buccal armature with 2 large branched mandibles, a pharynx with an anterior and a posterior bulb and a more or less similar shape of the copulatory apparatus. The widest ranges are found

within the morphometric data (Table 1): in males, more specifically in spicule length: 68-89 µm and also in the number of precloacal supplements: 12-16; to a lesser extend in body length: 1643-2560 µm in males, but more pronounced in females: from 2300-4340 µm and in a ratio: 19.23-32 (male) and 18.18-40 (female). The buccal armature is a complicated structure what may explain why its representation, also influenced by its orientation, differs according to the authors. The small weak dorsal armature was described only by GERLACH (1964a) as a reduced mandible and FILIPJEV (1918) in detail and also in cross section; it was not mentioned by the other authors. The most detailed description is given by FILIPJEV (1918), it corresponds with our specimens. The Mexican specimens largely agree with the description of the female specimen by FILIPJEV (1918). However, the Mexican male specimens are rather small (1485-1730 µm against 1643-2560 µm in other males and 4340 µm in FILIPJEV's female specimen) and up to twice as wide as the other specimens (a = 14-15 against 19.23-30.5 in males, 40 in the Russian female specimen), their spicules are slenderer and longer



(113-117 μm against 68-89 μm) and the number of precloacal supplements (15-18) is somewhat larger than the data from the literature (12 to 16).

Although, the differences in spicule length and number of precloacal supplements, we consider the Mexican male specimens as belonging to *Cheironchus vorax* COBB, 1917 until more data become available on the variability on species level within this genus.

***Cheironchus paravorax* n.sp.**
(Figs. 2C-F, 3A-Q, 4A-G, Table 2)

TYPE MATERIAL

Holotype male 1 ♂, slide RIT400, paratypes : 7 ♂♂, 4 ♀♀, 5 juv., slides RIT400-406; 5 ♂♂, 6 ♀♀, 5 juv. in Unidad Merida.

TYPE LOCALITY

Station 55, see material and methods.

OTHER LOCALITIES

Stations 14 and 22, see material and methods.

MEASUREMENTS

See Table 2.

DESCRIPTION

Body long cylindrical and robust, with bluntly rounded to slightly pointy head end and conical tail; tail usually with a more or less swollen cuticle resembling a blister (Fig. 2C, E). Body cuticle punctated, except at tail tip. Punctuation fine, arranged on transverse rows, with differentiation in the lateral field where punctuation coarser, more dispersed and slightly irregular. Cuticle three-layered with a smooth outer layer (epicuticle), a thicker median layer (mesocuticle) with numerous transverse bars in longitudinal optical section, seen as punctuation in surface view, and a fine basal layer. SEM pictures reveal an annulated, non-punctated epicuticle (Fig. 4B) and a mesocuticle provided with daisy-like structures (Fig. 4C). The latter consist of a flower-like

head with 6-7 rays around a central pore, ending of a hollow bar. In the tail region, the cuticle is usually more or less swollen due to a separation of the external cuticular layer from the median layer [? formed by an increase of the fluid component of the median zone (WRIGHT, 1975 in BIRD, 1991)]. The inflation is less developed ventrally. Body pores, with a small protruding sensilla, present but widely dispersed and scarce, except in the pharyngeal region. In the pharyngeal region, they are more numerous and arranged on about ten longitudinal rows; in the tail region, their inner canal is obvious in the swollen terminal cuticle. Precloacally, two well developed lateral body pores present on both sides (Fig. 3G).

Labial region with six lips, the lateral ones large and raised, the others reduced (Fig. 4A, 4D). One anterior crown of six inner labial papillae near lip apex, and one outer crown formed by six outer labial papillae and four short cephalic setae just posterior the lips. Posterior to the labial sensorial organs are two large multi-spiral amphidial fovea, ventrally wound, with about 4.5 turns and with circular outline; diameter is 45-59.5 % (♂), 41-50 % (♀) of corresponding head diameter.

Buccal cavity wide, with two prominent subventral mandibles (31-42 μm long) and a smaller dorsal one (13.5-20 μm long) with tooth-like end. Both subventral mandibles tripartite consisting of a long median rod-like part and two short curved lateral parts along the anterior fourth of the median processus. All parts anteriorly curved, with a pointed tip and the outer wall grooved (Fig. 4D). The inner side of the median rod bears distally a row of a few denticles, the lateral branches end on four to six teeth.

Pharynx anteriorly with a prominent muscular bulb largely envelopping the buccal armature and responsible of mobility, followed by a narrow isthmus surrounded by the nerve ring and ending on a well developed terminal bulb. Outlet dorsal pharyngeal gland apparently at base of reduced dorsal mandible. Terminal pharyngeal bulb, muscular, protruding into intestine as a small cardia (Fig. 2D). Intestine with large cells with numerous dark brown granules (Fig. 2F) and ending by a rectum; rectal glands obscure. Intestinal lumen filled with complete nematodes or parts, and several undigestible structures such as spicules. The gut content reveals its carnivorous nature.

Tail with three caudal glands debouching by a marked spinneret.

◁ Fig. 3. – *Cheironchus paravorax* n.sp. Holotype male. A. Anterior body region in surface view. – B. Posterior body region with copulatory apparatus. – C. Detail of anterior testis and sperm cells. — Paratype males. D. Pharyngeal region. – E-F. Spicules. – G. Posterior body region with copulatory apparatus. — Paratype females. H. Entire specimen in longitudinal optical section. – I. Anterior body region in surface view. – J. Pharyngeal region. – K-M. Detail of vagina at different optical levels. – M. Oblique ventrally. – N. Tail region. – O. Female reproductive system. — Paratype juvenile, 2nd stage. – P. Head region in surface view. – Q. Tail region.

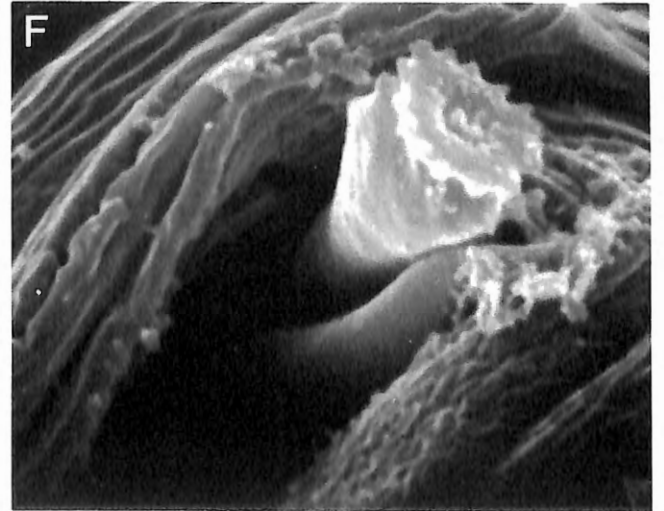
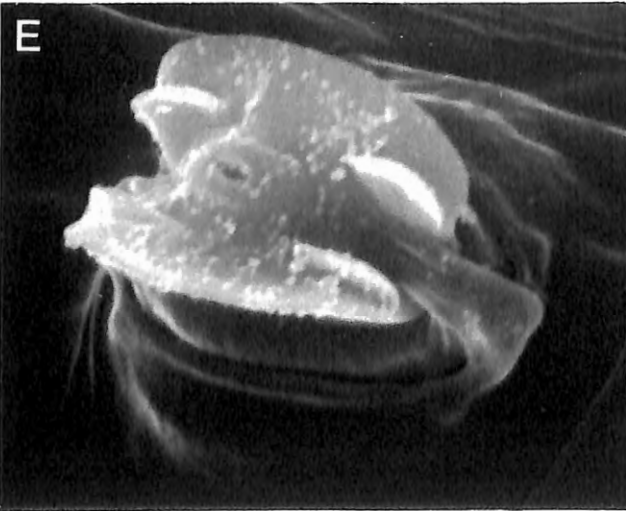
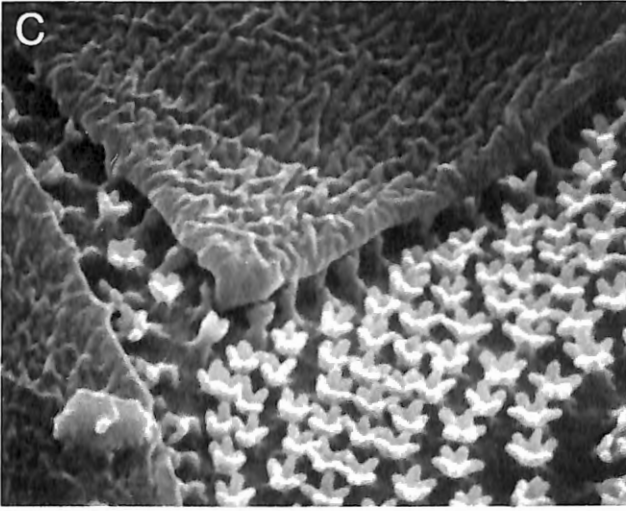
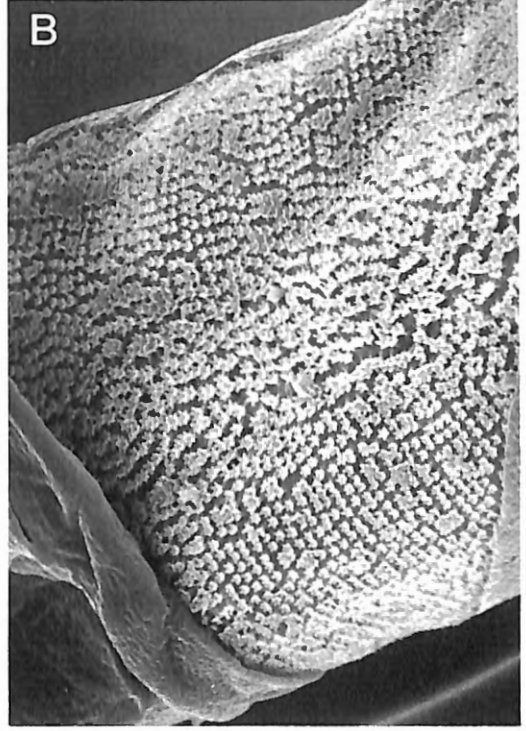


Table 2. Morphometric data of Cheironchus paravorax n.sp. type specimens.

	Males		Females	Juveniles		
	Holotype	n = 17 min.-max. (mean)	n = 13 min.-max. (mean)	stage II n = 4 min.-max. (mean)	stage III n = 3 min.-max. (mean)	stage IV n = 2 min.-max.
L	1905	1205-1925 (1395)	1600-2150 (1905)	970-1125 (1015)	1180-1405 (1270)	1595-1685
a	35.4	18.1-39.8 (28.1)	27-44 (33)	27-33 (30.5)	28-37 (33)	36-37
b	13.6	7.3-14.9 (11.4)	13-17 (15)	10-11 (10.2)	10-12 (11)	13
c	38.4	15.5-38.4 (28.4)	25-33 (28.6)	18-21 (19.5)	18-24 (21.6)	25-26
Width amphid	15.5	13.4-20.5 (15.8)	13-16 (14.2)	9-11 (9.5)	9-12 (10.6)	13
% amphid to corresponding head width	57.2	45.1-59.5 (52.7)	41-50 (45.8)	45-50 (47.5)	47-48 (47.6)	48-50
Length subventral mandible	35.5	31.0-38.5 (35.3)	39-42 (40.8)	29-31 (29.7)	28-29 (28.6)	32
Length pharynx	140	101-164 (121)	112-142 (127.5)	95-103 (100)	101-114 (106)	121-132
– width buccal bulb	32	25.5-42.5 (33.5)	32-37 (34.9)	24-28 (26)	28	30-31
– width endbulb	38.5	32-56 (39)	38-43 (40.2)	25-38 (30)	28-37 (31.6)	33-39
Tail	49.5	43-61 (51)	64-71 (66.8)	50-52 (52)	52-59 (55)	64-65
Spicule	55	53.5-62.5 (59.5)				
Gubernaculum	20	19-23.5 (21)				
Number precoacal supplements	12	10-12 (13)				
V%			44-49 (46.4)			
Length genital system				15-21 (18)	33-43 (38)	74-148

Male

Reproductive system diorchic with opposed testes, largely ventrally to the intestine. The anterior testis partly right, the reflexed posterior testis partly left to the intestine in the holotype. Sperm cells very small, aggregated. Spicules, 53.5-62.5 µm long, curved, with narrow more or less hooked manubrium (Fig. 3E-F), a wider shaft distally tapered to a fine end and provided with a well cuticularized inner septum (Fig. 2C). Spicular protractor muscles extend from manubrium to the ventral body wall near the cloacal opening, the spicular retractor muscles from the dorsal wall of the manubrium to the lateral body wall. Gubernaculum, 19-23 µm long, its weak corpus parallel to the spicules and ventrally provided with an arched thin sclerotized median cuneus in between the spicules and two well sclerotized lateral wings each ending distally on a rosette (Fig. 4G). Gubernaculum protractor muscles well developed. Ten to thirteen large, well sclerotized dummy-like ventromedian precloacal supplements present (Figs 3B, G, 4E).

Female

Reproductive system didelphic-amphidelphic, with reflexed ovaries : the anterior branch reflexed to the right side, the posterior one to the left side. The genital system largely ventral to the intestine and partly right of it anteriorly and left of it by the posterior branch. No clear spermathecae observed, uterus filled with numerous sperm cells. Vagina, 18 µm long, weakly sclero-tized, its lumen distally provided with a short (6 µm) sclerotized folded lock-like structure (Fig. 3K-M). Vulva situated at 44-49 % of total body length from anterior end. Vagina surrounded by well developed constrictor muscles and flanked by two large gland cells.

Juveniles

Similar to adults for most characteristics, including the tail blister (Fig. 4Q). Based on body length and development of the reproductive system, the second, third and fourth juvenile stages were distinguished. In a juvenile female of the fourth stage, the reproductive system was largely formed, with two reflexed branches

Fig. 4. – Cheironchus paravorax n.sp. SEM pictures of male specimens. A. Head region (x 3100). – B-C. Detail of body cuticle : mesocuticle (B : x 2100, C : x 10000). – D. Head in front view with buccal armature (x 2300). – E. Pre-cloacal supplement (x 9000). – F. Detail of distal end of one of the lateral parts of the gubernaculum (x 15000).

and a vulva located at 50 % of total body length from anterior end. No moults were observed.

Diagnosis

Cheironchus paravorax n.sp. is characterized by its slender habitus with rounded conical head end and conical tail with blister, by the armature of the buccal cavity with two large branched subventral mandibles and a reduced but distinct third one. Males can be differentiated by the length (53.5-62.5 μ m) and shape of the spicules and by the number of precloacal ventromedian supplements (10-13); females, by the sclerotized lock-like structure in the vagina.

Relationships

The new species closely resembles *Cheironchus vorax* COBB, 1917. Both species occurred once in the same sample. The new species differs from *C. vorax* by a different tail shape with long narrow terminal end with spinneret and tail blister, by more slender body ("mean" a-ratio 28 against 14-15 in Mexican *C. vorax* males), by the shorter spicules (53.5-62.5 μ m against 113-117 μ m in Mexican *C. vorax* specimens) and slightly different spicule shape, by the number of precloacal supplements (10-13 against 15-18 in Mexican *C. vorax* specimens), by the less developed rectal glands and by the smaller, slenderer subventral mandibles with grooved outer surface.

Conclusions

To our knowledge, specimens of the genus *Cheironchus* COBB, 1917 are found again after 25 years; their occurrence in the Gulf of Mexico is new. Although rare, *C. vorax* COBB, 1917 appears to be a cosmopolitan species. However, little is known on the variability of its morphological and morphometric features. With the discovery of a new species *C. paravorax* n.sp., the genus is no longer monospecific. The new species represented by a larger number of specimens of males, females and juveniles, shows usually little variability in morphological features and in morphometric data. It is closely related to *C. vorax*, having a similar head shape and arrangement of the anterior sensorial organs, cuticular ornamentation, structure of the buccal armature, digestive and reproductive system and similar precloacal supplements in male, all features defining the genus *Cheironchus*.

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