Three new records of Desmodorids (Nematoda, Desmodoridae) from sandy seabeds of the Canary islands

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Abstract

In an ecological study of meiofaunal assemblages in two locations (Los Abrigos and Los Cristianos) of Tenerife (Canary Islands, NE Atlantic Ocean), several desmodorid species were found throughout the study period. Three species belonging to the family Desmodoridae were collected in intertidal and shallow subtidal sandy seabeds. These species were *Desmodorella* aff. *tenuispiculum* Allgen, 1928, *Metachromadora* sp. and *Spirinia parasitifera* Bastian, 1865. Descriptions, figures and tables with meristic data are presented. Moreover, differences between canarian and specimens from other geographical regions were discussed.

Keywords: Free living nematodes; Desmodoridae; *Desmodorella*; *Metachromadora*; *Spirinia*; sandy seabeds; Tenerife; Canary Islands.

Resumen. *Tres nuevos registros de Desmodoridae (Nematoda, Desmodoridae) de fondos arenosos de las Islas Canarias*

Durante la realización de un estudio ecológico de las comunidades meiofaunales en dos localidades de muestreo (Los Abrigos y Los Cristianos) de la isla de Tenerife (Islas Canarias, Océano Atántico), varios ejemplares de desmodóridos fueron recolectados. Tres especies pertenecientes a la familia Desmodoridae fueron encontradas en fondos arenosos intermareales y submareales someros. Estas tres especies fueron: *Desmodorella* aff. *tenuispiculum* Allgen, 1928, *Metachromadora* sp. y *Spirinia parasitifera* Bastian, 1865. Se presentan descripciones, figuras y tablas con datos merísticos de estas especies. Además, se detallan las diferencias encontradas entre los ejemplares canarios y los procedentes de otras áreas geográficas.

Palabras clave: Nematodos de vida libre; Desmodoridae; *Desmodorella*; *Metachromadora*; *Spirinia*; fondos arenosos; Tenerife; Islas Canarias.

Introduction

The family Desmodoridae belongs to the suborder Desmodoroidea that includes the families Desmodoridae, Selachinematidae and Draconematidae (Lorenzen, 1994).

The family Desmodoridae Filipjev, 1922 stands out largely because it does not possess the typical features of Epsilonematidae and Draconematidae (Lorenzen, 1994). However, a series of characters are typical of species beloging to this family: Cuticle with transverse striations (not punctated), head region unstriated, cephalic setae in two separate circles (the posterior four always larger), amphids spiral, buccal cavity anteriorly 12-folded (not always obvious), gubernaculum without a dorsal apophysis, one anterior testis, ovaries paired, opposed and reflexed and tail conical (Platt & Warwick, 1988).

Species belonging to this family (i.e. *Desmodora, Pseudochromadora, Spirinia, Chromaspirina, Metachromadora*, etc) are typical components of nematofauna in sandy substrates, even dominants of interstitial fauna in certain areas (de Jesús-Navarrete, 2007). In recent decades, several desmodorid genera (*Eubostricus*, *Leptonemella* and *Catanema*) have been observed their cuticles covered with a coating of ectosymbiotic bacteria, that could give them an ecological advantage over the remaining free-living marine nematodes (Ott & Novak, 1989). The former species have a series of anatomical features that could be an adaptation of this symbiosis (e.g. reduction of buccal armature, multicellular glandular sensory organ) (Nebelsick et al., 1992).

To our knowledge, in the Macaronesian region there are no former records of Desmodorids from marine coastal areas (Riera, 2004). Thus, the present study constitutes the first records of this familiy in the canarian archipelago. The studied specimens belonging to the family Desmodoridae were collected in sandy seabeds on the southeast and southwest coast of Tenerife. These specimens were identified as *Desmodorella* aff. *tenuispiculum* (Allgen, 1928) (subfamily Desmodorinae), *Metachromadora* sp. (Spiriniinae) and *Spirinia parasitifera* Bastian, 1865 (Spiriniinae).

Material and methods

Samples were collected in the intertidal and shallow subtidal, at 3 m deep, soft-bottoms of Los Abrigos (SE Tenerife) and Los Cristianos (SW Tenerife). PVC cores of 4.5 cm of inner diameter were taken to a depth of 30 cm in the sediment. These samples were fixed with 10% formaldehyde in seawater for one day and decanted through a sieve of 63 μm mesh size, and posteriorly preserved in 70% ethanol. Several specimens were mounted in glycerine gel and drawings of these were done using a camera lucida on a Leica DMLB microscope equipped with Nomarski interference contrast. All measurements are in micrometers and curves structures are measured along the arc. The study material is deposited in the collection of the Benthos Lab, Department of Animal Biology, University of La Laguna (DBAULL).

Abbreviations used in the text are: a, body length divided by maximum body diameter; b, body length divided by pharyngeal length; c,body length divided by tail length; c', tail length divided by anal body diameter; cbd, corresponding body diameter; s', spicule length divided by anal body diameter; %V, position of vulva as a percentage of body length from anterior (Platt & Warwick, 1988).

Systematics

Order CHROMADORIDA Filipjev, 1929
Suborder CHROMADORINA Filipjev, 1929
Family DESMODORIDAE Filipjev, 1922
Genus ***Desmodorella*** Cobb, 1933

Cuticle with transverse striations and longitudinal files with spines. Cephalic capsule clearly discernible. Somatic seate in 4, 6 or 8 longitudinal files. Amphids multispiral with at least 2 laps. Conical tail. Males with one outstretched testis and females with two reflexed ovaries.

Desmodorella* aff. *tenuispiculum (Allgen, 1928) (Fig. 1, Tab. 1)
Desmodora tenuispiculum Allgen (1928): 263, fig. 6.
Desmodora (Desmodorella) tenuispiculum.- Gerlach (1963): 91, fig. 9 a.
Desmodora norvergica Allgen (1932): 452, fig. 11 a, b; Warwick & Buchanan (1970): 136.

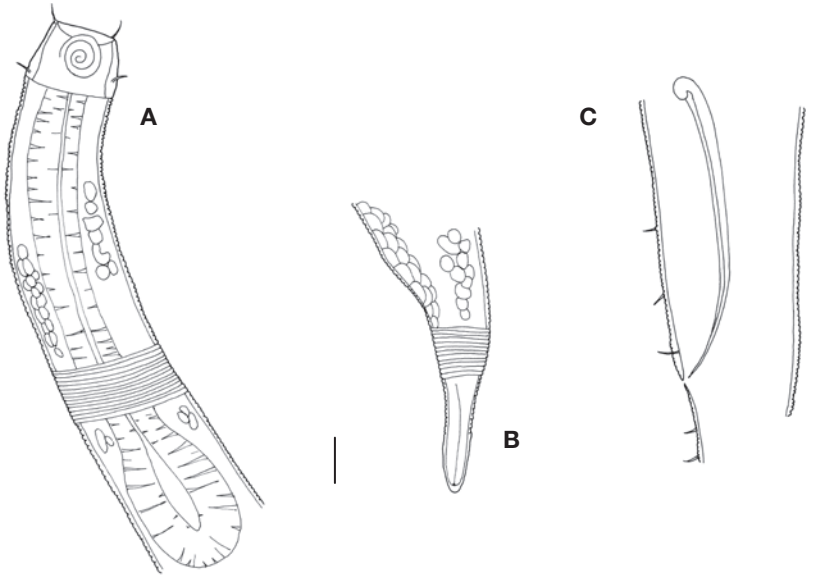

Figure 1. *Desmodorella* aff. *tenuispiculum*. Male. **A**. Anterior end. **B**. Posterior end. **C**. Spicule. Scale = 15 µm.

Meristic data and studied material: Abrigos subtidal: May 2000, 1 male (♂1).

Description. Body slender, tappering towards both ends. Head not set off, with a cephalic capsule. Cuticle finely transverse striated, lateral differentiation lacking. Amphids 54% of the corresponding body diameter in width, multispiral (3.5 rounds), located at the anterior tip. Buccal cavity conical and enlarged. Inner and outer labial setae inconspicuous. 4 cephalic setae 0.3 head diameters long, situated in the anterior part of the cephalic capsule. Subcephalic setae 4 µm long, located at 13 µm from anterior end. Pharynx slender and cylindrical. Nerve ring and ventral gland not seen.

The reproductive system is monorchic, with one anterior testis. Spicules 2.9 anal diameters long, paired, slender and slightly arcuated, proximally expanded. Gubernaculum absent. Precloacal seta 5 µm long, situated at 6 µm from the cloaca.

Table 1. Measurments of *Desmodorella* aff. *tenuispiculum in* µm.

	♂**1**
Total body length	971.4
a	23.7
b	6.8
c	11.7
Cephalic diameter	15
Inner labial setae	–
Outer labial setae	–
Cephalic setae	4
Subcephalic setae	4
Buccal cavity diameter	14.3
Amphid diameter	12.9
Amphid height	12.9
Amphid from anterior	0
Pharynx length	142.9
Pharynx cbd	39.3
Maximum body diameter	41
Vulva from anteriorr	
% V	
Spicule length	75
Gubernaculum length	17.1
s’	2.9
Tail length	83
Anal body diameter	26
c’	3.2
Spicule length/Tail length	0.9

Postcloacal seta 3 μm long, located at 8 μm from the cloaca. Precloacal supplements lacking. Tail 3.2 anal diameters long, conical and posteriorly filiform, with rounded tail tip. Caudal setae lacking. Spinneret slightly developed.

Females not found.

Discussion. The canarian specimens are closely related to *Desmodorella tenuispiculum* (Allgen, 1928) in spicule shape and cephalic setae arrangement. However, the studied material differs in the amphid (3.5 rounds), absence of gubernaculum and posterior tip slightly round whereas *D. tenuispiculum* presents amphids of 2.5 rounds, gubernaculum and posterior tip acuminated. The studied specimen has been determined as *D.* aff. *tenuispiculum* due to the lack of material in good conditions.

Sediment characteristics. This species was collected in medium sands (Q_{50} = 0.36), with a very good selection (S_0 = 0.86). The organic matter content was 1.68% and 3.08% of carbonates percentage.

Distribution. Amphiatlantic (Chitwood, 1936; Warwick & Buchanan, 1970). Indian ocean (Gerlach, 1963).West Pacific ocean (Allgen, 1932). This species is first recorded in the Canary Islands.

Genus ***Metachromadora*** Filipjev, 1918

This genus is characterized by having a finely striated cuticle, amphids unispiral and surrounded by cuticular striations. Buccal cavity with a noticeable dorsal tooth. Oesophageal bulb developed, sometimes with marked plasmatic interruptions. Males with one anterior testis and females with two reflexed ovaries.

Metachromadora sp. (Fig. 2, Tab. 2)

Meristic data and studied material. Abrigos subtidal: August 2000, 1 male (♂1).

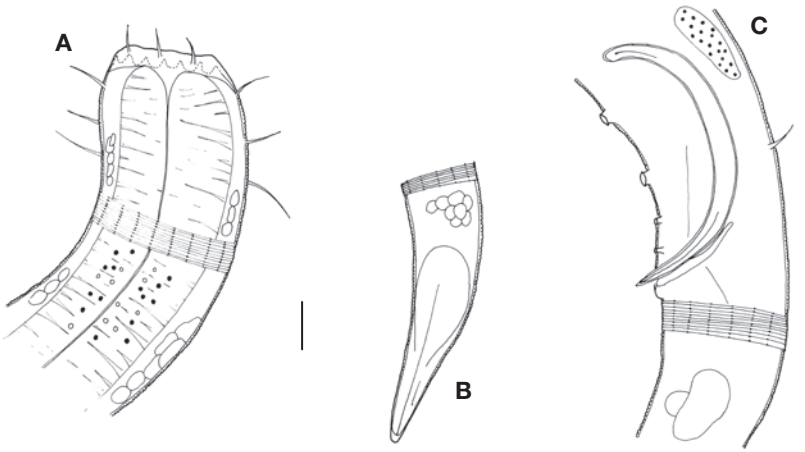

Figure 2. *Metachromadora* sp. Male. **A**. Anterior end. **B**. Posterior end. **C**. Spicule and gubernaculum. Scale = 15 μm.

Description.

Male: Body slender, tappering towards the posterior end. Head not set off. Cuticle ornamented with homogeneous punctations jointed by fine transverse striations, lateral differentiation lacking. Amphids inconspicuous. Buccal cavity conical, with no discernible dorsal tooth. Inner labial setae inconspicuos. 6 outer labial setae 0.2 cephalic diameters long and 4 cephalic setae 0.3 cephalic diameters long, located at the median part of the head. Subcephalic setae 10-15 µm long, situated at 30-40 µm from the anterior end. Pharynx slender and cylindrical.

The reproductive system is monorchic, with one anterior testis. Spicules 3 anal diameters long, paired, slender and arcuated, proximally expanded. Gubernaculum 0.7 anal diameters long. 2 cylindrical precloacal supplements 1.5 µm wide, situated the poseriormost at 4 µm from the cloaca. 10 anteriormost cup-

Table 2. Measurements of *Metachromadora* sp. in µm.

	♂**1**
Total body length	1471.4
a	25.8
b	5.8
c	20.7
Cephalic diameter	30
Inner labial setae	–
Outer labial setae	7
Cephalic setae	9.6
Subcephalic setae	10
Buccal cavity diameter	20
Amphid diameter	–
Amphid height	–
Amphid from anterior	–
Pharynx length	253.6
Pharynx cbd	50
Maximum body diameter	57.1
Vulva from anteriorr	
% V	
Spicule length	89.3
Gubernaculum length	24
s’	3
Tail length	71
Anal body diameter	30
c’	2.4
Spicule length/Tail length	1.3

shaped precloacal supplements 4 µm wide. Tail 2.4 anal diameters long, short and conical, with posterior tip acuminated. Caudal setae absent. Spinneret developed.

Females not found.

Discussion. The canarian specimen is closely related to *Metachromadora chandleri* (Chitwood, 1951) in total boty length (1-1.4 mm) and number of precloacal supplements (12-14). However, *M.chandleri* differs in having numerous pre- and postcloacal developed setae, absent in *Metachromadora* sp. Moreover, the studied specimen differs from the remaining species of the genus in the copulatory apparatus and has been determined to genus level due to the poor condition of the material.

Sediment characteristics. This species was recorded in fine sands ($Q_{50} = 0.24$), with a very good selection ($S_0 = 0.79$). The organic matter content was 0.77% and 9.57% of carbonates percentage.

Genus ***Spirinia*** Gerlach, 1963

This genus is characterized by having a not set off head, cuticle finely striated in some species. Amphids unispiral and located near the anterior end. Buccal cavity small and narrow, with cuticularized walls. Males with one extended testis and females with two reflexed ovaries.

Spirinia parasitifera (Bastian, 1865) (Fig. 3, Tab. 3)

Spirinia parasitifera.- Platt & Warwick (1988): 324, fig. 148; Palacín (1990): 315, fig. 29.

Spira parasitifera Bastian (1865): 159, figs. 201-203, pl. 13.

Spirinia (Spirinia) parasitifera.- Wieser & Hopper (1967): 272, fig. 35, pl. 17.

Meristic data and studied material. Abrigos intertidal: December 2000, 1 female (♀1); Abrigos subtidal: May 2000, 1 male (♂1); Cristianos subtidal:

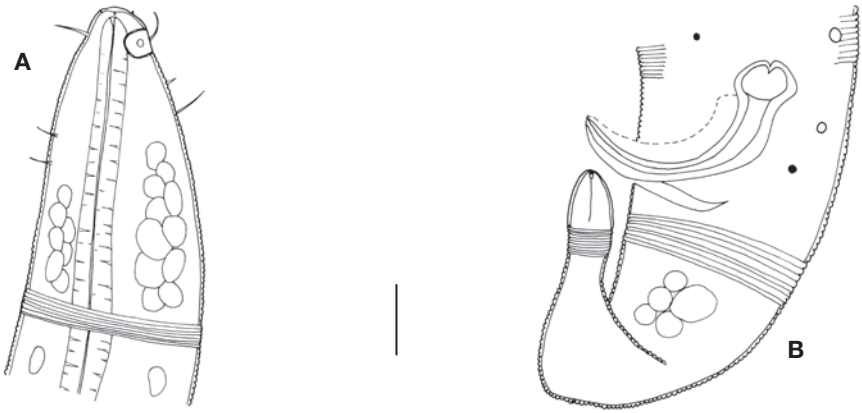

Figure 3. *Spirinia parasitifera*. **A**. Anterior end. **B**. Posterior end. Scale A = 15 µm, B = 27 µm.

May 2000, 2 males (♂3, ♂5), July 2000, 1 male (♂4), October 2000, 3 females (♀3, ♀4, ♀5), April 2001, 1 male (♂2) and 1 female (♀2).

Description.

Male: Body slender, tappering towards both ends. Head round and not set off. Cuticle ornamented with transverse striations, lateral differentiation lacking. Amphids 40% of the corresponding body diameter in width, unispiral, located at 6 µm from the anterior end. Buccal cavity conical and small, with one dorsal tooth and ventral denticles. Inner labial setae absent. 6 outer labial setae in papilla. 4 cephalic setae 0.5 head diameters long, situated in the posterior part of the head. Pharynx narrow and slender.

The reproductive system is monorchic, with one anterior testis. Spicules 1.1 anal diameters long, paired, arcuated and proximally expanded with a terminal

Table 3. Measurements of *Spirinia parasitifera* in µm.

	♂1	♂2	♂3	♂4	♂5	♀1	♀2	♀3	♀4	♀5
Total body length	2142.9	1800	1971.4	1685.7	2085.7	1742.9	1785.7	1678.5	1642.9	1777.8
a	30	29.6	33.5	27.8	31.6	21.3	25	22.6	23.7	24.6
b	16.7	14	15.8	15.2	17.2	19.1	12.8	14.7	15.9	14.3
c	18.2	14	19	16.9	17.7	20.3	28.8	22.4	21.6	21.6
Cephalic diameter	21.4	21.4	20	20	12.9	17.9	17.1	16.9	16.9	16.5
Inner labial setae	–	–	–	–	–	–	–	–	–	–
Outer labial setae	–	–	–	–	–	–	–	–	–	–
Cephalic setae	7.1	9.4	7.1	8.6	8.6	10	10	10	9.6	9.7
Subcephalic setae	5.7	6	5	8.6	8.6	6	5	5.6	5.6	5.4
Buccal cavity diameter	3.8	4.2	4.3	4.9	4.2	4.3	5.7	4.5	4.5	4.4
Amphid diameter	5.7	5.7	5.7	7.1	7.1	5.7	5.7	6	5.8	6
Amphid height	5.7	7.1	5.7	7.1	7.1	6.1	5.7	6	5.8	6
Amphid from anterior	10	8	8	8.6	8.6	11	12	11.4	11.9	11.6
Pharynx length	128.6	128.6	125	110.7	121.4	91.4	139.3	114.4	103.2	124.5
Pharynx cbd	50	39.3	32.1	42.9	50	53.6	54	52	51.2	52.6
Maximum body diameter	71.4	60.7	58.9	60.7	66	82	71.4	74.1	69.2	72.4
Vulva from anteriorr						922	957.1	909.7	888.9	940.4
% V						52.9	53.6	54.2	54.1	52.9
Spicule length	60.7	71.4	71.4	75	67.9					
Gubernaculum length	38	53.6	50	42.7	38.6					
s’	1.1	1.8	2.5	1.5	1.6					
Tail length	117.9	128.6	103.6	100	117.9	85.7	62	74.9	75.9	82.1
Anal body diameter	57.1	39.3	28.6	50	42.9	58.6	42.9	47.2	44.9	45.6
c’	2.1	3.3	3.6	2	2.8	1.5	1.4	1.6	1.7	1.8
Spicule length/Tail length	0.5	0.6	0.7	0.7	0.6					

internal cuticularised knob. Gubernaculum 0.6 anal diameters long. Precloacal supplements absent. Tail 2.1 anal diameters long, conico-cylindrical with round posterior tip. Caudal setae lacking. Spinneret poorly developed.

Female: Total body length slightly shorter (1.7-1.8 mm) than in males, with a less developed tail (1.4-1.8 anal diameters). The reproductive system is didelphic, with two reflexed ovaries. Vulva at 52.9-54% of the total body length.

Discussion. This species is characterized by having geographical variations. Specimens from eastern Atlantic present winding spicules whereas specimens from western Atlantic have rounded spicules with a terminal internal cuticularised knob, similar to canarian specimens. The studied material differs from the remaining geographical areas in having a spicule with a higher degree of cuticularization and a slightly swollen posterior tip.

Sediment characteristics. In the intertidal of Los Abrigos this species was recorded in medium sands (Q_{50} = 0.34), with a very good selection (S_0 = 0.83). The organic matter content was 1.33% and 5.30% of carbonates percentage. In the subtidal of Los Abrigos was collected in medium sands (Q_{50} = 0.28), with a very good selection (S_0 = 0.75). The organic matter content was 0.78% and 5.47% of carbonates percentage. In the subtidal of Los Cristianos was recorded in fine sands (Q_{50} = 0.15), with a very good selection (S_0 = 0.56). The organic matter percentage was 0.64% and 25.30% of carbonates content.

Distribution. Amphiatlantic (Wieser & Kanwisher, 1961; De Man, 1890). Mediterranean sea (Rouville, 1903). This species is first recorded in the Canary Islands.

Discussion

Free-living marine nematodes are the most important meiofaunal group in marine coastal areas in terms of abundance (90-95%) and biomass (50-90%) (Giere, 1993). Nematodes are of considerable ecological importance since they occur in all climatic areas and sediments (Heip et al. 1985), however, nemtadodes assemblages are largely determined by sediment properties (grain size, porosity, water content, etc.) as well as other environmental variables (e.g. organic matter, bacteria populations, etc.) (Warwick, 1989). The studied specimens were found in medium and fine sands with a low content of organic matter in the sediment (<2%) and no wave-dominated beaches (ultradissipative, sensu Short, 1999). Desmodorids are one of the chromadorid families well adapted to the former environmental conditions, with an epigrowth feeding regime (Moens & Vincx, 1997), they grasp on sediment surface to feed on particulate food attached to sediment grains (mainly diatoms and other microalgae). However, the studied sampling locations (Los Abrigos and Los Cristianos) are dominated by other nematode families with different feeding guilds (non-selective deposit feeders and predators), typical of highly-dynamic environments (Nicholas & Hodda, 1999).

The studied desmodorid species have been formerly recorded in sublittoral fine sands (*Desmodorella* aff. *tenuispiculum*) and muddy-sands (*Spirinia parasitifera*) in several localities throughout the Atlantic coasts of Europe (Platt & Warwick, 1988). Differences between canarian and specimens from other european

regions are considered within intraspecifical variations of each taxon, and thus, a detailed taxonomic and meristic study with a larger number of individuals, including genetics, should take in consideration in order to separate canarian specimens as a new taxa.

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