Crinoids

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Crinoids

Crinoids are part of a large group of marine invertebrate animals called echinoderms. Other echinoderms are starfish, brittle stars, sand dollars, sea urchins, and sea cucumbers. All living echinoderms have what is called pentameral symmetry, which means their bodies are organized in patterns of five; for example, the five arms of the common starfish. Crinoids may have as few as five arms, but usually they have arms in multiples of five. All echinoderms also have calcite plates (ossicles) embedded in their skin, which form their skeleton. That is why living starfish feel scratchy when you touch them. The skeletons of fossil crinoids are very representative of what the animals looked like a-live because only the outer skin layer is missing.

Crinoids are unusual looking animals because they look more like plants than animals, hence the name “sea lilies” applied to some living crinoids. Superficially, the stem or column of a crinoid resembles the stalk of a flower, the calyx or head resembles the sepals of a flower, and the arms resemble the petals of a flower- (Figure 1). But that is where the similarity ends, because flowers are reproductive parts of photosynthesizing plants, while crinoids are animals that eat plankton from seawater. Crinoids have muscles, nerves, a gut, a reproductive system, and other features of advanced animals. Crinoids evolved a plant-like morphology so that they could remain attached to the seafloor while they spread their arms to catch food.

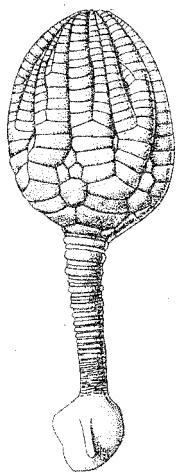

Figure 1. An example of a fossil crinoid, Calpiocrinus intermedius, from the Silurian (approx. 420 million years ago) of England.

Living and fossil crinoids

Many people who are aware of fossil crinoids think that crinoids are extinct. That’s not an unreasonable conclusion because crinoids are almost never found by beachcombers anywhere in the world. Where do crinoids live today? To answer that question we have to realize that there are two groups of living crinoids: those with columns, the living stalked crinoids, and those without columns, the comatulids (Figure 2).

Stalked crinoids today live only in the deep ocean, in quiet water below the lighted zone where it is too dark for predators to see them. Because they are attached to the seafloor and can’t- escape, they would be too vulnerable to predators in lighted shallow water. They live and die in such deep water that they are not washed onto beaches by - - waves. Living stalked crinoids were originally studied by dredging in deep water. Now they are also studied by scientists in deep-sea submersibles. During much of the Paleozoic Era (245—5 70 million years ago), stalked crinoids lived in shallow water where predators could see them. Apparently they were able to do this because

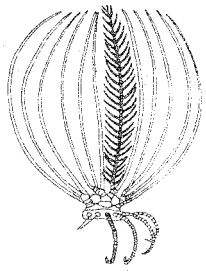

Figure 2. An example of a living stalkless crinoid, a comatulid.

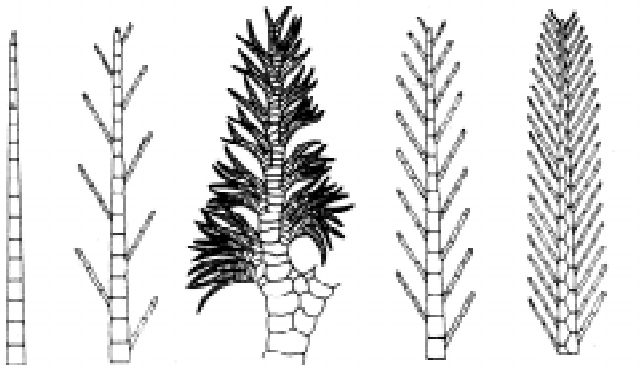

Figure 3. Examples of different kinds of crinoid arm branches ranging from simple to complex.

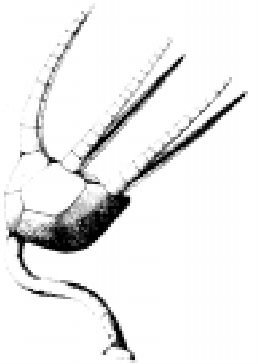

Figure 4. An example of a crinoid with simple arms and calyx, Hybocrinus bilatercilis, from the Ordovician (approx. 475 million years ago) of Tennessee.

Paleozoic predators were less efficient than modern predators (the bony fishes).

The comatulids evolved from stalked crinoids by losing their column during their larval development. They live today in shallow-water coral reefs in the Caribbean Sea and the South Pacific Ocean, as well as in cold Antarctic waters. They can crawl around on a reef, hiding in crevices during the day and climbing onto corals at night to feed. By only feeding at night, they make it harder for predators to find them. Because the comatulids live and die on reefs away from the shoreline, they are not found wa up on beaches by beachcombers.

Crinoids are common fossils from Paleozoic-age marine rocks, although none have been found in Cambrian rocks (505—5 70 million years ago). Crinoids were sometimes so diverse and abundant that beds of limestone hundreds of feet thick were formed. These covered thousands of square miles and were composed dominantly of crinoid plates. Crinoids were most diverse at this time because they were able to live in shallow water where plankton was abundant. Many different kinds of stalked crinoids were able to evolve by specializing on the kinds and sizes of plankton that they ate. Plankton is variable in size and includes a large range of different types of algae and microscopic animals. Crinoid arms were lined with tube feet (like the suckers of starfish) that could capture plankton. The size and arrangement of crinoid arm branches allowed different species of crinoids to special-ize on particular kinds of plankton (Figures 3—5).

Collecting fossil crinoids

As noted earlier, crinoids are common fossils. Com-pletely preserved crinoids are rare, however. This is because the plates of the skeleton fall apart when the muscles and ligaments rot after death. Well-preserved crinoids represent instances of rapid burial by sediment, such as during storms that stirred up the seafloor.

The most common and easily recognized parts of fossil crinoids are the columnals that make up the stem or stalk. Most columnals are round in outline, but they may be pentagonal (five-sided), elliptical or oval, or even square. The hole in the center of the columnal is called the axial canal. It is most commonly round but may also be pentagonal or star-shaped, or be multiple, with several separate canals. When the crinoid was alive, the axial canal contained a fluid-filled sac and nerve that extended the length of the stem. Columnal surfaces are common1 ridged. The ridges interlock and help hold adjacent columnals together. There was surely a wide range in flexibility of different stems.

In most crinoids each columnal is a single solid piece of the mineral calcite. But in some crinoids each columnal is divided into five pieces, like wedges of a pie (Figure 6).

Columnals may have small scars or stumps on their sides. These are indications of side branches called cirri. Cirri are most common at the root end of the stem farthest from the head. Cirri help anchor the stem onto the sea floor. A few crinoids have whorls of cirri spaced at intervals along the entire length of the stem.

Complete crinoids with the arms and stem preserved are rare and are prized by paleontologists for their scientificvalue and by collectors for their exquisite beauty. The complex mosaic of interlocking and con-nected plates is aesthetically pleasing to the eye. Among invertebrate fossils, crinoids rival trilobites and am-monoids in their interest to collectors.

The heads, or calyces, of crinoids are not too uncommon and can be found by careful searching of sedimentary rocks that contain crinoid columnals. The best way to

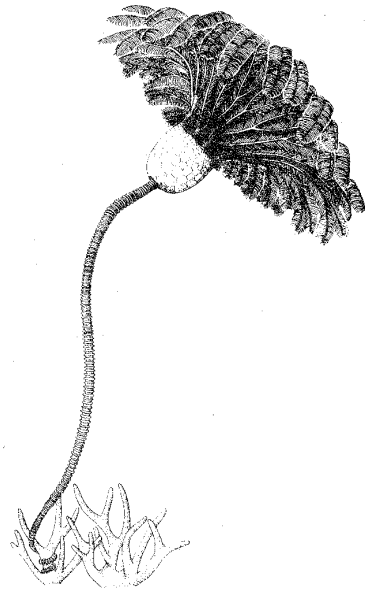

Figure 5. An example of a crinoid with complex arms and calyx, A rchaeocrinus snyderi, from the Ordovician (approx. 475 million years ago) of Tennessee.

find a crinoid head is to locate Paleozoic sedimentary rocks with obvious columnals. If columnals are not apparent, then it is unlikely that any heads will be found. Help in locating crinoid-bearing rocks can usually be obtained from university or college paleontologists, or paleontologists on the staffs of natural history museums and state geological surveys.

Suggested Reading

The following books may be available at your local library, and should be available at many college and university libraries.

Atlas as of Invertebrate Macrofossils, edited by J. W. Murray. Published by John Wiley and Sons. 1985.

The Audubon Society Field Guide to North American Fossils, by I. Thompson. Published by Alfred A. Knopf. 1982.

Fossil Invertebrates, edited by R. S. Boardman, A. H. Cheetham, and A. J. Rowell. Published by Blackwell Scientific Publications. 1987.

Fossils: A Guide to Prehistoric Life, by F. H. T. Rhodes, H. S. Zim, and P. R. Shaffer. Published by Golden Press. 1962.

Index Fossils of North America, by H. W. Shimer and R. R. Shrock. Published by the M.I.T. Press 1944.

Invertebrate Fossils, by R. C. Moore, C. G. Lalicker, and A. G. Fischer. Published by McGraw Hill Book Co. 1952.

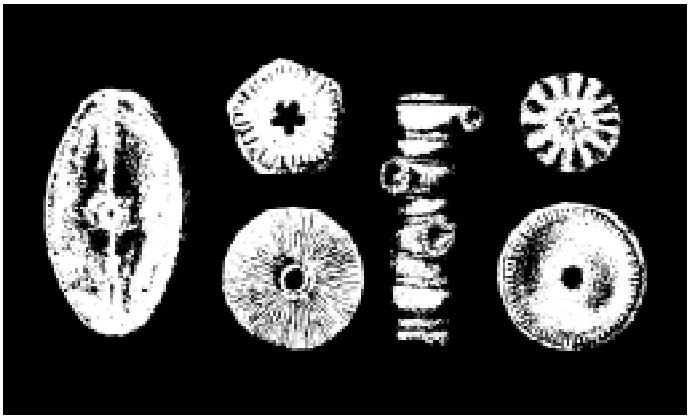

Figure 6. Examples of crinoid columnals.

Treatise on Invertebrate Paleontology, Part T, Echinodermata 2 (crinoids),édited by R. C. Moore and C. Teichert. Published by the Geological Society of America and the University of Kansas. 1978.

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