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### Raspailiidae (Porifera: Demospongiae: Axinellida) from the Mexican Pacific Ocean with the description of seven new species

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## Raspailiidae (Porifera: Demospongiae: Axinellida) from the Mexican Pacific Ocean with the description of seven new species

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The taxonomy of the family Raspailiidae has always been controversial. The family was first included in the order Poecilosclerida. It was then allocated to the order Axinellida and later moved back to Poecilosclerida. Currently with the development of molecular tools it has been assigned to the order Axinellida. In this contribution we describe 10 species from the Mexican Pacific Ocean. Seven of them are new to science: *Raspailia* (*Parasyringella*) *rubra* sp. nov., *Raspailia* (*Raspaxilla*) *hymani* (Dickinson 1945), *Raspailia* (*Raspaxilla*) *hyle* (de Laubenfels 1930), *Aulospongos cerebella* (Dickinson 1945), *Aulospongos californianus* sp. nov., *Aulospongos aurantiacus* sp. nov., *Eurypon patriciae* sp. nov., *Eurypon tylospinosum* sp. nov., *Eurypon diversicolor* sp. nov. and *Eurypon brunus* sp. nov. We discuss the genus *Eurypon* and include a table for all the species described worldwide with some comments about this genus.

<http://www.zoobank.org/urn:lsid:zoobank.org:pub:D462084B-EE9C-4C61-884A-C9DB70003B4A>

**Keywords:** Porifera; Raspailiidae; Mexican Pacific; new species; taxonomy

### Introduction

The sponges of the family Raspailiidae are characterized by a specialized ectosomal skeleton consisting of small thin styles, oxeas or anisoxeas. The choanosomal skeleton is reticulate, plumoreticulate, axial, extra-axial or hymedesmoid (Hooper 2002). Monactinal or diactinal spicules are coring the primary fibres. Echinating spicules are also present (acanthostyles or microspined rhabdostyles). Microscleres are usually absent, although a few genera have raphides in bundles (trichodragmas) (Hooper 1991).

Hentschel (1923) allocated sponges with sigmas and chelae as microscleres under the name of Raspailiidae. Bergquist (1970) considered that the growth form and the choanosomal skeleton were diagnostic features and recognized two families: Euryponidae and Raspailiidae. These families were allocated to the order Axinellida.

Sponges of the family Euryponidae have a hymedesmoid skeleton, monactines, diactines or tetractines and echinating spicules (genera: *Eurypon*, *Tricheurypon*, *Acantheurypon*). Raspailiidae are characterized by an axial, extra-axial or reticulate skeleton, with monactinal or diactinal choanosomal spicules and echinating acanthostyles (genera: *Raspailia*, *Aulospongos*, *Endectyon* and others) (Bergquist 1970).

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Van Soest et al. (1990) considered the order Axinellida as an artificial group and synonymized it with the order Halichondrida, but they considered Axinellidae as a valid family.

Hooper (1991) stated that the skeletal organization and the presence of echinating acanthostyles was a symplesiomorphic character similar to species of the family Microcionidae. Due to these morphological features, the family Raspailiidae was moved into the suborder Microcionina (order: Poecilosclerida) (Hooper 2002).

Erpenbeck et al. (2007) demonstrated that some genera of the family Raspailiidae were closely related to the family Axinellidae using ribosomal markers. Morrow et al. (2012) used nuclear and mitochondrial markers and resurrected the order Axinellida and included the families: Axinellidae Carter 1875, Raspailiidae Nardo 1833 and Stelligeridae Lendenfeld 1898.

In the Eastern Pacific there are few taxonomic studies of the family Raspailiidae and/or of the order Axinellida (de Laubenfels 1932; Dickinson 1945; Desqueyroux-Faundez and van Soest 1997; van Soest et al. 2012a). In this study we describe 10 species of this family from the Mexican Pacific Ocean, seven of them are new to science: *Raspailia (Parasyringella) rubra* sp. nov., *Raspailia (Raspaxilla) hymani* (Dickinson 1945), *Raspailia (Raspaxilla) hyle* (de Laubenfels 1930), *Aulospongius cerebella* (Dickinson 1945), *Aulospongius californianus* sp. nov., *Aulospongius aurantiacus* sp. nov., *Eurypon patriciae* sp. nov., *Eurypon tylospinosum* sp. nov., *Eurypon diversicolor* sp. nov. and *Eurypon brunus* sp. nov. Based on the literature we discuss the genus *Eurypon* and consider that there are some species assigned to this genus that do not have its morphological features.

## Material and methods

Specimens from shallow waters were collected by snorkelling, diving and by bottom trawling in deeper waters from the Mexican Pacific. Sponges were fixed in 4% formaldehyde and transferred to 70% ethanol for preservation. Spicule and skeleton preparation for light and scanning electron microscopy followed the techniques described by Boury-Esnault and Rützler (1997). Twenty-five spicules of each different category chosen at random were measured for each specimen. The minimum-(average)-maximum measurement for each spicule category was calculated.

Holotypes and paratypes were deposited in the Museo de Ciencias Naturales de Madrid (MCNM), and in the “Colección de Esponjas del Pacífico Mexicano” (LEB-ICML-UNAM). Additional material from the Los Angeles County Museum (LACM) and the Allan Hancock Foundation (AHF) was also examined.

## Results

Order **AXINELLIDA** Lévi, 1973  
 Family **RASPAILIIDAE** Nardo, 1833  
 Subfamily **RASPAILIINAE** Nardo, 1833  
 Genus *Raspailia* Nardo, 1833  
 Subgenus *Parasyringella* Topsent, 1928  
*Raspailia (Parasyringella) rubra* sp. nov.  
 (Figures 1A, 2, 3)

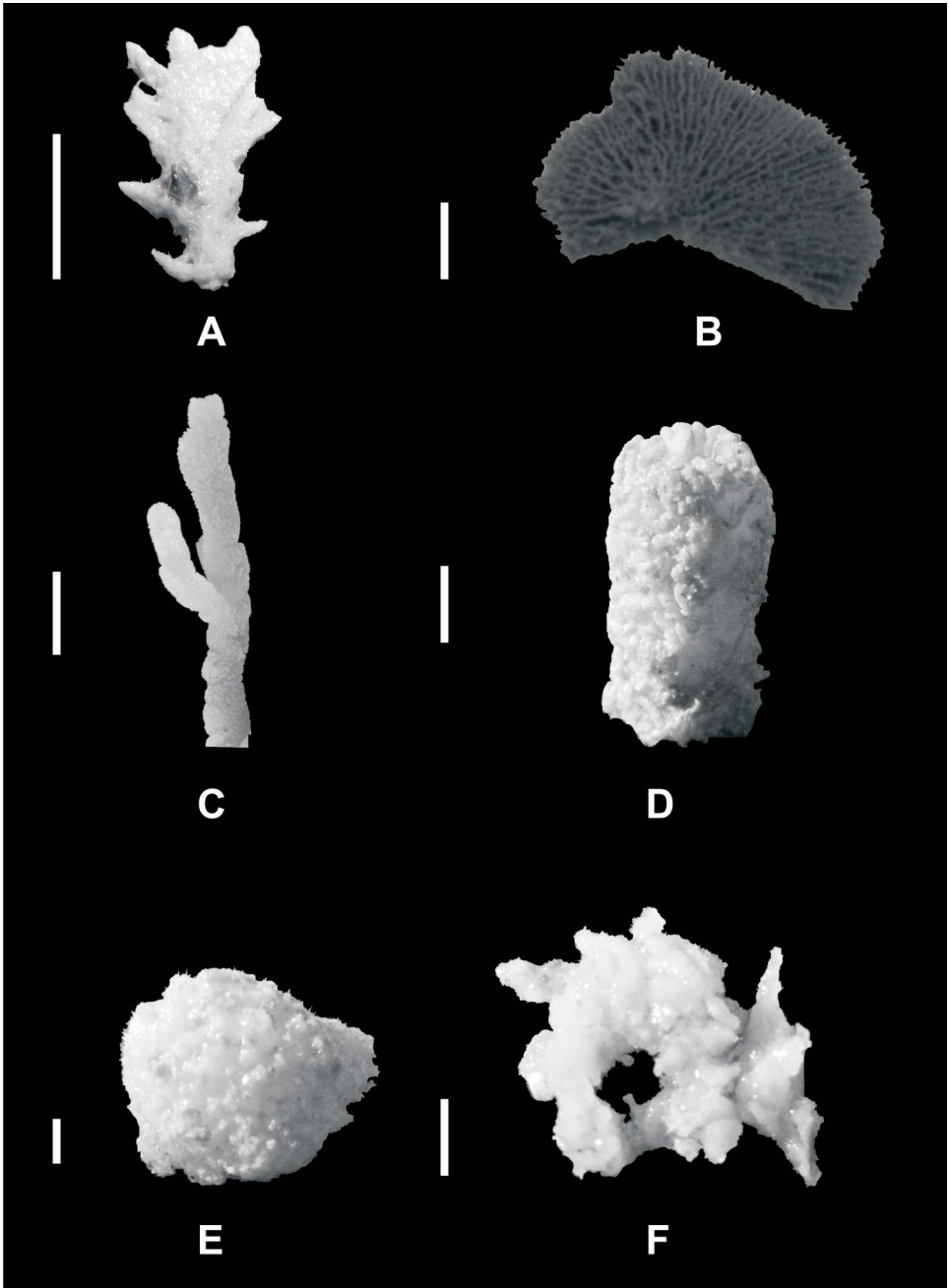


Figure 1. Photographs of preserved sponges from this study. (A) *Raspailia (Parasyringella) rubra* sp. nov. (B) *Raspailia (Raspaxilla) hymani* (Dickinson 1945). (C) *Raspailia (Raspaxilla) hyle* (de Laubenfels 1930). (D) *Aulospongus cerebella* (Dickinson 1945). (E) *Aulospongus californianus* sp. nov. (F) *Aulospongus aurantiacus* sp. nov. Scale bars: 1 cm (A, D, F); 2 cm (C, E); 4 cm (B).

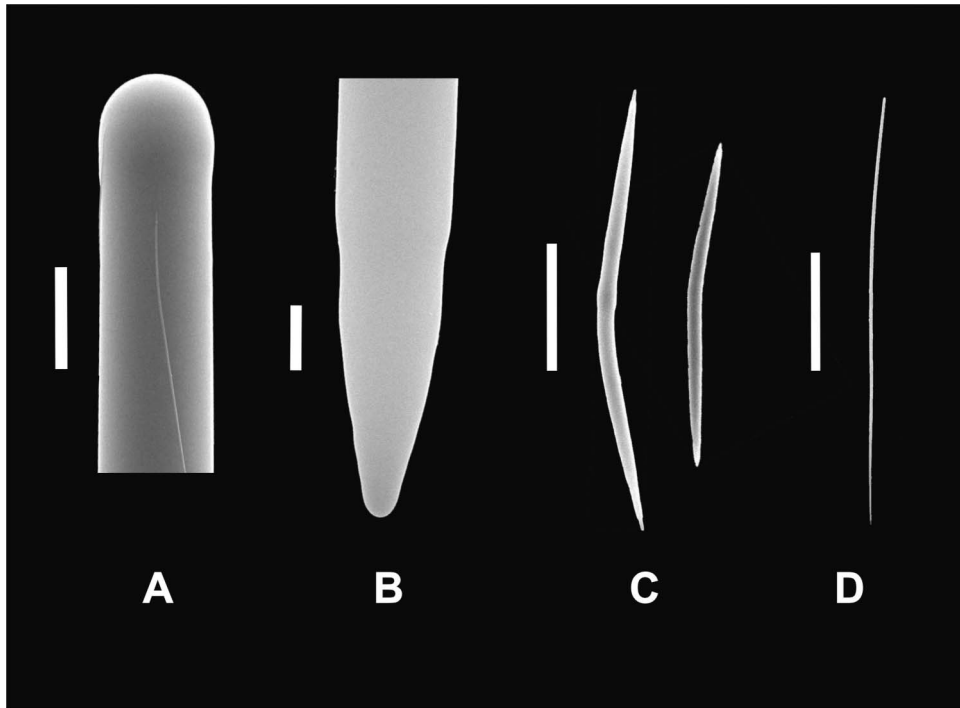


Figure 2. *Raspailia (Parasyringella) rubra* sp. nov. Scanning electron microscopy images of spicules. (A) Extra-axial style head; (B) extra-axial style end; (C) choanosomal oxoas; (D) ectosomal style. Scale bars: 4  $\mu\text{m}$  (A), 10  $\mu\text{m}$  (B), 50  $\mu\text{m}$  (C), 100  $\mu\text{m}$  (D).

#### *Material examined*

Holotype: MCNM 1.01/655, 11/10/2006, Isla Redonda (Marietas Nayarit) 13 m (20°42'04" N, 105°34'31" W). Paratype: 1601-LEB-ICML-UNAM, 11/10/2006, Isla Redonda (Marietas Nayarit) 11 m (20°42'04" N, 105°34'31" W).

#### *Description*

Fragment of a ramified sponge 3 cm thick at the base and 6 cm high. Oscules and ostia not observed. Surface hispid with the points of the ectosomal styles protruding above the surface (Figure 3D). Rounded lobes evenly distributed (8 mm in diameter). Consistency fleshy and difficult to tear. Colour in life red, white in preservation (Figure 1A).

#### *Skeleton*

Choanosomal fusiform oxoas: 165–250  $\times$  5–12  $\mu\text{m}$  (Figures 2C, 3B). Straight ectosomal extra-axial styles: 1020–1445  $\times$  5–10  $\mu\text{m}$  (Figures 2A, B, 3A). Ectosomal anisoxeas/styles: 210–390  $\times$  1.25–2.5  $\mu\text{m}$  (Table 1) (Figures 2D, 3C). The ectosomal skeleton is a dense layer (30  $\mu\text{m}$  thick) of bundles of anisoxeas/styles. There is an extra-axial skeleton formed by multispicular styles with the points protruding

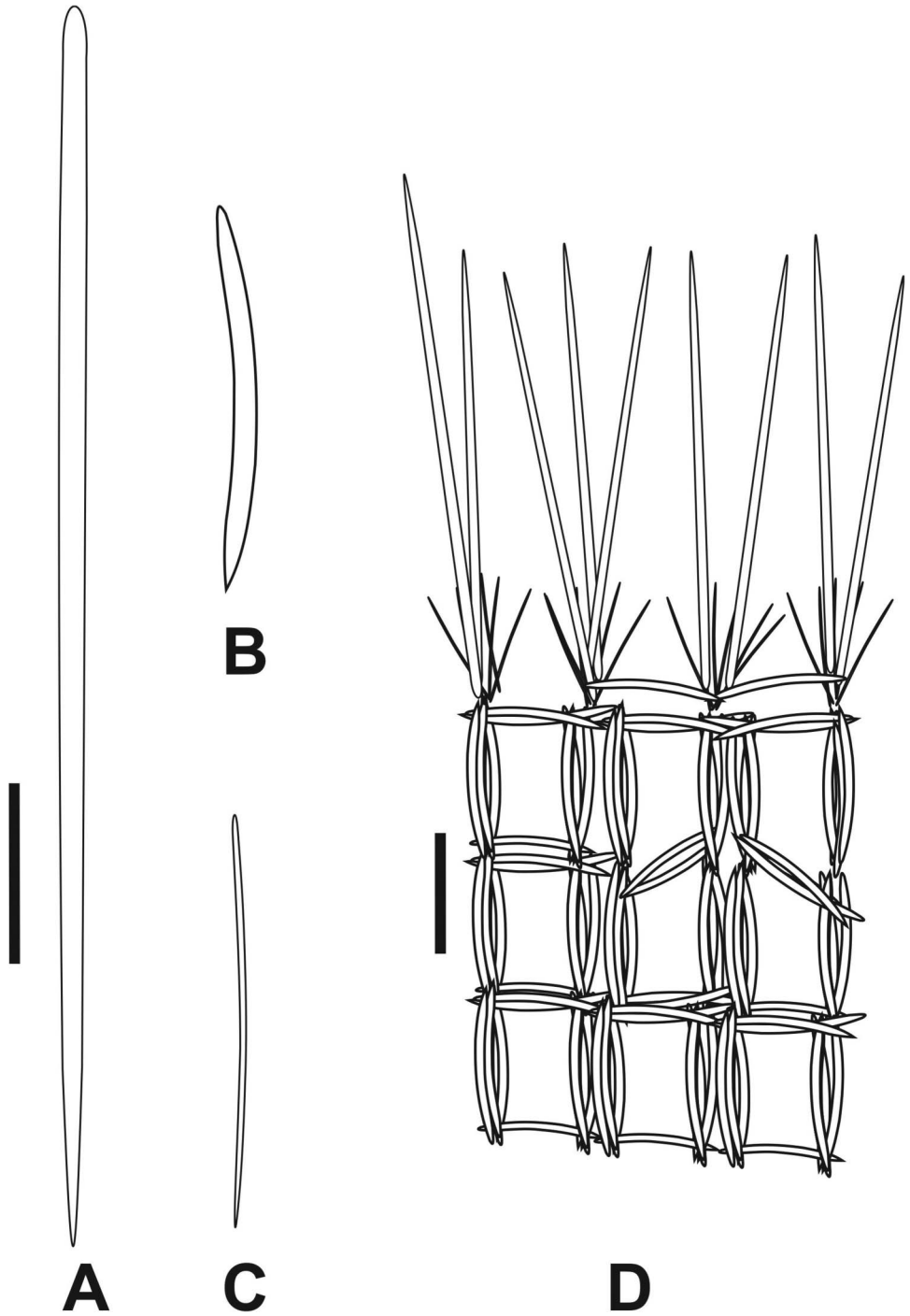


Figure 3. Drawings of *Raspailia* (*Parasyringella*) *rubra* sp. nov. (A) Extra-axial style straight; (B) choanosomal oxea; (C) ectosomal style/anisoxeas; (D) ectosomal skeleton (extra-axial) and choanosomal skeleton (axial). Scale bars: 80  $\mu\text{m}$  (A–C), 120  $\mu\text{m}$  (D).

Table 1. Spicule measurements of *Raspailia* (*Parasyringella*) *rubra* sp. nov. in  $\mu\text{m}$ .

Material examined	Oxeas (Length $\times$ Width)	Extra-axial styles (Length $\times$ Width)	Ectosomal anisoxeas/styles (Length $\times$ Width)
MCNM 1.01/655	175–(200.1)–245 $\times$ 5–(7.9)–12.5	1200–(1300.5)–1410 $\times$ 5–(7.9)–10	235–(310.6)–340 $\times$ 1.25–(1.9)–2.5
LEB-1601	165–(202.7)–250 $\times$ 5–(8.3)–12.5	1020–(1289.4)–1445 $\times$ 5–(8.6)–10	210–(322.1)–390 $\times$ 1.25–(2.1)–2.5

externally in the ectosomal layer. The choanosomal axial skeleton is formed by primary multispicular fibres (60–100  $\mu\text{m}$  thick) interconnected by secondary bispicular or multispicular fibres (15–45  $\mu\text{m}$  thick). The reticulum forms quadrangular irregular meshes (120–160  $\mu\text{m}$ ) (Figure 3D).

#### Remarks

*Raspailia* (*Parasyringella*) *rubra* sp. nov. constitutes the first record of the subgenus in the Eastern Pacific. Species of the subgenus *Parasyringella* are characterized by an axial extra-axial skeleton (Hooper 2002) and bearing choanosomal spicules, styles or oxeas (Table 2). The species assigned to this subgenus with oxeas as choanosomal spicules are: *R. (Parasyringella) elegans* (Lendenfeld 1887) and *R. (Parasyringella) nuda* Hentschel 1911. *Raspailia (Parasyringella) elegans* is an orange planar or biplanar fan sponge from the north-western coast of Australia (Hooper 1991). It has choanosomal oxeas (176–275  $\times$  4–11  $\mu\text{m}$ ), extra-axial styles (478–830  $\times$  2–5  $\mu\text{m}$ ) and ectosomal oxeas (108–164  $\times$  1.5–3.5  $\mu\text{m}$ ). The extra-axial styles are longer in *R. (Parasyringella) rubra* sp. nov. than in *R. (Parasyringella) elegans* (Table 2). Besides, there are some differences in the morphology and length of the ectosomal spicules (ectosomal oxeas in *R. (Parasyringella) elegans* versus ectosomal styles/anisoxeas in *Raspailia (Parasyringella) rubra* sp. nov.). *Raspailia (Parasyringella) nuda* Hentschel 1911 is an orange arborescent or stipitate sponge described from Australia (Hooper 1991). It has choanosomal oxeas/anisoxeas (260–640  $\times$  7–24  $\mu\text{m}$ ), subectosomal styles (820–1673  $\times$  9–16  $\mu\text{m}$ ) and ectosomal oxeas/anisoxeas (243–472  $\times$  1.5–7  $\mu\text{m}$ ). The choanosomal oxeas are longer in *R. (Parasyringella) nuda* than in *R. (Parasyringella) rubra* sp. nov.

#### Etymology

Named *rubra* which means red in Latin.

Subgenus *Raspaxilla* Topsent, 1913  
*Raspailia (Raspaxilla) hymani* (Dickinson, 1945)  
(Figures 1B, 4, 5)

*Hemectyon hymani* Dickinson, 1945; Green and Bakus, 1994:41–42.  
*Aulospongus hymani* Desqueyroux-Faúndez and van Soest, 1997:442.  
*Raspailia (Raspaxilla) hymani* Hooper et al. 1999:685–687.  
*Endectyon (Endectyon) hymani* Lee et al. 2007:35.



Table 2. Comparative table of all the *Raspailia* (*Parasyringella*) species described worldwide. Spicules measurements in  $\mu\text{m}$ .

Species	Choanosomal spicules (Length $\times$ Width)	Extra-axial spicules (Length $\times$ Width)	Ectosomal spicules (Length $\times$ Width)	Shape, colour, locality and depth
<i>R. (Parasyringella) agnata</i> (Topseint 1896)	Styles: 300 $\times$ 14	Styles: 1 250 $\times$ 20	Tornotes: 310 $\times$ 3	Stipitate, ramose. Yellow. West Coast of France. 40–50 m
<i>R. (Parasyringella) australiensis</i> (Ridley 1884)	Styles: 232–524 $\times$ 5–9	Style: 514–1355 $\times$ 9–25	Styles/anisoxeas: 96–392 $\times$ 0.5–5	Cylindrical shape. Beige preserved. Darwin, Great Barrier Reef.
*Hooper (1991)				7–21 m
<i>R. (Parasyringella) cervicornis</i> Burton (1948)	Styles: 1000 $\times$ 14	Styles: 500 $\times$ 14	Styles: 200–350 $\times$ 4–5	Erect, stipitate. Brown or dark yellow.
<i>R. (Parasyringella) clathrata</i> (Ridley 1884)	Styles: 155–348 $\times$ 2–5	Styles: 581–832 $\times$ 4–12	Not reported	Congo, Africa. Depth unknown
*Hooper (1991)				Stipitate, ramose. Grey preserved.
<i>R. (Parasyringella) elegans</i> (Lendenfeld 1887)	Oxeas: 176–275 $\times$ 4–11	Styles: 478–830 $\times$ 2–5	Oxeas: 108–164 $\times$ 1.5–3.5	Torres Strait Queensland Australia. 22 m
*Hooper (1991)				Planar or biplanar fan. Pale orange.
<i>R. (Parasyringella) falcifera</i> Topseint (1890)	Tylostyles: 615 $\times$ 26	Not reported	Not reported	Northwest of Australia, Torres. 0–85 m
<i>R. (Parasyringella) humilis</i> (Topseint 1892)	Tylostyles: 1000 $\times$ 40	Tylostyles: 400–600	Not reported	Ramose. Yellow. Pico and San Jorge. Azores. 318 m
<i>R. (Parasyringella) nuda</i> (Hentschel 1911)	Oxeas/anisoxeas: 260–640 $\times$ 7–24	Styles: 820–1673 $\times$ 9–16	Oxeas/anisoxeas: 243–472 $\times$ 1.5–7	Ramose. Grey. Pico and San Jorge. Azores. 1300 m
*Hooper (1991)				Stipitate, arborescent. Dark orange.
<i>R. (Parasyringella) stelliderma</i> (Carter 1885)	Styles/oxeas: 252–595 $\times$ 2–6	Styles/anisoxeas: 364–811 $\times$ 4–10	Styles/anisoxeas: 205–451 $\times$ 2–6	North and Western of Australia. 6–12 m Stipitate, ramose. Ochre. Port Phillip Australia. 20–40 m

\*Additional information from the original description.



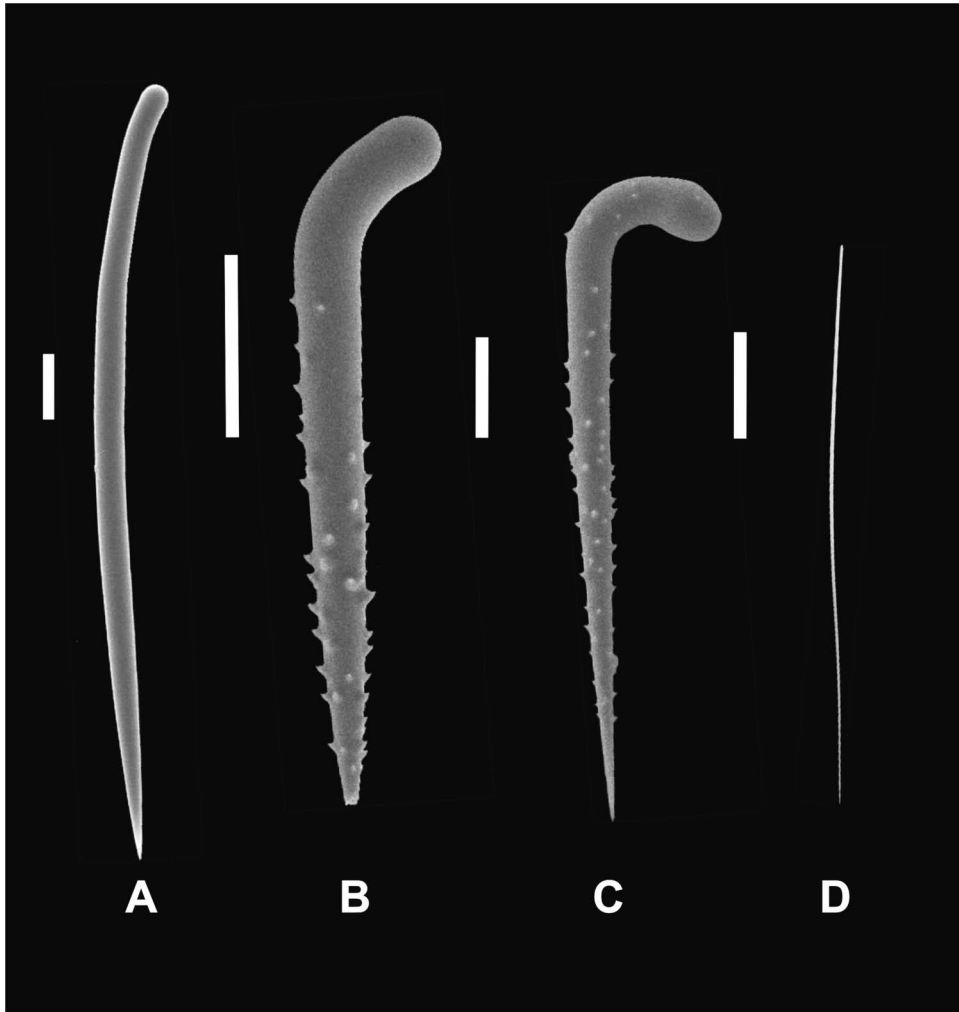


Figure 4. *Raspailia (Raspaxilla) hymani* (Dickinson 1945). Scanning electron microscopy images of spicules. (A) Choanosomal style; (B) rhabdostyle microspined I; (C) rhabdostyle microspined II; (D) ectosomal style. Scale bars: 60  $\mu\text{m}$  (A), 100  $\mu\text{m}$  (B, D), 40  $\mu\text{m}$  (C).

#### *Material examined*

Holotype: L35546 D-37, 03/03/1937, Isla Partida Cabo San Lucas (MEX) 138 m VELERO 618–37 (No data). AHF-R-213 (Dickinson 1945). Additional material: AHF-R-214; 26/02/1941, Isla Cedros Baja California (MEX) 28°5.7' N, 15°31.2' W, R/V VELERO III 117–119 m.

#### *Description*

Fan-shaped sponge 8–10 cm high and 3–6 cm in diameter. Surface hispid with unevenly distributed spicule projections. Oscules and ostia not observed. Consistency hard and difficult to tear. Colour in preservation green or yellow (Figure 1B).

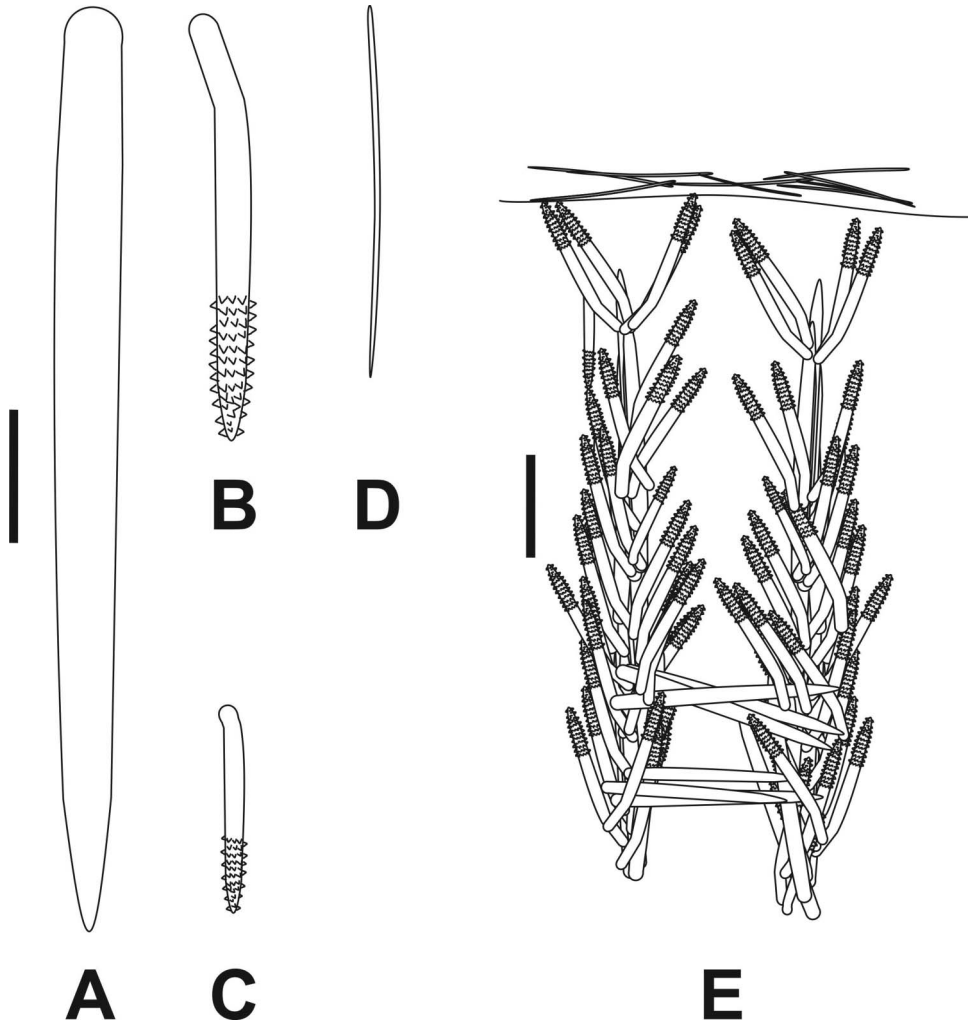


Figure 5. Drawings of *Raspailia* (*Raspaxilla*) *hymani* (Dickinson 1945). (A) Choanosomal style; (B) rhabdostyles microspined I; (C) rhabdostyles microspined II; (D) ectosomal style thin; (E) ectosomal skeleton (extra-axial) and choanosomal skeleton (axial). Scale bars: 100  $\mu\text{m}$  (A–D), 250  $\mu\text{m}$  (E).

### *Skeleton*

Straight or curved choanosomal styles: 1150–1720  $\times$  25–50  $\mu\text{m}$  (Figures 4A, 5A). Microspined rhabdostyles in two categories: the first long, curved and with prominent spines: 280–560  $\times$  25–40  $\mu\text{m}$  (Figures 4B, 5B); the second curved, with a pronounced head and with short spines: 130–260  $\times$  7.5–15  $\mu\text{m}$  (Figures 4C, 5C). Straight and curved ectosomal styles: 235–425  $\times$  1.75–2.5  $\mu\text{m}$  (Table 3) (Figures 4D, 5D). The ectosomal skeleton is a dense layer of spongin (100  $\mu\text{m}$  thick). The styles are dispersed with no special organization. There is a subectosomal extra-axial compressed skeleton formed by the rhabdostyles with the points protruding externally. The choanosomal

Table 3. Spicule measurements of *Raspailia* (*Raspaxilla*) *hymani* (Dickinson 1945) in  $\mu\text{m}$ .

Material examined	Styles (Length $\times$ Width)	Rhabdostyles microspined (Length $\times$ Width)	Ectosomal styles (Length $\times$ Width)
AHF-618-37	1150-(1484.6)-1720 $\times$ 25-(32.5)-45	1) 280-(371.9)-460 $\times$ 25-(30.7)-40 2) 130-(189.6)-260 $\times$ 7.5-(10.6)-15	235-(302.6)-380 $\times$ 1.75-(2.2)-2.5
AHF-R-213	1310-(1514.6)-1620 $\times$ 25-(36.8)-50	1) 340-(390.9)-560 $\times$ 30-(33.8)-40 2) 130-(171.4)-225 $\times$ 7.5-(11.6)-15	360-(393.5)-425 $\times$ 1.75-(2.1)-2.5

skeleton has an axial organization of primary multispicular ascendant fibres (300–600  $\mu\text{m}$  thick) interconnected by secondary multispicular fibres (100–250  $\mu\text{m}$  thick). The reticulum forms rectangular irregular meshes (200–300  $\mu\text{m}$ ). The rhabdostyles II are echinating the primary fibres (Figure 5E).

#### Remarks

*Raspailia* (*Raspaxilla*) *hymani* (Dickinson 1945) is a deep-sea species from the West Pacific coast of the Baja California Peninsula. The holotype was considered lost by Hooper et al. (1999), but this material was found in the Allan Hancock Collection. Dickinson (1945) reported one category of rhabdostyles; however, the material examined (including the holotype) has two categories. This species was originally described in the genus *Hemectyon* (Dickinson 1945), but Desqueyroux-Faúndez and van Soest (1997) moved this species into the genus *Aulospongus*. Later, Hooper et al. (1999) transferred this species to the subgenus *Raspaxilla* (genus *Raspailia*). The morphological difference between these genera is the choanosomal skeleton: axial extra-axially compressed in *Raspailia* (*Raspaxilla*) and a reticulum of compressed primary fibre bundles in *Aulospongus*.

#### *Raspailia* (*Raspaxilla*) *hyle* (de Laubenfels, 1930) (Figures 1C, 6, 7)

*Hemectyon hyle* de Laubenfels, 1930, 1932; Dickinson, 1945; Bakus and Green, 1987; Green and Bakus, 1994:39–40.

*Aulospongus hyle* Desqueyroux-Faúndez and van Soest, 1997:442.

*Raspailia* (*Raspaxilla*) *hyle* Hooper et al. 1999:685.

*Endectyon* (*Endectyon*) *hyle* Lee et al. 2007:33, 115, 189.

*Holotype*: USNM 21418, 16/02/1924, Puerto Fermín, San José (California, USA) 30–150 m.

#### Material Examined

L35609 D-17, 04/04/1935, Off Los Frailes Baja California (MEX) 10–28 m VELERO STATION AHF 751–37 (Dickinson 1945).

#### Description

Ramose sponge with peduncle 3 cm thick and 8 cm high. Two prominent branches 2 cm in diameter and 1–3 cm long. Uneven surface with rounded lobes (1–2 mm long

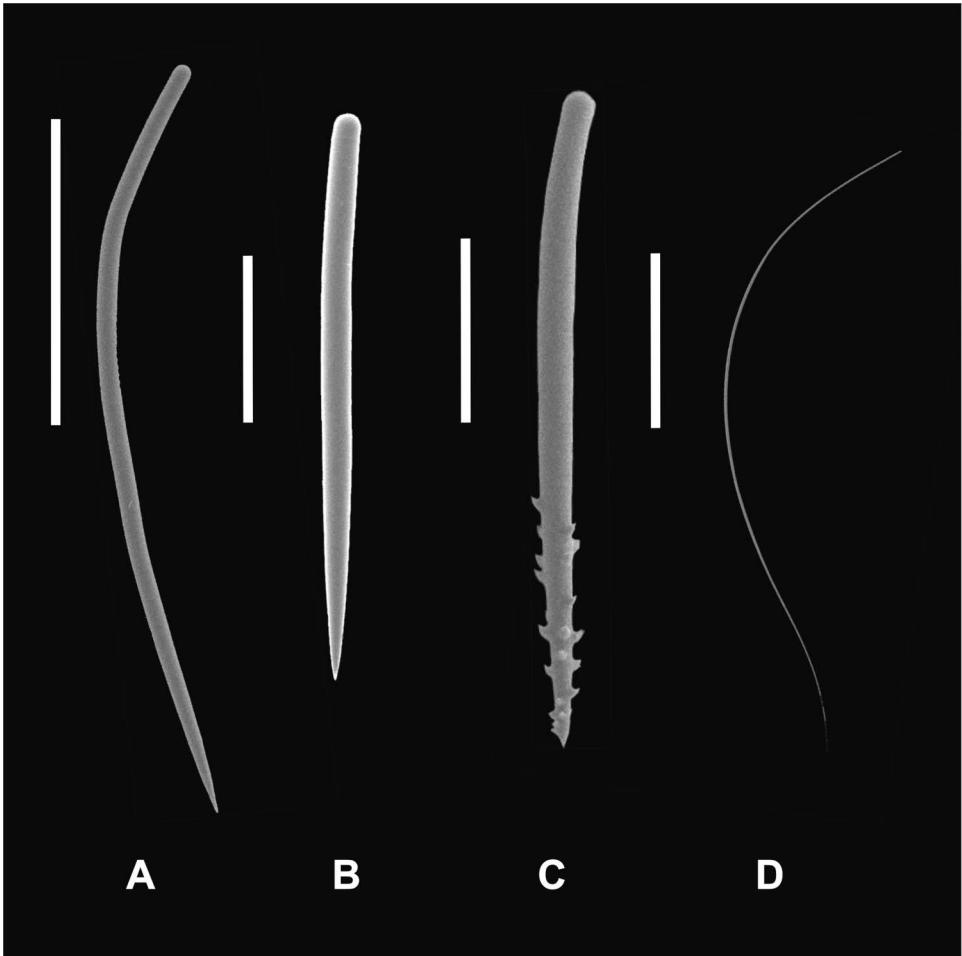


Figure 6. *Raspailia (Raspaxilla) hyle* (de Laubenfels 1930). Scanning electron microscopy images of spicules. (A) Subectosomal style curved; (B) choanosomal style straight; (C) rhabdostyle microspined; (D) ectosomal style curved and thin. Scale bars: 100  $\mu\text{m}$  (A, B, D), 60  $\mu\text{m}$  (C).

and 1.3 mm high) evenly distributed. Oscules and ostia not visible. Consistency hard and difficult to tear. Colour in preservation pale beige (Figure 1C).

#### *Skeleton*

Straight choanosomal styles: 500–780  $\times$  15–20  $\mu\text{m}$  (Figures 6B, 7A). Curved subectosomal styles: 765–1200  $\times$  8–20  $\mu\text{m}$  (Figures 6A, 7C). Rhabdostyles microspined curved with prominent spines: 230–400  $\times$  10–20  $\mu\text{m}$  (Figures 6C, 7C). These spines are localized in the terminal third of the rhabdostyles. Curved ectosomal styles: 230–395  $\times$  1.75–2.5  $\mu\text{m}$  (Figures 6D, 7D) (Table 4). The ectosomal skeleton is a dense layer of styles (30–50  $\mu\text{m}$  thick). There is a subectosomal extra-axial skeleton formed by the styles with the points of the spicules protruding externally.

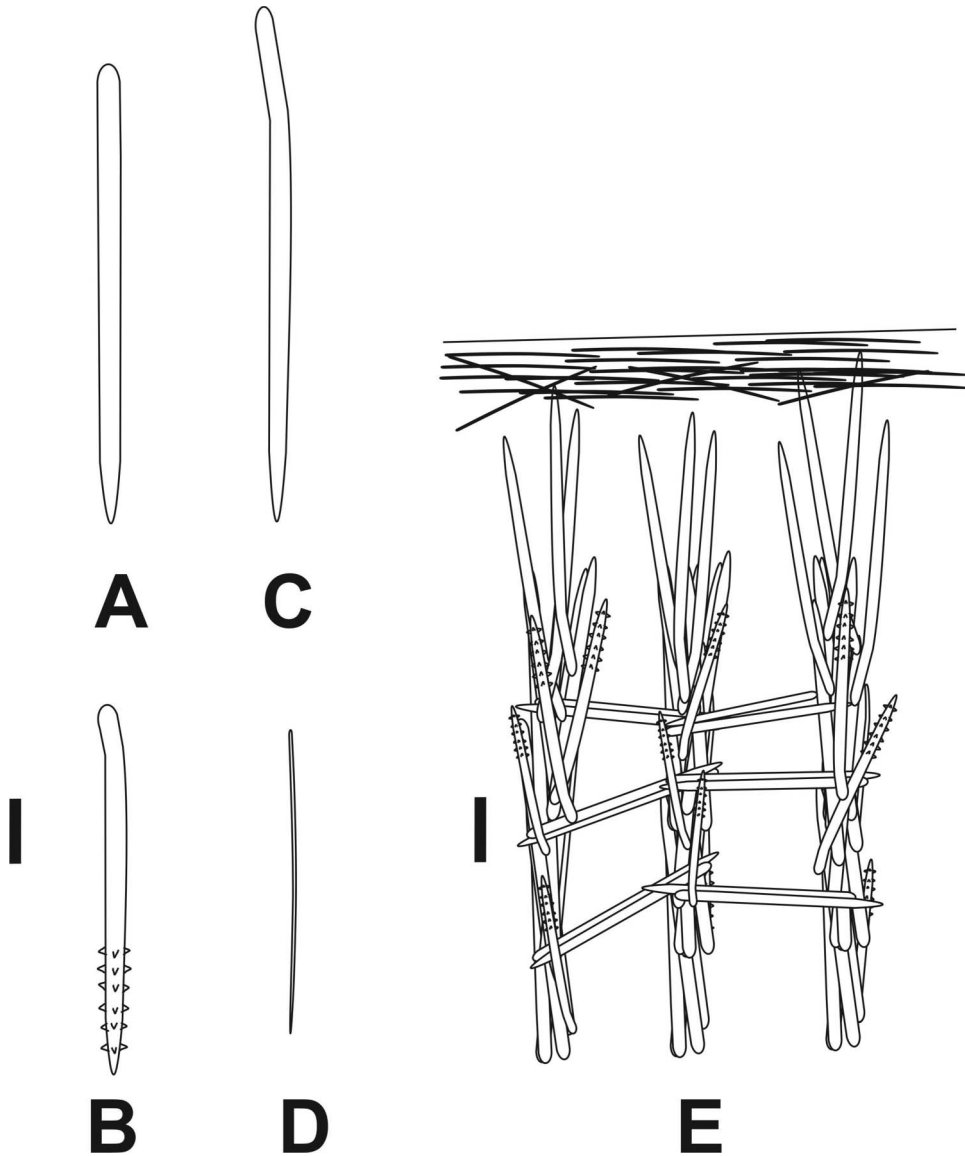


Figure 7. Drawings of *Raspailia* (*Raspaxilla*) *hyle* (de Laubenfels 1930). (A) Choanosomal style straight; (B) rhabdostyle microspined; (C) subectosomal style curved; (D) ectosomal style thin; (E) ectosomal skeleton (extra-axial) and choanosomal skeleton (axial). Scale bars: 40  $\mu\text{m}$  (A-E), 120  $\mu\text{m}$  (F).

The choanosomal skeleton has an axial compressed skeleton formed by primary ascending multispicular fibres (200–300  $\mu\text{m}$  thick) interconnected by bispicular or multispicular secondary fibres (20–40  $\mu\text{m}$  thick). The reticulum forms rectangular irregular meshes (100–120  $\mu\text{m}$ ). Rhabdostyles are echinating the primary fibres (Figure 7E).

Table 4. Spicule measurements of *Raspailia* (*Raspaxilla*) *hyle* (de Laubenfels 1930) in  $\mu\text{m}$ . + Spicule measurements from the original description.

Material examined	Choanosomal styles (Length $\times$ Width)	Subectosomal styles (Length $\times$ Width)	Rhabdostyles microspined (Length $\times$ Width)	Ectosomal styles (Length $\times$ Width)
AHF-751-37	500-(630.8)-780 $\times$ 15-(17.8)-20	765-(1010)-1200 $\times$ 8-(16.4)-20	230-(344.2)-400 $\times$ 10-(13.7)-20	210-(323.2)-395 $\times$ 1.7-(1.9)-2.5
De Laubenfels (1932)+	1) 430–550 $\times$ 15–20 2) 350–370 $\times$ 16–19	800 $\times$ 10	180–320 $\times$ 12–20	200–330 $\times$ 2
Dickinson (1945)+	480 $\times$ 18	>1000	180 $\times$ 12	250 $\times$ 2
Bakus and Green (1987)+	260–620 $\times$ 2–7	380–1045 $\times$ 12–25	106–420 $\times$ 6–34	72–180 $\times$ 1–4
Green and Bakus (1994)+	280–680 $\times$ 8–31	1125–2200 $\times$ 18–34	340–480 $\times$ 23–36	310–550 $\times$ 1–5
Hooper et al. (1999)+	322–585 $\times$ 12–19	715–1560 $\times$ 9–16	155–364 $\times$ 9–22	165–385 $\times$ 0.8–1.5

### Remarks

*Raspailia* (*Raspaxilla*) *hyle* (de Laubenfels 1930) is distributed along the West Pacific coast of Baja California Peninsula and the Pacific coast of the USA. This species was originally described in the genus *Hemectyon* for bearing rhabdostyles with prominent spines (de Laubenfels 1930). Currently, *Hemectyon* is considered a subgenus of the genus *Endectyon* (Hooper 2002). Hooper et al. (1999) moved this species into the subgenus *Raspaxilla* (genus: *Raspailia*) because of the axial extra-axial skeleton.

Genus *Aulospongus* Norman, 1878  
*Aulospongus cerebella* (Dickinson, 1945)  
(Figures 1D, 8, 9)

*Heterectya cerebella* Dickinson, 1945:22.

*Aulospongus cerebella* Desqueyroux-Faúndez and van Soest, 1997; Hooper et al. 1999:654–656.

### Material examined

Holotype: L 355667, 09/03/1936, D-4 Isla Partida Gulf of California (MEX) 83 m VELERO AHF-559–36 (Dickinson 1945). *Additional material*: LACM, 1941–3; 26/02/1941, Isla Cedros, Baja California (MEX) 28°5.7' N, 115°31.2' W, 117–119 m R/V VELERO III. AHF-1253–41. 2059-LEB-ICML-UNAM, 11/04/2011, Station 32 Talud XIV (Gulf of California, MEX) 122 m (27°56'13" N, 111°19'44" W).

### Description

Tubular sponge from 3 to 8 cm high and 2 cm thick with an apical oscule (6 mm long). Ostia not visible. Surface hispid with spicule projections (600–1200  $\mu\text{m}$ ) evenly distributed in the body. Consistency flexible and difficult to tear. Colour in preservation pale beige (Figure 1D).

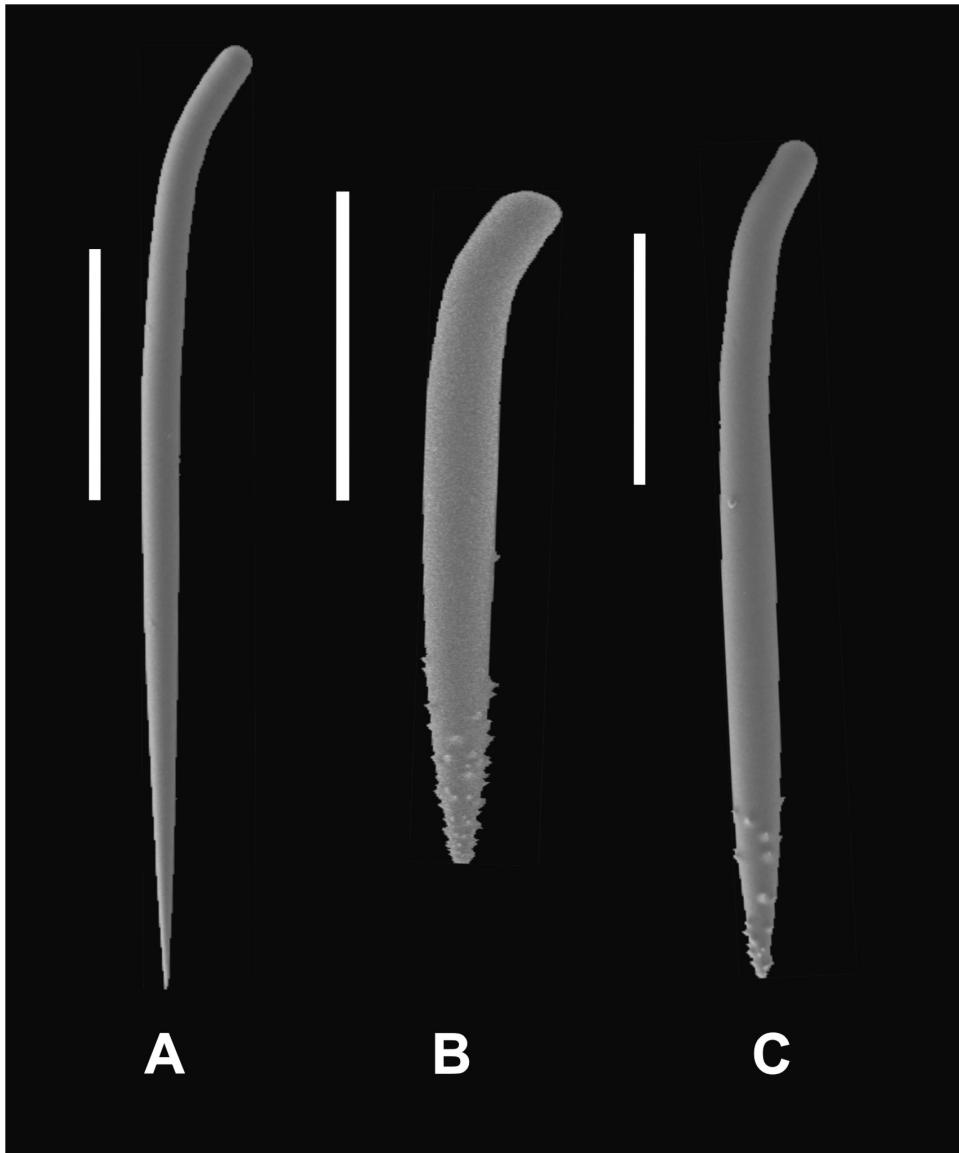


Figure 8. *Aulospongia cerebella* (Dickinson 1945). Scanning electron microscopy images of spicules. (A) Choanosomal style; (B) rhabdostyle microspined thick; (C) rhabdostyle microspined thin. Scale bars: 90  $\mu\text{m}$  (A), 100  $\mu\text{m}$  (B, C).

#### *Skeleton*

Straight or curved choanosomal styles: 300–720  $\times$  30–45  $\mu\text{m}$  (Figures 8A, 9A). Rhabdostyles microspined with prominent spines: 275–470  $\times$  20–35  $\mu\text{m}$  (Figures 8B, C, 9B) (Table 5). The spines are localized on the terminal third of this spicule. The ectosomal skeleton is a dense layer of spongin (100–120  $\mu\text{m}$  thick) with



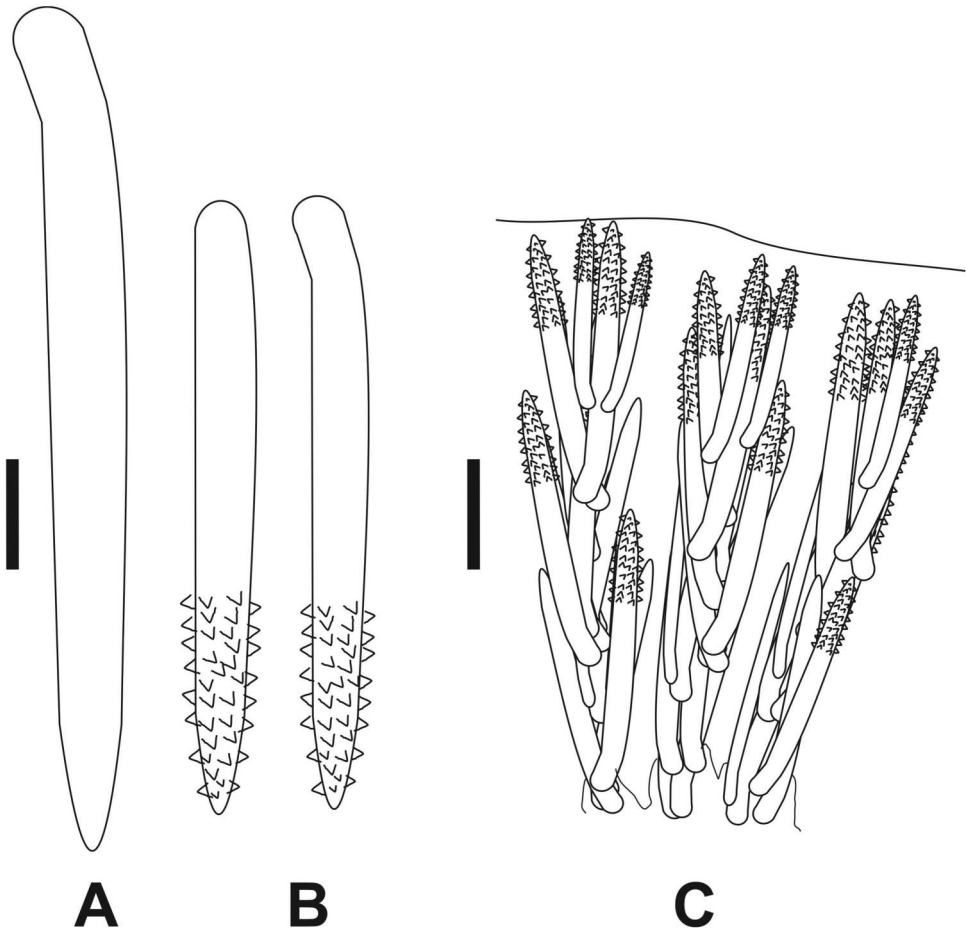


Figure 9. Drawings of *Aulospongus cerebella* (Dickinson 1945). (A) Choanosomal style; (B) rhabdostyle microspined; (C) choanosomal skeleton (ascending fibre bundles). Scale bars: 45  $\mu\text{m}$  (A, B), 120  $\mu\text{m}$  (C).

Table 5. Spicule measurements of *Aulospongus cerebella* (Dickinson 1945) in  $\mu\text{m}$ .

Material examined	Rhabdostyles microspined (Length $\times$ Width)	Rhabdostyles smooth (Length $\times$ Width)
AHF-559-36	275-(331.6)-430 $\times$ 20-(26.8)-35	300-(437.5)-650 $\times$ 30-(37.25)-45
LACM 1941-3	300-(377.2)-460 $\times$ 20-(26.7)-30	400-(481.5)-570 $\times$ 30-(38.7)-45
LEB-2059	310-(380.7)-470 $\times$ 20-(25.1)-30	410-(577.8)-720 $\times$ 30-(40.1)-45

the points of the spicules protruding externally. The choanosomal skeleton has a plumose structure formed by ascending multispicular fibre bundles (100–200  $\mu\text{m}$  thick). The points of the spicules are inside the fibres or protruding externally (Figure 9C).

*Remarks*

*Aulospongos cerebella* (Dickinson 1945) is a deep-sea species from the Gulf of California and West Pacific coast of Baja Peninsula. Hooper et al. (1999) considered that the holotype was lost. However, the type material was found in the Allan Hancock Collection.

*Aulospongos californianus* sp. nov.  
(Figures 1E, 10, 11)

*Material examined*

Holotype: MCNM 1.01/656, 11/04/2011, Station 32 Talud XIV (Gulf of California, MEX) 122 m (27°56'13" N, 111°19'44" W). Paratypes: 2060-LEB-ICML-UNAM,

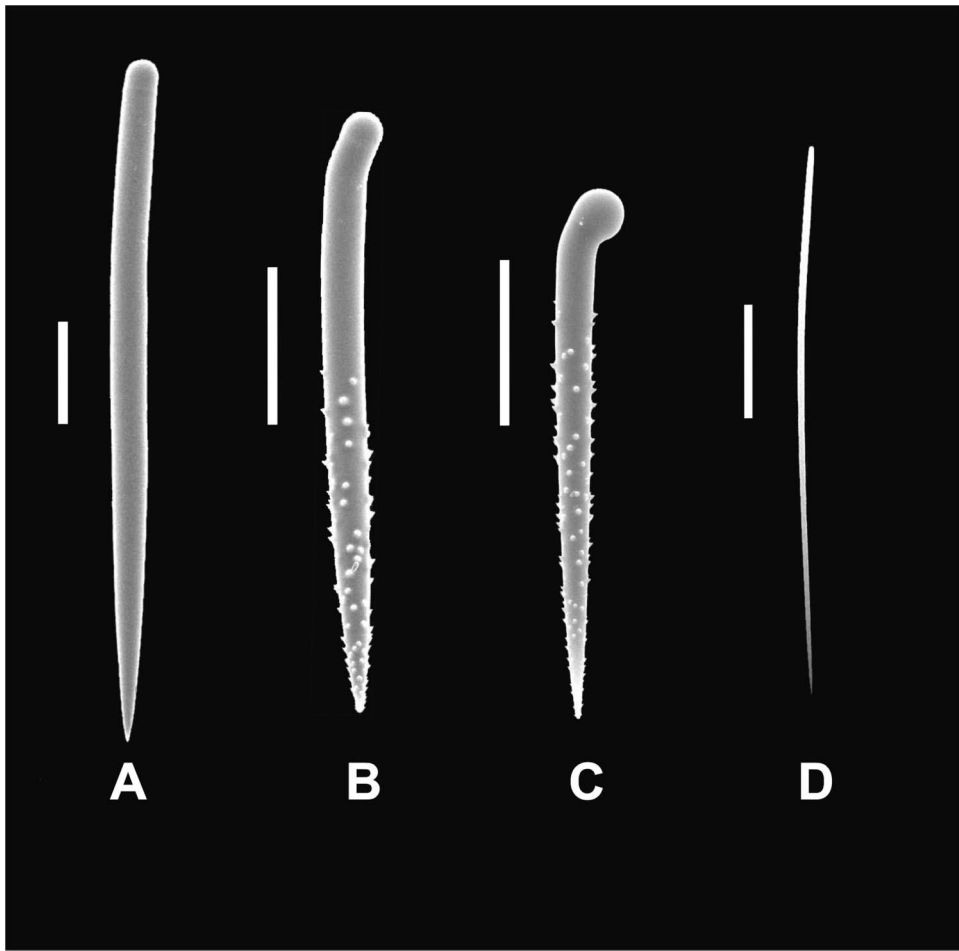


Figure 10. *Aulospongos californianus* sp. nov. Scanning electron microscopy images of spicules. (A) Choanosomal style straight; (B) rhabdostyle microspined I; (C) rhabdostyle microspined II; (D) ectosomal style. Scale bars: 50  $\mu$ m (A), 10  $\mu$ m (B), 100  $\mu$ m (C, D).

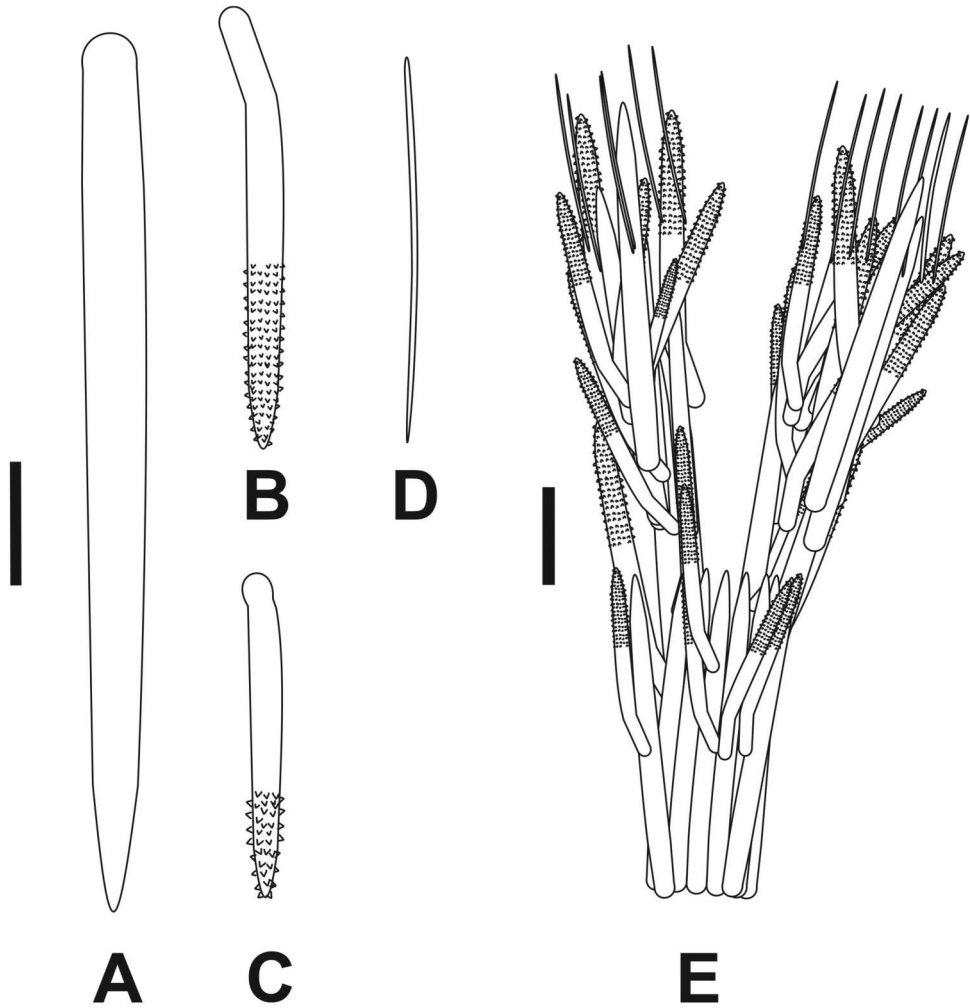


Figure 11. Drawings of *Aulospongus californianus* sp. nov. (A) Choanosomal style straight; (B) rhabdostyle microspined I; (C) rhabdostyle microspined II; (D) ectosomal style/anisoxeas; (E) choanosomal skeleton (ascending fibre bundles). Scale bars: 60  $\mu\text{m}$  (A–D), 250  $\mu\text{m}$  (E).

11/04/2011, Station 32 Talud XIV (Gulf of California, MEX) 122 m (27°56'13" N, 111°19'44" W). 2061-LEB-ICML-UNAM, 11/04/2011, Station 32 Talud XIV (Gulf of California, MEX) 122 m (27°56'13" N, 111°19'44" W). 2062-LEB-ICML-UNAM, 11/04/2011, Station 32 Talud XIV (Gulf of California, MEX) 122 m (27°56'13" N, 111°19'44" W).

#### *Description*

Massive or vase-shaped sponge, 1–2 cm in diameter and 3–5 cm high. Surface hispid with spicule projections evenly distributed. Oscula (6–10 mm) and ostia are circular

to oval-shaped (100–150  $\mu\text{m}$ ). Consistency hard and difficult to tear. Colour in preservation pale beige (Figure 1E).

### *Skeleton*

Straight choanosomal styles: 580–1130  $\times$  25–45  $\mu\text{m}$  (Figures 10A, 11A). Microspined rhabdostyles in two sizes: the first curved and with prominent spines: 340–610  $\times$  22.5–35  $\mu\text{m}$  (Figures 10B, 11B); the second short, with the head pronounced: 150–360  $\times$  10–30  $\mu\text{m}$  (Figures 10C, 11C). The spines are localized on the terminal third of the spicule. Curved ectosomal styles/anisoxeas: 290–460  $\times$  2.5–5  $\mu\text{m}$  (Figures 10D, 11D) (Table 6). The ectosomal skeleton is a dense layer of styles/anisoxeas with the points of the spicules protruding externally (30–80  $\mu\text{m}$  thick). Multispicular ascending fibres (480–600  $\mu\text{m}$  thick) (Figure 11E) form a plumose choanosomal skeleton.

### *Remarks*

*Aulospongos californianus* sp. nov. is a deep-sea species from the Gulf of California. The only species assigned to this genus in the Eastern Pacific is *Aulospongos cerebella* (Dickinson 1945). This is a tubular sponge with straight styles and microspined rhabdostyles in one category (see above). *Aulospongos californianus* sp. nov., has ectosomal styles/anisoxeas and rhabdostyles in two categories while *A. cerebella* lacks the ectosomal spicules and the rhabdostyles are in one category.

### *Etymology*

Named *californianus* for the type locality.

### *Aulospongos aurantiacus* sp. nov. (Figures 1F, 12, 13)

### *Material examined*

Holotype: MCNM 1.01/657, 30/10/2003, Isla Venados (Mazatlán, Sinaloa), 7 m (23°10'15" N, 106°26'42" W). Paratype: 962-LEB-ICML-UNAM, 30/10/2003, Isla Venados (Mazatlán, Sinaloa), 4 m (23°10'15" N, 106°26'42" W).

Table 6. Spicule measurements of *Aulospongos californianus* sp. nov. in  $\mu\text{m}$ .

Material examined	Styles straight (Length $\times$ Width)	Rhabdostyles microspined (Length $\times$ Width)	Styles/anisoxeas (Length $\times$ Width)
MCNM 1.01/656	650-(832.1)-975 $\times$ 25-(33.2)-45	1) 360-(498.3)-560 $\times$ 25-(26.1)-35 2) 150-(235.1)-300 $\times$ 10-(18.5)-20	300-(398.5)-450 $\times$ 2.5-(3.1)-5
LEB-2060	700-(883.6)-1010 $\times$ 25-(31.5)-40	1) 410-(478.3)-550 $\times$ 25-(29.7)-35 2) 150-(230.2)-350 $\times$ 10-(15.7)-20	350-(388.6)-460 $\times$ 2.5-(2.8)-5
LEB-2061	600-(780.6)-900 $\times$ 25-(32.5)-40	1) 380-(402.1)-480 $\times$ 22.5-(27.9)-35 2) 150-(201.2)-290 $\times$ 15-(20.2)-30	290-(369.2)-425 $\times$ 2.5-(3.1)-5
LEB-2062	580-(921.2)-1130 $\times$ 25-(33.4)-45	1) 340-(477.5)-610 $\times$ 25-(26.8)-30 2) 150-(248.8)-360 $\times$ 10-(17.7)-20	310-(370.2)-420 $\times$ 2.5-(3.0)-5

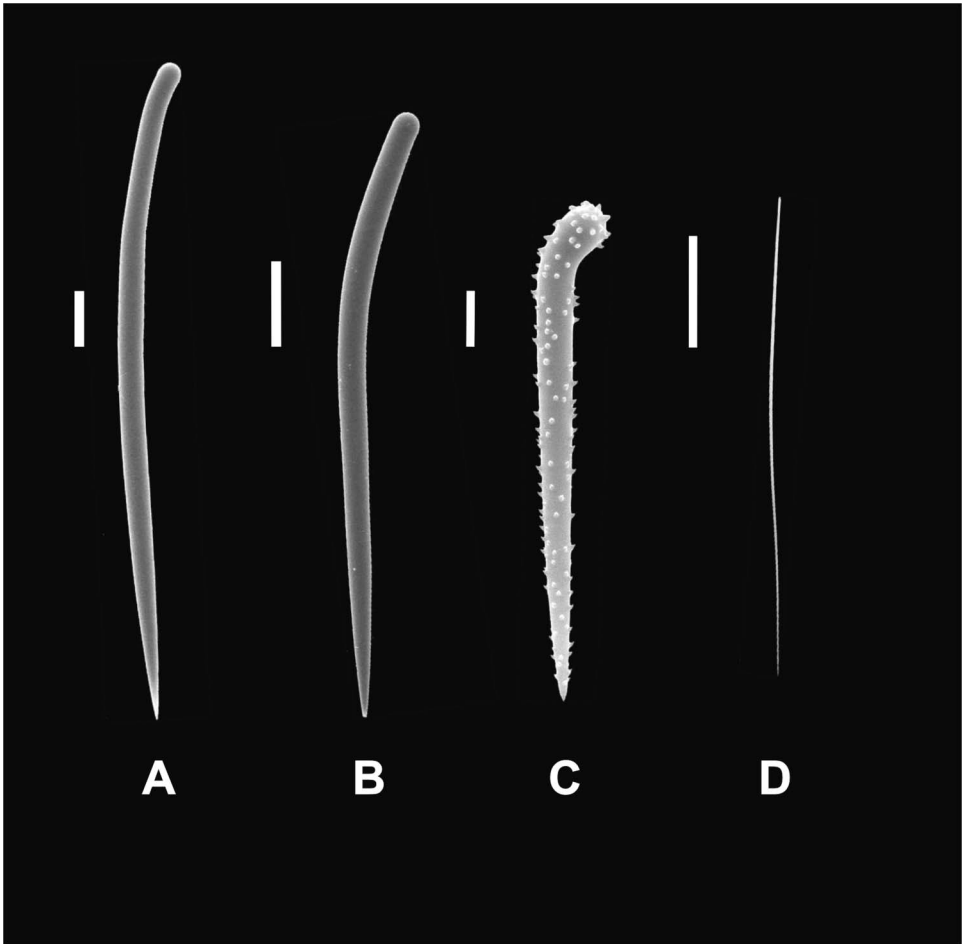


Figure 12. *Aulospongos aurantiacus* sp. nov. Scanning electron microscopy images of spicules. (A) Choanosomal style I; (B) choanosomal style II; (C) rhabdostyle microspined; (D) ectosomal style. Scale bars: 50  $\mu\text{m}$  (A), 100  $\mu\text{m}$  (B, D), 10  $\mu\text{m}$  (C).

### Description

Encrusting or laminated sponge 3–6 cm long and 1–2.5 cm thick. Oscules and ostia not observed. Surface hispid with conules circular to oval-shaped (300–750  $\mu\text{m}$  long) and evenly distributed. Consistency hard and difficult to tear. Colour in life is orange, pale in preservation (Figure 1F).

### Skeleton

Straight or curved styles in two sizes: 1). 440–970  $\times$  10–20  $\mu\text{m}$  (Figures 12A, 13A). 2) 135–250  $\times$  5–15  $\mu\text{m}$  (Figures 12B, 13B). Rhabdostyles microspined with prominent spines: 80–125  $\times$  2.5–15  $\mu\text{m}$  (Figures 12C, 13C). Curved or straight subectosomal subtylostyles/styles: 280–480  $\times$  2.5–7.5  $\mu\text{m}$  (Figures 12D, 13D) (Table 7). The ectosomal skeleton is a dense layer of spongin (40–100  $\mu\text{m}$  thick). The choanosome



Figure 13. Drawings of *Aulospongia aurantiacus* sp. nov. (A) Choanosomal style I; (B) choanosomal style II; (C) ectosomal style/subtylostyle; (D) rhabdostyle microspined; (E) choanosomal skeleton (ascending fibre bundles). Scale bars: 20  $\mu\text{m}$  (A–D), 200  $\mu\text{m}$  (E).

has a plumose structure formed by multipiscular fibre bundles (160–260  $\mu\text{m}$  thick). The microspined rhabdostyles are echinating (Figure 13E).

#### Remarks

*Aulospongia aurantiacus* sp. nov. is a subtidal sponge from the Gulf of California. This species is characterized by having choanosomal styles and curved rhabdostyles

Table 7. Spicule measurements of *Aulospongos aurantiacus* sp. nov. in  $\mu\text{m}$ .

Material examined	Choanosomal styles (Length $\times$ Width)	Rhabdostyles microspined (Length $\times$ Width)	Subtylostyles/styles (Length $\times$ Width)
MCNM 1.01/657	1) 445-(672.1)-865 $\times$ 10-(13.6)-20 2) 165-(200.1)-240 $\times$ 5-(11.7)-15	85-(90.1)-120 $\times$ 2.5-(3.4)-5	310-(320.1)-465 $\times$ 2.5-(4.8)-7.5
LEB-962	1) 440-(675.2)-970 $\times$ 10-(14.2)-20 2) 135-(189.2)-250 $\times$ 5-(12.4)-15	80-(96.5)-125 $\times$ 2.5-(3.75)-5	280-(362.5)-480 $\times$ 2.5-(5.6)-7.5

microspined. The species assigned to this genus with these characteristics are: *Aulospongos similaustralis* Hooper et al. 2008, *Aulospongos tubulatus* (Bowerbank 1873), *Aulospongos spinosum* (Topsent 1927) and *Aulospongos monticularis* (Ridley and Dendy 1886). *Aulospongos similaustralis* Hooper et al. (2008) is a globular sponge recorded from the western coast of Australia. It has choanosomal styles (150–400  $\mu\text{m}$ ), microspined rhabdostyles (70–255  $\mu\text{m}$ ) and subectosomal tylostyles (720–1400  $\mu\text{m}$ ). *Aulospongos aurantiacus* sp. nov. has styles in two categories and ectosomal subtylostyles/styles while *A. similaustralis* has one category of styles and ectosomal tylostyles. *Aulospongos tubulatus* (Bowerbank 1873) is a massive or tubular sponge recorded from Sri Lanka. It has choanosomal rhabdostyles (304–462  $\mu\text{m}$ ), rhabdostyles microspined (109–126  $\mu\text{m}$ ) and ectosomal styles (212–250  $\mu\text{m}$ ). The rhabdostyles are longer in *A. aurantiacus* sp. nov. than in *A. tubulatus*. *Aulospongos spinosum* (Topsent 1927) is a bulbous sponge described from Cape Verde at 219 m depth. It has choanosomal rhabdostyles in two sizes (770–1085  $\mu\text{m}$  and 90–182  $\mu\text{m}$ ), acanthostyles (75–145  $\mu\text{m}$ ) and ectosomal oxeas (40–50  $\mu\text{m}$ ). The morphology of the ectosomal spicules is the main difference between these species: styles/subtylostyles in *A. aurantiacus* sp. nov. and oxeas in *A. spinosum*. *Aulospongos monticularis* (Ridley and Dendy 1886) is an encrusting or massive sponge described from Cape Verde. This species has choanosomal rhabdostyles (290–518  $\mu\text{m}$ ), microspined rhabdostyles (132–275  $\mu\text{m}$ ) and subectosomal styles (620–960  $\mu\text{m}$ ). *Aulospongos aurantiacus* has the subectosomal styles shorter than *A. monticularis*.

### Etymology

Named *aurantiacus* which means orange in Latin.

Genus *Eurypon* Gray, 1867

*Eurypon patriciae* sp. nov.

(Figures 14A, 15, 16)

### Material examined

Holotype: MCNM 1.01/658, 18/10/2001, Isla Lobos 1 (Mazatlán, Sinaloa) 5 m (23°13'49" N, 106°27'43" W). Paratypes: 107-LEB-ICML-UNAM, 18/10/2001, Isla Lobos 1 (Mazatlán, Sinaloa) 5 m (23°13'49" N, 106°27'43" W).



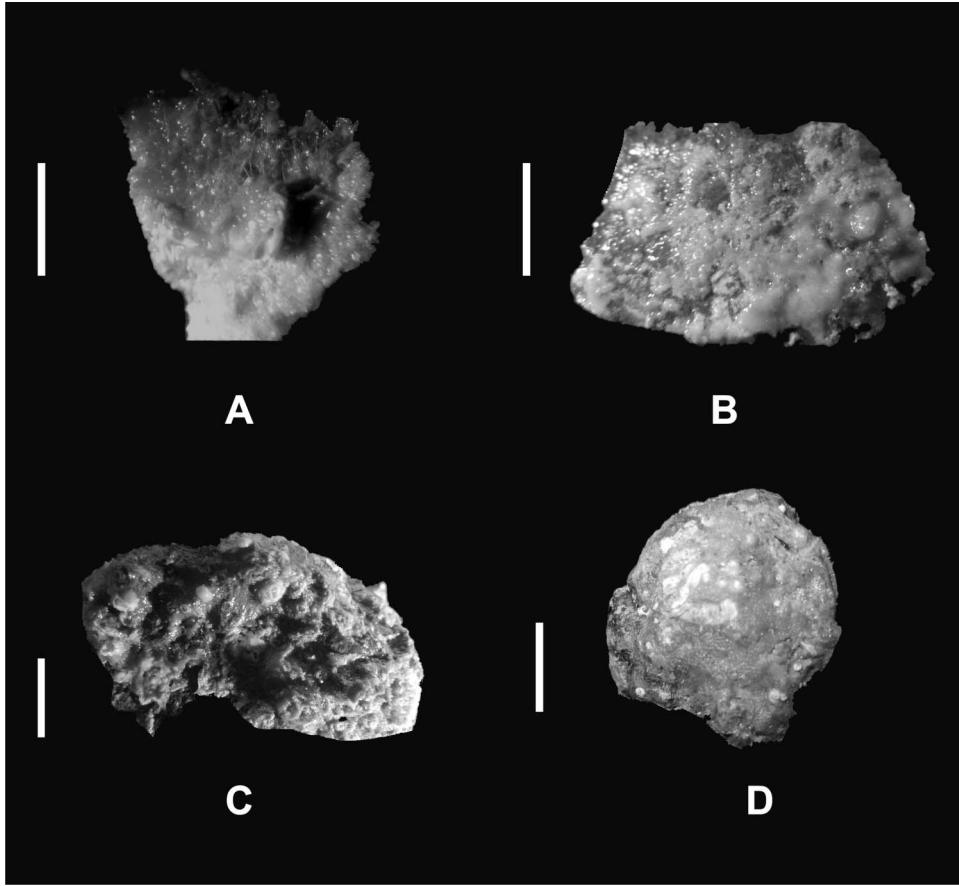


Figure 14. Photographs of preserved sponges from this study. (A) *Eurypon patriciae* sp. nov. (B) *Eurypon tylospinosum* sp. nov. (C) *Eurypon diversicolor* sp. nov. (D) *Eurypon brunus* sp. nov. Scale bars: 1 cm (A, B, D), 2 cm (C).

W).128-LEB-ICML-UNAM, 18/10/2001, Isla Lobos 1 (Mazatlán, Sinaloa) 5 m (23°13'49" N, 106°27'43" W).

#### *Description*

Encrusting sponge, size 2–4 cm length  $\times$  1–3 cm width and 6–8 mm thick growing over rocks. Oscules and ostia are not visible. Surface hispid due to evenly distributed projecting spicules. Consistency fleshy and difficult to tear. Colour in life yellow or green, pale brown in preservation (Figure 14A).

#### *Skeleton*

Straight choanosomal tylostyles: 1320–2400  $\times$  10–25  $\mu\text{m}$  (Figures 15A, B, 16A). Acanthostyles with short recurved spines in two sizes: 1) 130–180  $\times$  5–7.5

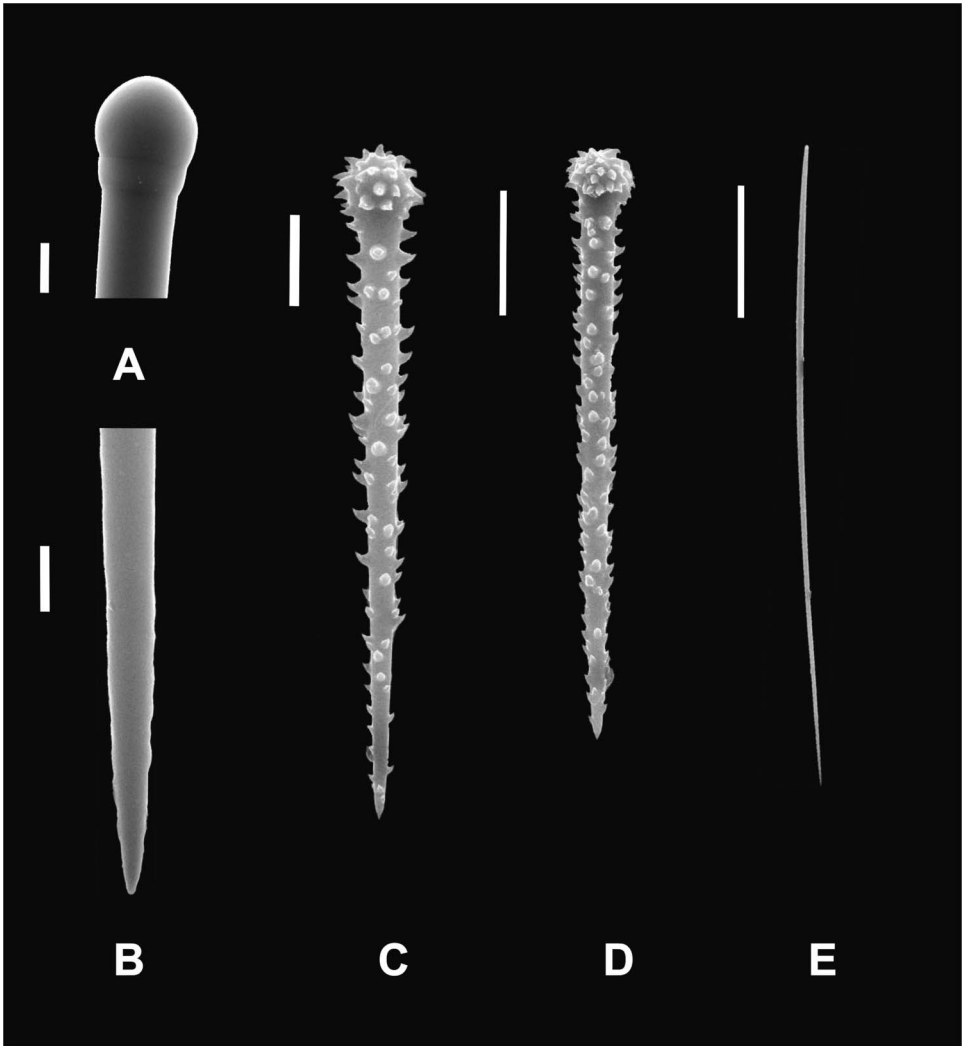


Figure 15. *Eurypon patriciae* sp. nov. Scanning electron microscopy images of spicules. (A) Choanosomal tylostyle head; (B) choanosomal tylostyle end; (C) acanthostyle I; (D) acanthostyle II; (E) subectosomal style. Scale bars: 2  $\mu\text{m}$  (A), 10  $\mu\text{m}$  (B, D), 20  $\mu\text{m}$  (C), 100  $\mu\text{m}$  (D).

$\mu\text{m}$  (Figures 15C, 16C); 2) 55–87.5  $\times$  2.5–5  $\mu\text{m}$  (Figures 15D, 16C). Straight stronglyxeas/styles: 400–550  $\times$  5–10  $\mu\text{m}$  (Figures 15E, 16B) (Table 8). The ectosomal skeleton is absent. The points of the spicules are protruding externally. The choanosomal skeleton has a hymedesmoid structure. Main tylostyles and acanthostyles are embedded in a spongin layer (20–40  $\mu\text{m}$  thick). The stronglyxeas and styles are dispersed in groups of one to three arranged along the tylostyles in the choanosome (Figure 16D).

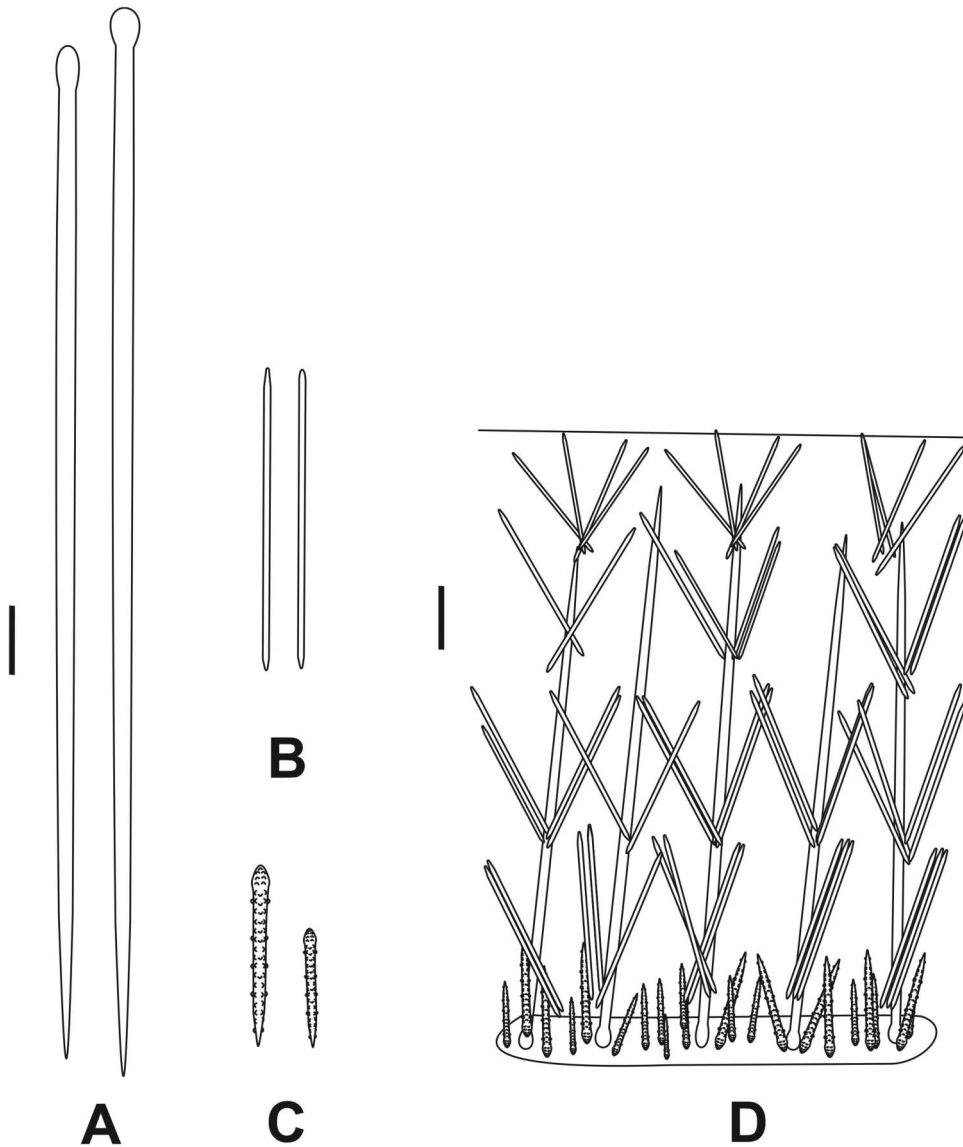


Figure 16. Drawings of *Eurypon patriciae* sp. nov. (A) Choanosomal tylostyles; (B) stronglyloxeas/styles; (C) acanthostyles recurved by short spines (two categories); (D) choanosomal skeleton (hymedesmoid). Scale bars: 850  $\mu\text{m}$  (A–C), 140  $\mu\text{m}$  (D).

### Remarks

*Eurypon patriciae* sp. nov. is a subtidal sponge distributed in the Gulf of California. In the Eastern Pacific, there are two species assigned to this genus. *Eurypon nigrum* Bergquist 1967 is a blue encrusting sponge described from Oahu (Hawaii). It has tylostyles in two sizes (1200–2400  $\mu\text{m}$   $\times$  6–12  $\mu\text{m}$  and 170–800  $\times$  6–12  $\mu\text{m}$ ) and acanthotylostyles (70–165  $\times$  6–9  $\mu\text{m}$ ). The spicule measurements are similar in these

Table 8. Spicule measurements of *Eurypon patriciae* sp. nov in  $\mu\text{m}$ .

Material examined	Choanosomal tylostyles (Length $\times$ Width)	Acanthostyles (Length $\times$ Width)	Styles/strongyloxeas (Length $\times$ Width)
MCNM 1.01/658	1450-(1985.4)-2225 $\times$ 10-(14.6)-25	1) 125-(154.3)-175 $\times$ 5-(6.4)-7.5 2) 60-(70.1)-85 $\times$ 2.5-(6.1)-5	450-(434.2)-525 $\times$ 5-(6.7)-10
LEB-107	1680-(2000.2)-2400 $\times$ 10-(17.5)-25	1) 130-(150.2)-180 $\times$ 5-(6.6)-7.5 2) 55-(71.1)-85 $\times$ 2.5-(4.5)-5.	400-(485.2)-550 $\times$ 5-(5.8)-7.5
LEB-128	1320-(1784.6)-2100 $\times$ 10-(16.2)-25	1) 130-(156.4)-180 $\times$ 5-(6.8)-7.5 2) 60-(74.1)-87.5 $\times$ 2.5-(3.6)-5.	410-(453.5)-500 $\times$ 5-(6.7)-10

two species. However, *E. nigrum* has tylostyles as ectosomal spicules while *E. patriciae* sp. nov. has strongyloxeas and styles. *Eurypon miniaceum* Thiele 1905 is a red encrusting sponge described from Calbuco (Chile) at 30 m depth. It has tylostyles in three categories (2000–3000  $\times$  30  $\mu\text{m}$ ; 800  $\times$  30  $\mu\text{m}$ ; and  $>120$   $\mu\text{m}$ ), acanthostyles (120  $\mu\text{m}$ ) and subectosomal styles (550  $\times$  5  $\mu\text{m}$ ). *Eurypon patriciae* sp. nov. has one category of styles while *E. miniaceum* has three.

#### Etymology

Named for Patricia Bergquist for her contribution to sponge science.

#### *Eurypon tylospinosum* sp. nov. (Figures 14B, 17, 18)

#### Material examined

Holotype: MCNM 1.01/659, 27/11/2002, Cabo Haro, (Guaymas, Sonora) 15 m (27°52'5" N, 110°57'1" W). Paratype: 769-LEB-ICML-UNAM, 27/11/2002, Cabo Haro, (Guaymas, Sonora), 15 m (27°52'5" N, 110°57'1" W).

#### Description

Encrusting sponge, size 2–5 cm length  $\times$  1–2 cm width and 3–5 mm thick. Oscules and ostia not visible. Surface smooth. Consistency flexible and difficult to tear. Colour in life red, pale in preservation (Figure 14B).

#### Skeleton

Choanosomal subtylostyles with a pronounced head or modified to style: 200–575  $\times$  7.5–15  $\mu\text{m}$  (Figures 17A, 18A). Acanthostyles with swollen head with prominent spines. These spines are arranged as a crown around the head: 70–200  $\times$  2.5–7.5  $\mu\text{m}$  (Figures 17B, C, 18B). Straight or curved subectosomal styles/anisoxeas: 330–460  $\times$  1.75–2.5  $\mu\text{m}$  (Figures 17D, 18C) (Table 9). The ectosomal skeleton is absent. The choanosomal skeleton has a hymedesmoid structure. Main subtylostyles and

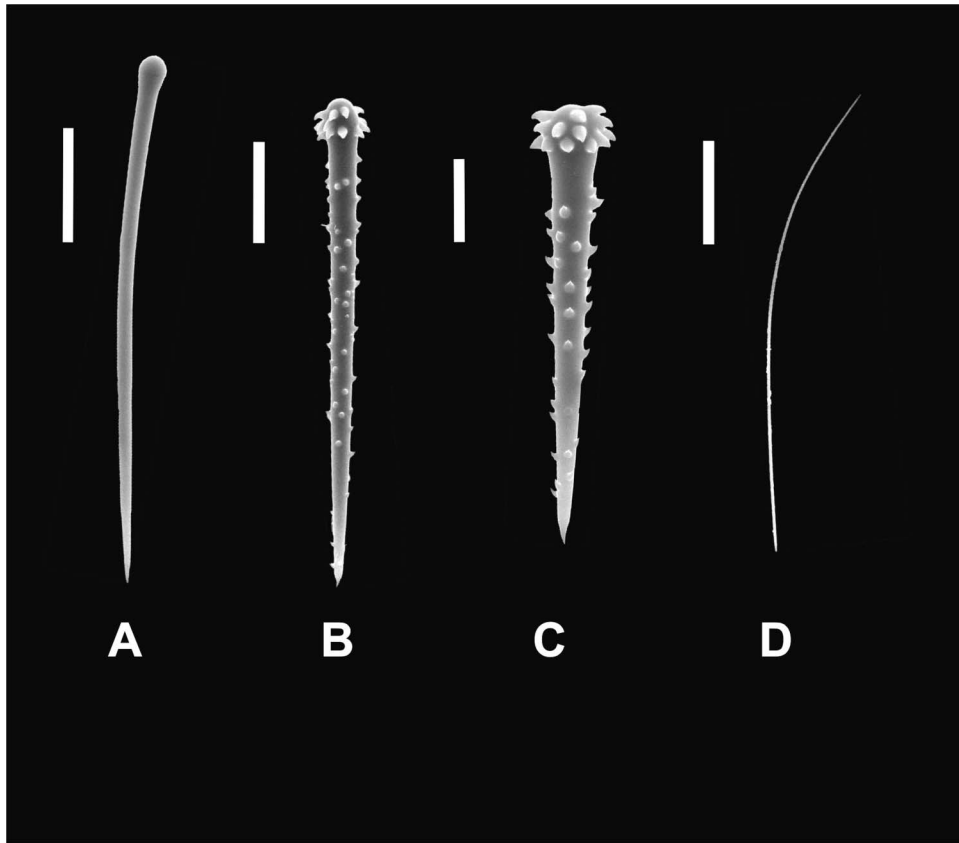


Figure 17. *Eurypon tylospinosum* sp. nov. Scanning electron microscopy images of spicules. (A) Choanosomal tylostyles; (B) acanthostyle with swollen head I; (C) acanthostyle with swollen head II; (D) subectosomal style. Scale bars: 50  $\mu\text{m}$  (A), 10  $\mu\text{m}$  (B), 20  $\mu\text{m}$  (C), 100  $\mu\text{m}$  (D).

acanthostyles are embedded in a spongin layer (10–25  $\mu\text{m}$  thick). The styles/anisoxeas are dispersed in trichodragmas in the subectosomal region (Figure 18D).

#### Remarks

*Eurypon tylospinosum* sp. nov. is a subtidal species distributed from the Gulf of California. It is characterized by having acanthostyles with swollen head and with prominent spines, which are arranged as a crown around the head. The only species described worldwide that have these features are *E. simplex* (Bowerbank 1874) and *E. coronula* (Bowerbank 1874) (Table 12). *Eurypon simplex* (Bowerbank 1874) is a yellow encrusting sponge described from the Shetland Islands. It has tylostyles (2116  $\times$  27.1  $\mu\text{m}$ ) and acanthostyles (105.8–218.9  $\times$  8.4  $\mu\text{m}$ ). The tylostyles are shorter in *E. tylospinosum* sp. nov. than in *E. simplex*. Besides, *E. tylospinosum* sp. nov. has subectosomal styles which are lacking in *E. simplex*. *Eurypon coronula* (Bowerbank 1874) is a grey encrusting sponge recorded from the Shetland Islands. It has tylostyles (635–1411  $\mu\text{m}$ ) and acanthostyles (254  $\mu\text{m}$ ). The tylostyles are longer in *E. coronula*

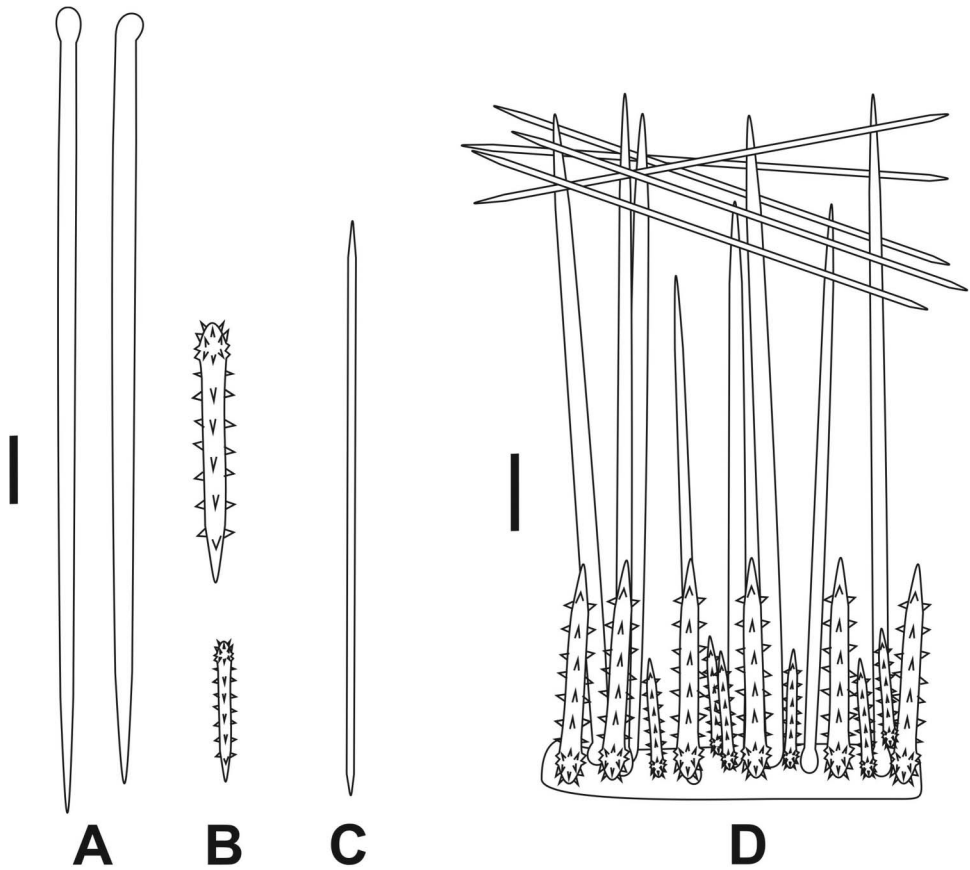


Figure 18. Drawings of *Eurypon tylospinosum* sp. nov. (A) Choanosomal tylostyles/styles; (B) acanthostyles recurved by prominent spines (two categories); (C) subectosomal stylus/anisoxea; (D) choanosomal skeleton (hymedesmoid). Scale bars: 40  $\mu\text{m}$  (A–C), 75  $\mu\text{m}$  (D).

Table 9. Spicule measurements of *Eurypon tylospinosum* sp. nov. in  $\mu\text{m}$ .

Material examined	Choanosomal subtylostyles (Length $\times$ Width)	Acanthostyles (Length $\times$ Width)	Subectosomal styles/anisoxeas (Length $\times$ Width)
MCNM 1.01/659	230-(445.6)-550 $\times$ 7.5-(11.8)-15	65-(125.5)-195 $\times$ 2.5-(4.9)-7.5	300-(380.1)-450 $\times$ 1.75-(2.4)-2.5
LEB-769	200-(470.5)-575 $\times$ 7.5-(12.6)-15	70-(130.2)-200 $\times$ 2.5-(5.8)-7.5	330-(397.2)-460 $\times$ 1.75-(2.3)-2.5

than in *E. tylospinosum* sp. nov. The remaining species assigned to the genus *Eurypon* have spicules in a different category or length than *E. tylospinosum* sp. nov. (Table 12).

### *Etymology*

Named tylospinosum by the swollen and spiny head of the acanthostyles.

### *Eurypon diversicolor* sp. nov. (Figures 14C, 19, 20)

### *Material examined*

Holotype: MCNM 1.01/660, 10/06/2003, Isla Redondas (Marietas, Nayarit), 12 m (20°42'03" N, 105°34'31" W). Paratypes: 818-LEB-ICML-UNAM, 10/06/2003, Isla Redondas (Marietas, Nayarit), 12 m (20°42'03" N, 105°34'31" W). 1500-LEB-ICML-UNAM, 11/10/2006, Cueva Marietas (Bahia Banderas, Nayarit), 10 m (20°42'01" N, 105°33'57" W).

### *Description*

Encrusting sponge, size 3–6 cm length × 2–5 cm width and 2–10 mm thick. Oscules and ostia not observed. Surface hispid with spicule projections evenly distributed.

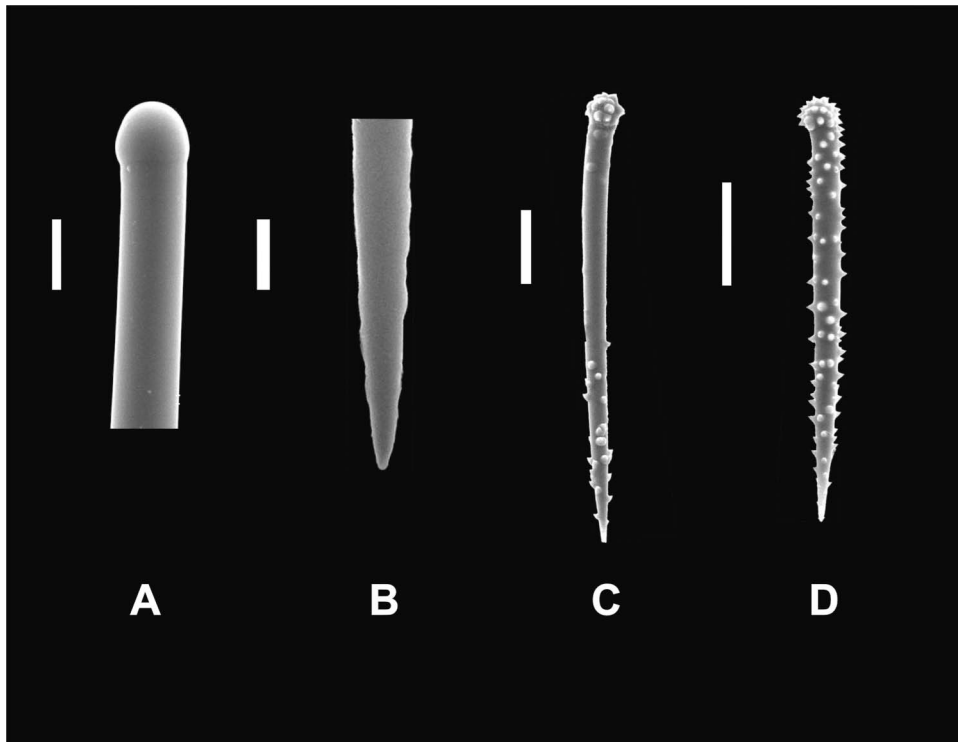


Figure 19. *Eurypon diversicolor* sp. nov. Scanning electron microscopy images of spicules. (A) Choanosomal tylostyle head; (B) choanosomal tylostyle end; (C) acanthostyle I; (D) acanthostyle II. Scale bars: 10  $\mu\text{m}$  (A, B), 50  $\mu\text{m}$  (C, D).



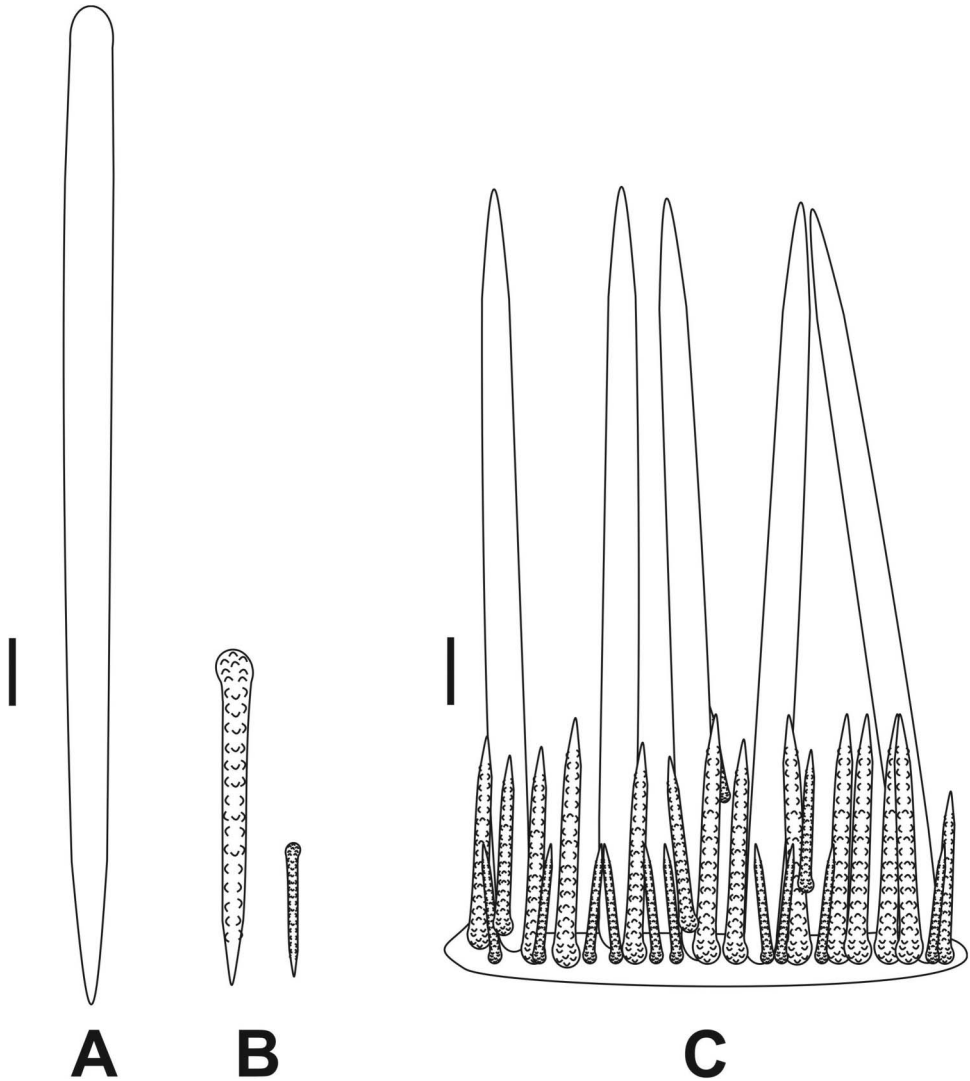


Figure 20. Drawings of *Eurypon diversicolor* sp. nov. (A) Choanosomal tylostyle/style; (B) acanthostyles recurved by short spines (two categories); (C) choanosomal skeleton (hymedesmoid). Scale bars: 30  $\mu\text{m}$  (A–C), 80  $\mu\text{m}$  (D).

Consistency hard and difficult to tear. Colour in life is orange or yellow, pale in preservation (Figure 14C).

#### *Skeleton*

Straight choanosomal subtylostyles: 900–1710  $\times$  10–30  $\mu\text{m}$  (Figures 19A, B, 20A). Curved or straight acanthostyles with prominent recurved spines in two categories: 210–390  $\times$  10–17.5  $\mu\text{m}$  (Figures 19C, 20B) and 60–180  $\times$  5–15  $\mu\text{m}$  (Figures 19D, 20B) (Table 10). The ectosomal skeleton is absent. The points of the spicules

Table 10. Spicule measurements of *Eurypon diversicolor* sp. nov. in  $\mu\text{m}$ .

Material examined	Subtylostyles (Length $\times$ Width)	Acanthostyles (Length $\times$ Width)
MCNM 1.01/660	1120-(1321.5)-1690 $\times$ 10-(18.1)-30	1) 200-(302.4)-370 $\times$ 10-(15.2)-17.5 2) 70-(100.6)-175 $\times$ 2.5-(8.8)-15
LEB-818	900-(1317.4)-1710 $\times$ 10-(17.9)-30	1) 230-(314.2)-390 $\times$ 10-(13.1)-17.5 2) 80-(124.2)-180 $\times$ 5-(8.5)-15
LEB-1500	1080-(1279.2)-1580 $\times$ 10-(16.2)-25	1) 210-(280.4)-360 $\times$ 10-(13.4)-17.5 2) 60-(98.5)-180 $\times$ 2.5-(6.9)-12.5

protrude externally. The choanosomal skeleton has a hymedesmoid structure. Main subtylostyles and acanthostyles are erect in a spongin layer (10–20  $\mu\text{m}$  thick) (Figure 20C).

#### Remarks

*Eurypon diversicolor* sp. nov. is found in the Mexican Pacific Ocean. The only similar species in the Eastern Pacific is *E. nigrum* Bergquist 1967. This is a dark-blue encrusting sponge described from Oahu (Hawaii). It has straight tylostyles in two sizes: 1200–2400  $\times$  6–12  $\mu\text{m}$  and 170–800  $\times$  6–12  $\mu\text{m}$ ; and acanthostyles (70–165  $\times$  6–9  $\mu\text{m}$ ). *Eurypon diversicolor* sp. nov. has acanthostyles in two categories (Table 10). The acanthostyles I are longer in *E. diversicolor* sp. nov. than in *E. nigrum*. *Eurypon duoacanthostyla* (Hoshino, 1981) is an orange encrusting sponge described from Mitsusuke (Japan) at 15 m depth. It has straight styles (250–320  $\times$  5–8  $\mu\text{m}$ ) and acanthostyles in two categories: 250–280  $\times$  7–9  $\mu\text{m}$  and 138–180  $\times$  6–8  $\mu\text{m}$ . *Eurypon diversicolor* sp. nov. has longer and thicker styles than *E. duoacanthostyla*. The other species belonging to the genus *Eurypon* from the Pacific Ocean have spicules of different length than *E. diversicolor* sp. nov. (Table 12).

#### Etymology

Named *diversicolor* which means different colours in Latin.

#### *Eurypon brunus* sp. nov. (Figures 14D, 21, 22)

#### Material examined

Holotype: MCNM 1.01/661, 31/10/2002, Isla Lobos 1 (Mazatlán, Sinaloa), 5 m (23°13'49" N, 106°27'43" W). Paratypes: 653-LEB-ICML-UNAM, 29/10/2002, Isla Lobos 1 (Mazatlán, Sinaloa) 4 m (23°13'49" N, 106°27'43" W). 655-LEB-ICML-UNAM, 31/10/2002, Isla Lobos 1 (Mazatlán, Sinaloa), 5 m (23°13'49" N, 106°27'43" W). 1505-LEB-ICML-UNAM, 11/10/2006, Cueva Marietas (Bahía Banderas, Nayarit), 11 m (20°42'1" N, 105°33'57" W).

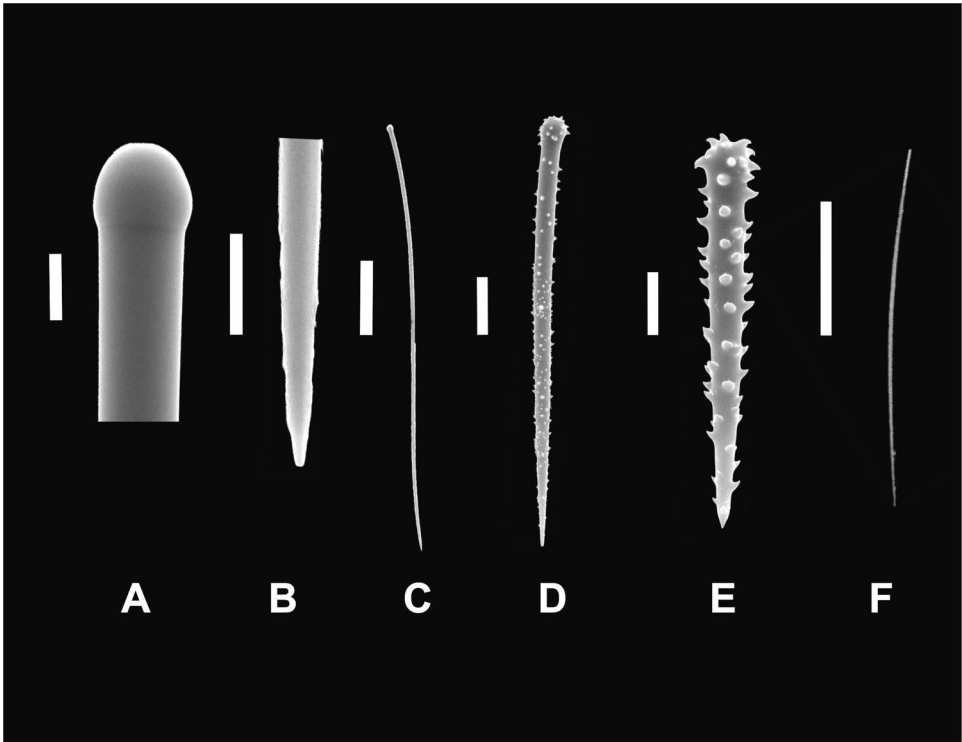


Figure 21. *Eurypon brunus* sp. nov. Scanning electron microscopy images of spicules. (A) Choanosomal subtylostyle head; (B) choanosomal tylostyle end; (C) choanosomal subtylostyle II; (D) acanthostyle I; (E) acanthostyle II; (F) subectosomal style. Scale bars: 10  $\mu\text{m}$  (A, B), 80  $\mu\text{m}$  (C), 100  $\mu\text{m}$  (D–F).

#### Description

Encrusting sponge, size 3–4 cm length  $\times$  1–3 cm width and 5–7 mm thick growing over rocks. Oscules and ostia not visible. Surface hispid. Consistency fleshy and difficult to tear. Colour in life black or dark brown, pale in preservation (Figure 14D).

#### Skeleton

Straight choanosomal subtylostyles in two categories: 700–1625  $\times$  7.5–20  $\mu\text{m}$  (Figures 21A, B, 22A) and 110–375  $\times$  2.5–10  $\mu\text{m}$  (Figures 21C, 22A). Acanthostyles with short recurved spines in two sizes: 200–390  $\times$  7.5–20  $\mu\text{m}$  (Figures 21D, 22B) and 60–190  $\times$  2.5–12.5  $\mu\text{m}$  (Figures 21E, 22B). Straight or curved subectosomal styles/anisoxeas: 260–520  $\times$  1.75–5  $\mu\text{m}$  (Figures 21F, 22C) (Table 11). The ectosomal skeleton is absent. The choanosomal skeleton is hymedesmoid. Main subtylostyles and acanthostyles are embedded in a spongin layer. The styles/anisoxeas are dispersed in the subectosomal region (Figure 22D).

#### Remarks

*Eurypon brunus* sp. nov. is a subtidal species from the Mexican Pacific Ocean. It is characterized by having subtylostyles in two categories, acanthostyles in two sizes and

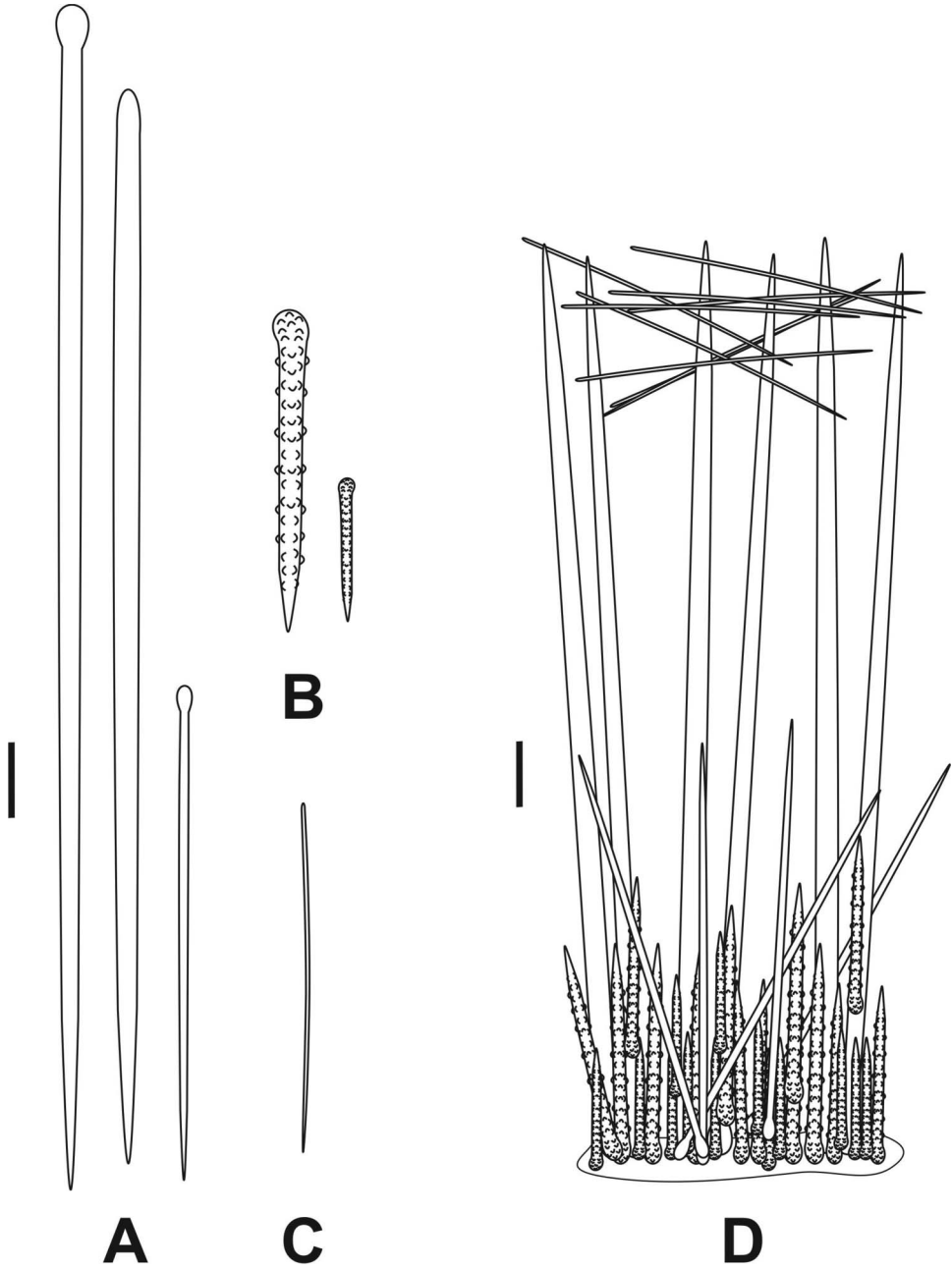


Figure 22. Drawings of *Eurypon brunus* sp. nov. (A) Choanosomal tylostyles/styles (two categories); (B) acanthostyles recurved by short spines (two categories); (C) subectosomal style/anisoxeas; (D) choanosomal skeleton (hymedesmoid). Scale bars: 40  $\mu\text{m}$  (A–C), 70  $\mu\text{m}$  (D).

Table 11. Spicule measurements of *Eurypon brunus* sp. nov. in  $\mu\text{m}$ .

Material examined	Choanosomal subtylostyles (Length $\times$ Width)	Acanthostyles (Length $\times$ Width)	Subectosomal styles/anisoxeas (Length $\times$ Width)
MCNM 1.01/661	1) 900-(1190.6)-1525 $\times$ 10-(12.1)-15.	1) 200-(298.1)-340 $\times$ 10-(15.4)-20	290-(346.1)-500 $\times$ 2.5-(3.5)-5
	2) 240-(295.2)-335 $\times$ 2.5-(5.1)-10.	2) 60-(123.7)-150 $\times$ 2.5-(4.6)-10	
LEB-653	1) 700-(1123.6)-1625 $\times$ 10-(12.1)-15.	1) 230-(303.4)-375 $\times$ 10-(15.4)-20	325-(366.4)-460 $\times$ 2.5-(3.2)-5
	2) 110-(255.2)-345 $\times$ 5-(7.9)-10.	2) 60-(123.7)-170 $\times$ 2.5-(5.6)-10	
LEB-655	1) 900-(1120.4)-1390 $\times$ 7.5-(11.5)-17.5.	1) 200-(255.4)-310 $\times$ 7.5-(13.4)-20	260-(330.2)-410 $\times$ 1.75-(2.9)-5
	2) 235-(278.6)-340 $\times$ 2.5-(3.8)-5	2) 60-(124.3)-190 $\times$ 2.5-(5.7)-10	
LEB-1505	1) 800-(1108.3)-1310 $\times$ 10-(16.5)-20	1) 215-(302.4)-390 $\times$ 7.5-(11.6)-15	260-(392.4)-520 $\times$ 2.5-(2.9)-5
	2) 280-(332.5)-375 $\times$ 2.5-(4.6)-10	2) 70-(128.3)-165 $\times$ 5-(8.6)-12.5	

subectosomal styles/anisoxeas. The only species assigned to this genus which have these characteristics are *Eurypon miniaceum* (Thiele 1905) and *Eurypon graphidiophora* (Hentschel 1911) (Table 12). *Eurypon miniaceum* (Thiele 1905) is a red encrusting sponge described from Calbuco (Chile) at 30 m depth. This species has choanosomal tylostyles in three categories 2000–3000  $\times$  30  $\mu\text{m}$ ; 800  $\times$  30  $\mu\text{m}$ ; and >120  $\mu\text{m}$ , acanthostyles (120  $\mu\text{m}$ ) and subectosomal styles (550  $\times$  5  $\mu\text{m}$ ). *Eurypon brunus* sp. nov. has the acanthostyles I longer than in *E. miniaceum*. *Eurypon graphidiophora* (Hentschel 1911) is a grey encrusting sponge described from Australia. This species has straight or curved styles (280–1500  $\times$  7–11  $\mu\text{m}$ ), acanthostyles (48–88  $\times$  5  $\mu\text{m}$ ) and ectosomal rhapides/styles (350–400  $\times$  2–3  $\mu\text{m}$ ). The acanthostyles are longer in *E. brunus* sp. nov. than in *E. graphidiophora*.

#### Etymology

Named *brunus*, which means brown in Latin.

#### Discussion

This study has revealed seven species new to science and three little known species from the Mexican Pacific Ocean. Previous to this study in the Gulf of California there were four species belonging to the family Raspailiidae (Dickinson 1945). The number has increased from four to 13 (*Trikentrium helium*, *Cyamon argon* and *Cyamon koltuni* were not included in this study). *Raspailia* (*Raspaxilla*) *hymani* (Dickinson 1945) and *Raspailia* (*Raspaxilla*) *hyle* (de Laubenfels 1930) are deep-sea species found on the West Pacific coast of Baja Peninsula.

Table 12. Comparative table of all the *Eurypon* species described worldwide. Spicule measurements in  $\mu\text{m}$ .

Species	Choanosomal spicules (Length $\times$ Width)	Acanthostyles (Length $\times$ Width)	Ectosomal spicules (Length $\times$ Width)	Colour, locality and depth
<i>E. calypsoi</i> (Lévi 1958)	Tylostyles: 2000 $\times$ 10	75–90 $\times$ 8–9	Oxeas: 400–475 $\times$ 3	Blue. Abulal, Saudi Arabia. Littoral
<i>E. polyplumosa</i> (Lévi 1958 such as <i>Proraspailla</i> )	Tylostyles: 300–375 $\times$ 11	60–350 $\times$ 7–11	Raphides oxeates: 280–320 $\times$ 0.5–1	Ochre. Saudi Arabia, depth unknown
<i>E. cinctum</i> (Sarà 1960)	Tylostyles: 2.5 mm $\times$ 8–30. 14–16 cabeza	31–316 $\times$ 7–16.	Style sor oxeas: 415 $\times$ 510 $\times$ 5–9	Lila. Point Imperatore, Nápoles. 70 m
<i>E. clavatella</i> (Little 1963)	Tylostyles: 249–470 $\times$ 14–51	75–145 $\times$ 5–9	Styles: 361 $\times$ 4	Purple. Florida, Gulf of Mexico. 10 m
<i>E. denisae</i> (Vacelet 1969)	Tylostyles: 3150 $\times$ 29	1) 150–120 $\times$ 7–10 2) 50–90 $\times$ 7–8 70–170 $\times$ 5–7.5	Oxeas: 250–300 $\times$ 4.5–7.5	Beige. Cassidaigne Canyon. Mediterranean Sea. 300–350 m
<i>E. obtusum</i> Vacelet (1969)	Tylostyles: $\text{?} \times \text{?} \times 10\text{--}12$		Oxeas: 400–430 $\times$ 2.5–3	Grey. Sicie Canyon. Mediterranean Sea. 250 m
<i>E. encrusta</i> (Thomas 1981)	Styles: 451–678 $\times$ 4–8	63–108 $\times$ 6–8	Trichodragmas: 40–50 $\times$ 21 Raphides: 40–5	White. Seychelles Islands

(Continued)

Table 12. (Continued).

<i>E. fulvum</i> (Lévi 1969)	Tylostyles: 1100–1500 × 12	75–85 × 9	Oxeas: 475–530 × 7–8	Yellow. Vena, South Africa. Depth unknown
<i>E. topsenti</i> (Pulitzer-Finali 1983) (Synonymy of <i>E. coronula</i> , Topsent 1936)	Subtylostyles curved: 1900–2500 × 12–14 Styles: 350–600 × 10.5–17.5	55–160 × 3–11	Styles: 370–430 × 1.5	Red. Port Tricase, Point Manara. Mediterranean Sea, 33–60 m
<i>E. vesicularis</i> (Sarà and Siribelli 1960)	Tylostyles: 442–2125 × 7–17	98–105 × 3.5	Styles: 1100–1200 × 1.7	Yellow Nápoles, Mediterranean Sea. 30–40 m
<i>E. major</i> (Sarà and Siribelli 1960)	Tylostyles: 1115–2210 × 10–17	80–220 × 4–10.5	Oxeas: 480–700 × 4–7.5	Rose. Nápoles, Mediterranean Sea. 14–20 m
*Pulitzer-Finali (1983)	Tylostyles: >2000 × 20	75–80 × 10	Tornotes: 230 × 7	Yellow.
<i>E. lacazei</i> (Topsent 1891 such as <i>Hymenaphia</i> )	Styles: 280–1500 × 7–11	48–88 × 5	Raphides: 350–400 × 2–3	Roscoff: Depth unknown Grey. Western coast of Australia, Depth unknown
<i>E. graphidtophora</i> (Hentschel 1911 such as <i>Hymenaphia</i> )	Subtylostyles: 304–1150 × 3–16	70–352 × 3–12	Absent	Orange. Leigh Reef, New Zealand. 20 m
*Hooper (1991)	Tylostyles: 1) 1200–2400 × 6–122) 170–800 × 6–12	70–165 × 6–9	Absent	Blue. Oahu, Hawaii 5–10 m
<i>E. hispida</i> (Bergquist 1970)				
<i>E. nigrum</i> (Bergquist 1967)				
<i>E. miniaceum</i> (Thiele 1905)	Tylostyles: 1) 2–3 mm × 302) 800 × 30 3) as acanthostyles	120	Styles: 550 × 5	Red. Calbuco, Chile. 30 m

(Continued)



Table 12. (Continued).

Species	Choanosomal spicules (Length × Width)	Acanthostyles (Length × Width)	Ectosomal spicules (Length × Width)	Colour, locality and depth
<i>E. viridis</i> (Topsent 1889 such as <i>Tricheurypon</i> )	Tylostyles: 570–1680 × 6–24	113–365 × 7–14	Raphides in trichodragmas: 46–70 × 0.5–3	White. Canarias Islands, Azores, Mediterranean Sea. 12–480 m
<i>E. longispiculum</i> (Carter 1876 such as <i>Microciona</i> )	Tylostyles: 2257 × 28.22	No data	Styles: 564	Brown. Celtic Sea. 630 m
<i>E. spinularum</i> (Bowerbank 1875 such as <i>Hymenaphia</i> )	Styles: 529.16 × 11	118.70	No data	Yellow ochre. Korean coast. Depth unknown
<i>E. simplex</i> (Bowerbank 1874 such as <i>Hymenaphia</i> )	Tylostyles: 2116 × 27.1	105.8–218.9 × 8.4	Absent	Pale yellow preserved. Shetland Islands. Depth unknown
<i>E. coronula</i> (Bowerbank 1874 such as <i>Hymenaphia</i> )	Tylostyle: 635–1411	254	Absent	Grey preserved. Shetland Islands
<i>E. clavatum</i> (Bowerbank 1866 such as <i>Hymenaphia</i> )	Subtylostyles: 685–2310 × 11–28	64–472 × 5–19	Styles: 418–695 × 3–5	Colour unknown. North Atlantic and Mediterranean. 30–1600 m
<i>E. toureti</i> (Topsent 1894 such as <i>Hymenaphia</i> )	Tylostyles: No data	50–60	Absent	Brown Campeche, Gulf of México. (depth unknown)
<i>E. duoacanthostyla</i> (Hoshino 1981 such as <i>Prianos</i> )	Styles: 250–320 × 5–8	1) 250–280 × 7–9 2) 138–180 × 6–8	Absent	Orange or Peach. Mitsukue, Japan. 15 m
<i>E. spitzbergensis</i> (Fristedt 1887 such as <i>Hymenaphia</i> )	Tylostyles: <2500	Styles: 300	Absent	Grey. Spisbergen, Artic. Depth unknown

\*Additional information of the original description.

*Aulospongia cerebella* (Dickinson 1945) is a deep-sea species from the Gulf of California and the West Pacific coast of Baja Peninsula. Of the remaining species, six are subtidal found in the Mexican Pacific with the exception of *Aulospongia californianus* sp. nov. which is a deep-sea species from the Gulf of California.

The hymedesmoid skeleton of the genus *Eurypon* is a homoplastic character in the order Axinellida (Family Raspailiidae). This choanosomal organization has been reported in several genera of different orders (such as: *Microcionia*, *Acarinus*, *Timea*, *Prosuberites* and others) (Boury-Esnault et al. 1994). The spicule shape and the presence of some microscleres are used in the allocation of some genera and families.

For example, in the family Microcionidae the subgenera *Clathria* and *Microcionia* have the same spicule elements and the difference between these two subgenera is the type of choanosomal skeleton (reticulate in *Clathria* and hymedesmoid in *Microcionia*). However, in the subgenus *Thalysias* there are species with a hymedesmoid and an axial or reticulate choanosomal skeleton. The diagnostic features used in allocating species to the genus *Thalysias* are the presence of ectosomal and subectosomal spicules (Hooper 1996).

### **The genus *Eurypon***

The genus *Eurypon* was originally described by Gray 1867 for the type species *Hymeraphia radiata* Bowerbank 1866. The principal characteristics of this genus are the presence of choanosomal styles or tylostyles, echinating acanthostyles and subectosomal or ectosomal spicules (styles, oxeas and raphides), and an encrusting habit with a hymedesmoid skeleton (Hooper 2002). The skeleton of the genus *Eurypon* is similar to that found in species belonging to the subgenus *Microcionia* (Genus *Clathria*; Family Microcionidae) (Hooper 1996). Recent molecular studies suggest that *Eurypon* is polyphyletic and belongs in the Order Axinellida (Morrow et al. 2012). Species of the genus *Eurypon* have tylostyles in one or two categories as choanosomal spicules. The subectosomal or ectosomal spicules if present are raphides, oxeas or styles. Table 12 allocates species with these diagnostic features.

### ***Species bearing acanthostyles as choanosomal spicules (genus *Acantheurypon*)***

The genus *Acantheurypon* was created by Topsent (1927) for *Hymeraphia pilosella* (Topsent 1904). This species has choanosomal acanthostyles, echinating acanthostyles and ectosomal subtylostyles (Table 13). Topsent (1928) described four new species of this genus from the Azores. Hooper (1991) synonymized *Acantheurypon* with *Eurypon* because the choanosomal skeleton is hymedesmoid. However, other authors considered the genus *Acantheurypon* valid (Boury-Esnault et al. 1994). Morrow et al. (2012) demonstrated using molecular tools that the genus *Eurypon* is polyphyletic and is within the order Axinellida. The genus *Acantheurypon* is monophyletic and grouped in the order Poecilosclerida. One difference between these two genera is the choanosomal spicule morphology (smooth choanosomal tylostyles in *Eurypon* and choanosomal acanthostyles in *Acantheurypon*). Because it has two size classes of acanthostyles, *Trachostylea lamellata* Lévi 1993 should be included in *Acantheurypon*. A further morphological and molecular examination is required to corroborate whether the genus *Acantheurypon* should be re-erected. Table 13 indicates species of the genus *Eurypon* bearing choanosomal acanthostyles.

Table 13. Comparative table of all the *Eurypon* species described worldwide bearing choanosomal acanthostyles. Spicule measurements in  $\mu\text{m}$ .

Species	Choanosomal acanthostyles (Length $\times$ Width)	Acanthostyles (Length $\times$ Width)	Ectosomal spicules (Length $\times$ Width)	Colour, locality and depth
<i>Eurypon pilosella</i> (Topsent 1904 such as <i>Hymenaphia</i> )	350-1700-11-34	95-300 $\times$ 11-34	Subtylostyles with microspined base: 250-668 $\times$ 3.5-9	Yellow or Green. Vilafranca Island, Azores. 50-1740 m
*Boury-Esnault et al. (1994)				
<i>Eurypon mixtum</i> (Topsent 1928 such as <i>Acanthureypon</i> )	>1000	100-320	Subtylostyles:	Grey.
<i>Eurypon incipiens</i> (Topsent 1928 such as <i>Acanthureypon</i> )	770	100-230	No data	Azores. 900-1330 m
<i>Eurypon scabiosum</i> (Topsent 1927 such as <i>Acanthureypon</i> )	1068 $\times$ 20-24	80-250 $\times$ 6-13	Subtylostyles:	Colour not reported.
*Topsent (1928)			No data	Azores. 1250 m
			Subtylostyles:	Grey.
			470-630 $\times$ 3-4	Azores. 914-650 m
			1 mm 65 micras $\times$ 4-7 micra	
<i>Eurypon mucronale</i> (Topsent 1928 such as <i>Acanthureypon</i> )	700-900 $\times$ 25	125-280 $\times$ 20	Tornotes:	Grey.
<i>Eurypon hispidulum</i> (Topsent 1904 such as <i>Hymenaphia</i> )	500 $\times$ 17	370 (Unusual)	400-490 $\times$ 12-17	Azores. 2460 m
<i>Eurypon lamellata</i> (Lévi 1993 such as <i>Trachostylea</i> )	1300-1800 $\times$ 8-10	160-200 $\times$ 10-12	Subtylostyles:	Grey.
			325-365 $\times$ 4	Azores. 99-880 m
			Absent	Colour not reported.
				New Caledonia, 965 m

\*Additional information of the original description.

Table 14. Species assigned to the genus *Eurypon* by van Soest et al. (2012b) with a massive or ramose form.

Species	Choanosomal spicules (Length × Width)	Acanthostyles (Length × Width)	Ectosomal spicules (Length × Width)	Shape, colour, locality and depth
<i>Eurypon cactoides</i> (Burton & Rao 1932 such as <i>Protoraspailia</i> )	Tylostyles: 850 × 16	140	Trichodragmas 48 × 8–20	Erect or cactiform. Brown. Indian Ocean. Depth unknown
<i>Eurypon sessile</i> (Carter 1880 such as <i>Dictyocylindrus</i> )	Tylostyles: 635 × 28.2	Acanthostyles: 148 × 8.5	Oxeas: 282	Massive, subspheric. Brown. Gulf of Manar. Depth unknown
<i>Eurypon inuisitaticanthostyla</i> (Hoshino 1981 such as <i>Prianos</i> )	Strongyles: 325–430 × 6–12	Acanthostyles: 320–482 × 6–16	Absent	Massive, Orange. Mitsukue Japan. 15 m

### ***On the presence of sponges with massive form allocated to the genus Eurypon***

There are three massive or ramose species of the genus *Eurypon* (van Soest et al. 2012b): *Protoraspailia cactoides* Burton and Rao 1932, *Dictyocylindrus sessile* Carter 1880, and *Prianos inuisitaticanthostyla* Hoshino 1981 (Table 14). The first two have choanosomal tylostyles, acanthostyles and ectosomal spicules. The skeletons are of an axial/extra-axial organization. These species are not encrusting or with a hymedesmoid skeleton as in *Eurypon*. We consider that these two species have more affinities with the genus *Raspailia*. Species assigned to this genus have a more-or-less compressed axial skeleton and a radial, plumose or simply reticulate extra-axial skeleton, with choanosomal spicules consisting of two, three or more different size classes (styles and/or oxeas), and echinating acanthostyles (Hooper 2002). *Prianos inuisitaticanthostyla* Hoshino 1981 is a massive sponge described from Japan with strongyles, acanthostyles and an axial compressed choanosomal skeleton. The allocation of this species to one of the current genera from the family Raspailiidae is problematic. There are no species with exclusively strongyles and acanthostyles in the skeleton (Hooper 2002). Hoshino (1981) did not report the ectosomal spicules. A morphological revision should be undertaken to clarify the status of these three species. They do not have the morphological features of the genus *Eurypon*.

### ***The genus Dragmatyle***

Topsent (1904) described a new genus for the type species *Dragmatyle lictor*. This is a white encrusting sponge with tylostyles, ectosomal diactinal spicules and trichodragmas as microscleres. Hooper (1991) synonymized this genus with *Eurypon* because it is encrusting and has tylostyles and ectosomal spicules. Hooper (1991) did not consider the presence of acanthostyles as a diagnostic feature for this taxonomic decision. Currently, all the species assigned to the genus *Eurypon* have this morphological feature. There are currently no genera in the family Raspailiidae [*Raspailia* (*Parasyringella*), *Ceratopsion* or *Thrinacophora*], which lack acanthostyles and have

Table 15. Species originally described in the genus *Dragmatyle* and currently assigned to the genus *Eurypon* by van Soest et al. (2012b). Spicule measurements in  $\mu\text{m}$ .

Species	Choanosomal spicules (Length $\times$ Width)	Subectosomal spicules (Length $\times$ Width)	Ectosomal spicules (Length $\times$ Width)	Shape, colour and depth
<i>Dragmatyle lictor</i> Topsent (1904)	Tylostyles: 2500 $\times$ 23	Tornotes: 1 575 $\times$ 4–5	Trichodragmas: 50 $\times$ 13–15	Encrusting, White. Azores, 1600 m
<i>Dragmatyle topsenti</i> * Burton (1954)	Tylostyles: 1600 $\times$ 14	Styles/Oxeotes: 1200 $\times$ 8	Trichodragmas: 60	Branches, Pale brown. Turneffe Island, Caribbean, Belize 900 m

\*This species has morphological features of the genus *Ceratopsion*.

a hymedesmoid skeleton (Hooper 2002). On the basis of these morphological features we think that the genus *Dragmatyle* is monotypic and might be re-erected. A further morphological analysis should be undertaken to corroborate the status of this genus. *Dragmatyle topsenti* Burton 1954 is a tubular deep-sea species from the Caribbean with tylostyles, ectosomal oxeotes/styles and trichodragmas as microscleres. The skeleton has an axial/extra-axial organization. These morphological features are similar to those of the genus *Ceratopsion*. This genus includes sponges with monactinal or diactinal choanosomal and subectosomal spicules; microscleres if present are trichodragmas (Hooper 2002) (Table 15). This species, previously allocated to *Dragmatyle*, might be included in the genus *Ceratopsion*. Currently, these two species are assigned to the genus *Eurypon* (van Soest et al. 2012b).

### ***Species allocated to the genus Eurypon that lack acanthostyles***

There are two species assigned to the genus *Eurypon* that lack acanthostyles in the skeleton (van Soest et al. 2012b). These species are: *Fasubera deprumi* de Laubenfels 1954 and *Hymeraphia unispiculum* Carter 1880. These species have monactinal spicules as megascleres. We propose to move these species into the genera *Monanchora* Carter 1883 and *Aptos* Gray 1867, respectively. de Laubenfels (1954) moved *Hymeraphia unispiculum* Carter 1880 to the genus *Aptos* and according to van Soest et al. (2012b) *Fasubera* is a junior synonym of *Monanchora* (Table 16).

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Table 16. Species assigned in the genus *Eurypon* by van Soest et al. (2012b) and moved to other genera. Spicule measurements in  $\mu\text{m}$ .

Species	Choanosomal spicules (Length $\times$ Width)	Colour, shape, locality and depth
<i>Monanchora debrumi</i> (de Laubenfels 1954)	Tylostyles: 225 $\times$ 2.5	Red, encrusting. Atoll Likiep. Central Pacific. 5 m
<i>Aptos unispiculum</i> (Carter 1880)*	Styles: 800 $\times$ 18	Pink, encrusting or laminated. Gulf of Manar, Central Pacific

\*This species was originally described in the genus *Hymeraphia* and moved to the genus *Aptos* by de Laubenfels (1954).

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