

SMITHSONIAN MISCELLANEOUS COLLECTIONS

VOLUME 106, NUMBER 5

ECHINODERMS FROM THE PEARL ISLANDS,  
BAY OF PANAMÁ, WITH A REVISION  
OF THE PACIFIC SPECIES OF  
THE GENUS ENCOPE

(WITH FOUR PLATES)

BY

AUSTIN H. CLARK

Curator, Division of Echinoderms  
U. S. National Museum



(PUBLICATION 3849)

CITY OF WASHINGTON  
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ECHINODERMS FROM THE PEARL ISLANDS, BAY OF  
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SPECIES OF THE GENUS ENCOPE

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(WITH FOUR PLATES)

Dr. Alexander Wetmore and Dr. Joseph P. E. Morrison, while on the Pearl Islands in the Bay of Panamá in the spring and summer of 1944, made a small but unusually interesting collection of echinoderms numbering 27 specimens representing 10 species.

A large *Encope* attracted immediate attention because of its peculiar spines, which were of a type not heretofore recorded in the genus. Some of these spines were sent to my good friend Dr. Hubert Lyman Clark of the Museum of Comparative Zoölogy, and he agreed that the specimen possessing such peculiar spines was certainly a representative of an undescribed species.

In view of all the work that has been done in the Panamá area, including the Pearl Islands, and on the west coast of Central America, it seemed most unlikely that such a distinctive form could have escaped the attention of collectors. Examination of the material in the United States National Museum disclosed seven specimens from Mazatlán, México, with spines of the same character on three, the others being bare tests. Two others from Mazatlán in the British Museum (Natural History) briefly described by Dr. H. L. Clark in 1925 are evidently similar; apparently they are bare tests, which would account for their not having been recognized as an undescribed species. With his usual generosity Dr. Clark sent me for examination a representative series of *Encopes* from the west coast of tropical America, and among these was another specimen of this new form from Mazatlán. As this is the only species of *Encope* I have seen from Mazatlán, it is probable that the specimens from Mazatlán at Bonn recorded as *Encope micropora* by Alexander Agassiz in 1872 also represent it. However, it is quite likely that both the new species and *E. micropora* occur at Mazatlán as they do in the Pearl Islands.

In examining the specimens of the species of *Encope* in the National Museum collection I found considerable confusion, particularly in regard to those from the Galápagos Islands, and Dr. Clark found the same confusion in the collection of the Museum of Comparative Zoölogy. So a revision of the eastern Pacific species and forms was undertaken, the results of which, Dr. Clark being in full agreement, are included herein.

Equal in interest to the representative of the new species of *Encope* is a specimen of an undescribed species of *Heliaster* characterized especially by its small and slender spines. It is apparently related, though not very closely, to *H. microbrachius*, which has been recorded from the Pearl Islands. The relationships between this new species and the other species of *Heliaster* occurring from the Galápagos Islands and Panamá northward are made clear by means of a key.

## ECHINOIDEA

### EUCIDARIS THOUARSII (L. Agassiz and Desor)

*Localities*.—San José; from rocks west of the landing beach, intertidal zone; February 26, 1944 (U.S.N.M. No. E.6775).

San José; tide pools on north side of small east bay; February 22, 1944 (U.S.N.M. No. E.6776).

### ECHINOMETRA VANBRUNTI L. Agassiz

*Locality*.—San José; tide pools on north side of small east bay; February 22, 1944 (U.S.N.M. No. E.6777).

### ENCOPE WETMOREI, new species

Plate 1; plate 2, upper

*Encope micropora* (part) ?A. AGASSIZ, Ill. Cat. Mus. Comp. Zoöl., No. 7, pt. 1, p. 128, 1872 (Mazatlán).—RATHBUN, Proc. U. S. Nat. Mus., vol. 9, p. 286, 1886 (Mazatlán).

*Encope perspectiva* (part) H. L. CLARK, A catalogue of the recent sea-urchins (Echinoidea) in the collection of the British Museum (Natural History), p. 175, 1925 (Mazatlán).

*Description*.—The test is 125 mm. long and 125 mm. broad, nearly circular with a slightly marked broadly rounded angle in front of the anterior ambulacrum and the border between the two posterior ambulacra only slightly convex. It is very thin, with a thin, sharp edge, especially posteriorly, and is highest (15 mm.) about halfway between the center of the abactinal system and the anterior border.

The ambulacral lunules are subequal, about 11 mm. long and 5 or 6 mm. broad, with the sides parallel for most of their length and the ends broadly rounded, or more or less egg-shaped with the broader end outward. The two posterior are 14 mm. from the edge of the test, the three anterior 11 mm. The interambulacral lunule is larger and broader than the ambulacral lunules and has rather strongly convex sides and sharply rounded ends. It is 14 mm. long and 6 mm. broad. The outer end is 24 mm. from the posterior edge of the test and the inner end is 27 mm. from the center of the abactinal system. The inner end is 9 mm. inside a line connecting the inner ends of the adjacent ambulacral lunules, and a line connecting the distal ends of the two posterior petals crosses it at about the middle.

The petals are long, reaching to about 4 mm. from the lunules. The outer ends of the two posterior petals are about 43 mm. from the center of the abactinal system, those of the two anterolateral about 37 mm., and that of the anterior about 39 mm. The petals are rather narrow, the maximum width of the two posterior and the two anterolateral being 16 mm., and the width of the raised central portion being 6 mm. in the posterior and 7 mm. in the anterolateral.

The spines on the aboral surface of the test (pl. 2, upper) are mostly about 0.8 mm. long. The basal half to two-thirds is a slender stalk beyond which the spine becomes conical, the sides of the cone making with each other an angle of about  $60^{\circ}$ ; the tip is truncated and flat, typically at right angles to the axis. Many of the spines, however, are shorter, down to 0.5 mm. long, the conical distal portion in the shortest making up about half the length. These shorter spines have the tip truncated more or less obliquely, down to an angle of  $45^{\circ}$ . The truncated ends of the spines are almost or quite in contact so that the general effect is that of a pavement, quite unlike the furry effect of more or less separated bulbous-tipped spines of most of the other species of the genus. This pavementlike covering almost entirely masks the ambulacral petals.

The color is dark olive gray.

*Localities.*—San José; from Playa Grande (east beach); March 1, 1944 (U.S.N.M. No. E.6768, holotype). Plate 1; plate 2, upper.

Mazatlán, México; collected by Alphonso Forrer, 1885 (U.S.N.M. No. 10017).

Mazatlán, México; 1885 (U.S.N.M. No. 3081).

Mazatlán, México (M.C.Z. No. 2419).

*Notes.*—A series of six specimens, three with spines and three bare, seems to represent this species. They are from Mazatlán,



México, and were received in 1885 from Alphonso Forrer of Santa Cruz, Calif. They were cataloged in the same year under the name of *Encope micropora*, with an annotation "probably correct, A. Ag." On the label is written "*Encope micropora* Ag. var. *perspectiva* Ag., Mazatlán." These were recorded under the name of *Encope micropora* by Dr. Richard Rathbun in 1886.

The measurements are as follows: Length 83 mm., width 83 mm., maximum height 9 mm.; 79-79-7.5 mm.; 69-69-6 mm.; 67-68-6 mm.; 69-70-7 mm.; and 64-64-6 mm.

They are almost perfectly circular, the posterior border continuing the same curve as the rest of the border. They are thin, the maximum height being from 8 to 11 (averaging 9.33) percent of the test length; in the type the maximum height is 12 percent of the test length. The interambulacral lunule is considerably larger than the ambulacral lunules, its inner end being about as far from the center of the abactinal system as the length of the lunule; it is also rather broad with usually convex, sometimes parallel sides. A line between the outer ends of the two posterior petals crosses the interambulacral lunule at about, or somewhat behind, the middle. The spines resemble those of the large specimen described, but the truncated tips are not quite so broad. The length of the petals varies somewhat, and in none is quite so great as in the type.

Except for the smaller size, the more perfectly circular form, and the relatively slightly larger interambulacral lunule, there seem to be no differences between these specimens and the type.

The bare test from Mazatlán, identified as *Encope micropora* by Dr. Richard Rathbun, undoubtedly represents this species. It is 100 mm. in diameter, but is much deformed.

The specimen from Mazatlán in the Museum of Comparative Zoölogy (No. 2419) is 110 mm. long and 111 mm. broad; the maximum height is 13.5 mm. It is somewhat deformed. The spines on the aboral surface resemble those of the type specimen from the Pearl Islands.

In 1925 Dr. Hubert Lyman Clark recorded as *Encope perspectiva* two specimens from Mazatlán measuring 65 x 65 mm. and 70 x 70 mm. He noted that "they are flat and thin like *Mellita*, but they seem to be the young of *E. perspectiva*." Circular and thin, these presumably represent the same species as those from Mazatlán just described.

This new species differs markedly from *E. perspectiva* in the character of the spines on the aboral surface (pl. 2). In *E. perspectiva* the spines have an abruptly enlarged and bulbous tip and are



separated from each other by more than the width of the tips, giving the aboral surface a furry appearance. The rows of spines on the petals are separated by two or three times the width of the tips, so that the petals are clearly evident. In the only undoubted specimen of *E. perspectiva* at hand (pl. 3, upper; pl. 2, lower), from Cape St. Lucas, Baja California, in 6 to 10 fathoms, collected by Dr. Waldo L. Schmitt on July 19, 1938 (U.S.N.M. No. E.5635), the test is heavy and thick, the maximum height being 14 percent of the length, and the posterior border between the two posterior ambulacral lunules is straight.

The characters separating the bare tests of *E. wetmorei* and *E. perspectiva* are not determinable on the basis of material at hand. It would seem that the test of *E. wetmorei* is more nearly circular than that of *E. perspectiva*, lower and thinner, and with a larger and broader interambulacral lunule, but this needs confirmation.

#### ENCOPE MICROPORA L. Agassiz

*Locality*.—San José; in drift from Playa Grande (east beach): August 2, 1944 (U.S.N.M. No. E.6769).

*Notes*.—This is a typical specimen, 102 mm. long and 107 mm. in maximum width, with the circumference flattened at right angles to the interambulacral lunule and at right angles to the two anterolateral ambulacral lunules. The maximum height is 14 mm., 14 percent of the length.

#### NOTES ON THE GENUS ENCOPE

Of the Pacific species of *Encope*, *grandis*, *wetmorei*, and *perspectiva* seem to be quite distinct and easily recognized, at least when complete specimens are available. The two other species recognized by Dr. Hubert Lyman Clark, *micropora* and *californica*, are closely related. The distinguishing feature of *micropora* is that the maximum height is anterior, between the abactinal system and the anterior edge, whereas in *californica* it is posterior, at the inner end of the interambulacral lunule.

Specimens from the Galápagos Islands at hand, some identified as *micropora* and some as *californica*, are usually highest at the abactinal system, or the aboral surface may be flat and parallel with the oral surface; such specimens are intermediate between *micropora* and *californica*. A few specimens are slightly higher anteriorly than elsewhere, thus intergrading with *micropora*.

Specimens from the northern part of the Gulf of California also may be highest at the abactinal system, or may have the aboral surface flat and parallel with the oral. Such specimens occur with *micropora*, and there is a complete series of intergrades between the two; but they differ rather widely in other features from those from the Galápagos Islands.

It would seem, therefore, that the form from the northern part of the Gulf of California, *californica*, *micropora*, and the form from the Galápagos Islands represent different variants of the same specific type. The form from the Galápagos is a local race or subspecies; *californica* is a localized race confined to the Gulf of California where *micropora* also occurs, perhaps under different ecological conditions; and the specimens highest in the middle from the northern part of the Gulf of California are an extreme variant from *micropora* which have not attained the status of a distinct race. Since *micropora* is by far the commonest and most widely distributed of any of the forms in this complex it may be regarded as the basic type from which the others were derived.

The systematic interrelationships of this group may be expressed by the following arrangement.

**ENCOPE MICROPORA L. Agassiz**

*Range*.—From the northern part of the Gulf of California and Ballenas Bay, Baja California, southward to Chilca, south of Callao, Perú, including the Galápagos Islands.

**ENCOPE MICROPORA MICROPORA L. Agassiz**

*Range*.—From the northern part of the Gulf of California and Ballenas Bay, Baja California, southward to Chilca, Perú.

**ENCOPE MICROPORA var. BOREALIS, new variety**

Plate 4

*Description*.—The test is nearly circular but with the posterior border between the two posterior ambulacral lunules straight, 110 mm. long and 120 mm. in greatest breadth, and 12.5 mm. high. The aboral surface is flat and parallel to the oral surface from the middle of the anterior petal to a line connecting the middle of the two posterior petals, beyond this area broadly curving and then sloping to the border. Lunules large and broad, about 11 mm. long and 8 mm. broad, the interambulacral lunule larger, 14 mm. long and 10 mm. broad.

*Localities.*—*Albatross* station 3028; northern part of the Gulf of California (lat.  $31^{\circ}32'30''$  N., long.  $114^{\circ}20'00''$  W.);  $9\frac{1}{2}$  fathoms; sand; March 26, 1889. Two specimens, the type (U.S.N.M. No. E.6794) (pl. 4), and another intermediate between this form and *micropora* (U.S.N.M. No. 17386).

*Albatross* station 3020; northern part of the Gulf of California (lat.  $30^{\circ}37'30''$  N., long.  $113^{\circ}07'00''$  W.); 7 fathoms; gray sand and black specks; March 24, 1889. Two typical specimens and one intermediate (U.S.N.M. No. 17385).

Concepción Bay, Baja California; *Albatross*, March 19, 1889. One dead test (U.S.N.M. No. 17387).

*Range.*—Northern part of the Gulf of California southward to Concepción Bay; 0 to  $9\frac{1}{2}$  fathoms.

#### ENCOPE MICROPORA GALAPAGENSIS, new subspecies

*Description.*—This subspecies resembles *E. m. micropora* in all respects except that the aboral surface from the middle of the anterior petal to the middle of the two posterior petals is flat and parallel with the oral surface.

The type specimen is 142 mm. long, 145 mm. in greatest breadth, and 18 mm. in maximum height; the interambulacral lunule is 17.5 mm. long, and its inner end is 38 mm. from the center of the abactinal system.

*Localities.*—Chatham Island, Galápagos; Dr. W. H. Jones, U. S. Navy, U. S. S. *Wachusett*, August 16, 17, 1884. One specimen (U.S.N.M. No. E.6817, the type).

James Island, Galápagos; *Albatross*, April 11, 1888. 3+ specimens (U.S.N.M. Nos. 33200, 34256).

James Island, Galápagos (M.C.Z. No. 4219).

Indefatigable Island, Galápagos (M.C.Z. No. 7492).

In the Galápagos Islands there occurs an undescribed local race of *Encope perspectiva* which differs from the continental form of that species just as *E. micropora galapagensis* differs from *E. m. micropora*. This race may be known as

#### ENCOPE PERSPECTIVA JONESI, new subspecies

*Description.*—This subspecies differs from *E. p. perspectiva* only in having the aboral surface from the middle of the anterior petal to the inner end of the interambulacral lunule flat and parallel with the oral surface.

The type specimen is 135 mm. long, 143 mm. in greatest width, and 17 mm. in maximum height; the interambulacral lunule is 20 mm. long, and its inner end, opposite the middle of the petals on either side, is 33 mm. from the center of the abactinal system.

*Locality.*—Chatham Island, Galápagos; Dr. W. H. Jones, U. S. Navy, U. S. S. *Wachusett*, August 16, 17, 1884. One specimen (U.S.N.M. No. E.6818, the type).

*Note.*—Although the type specimens of *Encope micropora galapagensis* and *E. perspectiva jonesi* bear the same data, this does not necessarily mean that they were collected at the same place or at the same time.

The interrelationships of the several species, subspecies, and varieties of *Encope* occurring on the Pacific coast of America may be appreciated from the following key.

KEY TO THE PACIFIC SPECIES OF ENCOPE

- a*<sup>1</sup>. Test heavy and thick, the edges 5 to 10 mm. high; ambulacral lunules and sometimes also the interambulacral lunule represented by broad rounded notches; two posterior petals markedly longer than the anterior petal and curved about the inner portion of the interambulacral lunule (Gulf of California) ..... *grandis*
- a*<sup>2</sup>. Test thinner and lighter, the edges not over 3 mm. high; ambulacral and interambulacral lunules closed, except in the young; two posterior petals little, if any, longer than the anterior petal and straight or only slightly curved.
- b*<sup>1</sup>. Interambulacral lunule extending inward to about the middle of the ambulacral petals on either side.
- c*<sup>1</sup>. Spines with the distal end expanded into a conical tip, the flat distal ends of the spines presenting a pavementlike appearance; test approximately circular, thin, highest about halfway between the center of the abactinal system and the anterior border (pl. 1; pl. 2, upper) (Mazatlán and Pearl Islands, Panamá) ..... *zvetmorei*
- c*<sup>2</sup>. Spines with swollen egg-shaped or bulbous ends, more widely separated, giving a furry appearance; test thicker, the posterior border between the posterior ambulacral lunules more or less straight (pl. 3, upper; pl. 2, lower) (Ballenas Bay, Baja California, to Costa Rica; Galápagos Islands) ..... *perspectiva*
- d*<sup>1</sup>. Test highest midway between the center of the abactinal system and the anterior border (Ballenas Bay, Baja California, to Costa Rica) ..... *perspectiva perspectiva*
- d*<sup>2</sup>. Test with the aboral surface between the middle of the anterior petal and the inner end of the interambulacral lunule flat and parallel with the oral surface (Chatham Island, Galápagos) ..... *perspectiva jonesi*

*b*<sup>2</sup>. Interambulacral lunule extending inward to or slightly beyond a line connecting the outer ends of the two posterior petals (northern part of the Gulf of California and Ballenas Bay, Baja California, southward to Chilca, south of Callao, Perú, including the Galápagos Islands) ..... *micropora*

*c*<sup>1</sup>. Test highest in the middle of the abactinal system, or flattened so that the aboral profile is parallel with the oral.

*d*<sup>1</sup>. Lunules broadly oval to subcircular, not more than half again as long as broad (pl. 4) (Gulf of California south to Concepción Bay)..... *micropora borealis*

*d*<sup>2</sup>. Lunules narrow with largely parallel sides, much more than twice as long as broad (James and Chatham, and Indefatigable Islands, Galápagos) . *micropora galapagensis*

*c*<sup>2</sup>. Test not highest in the middle.

*d*<sup>1</sup>. Test highest anteriorly, midway between the center of the abactinal system and the anterior border (Gulf of California and Ballenas Bay, Baja California, southward to Chilca, south of Callao, Perú).... *micropora micropora*

*d*<sup>2</sup>. Test highest posteriorly, at the inner end of the interambulacral lunule (Gulf of California) *micropora californica*

## ASTEROIDEA

### MITHRODIA BRADLEYI Verrill

*Locality*.—San José; South Bay, near camp; from rocks; February 27, 1944 (U.S.N.M. No. E.6772).

### PHARIA PYRAMIDATA Gray

*Localities*.—San José; near camp; on the rocks; August 1944 (U.S.N.M. No. E.6770).

San José; South Bay, near camp; from rocks; February 27, 1944 (U.S.N.M. No. E.6771).

### HELIASTER MORRISONI, new species

Plate 3, lower

*Description*.—Rays 24; R=85 mm., r=about 60 mm.; about 30 percent of the rays free. The rays are rather high, and are somewhat flattened abactinally. The central disk is somewhat elevated, about 30 mm. in diameter. The abactinal spines are very numerous, arranged roughly in five rows on the free rays, these rows extending inward to the central disk. In a broad ring about 10 mm. wide about the periphery of the disk the spines are somewhat larger, more crowded, and irregularly arranged. The spines are short, 1 to 1.5 mm. long, slender, and tapering to a blunt or more or less sharp point.



The skeleton is reticulate, and is less solid than usual. The upper marginal plates form a continuous line along each side of the abactinal surface of the rays which is continued inward to the central disk. The spines on these plates are somewhat stouter than those on the plates forming the network between them and are bluntly conical. Between the upper marginals of adjacent rays an irregular row of small plates, each bearing a spine, runs inward from the point of union of the rays.

The color when received (and presumably when in life) was deep violet, the spines light straw yellow.

*Locality*.—San José; South Bay, near Camp; from rocks; February 27, 1944 (U.S.N.M. No. E.6767, holotype).

*Notes*.—This species seems to be most nearly related to *H. microbrachius* Xantus, from which it is at once distinguished by its more slender spines which taper from the base, or at least in the outer half, and the rows of spines between adjacent superomarginals. In *H. microbrachius* the spines are short and thick, not over twice as long as broad, somewhat swollen with the greatest diameter shortly below the tip, which is broadly rounded. In the single specimen at hand the rays are fewer than in *H. microbrachius* and longer than is usual in that species. Verrill has recorded *H. microbrachius* from the Pearl Islands, and it occurs at Panamá.

In the starfishes of the genus *Heliaster* the food appears to consist chiefly of gastropods.

The interrelationships of the species of *Heliaster* occurring from the Galápagos Islands and Panamá northward are indicated by the following key, adapted from Dr. H. L. Clark.

KEY TO THE SPECIES OF HELIASTER OCCURRING FROM THE GALÁPAGOS ISLANDS AND PANAMÁ NORTHWARD

- a*<sup>1</sup>. Spines numerous, small, cylindrical with rounded tips to conical; a row of spines between the superomarginals running inward from the junction of the rays; 24 rays, free for about 30 percent of their length (pl. 3, lower) (Pearl Islands, Bay of Panamá).....*morrisoni*
- a*<sup>2</sup>. Spines stout, all or most with swollen or capitate tips; no row of spines between the superomarginals.
- b*<sup>1</sup>. Less than 30 rays, which are free for from 40 to 70 percent of their length.
- c*<sup>1</sup>. Rays free for half their length or more; color pale yellowish mottled with blackish, the rays more or less distinctly banded; spines, pedicellariae, and madreporic plate light yellowish (Galápagos Islands).....*solaris*<sup>1</sup>

<sup>1</sup> *Heliaster solaris* A. H. Clark, Proc. Biol. Soc. Washington, vol. 33, p. 183, 1920 (new name for *Asterias multiradiata* Gray, 1840, not *Asterias multiradiata* Linnaeus, 1758).



- c*<sup>2</sup>. Rays free for usually less than half their length, from 40 to 55 percent; color deep purplish, the rays sometimes indistinctly banded; spines, pedicellariae, and madreporic plate deep yellow (Gulf of California and Baja California to Macuoha, Nicaragua) ..... *kubini**ji*
- b*<sup>2</sup>. More than 30 rays, which are free for less than 30 percent of their length.
- c*<sup>1</sup>. Abactinal surface with numerous small subacute to capitate spines of nearly uniform length, not arranged in radiating series except on the rays where five such series are usually more or less evident; 27 to 44 rays, free for from 20 to 30 percent of their length (Gulf of California and Baja California southward to Pearl Islands, Bay of Panamá) ..... *microbrachius*
- c*<sup>2</sup>. Abactinal surface with rather large, often capitate, spines, arranged more or less in distinct radial series, especially on the rays where three such series are very evident; 32 to 40 rays, free for from 15 to 30 percent of their length (Galápagos Islands) ..... *cumingii*

## OPHIUROIDEA

## OPHIOCOMA AETHIOPS Lütken

*Localities*.—Pedro González Island; north side, west of Cocal; from rocks in lower intertidal zone; March 9, 1944 (U.S.N.M. Nos. E.6779, E.6780, E.6781).

San José; under big rocks in lower intertidal zone in small east bay; February 22, 1944 (U.S.N.M. No. E. 6782).

## OPHIONEREIS ANNULATA (Le Conte)

*Localities*.—Pedro González Island; north side, west of Cocal; from rocks in lower intertidal zone; March 9, 1944 (U.S.N.M. No. E.6773).

San José; under big rocks in lower intertidal zone in small east bay; February 22, 1944 (No. E.6774).

## OPHIODERMA PANAMENSE Lütken

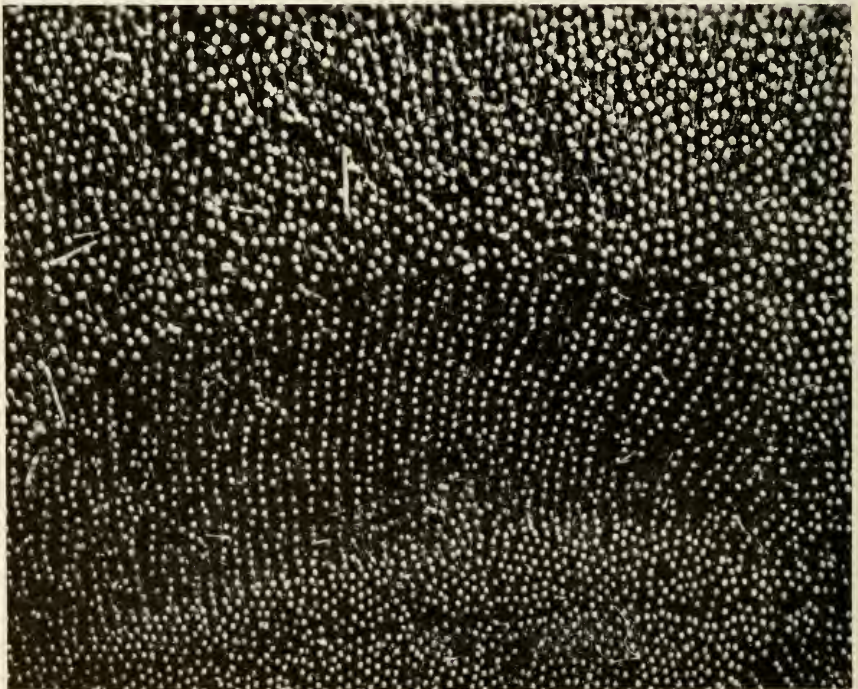
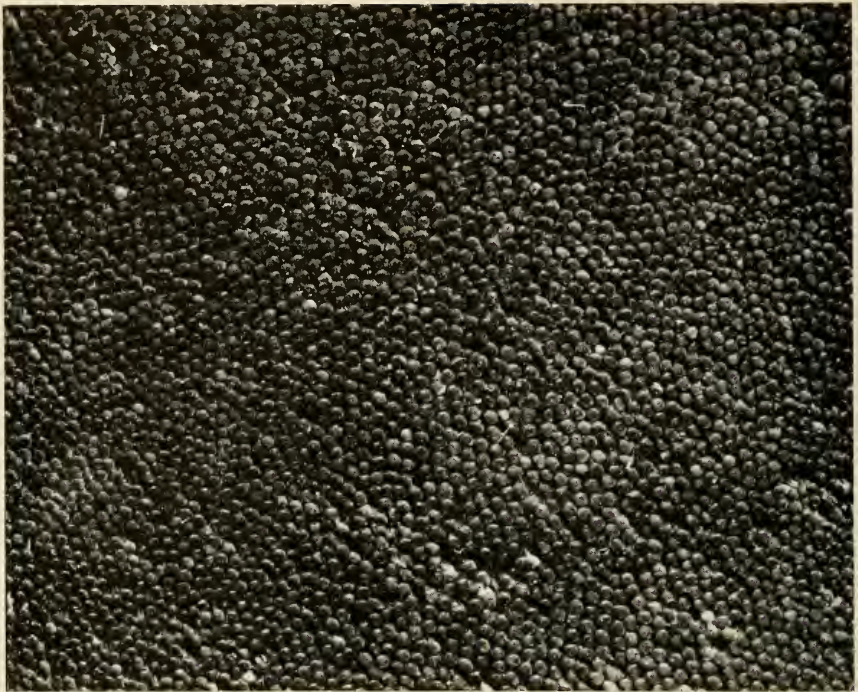
*Locality*.—San José; under big rocks in lower intertidal zone in small east bay; February 22, 1944; with the two preceding species (U.S.N.M. No. E.6778).





**ENCOPE WETMOREI, NEW SPECIES**

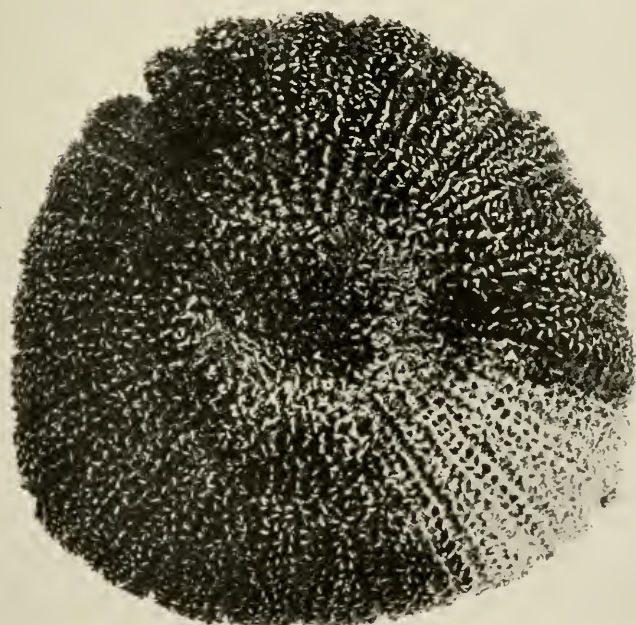
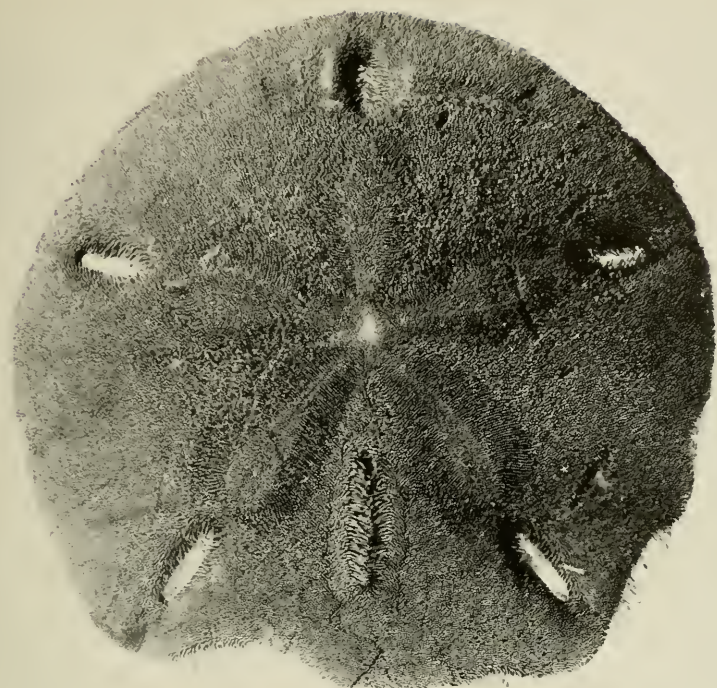
Type specimen from San José, Pearl Islands (U.S.N.M. No. 6768). Natural size.



Upper: Spines of *Encope wctmoreci*, new species, type specimen (U.S.N.M. No. 6768); right posterior interambulacrum, a small section of right posterior petal at upper left. Enlarged.

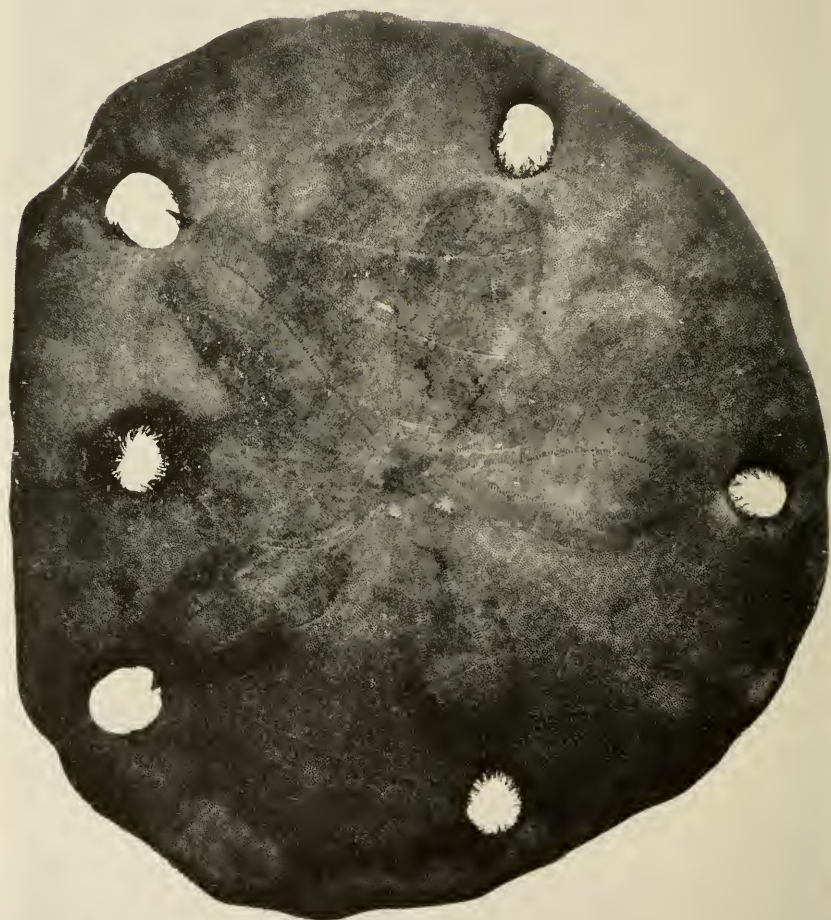
Lower: Spines of *Encope perspectiva* from Cape St. Lucas, Lower California (U.S.N.M. No. E.5635); part of right posterior petal and of right posterior interambulacrum. Enlarged.





Upper: *Encope perspectiva*, Cape St. Lucas, Lower California, 6 to 10 fathoms; Waldo L. Schmitt, July 19, 1938 (U.S.N.M. No. E.5035). Natural size.

Lower: *Heliaster morrisoni*, new species, type specimen from San José, Pearl Islands (U.S.N.M. No. E.6767). Natural size.



**ENCOPE MICROPORA BOREALIS, NEW VARIETY**

Type specimen from *Albatross* station 3028, northern part of the Gulf of California,  $9\frac{1}{2}$  fathoms (U.S.N.M. No. E.6794). Natural size.