



IEGC ANNUAL REPORT 2023

FRIENDS OF SEMIAHMOO BAY SOCIETY

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FUNDING AND VOLUNTEER ACKNOWLEDGEMENTS

*Thank you to those who contributed funding & inkind to monitor and trap the
Invasive European Green Crab in Boundary Bay.*



Vancouver Fraser Port Authority



Little Campbell Hatchery Society



Fisheries and Oceans Canada, Pacific Region



Fisheries and Oceans
Canada

Pêches et Océans
Canada



Thank you to those contributing inkind training, mentorship & equipment

Fisheries and Oceans Canada (DFO), Invasive Species Council of BC,
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Northwest Straits Commission

A special thank you to all the committed community volunteers who gave their time for training, participating and donating travel expenses.

A Rocha Canada Lanie Fung, Site Leader and team; Semiahmoo First Nation; Invasive Species Council of BC; City of Surrey Youth Group; Friends of Semiahmoo Bay Society Site Leaders Kathy Takasaki, Kristina Johnston, Phillip Milligan, Bridgette Epp and the over 25 volunteers who participated. Special appreciation for Diane Watson and Marg Cuthberts' guidance and coordination throughout the 2023 trapping season.

*The Friends of Semiahmoo Bay Society respectfully acknowledges the Fraser delta Boundary Bay watershed is on the traditional, ancestral & unceded territories of Kwantlen, Wsanec, Stz'uminus, Sto:lo, Katzie, Semiahmoo, Coast Salish, Hul'qumiinum Treaty Group, Tsawwassen, Musqueam, Tsleil-Waututh and Kwikwetlen First Nations and all South Coast Salish peoples on whose land we live and work.



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INTRODUCTION

Background

The Friends of Semiahmoo Bay Society (FoSBS) is a provincially registered, non-profit society working as environmental stewards in **conservation, community science, education and restoration** in Boundary Bay and the Fraser River Delta. Since 2001, our mission has been to **preserve, restore and raise knowledge** of the ecological values the Boundary Bay ecosystem and watershed provides to the community. For the past twenty-two years, FoSBS has led eelgrass meadow mapping and monitoring, marine shoreline surveys with the Shorekeepers program, and comprehensive forage fish spawning habitat surveys. We have initiated the Coastal Shoreline Inventory Mapping project and the Georgia Basin Habitat Atlas: Boundary Bay. Additionally, beach cleanups and riparian enhancement projects have been consistent programming throughout the years that we have been in operation. Hence, the Friends of Semiahmoo Bay are well situated to monitor and trap the IEGC across Boundary Bay sites. In 2020, FoSBS committed to a collaboration with the Department of Fisheries and Oceans, the Invasive Species Council of BC, and community partners. Building upon their 2007 Forage Fish spawning habitat survey in Boundary Bay, FoSBS launched the forage fish spawning habitat survey methods workshop August 27th, 2023 with ongoing monthly sampling. For more information about FoSBS, visit www.birdsonthebay.ca

The Invasive European Green Crab

The IEGC (*Carcinus maenas*) was first detected in Canadian water systems in 1951 in southwest New Brunswick and has since expanded to many other locations in Atlantic Canada.¹ This species' ability to transfer easily as plankton via ballast water and/or ocean currents over an 80-day period has allowed it to spread throughout Eastern Canada, damaging coastlines significantly.

Canada's marine ecosystems and economy have been detrimentally impacted by this incredibly destructive invasive species. It is an effective predator in killing bivalves, destroying eelgrass beds and impacting native invertebrates and fish. These dangers are just the beginning as the IEGC continue to establish and could pose a significant threat to clam and oyster fisheries in BC.² This species likely arrived in BC through larval transport between

¹ DFO citation

² University of Washington: College of the Environment (n.d.). European Green Crab. Retrieved December 03, 2020, from <https://wsg.washington.edu/crabteam/greencrab/>



1998 and 1999. In BC, this species is found along the entire West Coast of Vancouver Island from Barkley Sound to Winter Harbour with isolated populations in the Central Coast and Haida Gwaii (Figure 1). In Boundary Bay, the species was first detected in 2019 by the Department of Fisheries and Oceans Canada (DFO). Friends of Semiahmoo Bay Society (FoSBS) joined the Working Group composed of DFO, Tsawwassen First Nation (TFN) and the Vancouver Fraser Port Authority (VFPA) in 2020 to continue in our mission of protecting Boundary Bay and watershed.

In 2021, the FoSBS Marine Coordinator organized trappings at 6 survey sites within Boundary Bay. The coordinator arranged survey locations and methods with DFO and gathered volunteers in groups of four. The field season lasted from May to November 2021. During this time, 8 IEGC were captured by FoSBS. In 2022, FoSBS reorganized the trapping sites with a Site leader who signed onto trapping dates whereupon volunteers could then sign onto any of four sites on dates that worked for them. Fourteen IEGC were captured at Blackie Spit only.

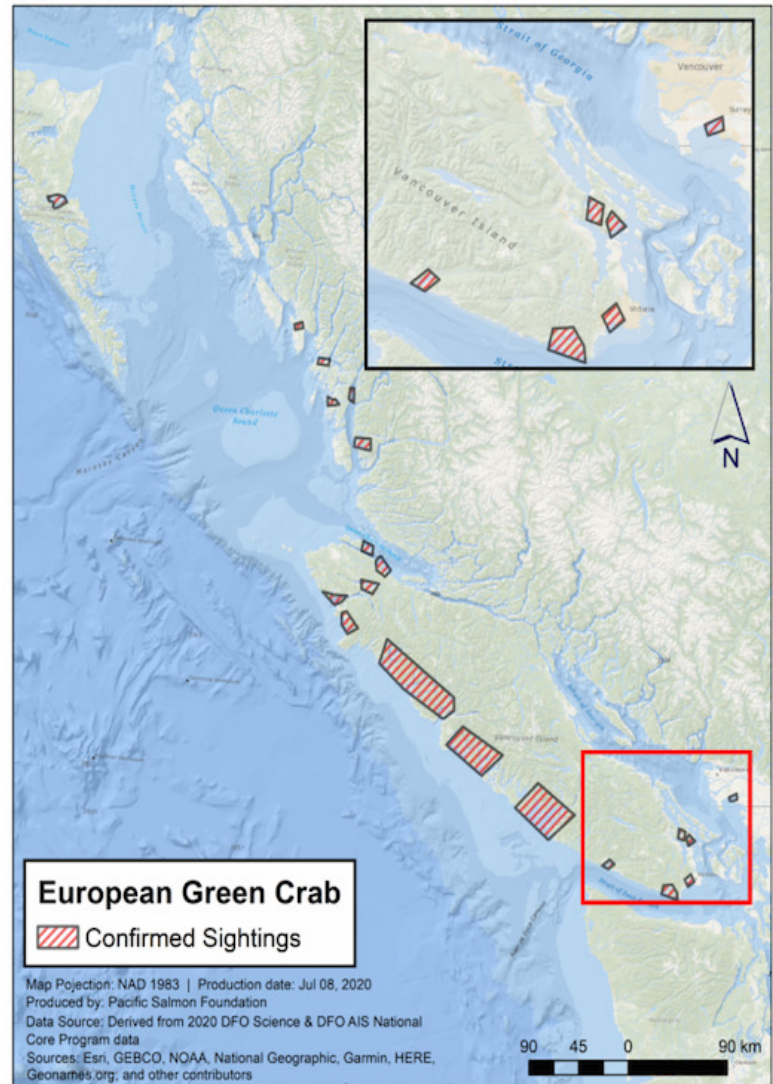


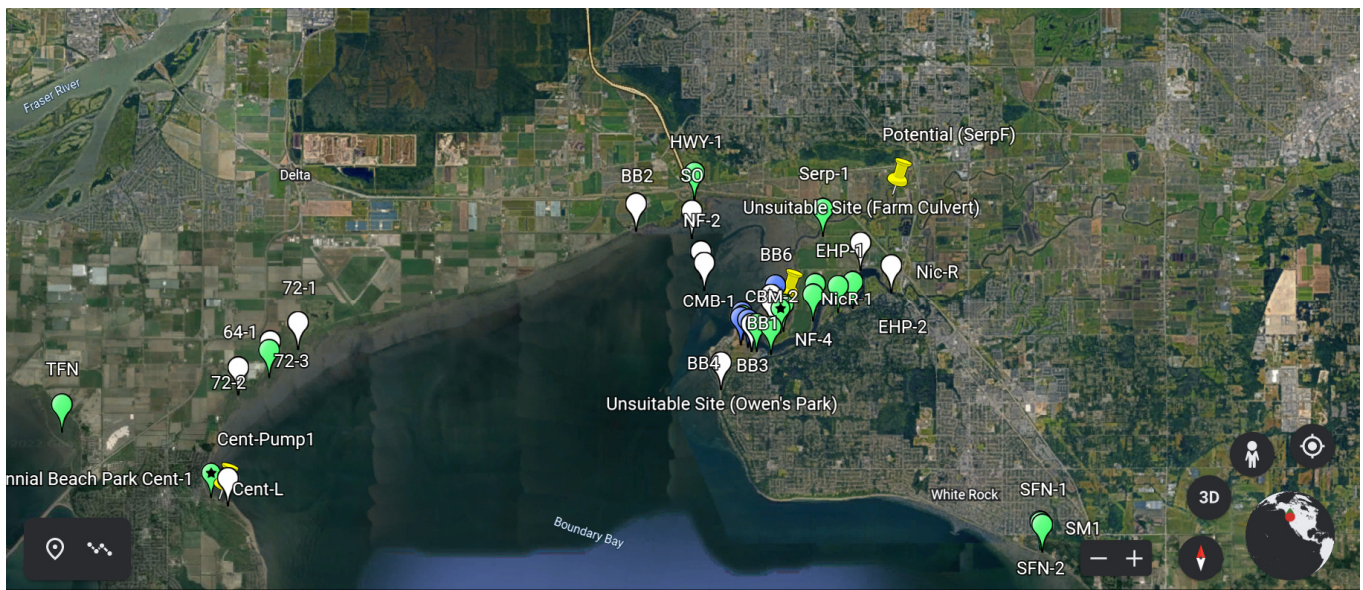
Figure 1: Confirmed sightings of European green crab in B.C. as of July 2020



METHODOLOGY _ SURVEY SITES

In 2019, DFO assessed survey sites within Boundary Bay based on IEGC habitat preferences and accessibility for volunteers. Sites were categorized as high, medium, and low priority. In 2020, FoSBS surveyed 3 high and 2 medium priority sites. We continued to follow these recommendations and further surveyed additional medium and low priority sites, under DFO's approval.

Figure 2: Screenshot below provided by DFO, Boundary Bay locations trapped since 2019. This includes sites that were identified as not suitable habitat and/or sites that were deemed not safe for volunteers to access regularly. Trapping will not continue in those locations.



As in 2022, FoSBS volunteers continued to survey 3 high priority sites and project partner A Rocha Canada surveyed the Little Campbell River estuary with Semiahmoo First Nation in 2023. DFO continued to monitor other sites in the bay and in the Fraser River estuary with Tsawwassen First Nation. See Table A below:

Table A: The list of high priority sites surveyed by FoSBS and project partner A Rocha in the 2023 season.

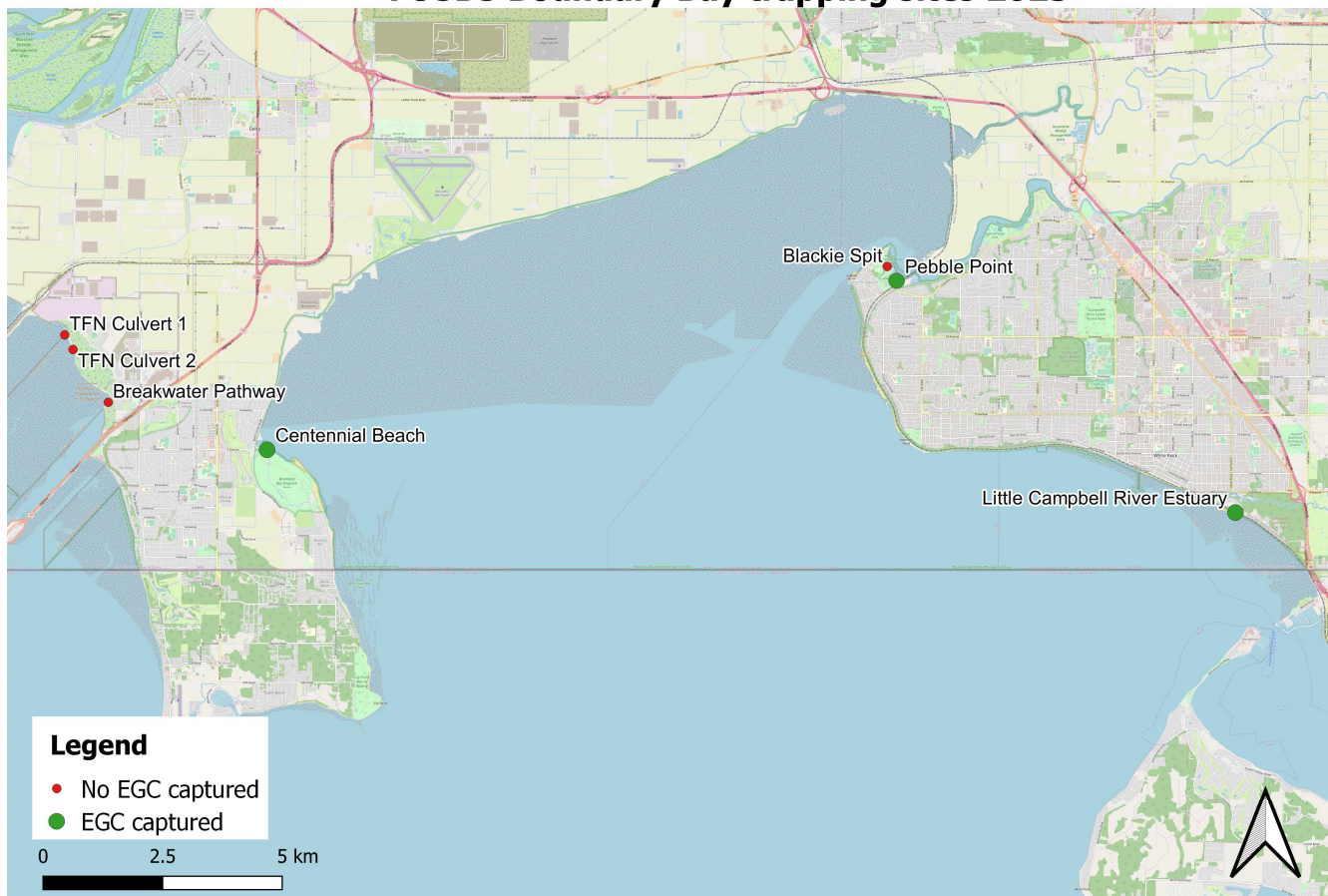
High Priority Sites: recommended to monitor monthly or several times per year during spring/summer field season.		
	Location	Reason
1	Blackie Spit Tidal Channels (BB1) 49° 3.558'N; 122° 52.614'W	Protected mud channel in estuarine marsh habitat. IEGC consistently captured in 2019, 2020, 2021 and 2022 but not in 2023. Require permission from City of Surrey.
2	Centennial Beach Park Creek Channel (Cent-1) 49° 1.479'N; 123° 3.253'W	Freshwater inundation, mud banks and shore crab prey. Require permission from Metro Vancouver Parks. There were 3 IEGC captured in 2020, 0 IEGC captured in 2021 and 2022. In 2023 2 IEGC were captured.
3	Semiahmoo First Nation Little Campbell River Estuary (2 channels SFN-1 and SFN-2) 49° 0.801'N; 122° 46.639'W	Suitable because of many shore crab prey, freshwater inundation and marsh channels. A Rocha Canada is currently partnering with FoSBS and the Semiahmoo First Nation for this site. No IEGC captured until 2023 when 36 were captured.
4	Elgin Heritage Park (EHP-2) 49° 3.965'N; 122° 50.393'W // In 2023 the Pebble Point Backchannel replaced the Elgin site.	The Elgin site had habitat features suitable for IEGC. Permission required from Surrey Parks. No IEGC were captured and issues arose due to difficulty for volunteers to access and mortality of bycatch in the traps at low tides. In 2023 trapping was moved west to the Pebble Point Backchannel south of the Blackie Spit site. 1 IEGC was captured.



All sites are considered tidal channels with an extensive tide flat and marsh vegetation. Most consisted of mud banks and ranged from having freshwater inundation and minimal wave exposure. Prey species typically consisted of shore crabs, barnacles, and snails.

Figure 3 map of Boundary Bay provided by DFO, Nanaimo
(map correction, EGC captured at the Pebble Point Backchannel site)

FOSBS Boundary Bay trapping sites 2023



Trappings - Trap Usage

Until 2022, Fukui traps were the standard across Canada for IEGC trappings as the most efficient in luring in and securing the target species. Unfortunately, in 2018, it was discovered that only 16% of IEGC that attempted to enter the traps were successfully captured.³ In the following year, Bergshoeff, McKenzie, & Favaro proposed several modifications to consider for the Fukui traps to aid in species capture and minimize post-capture escape. In this experiment, three out of four modifications were considered successful in increasing IEGC capture (Figure 12).⁴

In November 2021, FoSBS was notified of DFO's shift away from Fukui-style traps because of increased marine mammal bycatch at trapping sites throughout British Columbia. For the FoSBS 2022 trapping season under DFO advisement 6 prawn traps and 3 minnow traps per site (9 in total) at 4 sites (36 traps in total) were used. The monitoring and trapping season began May 16/17th (DFO participated with volunteers for field training) and continued until September 21st in Boundary Bay.

In 2023 DFO advised FoSBS to use 6 prawn traps and 6 minnow traps per site (12 in total) at 4 sites (48 traps in total were used). The FoSBS began the trapping season with methods training on April 12th & 13th (Blackie Spit), April 22nd & 23rd (Centennial Beach) and June 6th & 7th (LCE), again with DFO providing the field training and site advisement. Volunteers were required to complete a web training beforehand and sign a waiver, then signed up on specific scheduled trapping days once or twice a month at the three sites (LCE site led by A Rocha team). In addition to the field training, eight trappings at Centennial Beach were conducted on May 5/6, May 18/19, June 2/3, June 15/16, July 13/14, July 29/30, August 14/15, and August 28/29 (the September 26/27 trapping was cancelled).

Six trappings at Pebble Point Backchannel were conducted on April 24/25, May 23/24, June 19/20, July 6/7, August 18/19 and September 12/13.

Six trappings at Blackie Spit were conducted on April 12/13, May 7/8, June 15/16, July 4/5, August 18/19 and September 23/24.

Eight trappings were conducted with project partner A Rocha and their team at the Little Campbell Estuary on the Semiahmoo First Nation Reserve June 20/21, July 4/5, July 18/19

³ Bergshoeff, J.A., McKenzie, C.H., Best, K., Zargarpour, N., & Favaro, B. (2018). Using underwater video to evaluate the performance of the Fukui trap as a mitigation tool for the invasive European green crab (*Carcinus maenas*) in Newfoundland, Canada. *PeerJ*, 6(e4223). DOI: 10.7717/peerj.4223.

⁴ Bergshoeff, J.A., McKenzie, C.H., & Favaro, B. (2019). Improving the efficiency of the Fukui trap as a capture tool for the invasive European green crab (*Carcinus maenas*) in Newfoundland, Canada. *PeerJ*, 7(e6308). DOI: 10.7717/peerj.6308.



and August 1/2, August 18/19, August 29- 31, September 12 -14, September 26/27/28 (*note: blanket trapping in estuary with DFO Nanaimo).

The six prawn traps and six minnow traps were set at each site and spaced approximately 10m apart. Though in 2021, canned cat food was the bait of choice, in 2022 traps were baited with canned salmon, tuna or herring and tagged with the location and date. **In 2023**, DFO provided fresh herring to each of the site leaders as deemed by far the most effective to attract IEGC. Traps were set at a lower tide on one day when crabs are most active, and retrieved within 24 hours, the next day before the tide dropped low enough to cause stranding.

Below: Little Campbell Estuary site photo June 6th, on Semiahmoo First Nation Reserve,
photo: A Rocha



Below: Species counts from collected trap July 19th in the Little Campbell Estuary,
site leader, Lanie Fung, A Rocha, photo: A Rocha



Below: Prawn trap is emptied into tubs with seawater, species and numbers of species were
notated with all non-invasive green crab species returned to the location the trap was
collected. Centennial Park site, April 23,
site leader, Kristina Johnson, photo: Kristina Johnson



Below: Placing minnow traps at the Pebble Point Backchannel site,
site leader, Kathy Takasaki, photo: Kathy Takasaki



Preparing to set traps August 19th at the Blackie Spit site,
site leaders, Phillip Milligan & Bridgette Epp, photo, Phillip Milligan



Below: example of September 24th data form at Blackie Spit site

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EGC Sampling Datasheet

Organization: FOSBS DFO Licence Number: XAIS 49 2023

Lat (DD): 49.0 5939 Long (DD): -122 87631

Site Name: BLACKIE SPIT General Area Description: SURGE CHANNES

Trap Deployment Date: SEPT 23/23 Time: 8:00 AM Trap Retrieval Date: SEPT 24/23 Time: 8:00 AM

Method	#	Species Counts		Total #	# Shore Crab	# Red Rock	# Dungeness Crab	# Gracful	Other species
Trap type	1#	European Green Crab (<i>Carcinus maenas</i>)	Size of first 10 males (mm)	European Green Crab	(<i>Homograpsus</i> species)	(<i>Cancer productus</i>)	(<i>Metacarcinus magister</i>)	(<i>M. gracilis</i>)	
Prawn	7			M: 1					Starling - 1 Snails - 257
	8			F: 1					Snails - 487 Hermit - 2
	9			M: 15					Snails - 255
	10			F: 34					Sculpin - 2 Snails - 227
	11			M: 50					Sculpin - 2 Snails - 65
	12			F: 20					Starling - 2 Snails - 419

Comments:
 Presence of shellfish (oysters, clams, shell hash, snails):
 Aquatic vegetation noted in area:
 Any mortality of species in traps: 2 sculpin mortality (Trap 10)
 Observed EGC with eggs:

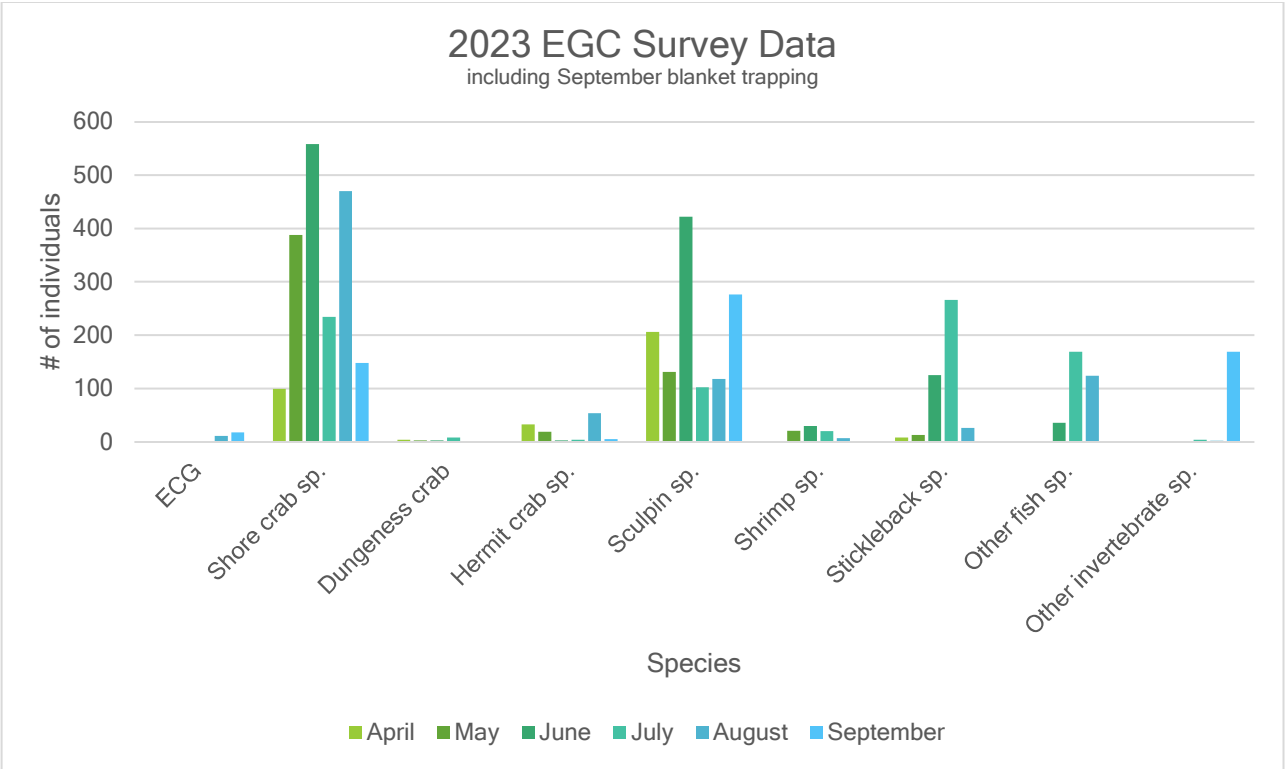
Send to: AISPacific@dfo-mpo.gc.ca

Caution was taken to prevent damage to the site and fish species were released quickly after a photo was taken. Location, soaking time, trap number, and each organism were recorded. If IEGC were captured, the size and sex was recorded before placing in a separate bucket to be destroyed. In 2022, the only site to capture invasive European green crab in Boundary Bay was at Blackie Spit yet in 2023 none were captured there. EGC were captured at the other three sites. Correspondence with the Northwest Straits Commission conducting trapping in Drayton Harbor, Washington, adjacent to the Little Campbell estuary suggests the possibility the LCE green crab may be coming from there. DFO has suggested the possibility of doing DNA sampling of captured crab in the LCE in 2024.

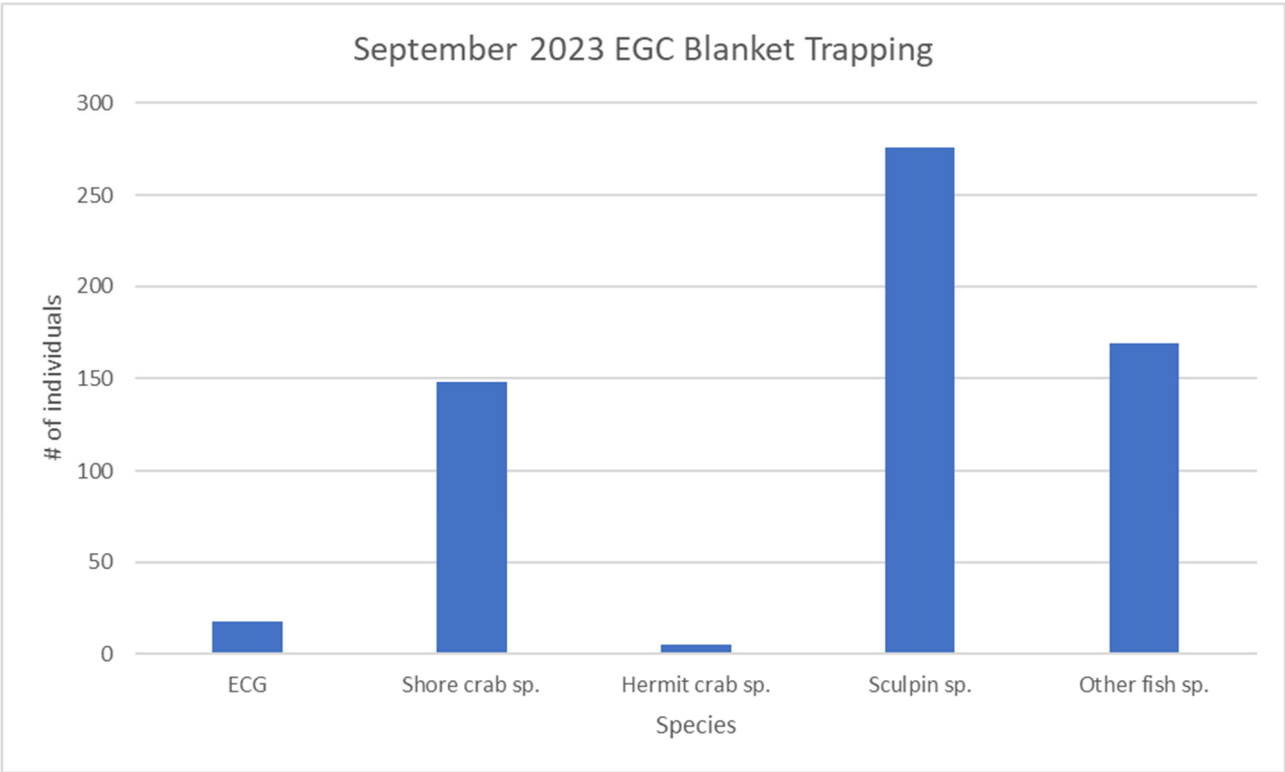
Results

Although excluded from the following two tables, the top species caught in the prawn and minnow traps were snail species. By far the most numerous species captured and released were shore crab species, sculpin and other fish species. The most unusual capture was a Western Terrestrial Garter Snake at the LCE site.





Above: Species collected in the 2023 traps, note snails were collected but the number is so high to skew the table. Table provided by Diane Watson.



Above: Species collected in the 2023 blanket trapping September 26/27/28 at the Little Campbell Estuary site by DFO and A Rocha. Table provided by Diane Watson.

COMMUNITY OUTREACH

FoSBS conducted many community outreach events in support of their marine and invasive European green crab project and distributed many hundreds of informational brochures on the invasive green crab, eelgrass habitat, coastal native plants, birds and the Boundary Bay, a Special Place.

FoSBS conducted twelve habitat enhancement events and participated in monthly invasive plant removals at a city park. FoSBS hosted four shoreline cleanups, a World Wetland event on February 4th with presentations and a walk to constructed wetlands and an invasive green crab webinar on World Oceans Day June 8th offering presenters from Clayoquot Sound and Drayton Harbor to share their experiences. FoSBS also hosted a World Migratory Bird weekend May 13/14th and a World Ocean week June 4th - June 11th with fun family activities and beach walks.

FoSBS attended upon request an Invasive Species Council of BC forum on February 28th giving a speedy talk on the invasive green crab and attended upon request the Invasive Species Council of Metro Vancouver Forum on November 1st to present a talk and slide show on the invasive green crab project in Boundary Bay. FoSBS attended upon request, a Parks Canada event, a museum event, two library events and hosted four other events, all to raise public awareness in the community. FoSBS also attended the City of White Rock's Sea Festival on August 5th with a Seaquaria, family activities and beach walks. Most recently, on November 5th, FoSBS attended the Semiahmoo Library and spoke to participants about the invasive green crab concern in Boundary Bay. On December 12th FoSBS volunteers will meet with DFO Nanaimo to debrief the 2023 efforts and discuss concerns and changes to the methods.

FoSBS hosted invasive green crab monitoring and trapping methods with DFO Nanaimo staff on three trapping dates and hosted a forage fish spawn sampling methods training August 27 with MABRRI biologist Alana Vivani launching a monthly sampling program at Crescent Beach, building upon our 2007 Boundary Bay survey results.

FoSBS has consistently posted to their social media (over 750 followers), and other organizations, interesting news and articles to promote knowledge and events.



Looking Ahead

In the 2024 trapping season, the Friends of Semiahmoo Bay Society are looking forward to...

- Working in tandem with DFO and our partner organizations to continue trapping for IEGC in Boundary Bay.
- Working to improve trapping methods for volunteers.
- Continuing to increase partnerships with local colleges/universities, youth organizations, First Nations and other community groups to involve them in trapping and to share resources to reach our common goals.
- Raising outreach capacity in social media and community event presence with regular postings.

Below, a bucket of green crab captured at the Little Campbell Estuary site August 8th.

Photo: A Rocha

