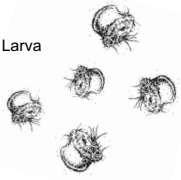


Veliger Larva



The Life History of the Northern Abalone

Scientists classify northern abalone as marine snails of the Phylum *Mollusca*, and Class *Gastropoda*, literally translated as “stomach foot.” Their scientific name is *Haliotis kamtschatkana*. Northern abalone are prevalent throughout the northeastern Pacific Ocean, found from Sitka Island in Alaska to Baja, California. They are the most northerly of over ninety described species of haliotids worldwide.

In Canada, they are commonly known as the “northern” abalone and in the United States, they are called “pinto” for their mottled white appearance. Northern abalone are most abundant in the waters of BC, Alaska and Washington, declining in numbers south of Washington. In California, seven other abalone species can be found: red, pink, white, black, green, threaded and flat abalone. Northern abalone are generally found in semi-exposed nearshore areas with firm stable substrate such as boulders and bedrock. In BC, they are found from the lower intertidal down to at least 100m, although most of the population is found at less than 10m down. Further south in California, northern abalone are found only in the subtidal area.

The population dynamics of abalone are not well understood. They are difficult to age, individual growth rates vary widely depending on living conditions, their reproductive success rate is not known, and their survival rate through different life stages is unknown. Their complex interactions with natural predators such as sea otters (a keystone predator species in semi-exposed nearshore habitats) or the sunflower sea star and with other grazing herbivores such as sea urchins, are being studied but not yet well understood.

REPRODUCTION

Like many marine invertebrates, abalone are broadcast spawners – adult abalone of separate sexes release millions of eggs and sperm into the water. Many gametes must be released at the same time in the same place for fertilization

to succeed. To increase spawning success, mature adults tend to congregate in the shallow subtidal, gathering in relatively high densities. Sometimes, spawning abalone will balance on top of one another up to 6 abalone tall! In BC, spawning tends to occur between June and August, although there may be sporadic spawning all year long.

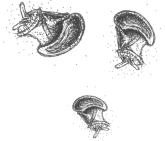
LARVAL STAGES

Within several days, the eggs hatch, beginning the free-swimming larval phase of the abalone life cycle. The first stage is a very small larvae called a trochophore, equipped with its own yolk sac for energy. The trochophore larva moves upwards in the water column, attracted to light, thus increasing its travel opportunities on surface currents. A couple days later, a larval shell starts to form and the trochophore transforms into the second stage of larval life as a veliger that is no longer attracted to the light. Chemical signals emitted from particular types of algae, including encrusting red coralline algae, stimulate the larva to undergo metamorphosis and settle. Within 5 to 8 days of hatch, the non-feeding larva changes in shape to become a very small baby abalone ready to spend its life roaming the rocks. This very short free-swimming larval stage means that larval dispersal is limited and abalone populations may be quite localized.

JUVENILES

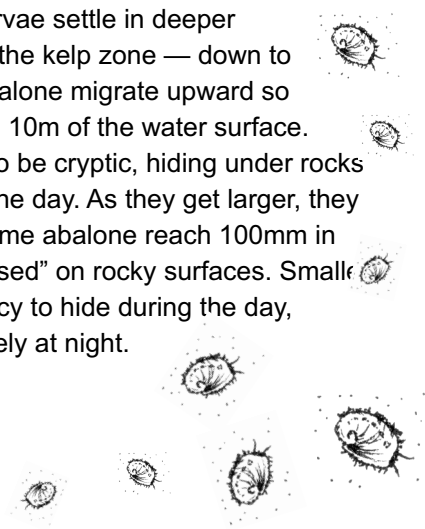
Juvenile animals less than one or two years old tend to be found on crustose red algae, generally deeper than adult animals. It is thought that larvae settle in deeper water - usually deeper than the kelp zone — down to 15m deep. As they grow, abalone migrate upward so most adults are found within 10m of the water surface. As juveniles, abalone tend to be cryptic, hiding under rocks and in crevices for most of the day. As they get larger, they tend to hide less — by the time abalone reach 100mm in shell length, most are “exposed” on rocky surfaces. Small abalone also have a tendency to hide during the day, foraging for food more actively at night.

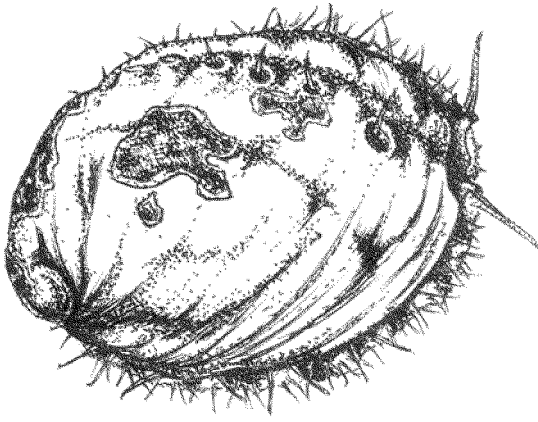
Trochophore Larva



Spawning Abalone

Juvenile Abalone





DIET

Abalone feed on algae by grazing with their long, rough “tongue” called a radula. When they are very small, juvenile abalone eat very tiny plants, grazing first on diatoms (single-celled phytoplankton) and bacteria which collect on the surface layer of encrusting red coralline algae. As they grow, juvenile abalone progress to scraping the surface layer of the coralline algae. By 6 to 13 weeks of age, crustose red algae dominates the abalone food palette. As they get larger, abalone tend to move around less, preferring to graze less and spend more time trapping drift algae for food. But not just any food will do! Experiments show that as adults, abalone prefer bull kelp (*Nereocystis*) and giant kelp (*Macrocystis*) over other kelps.

GROWTH

The growth rates of abalone are highly variable, depending on numerous environmental factors such as the quantity and quality of available food and the exposure to rough physical conditions. At the extremes, abalone fortunate enough to settle in a protected kelp forest with plenty of high quality drift algae will tend to grow much faster and to a larger maximum size than those who settle in a high exposure kelp forest with little drift algae. Different algae also provide different nutritional values. Interestingly, abalone will increase in growth rate and size when moved from difficult to more favourable habitat and food conditions. Abalone living in very exposed habitats such as parts of the west coast, may never reach a very large size — these smaller abalone are sometimes called “surf” abalone.

ADULTS

Unlike the aging of trees, salmon and geoducks, the age of abalone cannot be determined by counting growth rings. Although abalone do have seasonal growth cycles, annual growth ring formation is not consistent. Measuring, tagging and re-measuring of individual animals a year later has been the only reliable indicator of natural growth rates. From these data points, growth curves generated for abalone suggest that it takes at least 6 years, and more

often 7 or 8 years, for an abalone to reach 100mm in shell length (significant because this was the minimum size limit of the commercial and recreational harvest). By 3 years of age (~ 50mm length), gonads are maturing and by 4 years of age, individuals are generally spawning. Like many long-lived slow-growing animals, the level of egg production (fecundity) increases rapidly with size, reaches a plateau, then declines. The largest northern abalone ever documented was 165mm in length, at least 15 years old and perhaps up to 50 years old!

PREDATORS

Today, northern abalone around Haida Gwaii exist with natural predators: cabazons, wolf eels, sun stars, Pacific octopus, rock crabs, and ravens and river otters at low tide. In other areas of the coast, sea otters are a significant predator. The generally sedentary lifestyle of the abalone is disturbed when they do a little break dance to run from voracious sunflower stars! Less naturally, the odd rubber-suited poacher adds additional challenge to the survival of the species.

STATUS

Northern abalone survive in numbers much reduced by many factors, man-made and environmental — the short and severe history of commercial fishing, large-scale illegal fishing following abalone fishery closure in 1990, decline in rocky shore kelp bed areas since elimination of the sea otter, changing ocean currents and temperatures. Whatever the combination of factors, the failure of abalone populations to rebuild after the total closure in 1990 has largely been a consequence of their value as a commodity in world economic markets.

The future of BC’s northern abalone is in the hands of local communities and their survival depends largely on society’s ability to respect and cherish the species beyond its monetary value. Community participation is essential to successful rebuilding of northern abalone populations around Haida Gwaii. The choice is simple. Northern abalone are a part of Haida Gwaii tradition and culture — they are a vital part of a healthy marine community, a natural treasure.



Haida Gwaii Abalone Stewardship Project

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