

VIERAEA	Vol. 34	17-24	Santa Cruz de Tenerife, noviembre 2006	ISSN 0210-945X
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***Spadella lainezi* n. sp., the first cave chaetognath from the Eastern Atlantic Ocean**

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CASANOVA, J. P., F. HERNÁNDEZ & S. JIMÉNEZ (2006). *Spadella lainezi* n. sp., primer quetognato cavernícola del Atlántico Este. *VIERAEA* 34: 17-24.

RESUMEN: *Spadella lainezi* n. sp., quetognato bentónico, se describe a partir de 42 ejemplares recolectados en una cueva de la costa SE de la isla de Tenerife (Canarias, Atlántico este). Se trata del primer quetognato registrado para grutas de la costa este del océano Atlántico.

Palabras clave: Quetognatos bentónicos, cuevas, islas Canarias, *Spadella lainezi* n.sp.

ABSTRACT: A new species of benthic chaetognath, *Spadella lainezi* n. sp., is described from 42 specimens collected in a cave of the coast SE of Tenerife (Canary Islands, Eastern Atlantic). The species is the first chaetognath recorded for caves on the Eastern coast of the Atlantic Ocean.

Key words: Benthic chaetognaths, caves, Canary Islands, *Spadella lainezi* n. sp.

INTRODUCTION

After the descriptions of the two cave chaetognaths species, *Spadella ledoyeri* Casanova, 1986 and *Paraspadella anops* Bowman & Bieri, 1989, living respectively in the Mediterranean Sea (Casanova, 1986) and in the Western Atlantic Ocean (Bowman & Bieri, 1989); Hernández & Jiménez (1998) recorded for the first time, for the Eastern Atlantic Ocean, numerous specimens of a benthic chaetognaths species of the genus *Spadella* in a submarine cave of Tenerife (Canary Islands). Previously (Hernández & Jiménez, op. cit.), they named this species *Spadella* aff. *ledoyeri* owing to its affinity with the caves species known in the Mediterranean Sea (Casanova, op. cit.). Because of the difficulty to

compare with the type specimens of *Spadella ledoyeri*, they could not then establish the real status of these specimens.

Now, other studies have been carried out, since other specimens of the two above mentioned species have been available. It appears, on the one hand that the specimens from the Canary Islands caves belong to a new species described herein, and on the other hand that this species also exists in the Gulf of Marseille.

MATERIAL AND METHODS

In the previous paper, Hernández & Jiménez (1998) have lengthily described the sampling station (cave). This dark submarine cave is situated on the south-east of Tenerife (Canary Islands), between the towns of Santa Cruz and Candelaria. It is a volcanic pipe, with a broad entrance and a sandy floor. The cave entrance is at 16m deep below the surface, with a slope of 1.3m and a length of 15m. Immediately after the entrance, there is a marked narrow part on a short distance of its length (Bacallado *et al.*, 1995).

The 42 specimens studied were caught with a manual plankton net (mesh = 200µm) at 12m from the entrance and a few centimetres above the cave floor. Biometrical data were obtained from all the specimens and compared with those of selected specimens of *Spadella* from other origins :

- 2 specimens of *Spadella* sp. from the cave of Coral (SE of Tenerife island, Canary Islands)
- 3 specimens of *Spadella* sp. from the cave Grand Conglu (Gulf of Marseille)
- The specimens of *Spadella ledoyeri* from the cave les Trémies (near Cassis, east of Marseille), utilised for the description of the species
- 2 specimens of *Spadella ledoyeri* from the cave Jarre (Gulf of Marseille)

RESULTS

Phylum Chaetognatha
Class Sagittoidea
Family Spadellidae

Spadella lainezi n. sp.

Reference: *Spadella lainezi* Casanova, Hernández & Jiménez (2006)

Material examined: 42 specimens from a submarine cave of the coast of Tenerife island.

Type station: Santa María del Mar cave (SE Tenerife). Designated as holotype a mature specimen of 4.2 mm LT (total length). Collection date 21 January 1995. **Museum registers:** Holotype: TFM CZP/002689 (QU/00022), 10 paratypes: from TFM CZP/002690, (QU/00023) to TFM CZP/002699, (QU/00032) deposited in the Marine Biological collection type (Natural Sciences Museum of Tenerife) (see Hernández, Jiménez & Moro, 2005).

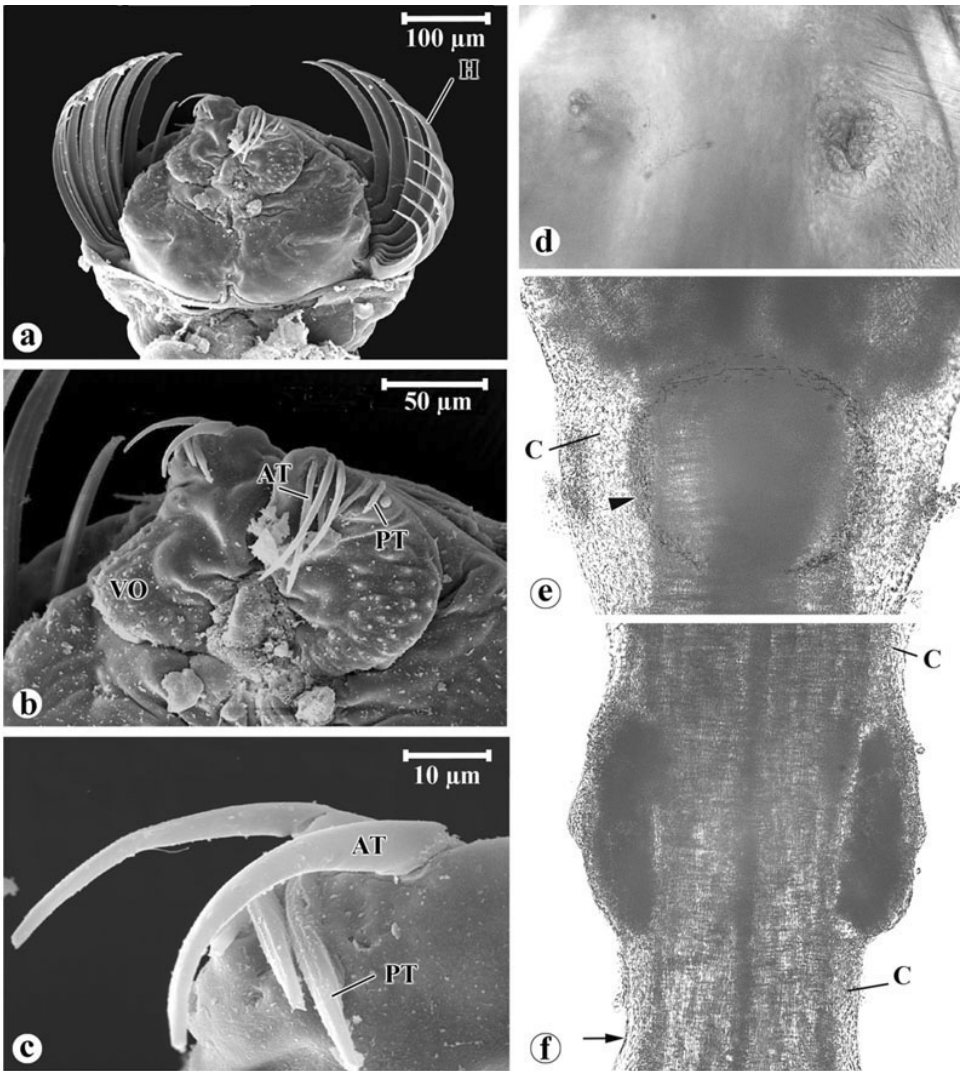


Fig. 1. *Spadella lainezi* n. sp. a-c, SEM photographs; d-f, light photographs. a,b = head in ventral view; c: detail of teeth; d: eyes (note the thin y-shaped pigment cell); e: corona ciliata (arrowhead); f: details of the seminal vesicles (the anterior limit of the tail fin is indicated by an arrow). AT = anterior teeth, C = collarrete, H = hooks, PT = posterior teeth, VO = vestibular organs.

Etymology: The new species is dedicated to the father of Mr. Alfredo Lainez who recolected the individuals by scuba diving and who is always involved in collection of material.

Description: Body large, more or less transparent. Length without tail fin comprised between 3 and 4.5mm. Tail segment represents 48.7 to 52% of the total length. Rectangular head, longer than wide. Hooks relatively numerous, generally 10-11, reddish-light brown coloured. Anterior teeth, 2-4, very long and thin; posterior ones, 3-4, shorter and ornamented with well-marked longitudinal ridges of small denticles. Vestibular organs as two swollen masses flanking the anterior part of the mouth, with tiny blunt spines scattered on their surface. Eyes with a small pigment cell. Corona ciliata perfectly rounded. Collarete tissue well apparent at the level of the neck, very thin if any from the trunk to the beginning of the tail fin, except at the level of the seminal vesicles where it is obviously present. Sensorial organs on the whole body. Ventral ganglion short, representing about 25% of the trunk length. No adhesive papillae on the ventral side of the body. Gut whitish, with a pair of small intestine diverticula. Transverse musculature from the neck area until the posterior end of the trunk. The longitudinal muscular masses are weak, allowing to see inside the body.

Short lateral fins (on 52.5 to 55.5% of the tail segment), narrow and sometimes more or less triangular. They begin at the end of the trunk, slightly before the trunk-tail septum. Tail fin roughly triangular. All fins rayed. Mature ovaries with ova large, having a polyedric shape, together with others small and no mature. Seminal vesicles large when mature, elongated, opening in the middle anterior zone, slightly separated from the lateral and tail fins to which they are nevertheless connected by a small mass of collarete tissue. The lateral view, in each tail cavity, the sperm is arranged as a regular and thin strip, perpendicular to the longitudinal septum of the tail segment. See figures 1 and 2.

Comparisons with other species (see tables I and II): Among the twelve species of *Spadella* actually described, five have both anterior and posterior teeth. One of them, *Spadella nunezi*, known from the shallow waters of La Graciosa (Lanzarote, Canary Islands), is a very small species (maximal length = 2.3mm), considered to have an interstitial habitat (Casanova & Moreau 2004). *Spadella birostrata* Casanova, 1987, *S. equidentata* Casanova, 1987 and *S. antarctica* Casanova, 1991 are larger and live more or less deeply. *Spadella ledoyeri* Casanova, 1986 is undoubtedly the most related to *S. lainezi* n. sp., owing to its gross morphology and habitat. This is well attested by the fact that, as previously said, the new species was firstly named *S. aff. ledoyeri* by Hernandez & Jimenez (1998), and also that the 3 specimens from the cave Grand Conglu near Marseille were referred to *S. ledoyeri* by Casanova (1992) who, nevertheless, pointed out the differences now considered to be of specific value between them and *S. ledoyeri*. Indeed, a few morphological characters allow to recognize these two cave species. The most evident is the size: *Spadella lainezi* is smaller, 4.5mm, against 6.6mm (cave les Trémies) to 7mm (cave Grand Conglu), for *S. ledoyeri*. It is the same remark for the eyes: about two times smaller for the former at comparable body lengths. Both two species have reduced lateral fins, but the reduction is less pronounced in *S. lainezi* n.sp., since the fins extend on 52.5 to 55.5% of the length of the tail segment, while only

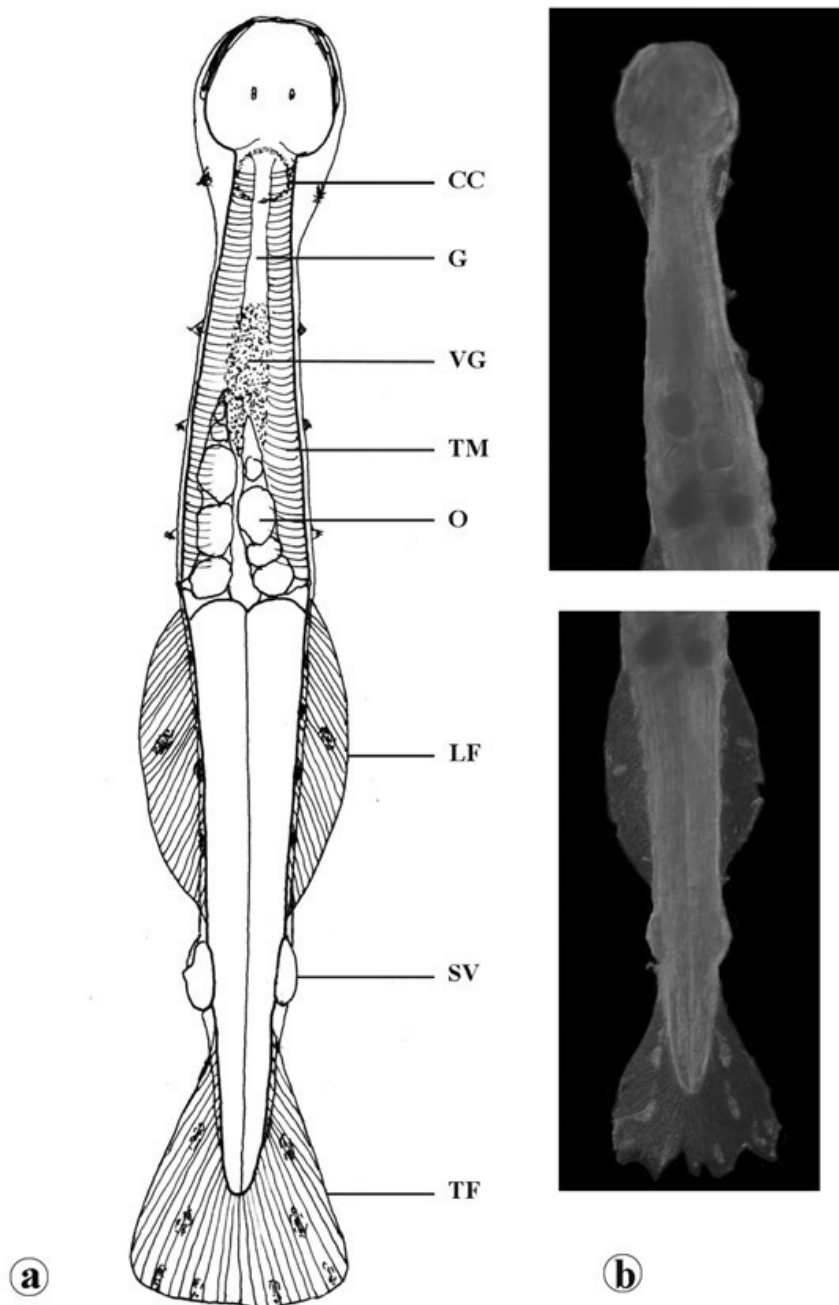


Fig. 2. *Spadella lainezi* n. sp. in dorsal view, a: habitus, b: light photographs. CC: corona ciliata, G: gut, LF: lateral fins, O: ovaries, SV: seminal vesicles, TF: tail fin, TM: transverse muscles, VG: ventral ganglion.

on 45 to 51% in *S. ledoyeri*. The mature seminal vesicles of *S. lainezi* are larger and more elongated than those of *S. ledoyeri* and, moreover, are devoid of the prominent protuberance well evident in the specimens of *S. ledoyeri* from the two caves in the area of Marseille. A last differential character, that had not been mentioned in the description of *S. ledoyeri*, is important: when alive, the specimens of this species have a gut red coloured, as that of some deep living species, while it is whitish in *S. lainezi* n.sp.

Spadella lainezi could perhaps have been considered as an Atlantic population or subspecies of *S. ledoyeri* if it was only found in the Canarian caves. But its presence in the cave Grand Conglu, not far from the caves les Trémies and Jarre, which both two house *S. ledoyeri*, pleads for the existence of two different species.

It would be interesting to go on with the study of other caves from the Canary Islands, in view to compare the diversity of their chaetognaths fauna with that of the French Mediterranean caves, where many species probably exist (Casanova, 1992).

Biometrical data: Maximal length is 4.5mm in mature individuals and the median is 4.3mm. 51.5% LC/LT.

Pictures: Several photographs of *Spadella lainezi* are included (see figures 1 and 2). For *Spadella nunezi*, another species recently described for the Canary Islands, see Casanova & Moreau (2004).

Interesting data: This material has been compared by the Dr. Casanova with those of *Spadella ledoyeri* (Mediterranean caves) and *Spadella nunezi* captured in organogenous sand outside caves (Canary Islands).

Species	Habitat	Islands	LT median (mm)	Substrat
<i>Spadella cephaloptera</i>	Outside caves	TF, GC, FV, LZ	3,4 (III)	<i>Cymodocea nodosa</i> and <i>Caulerpa prolifera</i>
<i>Spadella lainezi</i> n.sp.	Inside caves	TF	4,3 (III)	Sand
<i>Spadella nunezi</i>	Outside caves	LZ	2.3 (?)	Organogenous sand

Table I.- The species of genus *Spadella* found at the moment in the Canary Islands. The codes are: TF: Tenerife island, GC: Gran Canaria island, FV: Fuerteventura island and LZ: Lanzarote island. In brackets, the sexual stage (III= mature specimens).

ACKNOWLEDGEMENTS

We are grateful to all members of “*Benisahare*” group of Tenerife island, specially to Mister Alfredo Laínez Concepción who collected the samples (in a very difficult sampling into the caves) and for his cooperation in all aspects of the working field. Also to Dr. L. De Jong (Marseille University) for the MEB photographs.

Morphological data	1.- <i>Spadella tainezi</i> * n. sp.	2.- <i>Spadella tainezi</i>	3.- <i>Spadella cephaloptera</i>	4.- <i>Spadella ledoyeri</i> *
Body	Slender, longe	Slender	Strong	Large
Body colour	More or less transparent, white	Rigid	Opaque	Transparent
MAXIMAL LENGTH	4.5 mm (III) (mature)	2.3 mm	4.0 mm (III)	6.6 mm
LT media	4.3 mm (III) (mature)	No data in paper	3.4 mm (III)	No data in paper
Tail segment	51.5 %	47-50 %	33-60%	50-53.4 %
HEAD	Higher than wider	More or less rounded	Oval	Rounded
Hooks	Reddish-light brown	Amber coloured	Brown	Smooth with the end curve
Number hooks	10-11	8-9	6-8	10-11
Anterior teeth	2-4	1-2 (+1 pos)	2-4	3-5 (sometimes only)
POSTERIOR TEETH	3-4 (shorter and ornamented)	3-4	Not observed	3
Vestibular organs	Prominent	Behind the posterior teeth		Dentition slightly visible
Eyes	Pigment cell is reduced	Pigment cell is reduced, three short and thin branches very weakly coloured		Rectangular pigment cell evident
Corona ciliate	Perfectly rounded	Small and oval	Big and kidney-shaped	Circular
COLLARETTE	Specially in neck where is very prominent and notorius	In neck and seminal vesicles (not abundant)	Well developed by all body	From neck to the trunk
Sensorial organs	In whole body	Three sets in the trunk	By all body	Along collarete and fins
VENTRAL GANGLIUM	¼ trunk. Two very short opaque cellular masses in ventral position as two ventral fine lateral bands.	50% trunk. Two elongated and narrow dark masses in latero-ventral position.		Only 30%
DIVERTICULA	Small	Unpaired	Yes, present	No
Musculature	Not very strong	Thin	Strong	Not as strong as in <i>S. cephaloptera</i>
Adhesive papillae	Not observed	Numerous adhesive papillae in the ventral side of the trunk and tail segment.	Not observed	
LATERAL FINS	Narrow and short on 52.5% to 55.5% of the tail segment	Very narrow	Narrow	Short and rounded, only 50% of LC
TAIL FIN	Triangular	Elongated, spade-shaped	Spade-shaped	Spade-shaped
Fins (rays)	Totally rayed	Totally rayed	Totally rayed	All rayed with sensorial organs
Seminal v. (forme)	Elongated with kidney-shaped and a protuberance in the medium zone	Elongated like <i>chinese spoons</i> when mature	Very small	Oval and with anterior protuberance
VESICLES (position)	Slightly separated from the lateral and tail fins	Joined to the tail fin and lateral fins.	Joined to the tail fin and lateral fins.	Separated from both fins
OVARIES	In III stage large ova and with polyhedric shape together with other small and no mature ova	Two-four large ova	Big ova (3-6/ ov)	No mentioned in the description of the author

Table II.- Comparison between the characteristics of the species of *Spadella* in Canary Islands (1, 2 y 3) with *Spadella ledoyeri* (4) of the Mediterranean Sea. The species mentioned with asterisk* were captured in caves. All data of *Spadella tainezi* n. sp. were observed in mature specimens (III stage).

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