

## PHYLUM ECHINODERMATA

Keys are provided for the common members of four classes of living echinoderms (the Crinoidea are not represented at Woods Hole). These classes may be recognized as such without difficulty, except in the case of the very worm-like synaptid holothurians. Keys revised with the help and advice of John M. Anderson. Figure references are to Plate 27.

I. Class Asteroidea  
(Sea stars or starfishes)

1. Arms bear prominent spines; tube feet in 4 rows . . . . . Asterias 2
1. Arms bear only numerous minute spines; tube feet in two rows . . . . . 3
2. Arms tend to be blunt and cylindrical; skeleton firm; jaws of major pedicellariae (on adambulacral spines) broad and blunt (fig. 1); colors usually dark, brown to greenish black; common . . . . . Asterias forbesi
2. Arms pointed and somewhat flattened; skeleton rather soft; usually a line of spines on upper surface of each arm; jaws of major pedicellariae tapering and pointed (fig. 2); colors lighter, yellowish to lavender; rare south of Cape . . . . . Asterias vulgaris
3. Five arms; usually crimson above, yellow below; small; more common north of Cape . . . . . Henricia sanguinolenta
3. Nine to eleven arms; up to 25 cm across; found north of the Cape . . . . . Solaster endeca

II. Class Ophiuroidea  
(Brittle stars, serpent stars)

1. Lateral spines on arms short . . . . . 2
1. Lateral spines on arms prominent . . . . . 3
2. Disc granulated, with no distinct scales; 2 pairs of slits leading into genital bursae at base of each arm (fig. 3) . . . . . Ophioderma brevispina
2. Disc covered with small scales; only one pair of slits leading into genital bursae at base of each arm (fig. 4); found only north of the Cape . . . . . Ophiura robusta
3. Three lateral arm spines on each joint (fig. 5); small, gray and white . . . . . Amphipholis squamata
3. Five or six lateral arm spines on each joint (fig. 6); color variable, often bright; arms often banded . . . . . Ophiopholis aculeata

III. Class Echinoidea  
(Sea urchins, sand dollars)

1. Flat and disc-like; very numerous minute spines . . . . . Echinarachnius parma
1. Globular, with prominent spines . . . . . 2
2. Color purplish, brownish, or blackish, spines long and stout; the common sea urchin about Woods Hole . . . . . Arbacia punctulata
2. Color greenish or yellowish; spines short, slender, and more numerous; much more common north of the Cape . . . . . Strongylocentrotus drobachiensis

IV. Class Holothuroidea  
(Sea cucumbers)

1. Body wall muscular and opaque; typical tube feet present; 10 branching tentacles surround mouth . . . . . 2
1. Body wall thin, transparent, showing 5 longitudinal ("radial") muscle strands; 12 pinnately branched tentacles about mouth; tube feet absent; worm-like in appearance, tending to adhere to fingers when handled . . . . . 4
2. Tube feet scattered over body, not confined to five adambulacral rows . . . . . Thyone briareus
2. Tube feet mostly in 5 rows . . . . . Cucumaria 3
3. Large (up to 30 cm); color some shade of brown; north of Cape . . . . . Cucumaria frondosa
3. Small (up to 6 cm); color grayish or pale; south of Cape . . . . . Cucumaria pulcherrima
4. Color whitish; tentacular digits 4-6 pairs plus terminal digit (variable); usually in sand (see note in check list) . . . . . Leptosynapta tenuis
4. Color pinkish; tentacular digits 2-4 pairs plus terminal digit (variable); usually in gravel or under stones (see note in check list) . . . . . Leptosynapta roseola

Note: the two synaptid species can be distinguished by the following internal characteristic: In the calcareous ring of L. tenuis each radial plate contains a hole for the passage of the radial nerve (fig. 7); in L. roseola these plates are not pierced but are notched anteriorly (fig. 8).

ANNOTATED LIST OF ECHINODERMS

I. Class Asteroidea

- Asterias austera Verrill, 1895. Found only offshore in deep water. Not in key.
- Asterias forbesi (Desor, 1848). "Common starfish" south of the Cape.
- Asterias tenera Stimpson, 1862. Not in key. This "slender armed starfish" occurs in deeper water (6-40 meters) both north and south of the Cape, but is not recorded from Vineyard Sound.
- Asterias vulgaris Verrill, 1866. "Northern starfish"; South of the Cape this species occurs only in deeper water.
- Henricia sanguinolenta (O. F. Müller, 1776). "Blood starfish", formerly known as Cribrella sanguinolenta. The large yolky eggs are brooded beneath the mother; development is direct, without a free larval stage.
- Solaster endeca (Retzius, 1783). Does not occur at Woods Hole; found north of the Cape.

II. Class Ophiuroidea

- Amphipholis (formerly Amphiura) squamata (Delle Chiaje, 1828). One of the commonest ophiuroids of the region, but small and inconspicuous; generally in gravel, stones, or shell. Development direct, in brood pouches of parent.
- Gorgonocephalus agassizi (Stimpson, 1853). Not in key. Remarkable for its dichotomously branching arms, the "basket star" or "spider" occurs in northern waters. Known to the tip of the Cape and Nantucket Shoals. It is occasionally brought into Woods Hole by fishermen.
- Ophioderma (formerly Ophiura) brevispina (Say, 1825). Very common in protected, grassy bays such as Lagoon Pond.

## Plate 27

## ECHINODERMATA

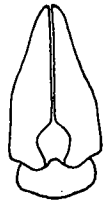
From specimens or redrawn from various sources, all by Bruce Shearer.

- Figure 1. Asterias forbesi, outline of a major pedicellaria, showing blunt form (after Coe).
2. Asterias vulgaris, outline of major pedicellaria, showing more elongated form (after Coe).
  3. Ophioderma brevispina, underside of junction of arm with disc, to show the two pairs of openings of the genital bursae.
  4. Ophiura robusta, underside of junction of arm with disc, showing one pair of openings of genital bursae (after Clark).
  5. Amphipholis squamata, lateral view of a portion of an arm, to show the three lateral arm spines per joint.
  6. Ophiopholis aculeata, lateral view of a portion of an arm, showing six lateral arm spines per joint.
  7. Leptosynapta tenuis, radial and interradial pieces of calcareous ring, the radial pierced for the passage of the radial nerve (after Heding).
  8. Leptosynapta (Epitomapta) roseola, radial and interradial pieces of the calcareous ring, the radial notched anteriorly (after Heding).

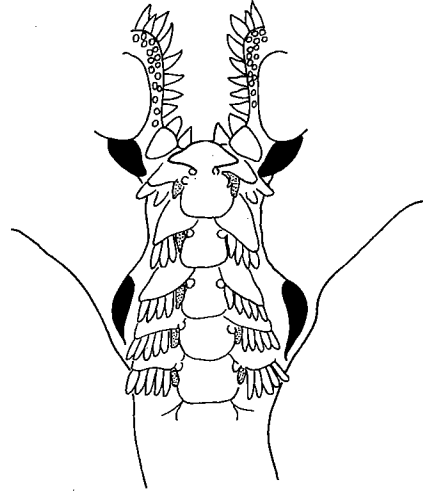
Plate 27



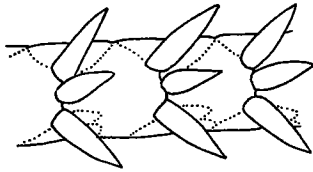
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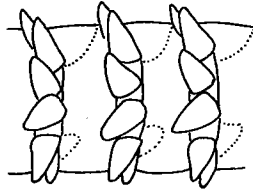
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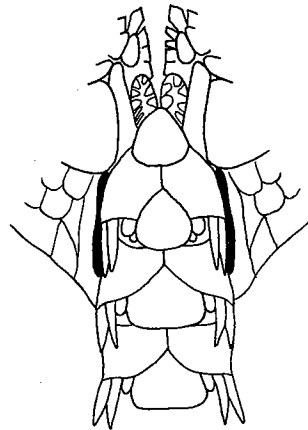
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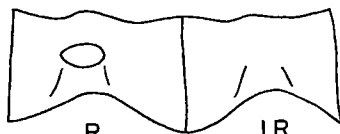
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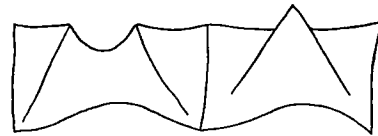
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Ophiopholis aculeata (Linnaeus, 1767). Uncommon; the "daisy brittle star"; may be found in exposed rocky areas, as at Cuttyhunk.

Ophiura robusta (Ayres, 1851). Found only north of the Cape.

### III. Class Echinoidea

Arbacia punctulata (Lamarck, 1816). "Purple" or "common sea urchin". One of the best known sources of embryological material.

Echinarachnius parma (Lamarck, 1816). "Sand dollar"; taken by dredging on sandy bottom.

Strongylocentrotus drobachiensis (O. F. Müller, 1776. "Green sea urchin"; taken rather rarely in Vineyard Sound, but is the common (and only) urchin north of the Cape.

### IV. Class Holothuroidea

Caudina arenata (Gould, 1841). Not in key. This apodous (tube-foot-less) holothurian much resembles a smooth skinned sipunculid with one end drawn out into a sort of tail. It is common in sand north of Boston and has been reported off Cuttyhunk.

Cucumaria frondosa (Gunnerus, 1770). This large sea cucumber may be expected only north of the Cape.

Cucumaria pulcherrima (Ayres, 1854). A small gray form; may occasionally be taken, or washed up in numbers, on Nobska and Stony Beaches after severe storms.

Leptosynapta (Epitomapta) roseola (Verrill, 1873). Heding (1928, p. 323) considers this form sufficiently distinct to be given subgeneric or even generic rank as Epitomapta roseola.

Leptosynapta inhaerens, see Leptosynapta tenuis.

Leptosynapta tenuis (Ayres, 1851). This species is almost always referred to at Woods Hole as L. inhaerens (O. F. Müller, 1738). But on the basis of a careful comparison, Heding (1928) concludes that the "L. inhaerens" of Woods Hole is not of the same species as the "L. inhaerens" of Europe and that the next available name, tenuis, should be used. The fact of this difference should be borne in mind if experimental results obtained on L. inhaerens in Europe and America are compared.

Thyone briareus (Lesueur, 1824). A well known experimental animal, collected in very soft mud in shallow bays.

Thyone scabra Verrill, 1873. Rare, dredged. Not in key.

Thyone unisemita (Stimpson, 1851). Rare, dredged. Not in key.

### REFERENCES

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- Coe, W. R., 1912. Echinoderms of Connecticut. Conn. State Geol. Nat. Hist. Survey, Bull. 19: 1-152.
- Deichmann, E., 1930. The holothurians of the western part of the Atlantic Ocean. Bull. Mus. Comp. Zool., Harvard, 71(3): 43-266, pl. 1-24.
- Heding, S. G., 1928. Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16, XLVI, Synaptidae. Vidensk. Medd. Dansk Naturhist. Foren., 85: 105-323.