Phylum Mollusca

Phylum Mollusca ranges from Cambrian to Recent. Members of this phylum exhibit bilateral symmetry. A shell encloses the soft parts of many mollusks. They have a foot adapted for burrowing, movement on the substrate, or food grasping. Three classes important in the fossil record are Bivalvia, Gastropoda, and Cephalopoda.

Class Bivalvia

This class (see Figs. 4.21 and 4.22) includes clams, oysters, scallops, and mussels. The shells have two valves and are composed of layered calcite and aragonite. In many bivalves, the two valves are mirror images, unlike brachiopod valves, which are different from each other. Muscles hold the valves together, and some bivalves have a flexible ligament that acts as a spring and opens the shells when the muscles relax. One or two muscles are present, and muscle scars are visible on the interior of the shell. An organ called the mantle secretes the shell by adding calcite along its edge. The pallial line marks the mantle attachment to the shell. If siphons are present, the interior of the shell shows an indentation called a pallial sinus. This indentation commonly indicates a burrowing habit for the bivalve. The incurrent siphon takes in seawater, the gills remove food and oxygen and move the food to the mouth. Wastes move out of the body through the excurrent siphon. The shells hinge together in the beak area. Teeth and sockets on either valve fit the shells together [see Fig. 4.21 (a), (b)].

The first bivalves appeared in the early Cambrian. They became more abundant by middle Ordovician. They probably lived in shallow water on top of the sediment or buried at shallow depths, filter feeding. After the Permian, many families of brachiopods became extinct and were replaced ecologically by bivalves.

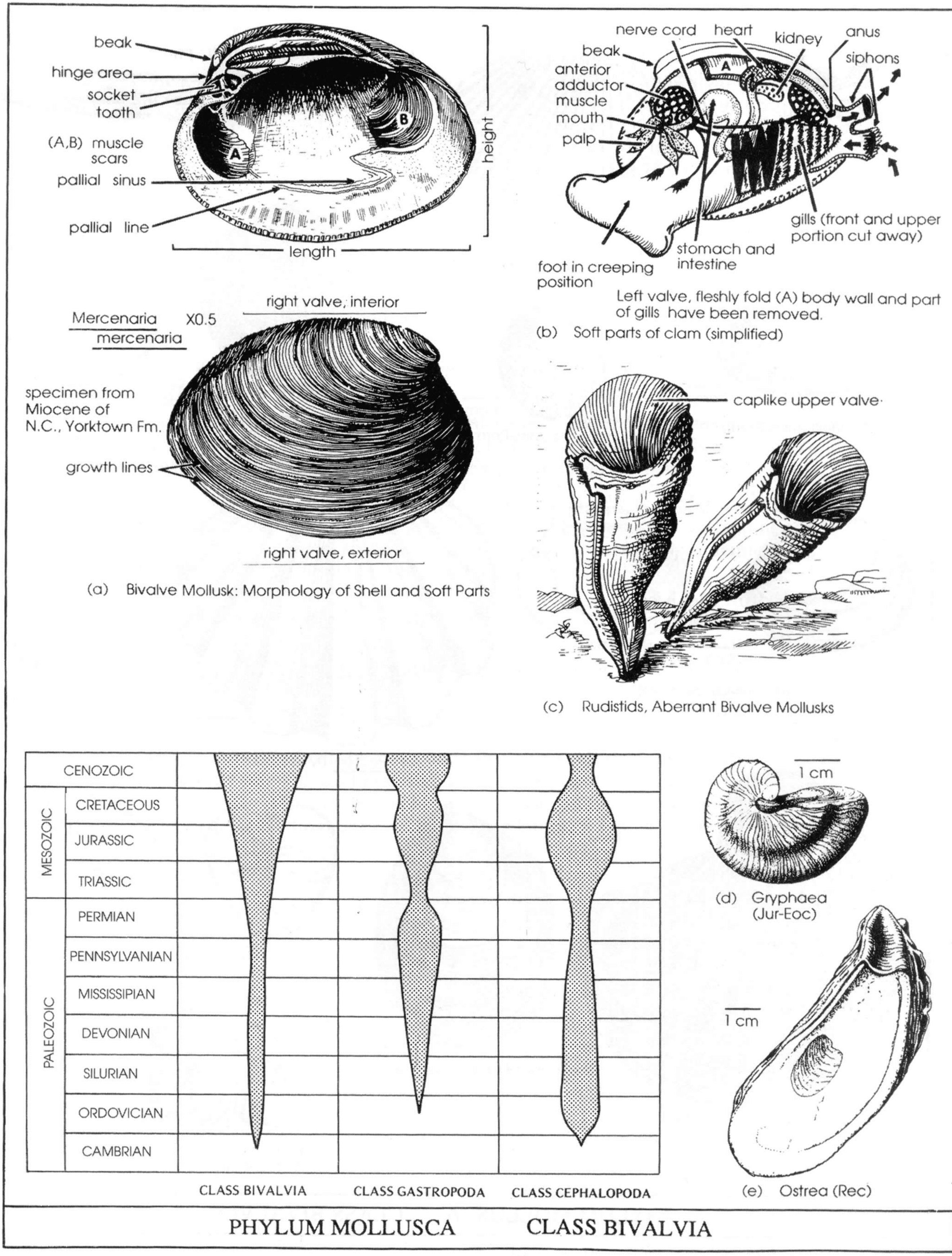
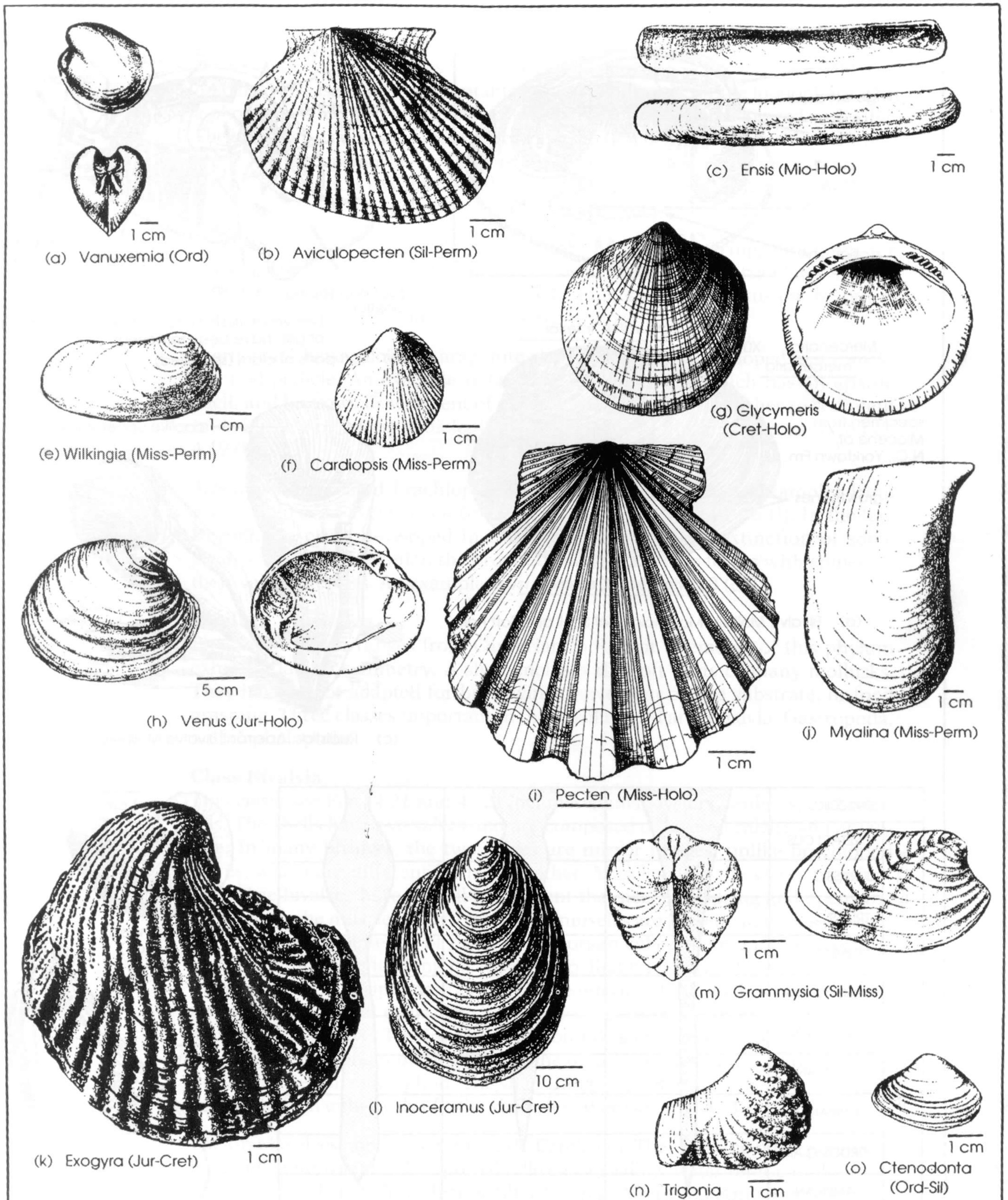


Figure 4.21 Phylum Mollusca, class Bivalvia



PHYLUM MOLLUSCA CLASS BIVALVIA

Figure 4.22 Phylum Mollusca, class Bivalvia

During the Mesozoic and Cenozoic, burrowers were more abundant, and scallops made their appearance. Following is a discussion of some of the life habits of members of the class Bivalvia.

Deep burrowers are clams with long siphons to reach the sediment-water interface from the deep burrow. The valves gape to accommodate the long siphons and the siphons cannot be retracted into the shell.

Attached bivalves such as mussels range from late Paleozoic to recent times. They attach by byssus fibers to sediment or rock. Rudists were unique attached bivalves that ranged from late Jurassic to Cretaceous. The lower valve is conical (like a horn coral) and the upper valve caps the top of the cone. They were reef-builders during the late Mesozoic. The largest rudists were 6 feet in length.

Swimming scallops range from Carboniferous to Quaternary. They lie on one valve and can move by snapping the valves together with a single muscle and jetting water from the mantle. Scallops possess light-sensing "eyes" around the outer edge of the mantle.

Cemented oysters range from late Paleozoic to recent Quaternary. The lower valve grows to conform to the shape of the object to which it is cemented, and oysters can form banks or reefs by cementing to each other.

Borers are clams with rough front edges on their shells for boring into rock, wood, or other shells. An example is the shipworm, *Teredo*. To help in boring into hard substances, some of these bivalves secrete corrosive chemicals.

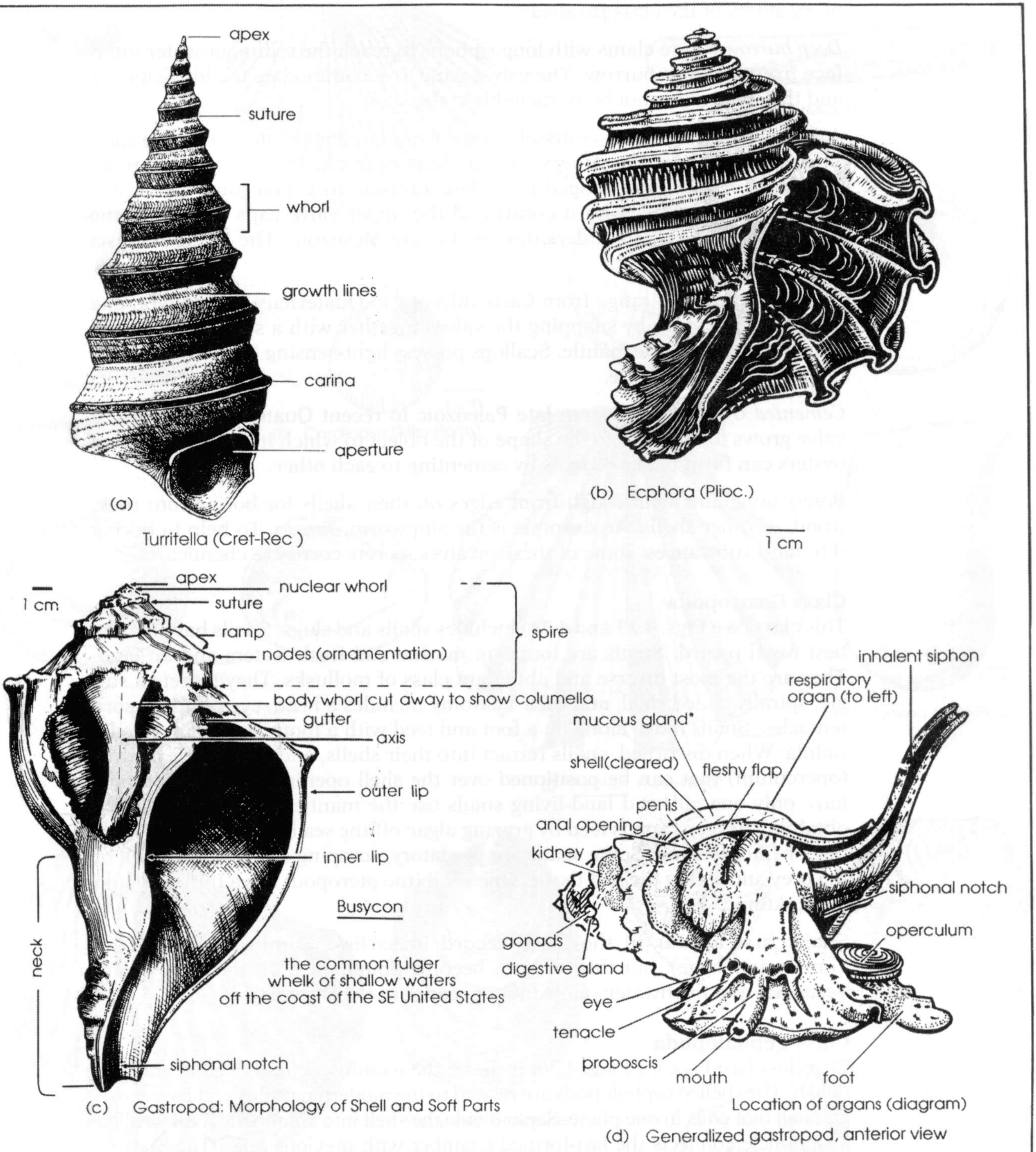
Class Gastropoda

This class (see Figs. 4.23 and 4.24) includes snails and slugs. Snails have left the best fossil record. Snails are found in marine and fresh waters and on land. They are the most diverse and abundant class of mollusks. They secrete a single, spirally coiled shell, and their anatomy includes a head, eyes, and sensory tentacles. Snails move along on a foot and feed with a toothlike organ called a radula. When disturbed, snails retract into their shells, and many have a cover (operculum) that can be positioned over the shell opening (aperture). Snails have only one gill, and land-living snails use the mantle cavity as a lung for obtaining oxygen. Snails feed by grazing algae off the sea bottom, deposit feeding, or filter feeding. Some snails are predatory, scraping a hole in the shell of the prey and eating the soft tissue. One snail (the pteropod) has a thin shell and is planktonic.

Snails first appear in the fossil record in earliest Cambrian strata (the Tommotian stage), but they did not become abundant until the Ordovician. Terrestial and freshwater snails first appeared in the Devonian.

Class Cephalopoda

This class (see Figs. 4.25 and 4.26) includes the nautilus, octopus, squid, and cuttlefish. The shelled cephalopods are related to the modern nautilus and have a single shell that coils in one plane. Septa divide the shell into chambers. A tube called a siphuncle connects the last-formed chamber with previous ones. The body of the animal occupies the last chamber; the rest are filled with gas, which controls the animal's buoyancy in the water. The foot is modified into a set of tentacles for grasping prey. Cephalopods have a well-developed eye. A funnel for jet propulsion allows the cephalopod to swim in any direction [see Fig. 4.25 (a), (c)].



PHYLUM MOLLUSCA CLASS GASTROPODA

Figure 4.23 Phylum Mollusca, class Gastropoda

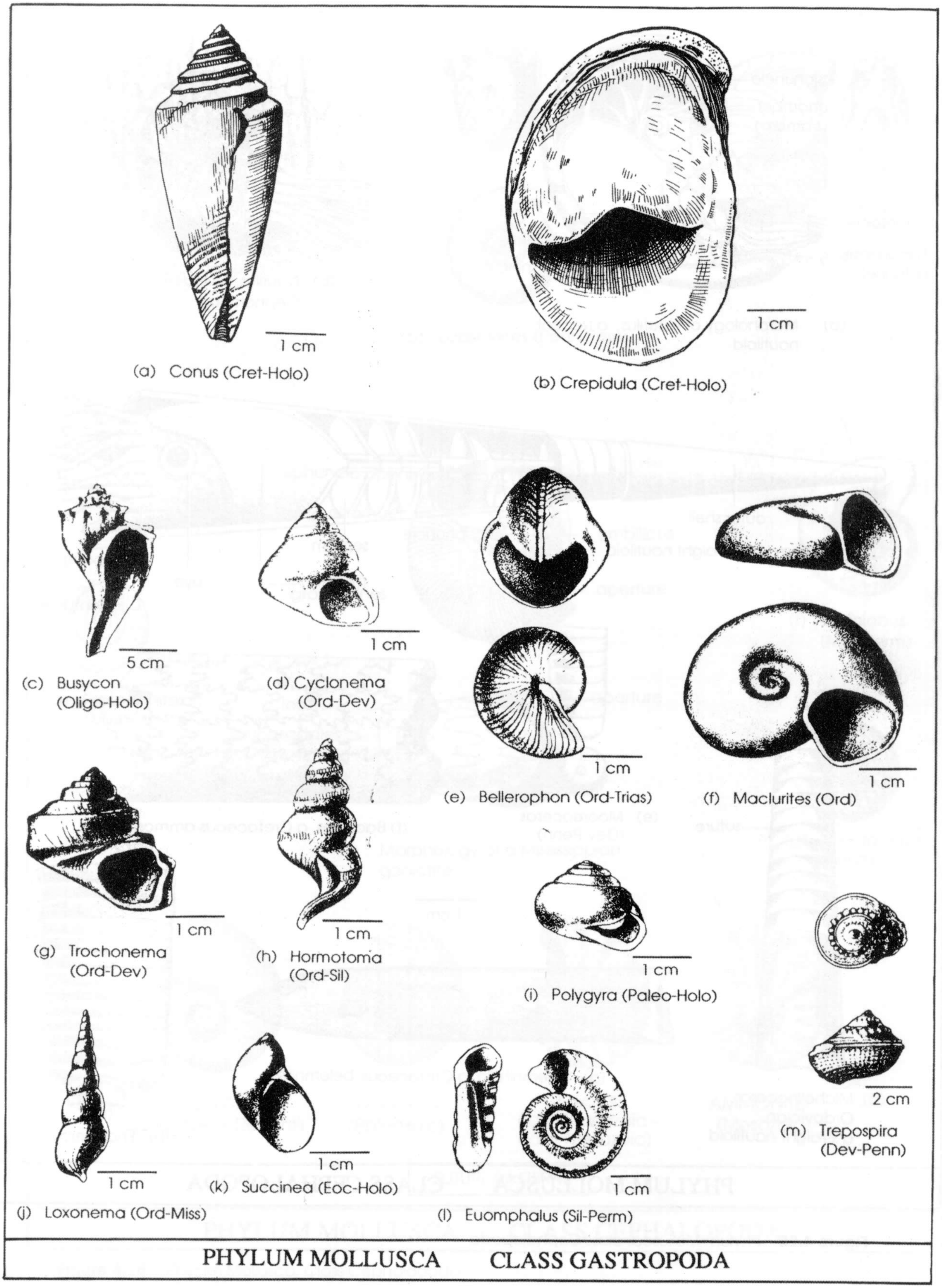


Figure 4.24 Phylum Mollusca, class Gastropoda

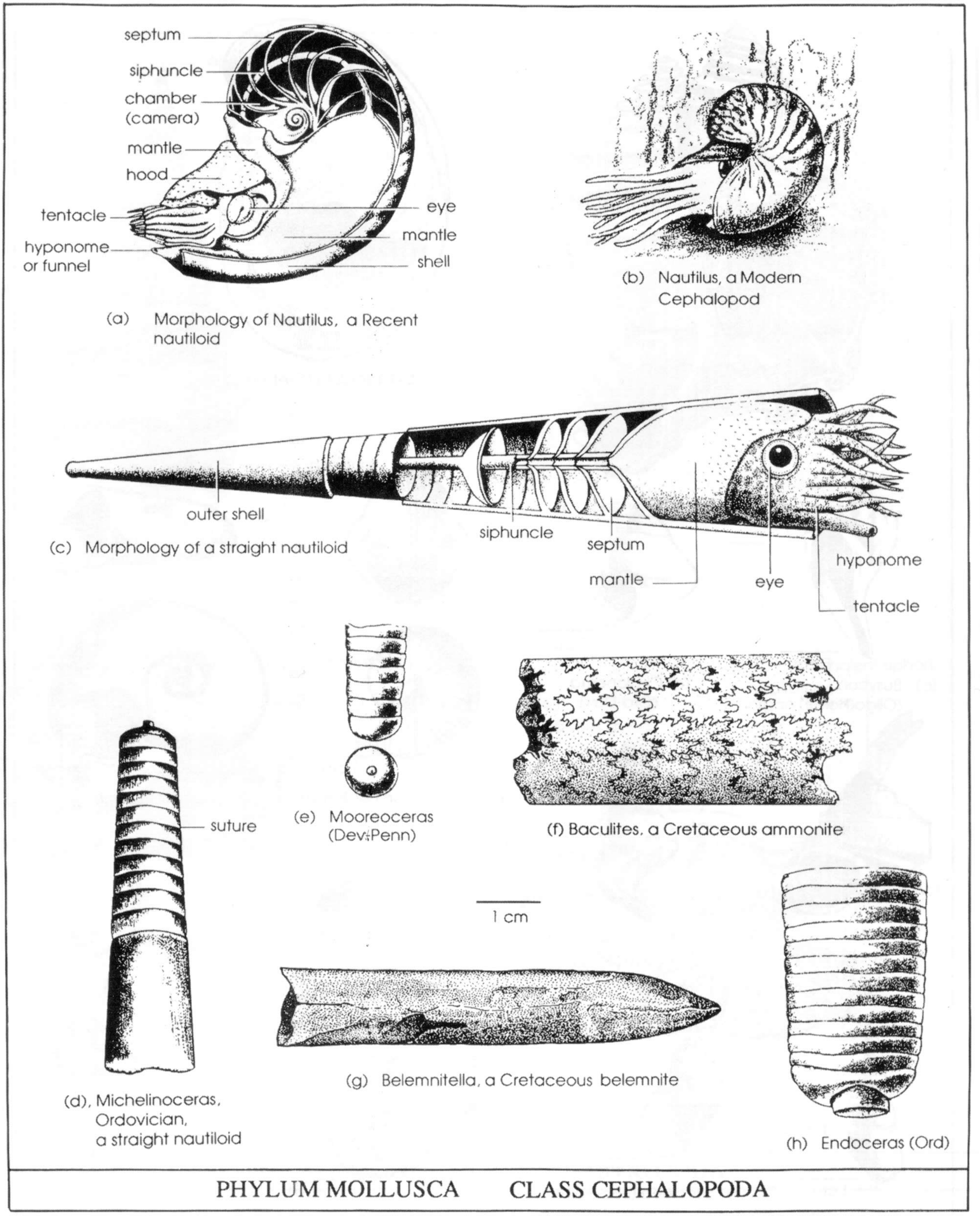


Figure 4.25 Phylum Mollusca, class Cephalopoda

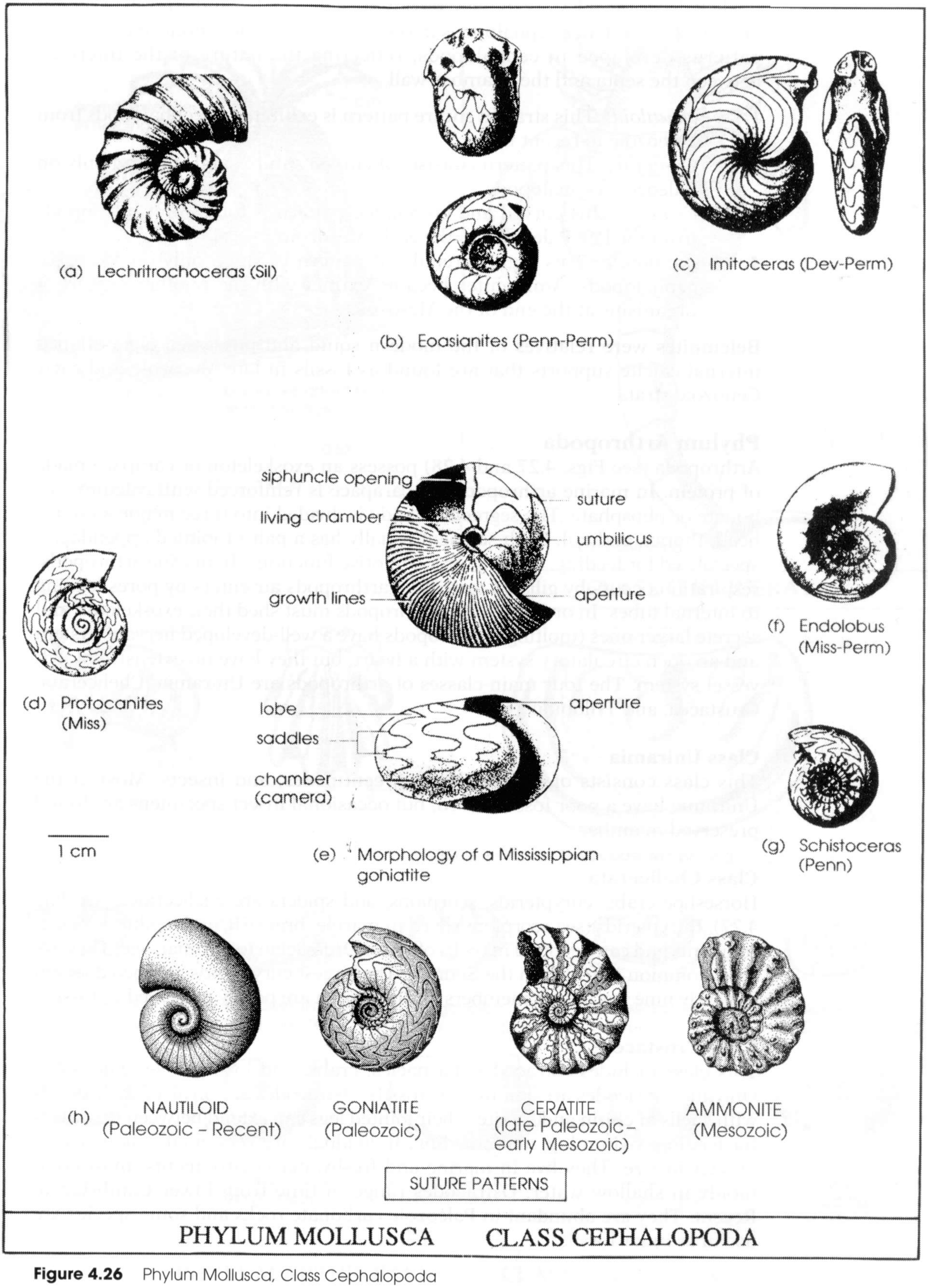


Figure 4.26 Phylum Mollusca, Class Cephalopoda

Early Paleozoic cephalopods were mostly straight-shelled and attained a length of up to 27 feet. Later cephalopods developed a coiled shell. Four major suture patterns developed in cephalopods, reflecting the nature of the interface between the septa and the chamber wall:

1. *Nautiloid*. This straight suture pattern is exhibited in cephalopods from Paleozoic to recent times.
2. *Goniatite*. This pattern consists of curved sutures and is found only on Paleozoic cephalopods.
3. *Ceratite*. This curved and crenulated pattern is found on cephalopods from the late Paleozoic to the early Mesozoic.
4. *Ammonite*. This highly crenulated pattern is found only on Mesozoic cephalopods. Ammonites became extinct with many other groups of organisms at the end of the Mesozoic.

Belemnites were relatives of the modern squid and possessed cigar-shaped internal calcite supports that are found as fossils in late Mesozoic and early Cenozoic strata.