# MARINE SPONGES OF SANTA CATALINA ISLAND, CALIFORNIA

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*OCCASIONAL PAPERS OF THE*

ALLAN HANCOCK FOUNDATION

*New Series No. 5*

PUBLISHED BY THE ALLAN HANCOCK FOUNDATION
University of Southern California
Los Angeles, California 90089-0371

1986

# Marine Sponges of Santa Catalina Island, California

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ABSTRACT. Forty-five species of marine sponges are described from Santa Catalina Island, California. Three of the species are new to science, including *Oxeostilon fernaldi, Cyamon koltuni,* and *Cyamon catalina.* New distribution records include *Callyspongia californica, Rhizochalina oleracea, Adocia ambrosia, Hymedesmia* cf. *levis, Cliona viridis, Axinella mexicana,* and *Geodia gibberosa.*

## INTRODUCTION

The present study on marine sponges is based on material from Santa Catalina Island, California (Fig. 1). A systematic survey of the marine biota of this island was first conducted in 1965 by the Allan Hancock Foundation, University of Southern California. The purpose of that survey was to assess the biological resources of the island and to provide data on marine organisms for use in research and teaching. Among the animals collected were numerous specimens of sponges. Some of these were tentatively identified by Dr. Robert Given, Director, Catalina Marine Science Center, and by Dr. Moshe Tsurnamal, a professor of zoology at the Hebrew University of Jerusalem at that time. Since then, additional sponges have been collected and studied by students conducting research projects at the Catalina Marine Science Center. All specimens are housed at the Catalina Marine Science Center with the exception of new holotypes and paratypes.

Detailed descriptions of the 45 species listed herein may be found in De Laubenfels (1932), Bakus (1966), Hartman (1975), Bakus and Abbott (1980), and Bakus and Green (manuscript). Color is described for living specimens unless noted otherwise. Only the commonly used synonyms are listed. Spicule measurements (in micrometers) are presented as mean values (underlined) surrounded by values representing the range, unless otherwise indicated. Chord lengths are given for spicules traditionally measured in this manner (e.g., sigmas, chelas). Mean values are based on 10 measurements each. Collecting locality refers to the specimen studied, unless otherwise indicated. Specimen numbers are those on collecting labels within bottles. Distribution records include new distributions in this study. Distributions of species reported by Burton (1963) are not included because of his questionable synonymies (Hartman 1964; Fischel Johnson 1978a).

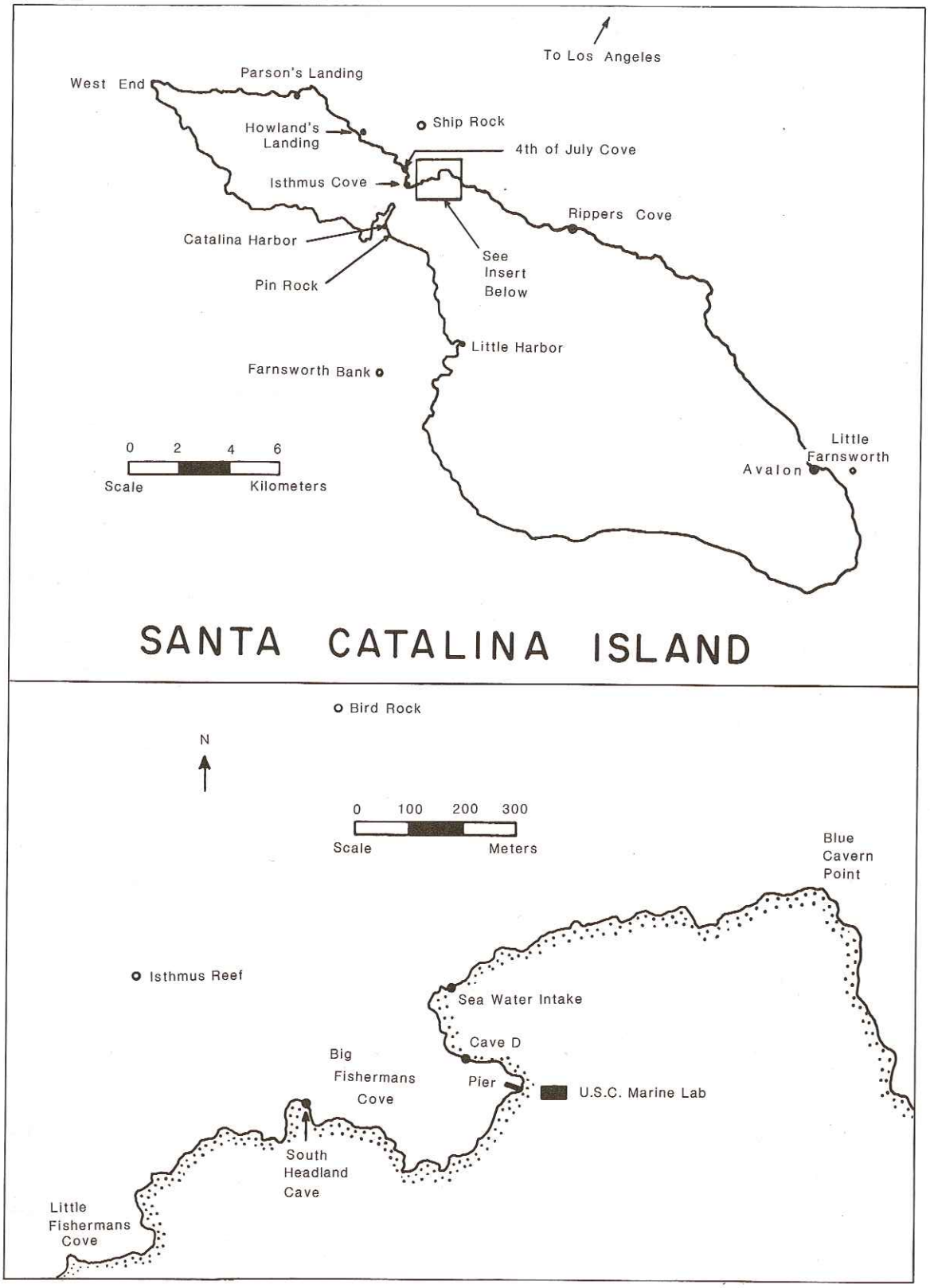



Fig. 1. Map of Santa Catalina Island, California, showing the principal locations for the collection of marine sponges.

## TAXONOMIC LIST OF SPONGES

## MARINE SPONGE DISTRIBUTIONS AND SPICULE MEASUREMENTS

### 1. *Clathrina blanca* (Miklucho-Maclay, 1868)

*Guancha blanca* Miklucho-Maclay, 1868, p. 221
*Leucosolenia macleayi* Lendenfeld, 1885, p. 1086
*Clathrina blanca* Minchin, 1896, p. 359

*Description.* Animal vase-shaped and stalked, body flattened, to 2 cm high, the stalk to 5 mm long; color white to tan.

*Collecting locality.* Big Fisherman's Cove, under pier; depth 2 m (specimen No. 44). Blue Cavern Cove, Big Fisherman's Cove, West End, etc.

*Distribution.* Cosmopolitan; depth 0–?820 m.

*Spicules.* Specimen No. 44.

| Spicule Type | Length | Diameter |
|---|---|---|
| Triradiate | 40–70 | 5 |

*Remarks.* Burton's (1963) inclusion of *Clathrina blanca* within *Clathrina coriacea* is incorrect (Fischel Johnson 1978a). This and the opinion of other sponge specialists cast doubt on his other synonymies in the Class Calcarea (Hartman 1964). See also Fischel Johnson (1978b–c, 1979a–b, 1980).

### 2. *Clathrina coriacea* (Montagu, 1818)

*Description.* Encrusting, anastomosing tubes; color white to tan.

*Collecting locality.* West End; depth 9 m.

*Distribution.* California; ? cosmopolitan; depth 0–?650 m.

*Spicules.* Specimen No. 25.

| Spicule Type | Length | Diameter |
|---|---|---|
| Triradiate | 100–110 | 10 |

*Remarks.* See Remarks under *Clathrina blanca.*

3. *Clathrina clathrus* (Schmidt, 1864)

*Description.* Encrusting, anastomosing tubes; color white to tan.
*Collecting locality.* Big Fisherman's Cove; no depth recorded.
*Distribution.* Mediterranean, British Isles, Spain, Ternate, New Zealand, California; depth 0–50 m.
*Spicules.* Specimen No. 17.

| Spicule Type | Length | Diameter |
|---|---|---|
| Triradiate | 60–70 | 6 |

*Remarks.* Burton (1963) synonymized *Clathrina clathrus* (Schmidt, 1864) under *Clathrina coriacea.* We prefer to retain the original name. See *Clathrina blanca.*

4. *Leucandra apicalis* Urban, 1905

*Description.* Oval to subspherical, surface hispid; color white.
*Collecting locality.* Near Bird Rock; depth 6 m.
*Distribution.* Central and southern California; depth 0–6 m.
*Spicules.* Marion Fischel Johnson Specimen No. 2.

| Spicule Type | Length | Diameter |
|---|---|---|
| Oxea (coronal) | 5000–6000 | 3 |
| Oxea (large) | 2000–3000 | 80 |
| Oxea (medium) | 550 | 40 |
| Microxea | 50–100 | 10 |
| Triradiate (paired rays) | 200 | 10 |
| Triradiate (basal ray) | 100 | 10 |
| Triradiate (equal rays) | 250 | 20 |
| Quadriradiate (rare) | — | — |

*Remarks.* De Laubenfels (1932) considered *Leucandra apicalis* a synonym of *L. heathi* Urban 1905. However, *L. apicalis* contains quadriradiates whereas *L. heathi* lacks quadriradiates.

5. *Leucandra heathi* Urban, 1905

*Description.* Cylindrical to subspherical, surface strongly hispid; color white.
*Collecting locality.* Off Howland's Landing; depth 30 m.
*Distribution.* Alaska to Baja California, Mexico; depth 0–92 m.
*Spicules.* Specimen No. 29.

| Spicule Type | Length | Diameter |
|---|---|---|
| Oxea (coronal) | 5000–7000 | 8 |
| Oxea (large) | 3600 | 11–114 |
| Oxea (large) | 1200 | 80 |
| Triradiate (sagittal rays) | 200 | 8 |
| Triradiate (choanosomal, paired rays) | 130 | 10 |
| Triradiate (choanosomal, basal rays) | 250 | 10 |
| Microxea | 50–90 | 3 |

6. *Leucilla nuttingi* (Urban, 1902)

*Description.* Slender, vase-shaped, stalked, to 5 cm long, the stalk to 2 cm long; color white to tan.
*Collecting locality.* Big Fisherman's Cove; depth 1.5 m.
*Distribution.* Alaska to Baja California, Mexico; depth 0–168 m.
*Spicules.* Specimen No. 39.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea (large) | 500–653–850 | 119 | 38 | 2–2–2 | 0 | 0 |
| Oxea (small) | 50–124–160 | 35 | 10 | 2–2–2 | 0 | 0 |
| Quadriradiate and Triradiate (large) | 400–500 | | | 40 | | |
| Quadriradiate and Triradiate (small) | 100 | | | 5–20 | | |

7. *Leucetta losangelensis* (De Laubenfels, 1930)

*Description.* Encrusting, to 3 cm thick and 15 cm in diameter, surface convoluted with many oscules; color white.
*Collecting locality.* Isthmus, under a float.
*Distribution.* Southern California to Baja California and the Gulf of California, Mexico; depth 0–111 m.
*Spicules.* Specimen No. 9.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Triradiate (regular) | 100–426–850 | 272 | 86 | 10–31–60 | 18 | 6 |
| Triradiate (sagittal) | 60–137–250 | 63 | 20 | 10–12–15 | 2.7 | 1.2 |
| Quadriradiate (paired rays) | 180–210 | | | | | |
| Quadriradiate (basal rays) | 100 | | | | | |
| Quadriradiate (apical ray) | 20–40 | | | | | |
| Oxea | 80–93–100 | 8 | 3 | 3–7–9 | 1.6 | 0.5 |
| Microspined cylinders | 25–60 | | | 3 | | |

*Remarks.* This probably is the most common calcareous sponge species in biomass in unpolluted waters of southern California and the Gulf of California.

8. *Leucosolenia tenuis* Dendy and Row 1913

*Description.* Erect, branching tube, minutely hispid; color tan.
*Collecting locality.* Pin Rock area; depth 15 m.
*Distribution.* British Columbia, Canada to southern California; Japan; depth 0–15 m.
*Spicules.* Specimen No. 23.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Triradiate (sagittal, paired rays) | 100–124–130 | 27 | 9 | 7–8.8–10 | 1.1 | 0.4 |
| Triradiate (basal rays) | 110–132–160 | 16 | 0.4 | 7–8.8–10 | 1.1 | 0.4 |
| Quadriradiate (sagittal, paired and basal rays) | 100–190 | | | 7–10 | | |
| Quadriradiate (apical ray) | 40–45 | | | | | |
| Oxea | 50–109–200 | 43 | 14 | 3 | 0 | 0 |

*Remarks.* This species is very similar to *L. eleanor,* but the oxeas in *L. tenuis* are shorter than those in *L. eleanor.*

9. *Leucosolenia nautilia* De Laubenfels, 1930

*Description.* Basal reticulation with long tubes rising from it, minutely hispid; color white.
*Collecting locality.* Big Fisherman's Cove, under pier; depth 0.2 m.
*Distribution.* British Columbia, Canada to southern California; depth 0–55 m.
*Spicules.* Specimen No. 43.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea (large) | 320–445–600 | 92 | 29 | 5–9–10 | 2.1 | 0.7 |
| Oxea (small) | 80–115–160 | 27 | 8 | 2–3.7–5 | 1.0 | 0.3 |
| Triradiate (paired rays) | 50–75–100 | 22 | 7 | 10–10–10 | 0 | 0 |
| Triradiate (basal ray) | 50–77–130 | 25 | 8 | 10–10–10 | 0 | 0 |
| Quadriradiate (apical ray) | 20–28–50 | 15 | 8 | | | |
| Quadriradiate (paired rays) | 80–100–120 | 15 | 7 | 7–7.2–8 | 0.5 | 0.2 |
| Quadradiate (basal ray) | 120–150 | | | | | |

10. *Aplysina fistularis* (Pallas, 1766)

*Spongia fistularis* (Pallas, 1766)
*Verongia thiona* De Laubenfels, 1930
*Verongia aurea* De Laubenfels, 1948
*Aplysina fistularis* (Pallas, 1766) Wiedenmayer, 1977

*Description.* Thick-walled hollow cylinders to 4 cm in diameter and 10 cm high; color bright yellow changing to purple and then black on exposure to air.
*Collecting locality.* Bird Rock; depth 4.6–6 m (specimen No. 259); Big Fisherman's Cove; depth 1.8 m.
*Distribution.* Southern California to Mexico; West Indies; depth 0–100 m.
*Remarks.* Specimen No. 259 contains only spongin fibers. Principal fibers measure 45 to 106 $\mu$m in diameter, the pith measures 28 to 80 $\mu$m in diameter.

### 11. *Dysidea fragilis* (Montagu, 1814)

*Description.* Massive to lobate, surface finely conulose; color lavender to pale grey.
*Collecting locality.* Big Fisherman's Cove; depth 0.6–2 m.
*Distribution.* British Columbia, Canada to southern California; nearly cosmopolitan; depth 0 ≥ 27 m.
*Remarks.* Specimen No. 262 was examined. This specimen contains only spongin fibers. Ascending fibers measure 114 to 190 μm in diameter; secondary fibers 30 to 60 μm in diameter; both contain abundant foreign material, especially sand grains.

### 12. *Haliclona* cf. *permollis* (Bowerbank, 1866)

*Description.* Encrusting, to 4 cm thick, elevated oscules rather evenly spaced; color often violet to rose.
*Collecting locality.* Little Harbor; depth 18 m (specimen No. 225). Farnsworth Bank; depth 21 m.
*Distribution.* Pacific coast of North America, ? cosmopolitan; depth 0 ≥ 21 m.
*Spicules.* Specimen No. 225.

| Spicule Type | Length | σ | S.E. $\bar{X}$ | Diameter | σ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 110–124–140 | 10 | 3 | 4–5.5–7 | 1.1 | 0.3 |

*Remarks.* The family Haliclonidae of California is under study by Dr. Welton Lee, California Academy of Sciences, San Francisco.

### 13. *Callyspongia californica* Dickinson, 1945

*Description.* Massive to somewhat ramose; color brown in alcohol.
*Collecting locality.* Little Harbor; depth 18 m (specimen No. 239). Big Fisherman's Cove; depth 3.6 m.
*Distribution.* Southern California; Gulf of California, Mexico; depth 0–18 m.
*Spicules.* Specimen No. 239.

| Spicule Type | Length | σ | S.E. $\bar{X}$ | Diameter | σ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 84–105–132 | 15 | 5 | 2.4–5.3–7 | 2.2 | 0.7 |

*Remarks.* This represents a new distribution record for the Pacific coast of North America.

### 14. *Rhizochalina oleracea* Schmidt, 1870

*Description.* Finger-like fistulae to 4 cm high, arising from an encrusting base; color tan to white.
*Collecting locality.* Catalina Harbor; depth 0.2 m.
*Distribution.* North Carolina; Florida; West Indies; southern California; shallow subtidal.
*Spicules.* Specimen No. 237.

| Spicule Type | Length | σ | S.E. $\bar{X}$ | Diameter | σ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 70–90–110 | 16 | 5 | 2–3.5–5 | 1.1 | 0.3 |

*Remarks.* This represents a new distribution record for the Pacific coast of North America.

### 15. *Toxadocia zumi* Ristau, 1978

*Description.* Coral-like, erect, lobate to palmate, rigid, regularly spaced oscula; color white in alcohol.
*Collecting locality.* West end of Bird Rock; no depth recorded.
*Distribution.* Central to southern California; depth 10–20 m.
*Spicules.*

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 90–117–140 | 18 | 6 | 2–7–10 | 3.9 | 1.2 |
| Toxa | 40–58–70 | 8 | 3 | | | |

### 16. *Adocia ambrosia* Dickinson, 1945

*Description.* Cylindrical branches, to 14 cm long, woody; color tan to drab.
*Collecting locality.* North wall in small cave in Big Fisherman's Cove; depth 0.9 m.
*Distribution.* Southern California; Gulf of California, Mexico; depth 0.9–22 m.
*Spicules.* Specimen No. 246.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 300–339–400 | 35 | 11 | 5–8.1–10 | 2.1 | 0.7 |

*Remarks.* This represents a new distribution record for the Pacific coast of North America.

### 17. *Microciona parthena* De Laubenfels, 1930

*Description.* Encrusting, to 2 cm thick; color red.
*Collecting locality. Pelagophycus* bed and rock slope west of Chalk Cliff; Big Fisherman's Cove; depth 18–24 m (specimen No. 10–6). Ship Rock; depth 37 m. Little Harbor; depth 21 m.
*Distribution.* British Columbia, Canada to southern California; depth 0–45 m.
*Spicules.* Specimen No. 10–6.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 270–429–600 | 89 | 28 | 10–18–20 | 3.2 | 1.0 |
| Subtylostyle | 250–303–380 | 39 | 12 | 2–4–8 | 2.6 | 0.8 |
| Acanthostyle | 80–113–180 | 39 | 12 | 5–7–10 | 1.6 | 0.5 |
| Toxa | 30–68–110 | 23 | 7 | | | |
| Isochela | 20–24–30 | 4.5 | 1.4 | | | |

18. *Ophlitaspongia pennata* (Lambe, 1895)
var. *californiana* De Laubenfels, 1932

*Description.* Encrusting, to 5 mm thick and almost 1 m in diameter; color orange to scarlet.
*Collecting locality.* Isthmus Cove; depth 3 m.
*Distribution.* British Columbia, Canada, to southern California; Gulf of California, Mexico; Sea of Japan; depth 0–52 m.
*Spicules.* Specimen No. 217.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Subtylostyle | 170–346–500 | 115 | 35 | 10–12.5–15 | 1.6 | 0.5 |
| Tylostyle | 150–253–380 | 82 | 26 | 2–2.1–3 | 0.3 | 0.1 |
| Toxa | 30–50–70 | 12 | 4 | | | |

19. *Clathriopsamma pseudonapya* De Laubenfels, 1930

*Description.* Encrusting, to 1 cm thick; color yellow.
*Collecting locality.* Farnsworth Bank; depth 20 m.
*Distribution.* Central to southern California; depth 0–20 m.
*Spicules.* Specimen No. 215.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylostyle | 250–336–410 | 60 | 19 | 3.5–5.5–10 | 2.1 | 0.7 |
| Acanthostyle | 10–59–110 | 33 | 11 | 4–4.8–5 | 0.4 | 0.1 |
| Microxea | 80–94–100 | 9 | 4 | | | |
| Toxa | 50–58–90 | 13 | 4 | | | |

20. *Leptoclathria asodes* (De Laubenfels, 1930)

*Description.* Encrusting, to 1 mm thick; color bright yellow.
*Collecting locality.* Isthmus mooring area; depth 15 m. Howland's Landing; depth 34 m. Big Fisherman's Cove; depth 2–2.7 m (specimen No. 215).
*Distribution.* Central to southern California; depth 0–34 m.
*Spicules.* Specimen No. 215.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Acanthostyle | 108–182–228 | 44 | 14 | 7–12.6–15 | 2.9 | 0.9 |
| Tylostyle | 87–171–230 | 45 | 14 | 3–4.5–6 | 0.8 | 0.3 |
| Palmate Isochela | 10–11.8–12 | 0.6 | 0.2 | | | |

21. *Axocielita originalis* (De Laubenfels, 1930)

*Description.* Encrusting to massive; color orange-red to brownish-red, juveniles pale yellow.
*Collecting locality.* Parson's Landing, Catalina Harbor; intertidal.
*Distribution.* British Columbia, Canada, to Baja California, Mexico; depth 0–75 m.
*Spicules.* Specimen No. 230.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 96–124–151 | 18 | 6 | 1–5.8–10 | 2.4 | 0.8 |
| Isochela | 12–13–15 | 1.5 | 0.5 | | | |

22. *Antho lithophoenix* (De Laubenfels, 1927)

*Description.* Encrusting to massive, up to 3 cm thick; color bright red.
*Collecting locality.* Bird Rock; depth 39.6 m (specimen No. 209). Fourth of July Cove; depth 4.5 m.
*Distribution.* Central to southern California; depth 0–40 m.
*Spicules.* Specimen No. 209.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylostyle | 37–59–90 | 20 | 6 | 1–1.3–2 | 0.3 | 0.1 |
| Style | 300–393–450 | 51 | 16 | 15–19–20 | 2.1 | 0.7 |
| Acanthostrongyle | 33–36–38 | 2 | 0.6 | 4–4.1–5 | 0.3 | 0.1 |
| Palmate isochela | 4–6.1–11 | 1.9 | 0.6 | | | |
| Toxa | 15–42–100 | 27 | 8 | | | |

23. *Acarnus erithacus* De Laubenfels, 1927

*Description.* Encrusting to massive; intertidal color scarlet, subtidal bronze.
*Collecting locality.* Mooring area, isthmus; depth 15 m.
*Distribution.* British Columbia, Canada, to Baja California, Mexico; Gulf of California; depth 0–700 m.
*Spicules.* Specimen No. 216.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 260–333–400 | 47 | 15 | 1–7.5–15 | 4.0 | 1.3 |
| Tylote | 140–193–270 | 41 | 13 | 1–2–3 | 0.5 | 0.1 |
| Cladotylote | 150–170–180 | 11 | 3 | 4–5.2–8 | 1.3 | 0.4 |
| Clad of Cladotylote | 50–60 | | | | | |
| Acanthocladotylote | 80–144–175 | 35 | 11 | 3–4.7–6 | 1.2 | 0.4 |
| Isochela | 7–10.1–12 | 1.4 | 0.4 | | | |
| Toxa | 50–228–300 | | | | | |

24. *Anaata spongigartina* (De Laubenfels, 1930)

*Description.* Encrusting, to 10 cm in greatest diameter; color reddish brown.
*Collecting locality.* Little Fisherman's Cove; depth 6 m.
*Distribution.* British Columbia to southern California; depth 0–6 m.
*Spicules.* Specimen No. 222.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Subtylostyle | 168–202–250 | 32 | 10 | 1–2.7–5 | 1.3 | 0.4 |
| Acanthotylostyle | 72–146–240 | 57 | 17 | 3–4.4–5 | 0.9 | 0.3 |
| Arcuate Isochela | 14–18–19 | 1.6 | 0.5 | | | |

25. *Astylinifer arndti* De Laubenfels, 1930

*Description.* Encrusting, to 2 m thick; color yellow to brown with purple areas.
*Collecting locality.* West End; depth 15 m.
*Distribution.* British Columbia to southern California; depth 0–15 m.
*Spicules.* Specimen No. 204.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylote | 38–56–64 | 9 | 3 | 0.7–0.9–1.2 | 0.2 | 0.04 |
| Acanthotylostyle | 32–40–90 | 11 | 4 | 1.5–2.3–5 | 0.9 | 0.3 |

26. *Hymenamphiastra cyanocrypta* De Laubenfels, 1930

*Description.* Encrusting, to 1 mm thick and nearly 1 m in diameter; color cobalt blue to light orange.
*Collecting locality.* Little Fisherman's Cove; depth 6 m (specimen No. 229). Big Fisherman's Cove; depth 2–2.9 m.
*Distribution.* Central and southern California; depth 0–37 m.
*Spicules.* Specimen No. 229.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Acanthostyle | 40–81–156 | 30 | 10 | 3–5.6–7 | 1.2 | 0.4 |
| Tornote | 108–138–192 | 24 | 7 | 2–2.4–3 | 0.3 | 0.1 |
| Amphiaster | 7–13–17 | 2.8 | 0.8 | | | |

27. *Lissodendoryx topsenti* (De Laubenfels, 1930)

*Description.* Encrusting to massive, oscules to 5 mm in diameter; color red-orange to salamon-pink.
*Collecting locality.* Face of Bird Rock; depth about 12 m (Dr. R. Given, pers. comm.).
*Distribution.* Central and southern California; depth 0–12 m.
*Spicules.* Specimen No. 6–1.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 240–266–300 | 23 | 7 | 2–8.7–10 | 2.6 | 0.8 |
| Tylote | 220–256–280 | 21 | 7 | 3–6.5–9 | 2.0 | 0.6 |

### 28. *Lissodendoryx firma* (Lambe, 1895)

*Description.* Encrusting; color burnished gold to cinnamon brown.
*Collecting locality.* West End (on barnacles); depth 15 m.
*Distribution.* Alaska to southern California; depth 0–91 m.
*Spicules.* Specimen No. 227.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 132–147–156 | 8 | 2 | 1–1.6–3 | 0.7 | 0.2 |
| Acanthostyle | 132–143–160 | 10 | 3 | 3–5.4–9 | 1.2 | 0.4 |
| Subtylote | 127–140–156 | 9 | 3 | | | |
| Sigma | 10–21–31 | 8.1 | 2.6 | | | |
| Arcuate Isochela | 14–18–22 | 2.8 | 0.9 | | | |

### 29. *Hymedesmia* cf. *levis* Lundbeck, 1910

*Description.* Encrusting; less than 1 mm thick; color light brownish-yellow in alcohol.
*Collecting locality.* Big Fisherman's Cove (South Headland); depth 9 m.
*Distribution.* Davis Strait; Denmark Strait; off Faroe Island; Iceland; southern California; depth (9)293–1065 m.
*Spicules.*

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylote | 150–165–180 | 10 | 3 | 2.4–2.9–4 | 0.5 | 0.2 |
| Acanthostyle | 50–110–180 | 55 | 17 | 5–6–10 | 2.1 | 0.7 |
| Isochela | 15–22–24 | 3.3 | 1.1 | | | |

*Remarks.* This represents a new distribution record for the Pacific coast of North America.

### 30. *Plocamia karykina* De Laubenfels, 1927

*Description.* Encrusting, mature specimens with stellate surface pattern; color bright orange-red to red.
*Collecting locality.* West End; depth 12 m (specimen No. 210). Pin Rock, Catalina Harbor; depth 9 m. Little Harbor; intertidal. Big Fisherman's Cove; depth 11.5 m.
*Distribution.* British Columbia, Canada, to Baja California, Mexico; depth 0–12 m.
*Spicules.* Specimen No. 210.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylostyle | 180–219–260 | 34 | 11 | 2–2.2–3 | 0.4 | 0.1 |
| Subtylostyle | 120–176–210 | 41 | 13 | 5–15–20 | 5 | 1.7 |
| Tylote | 100–169–210 | 31 | 10 | 8–12–16 | 2.4 | 0.8 |
| Isochela | 12–14–17 | 2.2 | 0.7 | | | |
| Toxa | 15–51–100 | 31 | 9 | | | |

31. *Plocamissa igzo* (De Laubenfels, 1932)

*Description.* Encrusting, surface lumpy; color orange to red.
*Collecting locality.* Little Fisherman's Cove; depth 4.5 m.
*Distribution.* Central to southern California; Gulf of California, Mexico; depth 0–30 m.
*Spicules.* Specimen No. 219.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tytostyle | 100–178–290 | 77 | 24 | 2–6.2–12 | 4.2 | 1.3 |
| Tylote | 60–91–110 | 17 | 5 | 3–3.7–5 | 0.9 | 0.3 |
| Arcuate Isochela | 10–11–12 | 1.0 | 0.3 | | | |

32. *Hymeniacidon sinapium* De Laubenfels, 1930

*Description.* Encrusting to massive; often with digitate processes; color yellow-orange to orange.
*Collecting locality.* Catalina Harbor (mud flat); depth 0.2 m (specimen No. 208). Little Harbor (under rocks); intertidal.
*Distribution.* Southern California; Baja California and the Gulf of California, Mexico; depth 0–103 m.
*Spicules.* Specimen No. 208.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 120–242–340 | 75 | 34 | 1–6–10 | 2.5 | 0.8 |

33. ***Oxeostilon fernaldi*** n. sp.
Fig. 2

*Holotype.* Smithsonian Institution, USNM 33629; collected off the south end of Bird Rock, Santa Catalina Island, California (33°27'N, 118°29'W), 20 November 1968. Depth 46 m; on reef.
*Description.* The sponge consists of several pieces, the largest measuring 9.5 × 3.2 × 1 cm, representing a thick incrustation or mass. The consistency is firm but friable and the surface texture crusty. Color in life is yellow; in alcohol it is beige.

The body surface is smooth but strongly and irregularly undulated. No pores were observed. The oscules are sparse and measure up to 6 mm in diameter. The mesenchyme is moderately dense and the spicules distributed in an irregular fashion. Spicules are shown in Figs. 2-2 and the dimensions follow:

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea (large) | 750–813–920 | 34 | 11 | 15–26–30 | 5 | 1.7 |
| Oxea (small) | 170–239–350 | 53 | 18 | 4–7–10 | 2.3 | 0.8 |
| Style | 400–708–920 | 132 | 4.2 | 15–25–35 | 6.7 | 2.1 |
| Strongyle | 400–541–680 | 97 | 32 | 20–25–30 | 4.7 | 1.6 |

Large oxeas are frequently curved. Styles and especially strongyles are uncommon in comparison with oxeas.

*Discussion. Oxeostilon fernaldi* is similar to *Oxeostilon oxeon* Dickinson from which it differs in having a markedly smoother surface, lacking extensive subdermal cavities, smaller spicules, and normal small oxeas. Dickinson (1945: 32–33) failed to mention that his specimens of *O. oxeon* contain abundant small oxeas that are typically bent twice, as well as uncommon strongyles. *Oxeostilon fernaldi* is named for the late Dr. Robert L. Fernald, former Director of the University of Washington Friday Harbor Laboratories, eminent marine embryologist, educator, and friend.

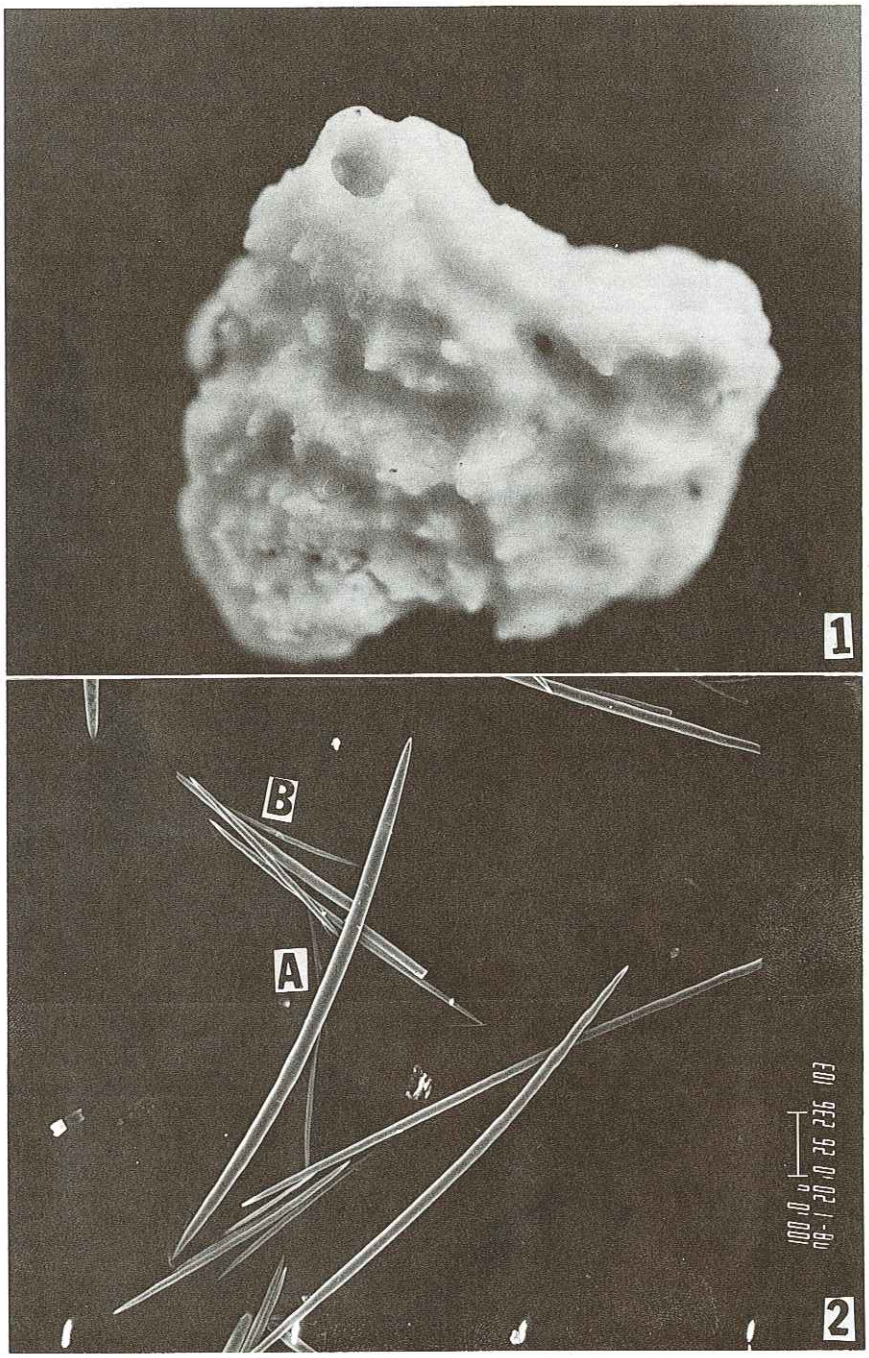



Fig. 2. *Oxeostilon fernaldi* n. sp. Fig. 2-1. Entire Animal. Fig. 2-2. Type of spicules: A, Large oxea, B. Small oxea.

Technical information on the photographs: The bar (|———|) = 100 μm. Second line: 1st No. = magnification (e.g., 14-1) = 140:1; 2nd No. = acceleration voltage (20) = 20 kV; 3rd No. = working distance in mm (25) = 25 mm; 4th No. = specimen No. (011) = 11; 5th No. = picture No. (103) = 103.

### 38. *Tethya aurantia* (Pallas, 1766)

*Description.* Subspherical, warty; color orange, yellow or green.
*Collecting locality.* Little Harbor; depth 21.3 m.
*Distribution.* Cosmopolitan; Pacific coast of North America; Gulf of California, Mexico; depth 0–440 m.
*Spicules.* Specimen No. 201.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Strongyloxea | 855–1450–1824 | 397 | 126 | 8–25–38 | 11 | 3.5 |
| Tylaster | | | | 10–13–15 | 2.2 | 0.7 |
| Spheraster | | | | 20–41–61 | 12 | 3.9 |

### 39. *Axinella mexicana* De Laubenfels, 1935

*Description.* Encrusting to massive, woody, very hispid; color tan to white in alcohol.
*Collecting locality.* Chalk Cliff, Big Fisherman's Cove; depth 6 m.
*Distribution.* Southern California; Baja California and the Gulf of California, Mexico; depth 6–140 m.
*Spicules.* Specimen No. 4-14.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style | 210–262–310 | 36 | 11 | 7–9–10 | 1.2 | 0.4 |
| Oxea | 220–268–310 | 35 | 11 | 5–9–10 | 1.7 | 0.5 |

*Remarks.* This represents a new distribution record for southern California.

### 40. *Cyamon neon* De Laubenfels, 1930

*Description.* Massive; color dark brown in alcohol.
*Collecting locality.* Blue Cavern Point; depth 10 m.
*Distribution.* Southern California; depth 0–36 m.
*Spicules.* Specimen No. 4-15.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea (thick) | 160–196–240 | 21 | 7 | 10–14–20 | 3.8 | 1.2 |
| Oxea (thin) | 170–268–370 | 54 | 17 | 4–5.5–6 | 0.9 | 0.3 |
| Style (long) | 1000–1236–1560 | 199 | 63 | 5–9.6–12 | 2.2 | 0.7 |
| Style (short) | 370–415–450 | 28 | 9 | 13–19–22 | 2.6 | 0.8 |
| Triactine | 7–9.5–11 | 1.2 | 0.4 | | | |

*Remarks.* The spicules in the holotype and our specimens differ from those erroneously illustrated by De Laubenfels (1932, fig. 65) in having triaxons of a different shape, size, and often being smooth, as well as having thin but short centrotylote oxeas.

34. *Halichondria panicea* (Pallas, 1766)

*Description.* Encrusting to massive, sometimes with elongate oscular tubes; color orange, yellow or green.

*Collecting locality.* West of Chalk Cliff, Big Fisherman's Cove (*Pelagophycus* bed and rock slope). Depth not recorded.

*Distribution.* Pacific coast of North America; Gulf of California, Mexico; cosmopolitan; depth 0–127 m.

*Spicules.* Specimen No. 10-3.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 260–287–320 | 24 | 8 | 5–10–12 | 1.9 | 0.6 |

35. *Cliona celata* Grant, 1826
var. *californiana* De Laubenfels, 1932

*Description.* Boring in calcareous materials, lemon-yellow papillae protruding from holes.

*Collecting locality.* Little Farnsworth; depth 33 m.

*Distribution.* Cosmopolitan; Pacific coast of North America; depth 0–40 m.

*Spicules.* Specimen No. E-1.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylostyle | 240–292–320 | 27 | 8 | 2–6–10 | 2.8 | 0.9 |

36. *Cliona viridis* (Schmidt, 1862)

*Description.* Encrusting to massive; color yellow brown.

*Collecting locality.* Big Fisherman's Cove (on rock); depth 2.7 m.

*Distribution.* Mediterranean Sea; Atlantic, Indian, and Pacific Oceans; depth 0–45 m.

*Spicules.* Specimen No. 274.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylostyle | 200–332–420 | 70 | 22 | 2–9–15 | 3.8 | 1.2 |
| Spiraster | 12–18–26 | 4.9 | 1.6 | | | |

*Remarks.* This represents a new distribution record for the Pacific coast of North America.

37. *Timea authia* De Laubenfels, 1930

*Description.* Encrusting to massive; color orange.

*Collecting locality.* Bird Rock (on rock); depth 30 m.

*Distribution.* Southern California; depth 0–85 m.

*Spicules.* Specimen No. 37.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Tylostyle | 210–463–600 | 110 | 37 | 4–9–15 | 5.5 | 1.7 |
| Style | 350–480–700 | 160 | 72 | 6–9–10 | 1.8 | 0.8 |
| Tylaster | | | | 10–19–25 | 5.5 | 1.7 |

### 41. *Cyamon koltuni* n. sp.
Fig. 3

*Holotype.* Smithsonian Institution, USNM 33630; collected near Big Fisherman's Cove (laboratory seawater intake pipes), Santa Catalina Island, California (33°27'N, 118°29'W), no date. Depth 6 m; under rock.

*Description.* The specimen is so thin (<1 mm) that it is difficult to distinguish it from the rock and incrusting bryozoans. Color in life is bright orange. Most sponge characteristics are absent because of its thinness. The smaller triactine to hexactine spicules are crowded together with styles; no special skeletal organization occurs. Spicules are shown in Fig. 3-2 and the dimensions follow:

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style (thick) | 260–316–380 | 46 | 15 | 10–14.7–20 | 3.8 | 1.3 |
| Style (thin) | 900–967–1400 | 330 | 110 | 5–5.9–7 | 0.5 | 0.2 |
| Triactine to Hexactine (rays only) | 35–46–66 | 9 | 3 | 5–8.9–10 | 1.5 | 0.5 |

The triactines to hexactines are often finely echinate and the rays terminate in small bulbs.

*Discussion. Cyamon koltuni* most closely resembles the thinly encrusting *Cyamon aruense* Hentschel 1912. *Cyamon koltuni* is a unique species in that its smaller spicules are triactines to hexactines whose rays have bulbous ends. *Cyamon koltuni* is named in honor of Dr. V. M. Koltun, a prominent Russian scientist who has contributed greatly to our knowledge of sponges of polar and boreal seas.

### 42. *Cyamon catalina* n. sp.
Fig. 4

*Holotype.* Smithsonian Institution, USNM 33631; collected off east Bird Rock, Santa Catalina Island, California (33°27'N, 118°29'W); date not recorded. Depth 50 m; on rocky cliff; Kim McCleneghan's station 9:69, tag No. 235.

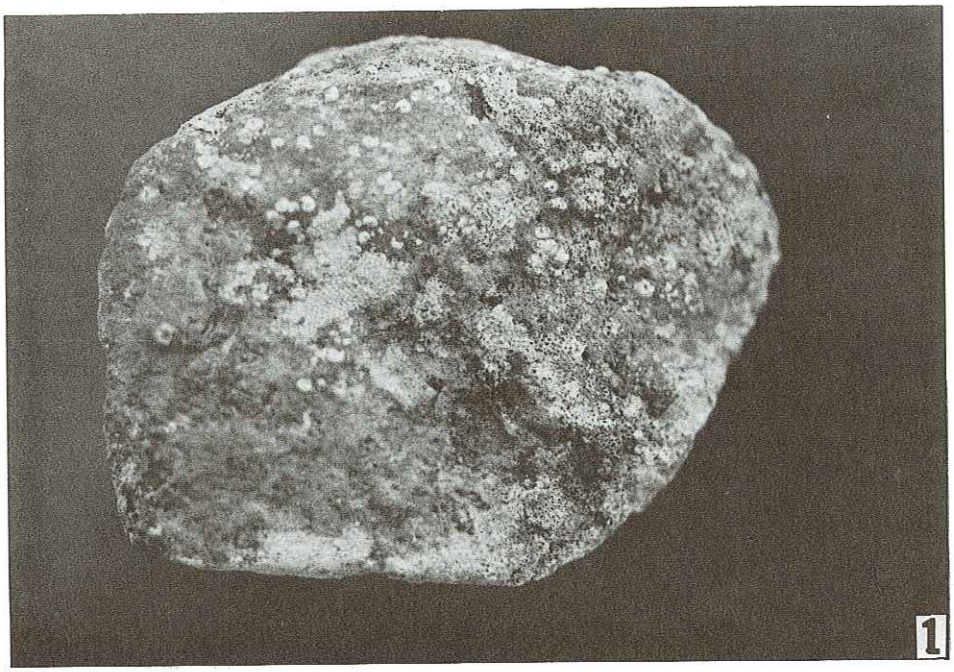
*Paratype.* British Museum (Natural History) 1985; collected off Ship Rock, Santa Catalina Island, California, on 29 June 1966. Depth 46 m; on rock; Dr. Robert Given.

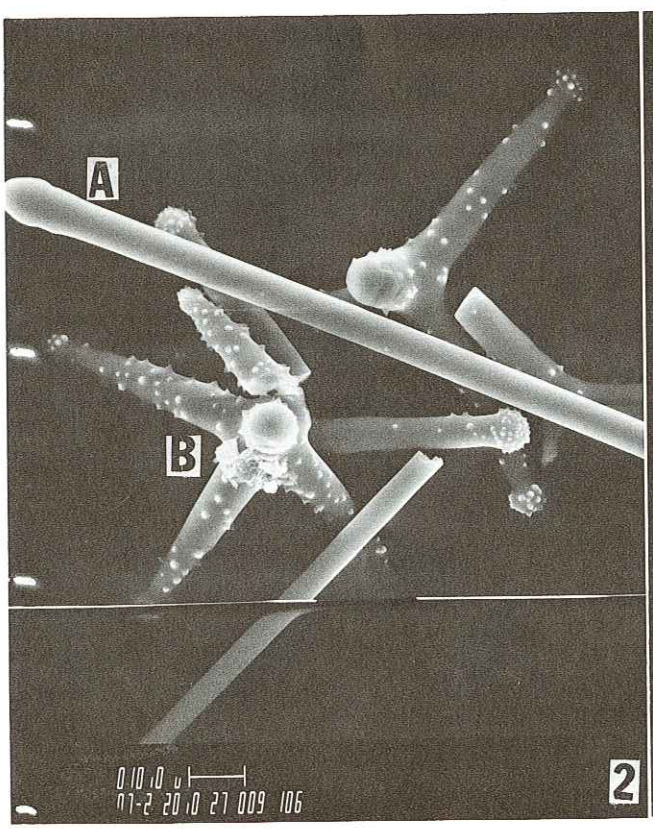
*Description.* The body is foliaceous, tending toward flabelliform, and measures 15 cm high by 8 cm wide by up to 4 mm thick. It is attached to the substratum by a 3 cm long stalk measuring up to 6 mm in diameter. The surface is hispid with numerous long styles projecting perpendicularly up to 3 mm, giving the sponge a felt-like texture. The consistency is firm and leathery. Color in life is red-orange; in alcohol it is beige.

The body surface is flattened, the outer edges becoming slightly convoluted. No oscules, pores or canals were observed. The mesenchyme is sparse, spicules being densely packed. The dominant choanosomal spicules are triacts, with thin styles and raphides also commonly observed. The triacts tend to cluster in places but do not produce well-formed spicule tracts. Spicules are shown in Figs. 4-2 and 4-3 and the dimensions follow:

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Style (thick) | 2660–3390–3900 | 441 | 147 | 20–31–40 | 8.8 | 2.9 |
| Style (thin, long) | 1400–1890–2400 | 317 | 106 | 8–12–17 | 3.2 | 1.1 |
| Style (thin, short) | 130–575–730 | 175 | 58 | 5–7–10 | 2.0 | 0.7 |
| Triact (large ray) | 100–170–240 | 39 | 12 | 10–22–30 | 6.2 | 2.0 |
| Triact (short ray) | 50–82–120 | 19 | 6 | 10–22–30 | 6.2 | 2.0 |
| Raphide | 60–73–80 | 6 | 2 | | | |

*Discussion.* Of the six species of *Cyamon* previously described, two are encrusting, two are lamelliform and two are massive. *Cyamon catalina* most closely resembles *Cyamon argon* Dickinson 1945 and *Cyamon*



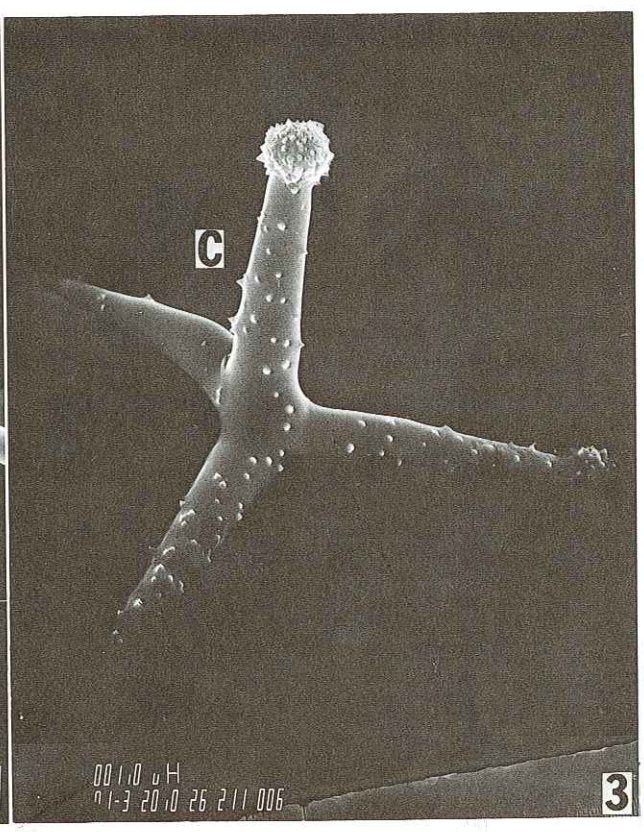
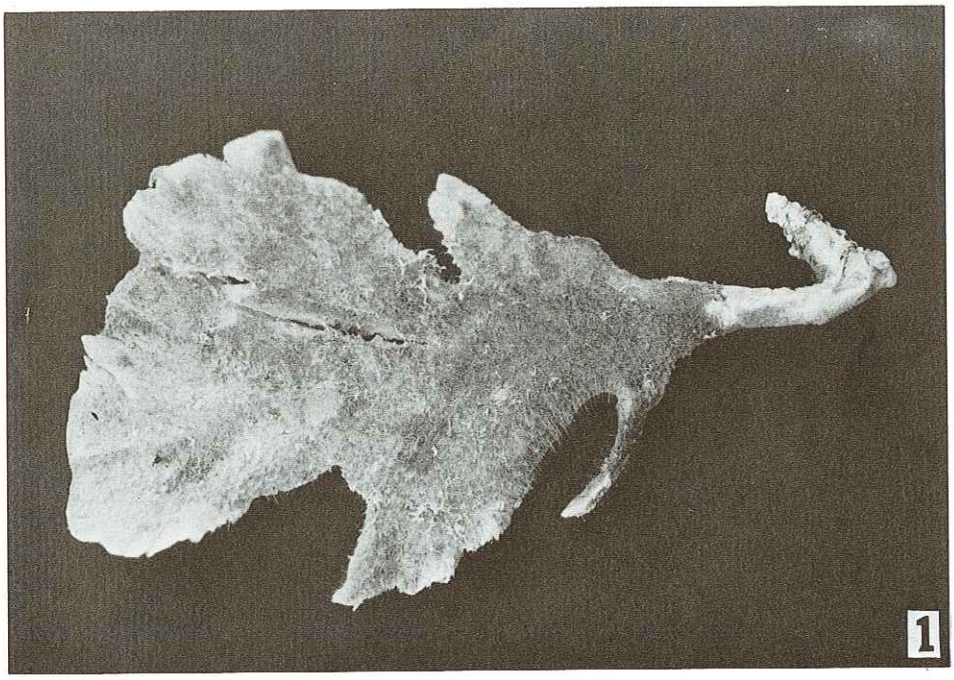
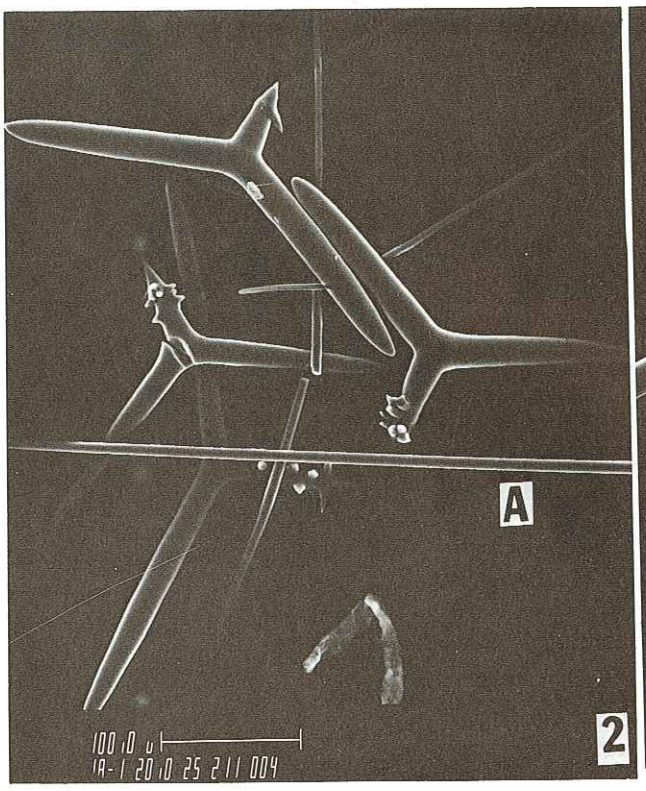




Fig. 3. *Cyamon koltuni* n. sp. Fig. 3-1. Thin incrustation on rock. Fig. 3-2 and 3-3. Type of spicules: A. Style, B. Hexactine, C. Quadriactine.



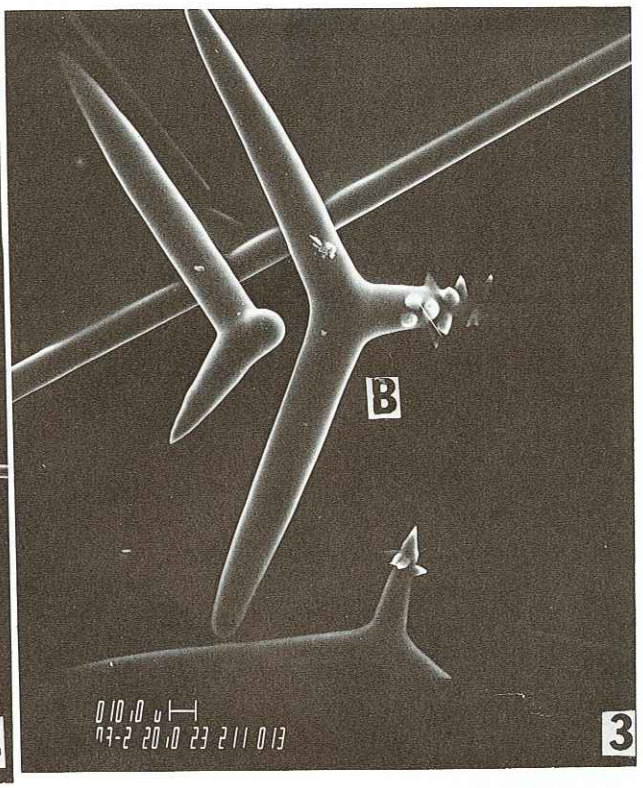




Fig. 4. *Cyamon catalina* n. sp. Fig. 4-1. Entire Animal. Fig. 4-2 and 4-3. Type of spicules: A. Style, B. Triact.

*(Microciona) quinqueradiata* Carter, 1880, in general morphology. All of the triacts of *C. argon* are usually echinate and contain a long, smooth and wavy stylote spicule. *Cyamon quinqueradiata* has a pentact in which one of the rays is echinate. *Cyamon catalina* has triacts with the short ray echinate and lacks wavy styles. *Cyamon catalina* is named after its type locality, Santa Catalina Island, California. It has also been collected from off Guerrero, Mexico; depth < 100 m (P. Gomez Lopez, per. comm.).

### 43. *Penares cortius* De Laubenfels, 1930

*Description.* Massive; color drab tan to dark brown.

*Collecting locality.* Near Bird Rock; depth 4.5 m.

*Distribution.* British Columbia, Canada, to southern California; Gulf of California, Mexico; Sea of Japan; depth 0–160 m.

*Spicules.* Specimen No. 255.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 550–800–1000 | 158 | 50 | 5–13–15 | 3.3 | 1.0 |
| Dichotriaene (rhabd) | 200–291–430 | 71 | 24 | 10–15–20 | 4.2 | 1.4 |
| Dichotriaene (clad) | 100–140–200 | 40 | 13 | | | |
| Microstrongyle | 80–101–140 | 26 | 8 | | | |
| Oxyspheraster | | | | 12–26–40 | | |

*Remarks.* This species exhibits considerable variation in spicules. Some specimens lack oxyspheraster, others have rare dichotriaenes.

### 44. *Stelletta clarella* De Laubenfels, 1932

*Stelletta estrella* De Laubenfels, 1930

*Description.* Encrusting to massive; color white.

*Collecting locality.* Catalina Harbor (southwest cove); intertidal.

*Distribution.* British Columbia, Canada, to southern California; Gulf of California, Mexico; depth 0–41 m.

*Spicules.* Specimen No. 213.

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea | 780–1100–1406 | 213 | 67 | 7–19–30 | 7.9 | 2.5 |
| Plagiotriaene (rhabd) | 330–504–950 | 170 | 54 | 10–51–80 | 20 | 6 |
| Plagiotriaene (clad) | 5–16–20 | 5.2 | 1.6 | 4–15–18 | 4.3 | 1.3 |
| Oxyspheraster | | | | 5–8–12 | 2.5 | 0.8 |
| Tylospheraster | | | | 12 | | |

*Remarks.* Tylospherasters are rare.

45. *Geodia gibberosa* Lamarck, 1815

*Description.* Massive to lobate, with fist-like projections; color dirty-white.

*Collecting locality.* Big Fisherman's Cove; depth 1.8 m.

*Distribution.* North Carolina; West Indies; Pacific coast of Panama; southern California; shallow subtidal.

*Spicules.*

| Spicule Type | Length | $\sigma$ | S.E. $\bar{X}$ | Diameter | $\sigma$ | S.E. $\bar{X}$ |
|---|---|---|---|---|---|---|
| Oxea (large) | 1300–1540–2000 | 207 | 65 | 15–26–40 | 9 | 3 |
| Oxea or Style (dermal) | 140–187–220 | 29 | 9 | 2–4–8 | 1.8 | 0.6 |
| Plagiotriaenes (rhabd) | 650–975–1320 | 194 | 61 | 20–31–50 | 8.4 | 2.7 |
| Plagiotriaenes (clad) | 80–144–200 | 8.4 | 2.7 | | | |
| Sterraster | | | | 40–52–60 | 8 | 3 |
| Oxyaster | | | | 17–22–30 | 3.9 | 1.2 |
| Strongylaster | | | | 5–7–10 | 2.1 | 0.7 |

*Remarks.* Large styles, not listed above, are comparable in size to large oxeas but are rare. This represents a new distribution record for the Pacific coast of North America.

## DISCUSSION

Some 150 specimens of sponges were examined from the collection of the University of Southern California Catalina Marine Science Center. This includes 45 species, 37 genera, 23 families, and 11 orders. Three of the species are new to science, as follows: *Oxeostilon fernaldi, Cyamon koltuni,* and *Cyamon catalina.* The dominant species, in descending order of abundance based on the number of specimens collected, are *Penares cortius, Acarnus erithacus, Plocamia karykina,* and *Antho lithophoenix.* Virtually all of the species are new published records for Santa Catalina Island, California, excepting *Clathrina blanca* and *Clathrina coriacea.* New distribution records for the Pacific coast of North America include the following: *Callyspongia californica, Rhizochalina oleracea, Adocia ambrosia, Hymedesmia* cf. *levis, Cliona viridis, Axinella mexicana,* and *Geodia gibberosa.* All of these species are tropical or subtropical except for the boreal, deep water *Hymedesmia* cf. *levis.* The geographical distribution of Caribbean species (*Rhizochalina oleracea, Cliona viridis,* and *Geodia gibberosa*) could have extended northward, when the Isthmus of Panama was open 3–4 million years ago, by the Costa Rica coastal current (Brusca and Wallerstein 1979). The range of these species and those from the Gulf of California could then have been extended further northward by the Davidson Current and California Countercurrent to Santa Catalina Island, the latter of which is bathed by the warm southern California eddy flow (Seapy and Littler 1980).

In summary, the sponge fauna of Santa Catalina Island, California, represents a mixture of cold and warm temperate species with fewer boreal and tropical representatives, much like that of southern California sponges in general (Bakus and Green, manuscript).

## ACKNOWLEDGMENTS

We thank the following people from the University of Southern California: Dr. Robert Given for providing the sponge collection and recorded field data; Carol Stepien for helping with field collections; and Farzaneh Mofidi and Mohammad Yazdanoust for aiding us in various aspects of the study. Mrs. Ruth Toyama and Stephen Spence kindly typed the manuscript and Mr. Yazdanoust took photographs of the new species. We thank Dr. Moshe Tsurnamal for the use of his notes on sponges from Santa Catalina Island, Dr. Fischel and M. Yazdandoust for Fig. 1, and Dr. Wolfgang Heimler for providing the SEM's for the new species. We appreciate reviews of the manuscript by Drs. Marion Fischel, Robert Given, Richard Brusca, and Klaus Ruetzler. We are grateful to Dr. Richard Dugdale for providing funds for publication.

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Accepted for publication 28 October 1985.