

Case study

Abalone



Disclaimer: The case study presented below is for a **fictional** species and is intended for training purposes only. The information presented in this account is not intended to reflect accurate information for any real species or the current situation within any particular country. This case study must not be cited for any purpose outside of Red List training.

Range:

This marine mollusc has a range that extends from Sitka Island, Alaska (USA) in the north, and along the coast of British Columbia (Canada) to northern Washington (USA). Its historic range extended south to Turtle Bay, Baja California (USA), however, it has been considered extinct in this part of its historic range for the last 64 years.

Population:

Even when the species' range extended to Baja California, its core range (containing >95% of the global population) was Alaska, British Columbia, and northern Washington.

Alaskan fishery data from 50 years ago to the close of the fishery 11 years ago indicate a decline in CPUE of 89.7% over this period. Now that the fishery is no longer active, there are no data available to confirm the current status of the population in Alaska. However, based on the ongoing threats, we suspect that the population has continued to decline over the last 11 years.

In British Columbia, fisheries data exist from 30 years ago up to 17 years ago when the fishery closed in this area. These data indicate a 41.4% decline in CPUE over this time period. The difference in decline rates in CPUE between Alaska and British Columbia is likely a result of different approaches in fisheries management.

Fisheries-independent data in British Columbia (consisting of population densities at survey sites along the coastline) demonstrate an 88.6% decline in population density in the central coast of British Columbia, comparing data from 45 years ago with data from 6 years ago. No direct data are available from within the last 6 years, but with ongoing threats in the area, we suspect the population here has continued to decline. An 85.5% decline in population densities has also been recorded in the Queen Charlotte Islands, comparing data from 40 years ago with the average densities recorded 5-17 years ago. There has been no significant increase or decrease in population densities observed in this area over the last 17 years.

Habitat & Ecology:

This species is a sessile gastropod that exists in a patchy distribution. Preferred habitat is rocky-shore coastline. It is an intertidal zone herbivore and is targeted by a diverse range of predators, depending on the water depth in which they occur.

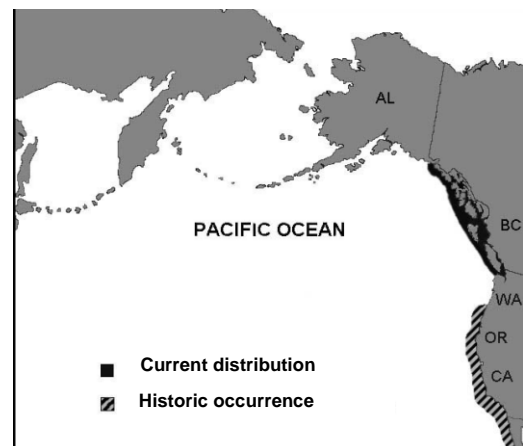


Figure 1: Map of species' global distribution. Black shading = core known distribution; hatched area = anecdotal range.



It is a long-lived mollusc, surviving up to around 40 years and reaching a maximum shell length of 15-16 cm. The species is fast growing during its first 5 years, increasing in size by an average of 19 mm per year, then annual growth rate slows down dramatically to 1-2 mm (see Table 1).

Individuals with shell length less than 50 mm are considered to be juveniles. Females with shell length 57-105 mm produce approximately 50,000 eggs each year, rising to around 157,000 eggs each year for females with shell length 106-138 mm. But once they reach 139 mm shell length fecundity jumps massively to around 11.5 million eggs per year. Young and larval stages are especially vulnerable to predation and changing environmental conditions, and natural mortality in their first year is very high (approximately 98%). Juveniles with shell length 10-25 mm have an annual natural mortality rate of 96.1%, but once they reach 25 mm shell length annual mortality reduces to 20% per year.

Table 1: Average shell length (mm) by age (years), based on measurements from >2 million samples from across 300 sites across the entire global range of the species (surveys spanning the last 20 years).

| Age (Years) | Average shell length (mm) | Age (Years) | Average shell length (mm) |
|-------------|---------------------------|-------------|---------------------------|
| <1 | <10 | 20 | 123 |
| 1 | 19 | 21 | 125 |
| 2 | 38 | 22 | 127 |
| 3 | 57 | 23 | 128 |
| 4 | 76 | 24 | 130 |
| 5 | 95 | 25 | 132 |
| 6 | 97 | 26 | 134 |
| 7 | 99 | 27 | 136 |
| 8 | 101 | 28 | 138 |
| 9 | 102 | 29 | 140 |
| 10 | 104 | 30 | 142 |
| 11 | 106 | 31 | 143 |
| 12 | 108 | 32 | 145 |
| 13 | 110 | 33 | 147 |
| 14 | 112 | 34 | 149 |
| 15 | 114 | 35 | 151 |
| 16 | 115 | 36 | 153 |
| 17 | 117 | 37 | 155 |
| 18 | 119 | 38 | 156 |
| 19 | 121 | 39 | 158 |

Threats:

Commercial fisheries for this species began more than 150 years ago, and are believed to have caused the extinction of the species in the southern part of its range. The last known commercial fishery (in Alaska) closed 11 years ago.

Poaching continues to be a problem for the remaining populations. Illegal harvest is likely to continue to pose a threat to the recovery of this mollusc. The large and mostly uninhabited coastline is a hindrance to enforcement efforts, and the high value of this species makes poaching a very lucrative enterprise. The removal of large numbers of mature individuals drastically threatens the reproductive potential of an already depressed population.



There is evidence to suggest that the species is susceptible to recruitment failure at reduced densities. This renders the population highly susceptible to recruitment over-fishing. Harvesters tend to remove all available individuals from each site visited, and the resulting reduced local populations are at risk of experiencing recruitment failure.

Sea Otters are effective natural predators of this species. Historically, the Sea Otter's range encompassed the entire range of this abalone. Over-exploitation at the end of the 19th century led to the extirpation of the Sea Otter throughout most of this range. Following major conservation efforts (translocations and reintroductions) over the last 40 years, the Sea Otter is rapidly re-establishing itself. Currently the Sea Otter's range overlaps with this mollusc only in the northernmost reaches of its distribution and it is doubtful that this natural predator is responsible for the population declines seen over the last few decades. Nevertheless, Sea Otter numbers are increasing in size and range and may pose a major problem for the now diminished abalone population.

Conservation Measures:

Several conservation actions are currently underway on behalf of this mollusc including:

- Inclusion on threatened species lists in Canada and USA.
- Development of a National Recovery Action Plan (NRAP) for the Canadian population.
- A communications campaign aimed at increasing public awareness of the decline of the species.
- Ongoing efforts to engineer its recovery through captive breeding and reintroductions;
- Recommendations for actions to curtail illegal harvest
- Recommendations for research aimed at determining the best methods for rebuilding the population, and many aspects of its biology, physiology and ecology of the species that currently are unknown.
- Ongoing monitoring projects.