

Echinoderms

Temporal range: Cambrian to recent

Echinoderms are diverse, commonly fossilized, marine animals; which are characterized externally by spiny skin from which it derives its name (echinos: hedgehog; derma: skin). Internally, they possess a **'water vascular system'** which is also unique for this phylum. The adults are recognizable by their (usually five-point) radial symmetry, and include such well-known animals as starfish, sea urchins, sand dollars, and sea cucumbers, as well as the sea lilies or "stone lilies". Echinoderms are found at every ocean depth, from the intertidal zone to the abyssal zone. Echinoderms are the largest phylum that has no freshwater or terrestrial (land-based) representatives.

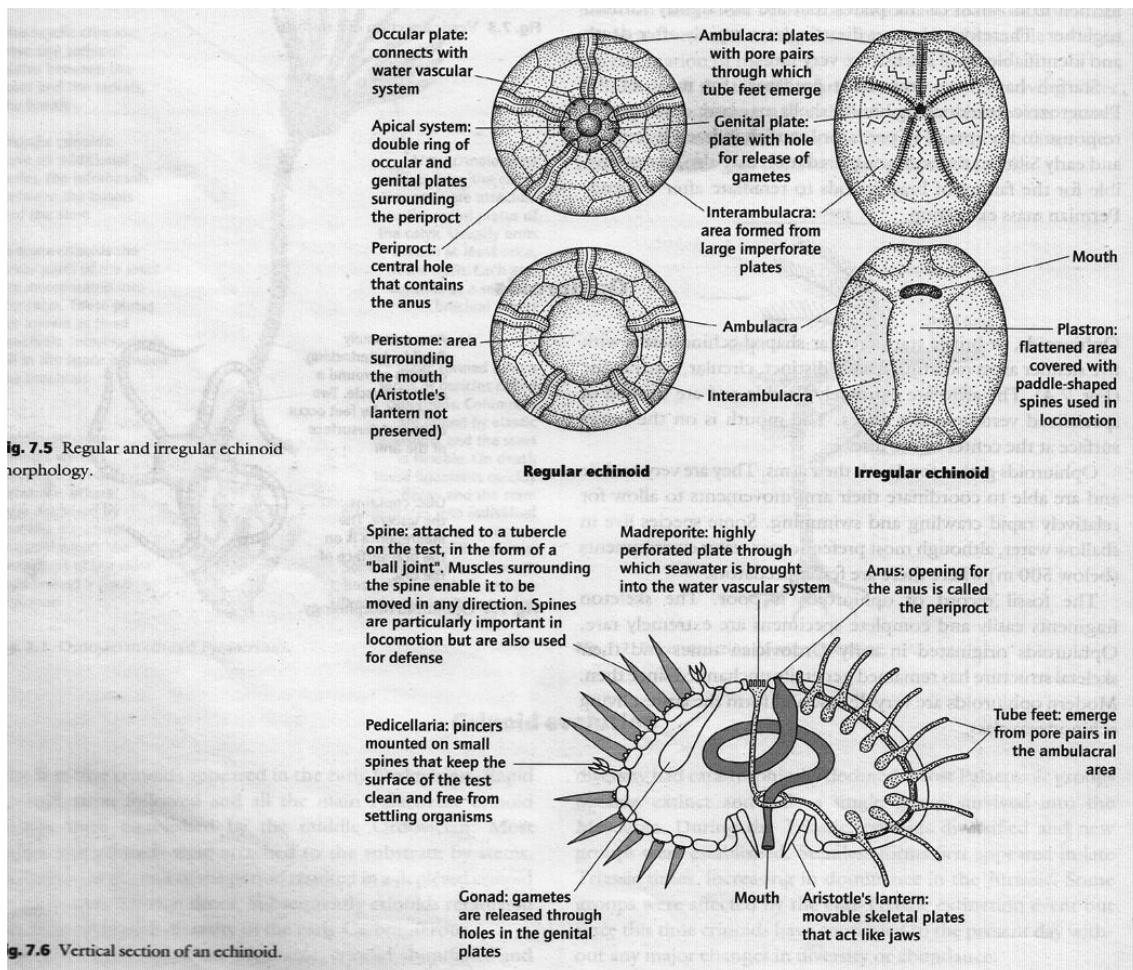


Fig.1 fossil echinoids

Echinoid morphology

Echinoids or sea urchins have robust internal skeleton (the test) composed of numerous fixed calcite plates. Instead of arms the test have five narrow zones formed from perforated plates (the ambulacra) through which the tube feet emerge. These porous segments alternate with broader areas (the inter ambulacra) that lack pores. Normally the skeleton exhibits a five rayed pentamerous symmetry. Some modern and fossil echinoids are found having a bilateral symmetry superimposed upon the radial plan. The anus is on the upper (aboral) surface and is surrounded by a double ring of plates (fig.7.5).The mouth is on the underside (oral surface). The external surface of the test is covered with spines and pedicellariae, tiny spines with pincers that remove settling organism(fig.7.6).

Accordingly, most of the paleontologist have subdivided echinoids into two divisions: regularia or endocyclic echinoids (with radial symmetry, rounded forms), e.g. sea urchins, and irregularia or exocyclic echinoids (with bilateral symmetry, heart shaped), e.g. sand dollars (fig.7.5). Regular echinoids are always surface dwellers and usually feed by scraping seaweed from rocks using a complex jaw apparatus know as "Aristotle's lantern". Articulated spines enable the animal to move slowly across the substrate aided by the tube feet. Irregular echinoids are often burrowers, and their spines are generally shorter and more densely spaced. The tube feet are highly modified. Some are used for digging and others are adapted for respiration, forming tubes that connect the animal with the sediment surface.



Echinoid ecology

Echinoids are exclusively marine benthic animals mainly vagile or infaunal burrower or cave dwellers. In sea they are ranging from intertidal down to abyssal depth. Regular echinoids mostly live upon sea floor, moving on their stout tubular tube feet. They are generally restricted to hard rocky bottom (reef zone) and they show various modifications which permit them to withstand the surge of waves and currents. Irregularia represents divergent lines of adaption to life in soft bottom and mostly they are burrowers.

Echinoids exploit three main life habits represented by three very distinctive morphologies (Fig. 7.7).

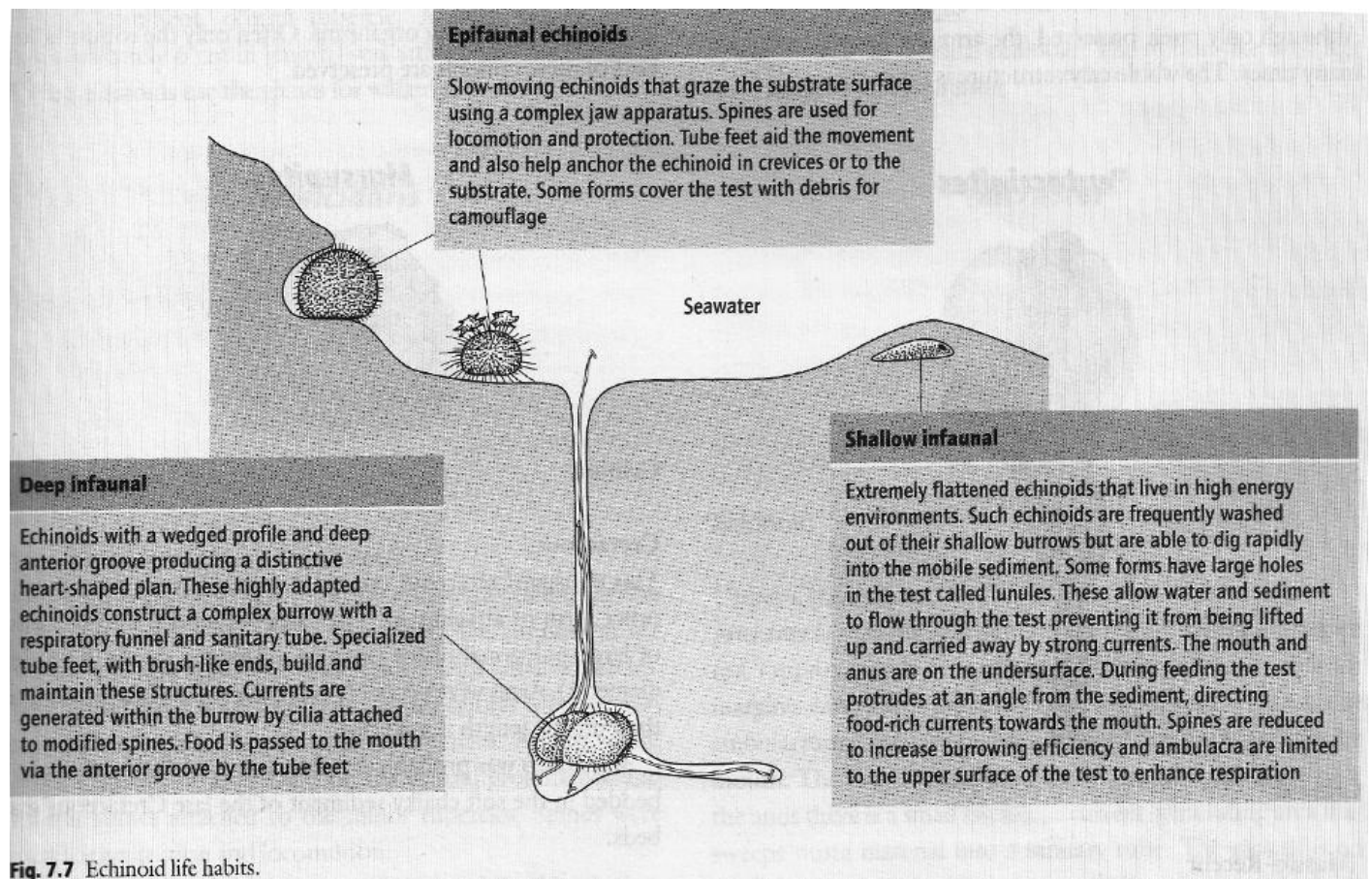


Fig. 7.7 Echinoid life habits.

Evolution and geological history

Echinoid fossils are first observed within Ordovician rocks but these forms lacked the Aristotle's lantern and possessed jaw like structure. From Ordovician, echinoids made a steady progress with the appearance of other groups but their number was rather limited upto carboniferous after which regular echinoids became diverse but never abundant. With the end of Permian all but only one genus *Microcidaris* became extinct and this became ancestor of all post-Permian echinoids. From this, first appeared Triassic cidaroides. There was a major radiation in the early Jurassic. Irregulars first appeared during this period, after this they showed a great diversity with the appearance of many taxa of regular and irregular echinoids, adapted for different modes of life.

Stratigraphic importance

Use of echinoids in stratigraphy is, however limited. This is partly due to their limited environmental occurrence and partly to the conditions affecting their preservation. Many regular echinoids have delicate test hence are rarely preserved in good condition. Irregular echinoids, because of their test and burrowing habits are more readily preserved and hence are of greater stratigraphic importance. Many irregular forms are used as zone fossils especially in the classification of cretaceous rocks.