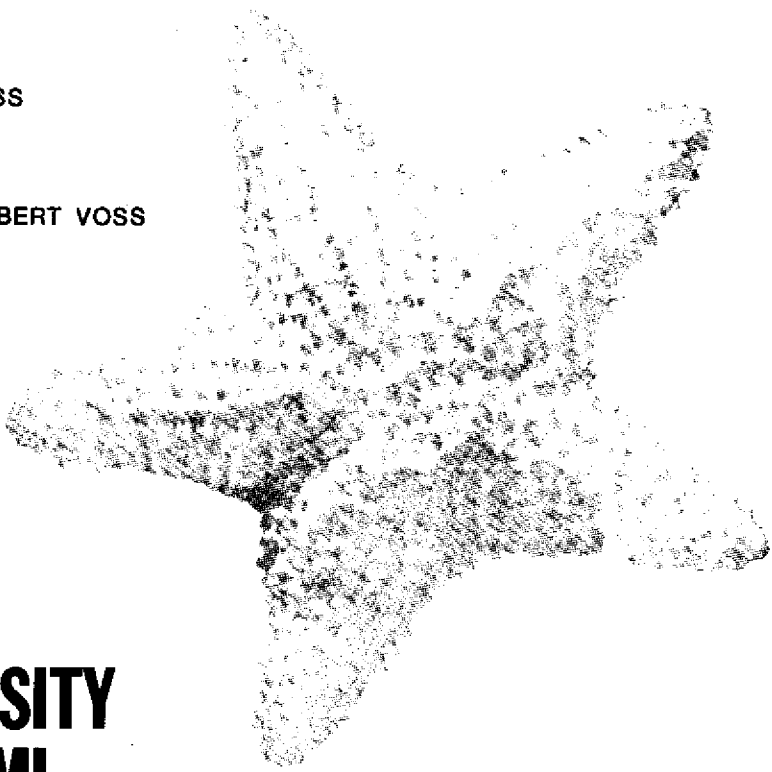


**GUIDE TO THE COMMONER  
SHALLOW-WATER ASTEROIDS (STARFISH)  
OF FLORIDA , THE GULF OF MEXICO ,  
AND THE CARIBBEAN REGION**

**STEVEN C. HESS**

**EDITED BY GILBERT VOSS**



**UNIVERSITY  
OF MIAMI  
SEA GRANT  
PROGRAM**

**SEA GRANT FIELD GUIDE SERIES  
NUMBER 7  
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Sea Grant Field Guide Series # 7

Guide to the Commoner Shallow-water Asteroids (Starfish) of Florida, the Gulf of Mexico, and the Caribbean Region.

Steven C. Hess

Edited by Gilbert Voss

University of Miami Sea Grant Program (NOAA Sea Grant No. 04-5-158-14)  
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## Foreword

The University of Miami Sea Grant Field Guide Series is published to make available to the commercial and sports fishermen, the general public, and fisheries and conservation personnel easily usable, non-technical, well-illustrated guides for the identification of the marine life of the area. Every means has been used to avoid technical terms where possible. When these must be used to avoid confusion, they are carefully explained and often illustrated. Glossaries are included when necessary.

But the guides go further than just identification. Where such knowledge is available, information is given on geographical distribution, depth distribution, abundance, time of spawning, present utilization, means of harvesting, and mariculture methods, besides other useful information.

The format is uniform in the series for greater ease of use. Actual photographs are used where possible but when greater clarity is required, drawings are used. In general we have attempted to illustrate each species, but, in cases where two or more species are very similar, this is noted, a single illustration is used, and distinguishing characters are given in the text.

The principle used in selection of species has been not whether the species are now commercially exploited, but whether the animal or plant is of sufficient size and occurs in large enough numbers to make it potentially capable of exploitation. In some cases, species are included that are known to be harmful or poisonous. This is done to draw attention to their presence and to avoid their mistaken use as food.

The Sea Grant Office, University of Miami, will appreciate comments from users of this series for the betterment of the guides, for the inclusion of future printings of species possibly overlooked by the compilers, and especially for suggestions concerning other groups of organisms for which guides are desired. Your comments are solicited.

The purpose of field guides is to make possible identification of animals or plants in the field without the need for other reference works, dictionaries, microscopes, or dissecting equipment. Most field guides fall short of these objectives mainly because of the use of unexplained technical terms and reference to characters not discernible to the naked eye.

In this guide we have attempted to use terms in general use; where a technical word is necessary it is explained at its first use and is illustrated in the introduction. Characters are used that are visible to anyone having normal vision, or in special cases, by use of a simple hand lens or magnifying glass.

We suggest that users first read the introduction in order to find the scope of the guide-area covered, kind of species included, characters used, and to familiarize themselves with the words used in the description and keys.

There are two ways to use this guide. One is to simply thumb through the pages looking at the illustrations until one is found that matches the specimen in front of the reader. When this or a series of species illustrations is found, the descriptions should then be read in search of further identifying remarks paying attention to the notes on distribution, depth of capture, and type of bottom. If all of these fit reasonably well, it is likely that your specimen belongs to that species.

The second method is to use the key first, and when a reasonable match is found, turn to the page number given in the key and follow the procedure as described in the paragraph above. In using the key, one must be aware that species not covered in this guide may apparently be identified by the key. This is why it is essential that, when a specimen is identified by the key, the illustrations and descriptions must be used also. If the name given in the key does not correspond to the species illustration and description, either your use of the key was wrong and another alternative is correct or the species is not considered to be potentially valuable and is not included in this guide. If key, illustration, and description agree, you may reasonably expect that your identification is correct.

When using the keys, always be sure to read both alternatives and choose the one most fitting your specimen before going to the next set of choices. In closely related species, each choice will be somewhat fitting to your specimen, but only one will fit it correctly.

Finally, do not expect your specimen to be exactly like the illustration, especially as to position of bands, ridges, shape and other characteristics. No two human beings are exactly alike; marine species have similar ranges of differences between individuals.

If at last you are unable to identify your specimen from this guide, but you are certain that it belongs to the group included in it, your final recourse is to bring or send it to a specialist for identification.

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Commoner Shallow-water Asteroids  
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## Introduction

Starfish or sea stars belong to the class Asteroidia, one of the divisions of the animal phylum Echinodermata. Other divisions contain the feather stars and sea lilies (Class Crinoidea), sea urchins and sand dollars (Class Echinoidea), brittle stars and serpent stars (Class Ophiuroidea) and sea cucumbers (Class Holothuroidea) (Barnes, 1968; Coe, 1972).

Starfish are free-living, active animals with a type of body plan called radial symmetry. It is exemplified by a central disc possessing a ventrally located mouth and usually bearing five broadly connected, tapering arms or rays. There is a furrow or ambulacral groove on the underside of each arm radiating outward from the mouth. Within these grooves are tube feet or podia, fleshy extensions of the animal's water vascular system. These function in locomotion, sensory reception, respiration and feeding. Rows of movable spines bordering each groove are used to close the grooves and to keep them clear of detritus. The body wall of starfish consists of an outer skin or epidermis, beneath which are skeletal plates or ossicles. The arrangement, shape and sculpture of these plates provide many of the characters employed in starfish identification and classification. The madreporite, a button-shaped feature on the upper surface of the disc, provides the water vascular system with an external connection. Although often concealed by spines or other ornamentation, the madreporite is, also, frequently used as a diagnostic character (Barnes, 1968; Hyman, 1955 and Thomas, unpub).

Starfish reproduction may take place in several different ways. Some species, for example those of the genus Linckia, are capable of reproducing asexually by division of the central disc or by an arm breaking off followed by regeneration of the missing parts. Most asteroids, however, reproduce sexually. Sexes are usually separate and the eggs and sperm are broadcast into the water simultaneously. After fertilization, a free-swimming larva develops. It passes through several metamorphoses to the juvenile stage. Under ideal conditions, growth is quite rapid with maturation and reproduction occurring within one year. Certain starfish species, however, brood their eggs and young, that is, development is direct with no larval stages (Barnes, 1968).

Asteroids are bottom-dwelling animals. For the most part they are carnivores, preying on mollusks, crustaceans, echinoderms, worms, and even fish. Starfish are also known to feed on dead animals. Some species feed on plankton, detritus, or mud. These suspension feeders trap the material in mucus, sweep it via the ambulacral grooves to the mouth and then digest the organic material (Hulings and Hemlay, 1963; Wells, Wells and Gray, 1961 and Gudger, 1933).

There are approximately 180 species of starfish known from Florida, the Gulf of Mexico and the Caribbean. Of these, about twenty species inhabit waters less than 150 feet (✓ 50 meters) deep (Downey, 1973; Clark, 1933; Verrill, 1915; Gray, Downey and Cerase-Vivas, 1968 and Clark, 1902). The eleven



species dealt with in this booklet represent the species most frequently encountered by snorkeling, SCUBA, wading, and beach collecting. Most of the characters used to identify starfish are visible with the unaided eye. In certain instances, however, closer examination using a hand lens may be necessary.

There are several preservation methods used for starfish. To prepare dried specimens, kill the animal in 70% ethyl alcohol and then remove it to dry. Best results are obtained if the arms are pinned out to prevent distortion during the drying stage (Wagstaffe and Fidler, 1955). For large specimens such as Oreaster reticulatus formaldehyde is poured into the arm furrows until the specimen is full. The outer surface should be rinsed of any formaldehyde to prevent staining. The specimen is then dried in the shade until there is no detectable odor.

### Commercial Importance

Loosanoff (1961) stated, "The starfish has long been regarded as one of the most destructive enemies of shellfish on the Atlantic coast of North America." This observation characterizes the major economic significance of sea stars. As predators of commercially valuable stocks of oysters and other shellfish, starfish are responsible for millions of dollars in lost revenue annually. Accurate figures regarding losses suffered by the oyster industry are not available. Between 1887 and 1889, losses due to starfish predation by Asterias forbesi exceeded 1.5 million dollars for the Connecticut oyster fishery alone. In 1958, one of the heaviest oyster sets in years was almost totally destroyed by starfish. Damage estimates ranged from ten to fifteen million dollars. Young, newly-set oysters are especially vulnerable prey. Although difficult to assess, depredation of young oysters probably accounts for greater losses than for adult animals.

Besides this direct loss of income, the oyster industry has been forced to expend large sums of money to control starfish populations. Biological, mechanical and chemical techniques have been employed. The latter two approaches have proven most effective. Mechanical means include the use of starfish mops, dredges and underwater plows (Loosanoff, 1960). In 1929, using mechanical devices, one oyster company operating in Narragansett Bay removed over ten million starfish from eleven thousand acres of oyster beds (Galtsoff, 1964). Chemicals such as copper sulfate and insecticides have been spread in a thin layer over the bottom or deposited as a barrier surrounding an oyster bed. Other techniques have been used, but no known measure is completely effective in eliminating starfish predation.

Acanthaster planci, a large, sixteen-armed starfish of the Pacific Ocean, provides another example of the effects of starfish predation. This species feeds primarily on reef-building, stony corals. During the 1960's large infestations of the animal were reported from various localities in the South Pacific. Extensive coral reef areas were destroyed in a very short period. Chesher (1969) reported the devastation of narrow, fringing reefs in Guam at the rate of one kilometer (5/8 mile) per month. During a two and one-half year period over 90% of the coral was destroyed along 38 kilometers (23-3/4 miles) of the Guam coastline. Soon after a reef area is killed by A. planci, the

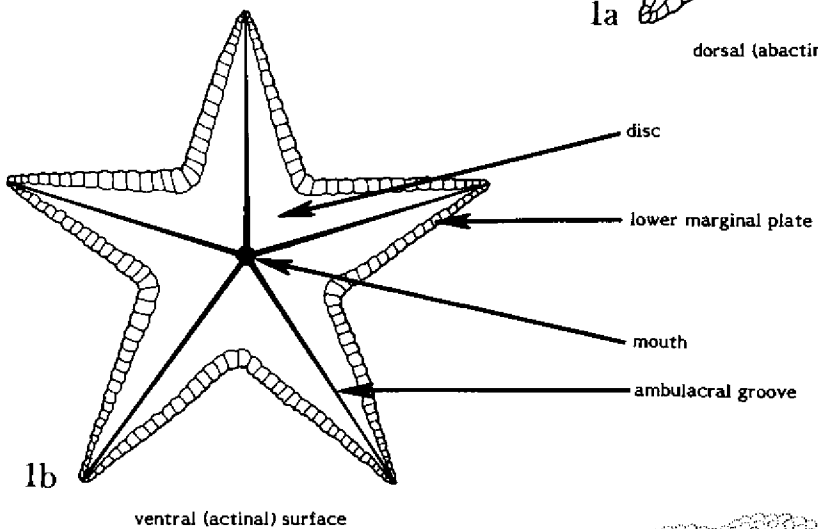
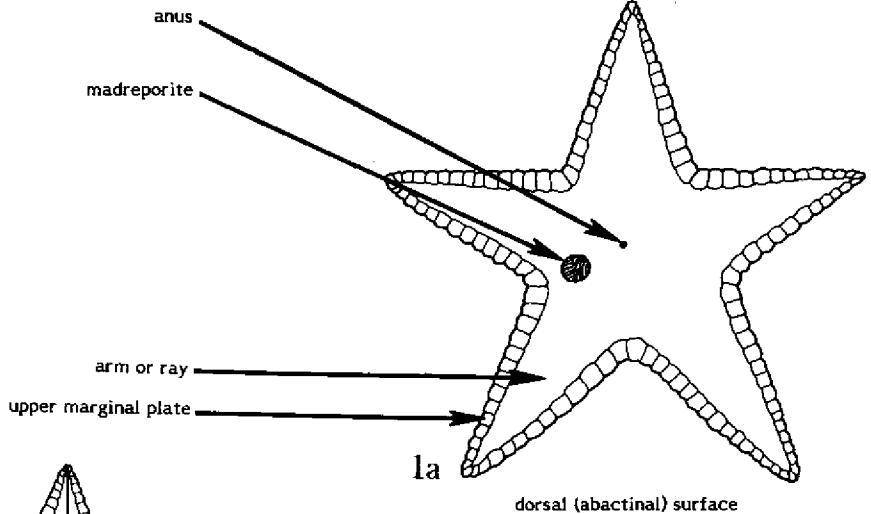
denuded coral heads become overgrown with algae and most of the reef-dwelling fish leave the area. As Cheser pointed out, the long term implications of reef destruction include the demise of local fisheries as well as eventual island erosion in the absence of protective reef systems.

The frequent harvest of huge numbers of starfish by oyster fishermen stimulated research into potential uses of the animals. In the past, they have been used as fertilizer and, when processed, as supplements to poultry feed (Nelson, 1964). More recently, new processing techniques have been developed permitting the manufacture of protein concentrates and defatted meals of sufficient quality to be competitive with fish meals as poultry feed additives (Lee, 1951). To date, however, an independent industry of this sort has proven economically unfeasible due to fluctuating availability of the raw material (Loosanoff, 1960). In any given area starfish abundance varies greatly from year to year (Galtsoff and Loosanoff, 1939). Until a sustainable harvest can be realized, establishment of such an industry remains unlikely.

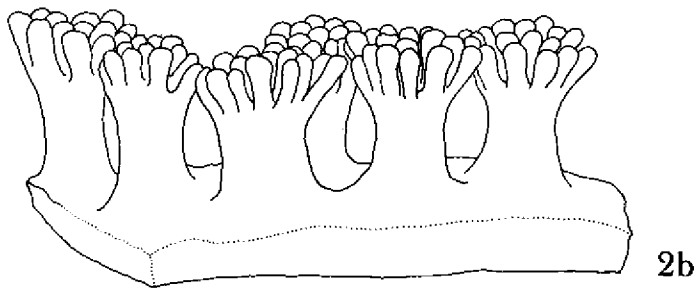
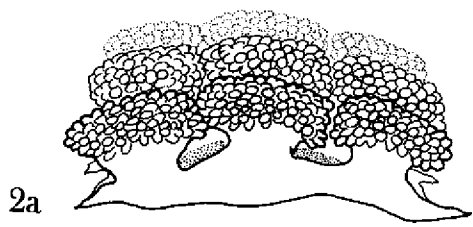
Another commercial use of starfish is the sale of preserved specimens to tourists as natural history curios and souvenirs. Marketed under a variety of common names, specimens are purchased by wholesalers in lots of 100 to 1000 from various localities around the world. Florida wholesalers pay from three to fifty dollars per 100 specimens depending on the size, condition, and type of starfish. Retail prices are generally marked up 100% for all specimens. Highest prices are commanded by large specimens of the Cushion Star, Oreaster reticulatus. The supply of this species comes mainly from the Bahama Islands, where fishermen receive 25 cents to 50 cents per animal from wholesalers in the United States. Retail prices in Florida, for example, average \$1.50 wholesale and \$3.00 to \$5.00 retail. Smaller starfish are marketed at the retail level from 5 cents to \$1.00 depending mostly on the specimen's size.

## Key to Identification

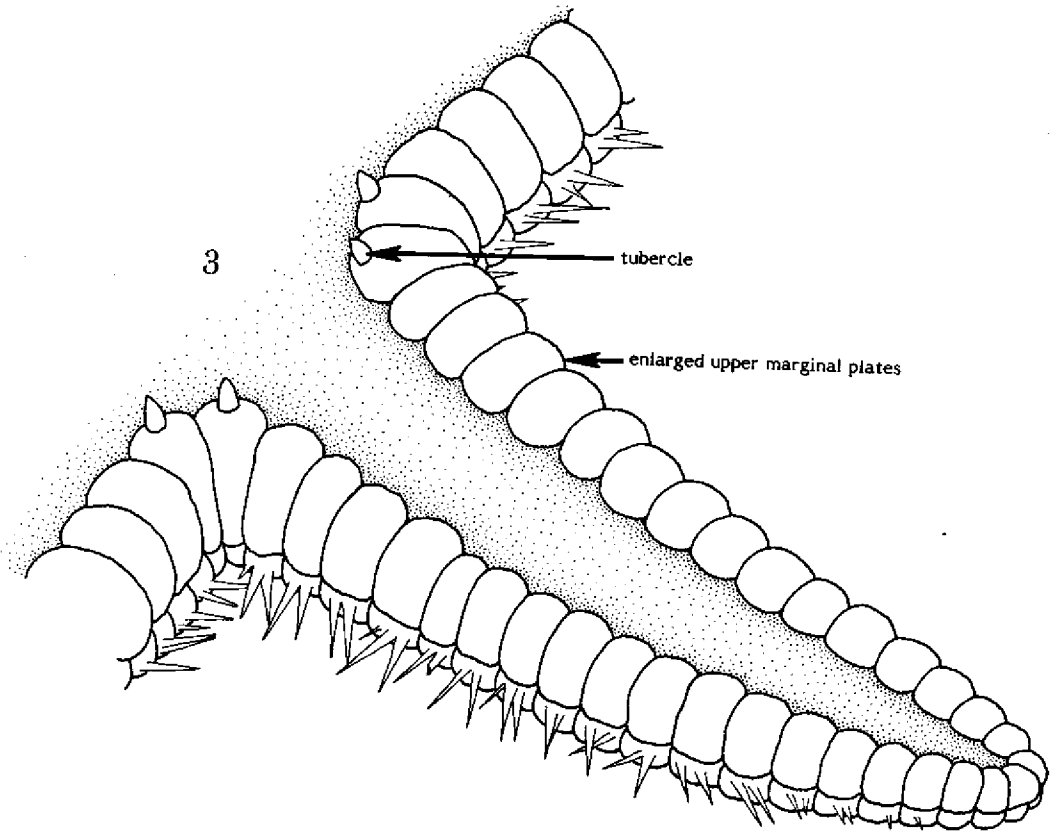
1. Upper surface of disc and arms with many close-set, stalked projections (paxillae) (Key Fig. 2a, b) . . . . . ( 2)
1. No stalked projections (paxillae) on upper surface . . . . . ( 6)
2. Upper marginal plates (Key Fig. 3) very large producing a prominent border at the edges of the arms . . . . . ( 3)
2. Upper marginal plates are not present . . . . . ( 4)
3. A large spine or tubercle present on each of the two upper marginal plates located between adjacent arms (Key Fig. 4) . . . . . Astropecten duplicatus p. 16
3. No spine or tubercle present as described above . . . . . Astropecten articulatus p. 14
4. Nine arms present (rarely eight) . . . . . Luidia senegalensis p. 22
4. Five arms present . . . . . ( 5)
5. Upper arm surface comparatively smooth and granular appearance; stalked projections closely packed in regular rows . . . . . Luidia clathrata p. 18
5. Upper surface appears shaggy or spinous; stalked projections irregularly spaced and often with the central spine enlarged (Key Fig. 5) . . . . . Luidia alternata p. 20
6. Disc large; arms short and wide; star-like or pentagonal in appearance . . . . . ( 7)
6. Disc small; arms long and almost cylindrical . . . . . ( 8)



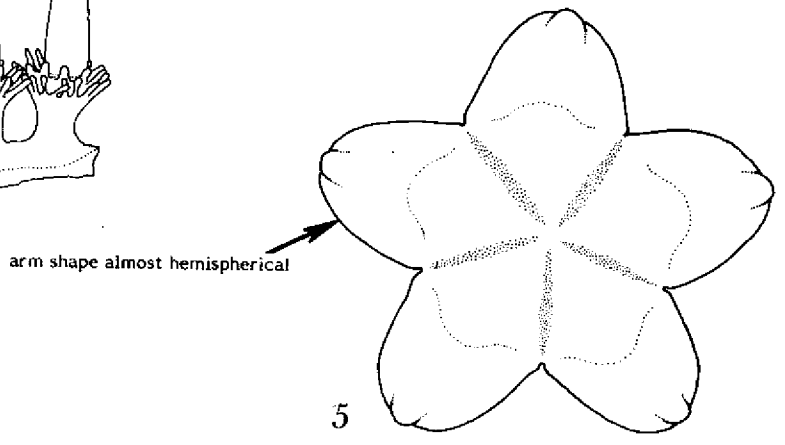
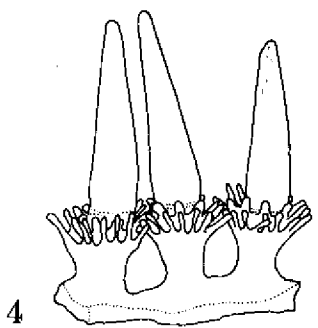
Key Figures 1a, b; 2a, b



- 7. Disc and arms very thick, animal reaching large size; upper surface with many blunt tubercles . . . . . Oreaster reticulatus p. 24
- 7. Disc and arms flattened, animal size small; arms almost hemispherical (Key Fig. 6). . . . . Asterina folium p. 30
- 8. Upper surface of arms granular, no spines . . . . . ( 9)
- 8. Upper surface of arms not granular, conspicuous spines on upper surface of disc and arms . . . . . (10)
- 9. Plates and porous areas of upper arm surfaces in regular longitudinal rows. . . . . Ophidiaster guildingii p. 26
- 9. Plates and porous areas arranged irregularly on upper arms . . . . . Linckia guildingii p. 28
- 10. Arms relatively short and blunt; few but large spines above; color brownish-red . . . . . Echinaster sentus p. 32
- 10. Arms long and tapering; numerous small, sharp spines; color bright red . . . . . Echinaster echinophorus p. 34



Key Figures 3 - 5



Astropecten articulatus (Say)

Say's Astropecten, Margined star, Royal sea star

Recognition Features.--Central disc somewhat thick with five moderately stout arms bordered by a prominent row of marginal plates. Upper marginal plates covered with densely packed granulations and sometimes with a single small spine on the plates of the outer half of the arms. Lower marginal plates with two short, flattened spines, side by side, often with a third minute spine adjacent to the other two and toward the disc. Grooves on the underside of the arms in series of three. Upper surface between marginal plates covered with minute stalked projections, each bearing a central spine surrounded by six to eight smaller spines. These projections are densely packed and are arranged in transverse rows except on the disc and in the midregions of the arms. Color of marginal plates white to orange, central areas of arms and the disc are blue or purple.

Size.--This species attains a diameter of about eight inches (20 cm). Greatest arm length measured from the center of the disc to arm tip may be four inches (10 cm). Most specimens, however, are somewhat smaller.

Comparisons.--Because smaller specimens of A. articulatus often lack spines on the upper marginal plates of the outer arm, this animal may be confused with another species, A. cingulatus Sladen. Because of the variability of the characteristics within this group of animals, some scientists (Clark, 1933) have considered A. cingulatus a variant of A. articulatus. Other workers (Downey, 1973) consider both species to be valid.

Geographic Range.--The species extends from Chesapeake Bay to Colombia, including the Gulf of Mexico.

Habitat and Depth Range.--A. articulatus is commonly found on sandy bottom near the outer edge of the Continental Shelf. It lives at depths from the low tide mark to 600 feet (185 m). Greatest abundance occurs between 59 feet (18 m) and 328 feet (100 m). It both scavenges and actively preys upon other small, bottom-dwelling animals, especially gastropod mollusks.

Spawning.--Unknown.

Other Names.--Asterias articulatus Say, 1825; Astropecten articulatus duplicatus Roa, 1967.

References.--Downey, 1973: 28, pl. 4c, d; Voss, 1976; Zeiller, 1974: 102 (color photograph).

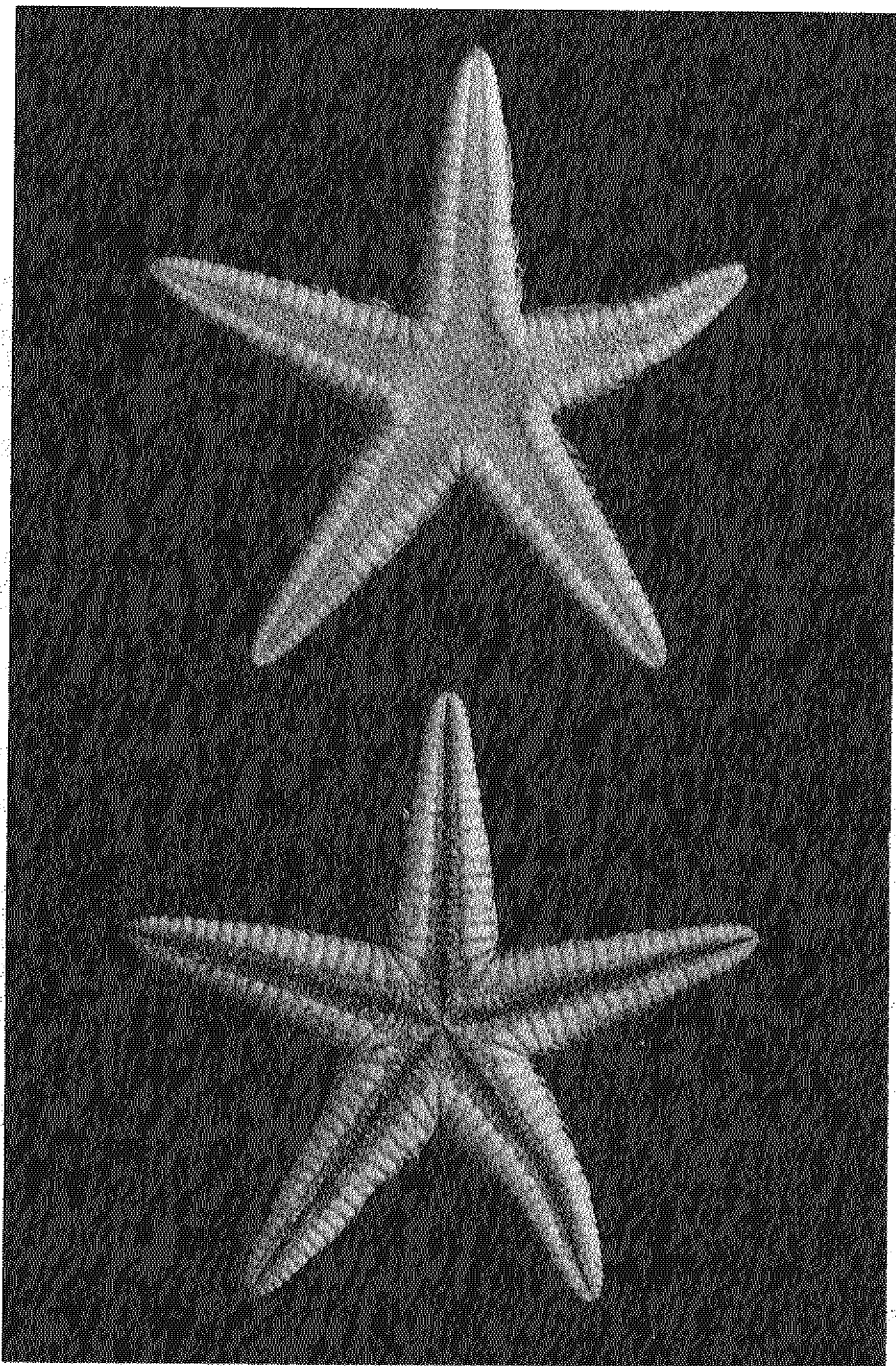


Figure 1: Say's Astropecten



Astropecten duplicatus (Gray)

Two-spined margined star

Recognition Features.--This species has a relatively small central disc bearing five arms each tapering regularly to the tips. Bordering the arms is a prominent double (upper and lower) row of marginal plates. The upper marginal plates are higher than wide and extend above the central area of the arms and discs. The central portion of each upper marginal plate is covered with small, rounded granules, while the sides show numerous small spines. The central pair of upper marginal plates in the area between the arms are slightly enlarged and bear a stout spine on the inner edge of the upper surface. The upper marginals of the arms bear a similar, but smaller spine on the outer edge of the upper surface. Lower marginal plates extend beyond those above and carry a single, large, flattened spine accompanied by a second smaller spine. The lower surface of these plates bear many closely set spines. On the upper surface of the arms the central area between the marginal plates is covered with regular transverse rows of stalked projections. Under magnification, these projections are seen to carry 15-25 minute, club-shaped spines. Color in life is reddish-brown to gray.

Size.--Large, adult specimens may reach eight inches (20 cm) in diameter. Generally, adults have arm lengths from three to four inches (7.5 to 10 cm). Arm width (measured across the base of the arms) of a specimen this size is usually less than one inch (2.5 cm).

Comparisons.--A. duplicatus displays considerable variation in specific characteristics. As a result, it can be easily confused with other variable species of Astropecten, such as A. articulatus. More specifically, the enlarged pair of marginal plates (and spines) between the arms is a character shared by another species, A. antillensis Lütken. A. antillensis is not included in this guide as it is not a very common species.

Geographic Range.--This species is common throughout the Gulf of Mexico and the Caribbean Sea. Its range extends northwards to Cape Hatteras, North Carolina.

Habitat and Depth Range.--A. duplicatus prefers sandy bottom and occurring from shallow water to depths over 1800 feet (550 m). Greatest abundance occurs between 18 and 60 feet (5-20 m).

Spawning.--Unknown.

Other Names.--Astropecten variabilis Lütken, 1859; Astropecten articulatus duplicatus Roa, 1967.

References.--Downey, 1973: 29; Voss, 1976: 125; Zeiller, 1974: 102 (color photograph).

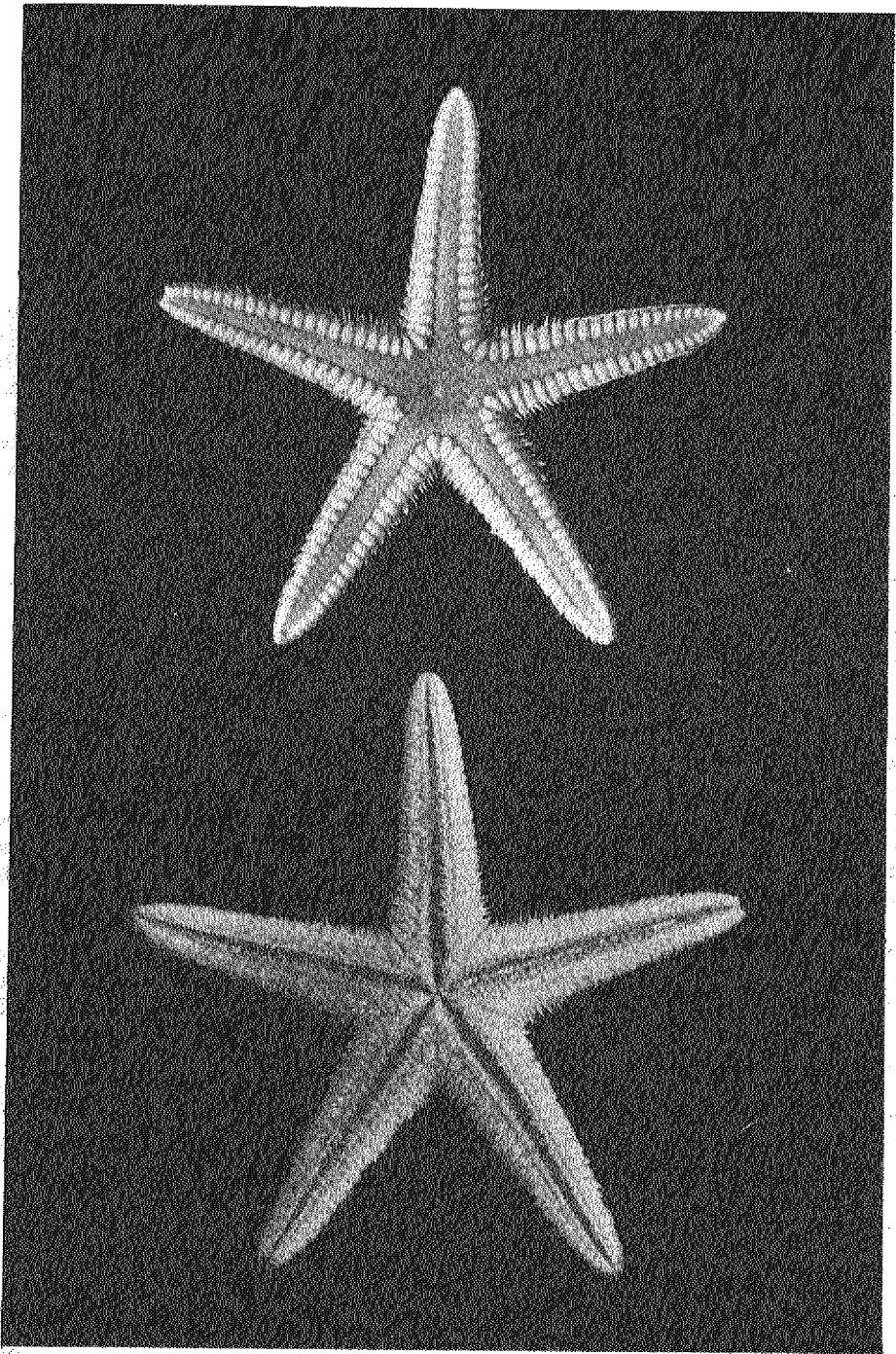


Figure 2: Two-spined Marginated Star

Luidia clathrata (Say)

Striped star, Lined sea star

Recognition Features.--This species has a small central disc bearing five long, straplike arms. The skeleton (the system of hard plates comprising the structural elements of the starfish body) is compact. The upper surface of the disc and arms is covered with small stalked projections or paxillae. These are arranged in regular transverse and longitudinal rows except on the central areas of the disc and arms. Each projection is square, granulated in the center with a surrounding, peripheral ring of small spines. Upper marginal plates are absent. The lower marginal plates bear one or two small spines below which is a single, longer, flattened and curved marginal spine. Just below this, is a covering of even smaller spines. Variation in these characters does occur, especially in regard to the number of marginal spines on the lower plate. Coloration of this species is highly variable. Specimens have been collected that range from rose colored to bluish-gray or gray. Gray forms appear to be most common, often with a darker stripe down the center of each arm.

Size.--Adult L. clathrata are known to reach 9 to 10 inches (22.5-25 cm) in diameter. Arm lengths of such specimens vary between 4 and 6 inches (10-14.5 cm).

Comparisons.--Members of this family are easily distinguished from other shallow water starfish. The long, straplike arms and absence of upper marginals are clear indications of the group. Although displaying variable characters, the several species of Luidia are also readily discernable.

Geographic Range.--This species is known to occur along the eastern coast of the Americas from New Jersey southward to Brazil including the Gulf of Mexico and Caribbean.

Habitat and Depth Range.--L. clathrata is commonly found in areas with sand or sandy mud bottoms. It generally conceals itself just below the surface of the sand where it preys on foraminifera, small mollusks, and echinoderms. Depth distribution is from shallow water to 300 feet (91 m), most commonly from water shallower than 120 feet (37 m).

Spawning.--Unknown.

Other Names.--Asterias clathrata Say, 1825.

References.--Downey, 1973: 22; Voss, 1976: 126-127; Zeiller, 1974: 103 (color photograph).

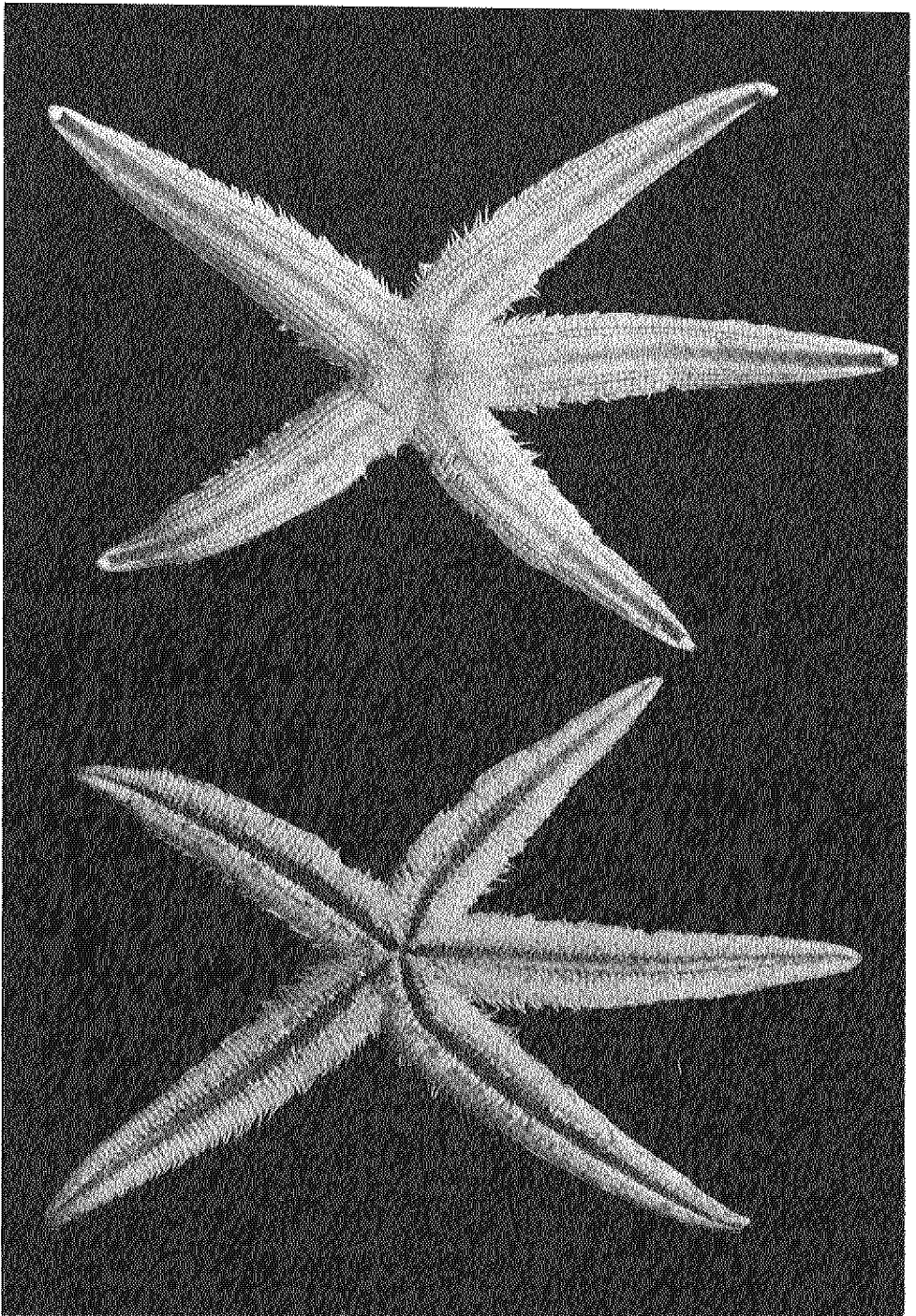


Figure 3: Striped Star

Luidia alternata (Say)

Weak sea star, Banded star, Banded Luidia

Recognition Features.--This species has five arms like L. clathrata, but the skeleton is not compact. The paxillae are not packed closely together. They occur in regular rows along the edges of the arms and become irregularly distributed at the center of the arms and disc. Most of these projections bear one to eight very small, club-shaped spines centrally, surrounded by many other smaller spines. The rows of stalked projections near the edges of the arms often bear a strong, pointed spine giving the appearance that the sides of the arms are higher or thicker. Upper marginal plates are absent. Lower marginals bear two to three long, pointed marginal spines and two to five shorter, slightly flattened spines. The plates lining either side of the ambulacral groove bear a long, flattened, curved spine, as well as two or three long, unflattened spines. The color of the underside of this species is yellow. The upper surface is blotched or banded with off-white and black-brown. This varies to markings of yellow blotched with green, purple or blackish.

Size.--L. alternata is known to reach 13 inches (32.5 cm) in diameter. However, specimens measuring about 8 inches (20 cm) are more common. Arm lengths of about 5 inches (12-13 cm) are typical for most adults.

Comparisons.--Because of its unique coloration, this species is easily differentiated from L. clathrata. In addition, the presence of five arms distinguishes it from L. senegalensis (Lamarck). Confusion with other species of Luidia is unlikely, as these are either very rare or confined to deeper water.

Geographic Range.--This species is known to occur along the eastern coast of the United States from Cape Hatteras southward to the northern coast of South America. It has not been reported from the western Gulf of Mexico.

Habitat and Depth Range.--L. alternata is found from just below the low tide mark to depths of 600 feet (183 m). It lives on sand or mud bottoms and seems to prefer sheltered localities.

Spawning.--Unknown.

Other Names.--Asterias alternata Say, 1825.

References.--Downey, 1973: 23; Voss, 1976: 126-127; Zeiller, 1974: 103 (color photograph).

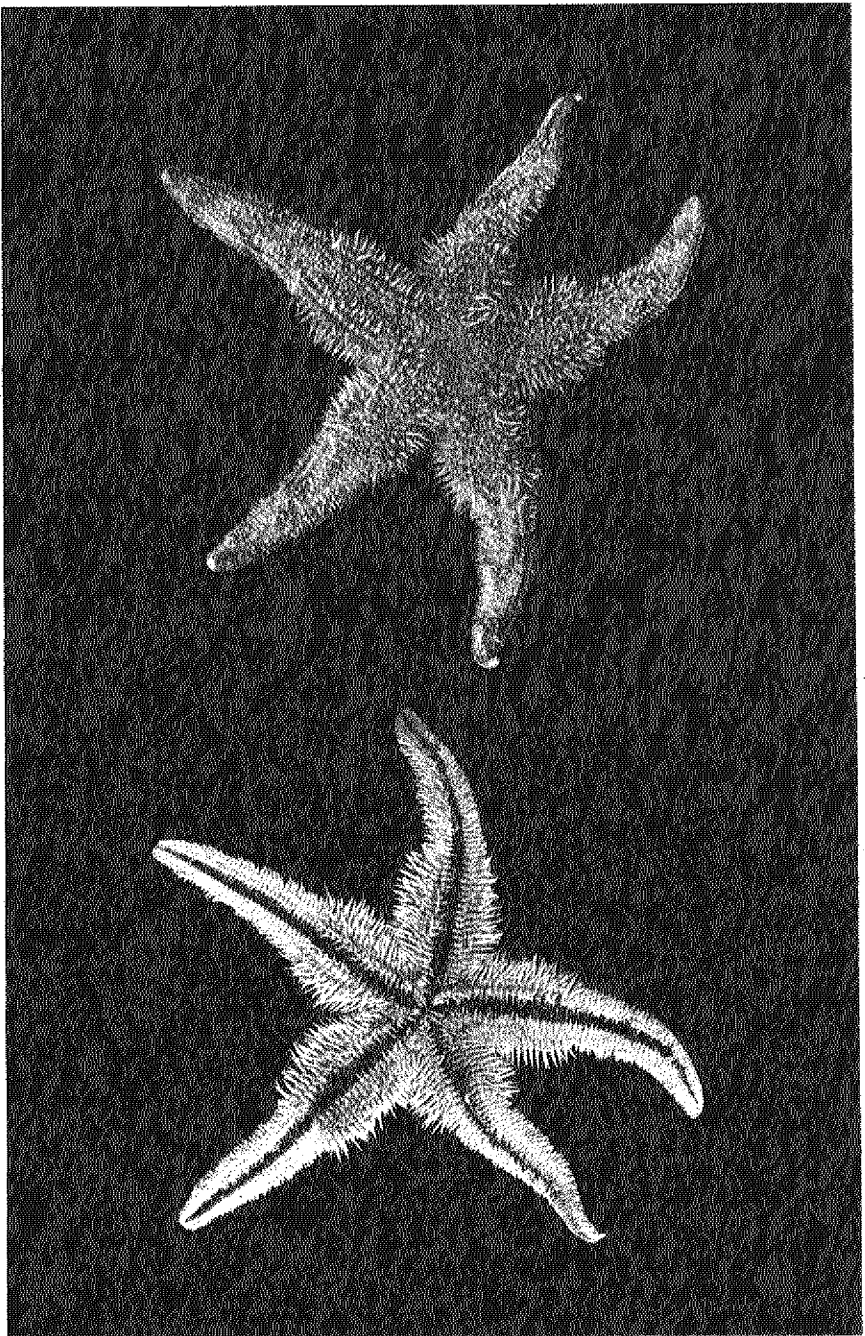


Figure 4: Weak Sea Star

Luidia senegalensis (Lamarck)

Nine-armed sea star

Recognition Features.--This species has a moderately large central disc and nine long, somewhat slender arms. The entire upper surface has a dense covering of paxillae. Along the sides of the arms these projections are square or rectangular and occur in regular transverse and longitudinal rows. The projections in the center of the arms and on the disc are much smaller and irregularly arranged. Small granules cover the upper, central surface of each projection. Each lower marginal plate bears one or two marginal spines. Between the arms, the lower marginal plates are elongated and reach the mouth. Color in life is a rather uniform bluish-gray or greenish-gray above with a lighter, beige underside.

Size.--L. senegalensis reaches considerable size. Arm lengths of adults often measure 5 to 6 inches (12.5-15 cm). Still larger specimens with arm lengths of 8 to 9 inches (21-21.5 cm) have been reported.

Comparisons.--This species is immediately recognizable because of the number of arms present. Although eight-armed individuals have been reported, nine arms is almost always the case. In either instance, L. senegalensis remains unique among the shallow water West Indian starfish.

Geographic Range.--This species has been collected from waters off Florida and throughout the Antilles to the northeast coast of South America, including Brazil. It is also known from the East Atlantic off Senegal.

Habitat and Depth Range.--L. senegalensis lives in areas with sand or sandy mud bottoms. Specimens have been collected from the shoreline to depths of approximately 150 feet (46 m).

Spawning.--Unknown.

Other Names.--Asterias senegalensis Lamarck, 1816; Luidia marcgrauii Lütken, 1859.

References.--Downey, 1973: 33; Voss, 1976: 126-127; Zeiller, 1974: 104 (color photograph).

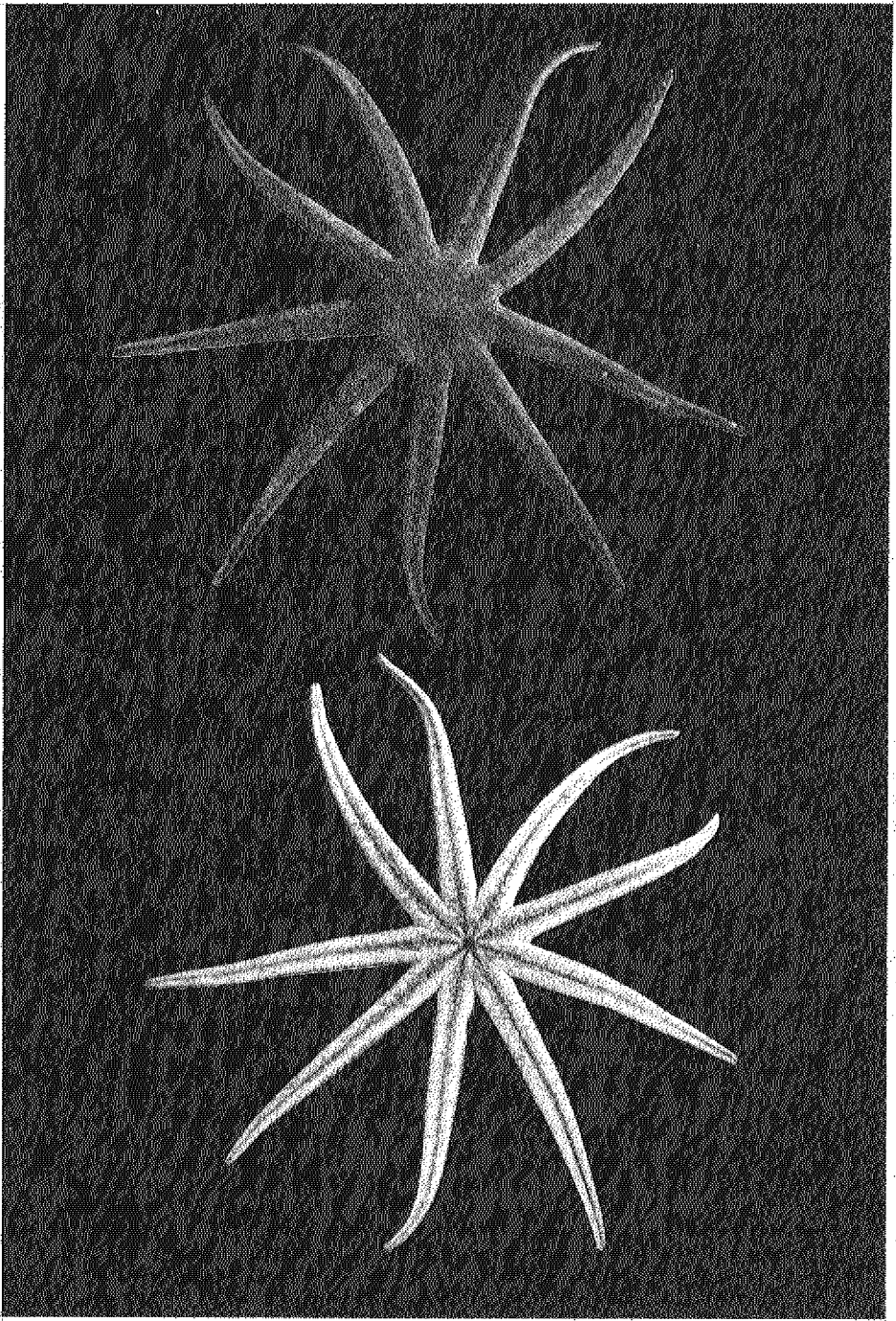


Figure 5: Nine-armed Sea Star



## Oreaster reticulatus (Linnaeus)

### Cushion star

Recognition Features.--This species is massive and heavy. The central disc is wide and inflated. Most specimens bear five arms, although others with four to seven arms have been collected. The arms are short and heavy tapering in width and thickness towards the tip. The arrangement of plates on the upper surface of the disc is distinctly circular. Both upper and lower surfaces are covered with very fine granules. The upper surface also bears many prominent tubercles or blunt spines. The lower edge of the arms carry a continuous row or fringe of closely-set, blunt spines. The underside is flattened and bears many blunt spines, smaller than those of the upper surface and arranged in somewhat regular transverse and longitudinal rows. Younger specimens are not as inflated as the adults and often appear to have relatively larger marginal plates. The color of this species varies with size. Small specimens are usually olive-green above and light beige below. With growth, the upper surface takes on a yellow- or reddish-brown shade. Still larger specimens are typically brownish or orange-red.

Size.--O. reticulatus is easily the heaviest species of West Indian starfish. It grows to a large size with arms reaching 8 to 9 inches (20-22.5 cm) in length. Specimens measuring over 19 inches (50 cm) in diameter have been recorded.

Comparisons.--This species shows considerable variation with respect to several characters. As indicated, color varies greatly. The overall configuration of the animal may also vary from star-shaped to more or less pentagonal. Lastly, the degree of inflation of the disc or height shows significant variability. Despite all this, O. reticulatus is easily identified by the casual observer.

Geographic Range.--This starfish is found from Cape Hatteras, North Carolina southward to Brazil, including the Dry Tortugas, the Florida Keys and the West Indies. The species is also represented in Bermuda and the Cape Verde Islands off western Africa.

Habitat and Depth Range.--O. reticulatus is restricted to shallow water. It is most often found in turtle grass beds (Thalassia testudinum) and is known to feed on sponges, algae and sea biscuits (Clypeaster).

Spawning.--Unknown.

Other names.--Asterias gigas Linnaeus, 1753; Asterias reticulatus Linnaeus, 1758; Oreaster gigas Verrill, 1867

References.--Downey, 1973: 60; Voss, 1976: 126-127; Zeiller, 1974: 104 (color photograph).

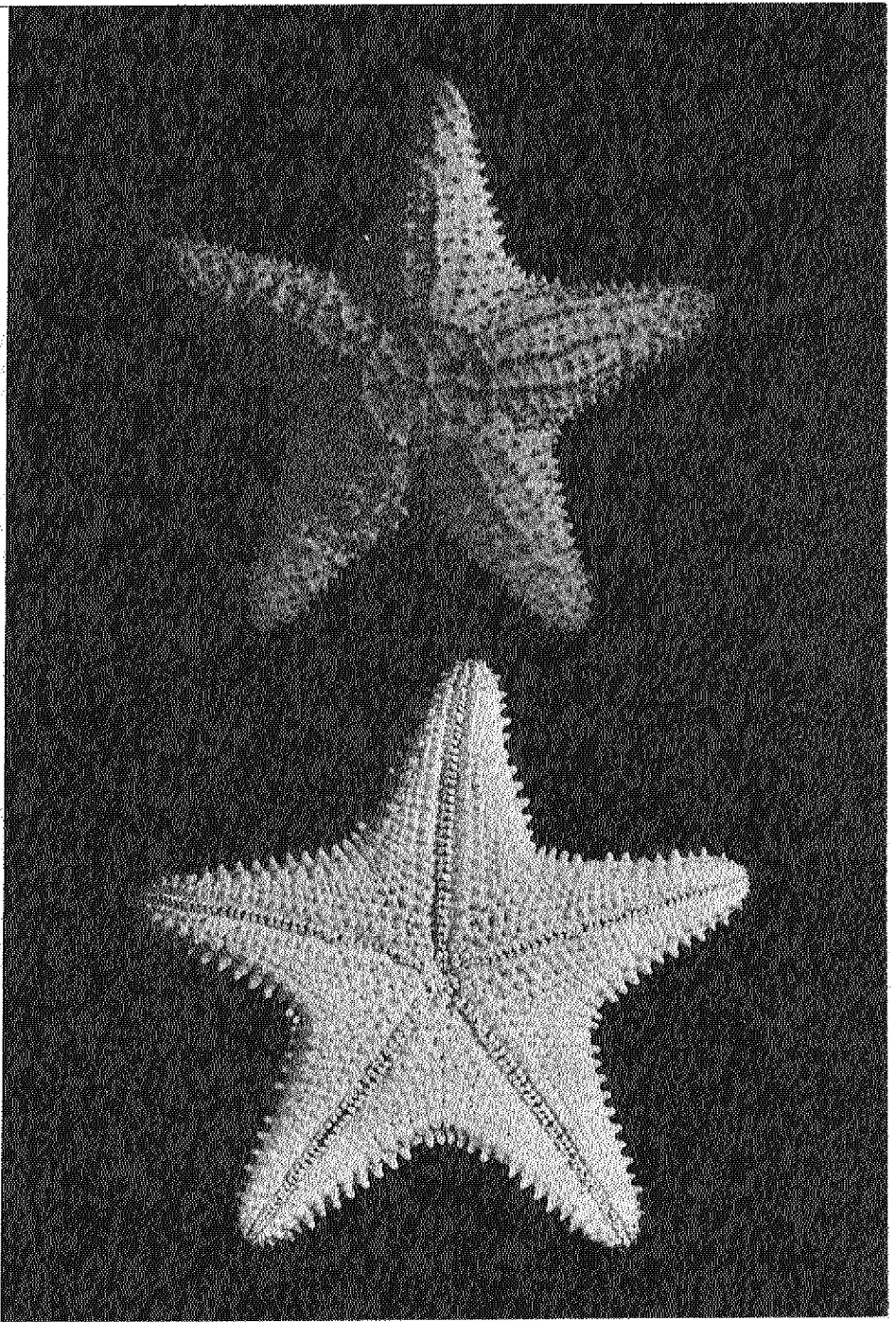


Figure 6: Cushion Star

Ophidiaster guildingii (Gray)

Guilding's star

Recognition Features.--O. guildingii has a small disc and five long arms. These are roughly cylindrical and narrow slightly at the base. The plates of the sides and upper surface of the arms are arranged in regular longitudinal rows and are covered with many small, rounded granules. Between the rows of plates, are eight longitudinal rows of porous areas. Each area is a cluster of five to twelve minute pores. The plates bordering the furrow on the undersides of the arms each bear a pair of closely set, flattened furrow spines. Collectively, these furrow spines appear as a fine fringe. Slightly farther away from the furrow is another row of larger, flat spines. A single large, round plate occurs at the tip of each arm. Coloration of this starfish is variable. Specimens range from dull shades of yellow to orange or brownish-red. Frequently, this background color is accompanied by blotches of a light shade or white.

Size.--This starfish is a comparatively small animal. Mature specimens usually have arms about 2 inches (5 cm) long, although somewhat larger examples have been collected.

Comparisons.--Its diminutive size and the longitudinal arrangement of plates and porous areas clearly distinguishes O. guildingii from other members of this family. Other species of the same genus, Ophidiaster, found in the West Indian region are confined to deeper water and therefore should not present any identification problems to the shallow water collector.

Geographic Range.--This starfish has been collected throughout the West Indies from the Dry Tortugas to Barbados. It apparently does not occur along the coastlines of the Gulf of Mexico or South America, as no specimens have been reported from those areas.

Habitat and Depth Range.--O. guildingii is strictly a shallow water form. It is most commonly found under rocks near the low tide mark.

Spawning.--Breeding occurs in April.

Other names.--Ophidiaster flaccidus Lütken, 1859.

References.--Downey, 1973: 68.

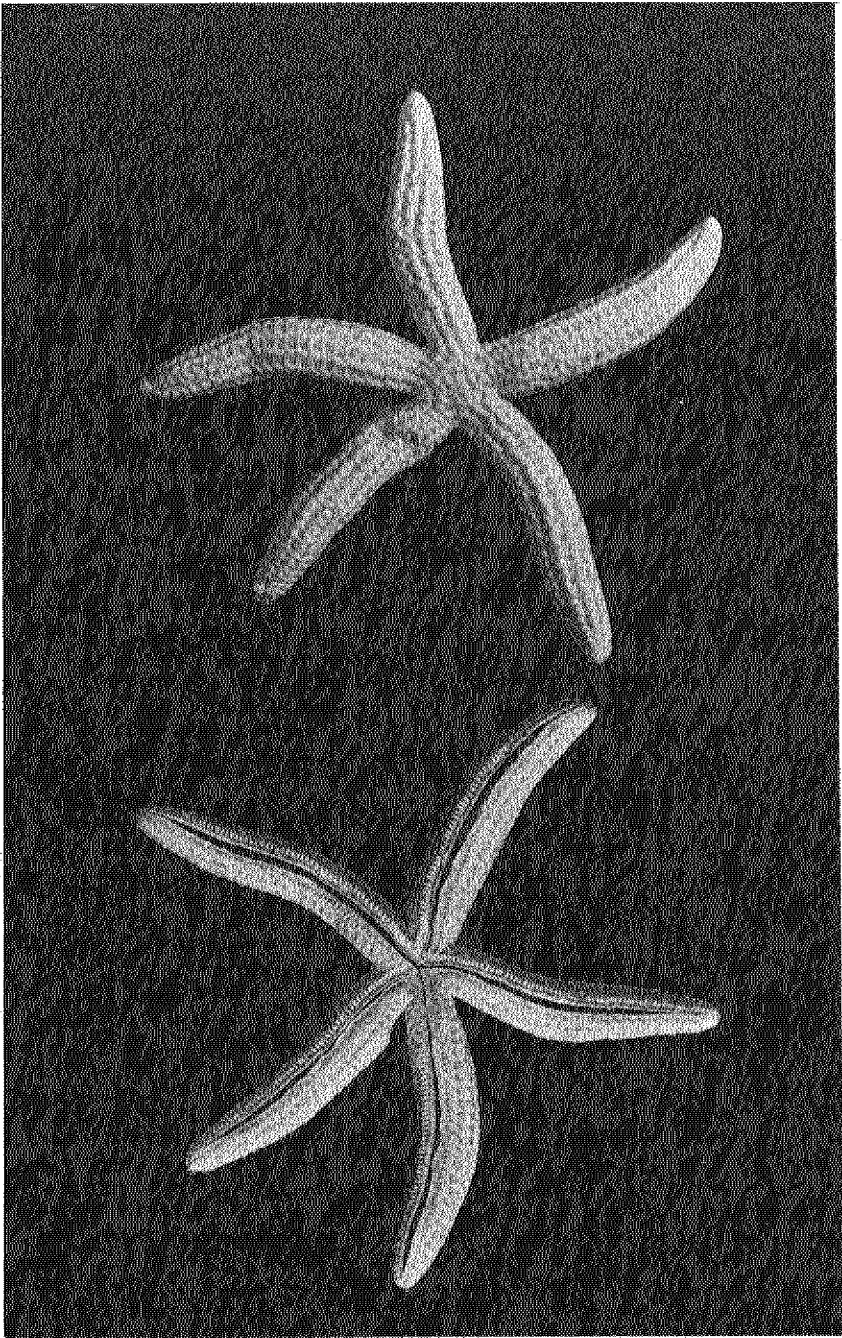


Figure 7: Guilding's Star

Linckia guildingii (Gray)

Common comet star

Recognition Features.--This starfish has a small disc. Normally, five arms are present, however, specimens may have two to seven arms. The upper arm surface and disc are covered with many small, irregularly arranged plates. Between plates are porous areas each composed of one to five pores in small specimens and up to forty in adults. Upper and lower marginal plates occur in regular longitudinal rows. The upper row is separated from the lower by a row of porous areas. All the plates mentioned bear a dense covering of very fine granules. The underside of the arms have two regular rows of smaller, closely-set plates on each side of the furrow. Of these, the plate nearest the furrow bears two very small spines. Between each pair of furrow spines is a third slightly larger spine. Because of their smaller size and the accompanying granulation, these spines are difficult to observe and appear as little more than a fine fringe. Small specimens of L. guildingii are usually a dull red, brown or purple with irregular patches of a lighter or darker shade. Adult specimens are a uniform reddish-brown, yellowish-brown or violet.

Size.--Adult arm lengths exceed 4 inches (10 cm). Arm lengths for a single specimen may vary considerably.

Comparisons.--Two other closely related species, L. nodosa Perrier and L. bouveri Perrier, occur in the West Indian area. Both of these, however, are found in deeper water. In addition, these two species consistently bear only five arms. Five-armed specimens of L. guildingii may be distinguished by the uniform size of the plates on the upper arms and disc. L. nodosa and L. bouveri have both small and enlarged plates on the upper surface.

Geographic Range.--Found throughout the tropical waters of the world with the exception of the eastern Pacific. In the western Atlantic, it has been collected from Bermuda, the Bahamas and Florida southward along Mexico to Brazil, including most Caribbean islands.

Habitat and Depth Range.--L. guildingii Gray lives in shallow waters. Although it occurs most commonly in coral reef areas, it has also been taken from areas with rocky and sandy bottom.

Spawning.--Information concerning the spawning time of this species is not available. Sexual reproduction is apparently reserved for fully grown adults. Younger specimens reproduce asexually by splitting apart with each fragment later regenerating a new disc and arms. This method of reproduction accounts for the unusual variation in number of arms and arm length. One-armed specimens or "comets" as they are referred to, are the result of a single arm splitting off.

Other Names.--Linckia nicobarica Lütken, 1871.

References.--Downey, 1973: 66; Voss, 1976: 128-129.

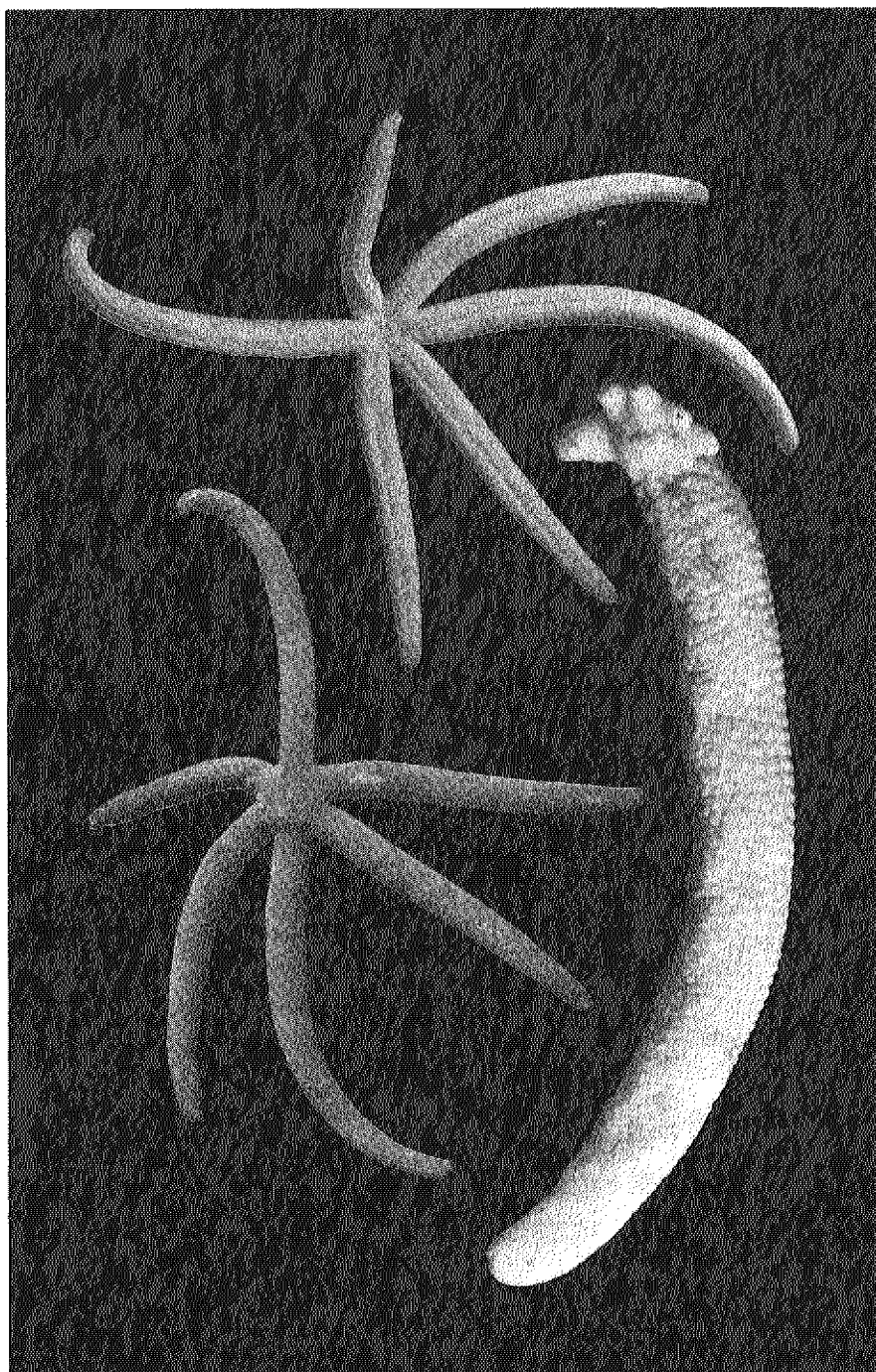


Figure 8: Common Comet Star

Asterina folium (Lütken)

Pentagon star

Recognition Features.--This species is quite flat with a relatively large disc bearing five short, blunt-tipped arms. The overall configuration of most specimens is nearly pentagonal becoming more stellate in larger examples. Four and six-armed specimens are known, but five is more often the case. The plates of the upper surface are overlapping and have a notch at one side within which appears a single pore. Collectively, these pores appear in six radial rows on each arm. The pores disappear between and at the margins of the arms. Some of the plates on the disc carry small, inconspicuous spines. The plates of the underside are close-set and bear three to five very small, slender spines, these being united at the base by a fine web. Coloration is variable. Small specimens are usually off-white. With growth, the color changes to yellow or yellowish-red. Adults are usually bluish-green or blue.

Size.--A. folium rarely exceeds 1 inch (2.5 cm) in diameter.

Comparisons.--Asterina minuta (Gray) is also known to occur in the West Indian area. Although very similar to A. folium, it may be differentiated on the basis of its smaller size and more uniform, white color. A. minuta (Gray) is also less pentagonal and bears only two to three spines on the plates bordering the furrow. Another similar starfish is Stegnaster wesseli Perrier. This species is larger than A. folium and is completely covered with a thick, granulated skin.

Geographic Range.--A. folium is known from Florida, Bermuda, the Bahamas and most of the Caribbean islands.

Habitat and Depth Range.--This species is found in shallow water often just below the low tide mark. It is secretive and prefers to hide by clinging to the underside of rocks or in any suitable crevice.

Spawning.--Unknown.

Other Names.--Astericus folium Lütken, 1859; Asterinides folium Verrill, 1913.

References.--Clark, 1933: 15, 26-27; Verrill, 1915: 58, Voss, 1976: 128-129.

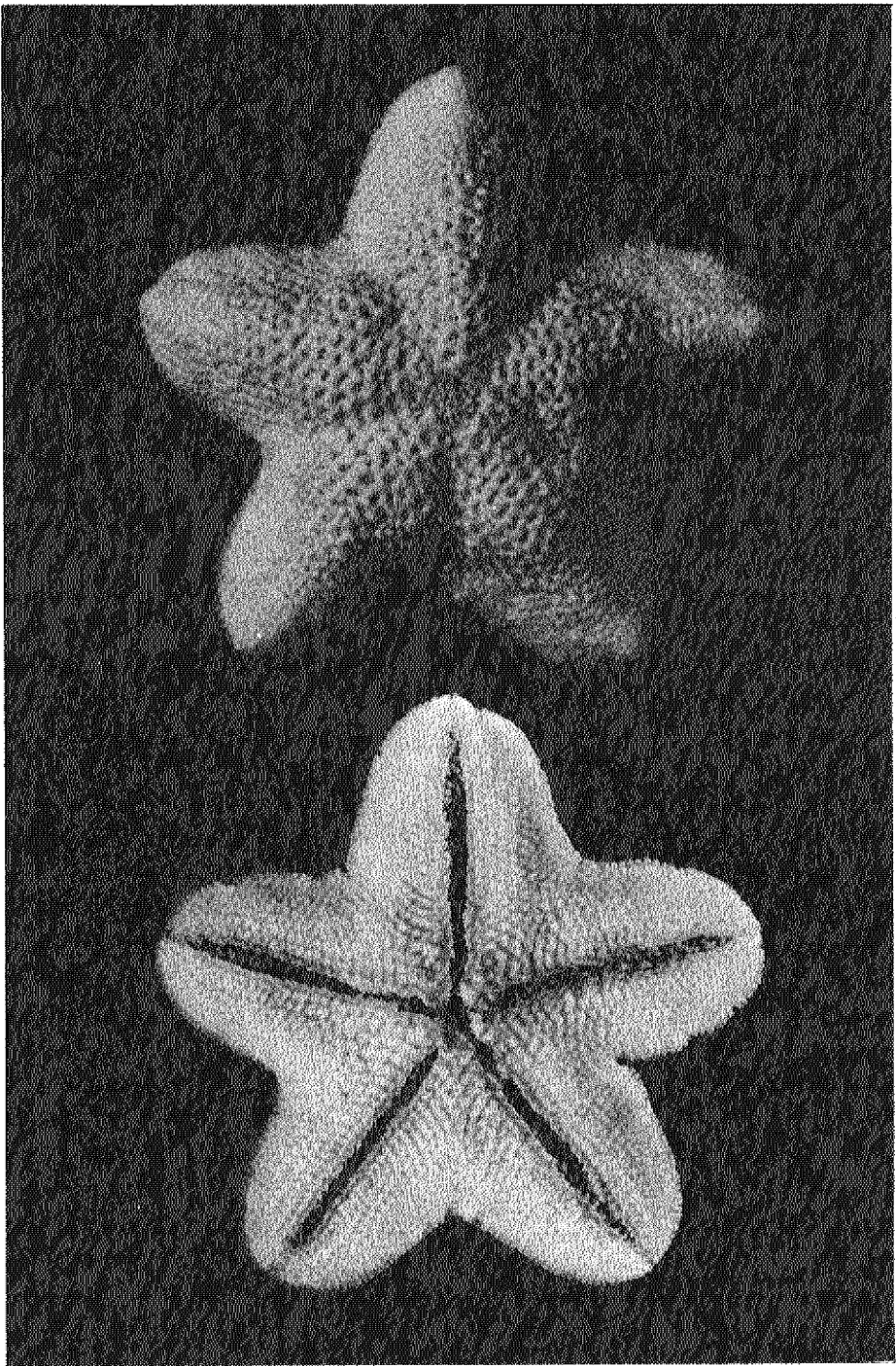


Figure 9: Pentagon Star



Echinaster sentus (Say)

Thorny starfish, Spiny sea star

Recognition Features.--This starfish has a small disc and five stumpy (short and blunt) arms. The skeleton is an open network of primary plates united by smaller secondaries interspersed with conspicuous, porous areas. The larger, primary plates often carry a heavy conical spine. The smaller, secondary plates, as well as some of the larger, each bear a small, flat patch of glassy projections or tubercles concealed by the outer skin. The plates lining the margins of the arm furrows each bear one or two small furrow spines. This longitudinal row of slender spines is united at the base by a shallow web. Each of the same plates also carry one or two larger spines located slightly farther away from the furrow. Adults are usually a dark brownish-red. Younger specimens are generally lighter in color.

Size.--Largest reported specimens with arms slightly over 3 inches (8 cm) in length.

Comparisons.--The several West Indian species of starfish belonging to this group present a rather confusing picture. Even authorities disagree concerning the number of valid species of Echinaster. A comparative examination of the group and the attendant problems is beyond the scope of this work. For detailed discussion the reader is referred to Downey, 1973.

Geographic Range.--This species is distributed from North Carolina to Brazil including many of the West Indian islands.

Habitat and Depth Range.--E. sentus is confined to shallow water. It has been reported from mud and sand bottoms in both mangrove and reef areas. Its diet consists of algae and soft sponges.

Spawning.--Unknown.

Other Names.--Asterias sentus Say, 1825.

References.--Downey, 1973: 87; Voss, 1976: 128-129; Zeiller, 1974: 105 (color photograph).

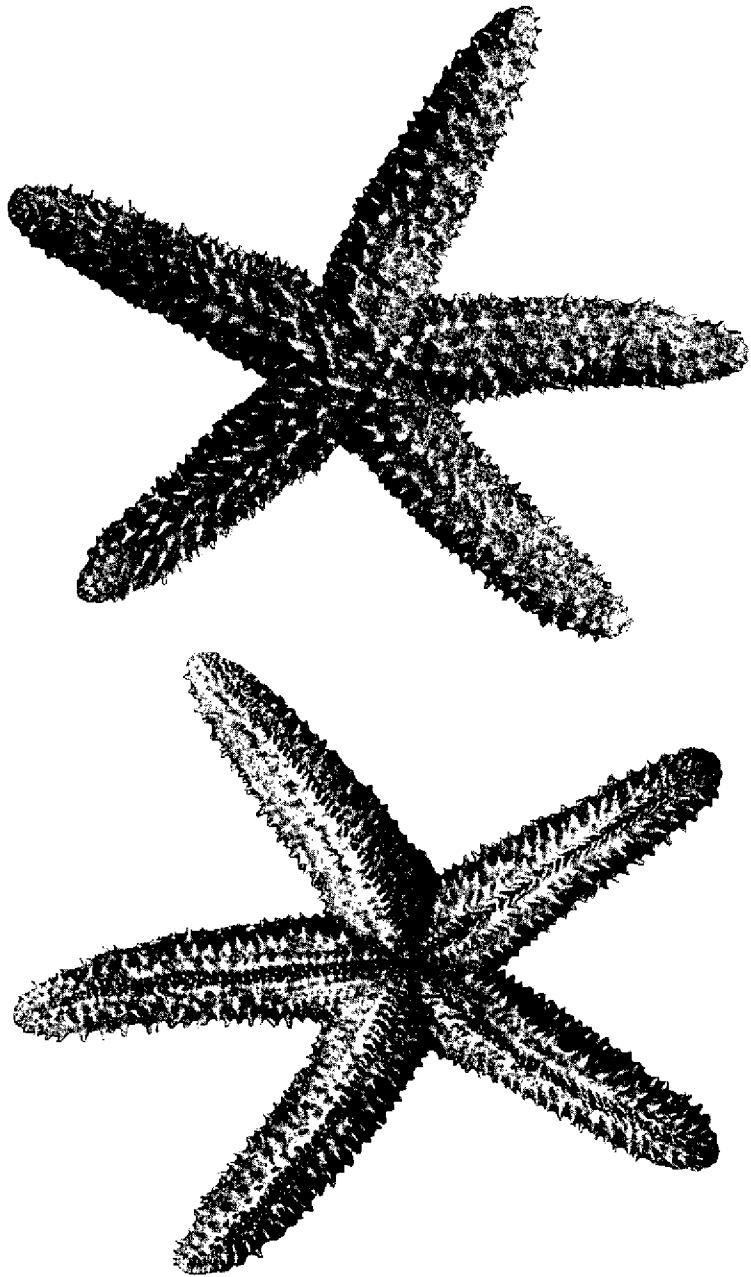


Figure 10: Thorny Starfish

Echinaster echinophorus (Lamarck)

Spiny starfish

Recognition Features.--This starfish has a small central disc and five short, blunt-tipped arms. Some of the plates of the upper surface carry a single large, movable spine. These plates are enlarged or swollen near the base of the spine. There are extensive porous areas between plates. Those plates not bearing a spine have a round patch of glassy projections or tubercles. The underside of the arms have fewer spines. Pores are also fewer in number and more widely spaced on the undersurface. The plates along the edges of the arm furrows each bear two spines, a small spine within the groove (furrow spine) and a slightly larger spine just outside the groove. Both series of spines are arranged in longitudinal rows. Live specimens of E. echinophorus are usually bright red.

Size.--Usually with arms less than 2 inches (5 cm) long, although larger specimens have been reported.

Comparisons.--E. sentus and E. echinophorus are very similar. They are most easily separated by examining the number of spines on the plates bordering the arm furrows. E. echinophorus bears a single spine within the furrow and one at the margin of each plate. E. sentus has three or four spines per plate, one or two within the furrow and one or two at the margin.

Geographic Range.--This species is found throughout the West Indies. It is also known from Yucatan southward to Brazil, where it is particularly abundant.

Habitat and Depth Range.--E. echinophorus inhabits shallow water and has been taken from reef areas and off rocky bottom.

Spawning.--Unknown.

Other Names.--Asterias echinophora Lamarck, 1816.

References.--Downey, 1973: 86; Voss, 1976: 128-129.

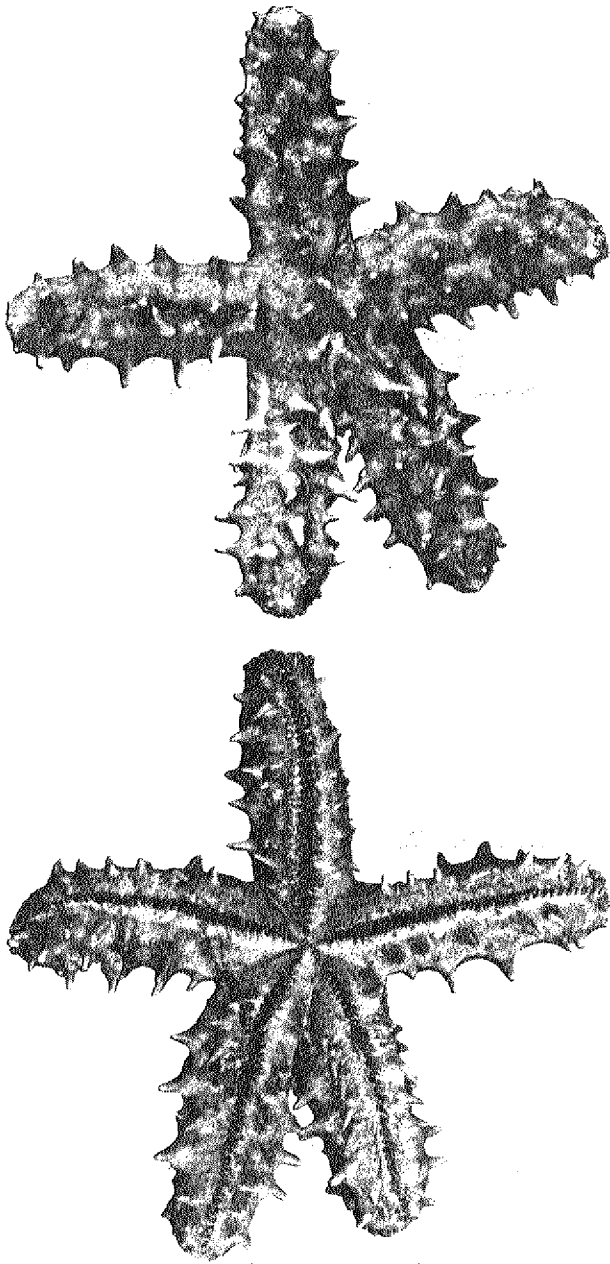


Figure 11: Spiny Starfish

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