

Trapping In The Grass

Presence of Dungeness Crabs through monitored traps within the Gorge Waterway and Gorge Creek estuary base in Esquimalt, BC

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Executive Summary

A trap monitoring project was implemented and conducted within the Gorge Waterway and Gorge Creek estuary in Esquimalt, British Columbia. The species in target for this project were native Dungeness crab (*Metacarcinus magister*) and invasive European green crab (*Carcinus maenas*). Dungeness crabs are a symbol of a healthy ecosystem. Confirming the presence of these crabs in the Gorge Waterway will support and inform future restoration efforts. European green crabs are an invasive species in the Pacific Ocean and are detrimental to native marine ecosystems; any presence of them is recorded and presented to Fisheries and Oceans Canada (DFO) to document the invasive population.

Four separate 24-hour soak samples were conducted seven days apart each week the month of February 2021. Using ring traps baited with chicken necks and generic aquaculture feed, 7 juvenile male Dungeness crabs were caught, proving that the eelgrass bed restoration efforts are providing a suitable ecosystem for Dungeness crabs. During the four samples, no European green crabs were observed.

It is recommended that the area be continuously monitored to document the health and growth of the Dungeness crab population and to alert DFO should European Green crabs appear.

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Introduction

Project Background

Collecting inventory data of an ecosystem's biodiversity is important. It allows us to better understand the ecosystem and aids future management decisions for the area of interest. Obtaining qualitative and quantitative data for the Dungeness crab population in the Gorge Waterway and Gorge Creek estuary will advance our understanding of this ecosystem's biodiversity and health, confirm the success of past restoration efforts, and inform future management decisions.

A special interest in this project was also to determine the presence of the invasive European Green Crab, as they could threaten the ecosystem and the DFO must be alerted if they are present.

Project Overview

Data were collected from monitored traps set at multiple durations within several sites of the Gorge Creek estuary base and Gorge Waterway. Baited traps were used in conjunction with a method of catch and release. Crab information was recorded onsite and field data can be used as a baseline for future restoration efforts. The main object of the project was to determine the presence or absence of Dungeness crab and invasive European green crab.

Juvenile Dungeness Crab Overview

Dungeness crabs are found in the coastal waters of western North America from Mexico to Alaska, in various ecosystems at different stages of their life (Fisheries and Oceans Canada, 2013). These stages are pelagic larvae, megalopa, instars, older juveniles, and adults. In the spring, mature adults migrate to shallow waters to mate, with the females producing between 200,000 and 2,000,000 eggs in October or November. Crab larvae emerge and float in the water column until later settling in the intertidal habitats of shallow estuaries and coastal zones. They prefer oyster and eelgrass beds, and live in the intertidal until reaching juvenile status. Juveniles stay within these areas for the first year of their life, migrating to subtidal areas as adults. Throughout its life cycle the Dungeness crab is continuously growing and moulting: shedding their old shell with the new shell growing then hardening over several months. The average

lifespan of a Dungeness crab is eight to ten years (Hemmera Envirochem Inc., 2014).

This project was tailored to monitor juvenile Dungeness crabs, as they are found throughout coastal estuaries. Estuaries offer warmer temperatures, food security and refuge from predators. Estuaries are essential ecosystems for juvenile crabs (Hemmera Envirochem Inc., 2014).

Dungeness crabs are important in the marine ecosystem, as both predator and prey throughout all life stages. Larvae are consumed by higher trophic species including fish and whales. Juvenile and adult crabs are consumed by marine birds, seals, otters, and fish. Juveniles and adults are omnivores, feeding on other crustaceans, marine worms, bivalves, and other molluscs (Hemmera Envirochem Inc., 2014).

Special Interest: European Green Crab

During trap monitoring, as per the interest of Fisheries and Oceans Canada, any indication of the presence of invasive European green crabs was to be documented. The European green crab is one of the ten most unwanted invasive species in the world. The species inhabits shallow waters and can tolerate a range of salinity, thus is commonly found in estuaries. Their presence causes detrimental effects to the surrounding ecosystem as they outcompete native species for food and uproot eelgrass beds, an important structural species in marine ecosystems (Government of Canada, 2021).

Location

The location of the sampling took place at the mouth of Gorge Creek and in the Gorge Waterway, to the northwest of Esquimalt Gorge Park, Esquimalt, BC. Exact coordinates of each sample can be seen in Table 1.

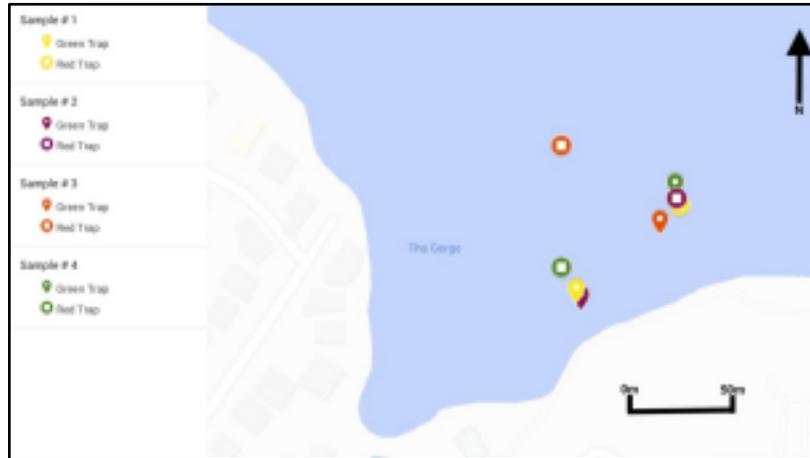


Figure 1: Location of sample points for both traps labelled “Red Trap” and “Green Trap” on samples number 1, 2, 3 and 4 in the Gorge Creek estuary and Gorge Waterway in Esquimalt, BC.

Methods and Materials

Method

The traps will be set for 24-hour soak times. The DFO recommended 24-hour soak times because they will catch larger specimens and be more useful for comparison with other research. While 1-hour soak times will catch smaller specimens, they are less useful for comparisons (J.S. Dunham, 2011). The bait placed in the traps consisted of standard 10mm Skretting Aqua Feed and raw chicken neck.

Traps will be identified and recorded via buoy color, red and green, throughout sampling. Captured specimens will be inspected and recorded onshore.

Detailed instructions of methods for sampling and trap setup can be found in Appendix A.

Materials

List of materials can be found in Appendix B.

Results

As seen in the sampling results, there are Dungeness crabs in the Gorge Waterway, with 7 specimens being caught. Specimen abdomen length had a range of 7cm-13cm with an average of 8cm. Abdomen width had a range of 10cm-13cm, with an average of 11.43cm. The specimens caught were all juveniles nearing 1 year old. All specimens were male, with good or okay overall health and shell condition. Four specimens had missing legs.

Table 1. Sampling schedule for green and red ring traps in the Gorge Waterway and Gorge Creek estuary in Esquimalt, BC placed to monitor Dungeness crabs in the eelgrass ecosystem. Traps were baited, then soaked for 24 hours.

Sampling #	Date Set	Date Pulled	Trap	Depth (m)	Location	Trap Set Time	Trap Pulled Time	Duration	Bait
1	Feb 02-21	Feb 03-21	Green	2.4	48.44717, -123.40661	10:30	10:43	24:13:00	Prawn bait
1	Feb 02-21	Feb 03-21	Red	2.1	48.44760 -123.40593	10:40	10:55	24:15:00	Prawn bait
2	Feb 09-21	Feb 10-21	Green	2.5	48.44714 -123.40658	10:00	10:07	24:07:00	Prawn bait and chicken neck
2	Feb 09-21	Feb 10-21	Red	2.2	48.44763 -123.40595	10:14	10:25	24:11:00	Prawn bait and chicken neck
3	Feb 16-21	Feb 17-21	Green	2.3	48.44747 -123.40606	10:39	10:45	24:06:00	Prawn bait and chicken neck
3	Feb 16-21	Feb 17-21	Red	1.4	48.44786 -123.40671	10:47	10:51	24:04:00	Prawn bait and chicken neck
4	Feb 22-21	Feb 23-21	Green	2.4	48.44763 -123.40596	10:14	10:25	24:11:00	Prawn bait and chicken neck
4	Feb 22-21	Feb 23-21	Red	1.2	48.44733 -123.40671	10:18	10:19	24:01:00	Prawn bait and chicken neck

Table 2. Amount of Dungeness Crab specimens caught on samples 1, 2, 3 and 4 within the Gorge Waterway and Gorge Creek estuary in Esquimalt, BC after 24-hour soak periods of baited ring traps.

Sample #	1	2	3	4
Amount of Specimens caught	2	5	0	0

Table 3. Recorded data of seven captured Dungeness Crab specimens after 24-hour soak samples of baited traps within the Gorge Waterway and Gorge Creek estuary in Esquimalt, BC.

Sample #	Trap	Specimen #	Abdomen Length(cm)	Abdomen Width (cm)	Sex	Health/shell condition	Observations
1	G	1	8	13	M	Okay	REAR LEFT LEG GROWING BACK
1	R	2	8	12	M	Okay	MISSING RIGHT BACK LEG
2	G	3	10	13	M	Good	
2	G	4	8	10	M	Good	
2	G	5	7	10	M	Good	
2	G	6	8	12	M	Okay	MISSING BACK LEGS
2	R	7	7	10	M	Okay	MISSING RIGHT BACK LEG











Figure 2. Photos of the Dungeness crab specimens caught in baited ring traps placed in the Gorge Waterway and Gorge Creek estuary in Esquimalt, BC. All specimens were caught in February of 2021. Specimen number can be seen in the bottom left of every picture. Specimen data can be found in Table 3.

Discussion

The specimens were caught during sampling numbers 1 and 2, with sampling numbers 3 and 4 resulting in no specimens being caught. There are many variables that could have contributed to the absence of crabs from samples 3 and 4. Predation, temperature, substrate, soak duration, and escape are all possible explanations. As all the crabs were male, it is thought that the smaller females may escape the traps more easily (J.S. Dunham, 2011). It is also possible that mating behaviour may have led to fluctuations in population density at the time of the survey (Hemmera Envirochem Inc., 2014); however, sampling took place two months before mating season, so a conclusion cannot be drawn.

Recommendations

Regular surveys of the Dungeness crab population are recommended. It would allow GWAS and

World Fisheries Trust to monitor the population while going ahead with large structural changes to the mouth of Gorge Creek and the population could be used as an indicator for the health of the eelgrass ecosystem. Regular surveys would also detect European Green crabs if they move into the area. Given that Dungeness crabs move through different habitats throughout the year, sampling should be conducted year round (Hemmera Envirochem Inc., 2014). It is also recommended to survey other patches of suitable habitat in the Gorge Waterway to better estimate population size.

Summary

The presence of Dungeness crabs within the eelgrass beds is a sign of healthy ecosystem function. With continuous monitoring and restoration efforts, this eelgrass ecosystem has the potential to increase in habitat quality and size, hopefully resulting in a larger and healthier Dungeness crab population. The monitoring showed no indication of invasive European green crabs. As they are encroaching into British Columbia coastal marine water, continuous monitoring should still occur.

References

- Fisheries and Oceans Canada. (2013) *Dungeness Crab biology*. Retrieved from <https://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/crab-crabe/bio-eng.html>
- Government Of Canada. (2021) *European Green Crab*. Retrieved from <https://www.dfo-mpo.gc.ca/species-especies/profiles-profil/europeangreencrab-crabevert-eng.html>
- Hemmera Envirochem Inc. (2014) *Marine Invertebrates: Juvenile Dungeness Crabs*. Retrieved from <https://www.robertsbankterminal2.com/wp-content/uploads/RBT2-Juvenile-Dungeness-Crabs-TDR.pdf>
- J.S. Dunham, A. P. (2011). *A Manual for Dungeness Crab Surveys in British Columbia*. Nanaimo, BC: Fisheries and Oceans Canada.

Appendix A

Trap setup:

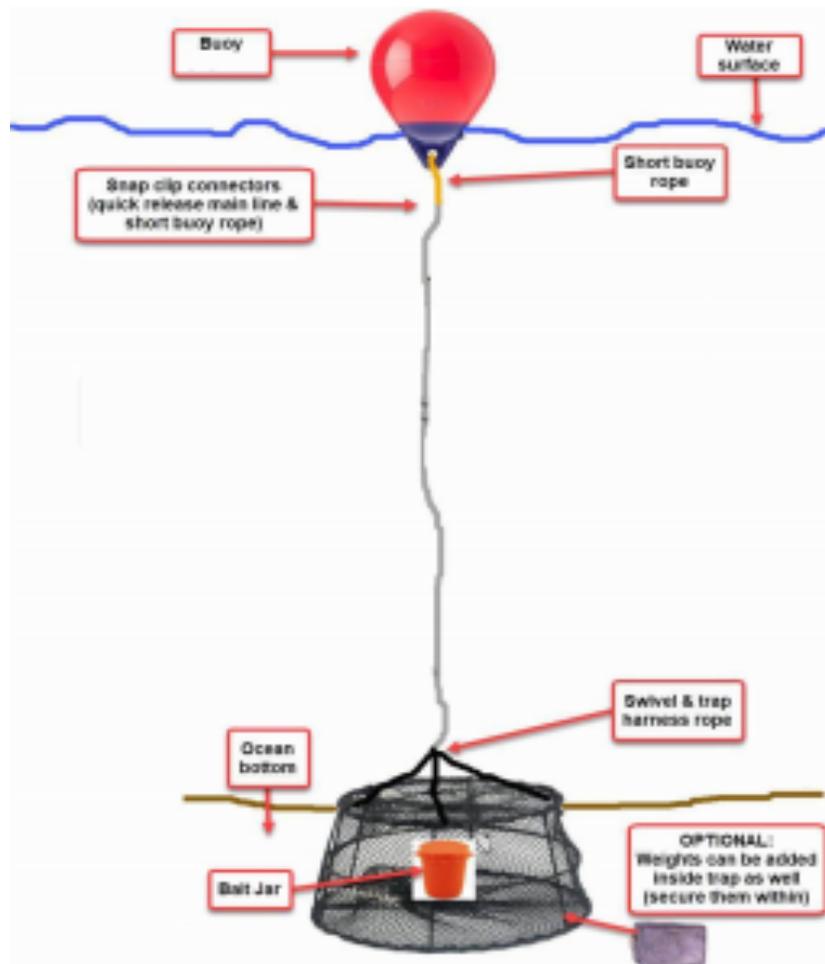


Image retrieved from <https://www.bcfishingjournal.com/wp-content/uploads/2021/02/prawn-trap-setup-diagram-bcfj.jpg>

Appendix B

Step by Step Methodology

1. Following sampling schedule, two traps will be prepared and set in trap locations 1 and 2 with bait, rope and buoy system

- Fill 800 mL Scotty bait cups with mixture of raw chicken neck 10mm Skretting Aqua Feed
- Secure bait cups into prawn traps
- Close baited traps
- Place kayak in upright position near launch area
- Secure prawn traps on kayak via bungee cords
- Put on PPE gear
- Enter and launch kayak
- Using iPhone in waterproof case, paddle to Location 1
- Unclip trap from bungee cords
- Slowly lower trap into water using sinking line at location 1 coordinates • Once trap secured on ocean floor, record depth using markings on rope ○ Other abiotic information recorded: current, weather and other • Attach buoy so rope has ability for fluxing with tides
- secure bungees to kayak
- Paddle kayak to shore
- Repeat all steps for Location 2 trap
- Remove kayak from water and store

2. Traps will be pulled after set duration on sampling schedule and assessed for presence of crustaceans

- Put on PPE gear

- Launch kayak
- Paddle to buoy
- Pull trap out of water
- Secure trap on kayak with bungee cords
- Paddle to shore
- detach trap from kayak
- Place trap onshore
- Place kayak on shore

3. Species will be identified, recorded and photographed immediately

- Fill 2 buckets with water from same location as traps
- Set up tarp on flat ground
- Open traps
- place specimens in one bucket
- Individually remove specimens from buckets
- Place onto tarp and record information using meter stick and digital camera
 - Species information recorded: Species, visible health, size (cm) and other
- Place specimen in second bucket once finished recording
- Repeat until all specimens are recorded in bucket one
- Release specimens back into original waters
- Clean up all field gear

Appendix C

Project list of materials:

- Traps
 - 2-3 light traps for marine sampling
 - tight knit to ensure capture
- 50m of durable rope
- 2-3 buoys
- Bait and bait cups
 - 10mm Skretting Aqua Feed
 - raw chicken necks
 - 2-3 800 ml Scotty bait cups
- Tarp
- 3 buckets
- Meter ruler
- Calipers
- Waterproof phone case
- Recording materials (pen, notebook, digital camera, clipboard)
- Kayak and paddle
- 3 bungee cords
- Timing device (iPhone)
- Scissors
- PPE (gloves, life jacket, weather appropriate clothing)