

# History of *Nuttallia* *obscurata*

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Commonly known as the Varnish Clam, *Nuttallia obscurata*, is an invasive species originally from Korea, China and Southern Japan that is suspected to have been introduced into the Pacific coastal waters via ballast water from ships (Dudas et al., 2007). It is a member of the Psammobiidae family. Other common names include the Purple Varnish Clam and the Dark Mahogany Clam (Meacham, 2015). *N. obscurata* is mainly found in the upper one-third of the tidal zone, although it can also be found in the middle and lower tidal zones along the west coast from Oregon up to British Columbia (Meacham, 2015). Additionally, it is known to be more tolerant of freshwater than other species that inhabit the area (Meacham, 2015). First observed in B.C. waters in the early 1990's (Dudas, 2005), they can now be found in abundance with numbers of reaching up to 800 individuals per square meter (Dudas et al., 2006).

*N. obscurata* has a shiny brown oval-shaped shell with a purple interior (Meacham, 2015). The exterior tends to darken as it transitions from a juvenile to an adult (Gillespie et al., 1999). The shell is both thinner and flatter compared to other species (Dudas et al., 2005). The body, mantle, foot and large unfused siphons of the clam are white (Gillespie et al., 1999). The morphology of the siphons supports the observations that this is a burrowing species that can live fairly deep, down to about 30cm, in a substrate (Meacham, 2015; Dudas et al., 2005). Most commonly it is found in sand or gravel type substrates (Dudas, 2005). Even though it is considered an invasive species, it appears to co-exist with several other species such as the little-neck clams *Protothaca staminea* and *Tapes philippinarum* in the same habitat (Dudas et al., 2005).

To feed, *N. obscurata* relies on both suspension and pedal feeding (Dudas, 2005). When pedal feeding, it will obtain food both while moving (locomotion) and by extending its foot in a sweeping motion (Dudas, 2005). In both instances, the food will enter the shell on its foot once it

is retracted. Since *N. obscurata* has more than one feeding method, it has been speculated that they may have higher levels of toxins than other species that co-inhabit with them (Meacham, 2015).

*N. obscurata* have a lifespan of at least six years and have the ability to reproduce as early as one year of age which has contributed to its successful invasion of the west coast (Dudas et al., 2006). Other species of clams in the area are generally not able to reproduce until two to three years of age (Dudas et al., 2006). They have two life stages: a planktonic stage where they are able to drift according to the oceanic currents and a benthic stage where they live on their select substrate (Dudas et al., 2006). Due to a long planktonic stage of three to eight weeks, they are able to spread quite far from their origin which contributes to their successful invasion (Dudas, 2005). Since there are male, female and hermaphrodite type clams, the ratio of male to females tends to vary (Dudas et al., 2006). During the early spring to fall spawning season, females have been observed to have between 40 000 and 6 000 000 eggs depending on location and water temperatures (Dudas et al., 2006). Larval growth was observed to be proportional to the water temperature of their habitat and, on a lesser scale, inversely proportional to the salinity of the water (Dudas et al., 2006).

Predators of *N. obscurata* include raccoons (*Procyon lotor*) (Simmons et al., 2014), various crab species (Dudas et al., 2005), Lewis Moonsnails (*Euspira lewisii*), Glaucous-winged gulls (*Larus glaucescens*) and northwestern crows (*Corvus caurinus*) (Gillespie et al., 1999). Although *N. obscurata* provides an additional food source for predators and it is commercially fished, it is not very popular with humans.

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