

Most species are confined to wet forest areas; rhytidids do not produce epiphragms and have a poor ability to withstand desiccation. The family ranges along the eastern Great Dividing Range from North Queensland and its offshore islands to Victoria, and south-eastern South Australia, Tasmania and the forests of south-western Australia. Several species are found in drier areas, and one species is found in open coastal heathland just south of Adelaide.

A number of species are thought to be preyed upon by bush-rats and blue-tongue lizards, as shells are found showing extensive damage. In the Sydney area, *Austrothyrida capillacea* preys on the introduced snail *Helix aspersa* where these species live sympatrically. This has been suggested in popular gardening magazines as a possible biological control agent for the helicid pest, triggering misguided suggestions of transplanting other rhytidids from rainforest to suburban gardens in other areas to control the introduced pest species.

The genus *Victaphanta* of south-eastern Australia shows affinity with the New Zealand *Paryphanta* and *Powelliphanta* in characters of the radula, reproductive system and shell. Tasmania and southern Victoria support the greatest diversity with 12 species in six genera. *Austrothyrida* (Smith 1987) also shows close affinities with the New Zealand *Rhytida*.

## Superfamily ACAVOIDEA

Acavoideans are medium-sized to very large snails with shells that vary from globose to fusiform and discoidal. The shells are dextral, usually without prominent sculpture and apertural lamellae. The lip is either sharp or thickened and strongly reflected. The colour of the shell and animal is variable between species and some are brightly coloured. The radula consists of numerous unicuspidate teeth arranged in transverse rows. The central teeth are smaller than the lateral and marginal teeth (Kershaw 1989). The kidney is subtriangular without a ureter or links with a primary ureter that follows the kidney edge to a ureteric pore situated at the rear of the pallial cavity. The reproductive system is simple and the penis usually has an epiphallus. Acavoideans are oviparous or ovoviviparous and hermaphroditic.

Two families are recognised: the Acavidae, distributed in Madagascar, the Seychelles and Sri Lanka; and the Caryodidae, in eastern Australia. Acavoideans have been found in Pleistocene sediments of Madagascar (Zilch 1959) and Eocene deposits of eastern Queensland (Stanisic 1994a).

## Family Caryodidae

Caryodids are medium-sized to large (15–100 mm in shell length) terrestrial snails (Pl. 32.4). The shell varies in shape from high-spired to conic to discoid. Usually the shell is banded or has a colour pattern; some have a distinctive sculpture. This endemic family contains Australia's largest terrestrial snail, *Hedleyella falconeri*, which attains a shell length of 80 mm. These large, conspicuous shells were collected by some of the earliest explorers and taken back to Europe for description. In his basic list of Australian land shells, Iredale (1937b) included all the species of the family, dividing them into four families because of the large variation in shell shape between the genera. Burch (1976b), Boss (1982) and Tillier (1989) placed the Australian species in a subfamily of the family Acavidae known from Madagascar and Sri Lanka. Solem (1978a) treated the family as a separate entity, placing it in the Acavoidea. Smith (1992) listed 13 species in seven genera.

Shell form varies a greatly between genera. *Caryodes* (Fig. 17.52A), *Brazierista*, *Pygmipanda* and *Pandofella* are bulimuliform (i.e. resembling the shape of bulimulid shells, in particular having a large, inflated last whorl), and in *Pandofella* the shell is reduced to a few whorls with a large open aperture (Pl. 32.4). Shells of *Hedleyella* species are subglobose (Fig. 17.52B); *Anoglypta*

(Fig. 17.52C), broadly conic with strong sculpture; and *Pedinogyra* species, large and discoidal (Fig. 17.52D). Smith (1992) listed seven valid genera and 15 valid species and subspecies in the family. In most species, the body is large and capable of considerable extension. Many of the shells and animals are strikingly coloured and patterned. The simple, unicuspidate radula teeth are strong (Fig. 17.52G, H). The animals are generally believed to feed on decaying vegetable and animal matter, but in captivity will also eat green plant material. The kidney is triangular and the narrow primary ureter opens at the base to a partially enclosed secondary ureter. Davies (1914) described the anatomy of *Caryodes dufresnii* from southern Tasmania, and in describing the pallial and alimentary organs, noted the large blood vessels and the large curved stomach.

Caryodids are oviparous hermaphrodites and have long been known for the large size of their eggs, sometimes compared with those of a small bird (Pilsbry 1894). The reproductive system has no accessory dart sac and the penis has no epiphallus in *Caryodes* and *Anoglypta* (Fig. 17.52E, F; Kershaw 1988a, 1988b). A short epiphallal swelling of the vas deferens occurs in *Pygmipanda* and *Hedleyella*, pressed tightly against the penis (Pilsbry 1894). There is no flagellum but a diverticulum enters the vagina adjacent to the bursal duct and free oviduct pores. The diverticulum of *Anoglypta* is reversed compared to the other genera. Sperm are transferred within mucous strings which can be seen throughout the terminal genitalia including the diverticulum (Kershaw 1988a). *Caryodes* species lay eggs in the spring in clutches of two to seven, in small depressions in the ground or in litter; hatching may take several weeks (Kershaw & Dartnall 1972, 1975). The life cycle is unknown, but individuals may not reach sexual maturity in the first year. Dartnall & Dartnall (1972) recorded chromosome numbers for several species. These range from  $2n=52$  in *Anoglypta* through  $2n=54$  in *Caryodes* to  $2n=58$  in *Pygmipanda*, *Pedinogyra* and *Hedleyella*.

Caryodids live in woodland to dry sclerophyll to rainforest habitats. Some species are confined to rainforest and all are threatened by forestry activities. The major predators are birds and small mammals. Shells broken in specific ways are found around anvil stones and in mammal runs. Bishop (1981) described predation in some Queensland species. Feeding activity is almost entirely nocturnal. The animal is dormant during the day and aestivates during dry periods, the aperture sealed with a thin epiphragm. Caryodids are generally found under logs or in moist litter, although some species will climb a short distance from the ground during rainfall. Bishop (1981) reported that *Hedleyella* hides in the strangler fig during the day and feeds on litter at night.

The family is endemic to eastern Australia and has a distribution from Queensland to Tasmania, largely along the Great Dividing Range on the mainland. *Caryodes* occurs in a wide range of habitats in Tasmania. The closest relatives of the Caryodidae appear to be the Acavidae of Sri Lanka, the Seychelles and Madagascar. Solem (1979a) listed a Pleistocene age for the Madagascan acavids but their Australian fossil history is very uncertain. Bruggen's (1980) suggestion that these snails have a Gondwanan origin is accepted by many workers. Stanisic (1994a) described *Praecaryodes antiquata* from Eocene deposits of mid-eastern Queensland.

A number of the species are rare and very localised; *Anoglypta launcestonensis* is considered one of the more rare and endangered land snails of the Australian fauna (Wells, Pyle & Collins 1983).

## Superfamily BULIMULOIDEA

Bulimuloidean snails are terrestrial and have variable shells, ranging in shape from large bulimuloid and ovate-, or elongate-conic to depressed helicoid, turreted or cylindrical, rarely discoidal or further reduced. The aperture varies from large to small and in many taxa has one to numerous apertural lamellae and denticles. The sculpture is smooth or consists of weak to strong radial ridges sometimes crossed by spiral grooves. Shell



Smith, Brian J and Kershaw, Ron C. 1998. "Pulmonata: Family Caryodidae." *Mollusca: The Southern Synthesis [Fauna of Australia. Vol. 5]* 5, 1093–1093.

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