

Snails, mussels, pea shells and basket shells



7 Phylum Mollusca—molluscs

Background

Over 100,000 species of Mollusca are described worldwide. In terms of its high number of species, Mollusca is second only to the phylum Arthropoda. Seven classes of living (extant) Mollusca are generally recognised, but only two have freshwater representatives in Australia—Gastropoda (snails) and Bivalvia (bivalves). These are discussed in more detail in individual sections below. The other five classes are marine and terrestrial. There are 15 aquatic families of gastropod and bivalve molluscs Australia-wide. Twelve families, with 40 species in total, are present in inland waters of South Australia. Molluscs are well represented in the fossil record due to their hard shells. They first appear in the Lower Cambrian period, over 500 million years ago.

Size

Molluscs range in size from very small, immature animals about 1 mm long to large freshwater mussels that can reach 150 mm long.

Features

Each mollusc has a single large foot and a soft body that is usually housed in a calcareous shell. Many have a hard, file-like feeding organ called a 'radula'. The shape and colour of mollusc shells can vary greatly. Gastropods have either a coiled or limpet-shaped shell. Bivalves have two shells that are hinged together at the rear of the animal.

Diet and feeding

Bivalves use a complex gill structure to filter the water and remove food particles, mainly microscopic plankton. Most gastropods are grazers and feed on algae and plant material.

Locomotion

Both gastropods and bivalves move along the substrate by using their muscular feet, sometimes leaving a mucous trail behind them. The mucus acts as a deterrent against predators. Bivalves do not move very often and generally bury themselves partially in the sediment.

Gas exchange (breathing)

To obtain oxygen, bivalves open their shells slightly and, using their complex gill structure, create currents that move water over the gills. Gastropods obtain oxygen either by using gills or by using the mantle cavity as a lung-like structure.

Life cycle and reproduction

The reproductive methods of molluscs are quite varied. Some species of mollusc are hermaphroditic, while others have separate sexes. Some females reproduce through parthenogenesis, others mate with male molluscs. Some molluscs bear live young, others produce eggs. The eggs of some molluscs are laid in gelatinous coatings on water plants, rocks or logs, while in others, including all bivalves, the young develop within the body of the adult. The entire life cycle is aquatic. Some gastropods can live up to 30 years.

Phylum Mollusca—molluscs

Habitat

Molluscs can be found in most inland water bodies, including fresh, saline, flowing, standing and temporary waters. They can be found attached to stable substrates such as rocks, logs and leaves of aquatic plants. Some bury themselves in the sediment. Molluscs are common throughout South Australia.

Critter facts

Squid, octopus and cuttlefish are also molluscs, but their shells are reduced to internal deposits of calcium.

Identification

Freshwater molluscs can be recognised easily by the shapes of their shells. Gastropods have either a coiled or a limpet-shaped shell and bivalves have two shells that are joined together by a hinge-like structure. Further identification is usually based on shell features. See page 40 of *The Waterbug Book* for a key to the families of molluscs.

Classification and sensitivity

Phylum Mollusca

 Class Gastropoda (1)

 Class Bivalvia (3)

References

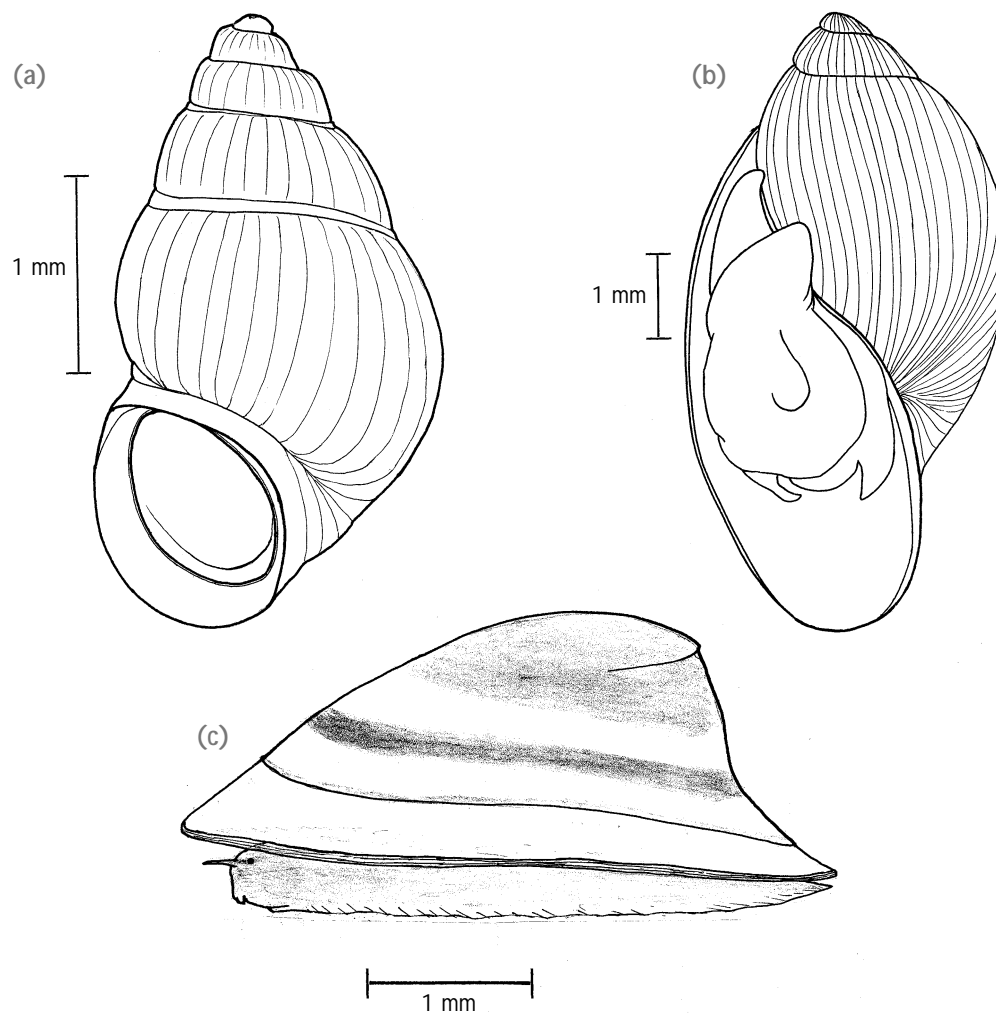
Hawking & Smith 1997, pp 24-39; Williams 1980, p 78; Gooderham & Tsyrlin 2002, pp 46-58.

7.1 Class Gastropoda-water snails

Background

About 35,000 species of gastropod have been described worldwide, among them terrestrial, marine, estuarine and freshwater species. In addition, around 15,000 fossil forms date back to the Cambrian period, over 515 million years ago. Twelve families and 203 species are known from inland waters of Australia. Eight families occur in South Australia.

Gastropoda can be divided into two subclasses: the Pulmonata (which includes the families Lymnaeidae, Ancyliidae, Planorbidae and Physidae) and the Prosobranchia (which includes the families Viviparidae, Thiaridae, Hydrobiidae and Pomatiopsidae). Most of the families of gastropods found in South Australia are also present in other parts of the world.



The gastropods:

- (a) *Angrobia* sp. (family Hydrobiidae)
- (b) *Glyptophysa concinna* (family Planorbidae) and
- (c) the freshwater limpet *Ferrissia* sp.

Phylum Mollusca—molluscs

Size

Gastropods range in size from very small-less than 1 mm-to 65 mm in diameter, depending on the species and age of the snail.

Features

Freshwater snails can have a coiled or a limpet-like shell, which protects a soft body. A number of shell features help classify Gastropoda, such as whether they have an operculum-the hardened door to the opening of the shell-and whether the shell has a left- or right-handed spiral. The shape and decoration of the shell can also be important. Some shells are highly sculptured. Members of the subclass Prosobranchia have an operculum, while Pulmonata lack this feature.

Diet and feeding

Most freshwater snails are herbivorous and feed on vascular plants, decaying vegetation and algae. They use their radula to rasp away plant tissue and to scrape algae from the surfaces of rocks, plants and other substrates. The radula is a file-like structure made of chitin and has a numerous teeth.

Locomotion

Gastropods glide along surfaces of rocks, logs and plants using waves of muscular contractions in their feet. They secrete mucus onto their feet to make travel easier. It is thought that the mucus decreases the friction between the foot and the surface along which they are moving; it also acts as a deterrent to predators.

Gas exchange (breathing)

Gastropods respire by two different methods. Prosobranch snails have gills inside their water-filled mantle cavity and gas exchange occurs across the gill surface. Ventilation of the respiratory surface occurs as water is drawn into the mantle cavity at the front of the body by currents created by movement of tiny hairs on the gills. Some snails have haemocyanin in their blood, which aids oxygen uptake.

Pulmonate snails, as the name implies, have a respiratory system that functions in a similar way to a lung. Instead of passing water through the mantle cavity, they hold air inside it. The mantle cavity is richly supplied with blood vessels.

Most pulmonate snails regularly come to the surface to refresh their air supplies, some species do not need to do this. Such snails have hairs that are used to ventilate the respiratory surface. These hairs are also used for locomotion.

The pulmonate order Basommatophora are able to survive in waters with low dissolved-oxygen levels. To obtain air, they hang upside down in the water, with the foot just touching the water surface. They ventilate their mantle cavity by arching and flattening the body.

Life cycle and reproduction

Some species are hermaphroditic, but most have separate sexes. However, some species seem to have only females and reproduce by parthenogenesis.

Most gastropods lay eggs that are contained in a gelatinous coating, which is thought to protect the eggs from bacteria and fungi. The egg mass is attached to water plants, twigs or logs. On hatching, the young resemble the adult in some ways. However, the shell is softer than that of the adult and the juveniles have a very small, squat shell rather than an elongate spire. Some gastropod species give birth to live young.

Habitat

All types of water bodies, including fresh, saline, flowing and standing waters, contain gastropods. They can be found attached to stable substrates such as rocks, logs and leaves of aquatic plants. Many live in temporary waters and have adaptations that enable them to withstand desiccation. When the water body dries up, they seal off the opening of their shell until conditions become more favourable. Species with opercula withdraw into their shells and close their 'doors'. Species without opercula seal the shell opening by secreting calcified mucous plugs. Some arid zone species can survive without water like this for up to two years. Pulmonate molluscs are able to tolerate waters with low levels of dissolved oxygen. One particular family of gastropods prefers saline inland waters.

Critter facts

The two most common freshwater snails in South Australia are introduced species: the physid snail, *Physa acuta*, and the hydrobiid snail, *Potamopyrgus antipodarum*. These snails can be found throughout South Australia, except in the far north region of the state.

Some species of Gastropoda act as the intermediate host for flukes-parasitic platyhelminths-including the sheep liver fluke.

One species of viviparid snail that inhabits the River Murray was thought to be extinct until it was found in the early 1990s in irrigation pipelines. It was a pest in these pipes, the vast accumulation of shells blocking irrigation equipment. It seems to have disappeared again, perhaps due to measures taken to clear snails from the pipes.

Identification

Snails have a variety of shell shapes-tall spires, limpet or dome shapes, or flat coils without a spire. The limpet-shaped snails of the genus *Ferrissia* are easily recognisable as they resemble marine limpets. Gastropods can have very thin to thick, highly calcified shells and can be coiled either to the left or the right. Sometimes empty shells are found, and often these can still be identified from shell characteristics. See page 40 of *The Waterbug Book* for a key to the families of gastropods.

Classification and sensitivity

Phylum: Mollusca

Class Gastropoda (1)

Order Architaenioglossa

Family Viviparidae (4)

Order Neotaenioglossa

Family Thiaridae (4)

Family Hydrobiidae (4)

Family Pomatiopsidae (1)

Order Basommatophora

Family Lymnaeidae (1)

Family Ancyliidae (4)

Family Planorbidae (2)

Family Physidae (1)

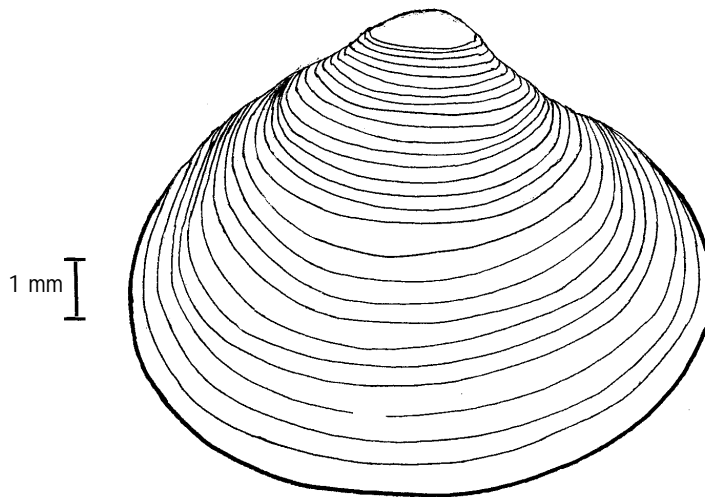
References

Hawking & Smith 1997, pp 24-35; Williams 1980, p 86; Gooderham & Tsyrlin 2002, pp 52-58.

7.2 Class Bivalvia-mussels, little basket shells and pea shells

Background

About 85% of the 25,000 bivalves that occur worldwide are marine. In Australia, representatives of three families and some 33 species of bivalves are found in inland waters. All three families occur in South Australia. Two species of freshwater mussels (family Hyriidae) occur in South Australia—the river mussel (*Alathyria jacksoni*) and the billabong mussel (*Velesunio ambiguus*). The other two families are Corbiculidae (little basket shells) and Sphaeriidae (pea mussels). Fossil records date back to the Cambrian period, over 515 million years ago.



The little basket shell *Corbiculina australis* (family Corbiculidae)

Size

Bivalves range in size from very small to 150 mm, depending on species and maturity. Freshwater mussels are the largest. Corbiculidae and Sphaeriidae are smaller, reaching a maximum shell height of only 25 mm

Features

The shell of a freshwater mussel consists of two separate valves hinged together to enclose the animal completely. The shells often have concentric growth rings and the shell is strengthened by the incorporation of calcium. Shell colour can be white, brown or black. Bivalves have soft bodies and lack defined heads. They have two siphons that protrude from between the shells when the animal is active. Water, containing food particles, is drawn into the shell through one siphon and passes over the gills to be expelled through the second siphon.

Diet and feeding

Bivalves filter food particles such as zooplankton, phytoplankton and organic detritus from the water. The food particles are trapped in mucus on the surface of the gills and passed to the mouth. The shells do not need to be opened very wide for this process to occur.

Locomotion

Bivalves move slowly by extending their foot out between their shells, gaining a hold on the substrate, contracting the muscles in the foot and thus dragging themselves along. Most of the time, they submerge themselves, either partially or completely, in the sediments.

Gas exchange (breathing)

Bivalves pass water over their single pair of gills while filter-feeding. Water is drawn into the mantle cavity via the longer of the two siphons and is moved across the gills by the action of fine hair-like structures called cilia. The water then exits through the second siphon. The blood of bivalves lacks any respiratory pigment.

Life cycle and reproduction

Bivalves reproduce sexually. Sphaeriidae are hermaphrodites and self-fertilise, but the members of the other families have separate sexes. Males release sperm into the water column and the sperm are drawn in through the siphons of females. Female Corbiculids and Sphaeriids brood their eggs and the larvae develop between the gills inside the shell. At the completion of development, the young are shed from the gills. Hyriid larvae attach to the gills or bodies of fish for a time before they drop off and settle on the bottom. The age of a bivalve can be determined by the number of growth lines on the shell, in the same way that the age of a tree can be determined by the rings of the trunk. Freshwater mussels may reach an age of 20 or 30 years.

Habitat

Bivalves are found in a variety of inland waters: Hyriidae are common in the River Murray, Sphaeriidae live in streams and ponds, and Corbiculidae live in sandy areas in fast-flowing water of streams. They often bury themselves into soft sediment. Bivalves don't appear to be as common as gastropods in South Australia, but can be found in a variety of water bodies throughout South Australia, including slightly saline waters.

Critter facts

Hyriidae are very resistant to desiccation. A specimen of one species survived after being left for five years in a dry box. Some bivalves can live for a very long time, one species of bivalve was recorded to have lived for 150 years.

Freshwater mussels have been used in studies of heavy metal pollution. They accumulate heavy metals within their soft tissues and in their shells. Comparing the concentration of metals in shellfish from different places and over different times can tell us about the presence and distribution of metals in the environment.

Identification

Bivalves can easily be recognised by the paired, hinged shells that completely enclose the soft-bodied animals. Little basket shells and pea shells look just like marine clams or cockles, but are slightly smaller. It is hard to distinguish between these two bivalves, but the shape of the shell at the hinge is often used. Freshwater mussels look very similar to marine mussels and can grow to be quite large. See page 40 of *The Waterbug Book* for a key to the families of bivalves.

Classification and sensitivity

Phylum Mollusca

 Class Bivalvia (3)

 Order Unionoida

 Family Hyriidae (5)

 Order Veneroida

 Family Sphaeriidae (5)

 Family Corbiculidae (4)

References

Hawking & Smith 1997, pp 36-39; Williams 1980, p 78; Gooderham & Tsyrlin 2002, pp 49-51.