



# FISHERIES FACT SHEET

# ABALONE

## Abalone

Family Haliotidae



**Roe's abalone**  
*Haliotis roei*



**Greenlip abalone**  
*Haliotis laevigata*



**Brownlip abalone**  
*Haliotis conicopora*

## Escargot of the sea

Abalone are a family of reef-dwelling marine snails which are the target in Western Australia of a lucrative export commercial fishery and one of the world's shortest recreational fishing seasons. Despite this fishing pressure and examples of stock collapses worldwide, WA can boast one of the few remaining sustainable wild-stock abalone fisheries.

### Marine snails

Abalone are a type of single-shelled (gastropod) herbivorous marine mollusc. Their body is large and fleshy, with a broad, muscular foot that is used to attach itself to reefs or rocks using suction.

The shells of abalone species are rough, flat and ear-shaped, which protects them from wave action. In addition, their shells are smooth and shiny on the inside to protect the soft flesh of the abalone from damage.



Rows of small holes or 'pores' that run along the edge of their shells distinguish abalone species from other marine snails. Abalone expel water that have passed through their gills through these holes. As abalone grow, these holes progressively close-up, with usually only the last four to six holes remaining open when they reach full-size.

There are 11 abalone species found in Western Australia, but only three of them are large enough in size to be fished: Roe's abalone (*Haliotis roei*), greenlip abalone (*Haliotis laevigata*) and brownlip abalone (*Haliotis conicopora*).

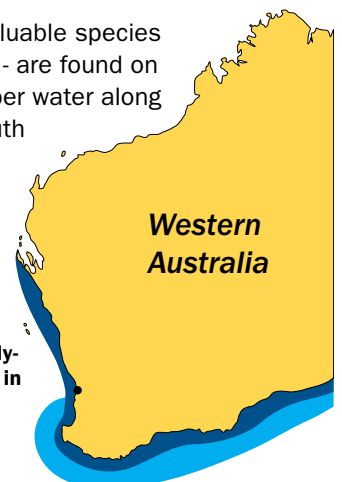
### Distribution

Abalone are widely distributed across tropical and temperate coastal areas. Roe's abalone can be found as far north as Shark Bay in Western Australia and south around to Victoria. They mostly inhabit shallow limestone reefs along the west coast, especially around Perth and near Geraldton.

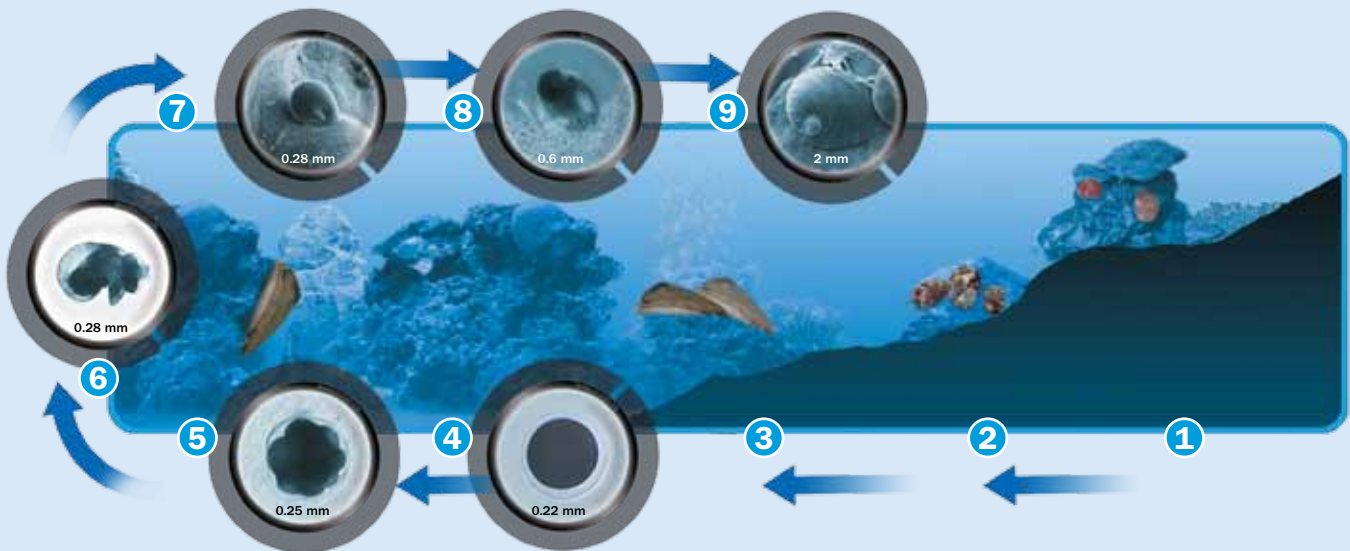
The two larger, more valuable species – greenlip and brownlip - are found on rocks and reefs in deeper water along Western Australia's south coast, ranging from Cape Naturaliste for greenlip and across to Rottnest Island for brownlip.

#### Distribution of commercially important abalone species in Western Australian waters

- Roe's abalone (to 5m depth)
- Greenlip/brownlip abalone (to 40m depth)



## Life Cycle



Roe's abalone spawn mostly in winter, while greenlip and brownlip spawn in late spring and summer. Female abalone release eggs into the water, where they are fertilised with sperm released by the males.

The spawning period in all species is influenced by temperature and availability of food. Female greenlip abalone can produce up to two million eggs each once they reach four or five years old. Within two days, the fertilised abalone eggs develop into tiny larvae, called spat. The spat then drift with water currents for about a week, feeding and growing before they develop their shell.

Fluctuating inshore currents and tides can prevent abalone larvae from travelling too far from the spawning site. Over time, this mechanism has helped to create several isolated abalone populations across the Western Australian coastline. The small abalone then settle on reefs and move into holes and crevices and graze on small algae and diatoms. As they grow bigger, the abalone tend to move to more open sections of the reef, where more food is available.

It is difficult to tell the age of abalone because their shell size depends on the availability of food, as well as how old they are. In some areas, abalone can form 'stunted' populations often in high densities that have different growth characteristics from other populations. These smaller abalone have a relatively slower growth than abalone in general and end up with a smaller maximum size. It is unclear whether genetic, environmental or density factors cause these stunted populations.

Generally, estimates of the ages of abalone are calculated from growth rates obtained through tagging studies. Roe's abalone are thought to live to at least 10 years, while greenlip and brownlip may live up to 13 years.

1. Juvenile abalone are found under rocks and in holes and crevices on reefs, grazing on small bits of algae.
2. As they outgrow crevices, abalone tend to move to the more open sections of reef where there are greater amounts of food. Abalone will tolerate high population densities - Roe's abalone can reach up to 400 animals per square metre.
3. Roe's abalone reach sexual maturity when they are about two-and-a-half year's old and four centimetres in shell length. The larger greenlip and brownlip abalone mature at three years of age, when they are about eight to nine centimetres in shell length.
4. Abalone are 'broadcast spawners', which means that eggs and sperm are released into the water at the same time.
5. The fertilised egg begins to divide.
6. The fertilised eggs develop into tiny larvae that hatch out during the next 24-hours. The larvae then drift and swim in the water column for about a week until they are ready to settle. They can be carried up to 50 km by ocean currents. The larvae do not feed during this time but may take up some nutrients from the seawater.
7. The larvae actively search for a suitable environment for permanent settlement. When a site is found the larvae settle and begin 'metamorphosis' – changing into a crawling 'post-larvae' that no longer have the ability to swim.
8. Post-larvae feed on tiny organisms, bacteria and microscopic algae, growing for about two to three months until their shell develops the first small opening for breathing.
9. At this stage the juvenile abalone are called "spat". When they reach about five millimeters in length they will start feeding on larger species of algae.

## Predators

As with most marine invertebrates, mortality rates of abalone are high while the animals are larvae and juveniles, but these decrease as abalone grow. Abalone are preyed upon by stingrays, fish (especially wrasses), sea stars, rock lobsters, and octopus.

In response to threats from predators, abalone can clamp themselves hard to the reef using its shell as protection – or move surprisingly fast away from slower-moving predators such as sea stars.



Photo: Larisa Vanstien

## Fishing for abalone

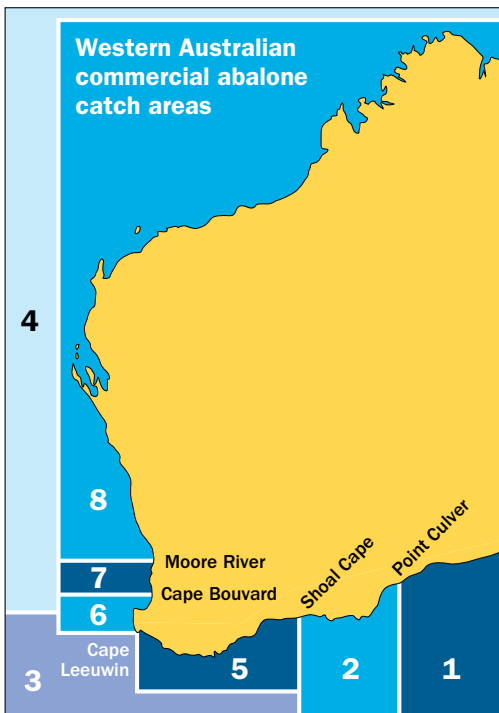
Roe's abalone are particularly abundant on shallow reef platforms around the Perth metropolitan area. Nearly 80 tonnes in total of Roe's abalone are taken annually by commercial and recreational fishers in this area alone. The reef platforms are exposed during low tide, making the fishery very accessible for large numbers of people wading out to collect abalone recreationally. Commercial divers target Roe's abalone that live in deeper water.



In a season lasting a few hours, recreational fishers intensively harvest Roe's abalone across Perth's intertidal reefs. Photo: Andrew Cribb

In Western Australia, a commercial fishery was established in the mid-1960s to supply Japanese and south-east Asian markets and coincided with the introduction of SCUBA (Self Contained Underwater Breathing Apparatus) diving.

Divers use 'hookah' breathing equipment (a surface air compressor and air hose) to harvest abalone. The compressor-related equipment is often carried by small boats but is sometimes set-up on the beach. Divers prize mature abalone from the reef using a chisel-shaped abalone 'iron'. Some divers choose to use motorised 'shark cages', which provide them with additional protection and enable the collection of abalone over a wider area.



The commercial fishery is managed by Total Allowable Catches across eight areas in the State. The minimum size limits for abalone used by commercial fishers are larger than those used in the recreational fishery, both voluntarily and through regulation.

The recreational fishery for abalone in Western Australia is strictly managed across three zones through seasons, licences, minimum size limits, catch restrictions, and possession limits.

The popularity and price of abalone worldwide has soared, causing this seafood delicacy to be overfished in many countries. The only abalone stocks that have not collapsed to date are in Australia and New Zealand.

Western Australia's commercial abalone fishery benefits from a high demand and price for abalone in international markets, particularly in Asia. Careful management of the fishery ensures that abalone is harvested at a sustainable level and the breeding stock is maintained at acceptable levels.

The high value of abalone makes them attractive to poachers and illegal fishing remains a problem throughout southern Australia.

## Algae eaters

Abalone have a rasping tongue, called a radula, to graze on algae, though they catch most food by raising their shell and clamping down on algae as it floats by. As a result, they are therefore found in greatest numbers on those parts of a reef where bits of broken-off algae tend to collect.

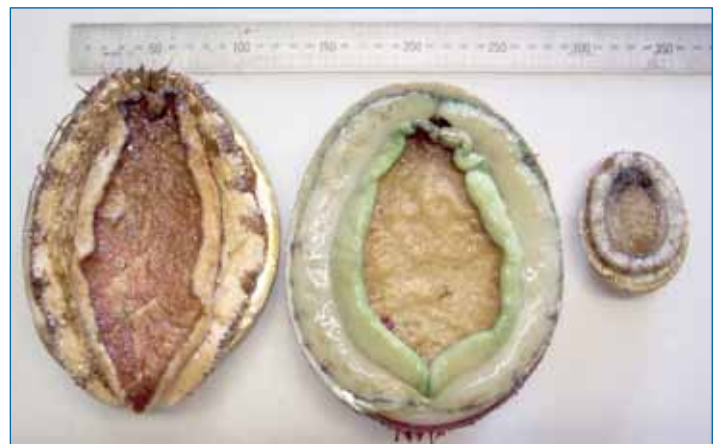
Abalone are selective feeders, showing a preference for certain types of food, particularly red algae. Drifting algae is generally more plentiful during winter, when storms tear it loose, so the growth rate of abalone is usually greater at this time of the year.



Photo: Dave Murphy

## Spot the difference

Roe's abalone have a reddish-brown sculptured shell and are small, measuring up to 12.5 cm across their shell. In contrast, greenlip shells are smooth, off-white and can measure up to 22 cm, while brownlip shells are ridged, reddish-brown, and up to 24 cm. Greenlip and brownlip abalone get their names from the coloured edge or 'lip' of their muscular foot.



Top and underside images of abalone, (from left to right) brownlip, greenlip and Roe's abalone. Photo: Frank Fabris

## Aquaculture

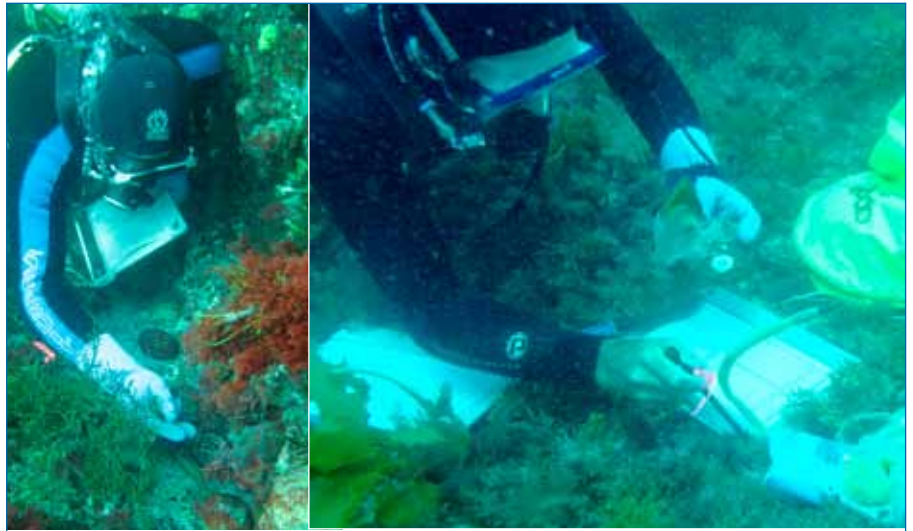
An abalone aquaculture industry in WA has been created in response to declining wild stock populations in other areas in the world and high market prices.

Abalone broodstock are obtained from the wild and reproduce under controlled conditions in a hatchery. Planktonic larval stage abalone filter-feed on microalgae and then settle on hatchery plates, which mimic a reef structure. On these plates, a slimy film of microscopic diatoms is grown as a food source for the juvenile abalone.



## Fishery science

Current research is focused on stock assessment using logbook catch and effort data that forms the basis for the setting of quota (Total Allowable Commercial Catch) in each area of the fishery. Current research initiatives include the collection of in-water diver survey data, commercially-fished abalone shell lengths, mark-recapture data, stock enhancement research programs and the use of underwater digital video equipment by industry divers to help carry out an assessment of the stock.



Diver carrying out greenlip stock assessment (left). Research tagging abalone (right).  
Photo: Jamin Brown

During the short recreational abalone fishing season along Perth reefs, a field survey is conducted involving departmental research staff and Fisheries Volunteers to count the numbers of fishers on reefs and count and weigh their catches. Less frequently, a telephone survey is used to estimate the state-wide recreational abalone catch.

## References

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## Glossary

### Collapse

Reduction of a stock abundance by fishing and/or other causes to levels at which the production is negligible compared to historical levels

### Larvae

The immature form of animals which undergo metamorphosis (a change in form) before becoming an adult

### Mortality

Frequency of death

### Radula

Tongue-like feature in the mouth of certain molluscs, consisting of rows of horny teeth used to scrape food off rocks or to create depressions in rocks that the mollusc uses for habitat

### Settle

Change from a free-swimming form to one that attaches to a substrate

### Spat

The development stage at which shellfish larvae form shells and settle out of the water column to attach themselves to reefs or the seabed

### Spawn

Release or deposition of spermatozoa or ova, of which some will fertilise, or be fertilised, producing offspring

### Stock assessment

Process of collecting and analysing biological and statistical information to determine the changes in the abundance of fishery stocks

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## FURTHER INFORMATION

Visit the Department's website at [www.fish.wa.gov.au](http://www.fish.wa.gov.au) or contact:

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