



Three new species and one new record of *Campylaimus* (Diplopeltidae, Nematoda) from Argentine coasts (Buenos Aires and Santa Cruz, Argentina)

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Abstract

Two new *Campylaimus* species from Arroyo Pareja, Buenos Aires province and one new species and one new record of *Campylaimus* from Puerto San Julián, Chubut province are described. The three species are characterized by the shape of the copulatory apparatus of the male and the presence of precloacal papillae. *Campylaimus bonariensis* **sp. nov.** has slender and arcuate spicules, with well-developed cephalization at the proximal end, tubular gubernaculum and three precloacal papillae; *Campylaimus arcuatus* **sp. nov.** has curved spicules, with well-developed cephalization at the proximal end, gubernaculum with dorso-caudally directed apophysis and five precloacal papillae; *Campylaimus patagonicus* **sp. nov.** has slender and arcuate spicules without proximal cephalization, gubernaculum with dorso-caudally directed apophysis and two precloacal papillae. An emended diagnosis of the genus *Campylaimus* and an identification key to species based on male characters are given

Key words: marine nematode, emended generic diagnosis, description, systematics, key

Introduction

New free-living marine nematodes were found during an ecological and taxonomical study of the meiobenthos of Argentine coasts. The family Diplopeltidae Filipjev, 1918 has been reviewed by Muthumbi & Vanreusel, (chapter 19, 2006) as having (Cyliindrolaiminae) or not having precloacal supplements (Diplopeltinae). The family Diplopeltinae was reviewed by Vincx & Gourbault, 1992 and the genus *Campylaimus* Cobb, 1920 was reviewed by Gerlach & Riemann, 1973; 1974, Warwick *et al.*, 1998, Huang & Zhang, 2006 and Tchesunov & Miljutina, 2008 without suggestion of the presence or absence of precloacal supplements. Analyzing descriptions of different *Campylaimus* species, we found that none of them mention the presence of precloacal supplements, either papilliform or setiform.

Huang & Zhang (2006) redescribed the species *C. gerlachi* Timm, 1961 collected in the Yellow Sea of China and did not observe precloacal supplements. The three species described as new in this paper: *Campylaimus bonariensis* **sp. nov.**, *Campylaimus arcuatus* **sp. nov.** and *Campylaimus patagonicus* **sp. nov.**, plus a population of *C. gerlachi* found in San Julián area all have tiny precloacal papillae present. So due to inconsistencies with the literature, we provide here an emended diagnosis of the genus *Campylaimus*.

Huang & Zhang, 2006 published a key to the genus that included nine species. They give good arguments to differentiate *C. inaequalis* Cobb, 1920 from *C. gerlachi* Timm, 1961. Their key did not include *C. inaequalis* Cobb, 1920 and did not take into account *C. tkatchevi* described by Tchesunov in 1978. *C. abnormis* was described by Thanh & Gagarin, 2011. We consider here *C. cylindricus* Gerlach, 1956, *C. minor* Timm, 1961, *C. siwaschensis* Sergeeva, 1981 and *C. gracilis* Thanh *et al.*, 2012 only described from females, as species inquirendae.

Within the genus *Campylaimus* we consider nine species as valid: *C. abnormis* Thanh & Gagarin, 2011; *C. inaequalis* Cobb, 1920; *C. gerlachi* Timm, 1961; *C. lefeveri* Gerlach, 1956; *C. mirus* Gerlach, 1950; *C. ponticus* Sergeeva, 1981; *C. rimatus* Vitiello, 1974; *C. striatus* Boucher & Helléouët, 1977 and *C. tkatchevi* Tchesunov, 1978.

In the present paper we also provide a new key for species identification in *Campylaimus*, based on male characters.

Materials and methods

Description of sites studied. Samples were collected from Arroyo Pareja (38°54'S, 62°04'W), Buenos Aires Province, Argentina during the summer of 2009 and at San Julián Bay, Santa Cruz Province (49°18'S, 67°42'W) during the summer of 2008–2009 (Fig.1).

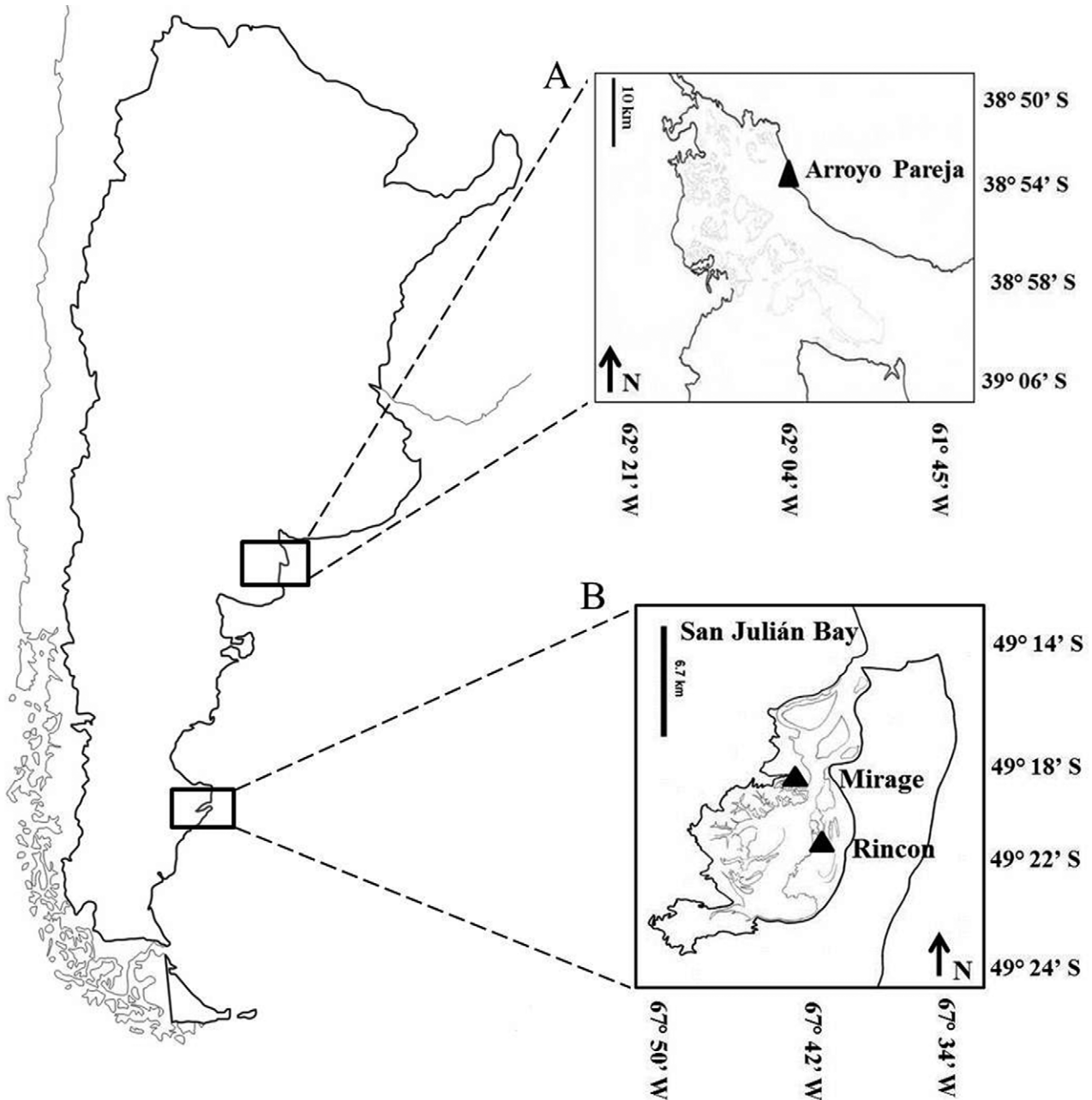


FIGURE 1. Map of the sampling areas: A. Arroyo Pareja in Buenos Aires, B. Rincon and Mirage in San Julián Bay.

Arroyo Pareja is located in the White Bay Estuary which has a 3.000 km² extension. The salinity is variable, less than 19‰ in winter and more than 40‰ in summer, so this environment varies between brackish water to brine. The specimens were collected in low littoral medium sand.

The San Julián Bay is 19.9 km long and has two distinct areas with one near the entrance to the bay (length/width 6.8/5.3 km) and one towards the very end (length/width 11.8/8.2 km) separated by a narrow passage where the city is located. The specimens were collected in “Rincon” at the end of the bay (49°20’S, 67°42’W) in low littoral sand and in “Mirage” at the city (49°18’S, 67°42’W) in low littoral sand. The salinity is more constant, varying between 30–33‰.

Sample collection and treatment. The samples were collected with a cylindrical Plexiglas corer, 10 cm high and 2.9 cm in diameter. They were preserved in 5% formaldehyde in filtered seawater, sieved through both 500 µm and 50 µm mesh sieves.

The nematodes recovered on the 50 µm mesh sieve were separated by LUDOX™, placed in Petri dishes with liquid fixative composed of glycerol-alcohol-water (Ditlevsen, 1911), stained with blue Nile, then placed in a desiccator where after 2–3 days the nematodes remain in pure glycerin. Later the specimens were mounted on slides in pure glycerin.

Specimen analysis. Nematodes were identified, drawn and described using a Zeiss microscope with differential interference contrast (DIC) and photographed using an Olympus BX51 microscope with a Nikon D80 digital camera. Literature has been obtained from Deprez (2006). Holotype and allotype specimens were deposited in the Invertebrate Collection of the Museo Nacional de Ciencias Naturales “Bernardino Rivadavia”, Argentina. Paratype specimens were deposited in the CNP-NEM collection, Puerto Madryn, Chubut, Argentina. The standard de Man’s ratios *a*, *b* and *c* used in this paper were calculated as usual. Measurements are in µm.

Abbreviations. The following abbreviations are used: amph% = amphidial fovea diameter as percentage of corresponding body diameter; c’ = tail length divided by anal body diameter; gub% = gubernaculum length as a proportion of anal body diameter; spic% = spicule chord as proportion of anal body diameter; PS = precloacal supplement; V% = distance from the anterior end to the vulva opening as a percentage of total body length.

Emended diagnosis of *Campylaimus*

DIPLOPELTIDAE. Cuticle smooth or striated. Ocelli may be present in Diplopeltinae. Buccal cavity is narrow, tubular, without teeth. Pharynx lacking a muscular basal bulb. Females with two outstretched ovaries (only one ovary in *Cylindrolaimus monhysterata*). Usually there are two testes and only occasionally the posterior one is absent. Precloacal papillae may be present (Cylindrolaiminae) or absent. The tail is conical or has a cylindrical section. The subfamily Diplopeltinae is entirely marine.

Results and discussion

Monhysterida Filipjev, 1929

Diplopeltidae Filipjev, 1918

Diplopeltinae Filipjev, 1918

Campylaimus Cobb, 1920

Campylaimus bonariensis sp. nov.

(Fig. 2 (A–I), Fig. 5 (E–F); Table 1)

Measurements: see Table 1.

Type material: Male holotype, registration number MACN-In 38917, female allotype, registration number MACN-In 38918, one male paratype and two females paratype, registration number CNP NEM 643, 644, 645.

Type locality. Arroyo Pareja, Buenos Aires province, Argentina. Coordinates: 38°54’S, 62°04’W; water depth: low littoral. Collected by Antonela Martelli, 20 March 2011.

Etymology. From the Spanish words “Buenos Aires”, in reference to the province where it was found.

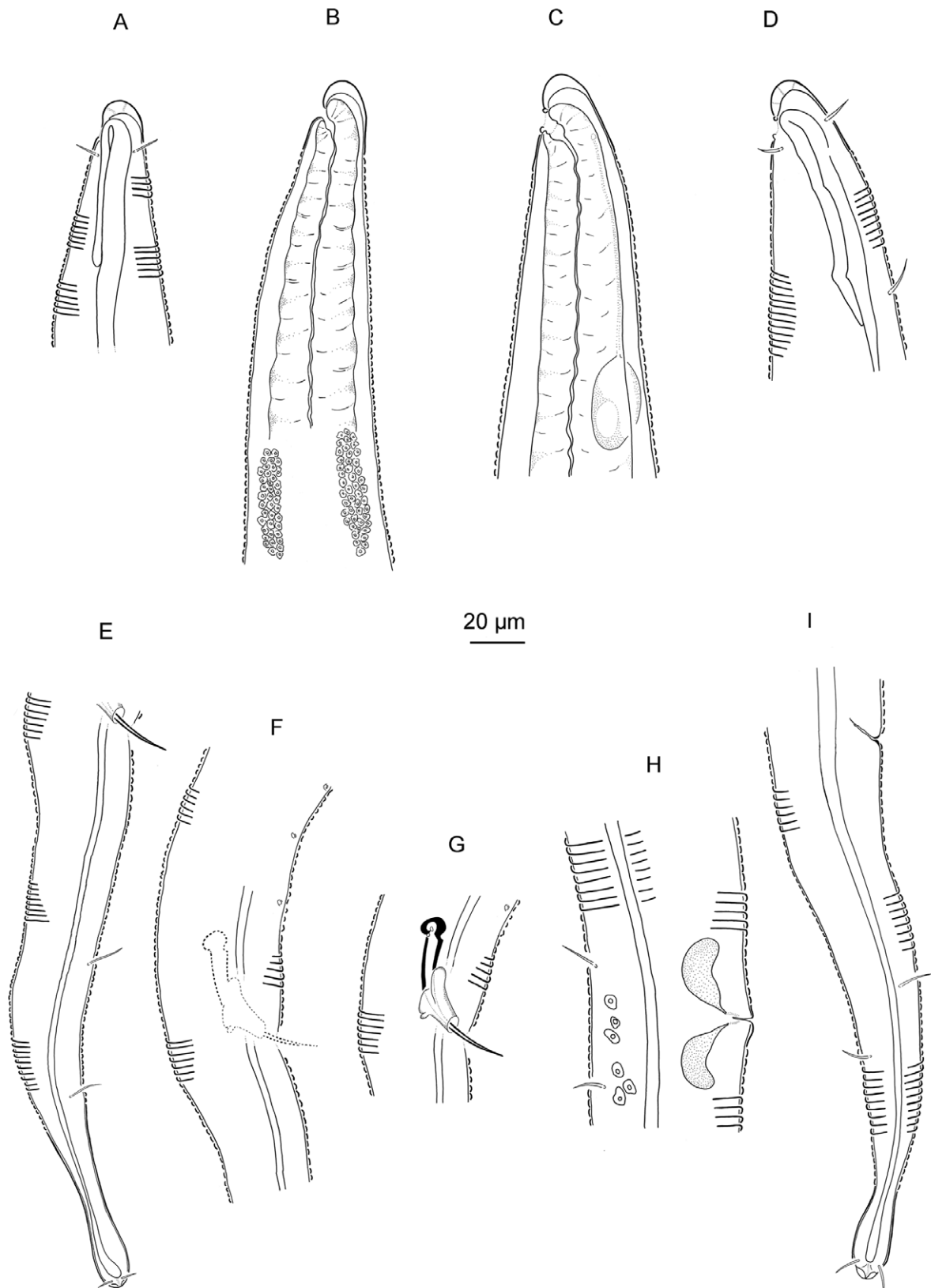


FIGURE 2. *C. bonariensis* sp. nov. A. Amphidial fovea and cephalic setae on anterior end of male holotype; B. Head and buccal cavity of male holotype; C. Head and buccal cavity of female allotype; D. Amphidial fovea and cephalic setae on anterior end of female allotype; E. Posterior end of male holotype; F. Copulatory apparatus, spicule, gubernaculum and precloacal papillae of male holotype; G. Spicule and gubernaculum of male holotype; H. Vulva of female allotype; I. Posterior end of female allotype. Scale bar: 20 µm.

TABLE 1. Measurements (in μm) of *C. bonariensis* sp. nov. (range, mean value in parentheses). *Juvenile in fourth stage.

	HOLOTYPE	ALLOTYPE	PARATYPE	PARATYPE	JUVENILE*
	Male	Female	Male	Females N=2	
L	830.0	840.0	950.0	750.0–830.0(790.0)	800.0
a	26.0	30.0	37.0	23.0–25.0(24.0)	31.0
b	6.0	6.0	6.0	6.0–7.0(6.5)	6.0
c	6.0	6.0	6.0	5.0	5.0
Maximum body diameter	32.0	28.0	26.0	30.0–36.0(33.0)	26.0
Buccal cavity, length	6.0	8.0	8.0	8.0–10.0(9.0)	10.0
Head diameter	12.0	14.0	16.0	16.0	17.0
Cephalic setae, length	5.0	6.0	4.0	3.0–4.0(3.5)	not seen
Cephalic setae, length	5.0	6.0	4.0	3.0–4.0(3.5)	not seen
amph%	42.0	36.0	44.0	31.0–37.0(34.0)	35.0
Amphidial fovea width	5.0	5.0	7.0	5.0–6.0(5.5)	6.0
Pharynx, length	145.0	130.0	150.0	115.0–130.0(122.5)	130.0
Anal body diameter	20.0	20.0	26.0	20.0–22.0(21.0)	22.0
Spicular, length	32.0	-	30.0	-	-
spic%	1.6	-	1.0	-	-
Gubernaculum, length	11.0	-	10.0	-	-
gub %	0.5	-	0.4	-	-
T	150.0	150.0	160.0	158.0–160.0(159.0)	160.0
c'	7.5	7.5	6.0	7.0–8.0(7.5)	4.0
Anterior end to anus, distance	680.0	690.0	790.0	590.0–672.0(631.0)	640.0
V	-	430.0	-	370.0–380.0(375.0)	-
V%	-	51.0	-	45.0–51.0(47.6)	-

Description. Male (holotype): Body length medium-sized. Cuticle moderately striated, approximately 2 μm thick. Head narrow, tapering towards the anterior end of the body, with a clearly visible cap. Oral opening located subterminally, on dorsal side of body. Lips absent. Four cephalic setae (5 μm long) located posterior to the level of the oral opening. Somatic setae absent. Amphidial fovea consisting of two parallel arms, situated posterior to the cephalic setae, the long ventral arm expanding into broad lateral alae extending the length of the body to the tail tip and the shorter amphidial branch measuring 60 μm long, with both branches measuring 5 μm wide or 2.4 times the cephalic diameter. The pharynx measures 145 μm long.

Reproductive system diorchic, testes opposed. Spicules equal in length, 32 μm long measured along the arch, slender and arcuate, proximal end with well-developed cephalization. Gubernaculum tubular, 11 μm long. Three precloacal papillae are present.

Tail 150 μm long ($c' = 7.5$), cylindrical, gradually tapering toward the distal end with swollen tip. The tip of the tail has two setae, 3 μm long.

Female (allotype): similar to male in general body shape. Gonads paired, opposed; ovaries outstretched, not reflexed. Anterior and posterior ovaries located on the left and right side of intestine, respectively. Vulval opening ventral, located in the middle of the body. Vagina short, not thickened. Two glands surrounding the vulva. Tail 150 μm long ($c' = 7.5$).

Discussion. *Campylaimus bonariensis* sp. nov. is characterized by the shape of the spicule and gubernaculum and by the presence of three precloacal papillae.

C. bonariensis sp. nov. resembles: *C. abnormis* Thanh & Gagarin, 2011 in the value of *a*, *b* and *c* ratios and the dorsal oral opening but differs in the length of the body, the length of the spicule, the length of the gubernaculum and the presence of precloacal papillae; *C. tkatchevi* Tchesunov, 1974 in the value of *b* and *c*, the dorsal oral

opening but differs in the length of the body, the length of the spicule, the value of a and the presence of precloacal papillae; *C. arcuatus* **sp. nov.** in the shape of the body, the value of a , b and c , the shape of the tail and the length of the gubernaculum but differs in the length and shape of the spicule, the shape of the gubernaculum and the number of precloacal papillae; *C. patagonicus* **sp. nov.** in the shape of the body, the value of c , the length of the spicule and gubernaculum but differs in the shape of the head and tail, the shape of the spicule and gubernaculum, the value of a , b and the number of precloacal papillae (Table 5).

C. bonaeriensis **sp. nov.** differs from all known species by the presence of precloacal papillae: from *C. rimatus* Vitiello, 1974, *C. striatus* Boucher & Helléouët, 1977 and *C. ponticus* Sergeeva, 1981 by the presence of gubernaculum; from *C. mirus* Gerlach, 1950 and *C. lefeveri* Gerlach, 1956 by the body shorter than 1000 μm and from *C. inaequalis* Cobb, 1920 and *C. gerlachi* Timm, 1961 by the dorsal oral opening.

Campylaimus arcuatus **sp. nov.**

(Fig. 3 (A–J), Fig. 5 (C–D); Table 2)

Measurements: see Table 2.

TABLE 2. Measurements (μm) of *C. arcuatus* **sp. nov.** (range, mean value in parentheses).

	HOLOTYPE	ALLOTYPE	PARATYPE
	Male	Female	Males N=3
L	820.0	900.0	800.0–850.0 (820.0)
a	21.0	20.0	24.0–28.0 (26.3)
b	6.0	6.0	6.0–7.0 (6.6)
c	5.0	6.0	6.0–7.0 (6.6)
Maximum body diameter	40.0	46.0	30.0–34.0 (31.3)
Buccal cavity, length	6.0	6.0	5.0–6.0 (5.7)
Head diameter	15.0	15.0	14.0–16.0 (14.7)
Cephalic setae, length	3.0	3.0	4.0–5.0 (4.3)
Cephalic setae, length	3.0	3.0	4.0–5.0 (4.3)
amph%	40.0	27.0	25.0–43.0 (34.0)
Amphidial fovea width	6.0	4.0	4.0–6.0 (5.3)
Pharynx, length	130.0	160.0	120.0–130.0 (125.0)
Anal body diameter	30.0	34.0	20.0–27.0 (23.7)
Spicular, length	24.0	-	26.0–32.0 (28.7)
spic%	0.8	-	1.1–1.4 (1.2)
Gubernaculum, length	16.0	-	10.0–12.0 (11.3)
gub %	0.5	-	0.4–0.6 (0.5)
T	150.0	150.0	114.0–140.0 (126.0)
c'	5.0	4.0	5.0–6.0 (5.4)
Anterior end to anus, distance	670.0	750.0	660.0–736.0 (693.7)
V	-	420.0	-
V%	-	47.0	-

Type material. Male holotype, registration number MACN-In 38919, female allotype, registration number MACN-In 38920; three males paratypes, registration number CNP NEM 646, 647, 648.

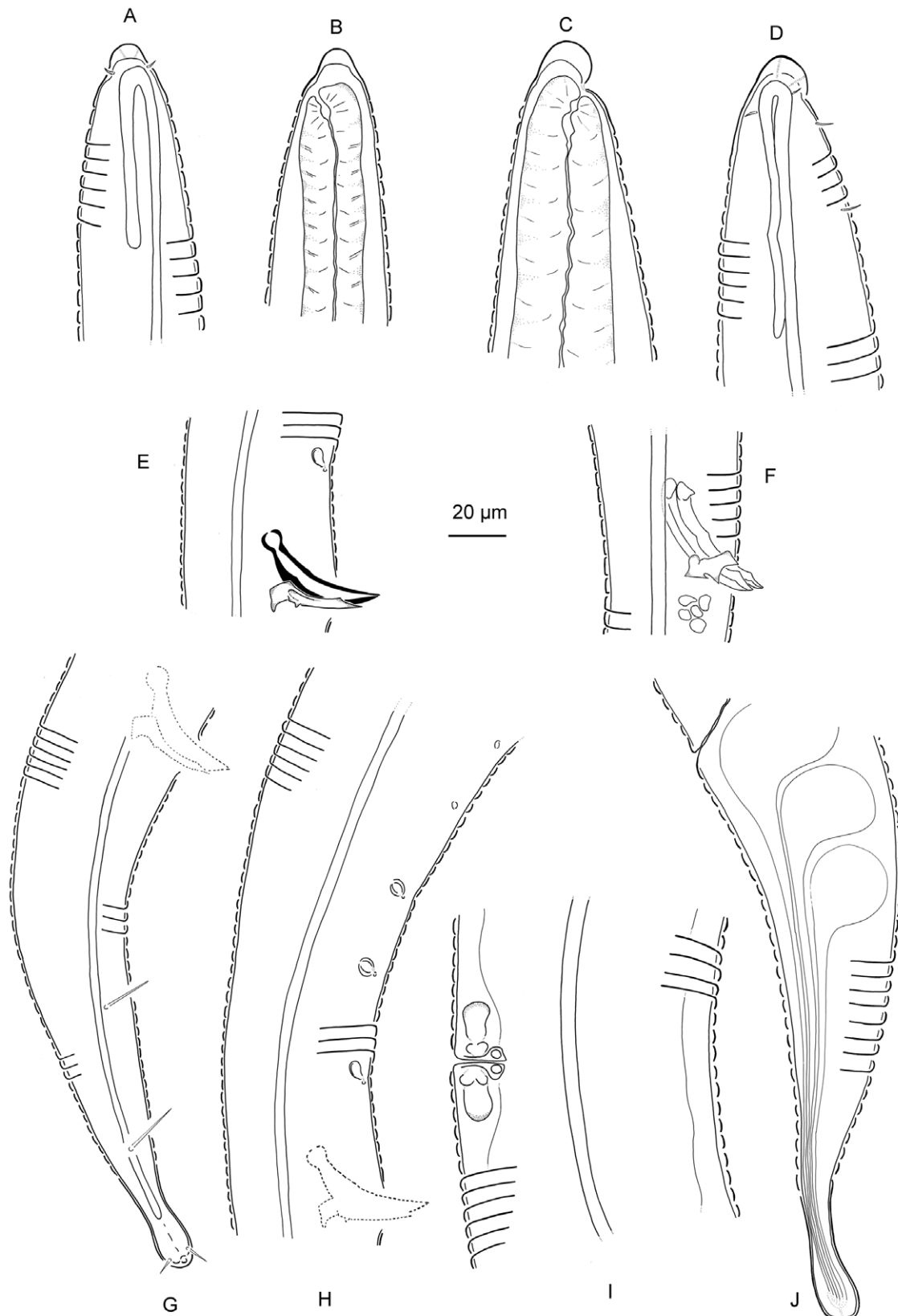


FIGURE 3. *C. arcuatus* sp. nov. A. Amphidial fovea of male holotype; B. Head and buccal cavity of male holotype; C. Head and buccal cavity of female allotype; D. Amphidial fovea of female allotype; E. Spicule and gubernaculum of male holotype; F. Spicule and gubernaculum of female allotype; G. Posterior end of male holotype; H. Copulatory apparatus, spicule, gubernaculum and precloacal papillae of male holotype; I. Vulva of female allotype; J. Posterior end of female allotype. Scale bar: 20 μ m.

Type locality. Arroyo Pareja, Buenos Aires province, Argentina. Coordinates: 38°54'S, 62°04'W; water depth: low littoral. Collected by Antonela Martelli, 20 March 2011.

Etymology. From Latin word *arcuatis* (adj.) = arcuate, referring to the shape of the spicule.

Description. Male (holotype): Body length medium-sized. Cuticle striated, approximately 3 µm thick. Narrow head, tapering towards the anterior end of the body, with a clearly visible cuticular cap. Mouth opening is located subterminally, on dorsal side of body. Lips are absent. Four cephalic setae (3 µm in length) located level with the oral opening. Somatic setae absent. Amphidial fovea consisting of two parallel arms, originating anterior to the cephalic setae, the long arm continuous with broad lateral alae extending the length of the body to the tail tip and the shorter amphidial branch measured 32 µm long, both branches measured 6 µm wide or 2.5 times the cephalic diameter. The pharynx measured 130 µm long.

Reproductive system diorchic, testes opposed. Spicules equal in length, 24 µm long measured along the arch, curved with well-developed cephalization at the proximal end. Gubernaculum with dorso-caudally directed apophysis, 16 µm long. Five precloacal papillae of different sizes are present. Tail is cylindrical 150 µm long ($c' = 5$), gradually tapering toward the distal end with swollen tip. The tip of the tail has two setae, 4 µm long.

Female (allotype): similar to male in general body shape. Gonads paired, opposed; ovaries outstretched, not reflexed. Anterior and posterior ovaries located on the left and right side of intestine, respectively. Vulval orifice ventral, located in the middle of the body. Vagina short not thickened. There are two glands surrounding the vulva. Tail 150 µm long ($c' = 4$).

Discussion. *Campylaimus arcuatus* **sp. nov.** is characterized by the shape of the spicule and gubernaculum and by the presence of five precloacal papillae.

C. arcuatus **sp. nov.** resembles: *C. abnormis* Thanh & Gagarin, 2011 in the value of *b*, the dorsal opening mouth, the length of the spicule and the shape of the gubernaculum but differs in the length of the body, the shape of the spicule, the value of *a* and *c* and the presence of precloacal papillae; *C. tkatchevi* Tchesunov, 1974 in the value of *a*, *b* and *c*, the dorsal opening mouth, the length of the spicule, the shape of gubernaculum but differs in the length of the body and the presence of precloacal papillae; *C. bonariensis* **sp. nov.** in the shape of the body, the value of *a*, *b* and *c*, the shape of the tail and the length of the gubernaculum but differs in the length and shape of the spicule, the shape of the gubernaculum and the number of precloacal papillae and *C. patagonicus* **sp. nov.** in the shape of the body, the value of *c* and the shape of the gubernaculum but differs in the shape of the head and the tail, the length and shape of the spicule, the length of the gubernaculum, the value of *a* and *b* the number of precloacal papillae (Table 5).

C. arcuatus **sp. nov.** differs from all known species by the presence of precloacal papillae, from *C. rimatus* Vitiello, 1974, *C. striatus* Boucher & Helléouët, 1977 and *C. ponticus* Sergeeva, 1981 by the presence of gubernaculum; from *C. lefeveri* Gerlach, 1956 and *C. mirus* Gerlach, 1950 by the body shorter than 1000 µm and from *C. inaequalis* Cobb, 1920 and *C. gerlachi* Timm, 1961 by the dorsal mouth.

***Campylaimus patagonicus* sp. nov.**

(Fig. 4(A–I), Fig. 5(A–B); Table 3)

Measurements: see Table 3.

Type material. Male holotype, registration number MACN-In 38921

Type locality. Rincon, San Julián Bay, Santa Cruz province, Argentina. Coordinates: 49°20'S, 67°42'W; water depth: low littoral. Collected by Virginia Lo Russo & Catalina Pastor, 23 January 2008.

Type material. Female allotype, registration number MACN-In 38922; one female paratype registration number CNP NEM 649.

Type locality. Rincon, San Julián Bay, Santa Cruz province, Argentina. Coordinates: 49°21'S, 67°41'W; water depth: low littoral. Collected by Catalina Pastor, 12 January 2009.

Etymology. From the Spanish word “Patagonia”, in reference of the sampling site.

Description. Male (holotype): Body length medium-sized. Cuticle moderately striated, approximately 2 µm thick. Wide head, with a clearly visible cap at the anterior end of the body. Mouth opening is located subterminally, on dorsal side of body. Lips are absent. Four cephalic setae (12 µm long) bases located posterior to the oral opening. Somatic setae absent. Amphidial fovea consisting of two parallel arms, situated posterior to the cephalic

setae, the long arm continuous with broad lateral alae extending the length of the body to the tail tip and the shorter amphidial branch measured 52 μm long, both branches measured 6 μm wide or 2.8 times the cephalic diameter. The pharynx measured 120 μm long.

TABLE 3. Measurements (μm) of *C. patagonicus* sp. nov.

	HOLOTYPE	ALLOTYPE	PARATYPE
	Male	Female	Female
L	940.0	950.0	810.0
a	38.0	39.0	32.0
b	8.0	6.0	7.0
c	6.0	7.0	5.0
Maximum body diameter	25.0	24.0	25.0
Buccal cavity length	3.0	2.0	-
Head diameter	17.0	14.0	20.0
Cephalic setae, length	12.0	9.0	not seen
Cephalic setae, length	12.0	9.0	not seen
amph%	35.0	43.0	30.0
Amphidial fovea, width	6.0	6.0	6.0
Pharynx, length	120.0	150.0	122.0
Anal body diameter	21.0	16.0	30.0
Spicular, length	30.0	-	-
spic%	1.4	-	-
Gubernaculum, length	10.0	-	-
gub %	0.5	-	-
T	150.0	130.0	160.0
c'	7.0	8.0	5.0
Anterior end to anus, distance	790.0	820.0	650.0
V	-	470.0	396.0
V%	-	49.0	49.0

Reproductive system diorchic, testes opposed. Spicules equal in length, 30 μm long measured along the chord, slender and arcuate, without cephalization at the proximal end. Gubernaculum with dorso-caudally directed apophysis, 10 μm long. Two precloacal papillae and two precloacal setae are present. Tail is elongated conical, 150 μm long ($c'=7$), without swollen tip. Tail tip lacking setae.

Female (allotype): similar to male in general body shape. Gonads paired, opposed; ovaries outstretched, not reflexed. Anterior and posterior ovaries located on the left and right side of intestine, respectively. Vulval orifice ventral, located in the middle of the body. The vagina short not thickened. Two glands surrounding the vulva. Tail 130 μm long ($c'=8$).

Discussion. *Campylaimus patagonicus* sp. nov. is characterized by the shape of the spicule and gubernaculum and by the presence of two precloacal papillae and two precloacal setae.

C. patagonicus sp. nov. resembles: *C. mirus* Gerlach, 1950 in body length, the value of *a*, *b* and *c*, the length of the spicule but differs in the shape of gubernaculum and the presence of precloacal papillae; *C. abnormis* Thanh & Gagarin, 2011 in the length and shape of the spicule and gubernaculum, the value of *b* and *c* and the dorsal opening mouth but differs in the value of *a*, the length of the body and the presence of precloacal papillae; *C. tkatchevi* Tchesunov, 1974 in the shape of the gubernaculum, the value of *c* and the dorsal opening mouth but differs in the length of the body, the shape and length of the spicule, the value of *a* and *b* and the presence of precloacal papillae; *C. bonariensis* sp. nov. in the shape of the body, the value of *c*, the length of the spicule and gubernaculum but

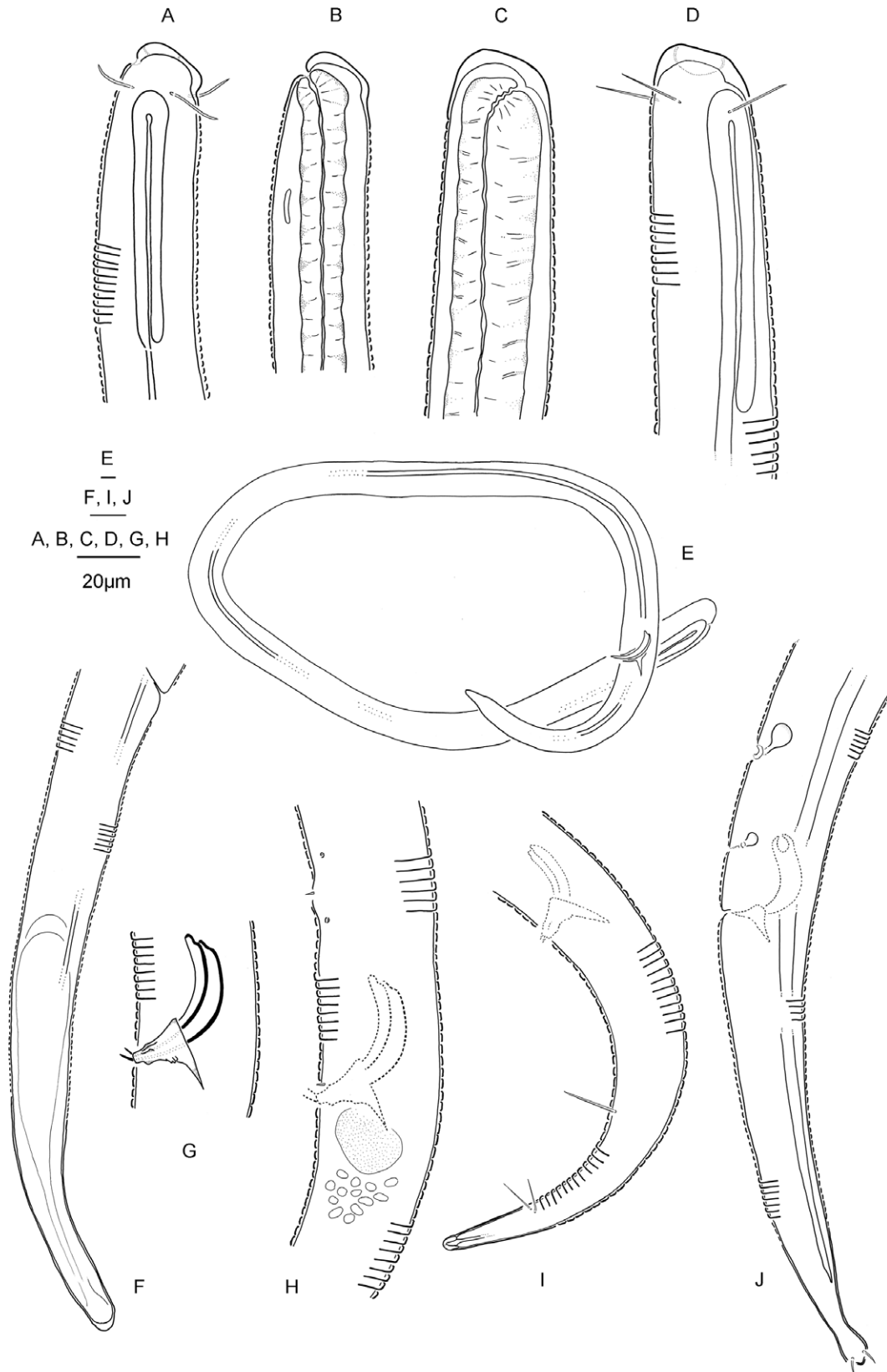


FIGURE 4. *C. patagonicus* sp. nov. A. Amphidial fovea and cephalic setae of female allotype; B. Head and buccal cavity of female allotype; C. Head and buccal cavity of male holotype; D. Amphidial fovea and cephalic setae of male holotype; E. Entire male holotype; F. Posterior end of female allotype; G. Spicule and gubernaculum of male holotype; H. Copulatory apparatus, spicule, gubernaculum and precloacal papillae of male holotype; I. Posterior end of male holotype. J. Copulatory apparatus, spicule, gubernaculum and precloacal papillae of male of *C. gerlachi*. Scale bar: 20 μm.

differs in the shape of the head and tail, the shape of the spicule and gubernaculum, the value of a , b and the number of precloacal papillae; *C. arcuatus* **sp. nov.** in the shape of the body, the value of b and c and the shape of the gubernaculum but differs in the shape of the head and the tail, the length and shape of the spicule, the length of the gubernaculum, the value of a and the number of precloacal papillae (Table 5).

C. patagonicus **sp. nov.** differs from *C. rimatus* Vitiello, 1974, *C. striatus* Boucher & Helléouët, 1977 and *C. ponticus* Sergeeva, 1981 by the presence of gubernaculum and precloacal papillae; from *C. lefeveri* Gerlach, 1956 by the body shorter than 1000 μm and the presence of precloacal papillae and from *C. inaequalis* Cobb, 1920 and *C. gerlachi* Timm, 1961 by the dorsal mouth and the presence of precloacal papillae.

Campylaimus gerlachi Timm, 1961

(Fig. 4 J: Table 4)

Material. Male; registration number CNP NEM 650.

Locality. Mirage, San Julián Bay, Santa Cruz province, Argentina. Coordinates: 49°18'S, 67°42'W; water depth: low littoral. Collected by Catalina Pastor, 12 January 2009.

Discussion. The Argentinian specimen found resembles the description of *C. gerlachi* Timm, 1961 in the general shape of the body, length of cephalic setae, shape, width and position of the amphidial fovea, de Man's ratios, shape of the spicule, gubernaculum and tail and ventral buccal cavity. It differs in the presence of two precloacal papillae, a character not found in the original descriptions probably overlooked.

TABLE 4. Measurements (μm) of *C. gerlachi* **sp. nov.**

	Male
L	570
a	24
b	3
c	6
Maximun body diameter	24
Buccal cavity length	4
Head diameter	10
Cephalic setae, length	3
Cephalic setae, length	3
amph%	40
Amphidial fovea, width	4
Pharynx length	170
Anal body diameter	18
Spicular, length	22
Spic%	1.22
Gubernaculum, length	6
Gub %	0.3
T	90
c'	5
Anterior end to anus, distance	480
V	-
V%	-

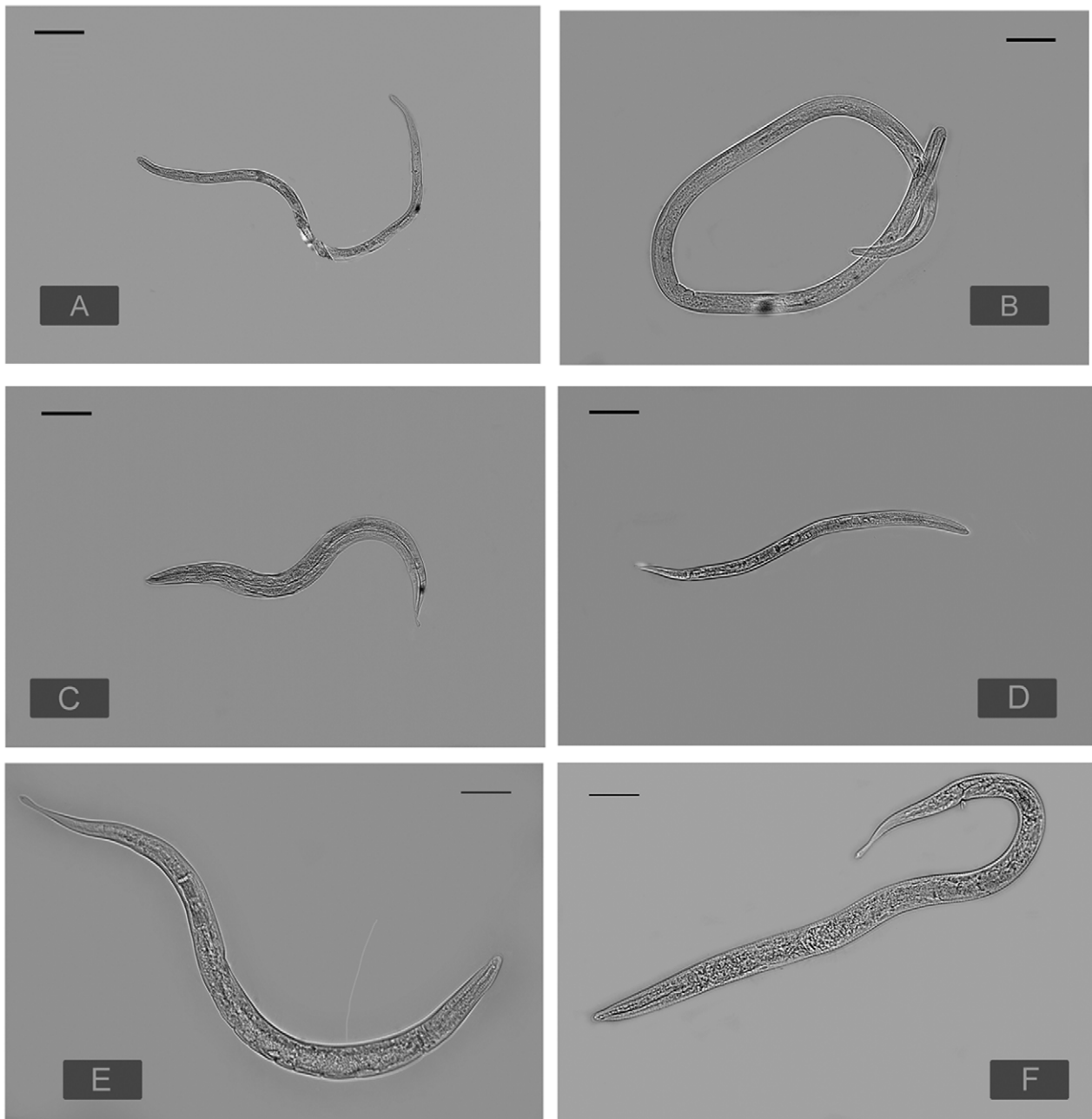


FIGURE 5. A) Entire female allotype of *C. patagonicus*; B) Entire male of holotype of *C. patagonicus*; C) Entire male holotype of *C. arcuatus*; D) Entire female allotype of *C. arcuatus*; E) Entire female allotype of *C. bonariensis*; F) Entire male holotype of *C. bonariensis*. Scale bar: 50 μ m.

Key to species of *Campylaimus*

(Based on male characteristics)

- 1 Oral opening ventral 2
- Oral opening dorsal 4
- 2 Anterior border of the amphids anterior to oral opening 3
- Anterior border of the amphids posterior to oral opening *C. gerlachi* Timm, 1961
- 3 One testis *C. inaequalis* Cobb, 1920
- Two testes *C. mirus* Gerlach, 1950
- 4 With precloacal papillae 5
- Without precloacal papillae 7

5	Tail with swollen tip	6
-	Tail without swollen tip	<i>C. patagonicus</i> Villares, 2012
6	With three precloacal papillae	<i>C. bonariensis</i> Villares, 2012
-	With five precloacal papillae	<i>C. arcuatus</i> Villares, 2012
7	Gubernaculum absent	8
-	Gubernaculum present	10
8	Lateral field varying in width and is interrupted along the body length	<i>C. ponticus</i> Sergeeva, 1981
-	Lateral field continuous over the body length	9
9	Body longer than 1200 µm	<i>C. lefeveri</i> Gerlach, 1956
-	Body shorter than 800 µm	<i>C. rimatus</i> Vitiello, 1974
10	Tail conical	11
-	Tail cylindrical	<i>C. striatus</i> Boucher & Helléouët, 1977
11	Value of <i>a</i> less than 20	<i>C. tkatchevi</i> Tchesunov, 1978
-	Value of <i>a</i> greater than 30	<i>C. abnormis</i> Thanh & Gagarin, 2011

Table 5. Differentiating data of male *Campylaimus* species

Species	L	a	b	c	Spicular, length	Gubernaculum, length	Spicule, shape	PS	Oral opening	Gubernaculum, shape
<i>C. bonariensis</i>	830	26.0	6.0	6.0	32.0	11.0	slender and arcuate, cephalized	3	dorsal	tubular
<i>C. arcuatus</i>	820	21.0	6.0	5.0	24.0	16.0	curved, cephalized	5	dorsal	dorso-caudally apophysis
<i>C. patagonicus</i>	940	38.0	8.0	6.0	30.0	10.0	slender and arcuate, without cephalization	2	dorsal	dorso-caudally apophysis
<i>C. abnormis</i>	542	30.0	6.9	6.5	24.0	6.0	strongly arcuate	0	dorsal	dorsal apophysis
<i>C. tkatchevi</i>	520	18.3	4.7	5.2	19.5	6.5	slightly arcuate	0	dorsal	dorso-caudally apophyses
<i>C. mirus</i>	1010	42.0	6.9	6.3	25.0	present	simple	0	dorsal	narrow, rod-shaped
<i>C. inaequalis</i>	700	41.2	-	-	-	-	slightly cephalized	0	ventral	-
<i>C. gerlachi</i>	318	17.4	4.5	4.8	16.5	7.7	arcuate, distinctly cephalized	0	ventral	posterior apophysis
<i>C. lefeveri</i>	1553	53.0	-	5.3	31	not identified	simple	0	dorsal	-
<i>C. ponticus</i>	816	20.7	6.6	5.8	20	absent	arcuate	0	dorsal	absent
<i>C. rimatus</i>	764	22.4	7.4	6.7	31	absent	arcuate	0	dorsal	absent
<i>C. striatus</i>	826	41.6	5.6	5.4	27	absent	arcuate	0	dorsal	absent

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