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Vignette 19: Invasive European Green Crab

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19 INVASIVE EUROPEAN GREEN CRAB

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European green crab (*Carcinus maenas*, EGC; Figure 1) pose documented threats to cultured and wild shellfish, eelgrass, and shoreline habitats and ecosystems. EGC diets include clams, oysters, mussels, marine worms, and small crustaceans. Because they can prey on juvenile crabs and shellfish, dense populations of EGC in the Salish Sea region could put fisheries and aquaculture resources in peril. EGC also play a role as ecosystem engineers, disturbing sediments and destroying below-ground tissue of plants while digging for food and burrows, decreasing stability of saltmarsh banks, drastically reducing eelgrass density (up to 75% in Nova Scotia and Newfoundland), and damaging nesting and feeding habitat for shorebirds and nursery grounds for fish and invertebrates.

After Fisheries and Oceans Canada researchers reported an established EGC population in Sooke Basin, BC in 2012, the Washington Department of Fish and Wildlife (WDFW) worked with Washington Sea Grant (WSG) to secure Puget Sound Marine and Nearshore Grant Program funding and establish a volunteer-based early detection and monitoring program (Figure 2). WSG launched Crab Team (wsg.washington.edu/crabteam) in 2015 with seven pilot sites. The program expanded to 26 sites the following year and has monitored more than 50 sites each year since, engaging hundreds of community members and partner staff in monthly monitoring of invertebrates, fish, and habitat in Puget Sound pocket estuaries, lagoons, and tideflats. Concurrent with early detection monitoring, a team led by WDFW developed the Salish Sea Transboundary Action Plan for Invasive European Green Crab, providing a foundation for prevention, early detection, rapid response, research, and coordinated management throughout the Salish Sea.

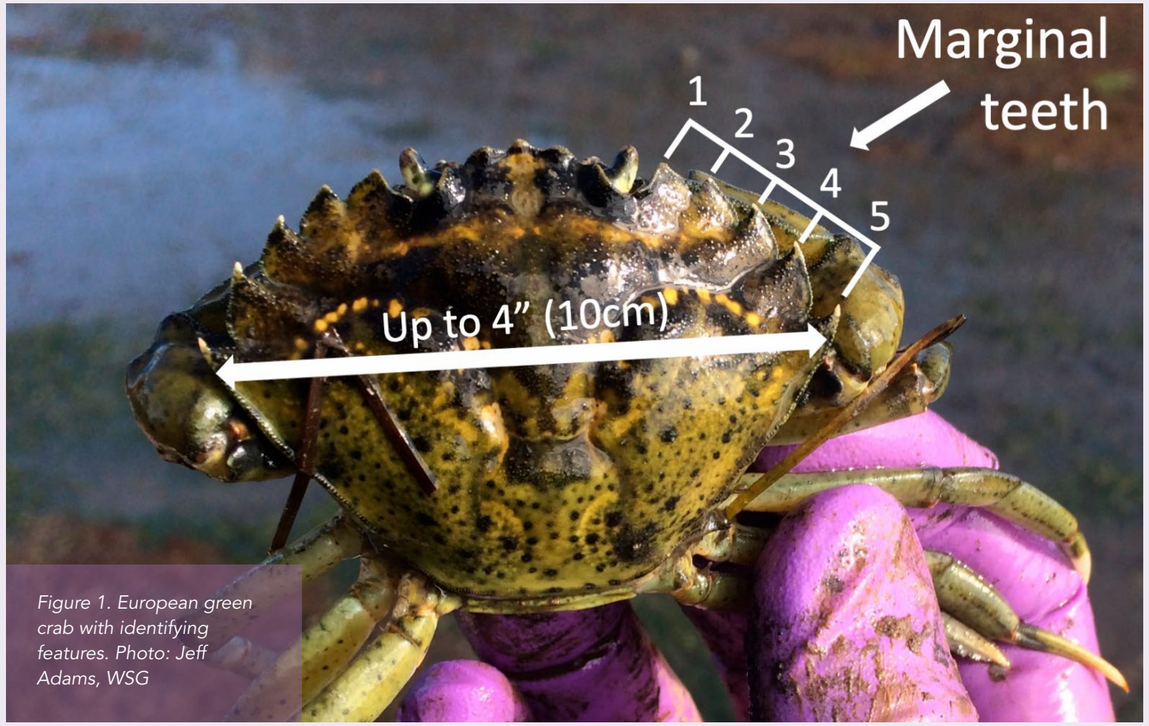

Figure 1. European green crab with identifying features. Photo: Jeff Adams, WSG

The first EGC detections in Puget Sound were made in 2016 by Crab Team volunteers on San Juan Island and by Padilla Bay National Estuary Research Reserve (PBNERR) staff in Padilla Bay (Figure 2). Follow-up rapid assessments detected only a molt on San Juan Island and three additional EGC along the shores of Padilla Bay. In 2017, the first discovery of more than two EGC at a single Puget Sound location occurred at Dungeness National Wildlife Refuge. The response by Refuge staff and volunteers, with support from WDFW, WSG, and other partners, was swift, intense, and sustained. Thousands of trap sets since then have removed over 220 EGC around Dungeness Spit, resulting in a catch per unit effort (CPUE) of 2.44 EGC/100 trap days (2016-2019). These efforts have been largely successful in reducing the abundance of EGC within the refuge; CPUE in 2020 was only 0.2 EGC/100 trap days.

At the same time, detections have increased in other locations. In 2019, EGC were reported across a broad swath of northern Puget Sound. Aquaculture partners in Samish Bay, WDFW staff in Chuckanut Bay, and Crab Team volunteers in Drayton Harbor all recovered evidence of EGC, prompting rapid assessment efforts in 2019 and a sustained response in 2020. Across northern Puget Sound in 2020, CPUE ranged from a low of 0.8 EGC/100 trap days

in Padilla Bay to a high of 75.3 EGC/100 trap days in Lummi Bay within the Lummi Sea Pond. Multiple cohorts were observed at many locations, as well as some evidence of local reproduction.

COVID-19 restrictions and precautions slowed and delayed the response in 2020, but the Lummi Nation, WDFW, and Northwest Straits Commission (NWSC) were eventually able to deploy crews for both removal and exploratory trapping. WSG volunteers and PBNERR staff continued long-term monitoring

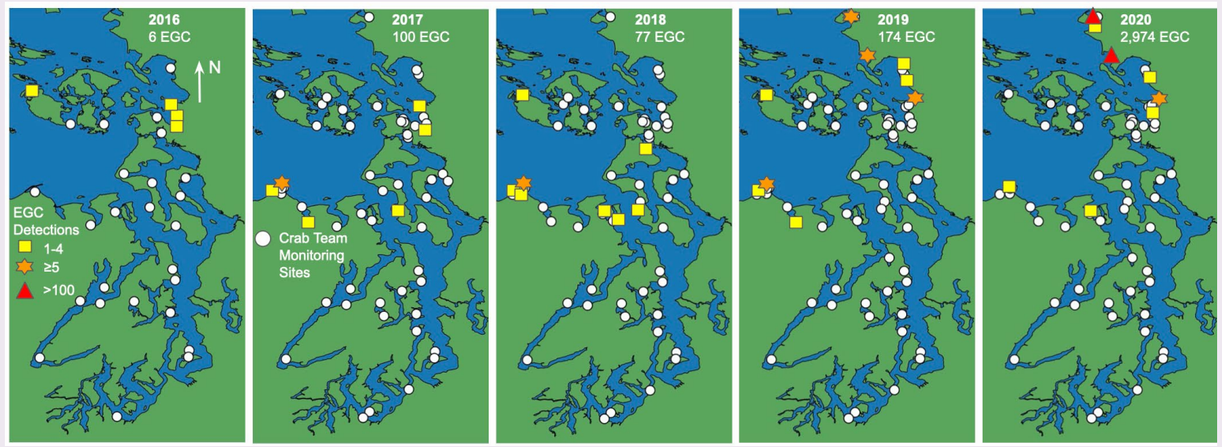

Figure 2. European green crab trapping in Puget Sound by location and year. Yellow squares indicate sites where fewer than five EGC were detected in the year, orange stars indicate sites with 5-99 detections, and red triangles indicates sites with 100 or more detections within the year. Crab Team monthly monitoring network (with the exception of Pysht, west of Port Angeles and beyond the map extent) are identified by white circles. The interactive map is available at tinyurl.com/wagreencrab.

without interruption, and aquaculture partners were able to set traps in Samish Bay. The Lummi Nation continues to devote staff and resources to trapping in Lummi Bay, and the NWSC was able to secure a local coordinator for Drayton Harbor using USEPA National Estuary Program funding for 2019-2020, which continues to present. The Washington State Legislature also provided funding to WFDW to implement an enhanced collaborative response and monitoring effort in Puget Sound as well as assessment efforts on the state's Pacific Coast; these efforts are ongoing. In addition to monitoring and removal, research continues on several fronts, including population genetics, parasite prevalence, and diet composition. This work, as well as lessons from removal trapping at Dungeness Spit, Makah Bay, and elsewhere, will continue to inform detection and control efforts across the Puget Sound region to reduce risk of spread and impact from EGC.

The coordinated response by WDFW and WSG Crab Team, along with tribal, state, and federal partners, and committed volunteers serves as a model for management of invasive species within the Salish Sea. Indeed, efforts to identify and eliminate nascent infestations have proven successful in many locations because of early detection and rapid response. However, as prevalence of EGC increases elsewhere in the northeastern Pacific, it is important to increase capacity to address the threat regionally.

Left and above: As part of the Washington Sea Grant's Crab Team program, volunteers evaluate habitat and monitor for invasive European green crab with baited traps. Source: University of Washington