



Axinella estacioi n. sp. (Porifera, Axinellida) from caves of the Strait of Gibraltar (Southern Iberian Peninsula)

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Abstract: A species new to science in the genus *Axinella* is described from caves of Tarifa Island (Strait of Gibraltar). It has a characteristic form, with branches fanning out from the stems on the same plane, in an alternating or opposing fashion, thus giving the branches a feather-like appearance, which clearly distinguishes the species from other known species. The spicules are characterized by their simplicity and by the frequent presence of a proximal or subproximal swelling. *A. estacioi* is compared with related Atlantic and Mediterranean species, and with the *Axinella* previously found in the Strait of Gibraltar.

Résumé : Une espèce nouvelle pour la science appartenant au genre *Axinella* est décrite provenant des grottes de l'île de Tarifa (Déroit de Gibraltar). Son aspect est caractéristique, car les branches sortent en éventail de l'axe. Ces branches se ramifient d'une façon alterne ou opposée, ce qui leur donne une apparence de plume, qui distingue cette espèce dans le genre. Les spicules sont caractérisés par leur simplicité et par la présence fréquente d'un renflement proximal ou subproximal. *A. estacioi* est comparée avec les espèces Atlantiques et Méditerranéennes plus proches, et avec les autres *Axinella* trouvées dans le Déroit de Gibraltar.

Keywords: Taxonomy, *Axinella*, Caves, Straits of Gibraltar.

Introduction

This work is part of a larger investigation on the littoral sponges occurring at depths of 0-50 m in the Strait of Gibraltar. Until fairly recently (Carballo & García Gómez, 1994a; Carballo *et al.*, 1994a; Carballo *et al.*, 1994b), little was known about species composition, diversity, ecology and other characteristics of the littoral sponge fauna from this zone. The bathyal sponges from the Strait of Gibraltar have been studied during the "Balgim" oceanographic campaign, and they are different from the hitherto recorded littoral fauna (Boury-Esnault *et al.*, 1994). At present, the

littoral sponge fauna of this region amounts to approximately more than 130 species (Carballo, 1994), of which only six have been found in the recently described bathyal community (Boury-Esnault *et al.*, 1994). The total sponge fauna (bathyal and sublittoral) consists of approximately 220 species.

The surveys carried out suggest that many ecological habitats such as caves or under rocks remain poorly known as shown by the recent findings of new species (Carballo *et al.*, 1995; Carballo & García Gómez, 1995), and by the presence of species previously considered rare (Carballo & García-Gómez, 1994b).

The sponges of the genus *Axinella* are important components of the biocenosis of rock bottoms: some are typical of sublittoral bottoms such as *A. damicornis* Esper, 1794

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and *A. verrucosa* Esper, 1794 (cf. Siribelli, 1961); others are typical of the coralligenous biocenosis, such as *A. salicina* Schmidt, 1868 (cf. Uriz & Maldonado, 1993). Some act as bioindicators of circalittoral levels, such as *Axinella polyoides* Schmidt, 1862 (cf. Carballo, 1994). Other *Axinella* species are components of the biocenosis of muddy rock bottoms, such as *A. egregia* Ridley, 1881, or of detritic bottoms, such as *A. pseudominuta* Bibiloni, 1993.

The only species of *Axinella* previously registered from the Strait of Gibraltar are *A. damicornis* and *Axinella polyoides* (cf. Carballo, 1994) in sublittoral and circalittoral rocks, and *A. pumila* Babic, 1922 in bathyal muddy rock bottoms (Boury-Esnault *et al.*, 1994).

In this article *Axinella estacioi* n. sp. is described from bottoms of sublittoral caves, an ecological habitat traditionally characterized by the diversity of its sponge fauna (Sarà, 1961; Vacelet & Vasseur 1965).

Material and methods

Three specimens were collected by scuba diving on the Iberian coast of the Gibraltar Strait; they were later preserved in 70 % alcohol. Preparation of dissociated spicules followed the techniques described by Rubi6 (1973).

The holotype has been deposited in the Museo Nacional de Ciencias Naturales de Madrid, MNCN (Spain) and the paratypes have been deposited in the Porifera collection of the Laboratorio de Biología Marina of the Universidad de Sevilla, LBM (Spain).

Results

Systematic description

Order AXINELLIDA Lévi, 1955

Family Axinellidae Ridley & Dendy, 1887

Genus *Axinella* Schmidt, 1862

Definition: Axinellidae of variable form, always with some axial condensation and with an extra-axial skeleton diverging in plumose fashion. Spiculation: oxeas, styles and strongyles together or separate. No special dermal spicules (Bergquist, 1970).

Axinella estacioi n. sp.

Material examined: Three specimens from Tarifa Island (Tarifa), 36° 01' 8"N ; 5° 36' 22"W, depth between 8 and 12 m, in cave floors.

Holotype and spicule slides ref. n° MNCN - 1. 01/168. Paratypes ref. n°s LBM-636a and LBM-636b.

Description. The holotype is an erect and branched sponge, with a cylindrical stem and branches which are sometimes more or less flattened. The branches are regularly set out in an alternating or opposing fashion around the main branch, giving them a plumose appearance; the smaller branches often form anastomoses (Fig. 1A). All the

branches are on the same plane, which is reminiscent of the fan-like shape of some gorgonians. The total height of the sponge is 8 cm; the total width is 10.4 cm, the length of stem up to the first branch is 1 cm, the diameter of the stem at the base is 1.1 cm; the diameter of the branches is from 2 to 4 mm. One of the paratypes is a young specimen about 3 cm high, with an incipient alternating or opposing ramification, like the one in the holotype (Fig. 1B). The surface is even, fairly smooth and very slightly hispid. The ectosome is transparent, very delicate, and not detachable. A subectosomal aquiferous system of well-developed canals runs along the length of the stem and along some of the branches. The oscula have not been observed. The texture of the stem is firm and compact, the branches are soft. The sponge is very flexible and soft. The colour alive is bright yellow and olive-tan in alcohol. The substratum at the base of the sponge is bored by *Cliona vastifica* Hancock, 1849.

Spicules: They are almost exclusively very slender, slightly curved or somewhat flexuous styles, very frequently with one or two, rarely more, successive proximal or subproximal swellings: 308-710 µm x 1-4.5 µm at the branch, and 197-593 µm x 2.5-5 µm at the stem (Fig. 2A). The styles gradually become thinner towards the tip, which has no special modification. Occasionally oxeas also appear of about the same size as the styles; they are curved at the center and some are flexuous, with very subtle central or distal swellings. At the stem there are almost exclusively styles of the same morphology but slightly wider than the ones at the branches (Fig. 2B). At the base of the sponge the spicules are of the same morphology as those of the body, but they are thicker (maximum thickness 6.5 µm), sometimes transformed into true subtylostyles, and they firmly attach the sponge to the substratum (Fig. 2C).

Skeletal arrangement: The skeletal arrangement is an axial condensation of reticulate tracks linked by spongin, and the extra-axial skeleton composed of radial tracks sometimes ends in a bundle of 1-3 styles protruding from the sponge surface (Fig. 3). The arrangement of the skeleton marks the position of the species as a member of the genus *Axinella*.

Ecology. The new species has been found on the floor of sublittoral caves. The area of study where the various specimens have been found has been frequently surveyed, yet this sponge was not observed until now. This species probably originates from the circalittoral or even from much deeper sites, and its colonization of sublittoral levels is likely recent. Five specimens of the species were observed in different stages of growth.

Distribution. Tarifa Island (Tarifa). Floor of sublittoral caves.

Etymology. The species is named after Dr. Francisco Estacio, for his many years of dedication to marine biology.

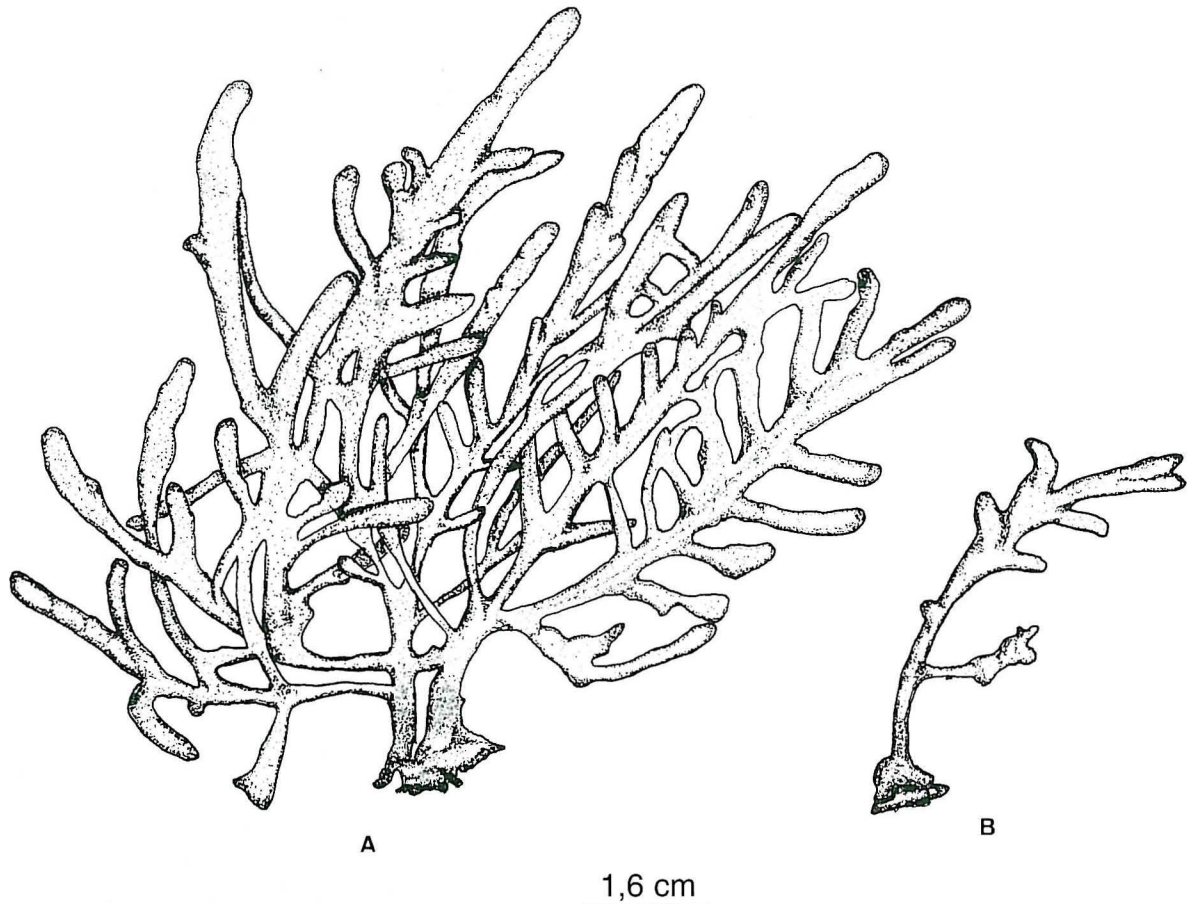


Figure 1 A. *Axinella estacioi* n.sp. (holotype); B: *Axinella estacioi* n. sp. young specimen (paratype).
Figure 1 A. *Axinella estacioi* n.sp. (holotype) ; B : *Axinella estacioi* n. sp. spécimen juvénile (paratype).

Discussion

This species is mainly distinguished by its very characteristic external form and its spiculation. These two features and others such as the consistency (very flexible) and the hispidity (scarce) make it clearly different from other species recorded from the eastern Atlantic and Mediterranean coasts. Based on the external appearance, the closest species seems to be *Axinella subdola* (Bowerbank, 1866), from the Eastern Atlantic, originally described as *Halichondria subdola*, later redescribed in the genus *Pachaxinella* by Burton (1930), and more recently described as *Homaxinella subdola* by Ackers *et al.*, (1992). However, important morphological differences exist between *A. subdola* and *A. estacioi*. The branches are circular in a cross-section in *A. subdola* (Ackers *et al.*, 1992), and they are more or less flattened and on a single plane in *A. estacioi*. Differences in spicular morphology can be

found as well: the spicules are smooth straight styles in *A. subdola* (Burton, 1930), and they are slender, slightly curved, somewhat flexuous styles frequently with one or two successive proximal or subproximal swellings in *A. estacioi* (Table 1).

Another species close to the new one is *A. salicina* Schmidt, 1868, a sponge recently redescribed in Atlantic waters of the Alboran Sea. It is an erect branching sponge, with branches typically narrower at their base than at their distal parts. It is very much more hispid than *A. verrucosa* or *A. polypoides* (Uriz & Maldonado, 1993). These features are absent in *A. estacioi*. There are also very clear differences at the spicular level, especially in the morphology and size of the styles, although *A. salicina* also frequently presents subproximal swellings (Table 1).

Axinella pedunculata Topsent, 1896 has spicular dimensions more similar to *A. estacioi* than all the species

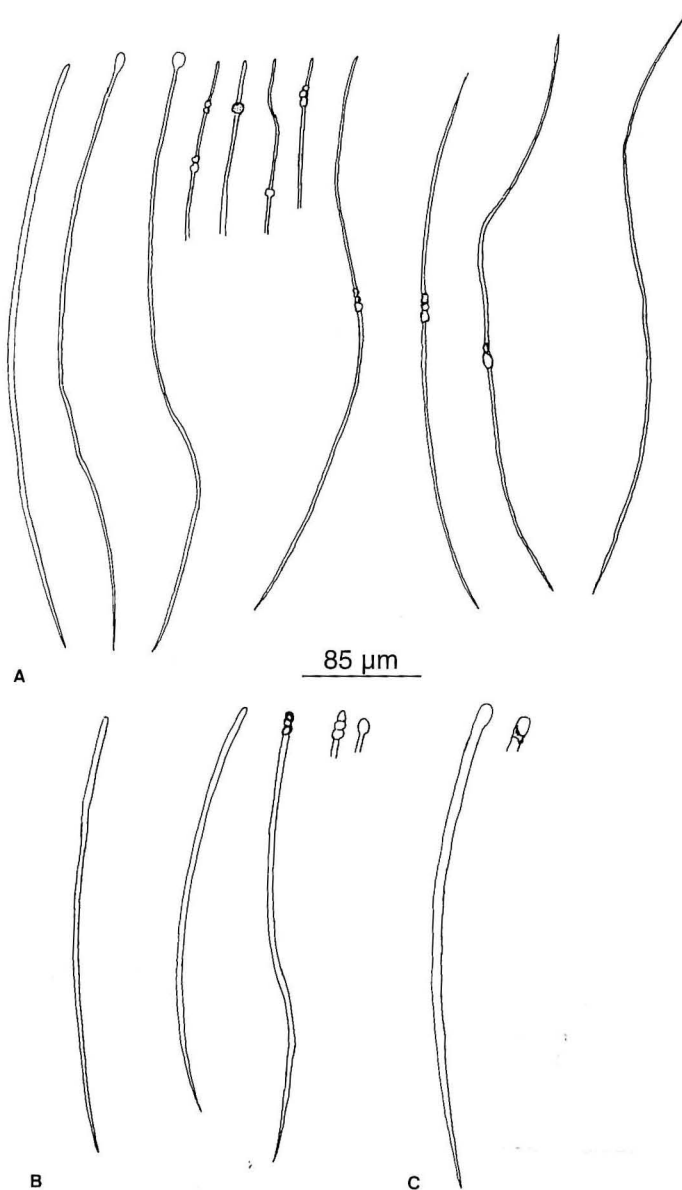


Figure 2 A: Spicules of the branches; B: Spicules of stem; C: Spicules of basal disc.

Figure 2 A: Spicules des branches ; B : Spicule de l'axe ; C : Spicules du disque basal.

swellings. Nevertheless, the form and the size of the styles (always superior to 1200 μm) are markedly different from *A. estacioi* (Table 1).

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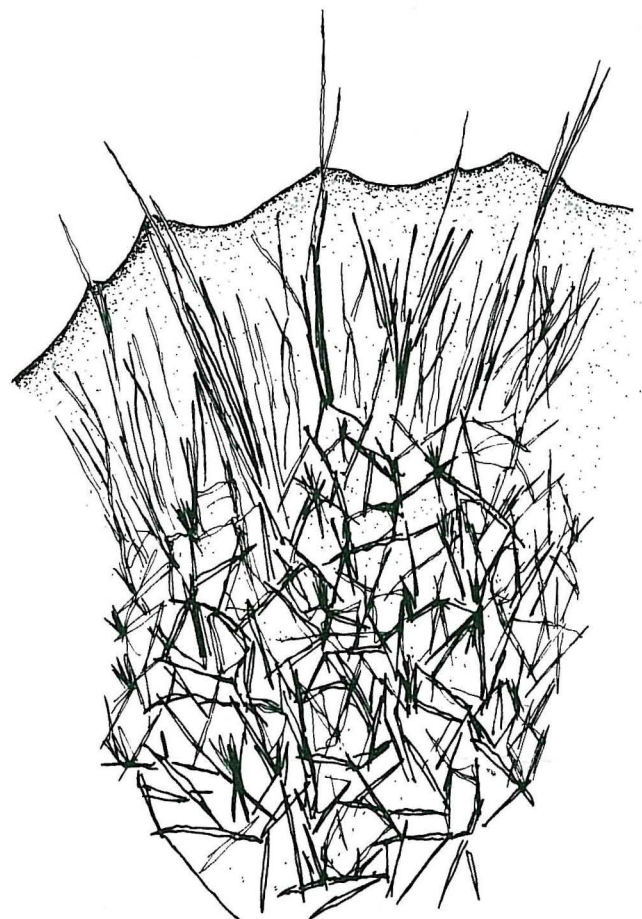


Figure 3. Cross section of a branch showing the skeletal arrangement.

Figure 3. Coupe transversale d'une branche montrant l'arrangement du squelette.

previously discussed. The presence of proximal and subproximal swellings in the styles, the width of the styles, the lack of oxeas, and aspects such as the external form, hispidity and colour, make this species different from *A. estacioi* (Table 1).

The sponge *Axinella centrotylota* Pansini, 1982, later redescribed by Uriz (1984), also presents somewhat flexuous spicules and oxeas which frequently have central

Table 1. Comparative features of *Axinella estacioi* n.sp. and related species.
Tableau 1. Caractères comparés d'*Axinella estacioi* n.sp. et des espèces apparentées.

SPECIES	DISTRIBUTION	HABITATS	EXTERNAL ASPECTS	SPICULES (sizes in μm)
<i>Axinella estacioi</i> n.sp.	Strait of Gibraltar	Sublittoral caves	Erect branching sponge, smooth, bright yellow colour	Oxeas scarce, same morphology and measurements as styles Styles: very thin, curved or flexuous: 197-710 x 1-5
<i>Axinella subdola</i> (Bowerbank, 1866)	British Isles (Bowerbank, 1868; Burton 1930, Ackers <i>et al.</i> , 1992, etc.)	Sublittoral. Found in sheltered and semi-exposed conditions over rocks, or at the bottom of gullies.	Irregularly branching-erect sponge. The branches are circular in cross-section	Styles: smooth, usually straight: 220-510 x 3-6 (Burton, 1930), 270-560 x 5 (Ackers <i>et al.</i> , 1992)
<i>Axinella salicina</i> Schmidt, 1868	Mediterranean Sea Algerian Coast (Schmidt, 1868; Topsent, 1938) Alborán Sea (Uriz & Maldonado, 1993)	Coralligenous biocoenosis between 70-120 m (Uriz & Maldonado, 1993)	Erect branching sponge, very hispid (whitish yellow in alcohol)	Oxeas: 450-915 x 12-22 Styles: 700-1118 x 12-20
<i>Axinella pedunculata</i> Topsent, 1896	Mediterranean Sea Banyuls (Topsent, 1896)	Melobesiae bottoms (Topsent, 1896)	Elongated mass, very hispid, grey colour	Styles: 600-750 x 8-12
<i>Axinella centrotylota</i> Pansini, 1982	Mediterranean Sea Italian Coast (Pansini, 1982) Spanish Mediterranean (Uriz, 1984)	Muddy bathyal bottoms (Uriz, 1984)	Massive (Pansini, 1982) fan-shaped (Uriz, 1984), hispid (whitish yellow in alcohol)	Oxeas: 460-490 x 10-15 (Pansini, 1982); 270-410 x 8-12 (Uriz, 1984) Styles I: 230-350 x 8-12 (Uriz, 1984); 220-360 x 10-15 (Pansini, 1982) Styles II: 560-1350 x 8-13 (Uriz, 1984); 850-1270 x 812 (Pansini, 1982)
<i>Axinella pumila</i> Babic, 1922	Mediterranean Sea and Eastern Atlantic-coast (Boury-Esnault <i>et al.</i> , 1994)	Sublittoral and bathyal bottoms (Boury-Esnault <i>et al.</i> , 1994)	Massive, branches not well defined. Slightly hispid (white in alcohol)	Oxeas: curved, flexuous : 350-520 x 12-15 Styles: thick, straight or slightly curved: 790-1300 x 20-25
<i>Axinella damicornis</i> (Esper, 1794)	Atlanto-Mediterranean (Vacelet, 1960)	From sublittoral rocks to bathyal bottoms (Vacelet, 1960)	Ramose, with flat branches. Very hispid. Light yellow colour.	Oxeas : 262-490 x 4,5-16 Styles : 700-1235 x 7-13
<i>Axinella polypoides</i> Schmidt, 1862	Atlanto-Mediterranean (Vacelet, 1960)	From sublittoral rocks to bathyal bottoms (Vacelet, 1960)	Branching form, very hispid, yellow-orange colour.	Oxeas: 156-292 x 10 Styles: 180-486 x 6

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