

## Blair Waterway and Saltchuk remediation site crab survey



**Puyallup Tribe of Indians Shellfish Department**

February 2022

## Introduction

This survey describes crab species and relative abundance in the Blair Waterway and Saltchuk remediation site prior to planned construction activity. Construction under consideration for the Blair Waterway includes dredging and widening (1). Saltchuk remediation site may use Blair Waterway dredge material to build islands or shallow tidelands (1). Depending on the final construction plans, both sites may see significant substrate modification. Dredging activity can cause variable Dungeness crab mortality depending on the type of activity (2). The most important crab species culturally and economically in the vicinity is the Dungeness crab (*Metacarcinus magister*) followed by the Red Rock crab (*Cancer productus*). Graceful crab (*Metacarcinus gracilis*) are also found in the vicinity. Dungeness crab support commercial fisheries for tribal fishers. Dungeness crab and Red Rock crab also support subsistence and recreational fisheries for tribal and non-tribal fishers. The survey took place December 2021 and January 2022.

## Methods

**Gear:** This survey used 2 different types of crab traps: Commercial style traps and cone traps (figure 1). Commercial style traps are typically found in the Dungeness crab commercial fishery and are useful for retaining adult Dungeness crab. Escape rings (circular openings to assist with the escape of sub-legal sized crab) on commercial style traps were blocked off to retain a larger variety of crab sizes for survey purposes. Cone traps use smaller sized mesh and can retain more juvenile Dungeness, Red Rock, and Graceful crab compared to commercial style traps (figure 2). A mixture of salmon and squid were used for bait.



**Figure 1.** The two trap styles used: cone style (left) and commercial style (right).



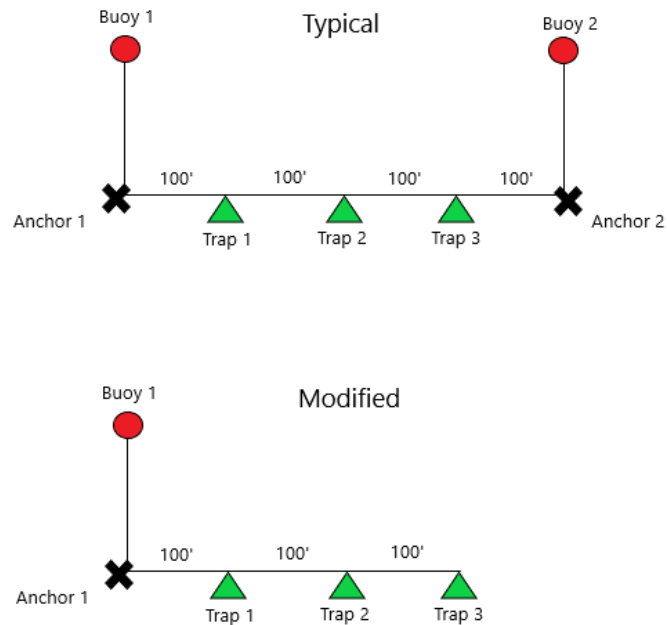


**Figure 2. A comparison of mesh sizes found on the cone trap (left) and the commercial trap (right).**

**Deployment:** 2 different deployment methods were used: single trap sets and longline sets. A single trap set consists of a buoy floating at the surface connected to a single trap on the sea floor. Single trap sets were used at reference and Saltchuk study sites. Four traps of each type were set along a 20' contour equally spaced out covering the length of the Saltchuk site. This process was repeated along a 40' contour at the Saltchuk site (figure 3). Longline sets were used in the Blair Waterway as way to keep the chances of gear entanglement with boat traffic to a minimum. A modified longline set was used to further reduce the risk of gear entanglement. The modified longline set consisted of a buoy floating at the surface connected to an anchor followed by 3 traps set in series (figure 4). The distance between the anchor, the first trap, and each successive trap in a longline set was approximately 100'. Four transects evenly spaced out and perpendicular to the length of the Blair waterway were chosen for longline set locations (figure 5). The terminal transect (transect #4) was split into 2 different sets (transect #4 east and #4 west) due to the increased width of the Blair Waterway at this location (figure 5). "Soak time", (the amount of time traps spend in the water attracting crab) was approximately 24 hours for every set. See appendix for a complete list of study site trap gps locations



**Figure 3. A map of the Saltchuk site. Blue line = site boundary, yellow lines = '20 and '40 contours, green dots = trap locations (Port of Tacoma GIS image)**

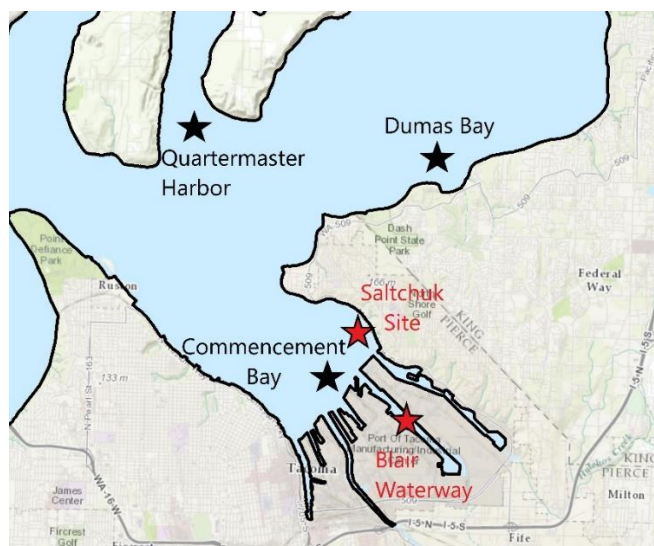


**Figure 4. A typical longline set (top) vs the modified set used in the Blair Waterway (bottom). The modified set was chosen to keep the chances of entanglement with waterway traffic to a minimum.**



**Figure 5. A map of transect locations for longline sets in the Blair waterway. Green dots are individual trap locations in a longline set (Port of Tacoma GIS image).**

**Reference sites:** From 2013 – 2020 the Puyallup Tribe has conducted crab surveys in the immediate area of the Blair Waterway and Saltchuk site. Three closest reference sites to the Blair Waterway and Saltchuk site were chosen to get a measure of current Dungeness and Red Rock crab abundance compared to the entirety of the survey period (figure 6). 3 single traps were set at each reference site, one at 50', 100', and 150'. Cone traps were set at one of the reference sites (Commencement Bay) however this data is not included because a majority of the entire set (2 out of 3 traps) had obvious operational malfunctions (figure 6, table 1). Dungeness and Red Rock crab catches in the immediate area (Vashon Island area) around the Blair Waterway and Saltchuk sites are characterized by considerable swings in abundance (figure 7 and 8).



**Figure 6.** Map showing the locations of the reference sites (black) and study sites (red).

**Data recorded:** Each crab was recorded by species, sex, size, and shell condition. Egg status was recorded for female crab. Crab with missing or damaged appendages were noted. Bycatch was also recorded. Data were discarded from any trap with an obvious operational malfunction.

## Results

**Overview:** A total of 58 trap sets were made. Two traps had obvious operational malfunctions, these data were excluded (table 1). Commencement Bay cone trap data was not included due to a majority of the traps (2 out of 3) having obvious operational malfunctions (table 1). The most common crab caught at the study sites were Graceful crab  $n = 503$ , followed by Red Rock crab  $n = 446$  (table 2). Dungeness crab were absent from catches at the Blair Waterway and uncommon at the Saltchuk site. Very few bycatch (shrimp and sculpin) was encountered in either the reference or the study sites (table 2).

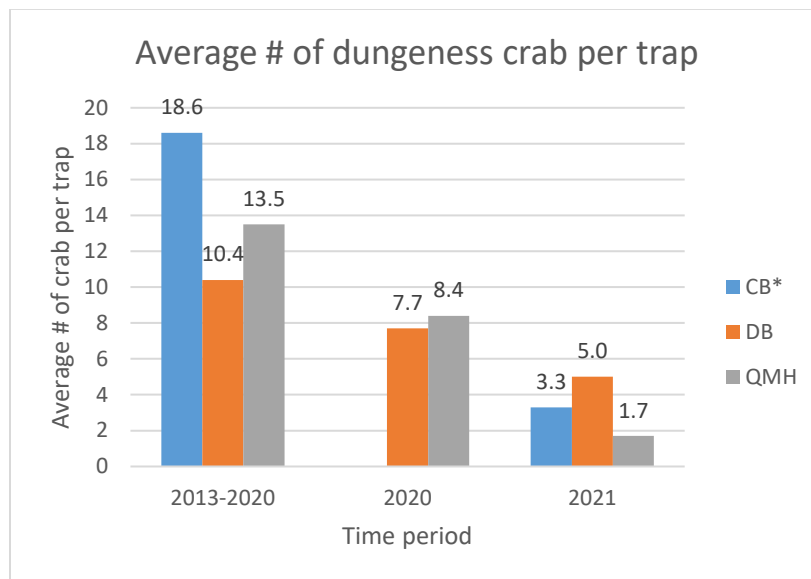
Trap type	Reference sites	Blair Waterway	Saltchuk site
commercial	9	15	8
cone	(3)*	15(2)	8

**Table 1.** Total number of traps set by type and location. Parenthesis are number of traps removed from data collection because of obvious operational malfunctions. \*Cone trap data was not included from this reference site (Commencement Bay) due to a majority of the traps (2 out of 3) having obvious operational malfunctions.

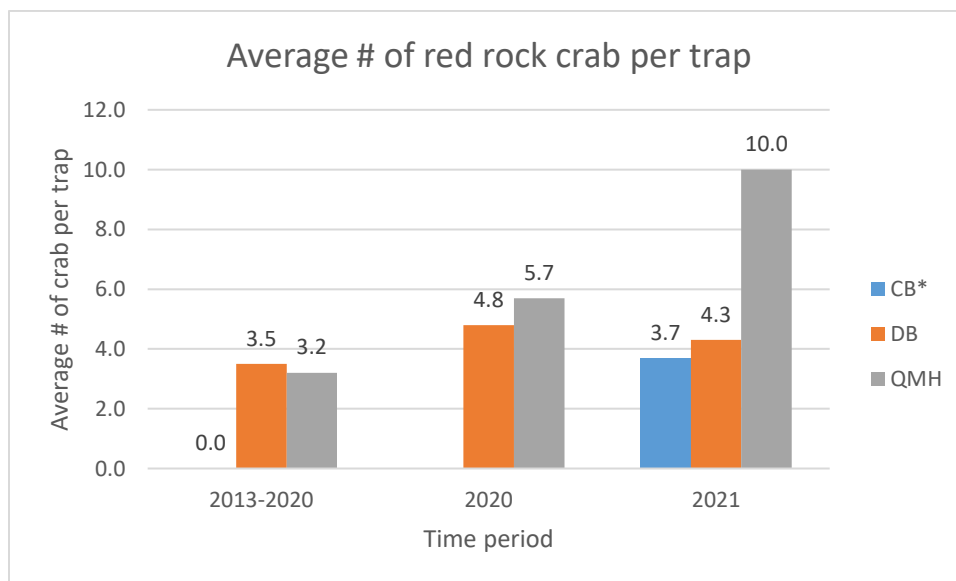
Species	Reference sites	Blair Waterway	Saltchuk site
Dungeness ( <i>Metacarcinus magister</i> )	30	0	2
Red Rock ( <i>Cancer productus</i> )	54	263	183
Graceful ( <i>Metacarcinus gracilis</i> )	1	294	209
Shrimp ( <i>Pandalus hypsinotus</i> )	0	1	0
Sculpin (unidentified)	1	0	0

**Table 2.** Total catches by species and location.

**Reference sites:** Catches of Dungeness and Red Rock crab at reference sites show considerable variation over time and have been inversely related to each other (figure 7 and 8). Compared to the entire 2013-2020 survey period, Dungeness catches are presently lower than average while Red Rock catches are higher than average in the surrounding waters of the survey area (figure 7 and 8).

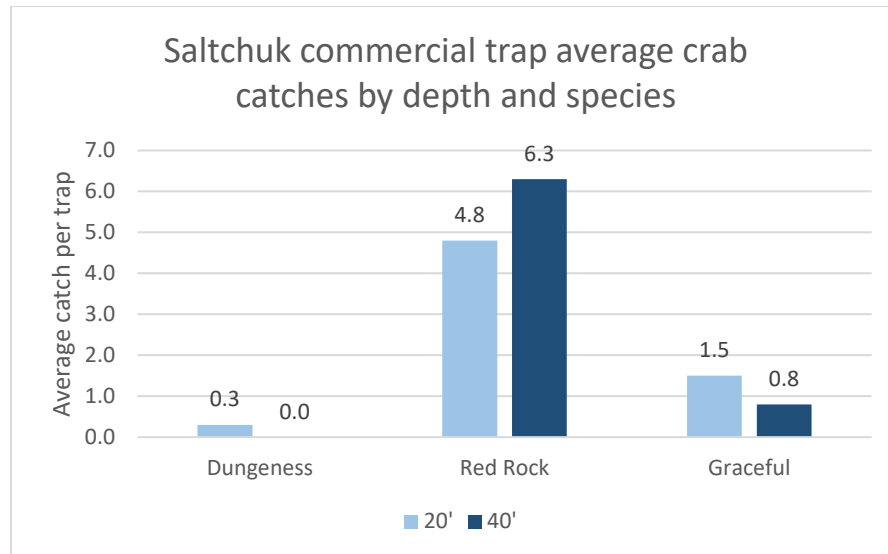


**Figure 7. Average catches of Dungeness crab at reference sites during the Puyallup Tribe winter/spring surveys from 2013-2020, the most recent year previous to the present study 2020, and the present study 2021. CB = Commencement Bay, DB = Dumas Bay, QMH = Quartermaster Harbor. \*Prior to this study Commencement Bay reference site was only surveyed 2013-2014.**

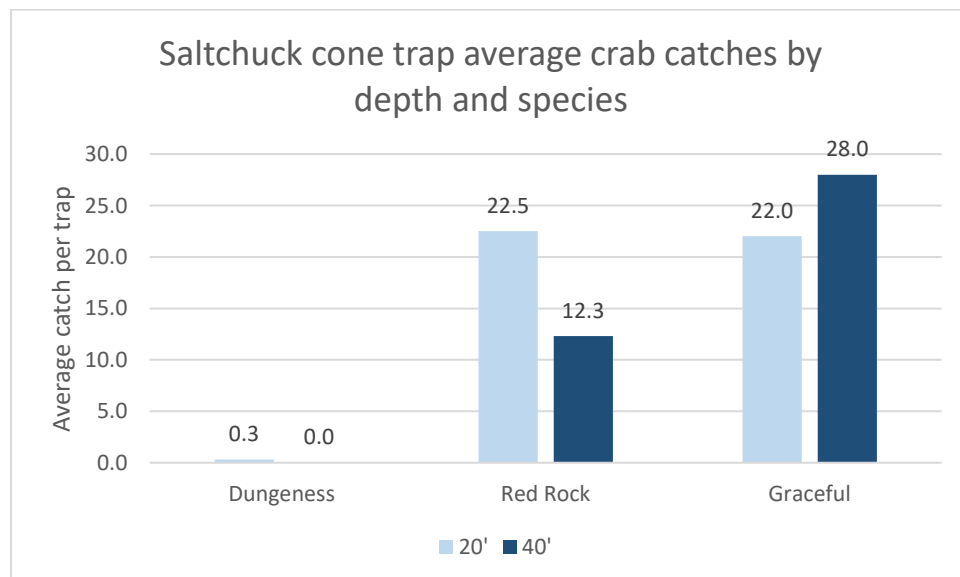


**Figure 8. Average catches of Red Rock crab at reference sites during the Puyallup Tribe winter/spring surveys from 2013-2020, the most recent year previous to the present study 2020, and the present study 2021. CB = Commencement Bay, DB = Dumas Bay, QMH = Quartermaster Harbor. \*Prior to this study Commencement Bay reference site was only surveyed 2013-2014.**

**Saltchuk site:** Red rock crab were the most common crab caught in commercial traps at both the 20' and 40' depths (figure 9). Cone traps retained nearly equal amounts of Red Rock and Graceful crab at the 20' depth however Graceful crab outnumbered Red Rock crab by more than 2 to 1 in cone traps at the 40' depth. (figure 10). Very few Dungeness were caught at the Saltchuk site in either commercial or cone style traps (table 2), (figures 9 & 10).

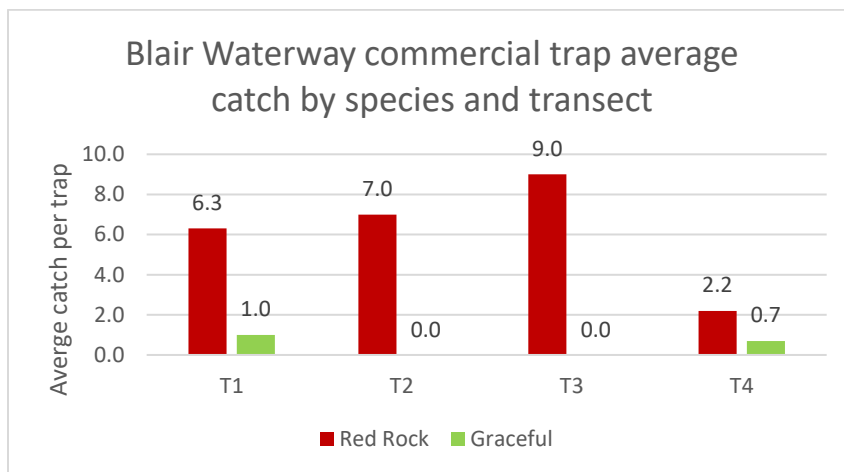


**Figure 9. Average catches of crab in commercial style traps at the Saltchuk site by depth and species.**

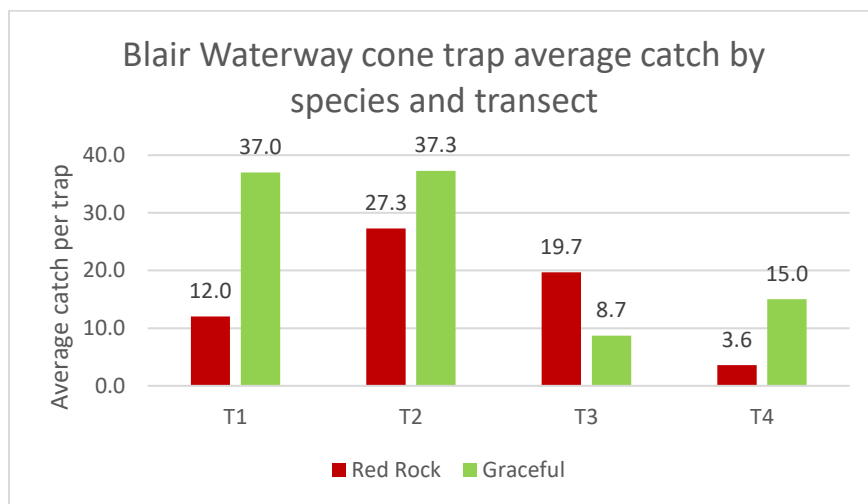


**Figure 10. Average catches of crab in cone style traps at the Saltchuk site by depth and species.**

**Blair Waterway:** Red rock crab were common in the Blair Waterway in both trap styles (figures 11 & 12). Red Rock crab average catches for both trap types dropped off considerably in the terminal transect (T4), compared to the other transects (figures 11 & 12). Very few Graceful crab were retained in commercial traps in the Blair Waterway. Graceful crab were common in Blair Waterway cone trap catches. The highest catches of any species for the entire survey were Graceful crab in cone traps in transect 1 and 2 (average catches of 37 and 37.3 crab per trap respectively), (figure 12). No Dungeness crab were encountered in the Blair Waterway in either trap style (table 2).



**Figure 11.** Average catches of crab in commercial style traps at the Saltchuk site by transect. Transects run perpendicular to the length of the waterway and approximately equally spaced from the mouth (T1) to the terminal end (T4).



**Figure 12.** Average catches of crab in commercial style traps at the Saltchuk site by transect. Transects run perpendicular to the length of the waterway and approximately equally spaced from the mouth (T1) to the terminal end (T4).



## Discussion

Very few Dungeness crab were encountered in catches at the Saltchuk site and were absent in catches from the Blair Waterway, however the present ecosystem at these two sites supports abundant catches of Red Rock and Graceful crab. Reference sites showed that compared to the 2013-2020 time period, Dungeness catches were lower than average during this study. Red Rock catches at reference sites were higher than average during this study. A future re-survey during periods of high Dungeness catches at the reference sites may find more Dungeness crab at the study sites. If this were the case, it would advocate for the use of reference sites similar to the ones used in this study near other ports and marinas to coordinate construction activity around times of low abundance for high value species that show cyclical abundance patterns.

## Acknowledgments

Funding for this study was provided by the Port of Tacoma. Resources were provided by the Puyallup Tribe and the Washington Department of Fish and Wildlife. Figure 3 and 5 gis images: Jenn Stebbings, Port of Tacoma.

Cover photo: A catch of Graceful crab (*Metacarcinus gracilis*) in the Blair Waterway during the survey (Puyallup Tribe of Indians)

## References

1. USACE, Port of Tacoma 2020. January 15 2020 Public Meeting Posters. Available at: <https://www.nws.usace.army.mil/Portals/27/January%2015%202020%20Meeting%20Posters.pdf>
2. Stevens, Bradley G. 1981. Grays Harbor Navigation Channel Maintenance Dredging. Dredging – Related Mortality of Dungeness Crabs Associated With Four Dredges Operating in Grays Harbor, Washington. USACE, Washington Department of Fisheries. Available at: <https://apps.dtic.mil/sti/pdfs/ADA100139.pdf>

## Appendix

### Saltchuck site and Blair Waterway trap gps locations

#### Saltchuck Site

47° 17.6393' N 122° 24.9337' W	47° 17.4893' N 122° 24.7548' W	47° 17.5802' N 122° 25.0361' W	47° 17.4255' N 122° 24.9282' W
47° 17.5566' N 122° 24.8270' W	47° 17.3635' N 122° 24.7295' W	47° 17.5221' N 122° 24.9883' W	47° 17.3504' N 122° 24.8576' W

#### Blair Waterway

##### Transect 1

47° 16.7534'N 122° 24.8442'W	47° 16.7474'N 122° 24.8546'W	47° 16.7390'N 122° 24.8662'W
---------------------------------	---------------------------------	---------------------------------

##### Transect 2

47° 16.2428'N 122° 24.0131'W	47° 16.2314'N 122° 24.0325'W	47° 16.2239'N 122° 24.0478'W
---------------------------------	---------------------------------	---------------------------------

##### Transect 3

47° 15.9460'N 122° 23.5179'W	47° 15.9331'N 122° 23.5368'W	47° 15.9252'N 122° 23.5500'W
---------------------------------	---------------------------------	---------------------------------

##### Transect 4 East

47° 15.4904'N 122° 22.6181'W	47° 15.4807'N 122° 22.6323'W	47° 15.4716'N 122° 22.6454'W
---------------------------------	---------------------------------	---------------------------------

##### Transect 4 West

47° 15.3527'N 122° 22.8542'W	47° 15.3437'N 122° 22.8682'W	47° 15.3321'N 122° 22.8856'W
---------------------------------	---------------------------------	---------------------------------