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Green Crabs and Aquatic Invasive Species

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There are invaders in our waters and on our beaches that threaten our native species and the ecological stability of infested areas. This “biological pollution” is referred to as AIS (Aquatic Invasive Species), ANS (Aquatic Nuisance Species), NAS (Nonindigenous Aquatic Species), and a host of other terms, and includes any species that enters our ecosystem from beyond its historic range. These species threaten the abundance and diversity of native species, and affect the recreational, commercial and aquacultural activities in our marine and estuarine waters. In recent months, one of the most dangerous of these species, the European green crab, has been found in Puget Sound. This issue of the Shore Stewards News covers green crabs and some of the other species that are a threat to our local waters, and the dangers they present.

Our aquatic invaders reach our waters in a variety of ways. Some arrive along with the water ballast of ships, which includes all the living organisms in that water. Ballast water is pumped into the ship from some foreign port and dumped into our own waters. Some arrive along with imported live seafood or bait, or as microscopic hitchhikers included with shellfish for the aquaculture industry. Recreational boats brought in from out of state can transport these foreign invaders. (See illustration on page 5 on how to avoid transporting invasive marine species.) Many organisms die during the trip, or cannot survive in our own waters, though this may change as our waters become warmer. Others thrive due to a lack of natural predators or pests that keep these species in balance in their home waters.

Some of the invasive species mentioned here are already established, and have been here for several years. Some non-native invasive species of tunicates have arrived, but are generally underwater and not readily visible to the casual observer, so will not be described in this newsletter.

European Green Crabs

The European green crab, *Carcinus maenas*, is native to the Atlantic coasts of Europe and northern Africa. It has invaded both coasts of the United States, and was

first found in Washington State waters in 1998, but until recently was found only in Grays Harbor and Willapa Bay on the Washington coast. This quickly reproducing species feeds on a large variety of marine life, including clams, mussels, oysters, small crabs and polychaetes. When competing with Dungeness crabs (*Cancer magister*) for food and shelter, the European green crab is often the winner, as they are quicker and more skilled at foraging than many of our native crabs.



Photo: Washington Dept. of Fish and Wildlife

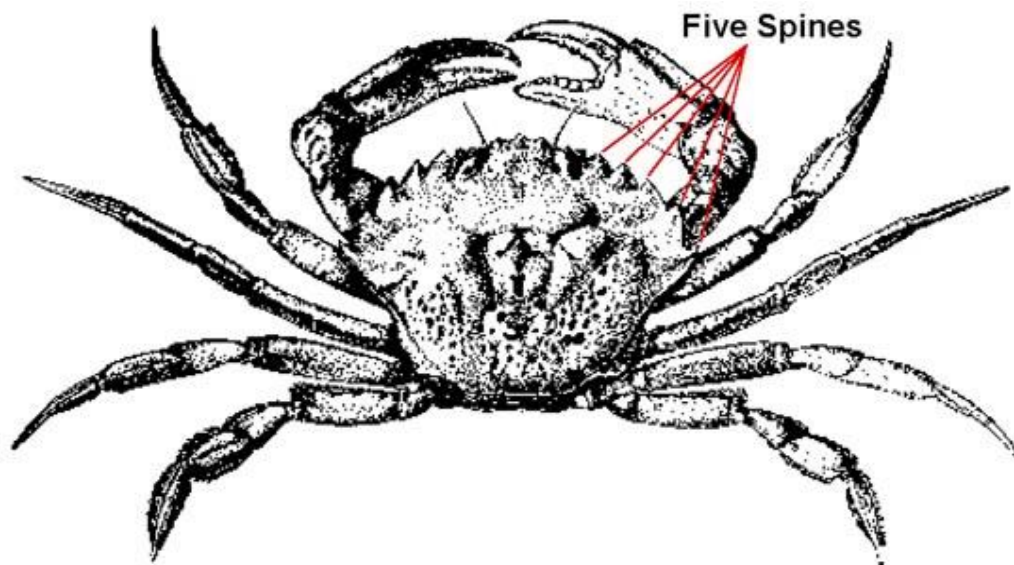
On the East Coast, green crabs forage for clams in coastal mudflat ecosystems, where they uproot eelgrass beds. Eelgrass beds provide protection for small animals and juvenile salmon, and are important food sources for migrating birds. According to an article by Hilary Neckles with US Geological Survey, “Over half of the *Zostera marina* (Eelgrass) cover disappeared from Casco Bay, Maine, largely between 2012 and 2013. Eelgrass decline coincided with a population explosion of the invasive crab *Carcinus maenas* (European Green Crab).” The shellfish industry on the East Coast estimates annual losses due to green crabs to be approximately \$22 million.

This invasive species could have a very negative impact on the recreational and commercial harvesting of Dungeness crabs, clams, oysters and mussels. In the 19th century, this crab caused severe damage to the Atlantic Coast’s soft-shell clam industry. The European green crab is also a host of a parasitic acanthocephalan worm, *Profilicollis botulus*. This worm is dangerous to the health of local shore birds that eat the green crab.

The first confirmed capture of a green crab within Puget Sound was made by a team of volunteers in late August of last year in Westcott Bay on San Juan Island. In late September, a green crab was found in Padilla Bay in Skagit County by staff from the Padilla Bay National Estuarine Research Reserve. Several more have been found in Padilla Bay since then, and in mid-April 2017 green crabs showed up in traps at Dungeness National Wildlife Refuge. Washington Sea Grant has been training volunteer monitors for several years, who have been setting traps in several locations around Puget Sound, ever since populations of green crabs were found on Vancouver Island. Once the first green crab was found on San Juan Island, Washington Department of Fish and Wildlife’s Aquatic Invasive Species Unit, including European green crab experts from Washington Sea Grant’s Crab Team, quickly went

to work to survey the area and determine the size of the population.

The European green crab is not always green. The top shell can vary in color from dark green to dark brown, and there are small, yellow patches. The color of the underside can change to a variety of colors throughout the molting cycle. The most distinguishing feature of this crab is that there are 5 spines on either side of the eyes, and there are 3 rounded bumps between the eyes. The adult is typically 2 ½ inches long, and can grow up to 4 inches. To find out more about identifying the green crab, learn more about the Sea Grant Crab Team, see a map showing updates of Puget Sound locations where volunteers are monitoring for the presence of green crabs, and learn what you can do if you sight a green crab, check out Sea Grant's excellent website: <https://wsg.washington.edu/community-outreach/environmental-threats/invasive-green-crab-volunteer-monitoring/shore-crab-id/>



E.F. Ricketts and J. Calvin 1968 *Between Pacific Tides*, fourth edition revised by J.W. Hedgpeth, Stanford University Press. From the Washington Department of Fish and Wildlife website.

The Purple Varnish, Savory, or Mahogany Clam

The varnish clam, *Nuttallia obscurata*, most likely came into our waters via ballast waters carried by ships from Asia, as it is native to the waters of Japan and Korea. Since the 1990s, the varnish clam has spread throughout the Strait of Georgia and the Gulf Islands in Canada, down into the Strait of Juan de Fuca, the San Juan Islands, and much of Puget Sound.

They are now commonly found throughout the marine waters of British Columbia, Washington and Oregon, seen in the upper third of the intertidal zone, often near fresh water inputs. One concern is that this clam may have an impact on our Manila clam's habitat (*Venerupis phillipinarum*); you may have seen these purple shells on the beach in locations where you previously found other clam shells.



The varnish clam is easily identified, as it does not look much like any other clam found on our beaches. The shell is relatively flat, and has a brown-colored outer coating that has the appearance of peeling off, similar to old varnish on a piece of furniture. If you look inside the shell, it is purple throughout. They grow to about three inches long, and are often found buried deeper than native littleneck or Manila clams.

There is little that can be done to control this species; in British Columbia, they have been renamed the “Savory Clam” in an attempt to get recreational clam diggers to gather them up and take them home for dinner. If you do decide to harvest varnish clams, be aware that they accumulate more toxins than other clams, and retain them longer, so check shellfish safety and beach closure sites before you harvest.

Japanese Oyster Drill

The Olympia oyster, *Ostrea conchaphilia*, is the only oyster that is native to Washington, and was an important food source to Native Americans. Formerly an abundant species, these oysters were prized by settlers, and schooners carried shiploads of this oyster from Washington to San Francisco in the 1850s and 1860s. By the 1870s, the populations were significantly depleted. In the 1930s, oyster cultivators began importing the Japanese or Pacific oyster, which are larger and faster growing than the native Olympia oyster, and thrive in our waters. The Pacific oyster soon displaced the Olympia in many of their cultivated beds. When Pacific oyster seed was imported from Japan, a predator came along with the cargo: the Japanese oyster drill, or *Ceratostoma inornatum*. The oyster drill is a small snail that drills a hole in the young oyster and eats the meat. These drills do not move by



Japanese Oyster Drill on Pacific Oyster. Photo: Washington Dept. of Fish and Wildlife

themselves, but are transported around the Sound on shells of oysters. It is therefore important for oyster growers to avoid transporting the oyster drill through their transplanting practices. The state has established drill-free tidelands, and there are regulations in effect that quarantine the drills and prohibit their introduction into these drill-free areas.

The Skokomish Tribe is experimenting on a method to control oyster snails using cinderblocks. Oyster drills like hard vertical structures where they can gather and lay their egg cases, then spread pheromones to attract other drills. In 2014, the tribe set out 72 cinderblocks on the tidelands, planning to later remove the blocks and the drills that latched on, along with their egg cases. Many commercial oyster growers located in infested areas normally wait for oyster drills to congregate together in the spring for mating and forming egg masses, then collect the drills and egg cases by hand.

References/Resources

Some info in this newsletter is from the July 2006 Shore Stewards Newsletter, by Scott Chase, WSU Extension Island County

Natural Resources Defense Council, 2016: [Puget Sound Braces for the Worst: A Green Crab Plague](https://www.nrdc.org/stories/puget-sound-braces-worst-green-crab-plague)

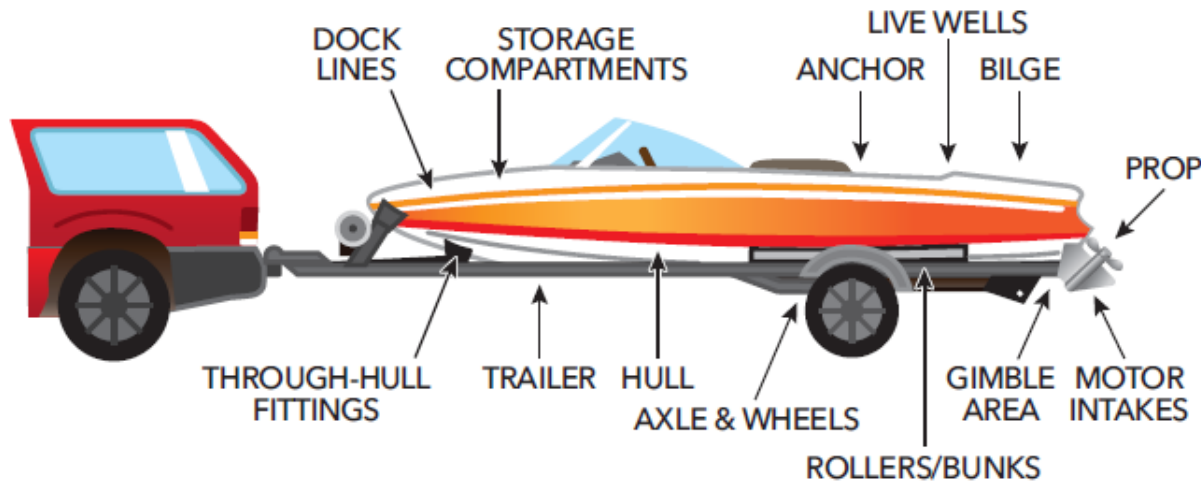
Encyclopedia of Puget Sound: [Invasive Species](https://www.eopugetsound.org/terms/174)

Encyclopedia of Puget Sound, [Salish Sea Currents series on invasive species](https://www.eopugetsound.org/magazine/invasive-species):

Peninsula Daily News, [Invasive European Green Crab Found in Dungeness Bay](http://www.peninsuladailynews.com/news/invasive-european-green-crab-found-in-dungeness-bay/):

Q13 Fox TV News: [Invasive green crabs found in Puget Sound](http://q13fox.com/2016/10/03/green-crabs-found-in-puget-sound/)

Before Leaving or Launching: Inspect Everything!



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