

CRINOIDS

By Garry K. Smith

Newcastle and Hunter Valley Speleological Society Inc. (NHVSS)

This article was first published in Newcaves Chronicles, July 1996, Vol 7, P33-35, then republished in "Australian Caver." Jan 199, No. 139, Pages 27-30. An official publication of the Australian Speleological Federation Inc.

Fossilised crinoid stems are found in many limestone caves throughout Australia. They are the remains of marine creatures which flourished predominantly throughout the Palaeozoic, era. They grew in diverse ocean habitats from shallow warm tropical water to cold deep water. These creatures were, anchored to the sea bed by a root-like structure. When they died their calcareous skeletons soon break into segments and fall to the bottom. Ocean currents of the Early Carboniferous period moved vast quantities of crinoid remains across the sea-bed to form large drifts which over time consolidated into limestone deposits.

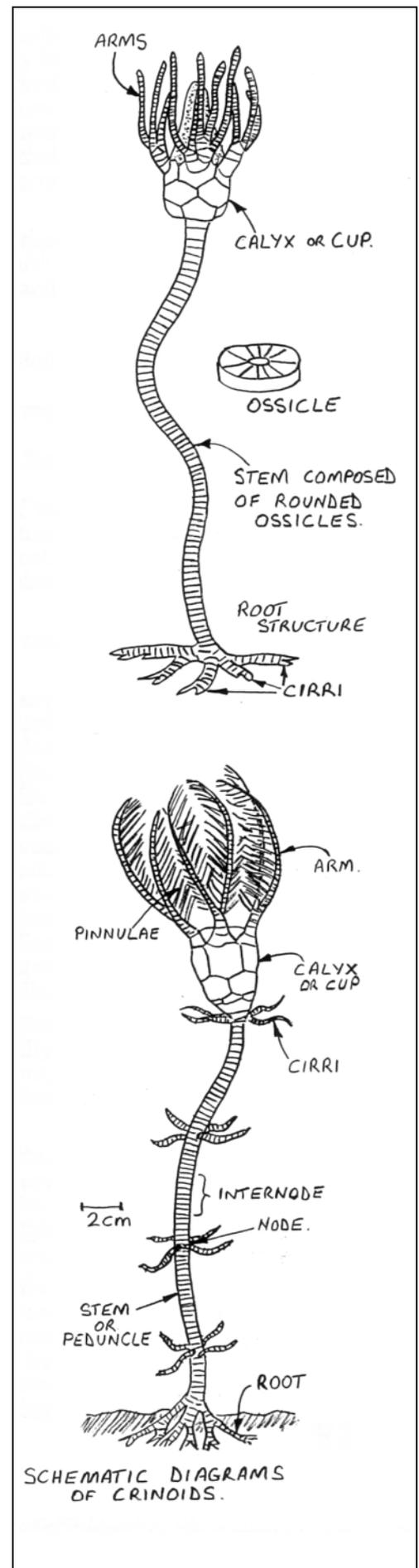
Crinoids, belong to the class of marine invertebrate called Crinoidea (phylum Echinodermata). Crinoidea meaning, "lily-shaped animals". A distinctive characteristic of echinoderms is their calcite skeleton and the symmetrical five-rayed structure of the adult body.

Crinoids consist of three main parts:-

- * **The calyx**, which is usually a cup-shaped body enclosing the vital organs.
- * **The arms**, of which there are five or more. They are used to convey the food particles to the mouth.
- * **The stem** (or peduncle) and roots (or cirri), which serve to fix the animal to the sea bed.

Crinoids are strictly marine animals which generally live attached to the bottom by a long peduncle, although some species are known that became free-moving as adults, having been fixed during development. These lack a peduncle, and carry on the lower part of the calyx a number of tendrils, which they can adhere to the solid ocean bottom.

Refer to the sketches at the side of the page as we look at the Crinoids in more detail.



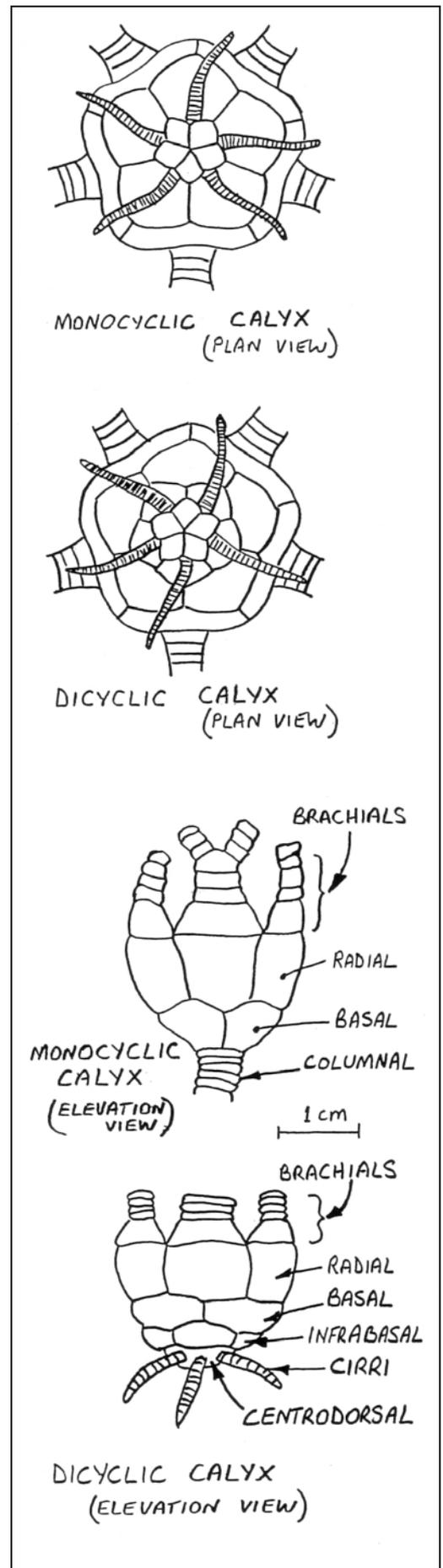
Crinoids have five arms, or tentacles, which are edged with feathery projections called pinnulae. The animal has a root structure called cirri which attaches it to the ocean bottom. A slender flexible stem (also called peduncle) supports the main part of the body, called the calyx. The mouth faces upward from the centre of the calyx. The five featherlike arms extend from the calyx and act as food gathers in the water current. Like the stem, the arms are made up of numerous calcareous discs called ossicles, which are held together by muscles or ligaments. The tentacles have open grooves, along which minute, hairlike projections sweep food particles toward the mouth. This food consists mainly of zooplankton less than 0.5 mm in size. When the animal dies the entire skeleton normally falls apart into the small separate plates (ossicles), therefore it is rare to find intact well-preserved crinoid fossils.

Morphology: Crinoid larva development is known exclusively from the comatulids. When the egg ruptures, a free-swimming, bilaterally symmetrical larva, called a doliolaria is formed. The larva swims about, using four or five rings of cilia, for a few hours or days and then settles to the sea floor to attach itself by the anterior end.

Crinoids can be divided into four subclasses, the **Inadunata**, **Flexibilia**, **Camerata** and **Articulata**. Of these, the first three are confined to the Palaeozoic era and the last to post-Triassic communities. The precise origins of the class are lost in the Precambrian, although both cystoids and eocrinoids have been proposed as possible ancestors.

Numerous species evolved with varying numbers of plates in the calyx, arms and other specific features. The anchorage structure of the crinoids is also present in many forms. The shape of columnar plates which make up the stem, varies from species to species. They may be circular, elliptical, pentagonal, square or stellate, while some may have a smooth outer surface, radial lines or petal-like designs. The one thing in common is that they all have a hole in the centre of each plate, to form a canal which runs the length of the stem. The classification of crinoid species is also based to a large extent on the structure of the cup (calyx).

Throughout the Palaeozoic, era the inadunates and camerates dominated coastal reef faunas. During this era, crinoids flourished in the ocean habitats from shallow warm tropical water to cold deep water.



Diversity of species and numbers reached a peak during the Silurian, Devonian and Carboniferous periods. (Approx. 430 to 280 million years ago). At the end of the Lower Carboniferous the camerates suffered a dramatic reduction in species from over 700 to just 4. This reduction also occurred in the other subclasses, but they survived in significant numbers until the end of the Permian Period (Approx 225 million years ago). Some Paleozoic limestone deposits, largely composed of crinoidal remains are up to a couple of hundred metres thick and cover areas measuring hundreds or thousands of square kilometres.

Echinoderms - "More than 21 classes have been identified, but only about 6,000 species of six classes are known to still exist. The six are:- Crinoidea (feather star and sea lilies), Asteroidea (starfishes), Ophiuroidea (brittle stars and basket stars), Echinoidea (sea urchins, cake urchins, and heart urchins), Concentricycloidea (sea daisies), and Holothurioidea (sea cucumbers). Echinoderms are widely distributed in all the oceans, occurring in marine environments ranging from the intertidal zone to the deepest ocean trenches". (*Encyclopaedia Britannica, 1989*)

There are approximately 700 Crinoid species alive today. All belong to the subclass, Articulata of which there are about 80 stemmed forms. They inhabit water more than 100 m deep. The deepest water crinoid, Bathocrinus, lives down to 9700 m in the Kuril Trench and to 8210 m in the Kermadec Trench.

Crinoidea - Subclass Articulata, is the only subclass in which there are species alive today. These include the Sea Lilies and Feather Stars.

Sea lilies live mostly in deep ocean waters. They were abundant in prehistoric times, but only few species remain today. Sea lilies eat tiny aquatic organisms.

Feather Stars are closely related to sea lilies, however they break from their stalks when young and live free, often on tropical coral reefs. Feather Stars can swim short distances by waving their arms up and down.

References

"Encyclopaedia Britannica", (1990). ISBN 0-85229-511-1

"Fossils - Collins Eyewitness Guides", (1992). Harper Collins Publishers, Written by Dr Paul D. Taylor, ISBN 0-7322-0074-1

"Fossils - Collins Eyewitness Handbooks", (1992). Harper Collins Publishers, ISBN 07322-0122-5

"McGraw - Hill Encyclopedia of Science and Technology", (1987). ISBN 0-07-079292-5

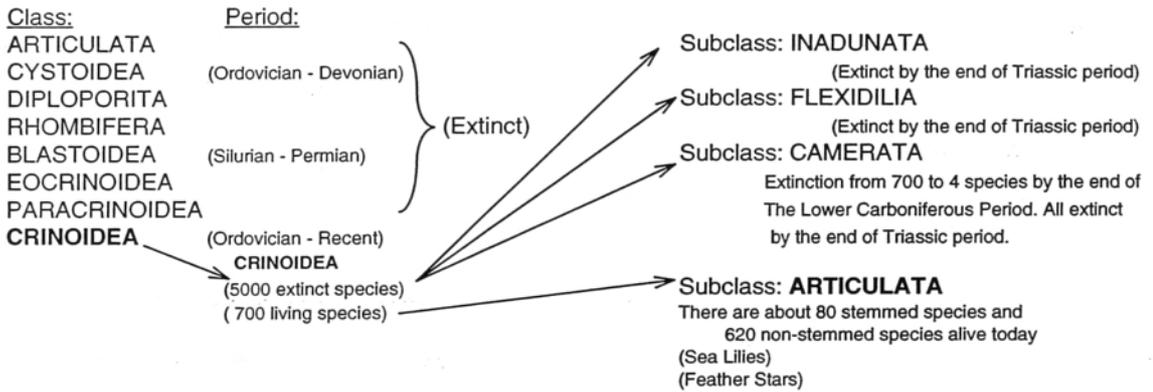
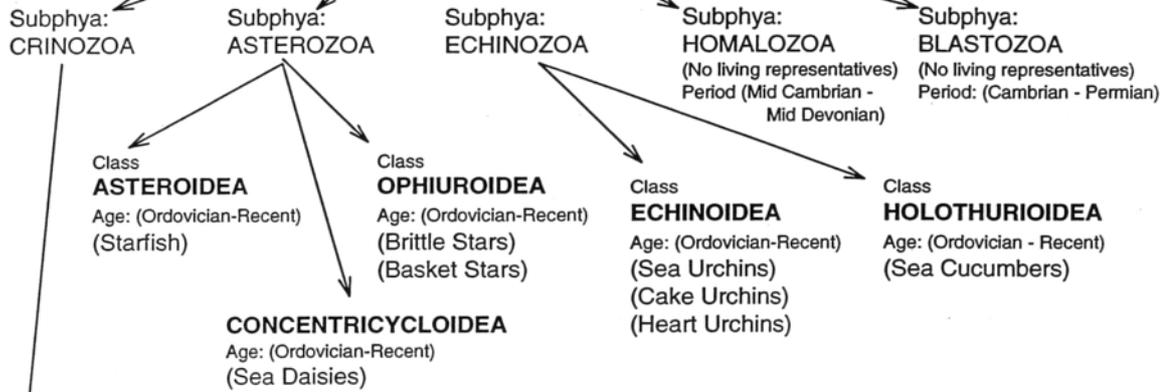
"The Fossil World", (1977). Written by Richard Moody, Published by The Hamlyn Publishing Group Ltd. - Sydney. ISBN 0-600-33609-3

"The New Encyclopaedia Britannica", (1989). Fifth Edition ISBN 0-85229-493-X

"The World of Fossils", (1972, revised 1975). By Giovanni Pinna, Orbis, Publishing - London. ISBN 0-85613-182-2

"World Book Encyclopedia", (1992). ISBN 0-7166-6692-8

ECHINODERMS (Phylum Echinodermata)



There are more than 21 classes of ECHINODERMS and only about 6,000 species in the six highlighted classes are known to exist today. About 700 of these belong to the subclass: Articulata.

Chart by Garry Smith

