

Mononchid nematodes from Spain. Six known species and *Miconchus baeticus* sp. n. occurring in southern fir forests

Domingo JIMÉNEZ GUIRADO, Javier C. ALHAMA and María Dolores G. GUTIÉRREZ

Departamento de Biología Animal, Facultad de Ciencias,
Avda. San Alberto Magno s/n, Universidad de Córdoba, 14004 Córdoba, Spain.

Accepted for publication 18 September 1996.

Summary - This article deals with the mononchid nematodes inhabiting the fir forests (*Abies pinsapo* Boiss.) from southern Spain and describes and illustrates a new species, *Miconchus baeticus* sp. n., collected in a natural and protected area (Sierra de las Nieves). It is characterized mostly by dorsal and ventrosublateral teeth in a suprabasal position, with replacement teeth always present in the adult within the functional ones and apexes located at 31-42% of the total buccal cavity length from base; pre- and postvulval papillae present; tail elongate-conoid with subtruncate terminus; and spinneret opening terminally. *Clarkus papillatus*, *Coomansus parvus*, *Prionchulus muscorum*, *Mylonchulus brachyuris*, *Anatonchus ginglymodontus* and *Miconchus studeri* are also recorded.

Résumé - Nématodes Mononchides d'Espagne. Six espèces déjà connues et *Miconchus baeticus* sp. n. présents dans les forêts méridionales de sapins - Cet article traite de nématodes Mononchides présents dans les forêts de sapin (*Abies pinsapo* Boiss.) d'Espagne méridionale et donne la description et l'illustration d'une nouvelle espèce, *Miconchus baeticus* sp. n., collectée dans une zone naturelle protégée (Sierra de las Nieves). *M. baeticus* est principalement caractérisé par les dents dorsale et ventrosublaterales en position suprabasale, les dents de remplacement toujours présentes chez l'adulte à l'intérieur des dents fonctionnelles, les apex des dents localisés à 31-42% à partir de la base de la cavité buccale, la présence de papilles pré- et postvulvaires, la queue allongée-conoïde avec une extrémité tronquée et les "filières" s'ouvrant terminalement. *Clarkus papillatus*, *Coomansus parvus*, *Prionchulus muscorum*, *Mylonchulus brachyuris*, *Anatonchus ginglymodontus* et *Miconchus studeri* sont également signalés.

Key-words: *Abies pinsapo*, description, fir forest, *Miconchus baeticus* sp. n., Mononchida, Nematoda, Spain, taxonomy.

A study of the nematode fauna of soil samples collected in Spanish fir woodlands (*Abies pinsapo* Boiss.) was made between 1992 and 1994. At the present, these wooded areas are undisturbed although they are mostly in a regression stage. Because of that, it may be important to study their biological or ecological characteristics including those concerning the soil organisms associated with them. A priori, both the forests and soil nematodes could be of biogeographic importance due to restricted or isolated location of the fir trees and the low surfaces occupied by them.

This work revealed the occurrence of six previously known mononchs and a new species of the genus *Miconchus* Andrassy, 1958 found, frequently in low or occasionally in high numbers, from the sites that were listed by Jiménez Guirado *et al.* (1995). The new species, *M. baeticus* sp. n., is compared to *M. studeri* (Steiner, 1914) Andrassy, 1958 and it is considered to be most closely related to *M. thornei* Mulvey & Jensen, 1967 and *M. aquaticus* Khan, Ahmad & Jairajpuri, 1978. These two species are known from different tropical countries (Mulvey & Jensen, 1967; Andrassy, 1973; Baqri & Jairajpuri, 1973; Khan *et al.*, 1978; Hunt, 1978; Malcevski, 1981). *M. aquaticus* was also

reported from Romania by Popovici (1990); these specimens (one female and one male) were available for comparative examination. Additional morphometric information is given on the remaining species.

The nematodes were extracted by the Flegg's (1967) technique, fixed in hot F.P.G. 4:1, processed in hot lactophenol and mounted in anhydrous glycerin.

Clarkus papillatus (Bastian, 1865) Jairajpuri, 1970

C. papillatus is a cosmopolitan species and the most abundant member of the genus. It was found in all sites sampled, both in pure fir forests and forests where fir was mixed with *Quercus ilex*, *Q. suber*, *Q. faginea*, *Pinus halepensis* or *P. pinaster*. Measurements are given in Table 1. Zell (1985) thinks that Bastian's and later descriptions of *C. papillatus* were based on specimens belonging to different mononchid species. Since it is not possible to determine with any certainty these identities, de Bruin and Heyns (1992a) and Andrassy (1993a) do not agree with Zell's opinions and accept the redescription and neo-

Table 1. Morphometric data of *Clarkus papillatus*, *Coomansus parvus*, *Prionchulus muscorum*, *Mylonchulus brachyuris* and *Anatonchus ginglymodontus* females (all measurements in μm , except *L* in mm).

	<i>C. papillatus</i>	<i>C. parvus</i>	<i>P. muscorum</i>	<i>M. brachyuris</i>	<i>A. ginglymodontus</i>
n	20	20	20	20	9
L	1.14 \pm 0.11 (0.91-1.30)	1.16 \pm 0.15 (0.97-1.47)	2.48 \pm 0.15 (2.20-2.89)	1.23 \pm 0.08 (1.09-1.39)	2.53 \pm 0.26 (2.07-2.88)
a	24.1 \pm 2.3 (20.3-29.1)	23.3 \pm 2.7 (19.3-29.3)	23.1 \pm 1.8 (19.5-27.4)	29.9 \pm 2.5 (25.0-35.5)	32.0 \pm 1.9 (28.4-35.4)
b	3.5 \pm 0.1 (3.3-3.9)	3.7 \pm 0.2 (3.3-4.1)	4.3 \pm 0.1 (4.1-4.7)	3.7 \pm 0.1 (3.4-4.0)	4.3 \pm 0.2 (3.9-4.5)
c	15.9 \pm 1.4 (13.6-19.5)	14.1 \pm 0.9 (12.6-15.9)	15.4 \pm 0.8 (13.7-16.9)	31.4 \pm 3.0 (25.1-35.8)	10.9 \pm 0.3 (10.1-11.3)
c'	2.5 \pm 0.2 (1.8-2.8)	2.6 \pm 0.4 (2.1-3.4)	2.9 \pm 0.2 (2.7-3.5)	1.3 \pm 0.1 (1.1-1.6)	4.8 \pm 0.3 (4.1-5.2)
V/T	62.9 \pm 1.4 (60.8-65.2)	63.1 \pm 1.7 (59.2-66.3)	64.0 \pm 1.4 (61.1-66.3)	61.0 \pm 1.3 (58.0-62.6)	66.2 \pm 1.6 (63.9-69.9)
G ₁	13.1 \pm 1.7 (9.6-16.6)	12.5 \pm 2.5 (8.6-17.1)	14.4 \pm 1.7 (11.6-17.8)	11.1 \pm 2.3 (7.2-17.5)	14.3 \pm 2.5 (11.6-18.6)
G ₂	12.6 \pm 1.7 (9.6-16.4)	12.7 \pm 2.7 (9.1-17.0)	13.6 \pm 1.2 (11.2-16.4)	10.1 \pm 2.3 (7.0-16.4)	12.3 \pm 1.7 (10.3-16.8)
Max. body width	47.1 \pm 2.8 (40.0-50.5)	49.7 \pm 3.1 (42.5-56.5)	108.1 \pm 8.7 (84.0-124.5)	41.1 \pm 2.3 (38.0-48.0)	79.3 \pm 8.7 (68.0-93.5)
Cuticle head	2.0 \pm 0.4 (1.0-3.0)	2.1 \pm 0.6 (1.0-3.0)	3.5 \pm 0.7 (2.0-5.0)	1.4 \pm 0.2 (1.0-2.0)	2.5 \pm 0.5 (2.0-3.5)
Cuticle midbody	2.1 \pm 0.6 (1.5-4.0)	2.2 \pm 0.6 (1.0-3.5)	4.2 \pm 0.7 (3.0-6.0)	1.4 \pm 0.3 (0.5-2.0)	3.3 \pm 0.7 (2.0-4.5)
Cuticle tail	2.8 \pm 0.6 (2.0-4.0)	2.8 \pm 0.6 (1.5-4.0)	6.0 \pm 1.6 (3.5-9.5)	1.7 \pm 0.5 (1.0-2.5)	3.7 \pm 0.6 (2.5-5.0)
Lateral chord	20.3 \pm 2.2 (17.5-25.5)	20.9 \pm 2.1 (17.0-24.0)	34.1 \pm 4.7 (26.0-43.0)	16.4 \pm 1.7 (13.0-19.5)	32.8 \pm 4.3 (28.0-42.0)
Head width	25.6 \pm 2.0 (22.0-29.5)	24.8 \pm 2.0 (21.5-29.0)	43.9 \pm 1.5 (41.5-47.0)	23.8 \pm 1.1 (21.5-26.0)	53.6 \pm 4.0 (45.0-58.5)
Head height	10.7 \pm 1.1 (8.5-12.5)	10.7 \pm 1.2 (7.5-13.0)	17.0 \pm 1.0 (15.0-18.5)	8.3 \pm 0.9 (7.0-9.5)	18.0 \pm 2.6 (14.0-22.0)
Amphid	4.8 \pm 0.5 (3.5-5.5)	4.7 \pm 0.6 (3.5-6.5)	4.8 \pm 0.7 (3.5-7.0)	4.4 \pm 0.5 (3.5-5.5)	6.3 \pm 1.2 (4.5-8.0)
Buccal cavity length	26.1 \pm 1.5 (22.5-29.0)	27.8 \pm 2.4 (22.5-32.5)	47.1 \pm 1.8 (43.5-50.5)	23.1 \pm 1.3 (21.5-25.5)	45.2 \pm 3.8 (38.0-50.5)
Buccal cavity width	12.9 \pm 0.7 (10.5-14.0)	13.6 \pm 1.0 (12.0-15.5)	24.2 \pm 1.1 (22.5-27.0)	13.3 \pm 1.1 (11.5-15.5)	36.1 \pm 2.4 (33.0-40.5)
Dorsal tooth apex	82.6 \pm 2.4 (78.5-87.0)	62.7 \pm 2.9 (57.0-67.5)	76.6 \pm 2.1 (73.0-80.5)	79.6 \pm 3.3 (71.5-83.5)	55.2 \pm 6.1 (44.5-65.0)
Nerv. ring-ant. end	110.5 \pm 15.0 (79.5-129.5)	116.0 \pm 13.3 (84.5-141.5)	178.8 \pm 10.4 (165-206.5)	109.4 \pm 9.2 (96.5-125.0)	179.5 \pm 14.7 (160.5-203.5)
Excr. pore-ant. end	122.9 \pm 16.3 (87.5-140.5)	129.1 \pm 13.6 (98.5-155.0)	195.7 \pm 11.1 (179.5-224)	125.3 \pm 10.6 (108.5-145)	202.9 \pm 19.7 (177.5-238.5)
Pharynx length	294.8 \pm 33.5 (228-328)	286.3 \pm 37.6 (216.5-346.5)	532.0 \pm 31.1 (488.5-624.5)	312.7 \pm 21.7 (272-342)	540.9 \pm 42.0 (484.5-631.5)
Vagina length	16.2 \pm 2.1 (12.5-21.5)	15.2 \pm 1.9 (11.5-18.0)	35.3 \pm 4.1 (26.5-44.0)	12.2 \pm 1.3 (9.5-14.5)	25.8 \pm 2.2 (22.5-30.5)
Tail	71.6 \pm 7.4 (48.0-80.5)	82.2 \pm 9.9 (68.5-104.5)	161.6 \pm 15.7 (142-211.5)	39.3 \pm 3.7 (33.5-46.5)	232.1 \pm 23.7 (183.5-267.5)
Egg length	88.0 \pm 4.9 (81.5-97.5)*	94.1 \pm 12.4 (77.0-116.5)**	90.0 \pm 7.9 (72.0-106)***	97.2 \pm 8.7 (77.0-111.5)**	120.7 \pm 19.7 (88.0-140.5) †
Egg width	39.5 \pm 3.4 (32.0-45.5)*	40.9 \pm 2.7 (36.5-45.0)**	70.1 \pm 5.7 (57.0-79.0)***	36.0 \pm 3.8 (29.5-45.0)**	62.5 \pm 5.8 (56.5-71.5) †

* n = 13; ** n = 10; *** n = 15; † n = 4.

Table 2. Morphometric data of *Miconchus studeri* (all measurements in μm , except *L* in mm).

	Females	Males	J1	J2	J3	J4
n	21	4	2	30	25	25
L	1.89 \pm 0.15 (1.34-2.13)	1.86 \pm 0.20 (1.62-2.18)	0.77, 0.74	0.87 \pm 0.09 (0.69-1.07)	1.18 \pm 0.10 (1.00-1.40)	1.54 \pm 0.17 (1.30-1.87)
a	31.6 \pm 2.1 (25.8-34.9)	31.8 \pm 2.0 (28.6-33.7)	22.5, 25.1	25.5 \pm 1.9 (21.1-30.5)	27.7 \pm 1.4 (25.1-31.0)	30.8 \pm 2.3 (27.4-34.6)
b	4.0 \pm 0.1 (3.6-4.3)	4.0 \pm 0.1 (3.8-4.2)	3.5, 3.3	3.3 \pm 0.2 (3.0-3.7)	3.6 \pm 0.2 (3.2-4.1)	3.8 \pm 0.3 (3.4-4.4)
c	13.7 \pm 0.9 (12.5-16.1)	15.7 \pm 0.8 (14.9-16.9)	10.9, 12.0	12.2 \pm 0.7 (10.9-14.0)	13.0 \pm 0.8 (11.0-15.4)	14.5 \pm 1.3 (11.9-17.3)
c'	3.4 \pm 0.3 (2.9-3.8)	2.4 \pm 0.2 (2.2-2.7)	2.9, 3.1	2.9 \pm 0.2 (2.4-3.4)	3.0 \pm 0.2 (2.6-3.5)	3.0 \pm 0.2 (2.6-3.6)
V/T	63.8 \pm 1.2 (61.7-66.2)	36.9 \pm 4.9 (31.5-43.2)	--	--	--	--
G ₁	10.8 \pm 0.7 (9.3-12.3)	--	--	--	--	--
G ₂	11.2 \pm 1.0 (9.8-13.5)	--	--	--	--	--
Max. body width	59.6 \pm 3.6 (52.0-65.5)	58.3 \pm 4.2 (55.0-65.5)	34.1, 29.5	34.1 \pm 3.3 (28.5-40.5)	42.7 \pm 3.5 (36.5-51.5)	49.9 \pm 4.2 (43.0-58.5)
Cuticle head	2.6 \pm 0.6 (1.5-4.5)	1.9 \pm 0.5 (1.5-2.5)	1.0, 1.0	1.5 \pm 0.4 (0.5-2.5)	1.5 \pm 0.4 (1.0-2.5)	1.7 \pm 0.4 (1.0-2.5)
Cuticle midbody	2.3 \pm 0.6 (1.0-3.5)	2.3 \pm 0.3 (2.0-3.0)	2.0, 1.5	1.6 \pm 0.3 (1.0-2.0)	1.9 \pm 0.4 (1.0-2.5)	1.9 \pm 0.4 (1.0-3.0)
Cuticle tail	2.4 \pm 0.7 (1.0-4.0)	2.5 \pm 0.7 (1.5-3.5)	2.5, 1.5	1.7 \pm 0.4 (1.0-2.5)	1.9 \pm 0.6 (1.0-3.0)	2.3 \pm 0.4 (1.0-3.0)
Lateral chord	21.4 \pm 4.0 (14.5-31.0)	21.7 \pm 3.7 (17.5-27.5)	14.0, 11.0	16.2 \pm 2.0 (13.0-20.0)	19.5 \pm 2.2 (15.0-24.0)	22.2 \pm 2.9 (17.0-28.5)
Head width	39.8 \pm 1.6 (37.0-43.5)	38.7 \pm 1.3 (37.0-40.5)	23.0, 20.0	24.7 \pm 1.4 (22.0-30.0)	29.4 \pm 1.5 (27.0-33.5)	35.3 \pm 1.9 (32.0-39.5)
Head height	12.1 \pm 1.9 (8.0-15.5)	12.8 \pm 0.8 (11.5-14.0)	7.0, 8.0	9.2 \pm 0.8 (7.0-10.5)	11.0 \pm 0.8 (9.5-12.5)	12.5 \pm 1.4 (9.5-14.5)
Amphid	5.3 \pm 0.4 (4.5-6.0)	6.4 \pm 0.3 (6.0-7.0)	3.0, 3.5	3.7 \pm 0.7 (2.0-5.5)	4.3 \pm 0.5 (3.0-5.0)	5.2 \pm 0.7 (4.0-6.5)
Buccal cavity length	43.9 \pm 2.3 (38.0-48.0)	41.4 \pm 2.9 (38.0-46.0)	20.5, 20.5	24.8 \pm 1.7 (21.5-28.5)	30.7 \pm 1.6 (29.0-34.5)	37.3 \pm 1.6 (34.0-40.5)
Buccal cavity width	25.6 \pm 1.2 (23.5-28.0)	24.7 \pm 1.9 (22.5-27.5)	12.0, 12.5	14.9 \pm 1.2 (13.0-18.0)	18.3 \pm 1.4 (16.0-23.0)	22.1 \pm 0.9 (20.0-24.0)
Dorsal tooth apex	28.6 \pm 2.4 (23.5-33.5)	25.9 \pm 1.3 (24.0-28.0)	28.0, 33.5	26.7 \pm 3.2 (20.0-32.5)	26.9 \pm 2.7 (21.5-33.5)	25.8 \pm 1.9 (23.0-30.5)
Nerv. ring-ant. end	148.3 \pm 9.5 (125-167)	151.1 \pm 14.3 (132.5-171)	61.5, 63.0	72.9 \pm 6.8 (55.0-86.5)	87.9 \pm 7.7 (70-103.5)	104.3 \pm 8.0 (93.0-121.5)
Excr. pore-ant. end	184.6 \pm 16.8 (141.5-215)	165 \pm 17.1 (146-189.5)	84.0, 88.5	99.7 \pm 9.4 (81.0-118.5)	120.0 \pm 8.2 (107, 138)	139.7 \pm 9.3 (127-162)
Pharynx length	428.7 \pm 33.5 (331-477.5)	423.2 \pm 30.7 (380-466.5)	199.5, 205.5	233.2 \pm 18.5 (196.5-270)	295.0 \pm 13.8 (269.5-324)	360.4 \pm 22.3 (329.5-417)
Vagina length	21.0 \pm 2.0 (17.7-25.5)	--	--	--	--	--
Tail	138 \pm 14.5 (94.5-160)	118.5 \pm 8.8 (105.5-128.5)	70.0, 62.0	70.9 \pm 7.1 (57.5-86.5)	90.9 \pm 9.1 (74-110)	106.7 \pm 10.8 (89-128)
Spicules	--	77.7 \pm 3.3 (72.5-81.5)	--	--	--	--
Gubernaculum	--	17.2 \pm 1.1 (16.0-19.0)	--	--	--	--
Lat. guid. pieces	--	14.2 \pm 1.2 (12.5-15.5)	--	--	--	--

End of Table 2 next page.

Table 2. (cont.)

	Females	Males	J1	J2	J3	J4
Supplements	--	11.7 ± 0.4 (11-12)	--	--	--	--
Sperm	--	5.5 ± 0.6 (5.0-6.5)	--	--	--	--
Egg length	107.1 ± 7.2 (93.5-116)*	--	--	--	--	--
Egg width	48.9 ± 3.7 (41.0-57.5)*	--	--	--	--	--

* n = 12.

type designation by Clark (1960). We prefer to accept its present taxonomical status.

***Coomansus parvus* (de Man, 1880)
Jairajpuri & Khan, 1977**

C. parvus occurs in Europe, Asia, North and South America and Africa but it has not been reported from Australia. Andrassy (1993a) noted that it was the most frequent species of the genus. It was absent in some of the localities studied and associated mainly to mixed forests. Measurements are given in Table 1. We accept previous opinions (Jairajpuri & Khan, 1982; Andrassy, 1993a; de Bruin & Heyns, 1992a) in regarding *C. parvulus* (Coetzee, 1968) Jairajpuri & Khan, 1977 as a junior synonym of *C. parvus*.

***Prionchulus muscorum* (Dujardin, 1845)
Cobb, 1916**

P. muscorum is widely distributed in the world but it has not been reported from South Africa nor Australia. In South America, it is known from Columbia and Brazil only. It occurs in most sites of pure or mixed fir forests studied, although in low numbers. Measurements are given in Table 1. Zell (1985) considered it to be a group of sibling species and proposed its subdivision in one known and six new species. Yeates (1987) and Andrassy (1993a) disagreed with these taxonomic actions because of the variability found in *P. punctatus* (Cobb, 1917) Andrassy, 1958 by Arpin and Ponge (1984). The classical taxonomical status of the species is supported here following the morphometric study made on Spanish populations of *P. muscorum* by Jiménez Guirado and Arcos (1993).

***Mylonchulus brachyuris* (Bütschli, 1873)
Cobb, 1917**

M. brachyuris is known to occur in Europe, Asia, North and South America and Africa. According to Andrassy (1992), it is the most abundant species of the genus. It was collected frequently in high numbers for most of the localities sampled. Measurements are given in Table 1. The studied specimens are similar in

morphometric as well as morphological features to those recorded from other countries by different authors (de Bruin & Heyns, 1992b).

***Anatonchus ginglymodontus* Mulvey, 1961**

A. ginglymodontus is known from the USA and several European countries. The present work provides the first record in Spain. It was collected in low numbers from four fir stands with *Quercus faginea* and reforestations of *Pinus halepensis* and *P. pinaster*. Measurements are given in Table 1. Andrassy (1993b) synonymized *A. killicki* Clark, 1963 with *A. ginglymodontus* which is also recorded from New Zealand, but this action needs to be reviewed since both species apparently belong to unrelated geographic areas. Yeates *et al.* (1994) mention the possibility of an introduction of this species in these islands and think it is the only record of a species of *Anatonchus* in the southern hemisphere. However, other species of *Anatonchus* are known from Fiji Islands (Siddiqi, 1984) and Australia (Winiszewska-Slipinska, 1989). Besides, Andrassy (1993b) transferred the species to *Tigronchoides* Ivanova & Dzshuraeva, 1971, although this genus cannot be clearly separated from *Anatonchus* Cobb, 1916 except for a more anterior location of the buccal teeth. This single difference should not be considered to be of generic significance. In consequence, we accept the synonymization of *Tigronchoides* under *Anatonchus* proposed by Siddiqi (1984).

Our specimens are in close agreement with those from California described by Mulvey (1961) except for the position of the teeth that have a more posterior position in the buccal cavity and they are smaller in body length and size of the stoma compared to those previously recorded from Europe (Baqri *et al.*, 1978; Popovici, 1990; Barsi, 1991).

***Miconchus studeri* (Steiner, 1914)
Andrassy, 1958
(Fig. 4)**

Miconchus studeri is the most frequent species of the genus and has been recorded from numerous locali-

Table 3. Morphometric data of *Miconchus baeticus* sp. n. (all measurements in μm , except L in mm).

	Holotype	Females	Males	J2	J3	J4
n		20	12	6	20	12
L	2.96	3.15 \pm 0.23 (2.68-3.75)	3.02 \pm 0.25 (2.45-3.28)	1.48 \pm 0.06 (1.36-1.55)	1.95 \pm 0.08 (1.85-2.17)	2.55 \pm 0.18 (2.30-2.89)
a	45	44.6 \pm 3.1 (38.3-51.3)	45 \pm 4.4 (37.6-53.2)	38.7 \pm 2.9 (34.9-42.8)	40.7 \pm 2.1 (36.5-44.0)	44.1 \pm 2.7 (38.8-48.7)
b	4.8	4.9 \pm 0.2 (4.4-5.3)	4.9 \pm 0.3 (4.6-5.5)	4.1 \pm 0.2 (3.8-4.4)	4.5 \pm 0.2 (4.2-4.8)	4.8 \pm 0.2 (4.4-5.2)
c	15.5	16.7 \pm 1.0 (14.3-18.3)	19.4-1.3 (17.2-21.7)	12.5 \pm 0.5 (11.6-13.5)	14.0 \pm 0.6 (13.2-15.2)	15.7 \pm 0.8 (14.3-17.1)
c'	4.3	4.0 \pm 0.2 (3.6-4.8)	2.8 \pm 0.2 (2.5-3.2)	4.0 \pm 0.2 (3.8-4.4)	3.9 \pm 0.3 (3.3-4.4)	3.6 \pm 0.2 (3.1-4.0)
V/T	65.7	64.7 \pm 1.5 (61.6-66.9)	42.7 \pm 3.0 (39.0-50.2)	--	--	--
G ₁	10.1	11.4 \pm 1.0 (9.0-13.5)	--	--	--	--
G ₂	9.7	11.0 \pm 0.8 (8.9-12.2)	--	--	--	--
Max. body width	65.5	70.6 \pm 6.1 (57.5-82.0)	67.8 \pm 9.4 (52.0-84.0)	38.6 \pm 4.0 (32.0-43.5)	48.1 \pm 2.9 (42.5-54.5)	58.0 \pm 3.8 (51.6-66.1)
Cuticle head	2.0	2.4 \pm 0.5 (1.5-3.5)	2.3 \pm 0.4 (1.5-3.0)	1.5 \pm 0.3 (1.0-2.0)	1.8 \pm 0.4 (1.0-2.5)	2.4 \pm 0.5 (1.5-3.0)
Cuticle midbody	3.0	2.6 \pm 0.7 (1.5-4.5)	2.3 \pm 0.6 (1.5-4.0)	2.3 \pm 0.6 (1.5-3.0)	2.1 \pm 0.4 (1.0-3.0)	2.6 \pm 0.7 (1.5-4.0)
Cuticle tail	3.0	3.9 \pm 0.8 (2.5-5.5)	3.1 \pm 0.8 (2.0-4.5)	2.1 \pm 0.4 (1.5-3.0)	2.7 \pm 0.6 (2.0-4.0)	3.3 \pm 0.8 (2.0-5.0)
Lateral chord	26.5	27.8 \pm 5.0 (16.5-35.5)	22.7 \pm 3.2 (18.0-28.5)	17.2 \pm 1.8 (13.5-19.5)	18.7 \pm 2.4 (15.0-24.0)	21.4 \pm 2.9 (16.5-26.0)
Head width	45.0	49.8 \pm 2.5 (45.0-55.5)	45.9 \pm 2.6 (42.0-49.5)	26.7 \pm 1.1 (24.5-28.5)	32.8 \pm 1.6 (30.5-36.5)	39.5 \pm 2.0 (36.5-43.5)
Head height	13.5	16.4 \pm 1.5 (14.0-20.0)	16.4 \pm 2.1 (12.5-20.0)	10.1 \pm 1.4 (8.5-13.0)	11.5 \pm 1.6 (9.0-15.0)	13.4 \pm 1.9 (10.5-16.5)
Amphid	7.0	7.1 \pm 0.5 (6.5-7.5)	7.0 \pm 0.6 (6.5-8.0)	4.2 \pm 0.3 (3.5-4.5)	5.4 \pm 0.6 (4.5-6.5)	6.3 \pm 0.5 (5.0-7.0)
Buccal cavity length	57.0	56.2 \pm 2.3 (51.0-60.0)	53.1 \pm 1.6 (50.0-55.5)	31.5 \pm 1.4 (29.5-33.5)	36.5 \pm 1.9 (32.5-39.0)	45.7 \pm 2.0 (41.0-49.5)
Buccal cavity width	37.5	35.9 \pm 1.4 (33.5-39.5)	32.3 \pm 1.0 (30.5-34.0)	17.6 \pm 1.8 (16.0-21.5)	21.3 \pm 1.0 (19.5-23.5)	26.4 \pm 1.1 (24.5-28.0)
Nerv. ring-ant. end	175	185.6 \pm 14.9 (153.0-204.0)	186.1 \pm 19.2 (153.0-227.0)	88.1 \pm 9.4 (72.0-100)	113.6 \pm 7.1 (100-127.5)	133.0 \pm 10.9 (110-148.5)
Excr. pore-ant. end	207	218.0 \pm 16.7 (179.0-242.0)	208.1 \pm 21.9 (172.5-249.0)	114.4 \pm 14.4 (93.5-137)	140.1 \pm 11.6 (117.5-166.5)	161.1 \pm 13.2 (130-178)
Pharynx length	567	575.3 \pm 35.5 (513.5-652.0)	561.7 \pm 54.9 (475.5-659.5)	327.5 \pm 10.6 (315-348.5)	395.7 \pm 13.6 (366-420.5)	481.5 \pm 15.3 (458.5-502.5)
Vagina length	23.5	22.9 \pm 2.8 (17.5-28.0)	--	--	--	--
Tail	191	189.6 \pm 11.9 (166.5-209.5)	156.1 \pm 15.2 (132.5-186.0)	119.1 \pm 4.4 (113-125)	139.4 \pm 8.9 (123-155.5)	162.5 \pm 9.1 (152-178)
Spicules	--	--	89.8 \pm 6.7 (80.0-105.5)	--	--	--
Gubernaculum	--	--	20.9 \pm 2.3 (18.0-26.0)	--	--	--
Lat. guid. pieces	--	--	18.6 \pm 2.4 (15.0-24.5)	--	--	--
Supplements	--	--	14.5 \pm 1.1 (13-16)	--	--	--

End of Table 3 next page.

Table 3. (cont.)

	Holotype	Females	Males	J2	J3	J4
Sperm	--	--	11.3 ± 1.1 (9.5-13.0)	--	--	--
Egg length	--	165.5*	--	--	--	--
Egg width	--	55.5*	--	--	--	--

* n = 1.

ties of Europe, in addition to the USA, El Salvador and Mauritius. It is the most abundant mononchid species collected in the Spanish fir forests although it was absent or rarely present in the purer fir stands. Measurements are given in Table 2. Our female specimens are in agreement with the previous descriptions (Andrássy, 1993b) except for the shorter body and tail length compared with those ranged by Jiménez Guirado *et al.* (1993) from several Spanish populations. At the contrary, the male specimens are slightly larger in body, tail and spicules length.

The juvenile stages were studied in detail by Khan and Coomans (1980) from a population collected in the Netherlands. The first stage is characterized by having only the developed dorsal tooth in the buccal cavity. The second stage also has a dorsal tooth plus three replacement teeth, one in each vertical plate. In this respect, both juvenile stages are similar to those of *Anatonchus amiciae* Coomans & Lima, 1965. It seems to be a shared character that could reflect a clear phylogenetic relationship between *Miconchus* and *Anatonchus* although it has not been equally described in other species as *A. tridentatus* by Mulvey (1961) or *A. ferox* by Siddiqi (1984). Finally, the third and fourth stages are well distinct in both species (Coomans & Lima, 1965).

Our first stage juveniles of *M. studeri* are larger in body and tail length and body width than those of Khan and Coomans (1980), but the second, third and fourth stages differ only in tail length.

***Miconchus baeticus** sp. n.**
(Figs 1-4)

MEASUREMENTS

See Table 3.

DESCRIPTION

Female: Body around 3 mm long, cylindrical, truncate anteriorly and clearly tapering toward posterior

end. Habitus when fixed and relaxed straight anteriorly and ventrally curved, G- to J-shaped posteriorly. Cuticle with fine transverse striations generally obscure except on the caudal region. Lateral chord occupying 39±6 (28-47) % of the midbody width. Lip region set off by clear depression, 3.1±0.34 (2.4-3.7) times as wide as high. Lips moderately separated and rounded. Labial and cephalic papillae slightly interfering with the head contour. Amphids cup-shaped, their opening occupying 15±1 (12-16) % of the head width. Buccal cavity broad and subrectangular with relatively thick walls and 1.57±0.08 (1.40-1.74) times as long as wide. Dorsal and ventrosublateral teeth similar in size and shape, large, forward directed, clearly suprabasal; adult always with replacement teeth within the functional ones; apices located at 36.6±2.1 (31.5-41.7) % of the total length of the buccal cavity measured from base. Ventrosublateral foramina visible in the basal plates. Pharynx cylindrical and muscular. Nerve ring located at 29.3±2.1 (26.0-33.3) % of the neck region measured from the anterior body end. Excretory pore small but clearly visible. Pharynx-intestine junction tuberculate with tubercles prominent and conical organ generally not well developed. Intestine with six to eight granular polygonal cells in transverse section. Bacillary layer especially visible at the anterior and posterior part of the intestine. Genital system didelphic-amphidelphic. Ovary relatively short, its proximal end not reaching the oviduct-uterus junction. Oocytes few in number. Oviduct with a well developed *pars dilatata* and a relatively large sphincter at the oviduct-uterus junction. Uterus not especially elongated and without special differentiations. Vagina cylindrical, extending inwards 33±5 (22-48) % of the corresponding body diameter. Medium sized sclerotized pieces present at the vagina-vulva junction. Vulva a short transverse slit. Papillae well developed and prominent, zero to three anterior and zero to three posterior to vulva. Tail elongate-conoid, ventrally curved and with subtruncate terminus. Caudal glands in tandem with a common duct expanding to apparently form an ampulla, supplied with an inconspicuous needle-shaped valve leading to a terminal spinneret. Caudal pores obscure.

* The specific name is derived from Latin word "Baetica", the Roman province of the Iberian Peninsula where the species was collected.

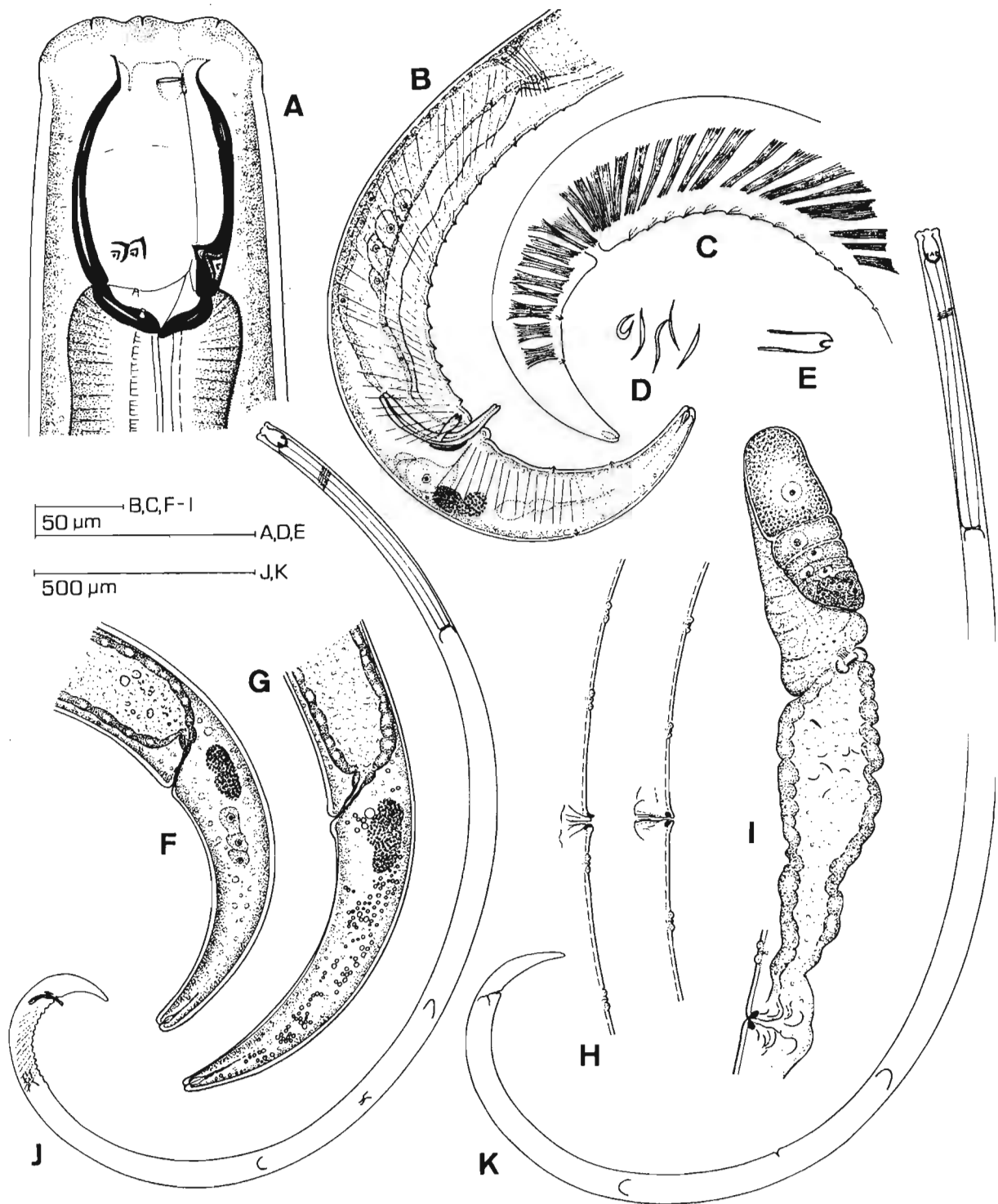


Fig. 1. *Miconchus baeticus* sp. n. A: Head; B, C: Male posterior region; D: Sperm; E: Lateral guiding piece; F, G: Female posterior region; H: Vulval region; I: Female genital branch; J, K: Habitus.

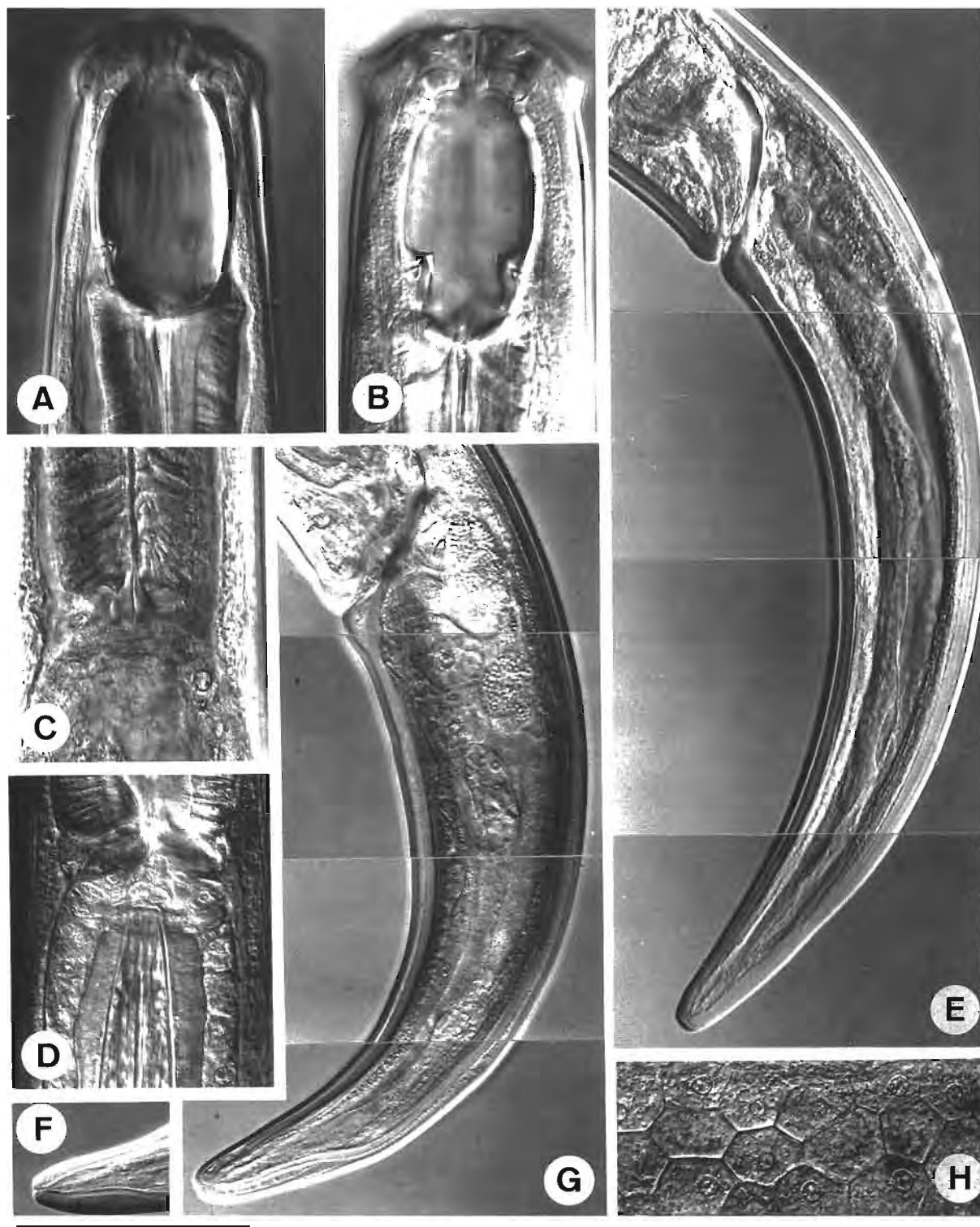


Fig. 2. *Miconchus baeticus* sp. n. A, B: Head; C, D: Pharynx-intestine junction; E, G: Female tail; F: Female tail terminus; H: Intestinal cells. (Scale bar = 50 μ m).

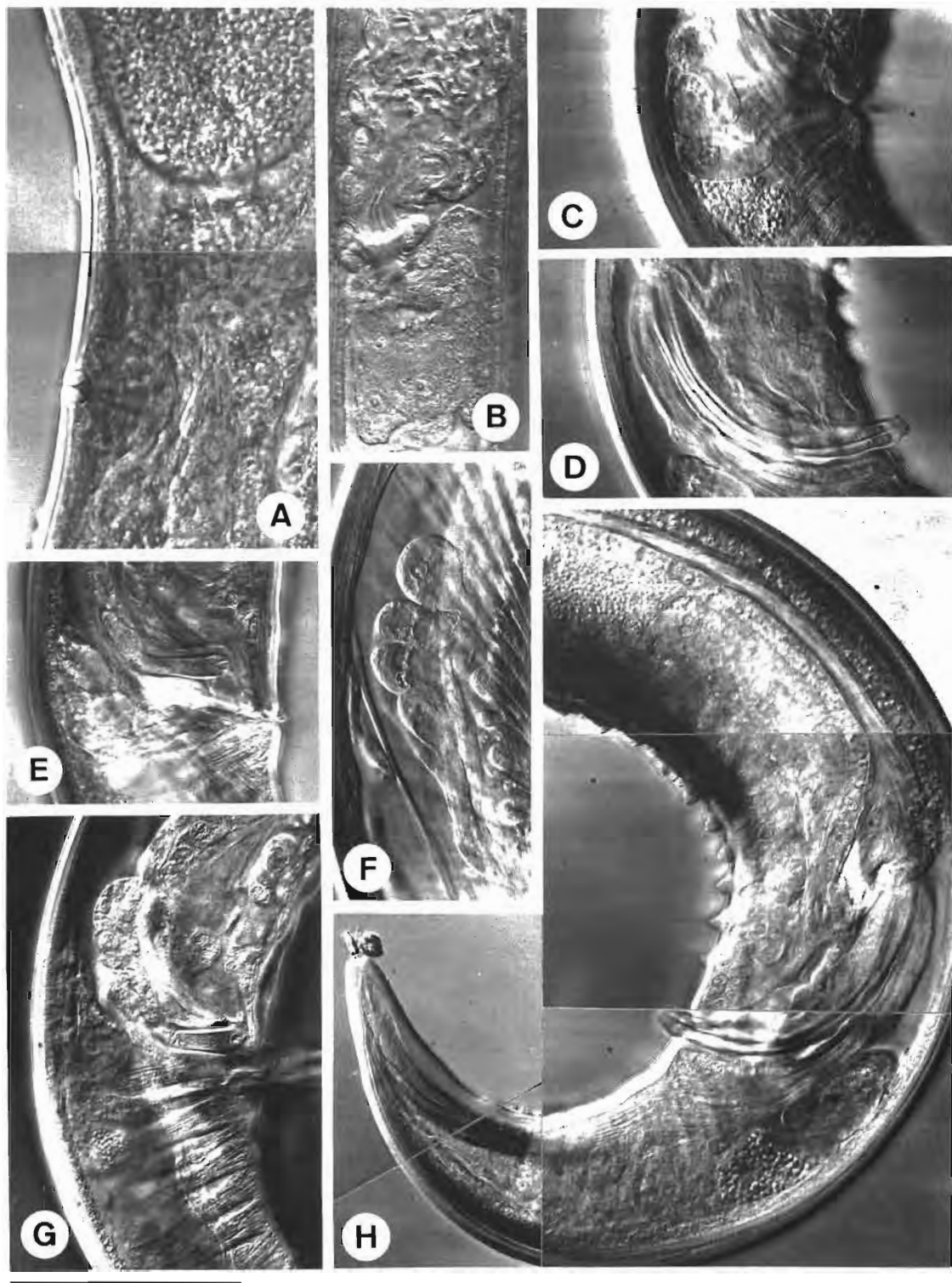


Fig. 3. *Miconchus baeticus* sp. n. A: Vulval region; B: Oviduct-uterus junction; C: Male rectal glands; D: Spicules; E, G: Lateral guiding pieces and cloacal region; F: Ejaculatory glands; H: Male posterior region. (Scale bar = 50 μ m).

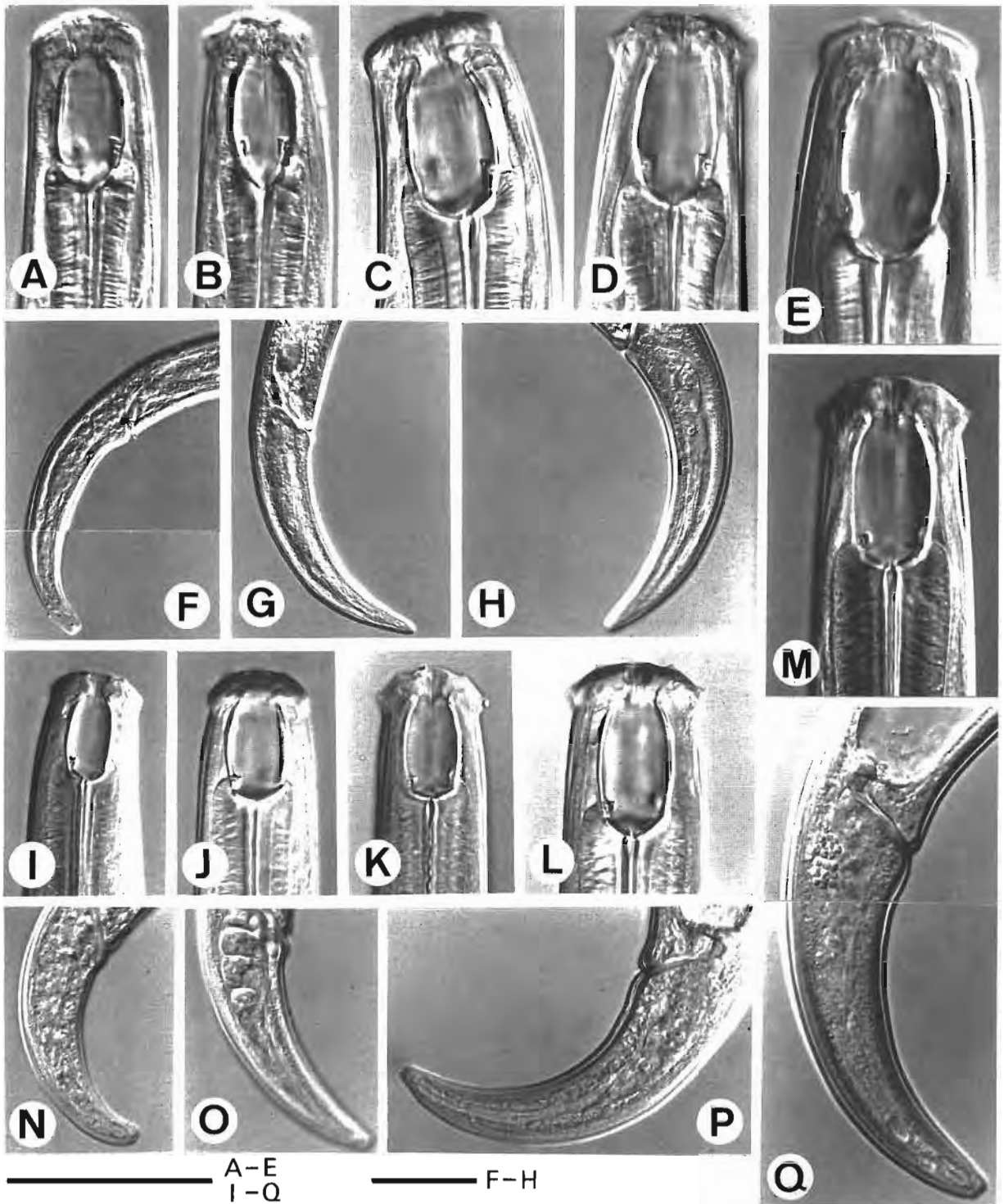


Fig. 4. Head and tail of juvenile stages of *Miconchus baeticus* sp. n. (A-H) and *M. studeri* (I-Q). I, N: First stage; A, B, F, J, K, O: Second stage; C, D, G, L, P: Third stage; E, H, M, Q: Fourth stage. (Scale bar = 50 μ m).

Male: Similar to female in morphology but general body size slightly smaller and posterior part of body more ventrally curved. Genital system diorchic. Testes opposed with elongate, spindle-shaped and frequently arched spermatozoa. *Vas deferens* and *ductus ejaculatorius* separated by a constriction with associated muscles. Ventral body contour slightly contracted in this body region. Ejaculatory glands in tandem. Rectal glands visible behind the spicules. Thirteen to sixteen ventromedian supplements present more or less regularly spaced, the anterior two usually less developed. Spicules moderately slender, ventrally curved and 1.6 ± 0.1 (1.5-1.8) times as long as anal body width, measured along axis. Gubernaculum moderately developed and lateral guiding pieces with chelate-forked terminus. Tail similar to female but shorter, more ventrally curved and less elongate shaped. Caudal glands and spinneret as in female. Caudal pore poorly visible.

Juvenile stages: Similar in general morphology to female. Second, third and fourth stages having three functional and three replacement buccal teeth. No first stage specimens found.

TYPE HABITAT AND LOCALITY

Soil around fir tree (*Abies pinsapo* Boiss.) in Sierra de las Nieves, Ronda, province of Málaga, Spain. Soil characteristics: pH 7.2, organic matter 5.9 %, C/N 11.3, sand 24.1 %, silt 32.3 % and clay 43.6 %.

TYPE MATERIAL

Holotype female, fourteen female and five male *paratypes* in the collection of the Departamento de Biología Animal, Universidad de Córdoba, Spain. *Paratypes*: four female and five male in the collection of the Departamento de Biología Animal, Vegetal y Ecología, Universidad de Jaén, Spain; two female and two male in the collection of the Laboratoire de Biologie Parasitaire, Muséum National d'Histoire Naturelle, Paris, France.

DIAGNOSIS AND RELATIONSHIPS

M. baeticus sp. n. is characterized by the relatively large body size (L=2.45-3.74 mm), slender body (a=37-53), buccal cavity 30-40 × 50-60 µm, dorsal and ventrosublateral teeth suprabasal and similar, with replacement teeth always present in the adult within the functional ones, and apex located at 31-42% of the total cavity length from base, V=61-67, advulval papillae present, spicules 80-105 µm long, lateral guiding pieces with chelate-forked extremity, thirteen to sixteen ventro-median supplements, tail elongate-conoid (167-210 µm, c=14.3-18.3, c'=3.6-4.8 in females and 132-186 µm, c=17.2-21.7, c'=2.5-3.2 in males) with subtruncate terminus, caudal glands in tandem and spinneret opening terminally.

The new species is similar to *M. studeri* in the presence of replacement teeth in the adults but it can be easily separated from it by longer and more slender

Table 4. Comparative morphometrics of *Miconchus thornei*, *M. aquaticus* and *M. baeticus* sp. n. (all measurements in µm, except L in mm).

Populations	<i>M. thornei</i>				<i>M. aquaticus</i>		<i>M. baeticus</i> sp. n.
	Nigeria (1)	Cuba (2)	El Salvador (3)	Ivory Coast (4)	India (5)	Romania (6)	Spain (7)
L (mm)	2-2.6	2.46, 2-2.44	1.75-2.06	2.1-2.4	2.3-2.4, 1.5-2	2.79, 2.53	2.7-3.7, 2.4-3.3
a	25-34	37, 36-40	29-30	33-38	26-30, 26-34	37, 40	38-51, 37-53
b	3.6-3.8	4.6, 4.3-4.5	3.4-3.7	3.4-3.8	4.2-4.5, 3.9-4.2	4.6, 4.6	4.5-5.3, 4.6-5.6
c	9.4-11.3	19, 22-25	8.3-9.1	9.8-10.7	18-21, 18-20	14.7, 17	14-18, 17-22
c'	5-6	3.3, 1.7-2.5	--	--	2.4-3, --	--	3.6-4.8, 2.5-3.2
V	63-68	68, --	64	67-69	69-72, --	66, --	61-67, --
Bucc. cav.	34-40 × 58-61	30-37 × 52-60	33 × 50-51	34-39 × 56-63	30-32 × 43-48, 28-30 × 41-50	32 × 50, 27 × 47	34-40 × 51-60 30-34 × 50-55
Tail	200-250	130, --	218-225	193-245	112-136, --	190, 140	167-210, 132-186
Vulval pap.	--	--	--	--	5-7/0-1, --	3/7, --	0-3/0-3, --
Spicules	--	--, 84-90	--	--	--, 62-70	--, 86*	--, 80-105
Suppl. number	--	--, 15	--	--	--, 17-21	--, 18	--, 13-16

* remeasured.

(1) Mulvey & Jensen, 1967; (2) Andrassy, 1973; (3) Baqri & Jairajpuri, 1973; (4) Malcevski, 1981; (5) Khan, Ahmad & Jairajpuri, 1978; (6) Popovici, 1990; (7) present work.

body, longer teeth and size of the buccal cavity, presence of advulval papillae (*vs* absence), longer spicules, greater number of supplements and longer tail (Tables 2, 3). In both species, the third and fourth juvenile stages are similar in having three functional and three replacement teeth in the buccal cavity. On the contrary, *M. baeticus* n. sp. can be distinguished by the presence of three functional teeth in the second juvenile stage (*vs* one functional tooth) (Fig. 4). It differs from *M. thornei* by greater body length, thinner body, presence of replacement teeth in the adult (*vs* absence), presence of advulval papillae (*vs* absence) and tail terminus subtruncate (*vs* set-off); from *M. aquaticus* by greater and slender body, presence of replacement teeth in the adult (*vs* absence), vulva

location, longer spicules, smaller number of supplements and longer tail (Table 4).

Remarks

Andrássy (1973) described specimens from Cuba as *M. thornei* but with some differences from the type specimens of Mulvey and Jensen (1967). They can be easily distinguished from *M. baeticus* sp. n. by smaller body size, the absence of the replacement teeth in the adult, the absence of advulval papillae and shorter tail length, but some male features are similar (*i.e.*, spicules length and supplement number). On the other hand, the specimens (Fig. 5) described from Romania as *M. aquaticus* by Popovici (1990) differ in their measurements from the type specimens of Khan *et al.*

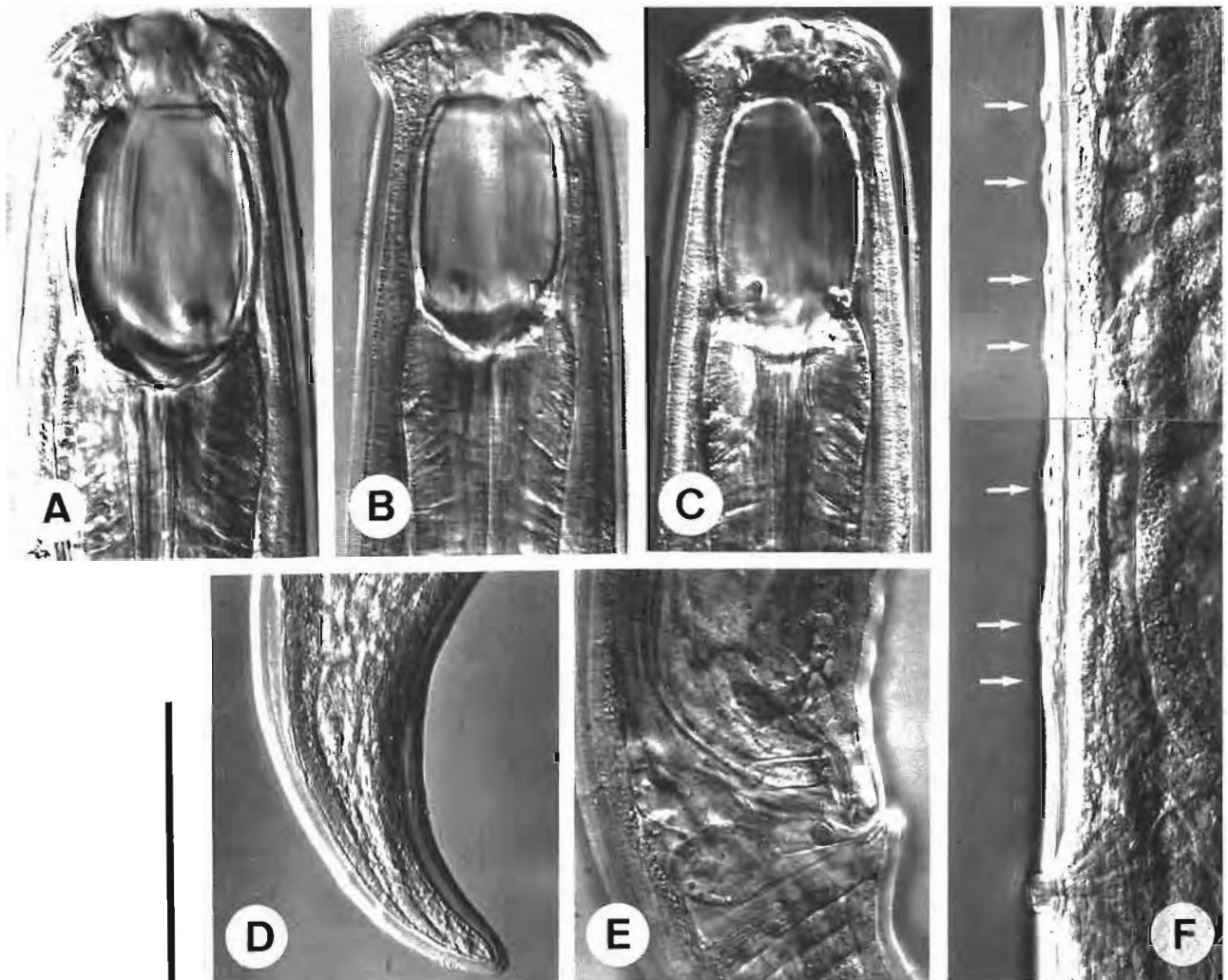


Fig. 5. *Miconchus aquaticus* (specimens from Romania). A-C: Head; D: Male tail; E: Cloacal region; F: Vulval region (arrows show postvulval papillae). (Scale bar = 50 μ m).

(1978) and they differ from *M. baeticus* sp. n. by the smaller teeth, the absence of replacement teeth in the adult, greater number of advulval papillae and larger number of male supplements; however, there are no significant differences in measurements. Notwithstanding any uncertainties that may still exist concerning the identity of these specimens, it can be stated that the present Spanish population represents an hitherto undescribed species.

Acknowledgements

Dr. I. Popovici is thanked for the loan of specimens from Romania. The collections in Sierra de las Nieves were possible by courtesy of the Agencia de Medioambiente de Andalucía. Financial support for the first author was provided by the Projects "Nematofauna asociada a los pinsapares" (DGICYT PB91-0712) and "Fauna Ibérica III" (SEUI-DGICYT PB92-0121).

References

- ANDRÁSSY, I. (1973). Nematoden aus strand- und höhlenbiotopen von Kuba. *Acta zool. Acad. Sci. hung.*, 19: 233-270.
- ANDRÁSSY, I. (1992). A taxonomic survey of the family Mylonchulidae (Nematoda). *Opusc. zool., Bpest.*, 25: 11-35.
- ANDRÁSSY, I. (1993a). A taxonomic survey of the family Mononchidae (Nematoda). *Acta zool. hung.*, 39: 13-60.
- ANDRÁSSY, I. (1993b). A taxonomic survey of the family Anatonchidae (Nematoda). *Opusc. zool., Bpest.*, 26: 9-52.
- ARPIN, P. & PONGE, J.-P. (1984). Étude des variations morphométriques de *Prionchulus punctatus* (Cobb, 1917) Andrassy, 1958 liées aux types d'humus. *Revue Nématol.*, 7: 315-318.
- BAQRI, Q. H., BAQRI, S. Z. & JAIRAJPURI, M. S. (1978). Studies on Mononchida. XI. Two new species of *Iotonchus*, *Cobbonchus indicus* n. sp. and *Anatonchus ginglymodontus* Mulvey, 1961. *Nematologica*, 24: 436-444.
- BAQRI, S. Z. & JAIRAJPURI, M. S. (1973). Studies on Mononchida. V. The mononchs of El Salvador with descriptions of two new genera, *Actus* and *Paracrassibuca*. *Nematologica*, 19: 326-333.
- BARSI, L. (1991). First record of *Anatonchus ginglymodontus* Mulvey from Yugoslavia. *Nematol. medit.*, 19: 97-99.
- CLARK, W. C. (1960). Redescription of *Mononchus truncatus* Bastian, *M. papillatus* Bastian and *Prionchulus muscorum* (Dujardin) (Enoplida, Nematoda). *Nematologica*, 5: 184-198.
- COOMANS, A. & LIMA, M. B. (1965). Description of *Anatonchus amiciae* n. sp. (Nematoda: Mononchidae) with observations on its juvenile stages and anatomy. *Nematologica*, 11: 413-431.
- DE BRUIN, S. & HEYNS, J. (1992 a). Mononchida (Nematoda) of southern Africa: genera *Mononchus* Bastian, 1865, *Clarkus* Jairajpuri, 1970 and *Coomansus* Jairajpuri & Khan, 1977. *Phytophylactica*, 24: 64-73.
- DE BRUIN, S. & HEYNS, J. (1992 b). Mononchida (Nematoda) from southern Africa: genera *Mylonchulus* (Cobb, 1916) Altherr, 1953 and *Granonchulus* Andrassy, 1958. *Phytophylactica*, 24: 119-192.
- FLEGG, J. J. M. (1967). Extraction of *Xiphinema* and *Longidorus* species from soil by a modification of Cobb's decanting and sieving technique. *Ann. appl. Biol.*, 60: 429-437.
- HUNT, D. J. (1978). List of Mononchida from St. Lucia and Dominica. *Revue Nématol.*, 1: 265-267.
- JAIRAJPURI, M. S. & KHAN, W. U. (1982). *Predatory nematodes (Mononchida) with special reference to India*. New Delhi, India, Associated Publishing Co., 131 p.
- JIMÉNEZ GUIRADO, D. & ARCOS, S. C. (1993). Influencia de algunos factores edáficos en la variabilidad morfológica de *Prionchulus muscorum* (Nematoda: Mononchida). *Actas XII Congr. Latinoam. Cienc. Suelo, Salamanca, España*: 458-463.
- JIMÉNEZ GUIRADO, D., GUTIÉRREZ, M. D. G., ALHAMA, J. C. & ARCOS, S. C. (1995). The occurrence and distribution of *Xiphinema* species (Nematoda: Dorylaimida) in Spanish fir woodlands. *Fundam. appl. Nematol.*, 18: 567-574.
- JIMÉNEZ GUIRADO, D., PEÑA SANTIAGO, R. & CASTILLO, P. (1993). Mononchid nematodes from Spain. One known and another new species of the genus *Miconchus* Andrassy, 1958. *Fundam. appl. Nematol.*, 16: 63-72.
- KHAN, S. H. & COOMANS, A. (1980). Observations on the juvenile stages of *Miconchus studei* (Nematoda: Mononchina). *Biol. Jaarb. Dodonaea*, 48: 111-118.
- KHAN, W. U., AHMAD, S. & JAIRAJPURI, M. S. (1978). Studies on Mononchida of India. X. Two new species of the genus *Miconchus* Andrassy, 1958. *Nematologica*, 24: 321-327.
- MALCEVSCHI, S. (1981). Mononchidae of Ivory Coast savannahs: genera *Iotonchus* (Cobb, 1916) and *Miconchus* Andrassy, 1958. *Nematol. medit.*, 9: 63-74.
- MULVEY, R. H. (1961). The Mononchidae: a family of predaceous nematodes. II. Genus *Anatonchus* (Enoplida: Mononchidae). *Can. J. Zool.*, 39: 807-826.
- MULVEY, R. H. & JENSEN, H. J. (1967). The Mononchidae of Nigeria. *Can. J. Zool.*, 45: 667-727.
- POPOVICI, I. (1990). Studies on Mononchida (Nemata) from Romania. *Nematologica*, 36: 161-180.
- SIDDIQI, M. R. (1984). *Anatonchus ferox* n. sp., with miscellaneous notes on Anatonchidae (Mononchida). *Pakistan J. Nematol.*, 2: 43-47.
- WINISZEWSKA-SLIPINSKA, G. (1989). Two new species of *Anatonchus* Cobb, 1916 (Nematoda: Mononchida). *Ann. zool. Polska Akad. Nauk*, 42: 197-202.
- YEATES, G. W. (1987). Distribution of Mononchoidea (Nematoda: Enopla) in pasture soils, with description of *Iotonchus stockdilli* n. sp. *N. Z. J. Zool.*, 14: 351-358.
- YEATES, G. W., BOAG, B. & SMALL, R. W. (1994). Species diversity and biogeography of Mononchoidea (Nematoda). *Russian J. Nematol.*, 2: 45-54.
- ZELL, H. (1985). Nematoden eines Buchenwaldbodens. 3. *Prionchulus muscorum* (Nematoda, Mononchida). *Carolinea*, 42: 57-74.