



# PACIFIC SALMON FOUNDATION



Invasive Species

## INVASIVE EUROPEAN GREEN CRAB EARLY DETECTION MONITORING

Marine Science Program Newsletter

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*Tsartlip First Nation Aquatic Habitat Restoration Program participating in training with the Pacific Salmon Foundation and Coastal Restoration Society.*

*Photo by Richard Underwood. Cover photos by Mitch Miller (top), Maria Catanzaro (left, centre and right)*

The Pacific Salmon Foundation has partnered with the Coastal Restoration Society (CRS) to build capacity for European green crab early detection monitoring in BC waters through the 'Pacific Region European Green Crab Mitigation and Capacity Development Project'. With regular monitoring within priority gap areas, it is hoped the crabs can be detected before they become established in new areas and a coordinated response can be initiated to help prevent further spread and subsequent damage. The project is funded by the Department of Fisheries and Oceans Canada through their Aquatic Invasive Species Program through March 2025.

## ABOUT EUROPEAN GREEN CRABS

### Background

European green crabs (*Carcinus maenas*) are widely known as one of the world's worst invasive species. They are native to coastal areas of Europe and North Africa, but have been introduced to several places around the world where they have caused ecological and economic damage. In 1989, green crabs were first found on North America's west coast in San Francisco Bay. They quickly became established and have since expanded their range northward, landing in British Columbia in 1998. In BC, populations are now established on the west coast of Vancouver Island and there have been a number of sightings in the Strait of Georgia, Queen Charlotte Sound, and Haida Gwaii.



*Photo by Maria Catanzaro*

*Kyla Sheehan (PSF) and Christine Spice (DFO) conducting European green crab early detection monitoring.*

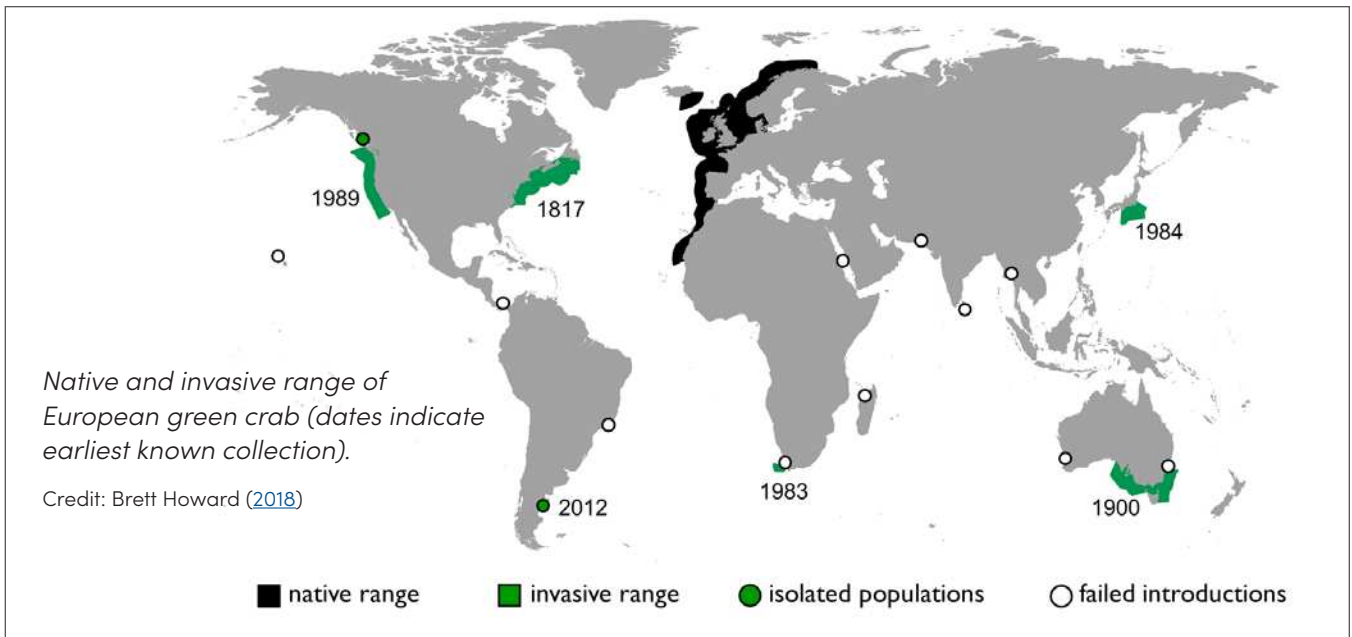


Photo by Allie Simpson

European green crabs are not necessarily green, they come in a range of colours.

Climate change stacks the deck in favour of green crabs to be able to continue expanding their range. As BC waters warm, more areas will become suitable for the pest; and, as currents shift, they may disperse to new areas. As a result, there are concerns green crabs will become established in new locations in the Salish Sea and additional areas in the north along BC's central coast.

European green crabs are medium-sized intertidal shore crabs that can grow up to 10 centimetres in width. Despite their name, green crabs may be red, orange, brown, or green. Part of what makes green crabs such successful invaders is that they can survive in a wide range of habitats and environmental conditions. They prefer muddy sheltered areas, but they can be found in rocky beaches, tidal flats, marshes, and in river mouths. Green crabs can inhabit areas between the high intertidal to depths of 20 metres and they are able to tolerate freezing temperatures up to 35°C as well as varying salinity. They are also highly fecund. Female green crabs release approximately 185,000 eggs once or twice a year, meaning, over a typical life span of 4-7 years, a female green crab may release up to a million eggs! Those subsequent larvae can then live up to 90 days in the currents, and spread to new destinations.



European green crab  
Illustration by Anisha Parekh



## HOW TO IDENTIFY A EUROPEAN GREEN CRAB

Several native shore crabs are green or have a similar appearance that could be confused with European green crabs. The best way to identify European green crabs is by their five distinct marginal teeth (points) on either side of the eye. It is also worth noting that not all European green crabs are actually green in colour, their colouration varies from orange to brown. See the photo for the identifying features and check out the [Crab Field ID Guide](#) created by the Washington Sea Grant.

### Impacts

Not all non-native species are considered invasive. To be an invasive species, a non-native species will be able to aggressively colonize and cause ecological or economic damage. This is the case with European green crabs, which can cause significant damage and disruption to nearshore environments. They compete with native species for food and shelter and prey upon native species such as oysters, mussels, clams and other juvenile crabs. Eelgrass and salt-marsh meadows, which are important rearing areas for native species including Pacific salmon, can be uprooted by green crabs digging for food and burrowing. Because of this, there are concerns that green crab activities also increase bank erosion. As well as impacts to Pacific salmon, European green crabs affect First Nations communities that depend on healthy, balanced ecosystems.

### Invasion Tendencies

In early stages of invasion at a new location, European green crabs are often found higher up in the intertidal — even as high as the tidal reach in a river where the salinity is quite low. They tend to be found in locations where prey species, such as native shore crabs, shellfish, sculpin and snails, are present and where they have less competition from other larger native crabs. In the early stages when green crabs are trying to establish, they prefer low wave action, softer substrates, beaches that have shallow slopes, isolated lagoons, meandering channels with undercut banks, tidal flats with pools that don't drain at low tide, and cover (e.g., log debris, marsh vegetation, or seaweed). If European green crabs become established, they typically move into deeper habitats which can include subtidal eelgrass meadows.





Photo by Mitch Miller

## OUTREACH AND CAPACITY DEVELOPMENT

Controlling and managing the spread of European green crabs is a high priority within the Pacific Region. As such, DFO engaged PSF and CRS to build capacity and deliver green crab detection monitoring training with Indigenous and non-Indigenous partners in coastal communities in priority gap areas within the Salish Sea, northern portions of the South Coast (i.e., Johnstone Strait, Discovery Islands, Broughton Archipelago, etc.), and the Central and North Coasts of British Columbia.

### Materials and Methods

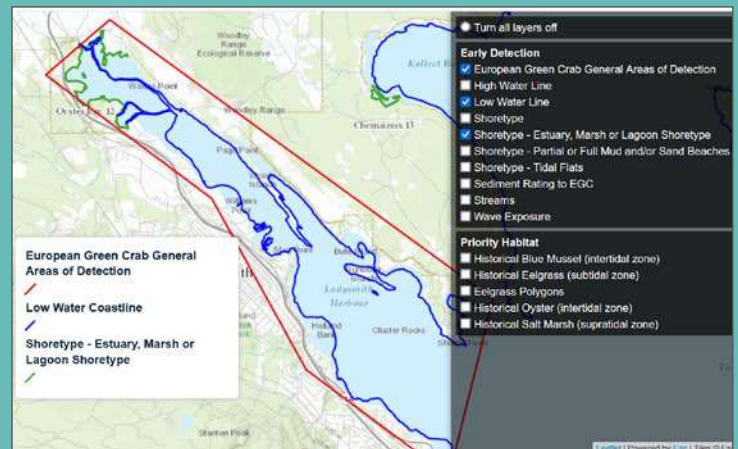
In 2023, as the first year of the project, the team was busy getting the project off the ground.

The first step was developing the survey protocols, which involved a dive into the existing methodologies as well as creating other tools and practical guides necessary for the project. All of the protocols and supporting materials are posted [online](#), and include:

1. **A comprehensive protocol**, which is designed as the primary reference material. It includes informative photos and step-by-step directions for site selection, setting and retrieving traps, and instructions on what to do if a European green crab is found.
2. **A simpler ‘Quick Guide’** outlines the key steps for someone already familiar with the protocol and serves as a reference in the field.
3. **Easy-to-use applications for tablets and phones** for data collection and storage.
4. **Supporting information** such as data sheets, local contacts, permit requirements and tips are also provided in the training and online.
5. **Site selection tool**, an interactive mapping tool to help identify survey areas.

## THE SITE SELECTION TOOL

To help communities plan their surveys, the Strait of Georgia Data Centre created a [site selection tool](#). The tool is a map interface with spatial data layers of shoreline features, habitats, freshwater influence, and prey availability that match conditions of where European green crabs tend to first be found and become established. Local areas of interest along the coast can be zoomed into with the various layers of data switched on and off to prioritize locations for scouting. While the site selection tool does not replace on-the-ground scouting for suitable locations to monitor, it can help identify target areas ahead of time.



A screen capture of the site selection tool showing areas where conditions are likely favourable for green crab settlement.



Photo credit: Olam Films

## THE SURVEYS

The PSF and CRS team led their first community through training and trapping in May 2023 and continued delivering training to additional First Nations communities and other stewardship groups through the summer and fall. For each community, the PSF and CRS team procured, assembled and distributed the sampling equipment required, and a grant was provided to each community to assist with additional monitoring costs.

Prior to embarking on the on-the-ground surveys, participants first acquire a certificate by completing an [online training module](#) on species identification and trapping procedures offered by the Invasive Species Council of BC. An initial planning meeting (either virtual or in person) is then set up to discuss where green crab may be found when they are invading a new area, concerns and priority locations for each community, and for virtual scouting of potential suitable monitoring sites using the Site Selection Tool. This is then followed by two days in the field guided by a PSF and CRS team.

On the first day, the PSF and CRS team provide an overview of European green crab, invasive tendencies, trapping methods, and identification tips. Then the crew discuss several potential locations to visit to see if they are appropriate sites to work in – i.e., easy access, signs of food and shelter for green crab, standing water at low tide, freshwater influence, and the absence of larger crabs. The crew scouts each site and typically deploy minnow and folding prawn traps at two of the sites. Six traps, alternating between minnow and folding prawn traps, are deployed and secured in place every 10 m at each site; each trap contains pieces of herring for bait. Where high tidal currents are expected, the six traps are strung together by rope to form a set and secured in place; weights or rebar are often included at each end of the line to help keep the traps in place. Otherwise, traps are secured individually by J shaped steel rods or by tying the trap to a sturdy tree branch with rope.



Photo by Maria Catanzaro

*A green crab being measured across its carapace.*



Photo by Hannah Gentes

*Peninsula Streams and Shorelines participating in training with Tyranna Souque, from the Coastal Restoration Society.*

On the second day, the crews return to retrieve the traps and record the contents. As a trap is brought out of the water, it is emptied into a sorting bin to count and identify the species caught. Fish, which are less adapted to spending time out of water, are counted first and quickly returned to the water. Then, the sex and species of native crabs are recorded and the first 10 males and females of each species are measured before being returned to the water. If any European green crabs are found, they are all measured, sexed, and it is noted if any females have eggs (berried). Contacts at DFO are then notified of the detection and all the green crabs are retained for genetic identification and humane disposal.

Information on all European green crab (sex, carapace width), native species by-catch counts, time set, time pulled, and coordinates are recorded.

Afterwards, the community discusses whether the site characteristics were suitable for monitoring and sites are officially selected. Monitoring occurs during months with appropriate low tides (typically April to September) and based on the capacity of each group.

As of October 2023, the PSF and CRS crew have provided training on green crab early detection monitoring methods to 13 groups. There have been two groups in the North Island region, three in the North Central Island region, one in the Pacific Rim region, six in the South Island region, and one group in the Sunshine Coast. The crew and communities had quite an adventure, often trekking through forests and mud flats, and getting stuck in the mud more often than not!



Photo by Maria Catanzaro

*Retrieving traps at low tide.*

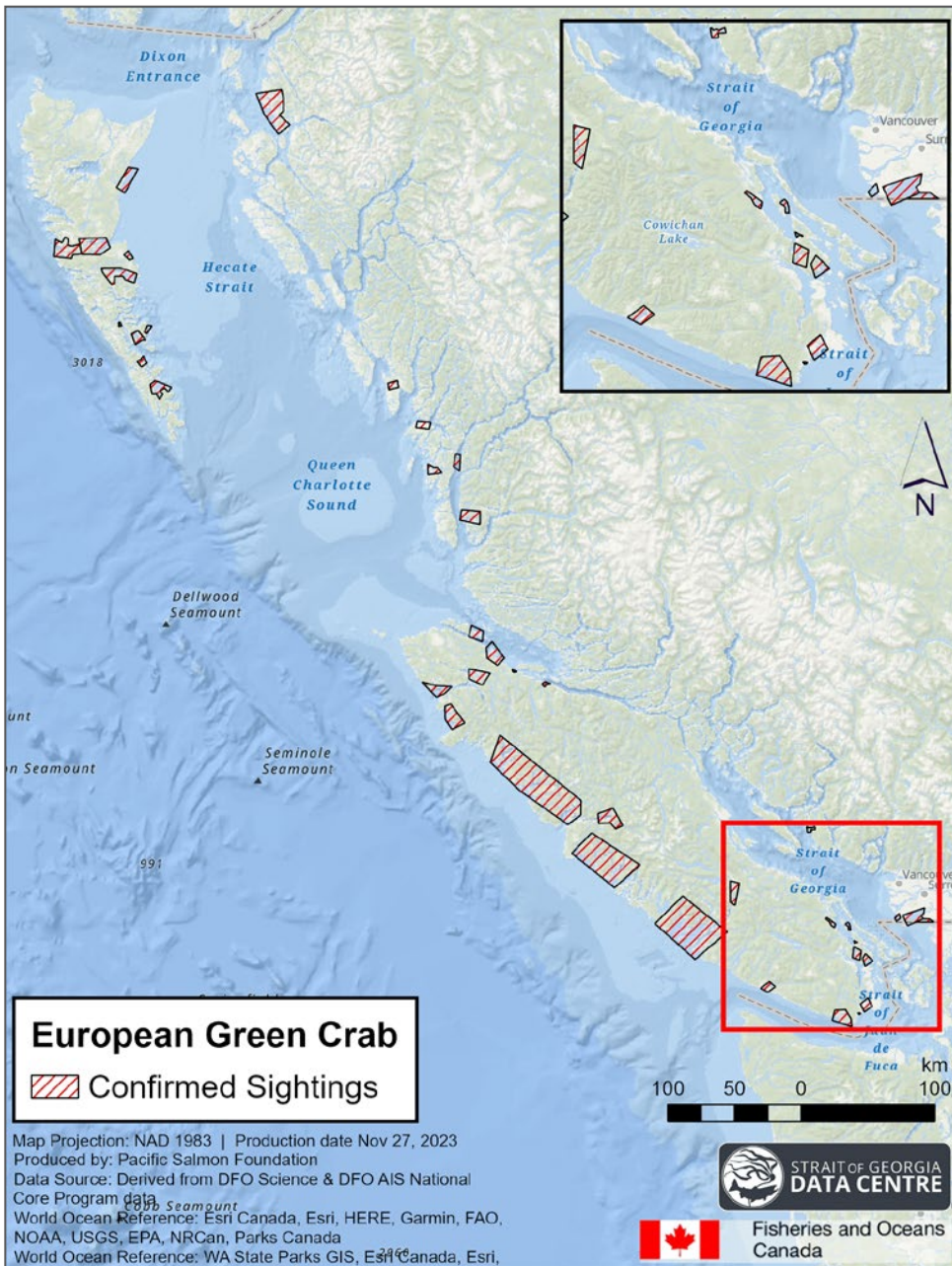


Photo by Maria Catanzaro

*Hannah Gentes and Tyranna (CRS), conducting early detection monitoring.*

## NEXT STEPS

Training for early detection monitoring is typically conducted from April to September, so now until the next season, the PSF and CRS crew will continue to support existing groups with assistance as needed and prepare for next year. They plan to expand the early detection monitoring by training new interested groups in priority gap areas and supporting existing groups as needed. The crew are also creating educational materials, like informative how-to videos, to share with the participating and new groups.



Monitoring new areas as well as in areas that have nearby established populations, can help British Columbia respond quickly and [stop the spread](#) before European green crab get a chance to establish. This allows for early, more effective, and less costly intervention actions to be taken to mitigate green crab impacts. An added benefit of the project is the increased awareness of green crabs among the individuals trained who can share their knowledge. More broadly, communities are also encouraged to apply for informational signage, which can be requested [here](#).

The team will also meet with scientists in Washington early 2024 for a green crab larval workshop. This workshop will provide the opportunity to learn how to identify green crab larvae. It is hoped that adding this larval ID to their tool kit can help stop the spread of invasive green crab with multiple methods.

*The areas where European green crabs have been found in BC coastal areas. Data from DFO and this project are stored in and mapped by the Strait of Georgia Data Centre.*

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