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New records and checklist of sponges from El Salvador (Eastern Tropical Pacific)

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Abstract

Sponges constitute an important component of the benthic community in coral and rocky reefs. Although they play many ecological roles and interact with diverse marine invertebrate and vertebrate organisms, little is known of the diversity of marine sponges in El Salvador. The present study is the first effort in the study of the biodiversity of shallow rocky reef sponges from Los Cóbanos, the largest reef system and the only marine protected area of the country. The ten species herein described represent the first sponge fauna on non-intertidal reefs up to 16 m depth: *Axinella nayaritensis*, *Endectyon (Endectyon) hyle, Mycale (Carmia) cecilia, Mycale (Zygomycale) ramulosa, Tedania (Tedania) tropicalis* and *Cliona euryphylle. Haliclona (Soestella) caerulea* and *Aplysina chiriquiensis* are new records for the country, while *Callyspongia (Callyspongia) californica* and *Subera etiennei* are new records for the Central America Pacific coast. In addition, a review of the records and distribution of sponges in El Salvador was carried out.

Key words: Biodiversity, Central America, Los Cóbanos, rocky reef, marine sponges

Introduction

Sponges represent an important component in reefs due to their effectiveness in filtering large amounts of water, modifying the reef structure, competing for space, and serving as food for many fish and invertebrates (Rützler 1978). In addition, sponges provide information on the temporal behavior of some environmental variables thanks to the fact that they are closely linked to the environmental conditions where they are found (Carballo *et al*. 1996). Despite the multiple contributions that sponges provide to reefs, they are one of the most unknown groups of invertebrates, mainly due to the difficulty in taxonomic identification of species and in some areas due to the lack of specialists (Van Soest *et al*. 2012).

The study of sponges in the Eastern Tropical Pacific has been mainly developed on the Mexican coasts with studies such as those of Wilson (1904), de Laubenfels (1936), Green & Gómez (1986), and Carballo *et al*. (2019). Other countries in the region have also carried out sponge biodiversity studies, such as Costa Rica (Cortés 1996; Cortés *et al*. 2009; Pacheco *et al*. 2020), Panama (Van Soest & Hajdu 2000), Colombia (Lizarazo *et al*. 2020), and Ecuador (Desqueyroux-Faundez & Van Soest 1997).

The sponge fauna of El Salvador is poorly known, very few studies have focused mainly on sponges such as those performed by Pacheco *et al*. (2018) and Trejo *et al*. (2021), who studied the richness, distribution and abundance of boring sponges at intertidal coral reefs at Los Cóbanos, also for this area, Segovia & Trejo (2023) described the functional role of sponges as one of the main components of the benthic community. More recently, Trejo & Segovia (2024) studied the diversity of sponges in shallow rocky reefs of Punta Amapala, resulting in the

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record of nine species of the class Demospongiae and one species of the class Calcarea. Since the information of sponge fauna in El Salvador remains scarce, it was the aim of this study to describe the diversity of sponges in rocky reefs of Los Cóbanos. In addition, an updated checklist of sponges from El Salvador is also provided.

Materials and methods

El Salvador is located in the Pacific Ocean in Central America and has a coastline of 321 km. The country's coastal area is located to the south and is made up of a continental platform 50 to 80 km wide, up to its natural limit, which is the continental slope towards the Mesoamerican Trench (Gierloff-Emden 1976). The study was carried out in the rocky reef of Los Cóbanos (13°31'25.6" N, 89°48'24.6" W), which is to date the area with the greatest development and diversity of marine communities described for El Salvador (Segovia 2023; Segovia & Trejo 2023). The reef is characterized by coral communities of the species *Porites lobata* Dana, 1846 restricted for the country in a perpendicular strip to the beach, between Acajutla and Punta Remedio up to 13 m deep; as well as patches of calcareous matrix formed by dead colonies of *Pocillopora* Lamarck, 1816, which are eroded (Segovia-Prado & Navarrete-Calero 2007; Elías-Ilosvay *et al.* 2021; Trejo *et al.* 2021). Gorgonian communities are also found from the intertidal to the mesophotic zone (Segovia & Trejo 2023), where they overlap with black coral forests (Segovia 2023).

The specimens were collected by Scuba diving at 12 rocky reef locations (Table 1, Figure 1). The material was collected from the intertidal zone to 16 m maximum depth. The specimens were photographed with a Fujifilm XP subaquatic camera before being detached with a knife from the rocky substrate. The specimens were immersed in 90% ethyl alcohol for preservation. Spicule preparation followed the techniques described by Bautista *et al.* (2006) for light microscopy. Organic skeleton sponges were manually cleaned with fine tweezers to detach the skeleton from the organic material. Spicule and fiber measurements were obtained from 30 spicules of each type or fibers chosen at random for each specimen with the Motic Images Plus 2.0 software. The measurements (minimum length—mean length—maximum length x minimum width—mean width—maximum width) are presented in micrometers.

The specimens were deposited in the Colección de Invertebrados Marinos of the Museo de Historia Natural de El Salvador (MUHNES), under the permit for collection MARN-DEV-GVS-AIMA-021-2018.

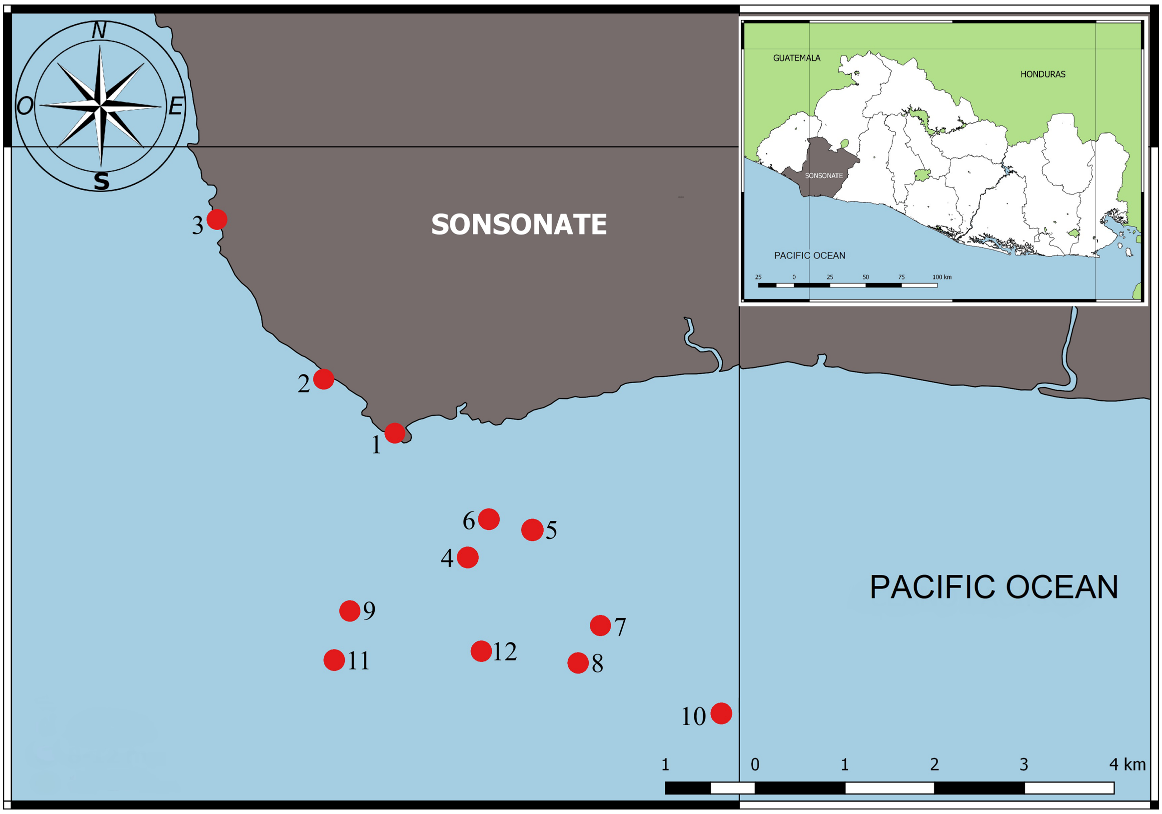

FIGURE 1. Map of Los Cóbanos, showing the collection localities. Numbers in the map refer to those in Table 1.

TABLE 1. List of collection localities at Los Cóbanos, El Salvador.

#	Locality	Depth range (m)	Geographic Coordinates
1	El Faro	0–4	13° 31’ 25.4” N, 89° 48’ 24.3” W
2	Salinitas	0–4	13° 31’ 44.65” N, 89° 48’ 51.05” W
3	El Zope	0–4	13° 32’ 41.9” N, 89° 49’ 31.33” W
4	Las Parguetas	4–8	13° 29’ 45.2” N, 89° 46’ 22.1” W
5	Punta de Monte	4–8	13° 30’ 2.8” N, 89° 48’ 45.9” W
6	La Naviera	4–8	13° 30’ 6.8” N, 89° 47’ 51.4” W
7	El Bajón de Zúniga I	8–12	13° 30’ 16.15” N, 89° 47’ 7.4” W
8	El Bajón de Zúniga II	8–12	13° 30’ 2.9” N, 89° 47’ 15.5” W
9	La Puntita	8–12	13° 30’ 20.7” N, 89° 48’ 40.2” W
10	El Candado	12–16	13° 30’ 40.6” N, 89° 47’ 56.7” W
11	El Arco	12–16	13° 30’ 50.9” N, 89° 47’ 33.1” W
12	La Peñona	12–16	13° 30’ 54.5” N, 89° 47’ 48.9” W

Results

Systematics

Class Demospongiae Sollas, 1885

Subclass Heteroscleromorpha Cárdenas, Pérez & Boury-Esnault, 2012

Order Haposclerida Topsent, 1928

Family Callyspongiidae Laubenfels, 1936

Genus *Callyspongia* Duchassaing & Michelotti, 1864

Definition. Callyspongiidae with a regular ectosomal tangential reticulation of primary, secondary and sometimes tertiary spiculo-fibres (Desqueyroux-Faúndez & Valentine 2002).

***Callyspongia (Callyspongia) californica* Dickinson, 1945**
Figure 2, Table 2

Examined material. MUHNES-91-8—El Faro (13°31’25.4”N, 89°48’24.3”W), depth 1 m, A. Trejo (18.VI.2018); MUHNES-91-22—Salinitas (13°31’44.65”N, 89°48’51.05”W), depth 2 m, A. Trejo (19.VI.2018); MUHNES-91-32—La Naviera (13°30’6.8”N, 89°47’51.4”W), depth 15 m, A. Trejo (17.VII.2018); MUHNES-91-34—El Bajón de Zúniga I (13°30’16.15”N, 89°47’7.4”W), depth 8 m, A. Trejo (18.VII.2018); MUHNES-91-45—El Bajón de Zúniga II (13°30’2.9”N, 89°47’15.5”W) depth 12 m, A. Trejo (18.VII.2018); MUHNES-91-54—El Candado (13°30’40.6”N, 89°47’56.7”W) depth 7 m, A. Trejo (19.VII.2018).

Description. Thin cushioned or lobed sponge, color in life ranges from lilac-purple, pale orange, light brown, and white (Figure 2A). The species has small oscula like volcano-shaped elevations or small tubular projections, the oscula are circular and measure between 1.5 to 4.5 mm. The surface is even and smooth. It has a compressible, elastic and resistant consistency, it quickly returns to its original shape after being compressed. The ectosome consists of a reticulated tangential network of primary and secondary fibers, which create triangular or polygonal networks (Figure 2B). The choanosome is made up of a square reticulation of primary fibers (Figure 2C). The spicules are small oxeas slightly curved in the center (Figure 2D).

Ecological notes. The species was found on rocks and calcareous algae up to 16 m depth.

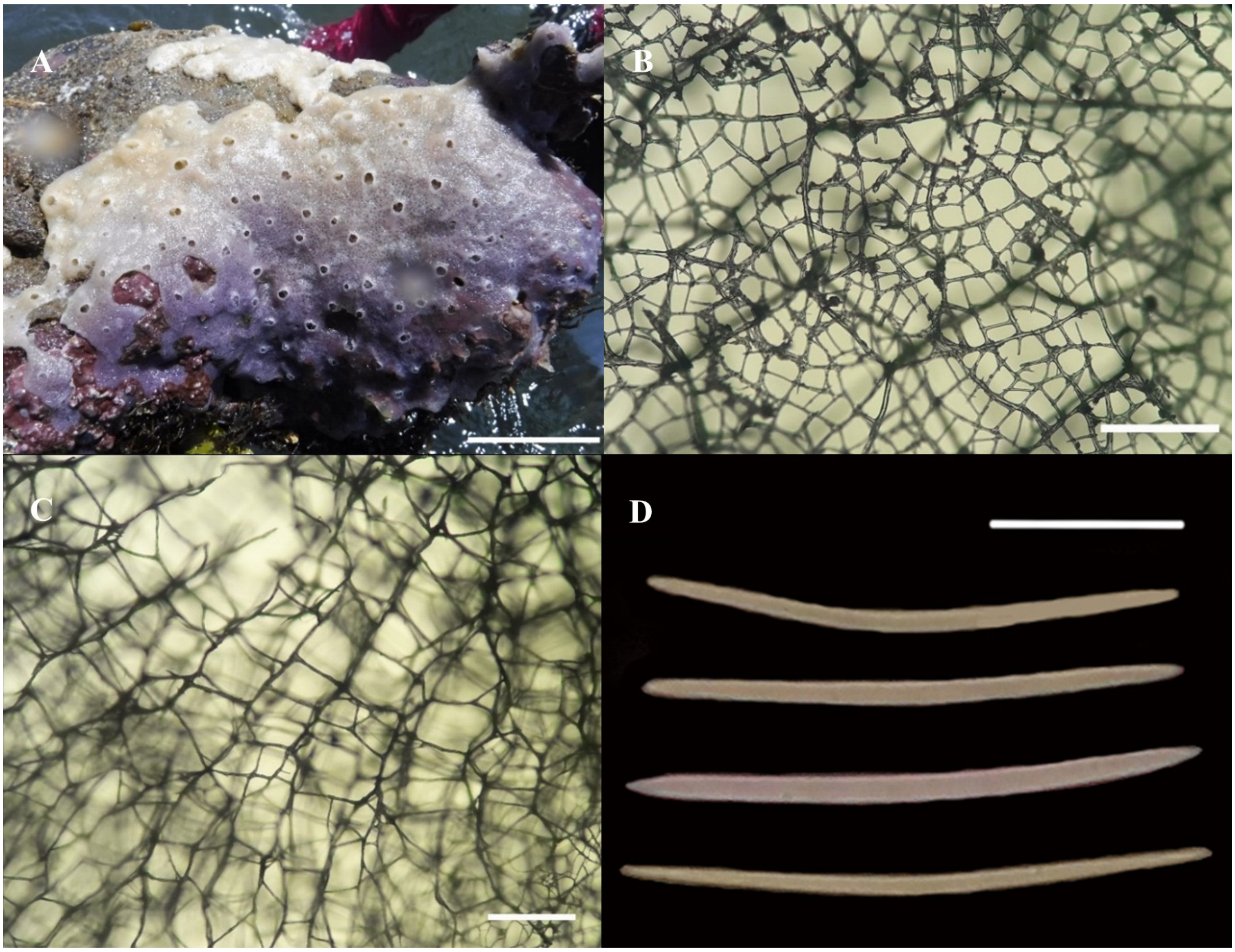

FIGURE 2. *Callyspongia (Callyspongia) californica*. A. Intertidal specimen. B. Ectosome. C. Choanosome. D. Oxeas. Scale bars: A, 5 cm; B, 200 µm; C, 300 µm; D, 25 µm.

TABLE 2. Comparative data on spicule measurement and known distribution of *Callyspongia (Callyspongia) californica*. Values are presented as minimum (mean) maximum in µm.

Examined material	**Oxeas (Length x width)**	**Distribution and depth**
MUHNES-91-8	64.1 (74) 85.3 x 1.6 (4.5) 6.5	El Faro. 1m
MUHNES-91-22	63.7 (76.2) 85 x 2.4 (4) 6.8	Salinitas. 2 m
MUHNES-91-32	63 (72.5) 84.9 x 1.1 (2.6) 3.7	La Naviera. 15 m
MUHNES-91-34	68.3 (76.4) 90 x 2 (3.4) 4.4	El Bajón de Zúniga I. 8 m
MUHNES-91-45	67.1 (78.6) 95.6 x 1.6 (2.6) 3.9	El Bajón de Zúniga II. 12 m
MUHNES-91-54	69 (77.4) 87.7 x 2.5 (3.8) 5.3	El Candado. 7 m
C. californica Sim & Bakus 1986	84 (105) 132 x 2.4 (5.3) 7	Santa Catalina Island, California. 0–18 m
C. californica Cruz-Barraza & Carballo 2008	55 (73) 117 x 1.3 (2.4) 5	Mexican Pacific Ocean. 0–15 m

Distribution and previous records. The species was described by Dickinson in 1945 from the Gulf of California, also, Sim & Bakus (1986) made a report from Santa Catalina Island. Cruz-Barraza & Carballo (2008) have reported the species along the Pacific coast of Mexico, and Jaramillo *et al*. (2021) reported it from Reserva Marina El Pelado, Ecuador. Here we extend the species distribution and present the first record for El Salvador and the Pacific coast of Central America (Table 12).

Remarks. Our specimens are consistent with the descriptions of Sim & Bakus (1986), and Cruz-Barraza & Carballo (2008), but the spicules of these specimens are slightly shorter (up to 95.6 µm). *Callyspongia (Callyspongia) roosevelti* van Soest, Kaiser & Van Syoc, 2011 is another species reported from the eastern Pacific, specifically from Clipperton Islands, this species is similar in shape to our specimens but differs in the size of the oxeas (up to 150 x 5 µm).

Family Chalinidae Gray, 1867

Genus *Haliclona* Grant, 1841

Definition. Chalinidae whith unispicular secundary lines (De Weerdt 2002).

***Haliclona (Soestella) caerulea* Hechtel, 1965**
Figure 3, Table 3

Examined material. MUHNES-91-1—Las Parguetas (13°29'45.2"N, 89°46'22.1"W) depth 12 m, A. Trejo (13. VI.2018); MUHNES-91-35—Punta de Monte (13°30'2.8"N, 89°48'45.9"W) depth 16 m, A. Trejo (17.VI.2018); MUHNES-91-49—La Naviera (13°30'6.8"N, 89°47'51.4"W) depth 15 m, A. Trejo (17.VI.2018).

Description. Sponge that lives in association with the calcareous algae *Jania adherens* J.V.Lamouroux, 1816, it is massive and has mounds that resemble small volcanoes. The oscula are circular and mostly oval, 2–6 mm in diameter (Figure 3A). The surface is rough, not very compressible and brittle. The ectosome is regular, tangential, made up of single oxeas that are joined at each end by spongin (Figure 3D). The choanosome is more difficult to differentiate due to the ramifications of the calcareous algae, but a reticulate network of spicule lines is distinguished (Figure 3E). It has robust oxeas, with a slight curve in the middle and sharp ends (168.5 x 6.7 µm), the microsclere are C-shaped sigmas (20.4 µm) (Figure 3B–C).

Ecological notes. The species was found over rocks and calcareous algae from 12 to 16 m deep.

Distribution and previous records. The species was described by Hechtel in 1965 from Jamaica and has been reported from different Caribbean locations as Curaçao (Van Soest 1980), Gulf of Mexico (Rützler *et al.* 2009; Ugalde *et al*. 2021), Belize (Rützler *et al*. 2000) and Bocas del Toro, Panamá (Díaz 2005). Its distribution in the Pacific Ocean has been reported from Hawaii (Núñez *et al*. 2017), the Mexican Pacific coast (Cruz-Barraza & Carballo 2008) and the Pacific of Panama (Wulff 1996). Here we extend the species distribution and present the first record from Los Cóbanos, El Salvador (Table 12).

Remarks. The specimens coincide with the original description in size and form of the spicules (Hetchel 1965). They also agree with the ones described by Cruz-Barraza & Carballo (2008) which they found between the intertidal to 6 m depth, unlike our specimens that were found from 12 to 15 m depth. There are two other *Hacliclona (Soestella)* species described from the eastern Pacific: *H. (S.) spuma* and *H. (S.) roslynae* Sim-Smith, Hickman & Kelly, 2021, but these species have larger oxeas (up to 192 x 13 µm and 117x7 µm respectively) and they lack of microsclere (Sim-Smith *et al*. 2021).

TABLE 3. Comparative data on spicule measurement and known distribution of *Haliclona (Soestella) caerulea*. Values are presented as minimum (mean) maximum in µm.

Examined material	**Oxeas** **Length x width**	**Sigma** **Length**	**Locality and depth**
MUHNES-91-1	141.3 (178.8) 205.7 x 2.4 (7.6) 10	17.3 (22.6) 27.9	Las Parguetas. 12 m
MUHNES-91-35	128.2 (153.5) 177 x 2.2 (5.4) 9.3	18.5 (21.2) 26.7	Punta de Monte. 16 m
MUHNES-91-49	128.4 (156.3) 181.9 x 4.6 (6.2) 8.7	18.7 (21.5) 24.2	La Naviera. 15 m
H. caerulea Hechtel 1965	128–200 x 5–9	15–30	Port Royal, Jamaica
H. caerulea Cruz-Barraza & Carballo 2008	82.5 (177.3) 210.0 x 2.5 (5.9) 11.3	17.5 (21.6) 30.0	Punta Mita, Punta Santiago, Acapulco. 0–6 m

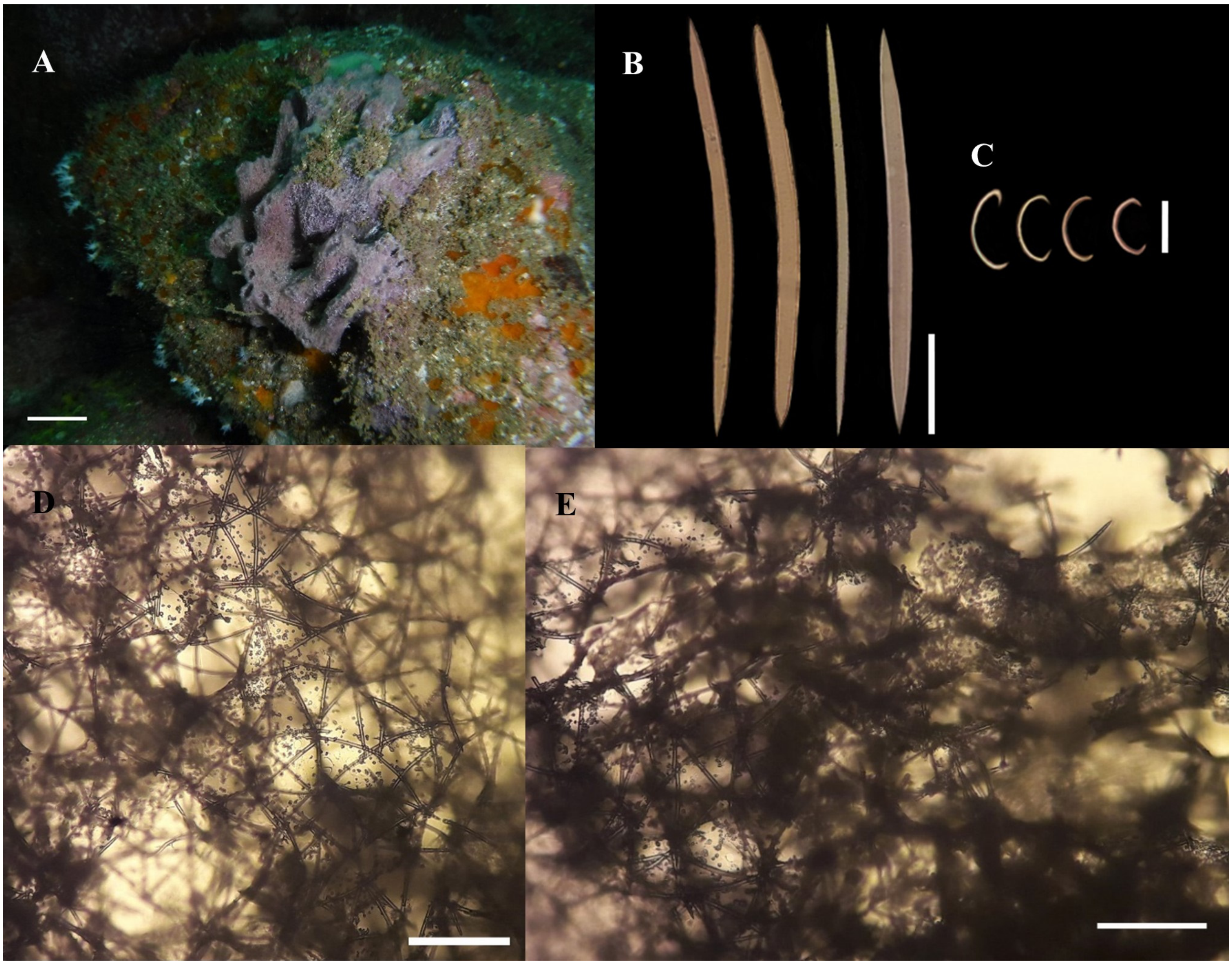

FIGURE 3. *Haliclona (Soestella) caerulea*. A. Specimen collected at 16 m depth. B. Oxeas. C. Sigma. D. Ectosome. E. Choanosome. Scale bars: A, 1 cm; B, 50 µm; C, 12 µm; D–E, 200 µm.

Order Axinellida Lévi, 1953

Family Axinellidae Carter, 1875

Genus *Axinella* Schmidt, 1862

Definition. Axinellidae with axial and extra-axial differentiation in the choanosomal skeleton. Megascleres are styles and oxeas. Microscleres are microraphides and trichodragmata, if present (Alvarez & Hooper 2002).

Axinella nayaritensis Carballo, Bautista-Guerrero & Cruz-Barraza, 2018
Figure 4, Table 4

Examined material. MUHNES-91-12—El Bajón de Zúniga (13°30'16.15"N, 89°47'7.4"W), depth 12 m, A. Trejo (13.VI.2018); MUHNES-91-41—El Candado (13°30'40.6"N, 89°47'56.7"W), depth 4 m, A. Trejo (19.VI.2018).

Description. Erect sponge with cylindrical ramifications, and corrugated surface very difficult to break. The size of the sponge varies between 15–20 cm high by 16–20 cm wide. Branches have a diameter of 0.4–1.2 cm and in young sponges a simple bifurcation can be observed. It has small, slightly raised oscula. Color in life is orange and turns brown when preserved in alcohol (Figure 4A). The skeleton is distinguished by having a condensed axial center that expands towards the surface (Figure 4D), many styles exceed the surface of the sponge forming groups of spicules that resemble brushes (Figure 4E). The spicules present are oxeas (260–501 µm) and styles (254–440 µm) (Figure 4B–C).

Ecological notes. The species was found on sandy substrate, usually in sites surrounded by large rocks and is colonized by large numbers of brittle stars. It was collected in sites from 4 to 12 m depth.

Distribution and previous records. The species was described by Carballo *et al*. (2018) from Nayarit, Mexico. Lizarazo *et al*. (2020) reported the species from the northern Colombian Pacific and, Trejo & Segovia (2024) previously reported it from El Salvador at Punta Amapala. Here we extend the species distribution to Los Cóbanos, the southwestern reef of the country (Table 12).

Remarks. The specimens agree to the original description in the spicules form and skeletal arrangement (Carballo *et al*. 2018), although, our specimens have slightly shorter oxeas (up to 501 µm). The species has been collected from the Eastern Tropical Pacific in a range of 7 to 25 m depth (Carballo *et al*. 2018; Lizarazo *et al*. 2020) while in El Salvador appears to have a shallower distribution starting at 3 m and up to 12 m depth.

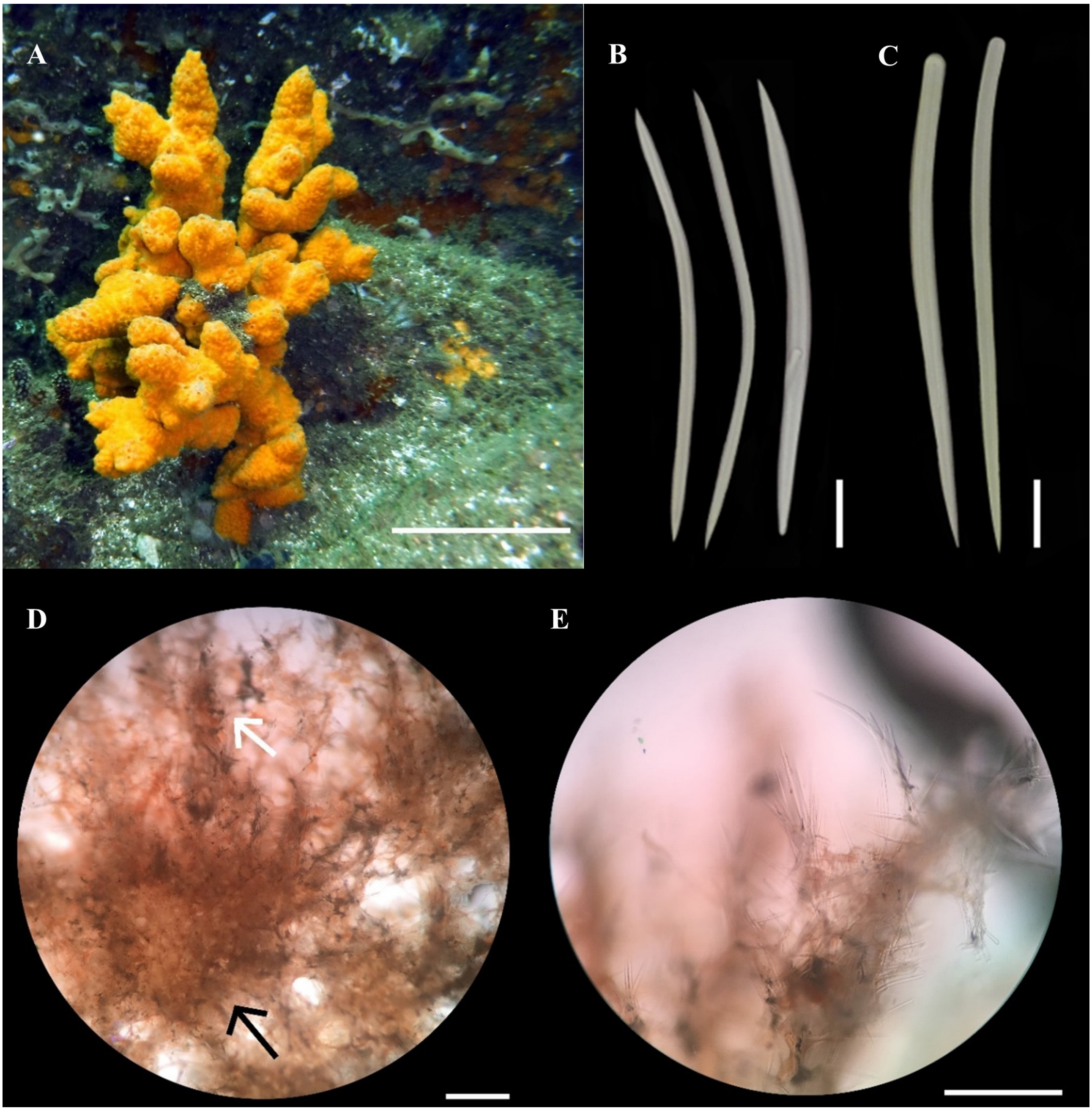

FIGURE 4. *Axinella nayaritensis*. A. Collected specimen. B. Oxeas. C. Styles. D. Axial center (black arrow), Axial branch (White arrow). E. Extra-axial skeleton with spicules projecting towards the surface. Scale bars: A, 5 cm; B–C, 50 µm; D, 1 mm; E, 500 µm.

TABLE 4. Comparative data on spicule measurement and known distribution of *Axinella nayaritensis*. Values are presented as minimum (mean) maximum in µm.

Examined material	**Oxeas** **Length x width**	**Styles** **Length x width**	**Locality and depth**
MUHNES-91-12	270 (347.8) 501 x 6 (12.7) 19.7	260 (324.2) 440 x 11 (14.1) 20	El Bajón de Zúniga I. 12 m
MUHNES-91-41	300 (341.6) 495 x 8 (13.4) 19	254 (328.5) 439 x 10.7 (13.9) 20.3	El Candado. 4 m
A. nayaritensis Carballo *et al*. 2018	300 (417) 575 x 6 (11.6) 21	260 (373.8) 470 x 7.5 (17.2) 25	Isla Isabel, Nayarit, México. 7–25 m
A. nayaritensis Lizarazo *et al*. 2020	241 (362) 632 x 6.9 (11.5) 17.5	223 (307) 388 x 7.8 (12.4) 17.8	Colombian North Pacific. 7.8–14.4 m
A. nayaritensis Trejo & Segovia 2024	280 (347.8) 495 x 5 (12.7) 17.9	260 (324.2) 428 x 10 (14.1) 19	Maculís, El Salvador. 3–8 m

Family Raspailiidae Nardo, 1833

Genus *Endectyon* Topsent, 1920

Definition. Raspailiidae with acanthostyle geometry and acanthostyles confined to a particular region outside of the skeletal axis (Hooper 2002).

Endectyon (Endectyon) hyle (de Laubenfels, 1930)

Figure 5, Table 5

Examined material. MUHNES-91-52—El Candado (13°30'40.6"N, 89°47'56.7"W), depth 6 m, A. Trejo (19. VI.2018).

Description. Branched sponge 3 cm wide and 5 cm high. Each branch of the sponge has two rounded lobes, each 0.5 cm in diameter (Figure 5A). The surface is irregular, no oscula are observed. Hard consistency and difficult to break. Color in life is bright orange with fine sediment on it, when preserved in alcohol it turns beige. The ectosome consists of a layer of straight, long and thin styles (200–250 x 1–2 µm) (Figure 5B). There is an extra-axial subectosome made up of styles that project their tips toward the surface. The choanosome is a compressed axial skeleton formed by primary multispicular fibers interconnected by secondary fibers of two or more spicules, where styles and acanthostyles meet (Figure 5C). The species presents styles in two categories, those of the ectosome that are straight and very thin, while those of the sub ectosome and choanosome are robust, with a sharp point and some are curved in the middle or in the third region closest to the head, the acanthostyles are stout with prominent spines from the mid-region to the tip of the spicule (Figure 5D–F).

TABLE 5. Comparative data on spicule measurement and known distribution of *Endectyon (Endectyon) hyle*. Values are presented as minimum (mean) maximum in µm.

Examined material	**Ectosome styles** **Length x width**	**Choanosome styles** **Length x width**	**Acanthostyles** **Length x width**	**Locality and depth**
MUHNES-91-52	200 (238.7) 250 x 1 (1.5) 2	235.3 (312.5) 369.6 x 4.5 (7.9) 12.7	157.2 (198.5) 232.7 x 8.8 (10.8) 13	El Candado. 6 m
E. hyle De Laubenfels 1932	200–330 x 2	1: 430–550 x 15–20 2: 350–370 x 16–19	180–320 x 12–20	Point Fermin, California.
E. hyle Aguilar-Camacho *et al*. 2013	210 (323.2) 395 x 1.7 (1.9) 2.5	500 (630.8) 780 x 15 (17.8) 20	230 (344.2) 400 x 10 (13.7) 20	Los Frailes Baja California, México. 10–28 m
E. hyle Trejo & Segovia 2024	205 (228.7) 247 x 1 (1.5) 2	230.1 (310.5) 370 x 5 (7.7) 13.1	160 (187.5) 230.4 x 9 (11.3) 12.9	Maculís, El Salvador. 3–8 m

Ecological notes. The species was found on sandy substrate at 6 m depth.

Distribution and previous records. The species was described by de Laubenfels in 1930 from California. Reports have been made from Galapagos Islands (Desqueyroux-Faúndez & Van Soest 1997) and Mexican Pacific Ocean (Aguilar-Camacho & Carballo 2013). In El Salvador, the species has been recorded in Punta Amapala (Trejo & Segovia 2024). Here we extend the species distribution in the country to Los Cóbanos (Table 12).

Remarks. The specimen is similar to the original description in skeletal arrangement and spicule composition (De Laubenfels 1932), although, the size of our specimen is slightly larger, up to 5 cm high. Also, in the type specimen there are two size categories of choanosome styles, unlike our specimen where only one size category was found. Aguilar-Camacho *et al*. (2013) also describe specimens with a single size category of choanosome style, but these are much larger than the ones reported here (up to 780 µm length).

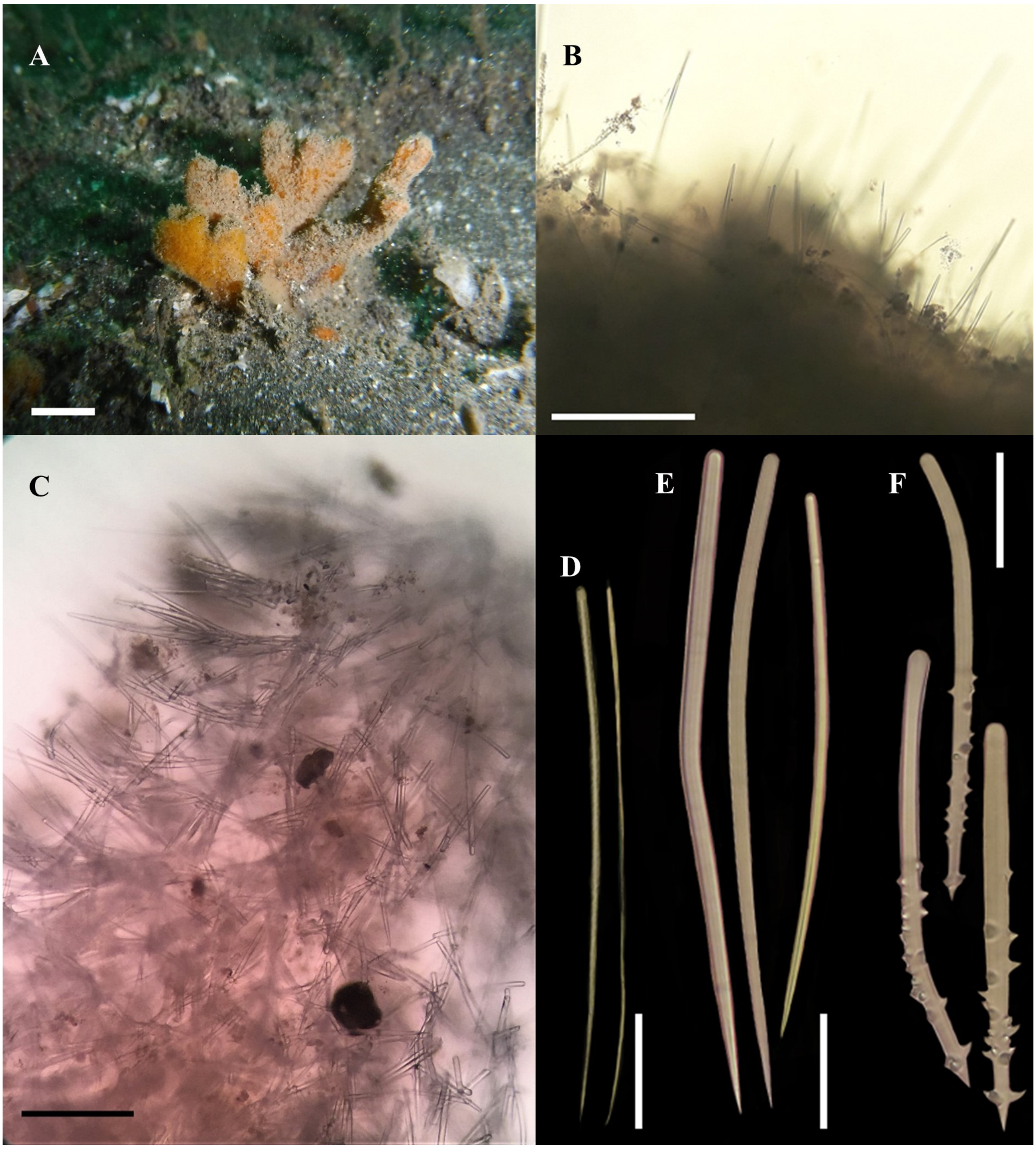

FIGURE 5. *Endectyon (Endectyon) hyle*. A. Collected specimen at 6 m depth. B. Ectosome with styles projecting towards the surface. C. Choanosome. D. Styles from the ectosome. E. Styles from the choanosome. F. Acanthostyles. Scale bars: A, 1 cm; B, 150 µm; C, 300 µm; D–F, 50 µm.

Order Poecilosclerida Topsent, 1928

Family Mycalidae Lundbeck, 1905

Genus *Mycale* Gray, 1867

Definition. Mycalidae with megascleres in a single category of shape, but may have size categories (Van Soest & Hajdu 2002).

***Mycale (Carmia) cecilia* de Laubenfels, 1936**
Figure 6, Table 6

Examined material. MUHNES-91-2—Salinitas (13°31'44.65"N, 89°48'51.05"W), depth 1 m, A. Trejo (19.VI.2018); MUHNES-91-7—El Bajón de Zúniga II (13°30'2.9" N, 89°47'15.5"W), depth 12 m, A. Trejo (18.VII.2018); MUHNES-91-27—El Arco (13°30'50.9"N, 89°47'33.1"W), depth 4 m, A. Trejo (20.VII.2018); MUHNES-91-33—La Peñona (13°30'54.5"N, 89°47'48.9"W), depth 8 m, A. Trejo (20.VII.2018).

Description. Cushion or encrusting sponge 3–7 mm thick. Color in life is intense orange or reddish, when preserved it becomes light brown or beige (Figure 6A). In the skeleton, free mycalostyles are observed, while in the choanosome there are multispicular bands that ascend to the surface, forming brushes (Figure 6B). Spicules are mycalostyles, these are straight and with a very pronounced tip (264.8 x 5.4 µm), the head is slightly oval (5.1 µm). As microscleres, there are anisochela in a single category (19.4 µm) and C shape sigmas (37.7 µm) (Figure 6C–F).

Ecological notes. The species was found on rocky substrate and calcareous algae from the intertidal zone to 12 m depth.

Distribution and previous records. The species was described by de Laubenfels in 1936 from the Pacific end of the Panama Canal. Reports have been made from the Pacific Coast of Mexico (Carballo & Cruz-Barraza 2010; Castillo-Páez *et al*. 2024) and Galápagos Islands (Desqueyroux-Faúndez & Van Soest 1997). In El Salvador the species is reported from Punta Amapala (Trejo & Segovia 2024) and now its distribution is extended to Los Cóbanos (Table 12).

TABLE 6. Comparative data on spicule measurement and known distribution of *Mycale (Carmia) cecilia*. Values are presented as minimum (mean) maximum in µm.

Examined material	Mycalostyle Length x width; head width	Sigma Length	Anisochela Length	Locality and depth
MUHNES-91-2	226.3 (282.3) 325.6 x 3.8 (6) 8.2; 3.2 (5) 6.1	33.3 (38) 42.4	14.6 (19.5) 24.2	Salinitas. 1 m
MUHNES-91-7	245.2 (271) 296.1 x 4.2 (5.6) 6.7; 3.5 (4.9) 6.7	31.8 (38.1) 45.3	13.9 (19.4) 22.5	El Bajón de Zúniga II. 12 m
MUHNES-91-27	226 (243.6) 260.3 x 2.1 (5.1) 7.3; 4 (5.5) 7.3	29.6 (36.3) 44.6	16.8 (19.3) 21.1	El Arco. 4 m
MUHNES-91-33	217.4 (262.9) 301.1 x 2.5 (4.8) 7; 3.5 (5) 6.6	32.7 (38.5) 43.2	15.4 (19.7) 24.2	La Peñona. 8 m
M. cecilia Desqueyroux-Faúndez & Van Soest 1997	166 (230) 260 x 2–4	24 (30) 35	10 (14) 20	Galapagos Islands. 23 m
M. cecilia Carballo & Cruz-Barraza 2010	130–290 x 2.1–8.8; 2.5–10	15–50	12.5–27.5	Mexican Pacific Coast. 0–25 m
M. Cecilia Trejo & Segovia 2024	232 (240) 260.5 x 2.3 (5.2) 7.2; 4.1 (5.4) 7.2	30.1 (35) 42.7	17 (20) 21.3	Maculís, El Salvador. 3–8 m

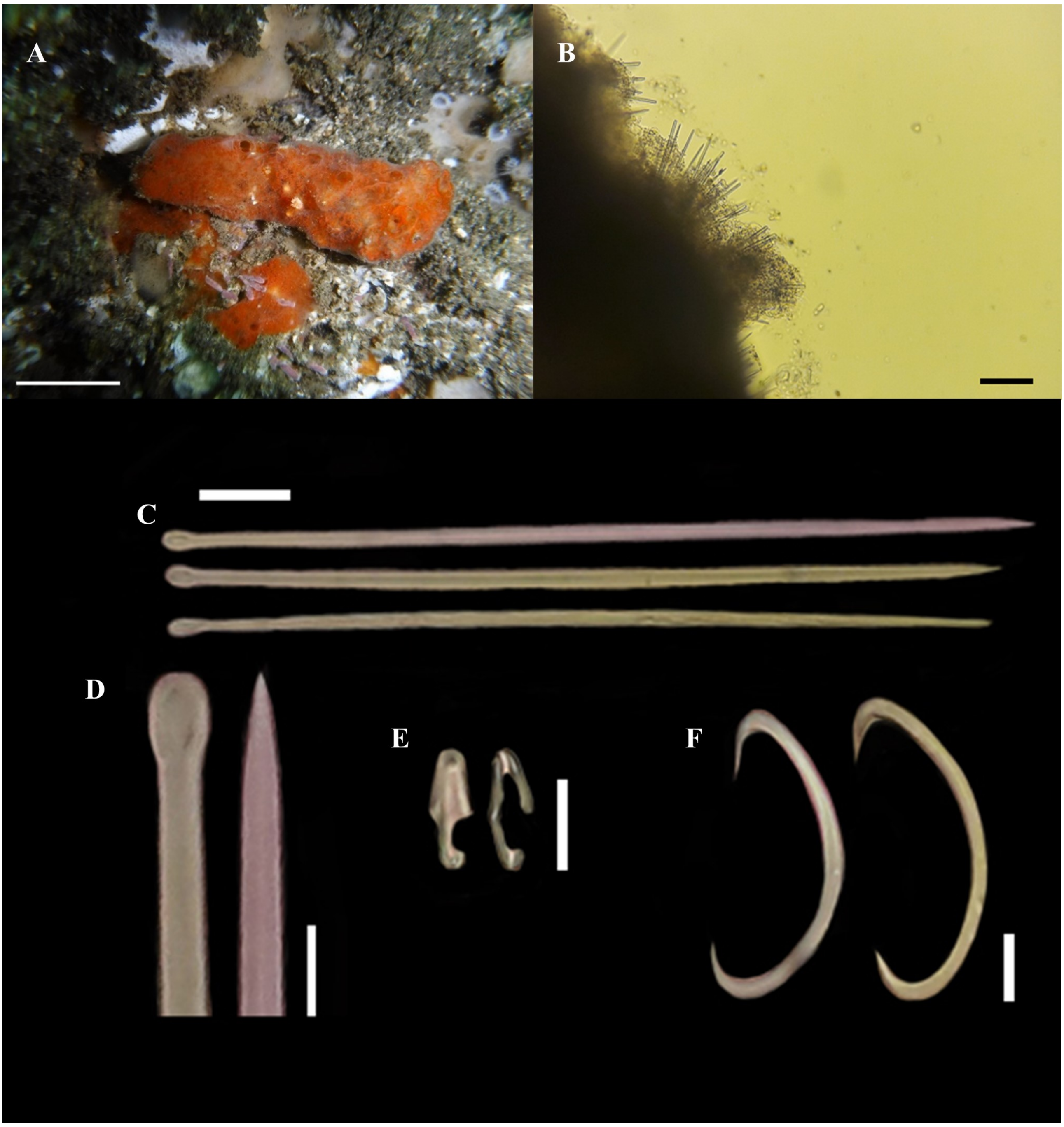

FIGURE 6. *Mycale (Carmia) cecilia*. A. Collected specimen at 4 m depth. B. Sectional view of the ectosome. C. Mycalostyles. D. Detail of head and tip of mycalostyle. E. Anisochela. F. C shaped sigma. Scale bars: A, 3 cm; B, 300 µm; C, 25 µm; D, 5 µm; E, 20 µm; F, 12 µm.

Remarks. Our specimens were found in only one coloration type, bright red to reddish-orange, with the typical formation of brushes composed of mycalostyles towards the surface of the sponge. We determined that the specimens correspond to *M. cecilia* due to the absence of ectosomal skeleton specialization, that is a shared characteristic within the genus *Mycale (Carmia)* Gray, 1867. Toxas were also absent in our specimens, which are present in *M. (Carmia) contax* (Dickinson, 1945).

***Mycale (Zygomycale) ramulosa* Carballo & Cruz-Barraza, 2010**
Figure 7, Table 7

Examined material. MUHNES-91-5—Punta de Monte (13°30’2.8”N, 89°48’45.9”W) depth 16 m, A. Trejo (17.VI.2018); MUHNES-91-16—La Naviera (13°30’6.8”N, 89°47’51.4”W) depth 14 m, A. Trejo (17.VI.2018); MUHNES-91-25—El Bajón de Zúniga I (13°30’16.15”N, 89°47’7.4” W), depth 8 m, A. Trejo (18.VI.2018).

Description. Massive sponge with 13 cm long x 16 wide coverage, it presents lobes 1–2 cm high and 1.3–1.9 cm in diameter. Color in life is orange-brown or purple-brown (Figure 7A). Surface is irregular and smooth, but when observed under the microscope there are notable groups of spicules that protrude from it (Figure 7B). The sponge is of compressible and elastic consistency. The skeleton is formed by a tangential reticulate ectosome containing fibers of multiple mycalostyles. The choanosome contains tracts formed by mycalostyles that arise from the base of the sponge and come to exceed the surface assimilating small brushes. Spicules are mycalostyles, isochelae, sigma and anisochelae in two size categories, toxa and raphides (Figure 7C–I).

Ecological notes. The species was found covering large rocks and calcareous algae up to 16 m depth.

Distribution and previous records. The species was described by Carballo & Cruz-Barraza in 2010 from the Mexican Pacific coast, and has also been reported from Punta Amapala in El Salvador (Trejo & Segovia 2024). Here we extend its distribution in the country to Los Cóbanos (Table 12).

Remarks. Our specimens coincide with the original description in skeletal arrangement and spicule composition, above all, on the presence of anisochela in two categories and palmate isochelae (Carballo & Cruz-Barraza 2010), this last characteristic was determinant for the identification of *M. ramulosa* above all *Mycale* species reported for the Eastern Tropical Pacific. Color in life of the specimens was brownish orange and brownish purple, and they were found with massive and incrusting morphologies.

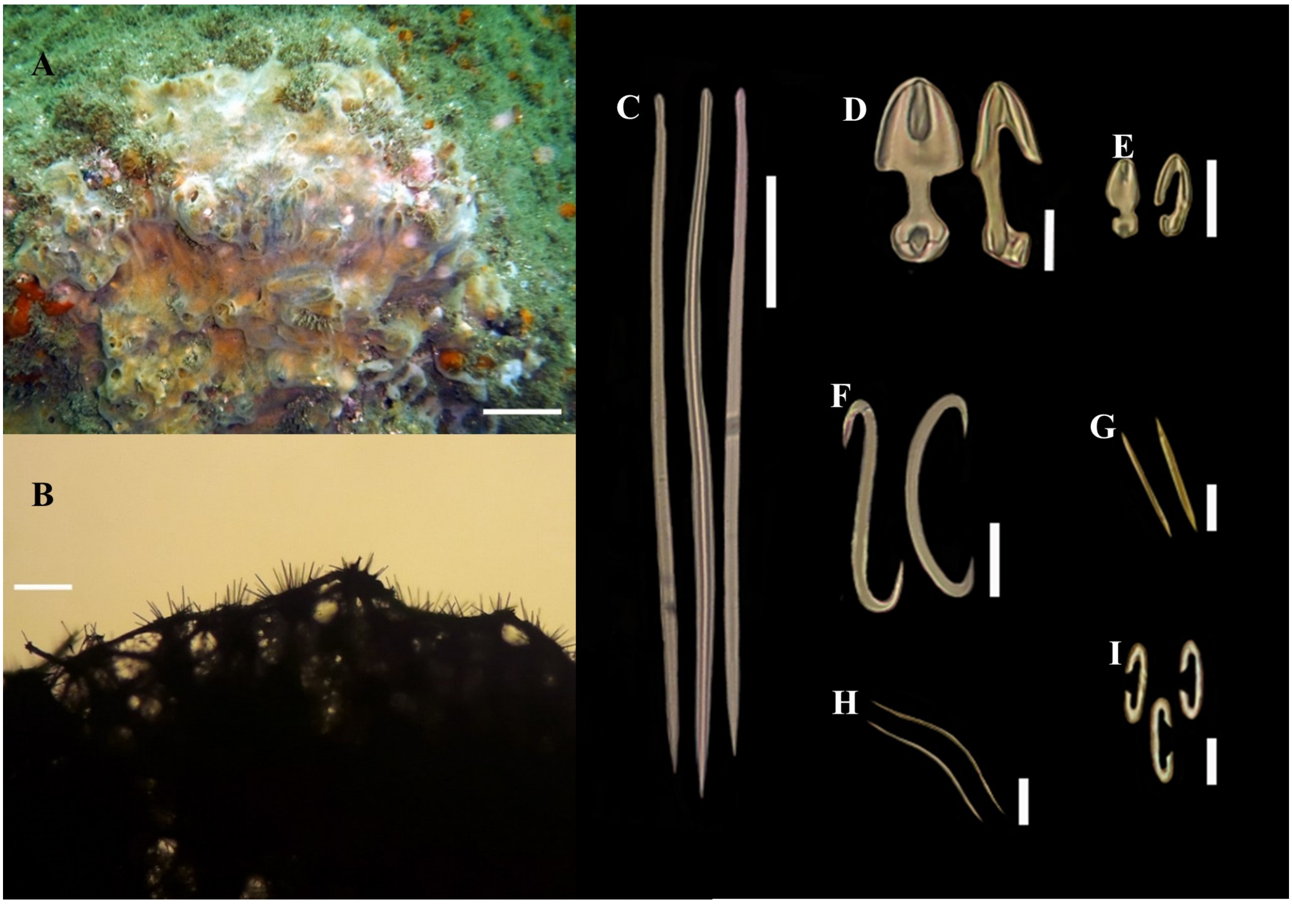

FIGURE 7. *Mycale (Zygomycale) ramulosa*. A. Collected specimen at 16 m depth. B. Cross-sectional view of the choanosome. C. Mycalostyles. D. Anisochela of size category I. E. Anisochela of size category II. F. “S” and “C” shape sigma. G. Raphides. H. Toxa. I. Isochela. Scale bars: A, 5 cm; B, 400 µm; C, 50 µm; D, 10 µm; E, 15 µm; F, 20 µm; G, 10 µm; H, 15 µm; I, 5 µm.

TABLE 7. Comparative data on spicule measurement and known distribution of *Mycale (Zygomycale) ramulosa*. Values are presented as minimum (mean) maximum in µm.

Examined material	Mycalostyle Length x width; Head width	Toxa Length	Sigma Length	Anisochela Length	Isochela Length	Raphides Length	Locality and depth
MUHNES-91-5	217.1 (250.6) 275.3 x 3.5 (5.7) 8.5; 2.5 (4.6) 7.1	30.1 (43.7) 64.1	63.3 (71.1) 80.3	I: 33.9 (41.4) 47.7 II: 16.3 (18) 22.8	9.2 (11.2) 12.9	15.2 (24.4) 30.8	Punta de Monte. 16 m
MUHNES-91-16	221 (255.3) 301.6 x 3.3 (5.5) 8.4; 3.1 (4.9) 6.9	30.3 (44.8) 62.7	62.9 (69.7) 77.4	I: 36.7 (43.3) 47.9 II: 15.1 (18.9) 24	9.1 (11.1) 12.3	21.5 (27) 31.8	La Naviera. 14 m
MUHNES-91-25	239.3 (268.3) 312.5 x 4 (6) 8.2; 3.5 (5.1) 6.7	30.9 (50.3) 69.9	57.8 (68.7) 76.6	I: 39.9 (44.5) 49.9 II: 15.9 (20.1) 24.9	9.5 (10.6) 11.8	24.7 (28.8) 34.9	El Bajón de Zúniga I. 8 m
M. ramulosa Carballo & Cruz-Barraza 2010	157–340 x 2.5–10	25–97	62.5–100	I: 38.8–51.3 II: 16–25	10–15	20–46	Mexican Pacific Coast 1–6 m
M. ramulosa Trejo & Segovia 2024	240 (267) 310 x 4.1 (5.9) 8; 3.5 (5) 6.4	29.8 (49.5) 67.3	56.7 (66.8) 76.3	I: 40 (45.4) 50.1 II: 15.5 (21.2) 25.1	10 (10.4) 11.6	25 (28.6) 33.3	Las Mueludas, El Salvador. 3–8 m

Family Tedaniidae Ridley & Dendy, 1886

Genus *Tedania* Gray, 1867

Definition. Tedaniidae with differentiated ectosomal and choanosomal megascleres (Van Soest 2002).

Tedania (Tedania) tropicalis Aguilar-Camacho, Carballo & Cruz-Barraza, 2018

Figure 8, Table 8

Examined material. MUHNES-91-18—Punta de Monte (13°30'54.5"N, 89°47'48.9"W), depth 7 m, A. Trejo (20. VII.2018).

Description. Massive sponge 7 cm long and 2–5 cm thick. The surface is irregular and smooth, with a flexible and elastic consistency. Color in life is orange and becomes pale when preserved in alcohol (Figure 8A). The ectosome consists of tylotes with microspined heads (170–200 µm x 2.5–5 µm). Styles (220–240 µm) are found in the choanosome, forming multispicular lines and scattered onychaetes (150–180 µm) (Figure 8B–E).

Ecological notes. The species was found on rocky substate surrounded by fine sediment.

Distribution and previous records. The species was described by Aguilar-Camacho *et al*. in 2018 from the Mexican Pacific Coast and Islas Secas, Panama. In El Salvador, the species was reported from Punta Amapala (Trejo & Segovia 2024), and now its distribution is extended to Los Cóbanos (Table 12).

TABLE 8. Comparative data on spicule measurement and known distribution of *Tedania (Tedania) tropicalis*. Values are presented as minimum (mean) maximum in µm.

Examined material	**Styles** **Length x width**	**Tylotes** **Length x width**	**Onychaetes** **Length x width**	**Locality and depth**
MUHNES-91-18	220 (228.7) 240 x 5 (6.1) 7.5	170 (189.5) 200 x 2 (2.3) 2.5	150 (164.7) 180 x 2.5	La Peñona. 7 m
T. tropicalis Aguilar-Camacho *et al.* 2018	150–215 x 2.5–7.5	150–210 x 2.5–5	90–180 x 0.5–1.75	Mexican Pacific Coast. 1–25 m
T. tropicalis Trejo & Segovia 2024	222 (235.4) 240 x 4.9 (5.1) 7.3	185 (189.5) 205 x 2 (2.2) 2.5	147 (166.4) 178 x 2.5	Maculís, El Salvador. 3–8 m

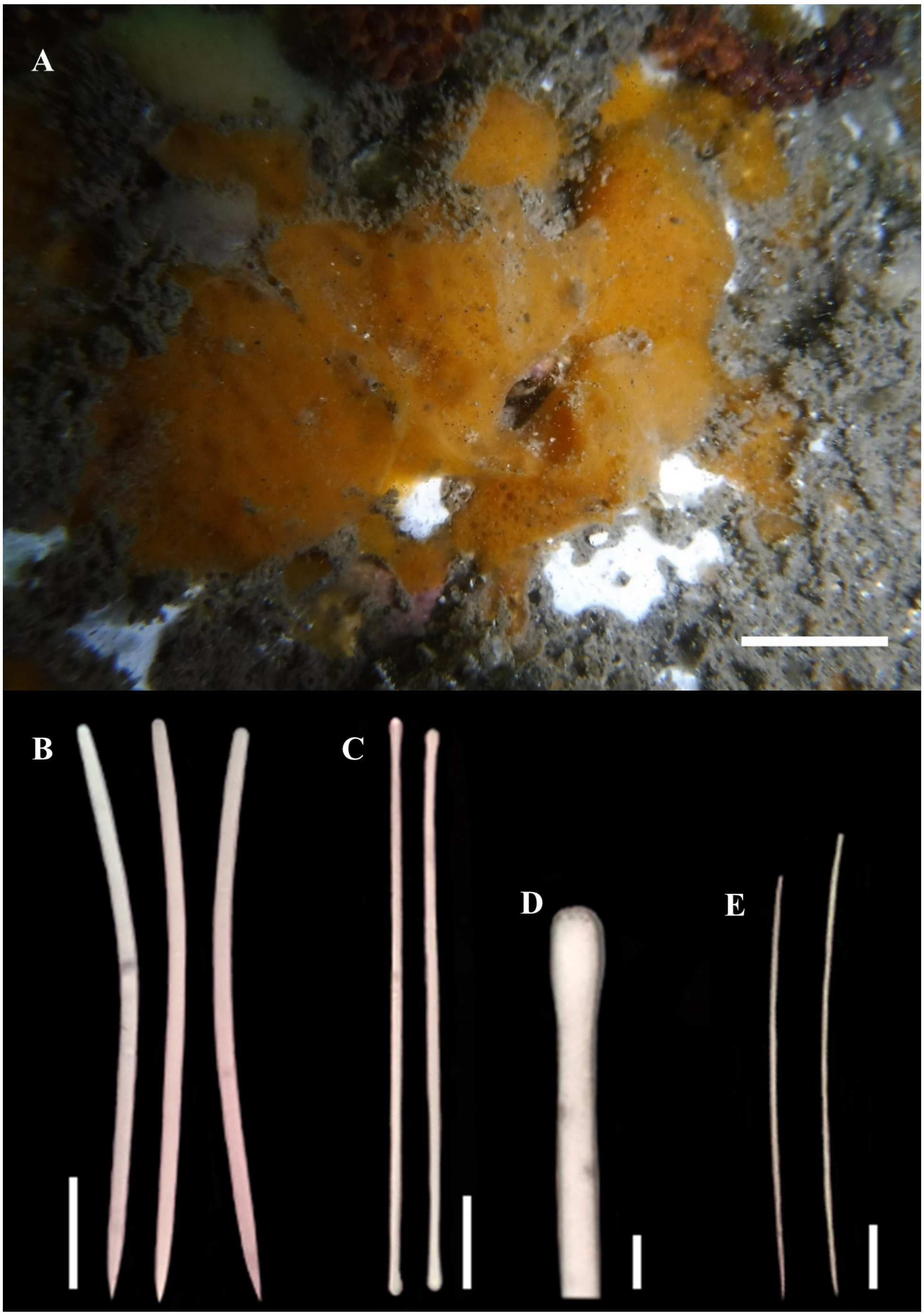

FIGURE 8. *Tedania (Tedania) tropicalis*. A. Collected specimen at 7 m depth. B. Styles. C. Tylotes. D. Detail of the microspined head of a tylote. E. Onychaetes. Scale bars: A, 1 cm; B, 50 µm; C, 30 µm; D, 2 µm; E, 25 µm.

Remarks. The specimen agrees with the original description in spicule composition, with onychaetes in one category and its characteristic reddish-orange color, unlike *Tedania fulvum* Aguilar-Camacho, Carballo & Cruz-Barraza, 2018, which is another species distributed in the Eastern Tropical Pacific, but has onychaetes in two categories, and it has been reported only from the Bay of Mazatlan (Aguilar-Camacho *et al*. 2018).

Order Clionaida Morrow & Cárdenas, 2015

Family Clionaidae D'Orbigny, 1851

Genus *Cliona* Grant, 1826

Definition. Excavating, mostly cryptic Clionaidae without elaborate aquiferous morphology; with microscleres composed of raphides or spirasters, including amphiastrose modifications of spirasters or entirely smooth forms (Rützler 2002).

Cliona euryphylle Topsent, 1888

Figure 9, Table 9

Examined material. MUHNES-91-43—El Arco (13°30'50.9"N, 89°47'33.1"W) depth 6 m, A. Trejo (20. VII.2018).

Description. Boring sponge of calcareous substrate, with a surface area of 5 x 3 cm. Color in life is bright yellow, it turns pale yellow when preserved in alcohol. It has oval oscular papillae of 2–4 mm in diameter slightly protruding from the surface (Figure 9A). The skeleton consists of tylostyles and spiraster. Tylostyles have a well-formed head, are straight and with a pointed termination, measuring between 149–354.8 µm. Spiraster are short, stout and with many thick spines (Figure 9B–C). The sponge was collected on calcareous algae at a depth of 6 m, and it was possible to observe it thanks to the oscular papillae that protruded from the surface.

Ecological notes. The species was found over calcareous algae surrounded by turf and coarse sand.

Distribution and previous records. The species was described by Topsent in 1888 from the Gulf of Mexico, later it was reported in New Zealand (Bergquist 1968; Kelly *et al*. 2009). For the Eastern Tropical Pacific, it has been reported from the states of Sonora, Sinaloa, Nayarit, Jalisco and Baja California Sur in México (Carballo *et al*. 2008), also from Costa Rica (Pacheco *et al*. 2018) and previously from Punta Amapala, El Salvador (Trejo & Segovia 2024). Here we extend its distribution to Los Cóbanos (Table 12).

Remarks. The specimen is similar to the description made by Carballo *et al*. (2008) and Pacheco *et al*. (2018) for *C. euryphylle* from the Mexican and Central America Pacific, with tylostyles and spirasters as the only spicules present. Another species with these characteristics is *C. flavifodina* Rützler, 1974, but its spirasters are much longer (up to 75 µm) and may have three to four undulations than in our sample which only has one.

TABLE 9. Comparative data on spicule measurement and known distribution of *Cliona euryphylle*. Values are presented as minimum (mean) maximum in µm.

Examined material	Tylostyles Length x width; head width	Spiraster	Locality and depth
MUHNES-91-43	149 (257.1) 354.8 x 3.5 (6.8) 8.7; 5 (5.5) 6.1	10.1 (17.3) 25.6	El Arco. 6 m
C. euryphylle Carballo *et al.* 2008	115–365 x 1.3–11.3; 5–6.3	6–30	Mexican Pacific Coast. 1–13 m
C. euryphylle Pacheco *et al*. 2018	120 (201) 300 x 5 (6.7) 8	9 (18) 24	Isla del Caño and Bahía Salina, Costa Rica. 4–20 m
C. euryphylle Jaramillo *et al*. 2021	221 (267) 336 x 5 (7) 11	8 (19) 35	El Pelado Islet, Ecuador 5–10 m

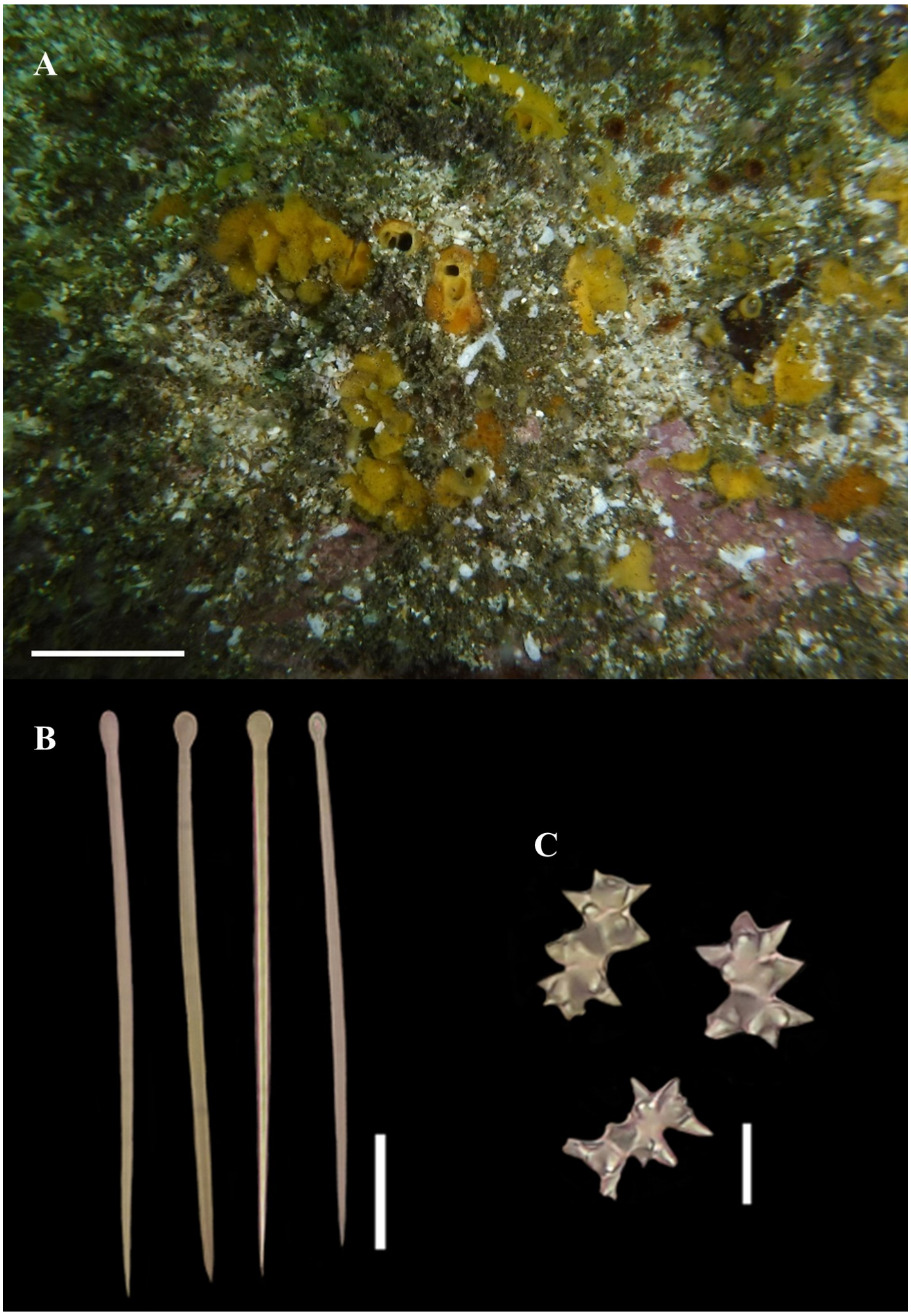

FIGURE 9. *Cliona euryphylle*. A. Collected specimen at 6 m depth. B. Tylostyles. C. Spiraster. Scale bars: A, 2 cm, B, 30 µm, C, 5 µm.

Subclass Verongimorpha Erpenbeck, Sutcliffe, De Cook, Dietzel, Maldonado, van Soest, Hooper & Wörheide, 2012

Order Verongiida Bergquist, 1978

Family Aplysinellidae Bergquist, 1980

Genus *Suberea* Bergquist, 1995

Definition. Aplysinellidae with coarse irregular dendritic fibres in which bark and pith elements are present but the pith predominates. The surface is smooth or conulose and the sponge form massive, sometimes stalked or branching (Bergquist & de Cook 2002a).

Suberea etiennei **Soest, Kaiser & Van Syoc, 2011**
Figure 10, Table 10

Examined material. MUHNES-91-51—El Bajón de Zúniga I (13°30'16.15"N, 89°47'7.4"W), depth 9 m, A. Trejo (18.VII.2018).

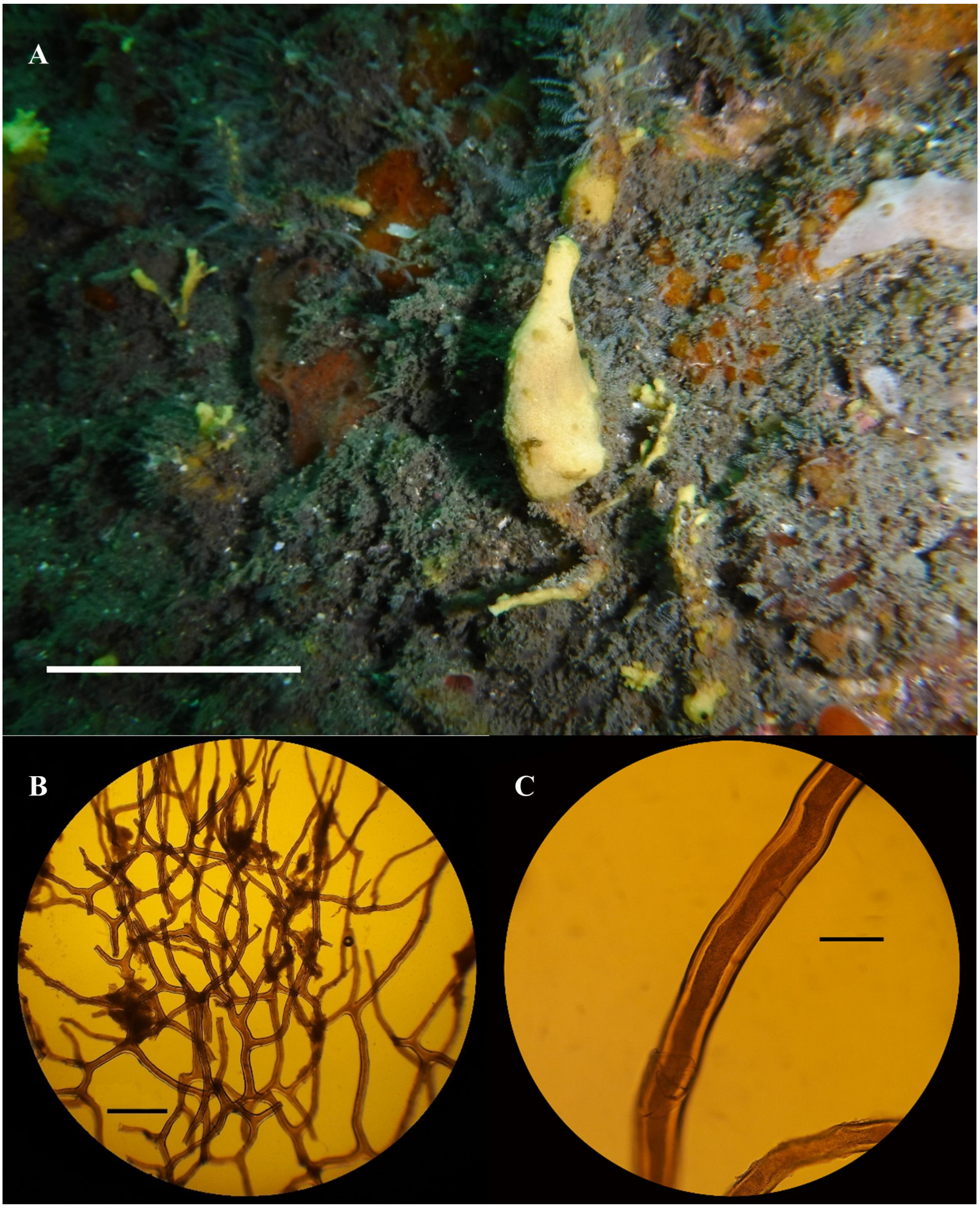

FIGURE 10. *Suberea etiennei.* A. Collected specimen at 9 m depth. B. Skeletal morphology of dendritic termination and dichotomous fibers. C. Fiber detail with dark and granulated pith. Scale bars: A, 3 cm; B, 500 µm; C, 100 µm.

TABLE 10. Comparative data on fiber measurement and known distribution of *Suberea etiennei*. Values are presented as minimum—maximum; mean ± SD in µm.

Examined material	Fiber diameter	Bark (% of the diameter in the fiber)	Pith (% of the diameter in the fiber)	Locality and depth
MUHNES-91-51	35–90; 57.7 ± 16.3	25–57; 42 ± 10.4	43–75; 58 ± 10.4	El Bajón de Zúniga I. 9 m
S. etiennei Van Soest *et al*. 2011	55–97	15–20	--	Clipperton Island. 8–32 m

Description. Pale yellow sponge in life, after preservation it turned violet-black, it does not have a specific morphology and has a low proportion of fibers compared to the organic material, it is soft and irregular to touch (Figure 10A). It presents mostly dichotomous dendritic fibers that divide irregularly and much more frequently when approaching the surface. The fibers are thin (35–90 µm) compared to other species of the same genus, the pith is dark and granular, occupying between 43–75% of the fiber (Figure 10B–C).

Ecological notes. The species was found attached to large rocks and surrounded by turf at 9 m depth.

Distribution and previous records. The species was described by Van Soest *et al*. in 2011 from Clipperton Islands. Here we report it for the first time in Central America (Table 12).

Remarks. The specimen shares the common characteristics of the genus *Suberea* as the low proportion of fibers compared to the soft tissue. We state that the specimen belongs to *S. etiennei* because it has very thin fibers and the proportion of the pith is similar to the original description (Van Soest *et al*. 2011). There are only two species of *Suberea* described from the eastern Pacific: *S. etiennei* from Clipperton Islands, and *S. esmerelda* Sim-Smith, Hickman Jr & Kelly, 2021 from Galapagos Islands, this species differs with our specimen because of its morphological external characteristics as a massive and multilobate sponge with large conspicuous oscules at the ápex of the lobes, also its color in life is dull yellow to greenish grey (Sim-Smith *et al.* 2021).

Family Aplysinidae Carter, 1875

Genus *Aplysina* Nardo, 1834

Definition. Aplysinidae characterised by possession of fibres of only one kind with no foreign detritus and having a thick pith component (Bergquist & de Cook 2002b).

Aplysina chiriquiensis Díaz, Van Soest, Rützler & Guzmán, 2005

Figure 11, Table 11

Examined material. MUHNES-91-4—El Bajón de Zúniga I (13°30'16.15"N, 89°47'7.4"W), depth 8 m, A. Trejo (18.VII.2018); MUHNES-91-13—La Puntita (13°30'20.7"N, 89°48'40.2"W), depth 8 m, A. Trejo (19.VII.2018).

Description. Branched sponge, with finger-like branches coming from a common base. Specimens are 10 to 20 cm tall, their branches 3 to 15 cm tall and 1 to 4 cm thick. Branches are soft to touch, they can be cylindrical and sometimes compressed (Figure 11A–B). The external color of the sponge is intense yellow and when exposed to air they turn blue, when preserved they turn dark brown or black. The skeleton has a compressible and elastic consistency, and generally presents oscula located in small protuberances. The skeleton consists of a reticulate meshwork of laminated amber fibers 70–170 µm in diameter, a granular pith occupying 10–38% of the fiber diameter (Figure 11C–D).

Ecological notes. The species was found attached to large rocks and among octocorals of the genus *Carijoa* Müller, 1867, at 8 m depth.

Distribution and previous records. The species was described by Díaz *et al*. in 2005 from the Gulf of Chiriqui, Panama. It was previously reported by Desqueyroux-Faúndez & Van Soest in 1997 from Galápagos Islands under the synonym of *Aplysina ecuatorensis.* Later, Lizarazo *et al*. (2020) and Willenz & Hajdu (2022) reported the species from the Pacific of Colombia and Peru, respectively. Here we report it for the first time from Los Cóbanos, El Salvador (Table 12).

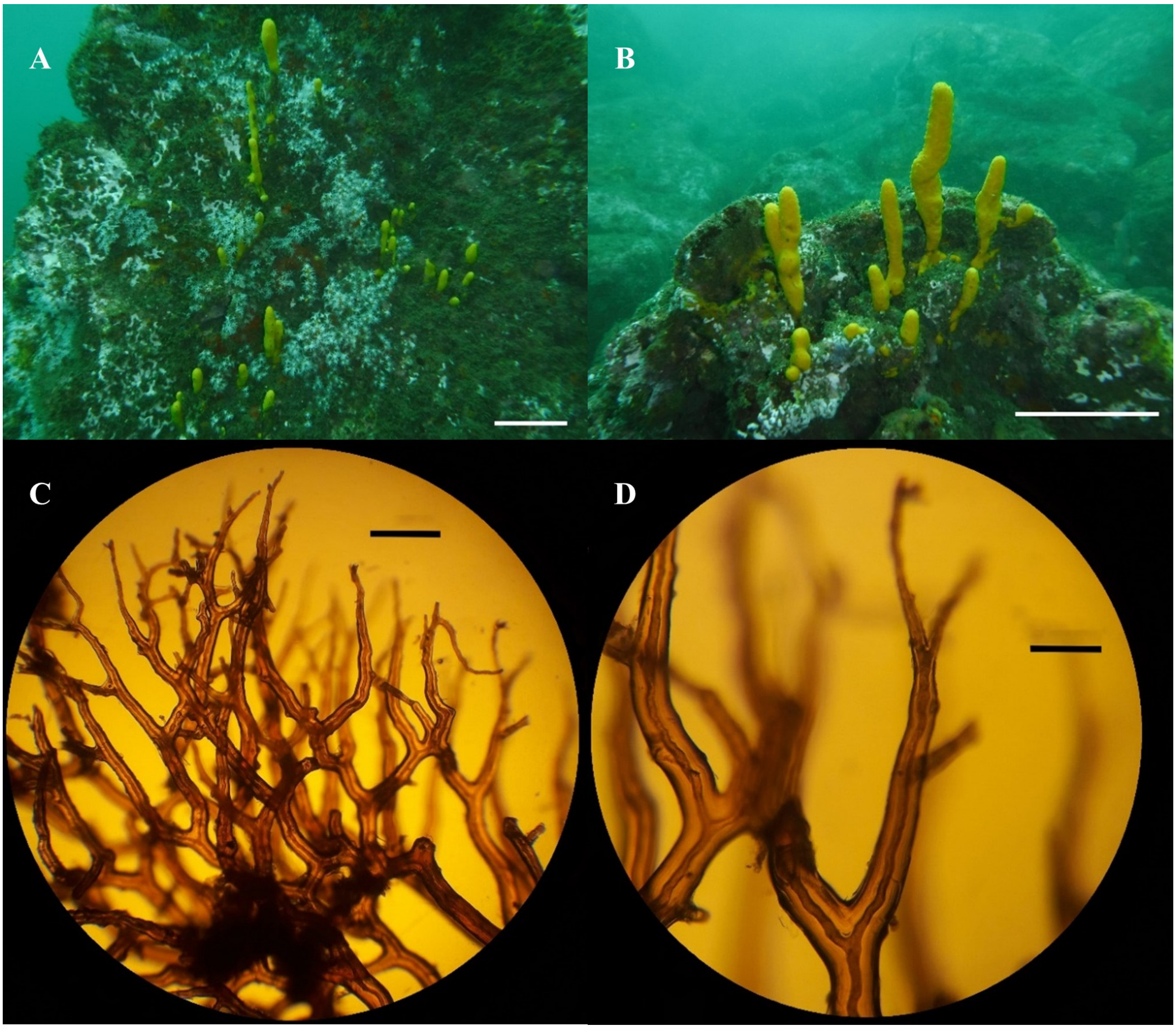

FIGURE 11. *Aplysina chiriquiensis*. A, B. Collected specimen at 8 and 12 m depth. C. Reticulated mesh of fibers with dichotomous termination. D. Detail of amber dendritic fiber. Scale bars: A–B, 5 cm; C, 500 µm; D, 200 µm.

TABLE 11. Comparative data on fiber measurement and known distribution of *Aplysina chiriquiensis*. Values are presented as minimum—maximum; mean ± SD in µm.

Examined material	Fiber diameter	Bark (% of the diameter in the fiber)	Pith (% of the diameter in the fiber)	Locality and depth
MUHNES-91-4	70–170 119.5 ± 28.9	61.5–93.3 79.9 ± 8.7	10–38.5 21.6 ± 7.9	El Bajón de Zúniga I. 8 m
MUHNES-91-13	80–160 124.2 ± 25	66–93 80.9 ± 8.8	12.5–38.4 21 ± 8.3	La Puntita. 12 m
A. chiriquiensis Díaz *et al*. 2005	30–210	--	15–70	Gulf of Panamá and Galápagos Islands. 15–35 m

Remarks. From the four species of the genus *Aplysina* reported in the Eastern Tropical Pacific, our specimen matches the description of *A. chiriquiensis,* since is the only species with pedunculate morphology and bright yellow coloration, although, the species can be found in color ranges from pinkish-red or purple too (Díaz & Van Soest 2005), the only coloration identified for our specimens was bright yellow. Our samples differ from the other species specially in morphology and coloration since *A. clathrata* Cruz-Barraza, Carballo, Rocha-Olivares, Ehrlich & Hog, 2012, is a semi-spherical to massive sponge with bright yellow or yellow to brown, red, violet or pink (Cruz-Barraza *et al*. 2012). The other two species *A. gerardogreeni,* Gómez & Bakus, 1992, and *A. revillagigedi* Cruz-Barraza, Carballo, Rocha-Olivares, Ehrlich & Hog, 2012, are cushion-shaped to massive sponges, the first one commonly yellow with tubes topped by an oscule and the second one usually green with oscula lineally on rims (Cruz-Barraza *et al*. 2012).

TABLE 12. Species of freshwater and marine sponges reported from El Salvador. *= reported in this study.

Systematics	Taxon	Location	Reference / Comments
Class Calcarea Bowerbank, 1862			
	Sub Class Calcinea Bidder, 1898	Punta Amapala	Trejo & Segovia 2024
Class Demospongiae Sollas 1885			
Subclass Heteroscleromorpha Cárdenas, Pérez & Boury-Snault 2015			
Order Haposclerida Tospent, 1928			
Family Callispongiidae de Laubenfels, 1936	*Callyspongia californica* Dickinson, 1945	Los Cóbanos*	First record from El Salvador and Central America
Family Chalinidae Gray, 1867	*Haliclona caerulea* Hechtel, 1965	Los Cóbanos*	First record from El Salvador
	Haliclona sp.	Punta Amapala	Trejo & Segovia 2024
Family Phloeodictyidae Carter, 1882	*Siphonodictyon crypticum* Carballo, Hepburn, Nava, Cruz-Barraza & Bautista-Guerrero, 2007	Los Cóbanos	Pacheco *et al*. 2018, Trejo *et al.* 2021
Order Axinellida Lévi, 1953			
Family Axinellidae Carter, 1875	*Axinella nayaritensis* Carballo, Bautista-Guerrero & Cruz-Barraza, 2018	Punta Amapala, Los Cóbanos*	Trejo & Segovia 2024 / Extended distribution in El Salvador
Family Raspailiidae Nardo, 1833	*Endectyon (Endectyon) hyle* de Laubenfels, 1930	Punta Amapala, Los Cóbanos*	Trejo & Segovia 2024 / Extended distribution in El Salvador
Order Tetractinellida Marshall 1876			
Family Thoosidae Cockerell, 1925	*Thoosa calpulli* Carballo, Cruz-Barraza & Gómez, 2004	Los Cóbanos	Pacheco *et al*. 2018, Trejo *et al.* 2021
Order Spongillida Manconi & Pronzato, 2002			

......*continued on the next page*

TABLE 12. (Continued)

Systematics	Taxon	Location	Reference / Comments
Family Spongillidae Gray, 1867	*Ephydatia fluviatilis* Linnaeus, 1759	Lake Ilopango	Poirrier & Trabanino 1989
	Spongila alba Carter, 1849	Lake Ilopango	Poirrier & Trabanino 1989
Order Poecilosclerida Topsent, 1928			
Family Mycalidae Lundbeck 1905	*Mycale (Carmia) cecilia* de Laubenfels 1936	Punta Amapala, Los Cóbanos*	Trejo & Segovia 2024 / Extended distribution in El Salvador
	Mycale (Zygomycale) ramulosa Carballo & Cruz-Barraza, 2010	Punta Amapala, Los Cóbanos*	Trejo & Segovia 2024 / Extended distribution in El Salvador
Family Tedaniidae	*Tedania tropicalis* Topsent, 1887	Punta Amapala, Los Cóbanos*	Trejo & Segovia 2024 / Extended distribution in El Salvador
Order Clionaida Morrow & Cárdenas, 2015			
Family Clionaidae D'Orbigny 1851	*Cliona californiana* de Laubenfels, 1932	Punta Amapala	Trejo & Segovia 2024
	Cliona euryphylle Topsent, 1888	Punta Amapala, Los Cóbanos*	Trejo & Segovia 2024 / Extended distribution in El Salvador
	Cliona microstrongylata Carballo & Cruz-Barraza, 2005	Los Cóbanos	Pacheco *et al*. 2018, Trejo *et al.* 2021
	Cliona pocillopora Bautista-Guerrero, Carballo, Cruz-Barraza & Nava, 2011	Los Cóbanos	Pacheco *et al*. 2018, Trejo *et al.* 2021
	Cliona vermifera Hancock, 1867	Los Cóbanos	Pacheco *et al*. 2018, Trejo *et al.* 2021
	Cliothosa tylostrongylata Cruz-Barraza, Carballo, Bautista-Guerrero & Nava, 2011	Los Cóbanos	Pacheco *et al*. 2018, Trejo *et al.* 2021
Subclass Verongimorpha Erpebeck, Sutcliffe, De Cook, Dietzel, Maldonado, Van Soest, Hooper & Wörheide, 2012			
Order Verongiida Bergquist, 1978			
Family Aplisinellidae Bergquist, 1980	*Suberea etiennei* Van Soest, Kaiser & Van Syoc, 2011	Los Cóbanos*	First record from El Salvador and Central America
Family Aplysinidea Carter 1875	*Aplysina chiriquiensis* Díaz, Van Soest Rützler & Guzmán, 2005	Los Cóbanos*	First record from El Salvador
	Aplysina gerardogreeni Gómez & Bakus, 1992	Punta Amapala	Trejo & Segovia 2024

Discussion

The study of sponges in El Salvador has been scarce. The first records correspond to the freshwater sponges *Spongilla alba* Carter, 1849, and *Ephydatia fluviatilis* Linnaeus, 1759, by Poirrier & Trabanino (1989). After that, until very recently, they are no more records of sponges from El Salvador (Pacheco *et al*. 2018). Since then, several studies have determined the importance of the sponges in reefs ecosystems, where can occupy between 4 and 20% of the benthic coverage (Segovia & Trejo 2023; Trejo & Segovia 2024).

With our findings the sponge fauna of El Salvador increased to 22 species (Figure 12). This research contributes to increasing the diversity of the group with four new records: *Callyspongia (Callyspongia) californica, Haliclona (Soestella) caerulea*, *Aplysina chiriquiensis* and *Suberea etiennei* (Table 12, Figure 12), also, the geographical distribution expansion of six species to the southwest of the country: *Axinella nayaritensis, Endectyon (Endectyon) hyle, Mycale (Carmia) cecilia, Mycale (Zygomycale) ramulosa, Tedania tropicalis* and *Cliona euryphylle* (Table 12, Figure 12). The total species in El Salvador is not yet compared to what is registered in other countries of the region, such as in the case of Mexico with more than 150 identified species (Carballo *et al.* 2004; Carballo *et al*. 2019); Costa Rica and Colombia with more than 40 species each (Cortés 1996; Cortés *et al.* 2017; Pacheco *et al*. 2018; Lizarazo-Rodríguez *et al*. 2020). It is important to highlight that these countries have dedicated more time and effort in the study of this group.

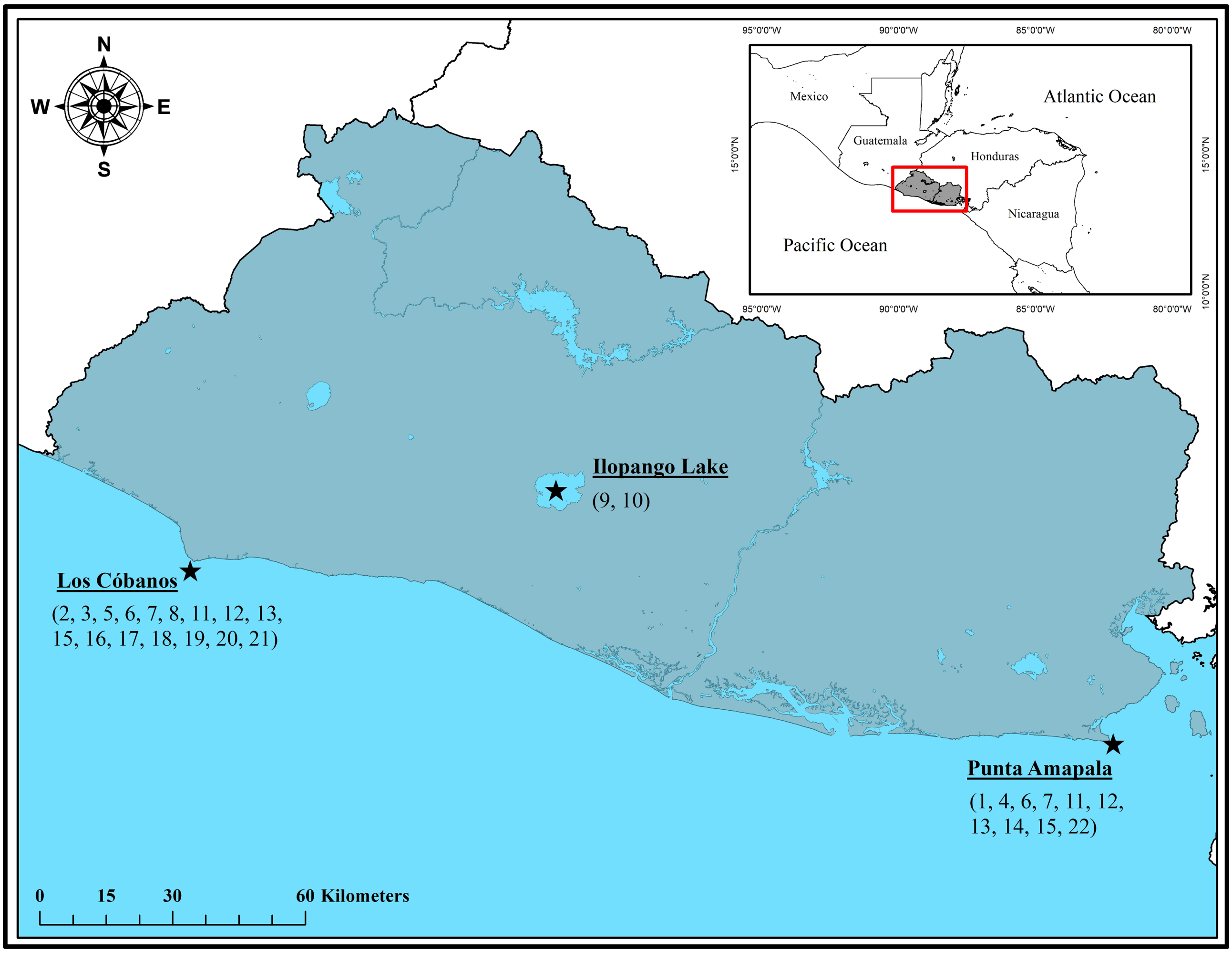

FIGURE 12. Distribution of freshwater and marine sponges of El Salvador. Numbers correspond to different species: (1) Calcinea, (2) *Callyspongia californica*, (3) *Haliclona (Soestella) caerulea*, (4) *Haliclona* sp. (5) *Siphonodictyon crypticum*, (6) *Axinella nayaritensis*, (7) *Endectyon (Endectyon) hyle*, (8) *Thoosa calpulli*, (9) *Ephydatia fluviatilis*, (10) *Spongila alba*, (11) *Mycale (Carmia) cecilia*, (12) *Mycale (Zygomycale) ramulosa*, (13) *Tedania tropicalis*, (14) *Cliona californiana*, (15) *Cliona euryphylle*, (16) *Cliona microstrongylata*, (17) *Cliona pocillopora*, (18) *Cliona vermifera*, (19) *Cliothosa tylostrogylata*, (20) *Suberea etiennei*, (21) *Aplysina chiriquiensis*, (22) *Aplysina gerardogreeni*.

Our findings also represent an important contribution to the increase of sponge fauna for the region, since two species are reported for the first time in the Pacific of Central America: *Callyspongia (Callyspongia) californica,* which was originally described in the Gulf of California (Dickinson 1945) and documented for the Mexican Pacific coast and Ecuador (Cruz-Barraza & Carballo 2008; Jaramillo *et al*. 2021), and *Suberea etiennei* which was described and reported only for the Clipperton Island (Van Soest *et al*. 2011) (Table 12, Figure 12).

For many years the lack of research not only for sponges but also for other groups of invertebrates such as corals, has led the coast of El Salvador to be known as part of the "Pacific Central American Faunal Gap (PCAFG)", which is the coastal stretch between Guatemala and northwestern Nicaragua (Springer 1958; Cortés *et al*. 2017), nevertheless, Los Cóbanos reef and the recently discovered reef at the coast of Nicaragua have been found to host significant coral communities within the PCAFG (Alvarado *et al*. 2010).

Studies on marine biodiversity have confirmed that rocky reefs of El Salvador harbor, in general, considerable species richness, its distribution has been registered specially for benthic organisms and studies of coral associated communities, gorgonian gardens and black coral forest have been performed (Segovia 2012; López 2017; Segovia *et al*. 2017; Elías *et al*. 2021; Segovia *et al.* 2021; Ramos & Segovia 2022; Dubuc *et al.* 2023; Segovia 2023, Segovia & Trejo 2023; Ramírez *et al.* 2024). This highlights that the research factor has led the information gaps to prevail in time, as mentioned by Van Soest *et al*. (2012) in their analysis of the world distribution of sponges where tropical regions of coral reefs present a low diversity, this being the result of the lack of specialists in the group and not of the environmental conditions of the region.

Although it is recognized that some of the shallow reef conditions that characterize the Eastern Tropical Pacific (strong turbulence, sedimentation and high levels of sunlight) (Bautista-Guerrero *et al*. 2006; Powell *et al*. 2014) could affect sponges not being as conspicuous as in other regions (Carballo *et al*. 2019), this leads us to analyze that the search methodology for sponges on rocky substrates must be modify to include cryptic and endolithic environments that allow us to register species adapted to these conditions, such as boring sponges.

Ecological studies also must be performed in order to comprehend the response of the ecosystems where sponges are found, for example, as corals reefs are rapidly degrading, it is important to study the possible shifts of the reefs being dominated by other organisms (including sponges) and which roles sponges play during this shift (Norström *et al*. 2009; Bell *et al.* 2013).

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