Notes on free-living marine nematodes from the Canary Islands: the genus *Daptonema*

RODRIGO RIERA, JORGE NÚÑEZ & MARÍA DEL CARMEN BRITO

Riera, R., J. Núñez & M. Del Carmo Brito 2011. Notes on free living marine nematodes from the Canary Islands: the genus *Daptonema*. *Arquipelago*. Life and Marine Sciences 28: 1-6.

Two species of *Daptonema, D. fistulatus* (Wieser & Hopper, 1967) and *D. hirsutum* (Vitiello, 1967) from soft substrates in Tenerife are recorded for the first time for the Canary Islands. These species are described and geographical variability is discussed. Furthermore, meristic and ecological data are presented.

Key words: Xyalidae, roundworms, meiobenthos, coastal habitats, Tenerife

Rodrigo Riera (e-mail: rodrigo@cimacanarias.com), Centro de Investigaciones Medioambientales del Atlántico (CIMA SL), Arzobispo Elías Yanes, 44, ES-38206 La Laguna, Tenerife, Canary Islands, Spain; Jorge Núñez & María del Carmen Brito, Benthos Lab, Department of Animal Biology, Faculty of Biology, University of La Laguna, ES-38206 La Laguna, Tenerife, Canary Islands, Spain.

INTRODUCTION

The genus *Daptonema* Cobb, 1920 is one of the most common free-living nematodes in marine benthic soft substrates. Wieser (1956) included this genus within the subgenera *Daptonema, Cylindrotheristus, Mesotheristus* and *Pseudotheristus* of the genus *Theristus*.

This genus is characterised by the presence of a buccal cavity without teeth, conico-cilindrical tail with caudal setae and somatic setae shorter than the corresponding diameter.

During an ecological study of the intertidal and shallow subtidal soft substrates in Tenerife, two species of *Daptonema* were collected. *Daptonema fistulatus* and *D. hirsutum*, the latter being the most abundant species in the subtidal station.

MATERIAL AND METHODS

STUDY AREA

Samples were collected in the intertidal and shallow subtidal (3 m depth) soft substrates 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. The 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 (Platt & Warwick 1983). 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).

To assess the granulometric composition of the sediment, ca. 100 g of sediment from each monthly sample was oven dried at 105ºC, passed through a graded series (2 mm, 1 mm, 0.5 mm, 0.25 mm, 0.125 mm and 0.063 mm) of sieves, and then weighted (Buchanan 1984). The method of Walkley & Black (1934) was used to determine the organic matter content (% OM) of the sediment. Total nitrogen (%) was determined following the Kjeldahl method (Bradstreet 1965).

RESULTS

TAXONOMY

Order MONHYSTERIDA Filipjev, 1929
Family Xyalidae Chitwood, 1951
Genus *Daptonema* Cobb, 1920
Daptonema fistulatus (Wieser & Hopper, 1967)
(Fig. 1, Tab. 1)
Theristus (Cylindrotheristus) fistulatus Wieser & Hopper (1967): 301, fig. 8 a-d; Lorenzen (1972): 241, fig. 13 a-h.

Meristic data and studied material: Tenerife, Los Abrigos subtidal: May 2000, 1 female (♀1) Tenerife, Los Cristianos intertidal: February 2001, 1 male (♂1); Los Cristianos subtidal: September 2000, 1 male (♂2), November 2000, 2 males (♂3, ♂4).

Description: Male. Cylindrical body attenuating on anterior and posterior ends (Fig. 1a and b). Head round and slightly set off by a fine constriction. Cuticle annulated and quite conspicuous and starts posterior to the cephalic sensilla. Amphids are 25% of the corresponding body in diameter, simple and round. They are located at 31 μm from the anterior end. Buccal cavity conical and without teeth. Cephalic arrangement is in three separated circles (inner labial, outer labial and cephalic setae). Inner labial sensilla 2 μm long and 6 external labial setae are 0.9 cephalic diameters long. Cephalic setae are 0.4 cephalic diameters long, situated in the posterior half of the head. Sucephalic setae are 9-10 μm long, located at 25 μm away from the anterior end. Pharynx slender and cylindrical. Ventral gland not seen.

The reproductive system is diorchic with two opposed testes, difficult to discern. The spicules are 0.9 anal diameters long and L-shaped with a poorly developed capitulum (Fig. 1c). The gubernaculum is tubular, without apophysis, and surrounding the spicule, 0.3 anal diameters long. The tail is 4.7 anal diameters long, slightly conical anteriorly and filiform on the posterior part. Two terminal setae 7 μm long and located at 2 μm of the posterior end. Spinneret poorly developed.

Female. External morphology similar to males. Total length longer than males (2 mm) as well as the tail length (7.1 anal diameters). Inner labial (27 μm) and cephalic (19 μm) setae more developed than in males. The reproductive system is monodelphic with one anterior reflexed ovary. Vulva located in the posterior half of the body, 53.9% of body length from anterior.

Ecology: Daptonema fistulatus was recorded in medium and fine sandy substrates without vegetation. The organic matter content varied between 0.53% and 1.10% and the percentage of carbonates were very variable (1.54-26.84%).

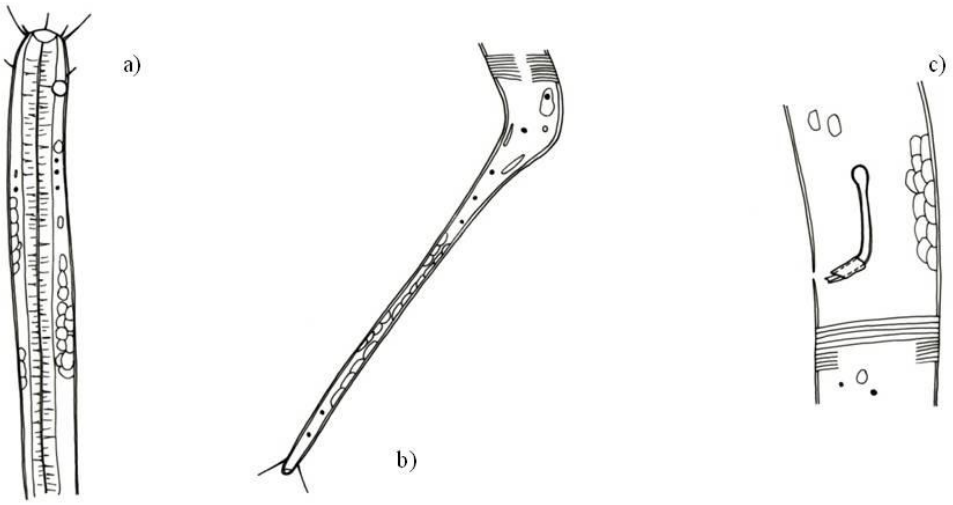

Fig. 1. *Daptonema fistulatus* (♂): a) anterior end; b) posterior end, and c) spicule and gubernaculum. Scale = 20μm.

Table 1. Measurements of Daptonema fistulatus in µm: 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.

Measurements	♂**1**	♂**2**	♂**3**	♂**4**	♀**1**
Total body length	1500	1414.3	1414.3	1185.7	2014.3
a	28.8	28.3	24.8	22.1	28.2
b	6.8	6.2	5.2	5.9	10.4
c	8.9	7.9	8.8	9.2	5.6
Cephalic diameter	26	22.9	28.1	20	42.9
Inner labial setae	3	2	2	3	2.3
Outer labial setae	21.4	22.8	21.4	19	27.1
Cephalic setae	12.9	14	12.9	10	18.6
Subcephalic setae	9	9	10	10	8
Buccal cavity diameter	10	11	18.6	10	11.4
Amphid diameter	13	11.4	11.4	-	10
Amphid height	8.6	8.6	15.7	-	9
Amphid from anterior	31.4	25.7	28.6	-	15
Pharynx length	221.4	228.6	271.4	200	192.9
Pharynx cbd	35.7	32.1	46.4	46.4	67.9
Maximum body diameter	52	50	57.1	53.6	71.4
Vulva from anteriorr					1085.7
% V					53.9
Spicule length	30	35.7	38.9	27.1	
Gubernaculum length	18.4	12.9	14.3	13.8	
s´	0.8	0.9	0.6	0.8	
Tail length	167.9	178.6	160.7	128.6	357.1
Anal body diameter	35.7	39.3	33.8	32.1	50
c´	4.7	4.5	4.8	4	7.1
Spicule length/Tail length	0.2	0.2	0.2	0.2	

Discussion: Daptonema fistulatus is characterised by the presence of a tubular gubernaculum surrounding the spicule, observed in studied specimens. There were, however, slight differences between the studied specimens and that of former authors. The Canarian specimens were found to be somewhat longer than those from Florida (Wieser & Hopper 1967) and the North Sea (Lorenzen 1972) (0.8-1.1 mm). Spicule was slightly more developed in the studied material compared to Lorenzen´s specimens while amphid sizes were larger in Wieser & Hopper´s individuals (40-45% corresponding diameter).

Distribution: Amphiatlantic (Wieser & Hopper 1967; Lorenzen 1972). This is the first record for the Canary Islands.

Daptonema hirsutum (Vitiello, 1967)
(Fig. 2, Tab. 2)
Daptonema hirsutum Palacín (1990): 321; Warwick, Platt & Somerfield (1998): 120, fig. 49.
Theristus (Mesotheristus) hirsutus Vitiello (1967): 413, fig. 5.
Mesotheristus hirsutus Hopper (1969): 688.

Meristic data and studied material: Tenerife, Los Abrigos intertidal: August 2000, 1 male (♀3); April 2001, 1 female (♀2); Los Abrigos subtidal: May 2000, 1 female (♀1); November 2000, 1 male (♂5); December 2000, 1 male (♂2). Tenerife, Los Cristianos intertidal: September 2000, 1 female (♀4); April 2001, 1 male (♂1) and 1 female (♀5); Los Cristianos subtidal: March 2001, 2 males (♂3, ♂4).

Description: Male. Cylindrical body attenuating on anterior and posterior ends (Fig. 2a and b). Head slightly round. Cuticle annulated and quite conspicuous. Somatic setae present along the body surface. Amphids are 18% of the corresponding diameter, simple and round. They are located at 23 µm from the anterior end. Buccal cavity conical and without teeth. Inner labial sensilla 3 µm long and 6 external labial setae are 0.9-1.1 cephalic diameters long. Cephalic setae are 1.2-1.3 cephalic diameters, situated in the anterior part of the head. Subcephalic setae are 2-9 µm long, located at 8-25 µm away from the anterior end. Pharynx slender and cylindrical. Ventral gland and nerve ring not seen.

The reproductive system is diorchic with two opposed testes. The spicules are 1.2 anal diameters long, curved and with a poorly developed capitulum. The gubernaculum is 0.2 anal diameters long with a dorso-caudally directed apophyses (Fig. 2c). Precloacal setae situated at 11 µm from the cloaca and 10 µm long. Tail cylindrical and filiform posteriorly with swollen tip at the posterior end, 4.5 anal diameters long. Caudal setae are 38 µm long and subcaudal ones 6 µm long, located at 4 µm from the posterior end. Spinneret developed.

Female. External morphology similar to males. Tail length higher than in males (4.8-6.4 anal diameters). Inner labial setae inconspicuous. Outer labial setae (18-22 µm) and cephalic (20-25 µm) slightly shorter than in males. The reproductive system is monodelphic, with one anterior reflexed ovary. Vulva located in the posterior half of the body, at the 58.9-66.2% of body length from anterior end.

Ecology: Individuals of this species were collected in intertidal and shallow subtidal sandy substrates from Los Abrigos and Los Cristianos, on the south coast of Tenerife. These soft substrates were characterised by medium and fine sands, with low and intermediate organic matter content (0.006-1.5%), and the percentage of carbonates varying between 5.30% and 26.84%.

Discussion: Studied material agreed well with the descriptions of Vitiello (1967) and Boucher & Hellequét (1977), although some differences were observed, such as the spicules in the Canarian specimens being slightly thicker. The studied specimens were also slightly shorter than those described by Vitiello (1967) (1.8-1.9 mm).

Distribution: Amphiatlantic (Hopper 1969; Warwick et al. 1998). Mediterranean Sea (Vitiello 1967). This is the first record of this species in the Canary Islands.

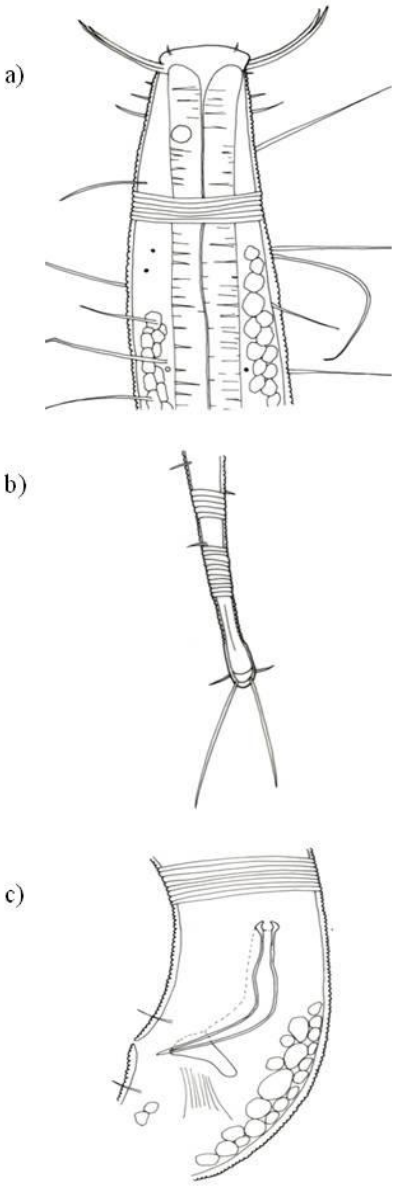

Fig. 2. *Daptonema hirsutum* (♂): a) anterior end; b) posterior end, and c) spicule and gubernaculum. Scale a and b = 15µm, c = 20 µm.

Table 2. Measurements of *Daptonema hirsutum* in µm: 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.

Measurements	♂**1**	♂**2**	♂**3**	♂**4**	♂**5**	♀**1**	♀**2**	♀**3**	♀**4**	♀**5**
Total body length	1500	1728.6	1514.3	1528.6	1642.9	1171.4	971.4	1642.9	1871.4	1371.4
a	18.3	19.4	17	14.8	14.8	25.2	24.7	25.6	22.8	22.6
b	41.7	3.6	15.1	12.2	3.6	4.3	4.3	3.6	4.2	3.2
c	6.4	5.8	5.6	5.9	5.5	5.1	6.6	5.7	6.9	6.5
Cephalic diameter	22	29.3	28.6	26.9	32.1	25	25	29	25	32.1
Inner labial setae	3	2.6	2.8	3	3	-	-	-	-	-
Outer labial setae	21.5	23.4	25	24	26.1	17.8	19	18.7	20.8	22.4
Cephalic setae	28	31.4	28.6	27.1	30	21	20	20	23	25.1
Subcephalic setae	11	10	8.6	10.0	7.1	85.7	79	77.0	85.7	53.6
Buccal cavity diameter	13	14.3	13.2	15.2	17.1	13	12	15	14.3	21.4
Amphid diameter	7	8.6	7.1	7.1	-	7	6	5.7	7	-
Amphid height	7	8.6	7.1	8.6	-	7	6	5.7	7	-
Amphid from anterior	26	30	20	21.4	-	26	2.5	25.7	24	-
Pharynx length	36	485.7	100	125	457.1	275	225	457.1	442.9	428.6
Pharynx cbd.	53	78.6	71.4	82.1	85.7	42.9	35.7	57.1	75	125
Maximum body diameter	82	89.3	89.3	103.6	110.7	46.4	39.3	64.3	82.1	60.7
Vulva from anterior						nd	642.9	1020.2	1102.2	881.8
% V						nd	66.2	62.1	58.9	64.3
Spicule length	66	71.4	70	71.4	71.4					
Gubernaculum length	20	20	20	21.3	17.9					
s´	1.2	1	1.2	1	1					
Tail length	236	300	271.4	257.1	300	228.6	146.4	284.3	271.4	210.7
Anal body diameter	53	75	60.7	75	75	35.7	28.6	42.9	46.4	43.5
c´	4.5	4	4.5	3.4	4	6.4	5.1	6.6	5.8	4.8
Spicule length/Tail length	0.3	0.2	0.3	0.3	0.2					

ACKNOWLEDGEMENTS

Authors are grateful to P.J. Somerfield (Plymouth Marine Laboratory, UK) for introducing us to the taxonomy of marine free-living nematodes. We also acknowledge Dr. Catalina Pastor de Ward (Centro Nacional Patagónico, Argentina) for her insightful comments and suggestions.

REFERENCES

Boucher, G. & M. Hellequét 1977. Nématodes des sables fins infralittoraux de la Pierre Noire (Manche occidentale). III. Araeolaimida et Monhysterida. *Bulletin du Muséum National d'Histoire Naturelle* 427: 85-122. [in French]

Bradstreet, R.B. 1965. *The Kjeldahl Method for Organic Nitrogen.* Academic Press, NY: 121-125

Buchanan, J.B. 1984. Sediment analysis. Pp. 41-65 in: Holme N.A. & A.D. McIntyre (Eds). *Methods for the study of marine benthos*. Blackwell Scientific Publications, Oxford. 387 pp.

Hopper, B.E. 1969. Marine nematodes of Canada. II. Marine nematodes from the Minas Basin-Scots Bay area of the Bay of Fundy, Nova Scotia. *Canadian Journal of Zoology* 47: 671-690.

Lorenzen, S. 1972. Die Nematodenfauna im Verklappungsgebiet für Industrieabwässer nordwestlich von Helgoland. I. *Araeolaimida und Monhysterida. Zoologischer Anzeiger* 187: 223-248. [in German]

Palacín, C. 1990. *Estudio ecológico de la meiofauna bentónica de la Bahía de Els Alfacs (Delta del Ebro). Ecología y sistemática de las poblacionesde nematodos.* Tesis Doctoral. Universidad de Barcelona. 406 pp. [in Spanish]

Platt, H.M. & R.M. Warwick 1983. *A synopsis of free-living marine nematodes, Part I. British Enoplids*. Cambridge University Press, London. 307 pp.

Vitiello, P. 1967. Nématodes libres marines de Roscoff. I. Déscription de cinq espéces nouvelles. *Cahiers Biologie Marine* 8: 403-416.

Walkley, A. & I.A. Black 1934. An examination of the Degtjareff method for determining soil organic matter, and a proposed modification of the chromic and titration method. *Soil Science* 37: 29-38.

Warwick, R.M., H. Platt & P.J. Somerfield 1998. *Free-living marine nematodes. Part III. Monhysterids*. Kermarck, D.M. & R.S. Barnes (Eds). Cambridge University Press. London. 296 pp.

Wieser, W. 1956. Free-living marine nematodes. II. Axonolaimoidea and Monhysteridea. *Acta Universitatis Lundensis* 52(13): 1-115.

Wieser, W. & B. Hopper 1967. Marine nematodes of the east coast of North America. I. Florida. *Bulletin of the Museum of Comparative Zoology*, 135: 239-344.

Accepted 12 September 2010.