

COUNTY: Jefferson
Grant No: SEANWS-2021-JeCoWS-00007

PROJECT TITLE: Jefferson County MRC Operations and Projects

TASK NUMBER: 4-Mapping Lost Crab Pots

T4.3
ROV Summary Report

PERIOD COVERED: October 1, 2022 – September 30, 2022

DATE SUBMITTED: September 30, 2022

***Revised with corrected data on November 17, 2022**



Jefferson County
Marine
Resources
Committee



PUGET SOUND
PARTNERSHIP



Northwest
Straits
INITIATIVE

This project has been funded wholly or in part by the United States Environmental Protection Agency. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency under Assistance Agreement [CE-01J97401]. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

**Jefferson County Marine Resources Committee (MRC)
2022 Derelict Crab Pot Removal Pilot Project Summary Report
Discovery Bay, WA**

Project Overview

More than 12,000 crab pots are lost and become derelict every year in Washington’s Salish Sea, killing over 180,000 harvestable crab each year. Responding to community concerns of derelict crab pots near Adelma Beach and the Cape George Marina in Discovery Bay, the Jefferson MRC partnered with the Sea Dragons, a local STEM robotics group, to pilot the use of a custom-built submersible remotely operated vehicle (ROV) for locating and removing derelict crab pots. The MRC also contracted side scan sonar surveys covering the same areas to optimize the utility of the ROV in locating pots for removal by using known GPS coordinates. The side scan sonar surveys located 126 pots between the Cape George Marina and Beckett Point, and 31 pots near Adelma Beach. With limited time on-the-water to work, the team successfully relocated 6 derelict crab pots and removed 3, proving the concept of using an ROV as a relatively low-cost method for crab pot removal. The MRC plans to continue growing its partnership with the Sea Dragons, to enhance the ROV’s capabilities, remove pots in other locations across East Jefferson County, refine ROV survey methods for pots with unknown locations, and eventually, advise other communities with access to a robotics team and interest in adopting similar efforts.

Project Lead: Jeff Taylor

Subcommittee Members: Troy McKelvey, Frank Handler

October 2021 – September 2022 Project Activities

- Fall 2021-Winter 2022 – Work on permit and approval from WDFW for removing derelict crab pots (secured May 16, 2022).
- May 2022 – Inform Adelma Beach neighbors of crab pot removal efforts with invitation to observe surveys and removal.
- May 16 & 17 – Contracted Coastal Sensing & Survey to conduct side scan sonar surveys of the Cape George and Adelma Beach areas of Discovery Bay, for locating derelict crab pots and generating maps using GPS coordinates.
- June 14 – ROV crab pot removal efforts: the team spent a full day searching for crab pots using the GPS coordinates from the side scan sonar surveys, working from a large vessel. Various challenges made it difficult to relocate the pots. However, upon pulling up the boat anchor at the end of the day, the team incidentally recovered a derelict crab pot with the anchor.
- June 19 – ROV crab pot removal efforts: with smaller 14-foot boats and new navigational equipment added to the ROV, the team successfully located 3 pots, however, opted not to remove them since they appeared to no longer be fishing and were covered in plumose anemones, seeming to be functioning as artificial reef.
- June 20 – ROV crab pot removal efforts: the team located and recovered two derelict crab pots – the first with live and dead Dungeness crabs and the second with a live red rock crab and other invertebrates.

June 21 – ROV crab pot removal efforts: we located one derelict pot but could not recover it due to changing weather conditions and prioritizing safety on the water.

2022 Derelict Crab Pot Removal Summary

There were several goals for this project: (1) remove derelict crab pots from local waters, (2) support a local STEM student group (the Sea Dragons) with an interest in marine conservation and real-world applications for their custom built underwater ROV, (3) demonstrate a lower cost alternative for removing derelict crab pots using an ROV, and (4) provide education to the public about the consequences of losing crab pots and the extent of the issue in our local waters.

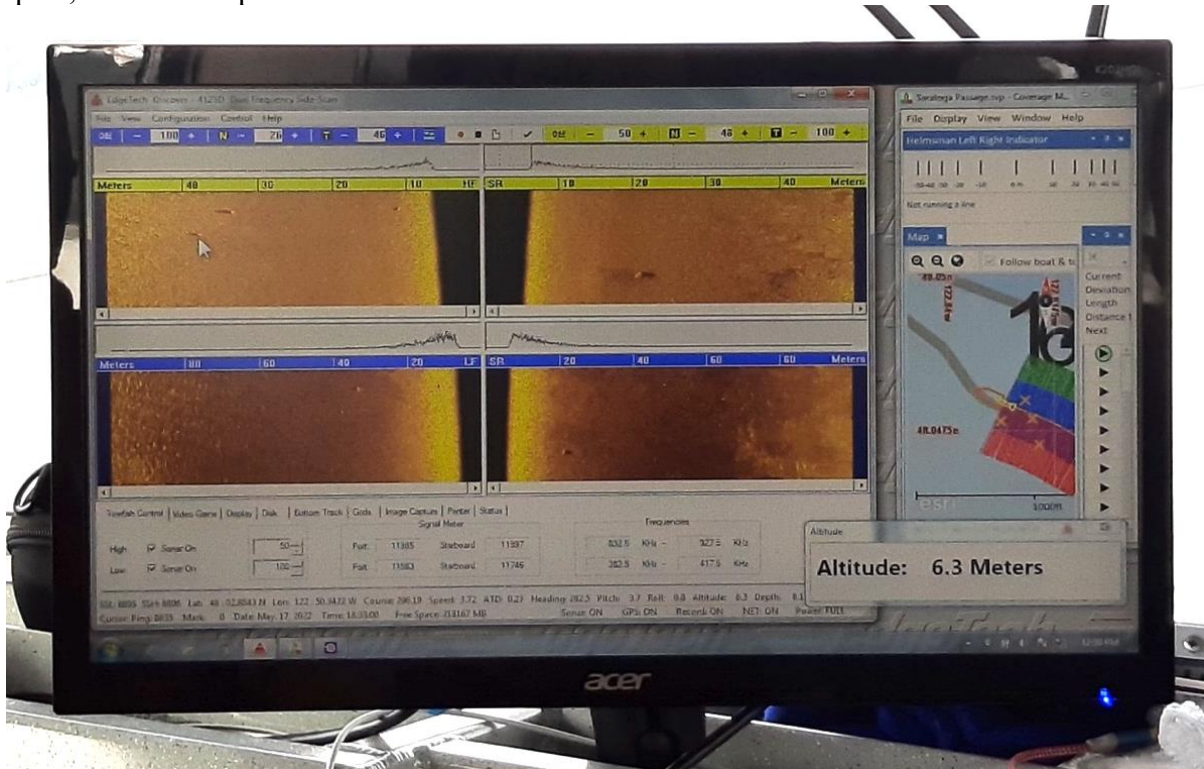
This project was a collaborative community-led effort between the Jefferson MRC and the Sea Dragons, with support from the Northwest Straits Foundation (NWSF) and WA Department of Fish and Wildlife (WDFW). After a presentation to the MRC by the Sea Dragons about their ROV’s capabilities, coinciding with an Adelma Beach resident expressing concern about derelict crab pots in Discovery Bay and interest in a recent NWSF video on derelict gear removal efforts, Jeff Taylor (Project Lead) reached out to the Sea Dragons about using their ROV to locate and remove derelict crab pots near Cape George and Adelma Beach. The Sea Dragon team members who worked on this project include Ella and Nathaniel Ashford who operated the ROV, Logan Flanagan who handled the cables, and Riley Forth who lent her GIS expertise to navigate the team. For this pilot project, the Sea Dragons worked to test and iteratively adapt their ROV – previously used in indoor pools for robotics competitions – for greater depths and lower visibility in the Salish Sea. Sea Dragon team member Logan Flanagan shared that “...prepping the ROV for ocean work involved refitting it for depths of up to 200 feet and designing and building the custom onboard battery system that could sustain the cold ocean temperatures.” He also shared that they received upcycled bike batteries from The Broken Spoke, as one example of how local companies have supported these efforts.

To optimize the utility of the ROV in locating pots for removal, the MRC contracted Ben Griner with Coastal Sensing & Survey to conduct a two-day side scan sonar survey to obtain GPS coordinates of likely derelict crab pots. Due to a small craft advisory warning on May 16, the team was unable to round Point Hudson to get to Discovery Bay from Port Townsend. Instead, the team (Jeff, the MRC Coordinator, and two Sea Dragon team members – Ella and Logan) used it as a practice day in Port Townsend Bay, learning how to operate the side scan sonar and work with the



Ella Ashford, with Ben Griner of Coastal Sensing & Survey, carefully deploying the side scan sonar. Photo by Monica Montgomery.

specialized software for marking potential derelict crab pots. On May 17, the team (MRC Coordinator, Jeff and Ella), led by Ben Griner, surveyed the two project areas: (1) between the Cape George Marina and Beckett Point and (2) Adelma Beach. The MRC had intended on additionally surveying north of Cape George, a popular crabbing location that was recommended by Liz Tobin, Jamestown S'Klallam Tribe Shellfish Program Manager. However, the previous day's small craft advisory limited time on the water in Discovery Bay. Survey results found 126 potential derelict crab pots between the Cape George Marina and Beckett Point, the majority of which were deeper than 105ft, the maximum depth allowed for diver removal, and 31 pots near Adelma Beach. See the "T4.2 ROV Maps and Data" report for derelict crab pot coordinates, depths, and area maps.



Computer cursor marking a derelict crab pot. Photo by Monica Montgomery.

With permit and approval from WDFW and GPS coordinates of derelict crab pot locations, the team set out on June 14 to relocate and recover pots using the ROV. Onboard a 30+ foot vessel donated by a community boater, Ross Anderson, the team spent a full day searching for crab pots at Cape George and Adelma Beach. Various challenges made it difficult to relocate the pots. The most pressing challenge was the lack of navigational equipment that made it impossible to orient the ROV once it was underwater. Another challenge was the particularly strong currents at Cape George, so strong that the ROV stayed in place while on full throttle. The team also found working from a large vessel to be a challenge, as it was difficult to reposition as frequently as needed to find accurate GPS coordinates as the vessel and tethered ROV continued to drift with the currents. Other challenges included floating seaweed and fishing line that jammed up the ROV's thrusters, and the occasional part malfunction. Despite these challenges, upon pulling up the boat anchor at the end of the first on-the-water day, the team incidentally recovered a derelict crab pot attached to the anchor. The crab pot had marine growth on half of it, including seven mottled sea stars (*Evasterias troschelii*) of varying sizes. Along with four big pieces of

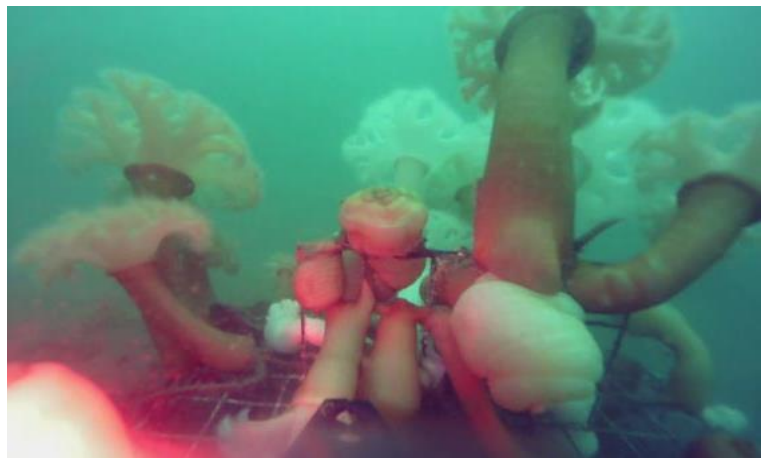
rebar ziptied to it, the pot also had a frayed rope attached, indicating it may have been lost due to a boat propeller cutting its line.



Anchor recovered pot. Photo by Monica Montgomery. Team with the anchor recovered pot. Photo by Gabriella Ashford.

Due to the strong currents experienced at Cape George, the team focused its efforts on the Adelma Beach area, which is much more protected, calm, and shallow. With new navigational equipment added to the ROV and working from two 14-foot dinghies, the team set out on the mornings of June 19, 20 and 21 to relocate and remove derelict crab pots at Adelma Beach. The Sea Dragons also adapted the ROV survey protocol, by dropping the boat anchor near the GPS coordinate and running alternating circular transects around the anchor.

On June 19, the team located three crab pots, however, opted not to remove them since they appeared to no longer be fishing and were covered in plumose anemones, seemingly creating habitat and functioning as artificial reef. As stated by Sea Dragon team member Nathaniel Ashford, “I came into this project expecting to be retrieving rusted derelict crab pots that were causing marine degradation. It didn’t occur to me that the pots could serve any other purpose. But after multiple dives, we found that several crab pots had filled the role of artificial reefs, serving as homes for sea anemones and shrimp along sections of barren seafloor. Seeing a forest of sea anemones growing from the crab pots shifted my perspective and helped me to realize it wasn’t a straightforward solution. As a result, we ended up leaving the crab pots with trapdoors that had been disabled to continue to serve as microecosystems.”



Derelict crab pot acting as artificial reef. Photo by the Sea Dragons.

On June 20, the team located and recovered two derelict crab pots. The first pot had a perfectly intact rope, suggesting it may have been lost due to a poorly tied knot. Trapped inside were two

live and two dead Dungeness crabs (*Cancer magister*) and one lyre crab (*Hyas lyratus*). The second pot had its rope cut short, indicating it may have been lost due to a boat propeller. This pot contained one live red rock crab (*Cancer productus*), two lyre crab, and four mottled sea stars. Both were located at a depths of ~69 and ~67 feet.

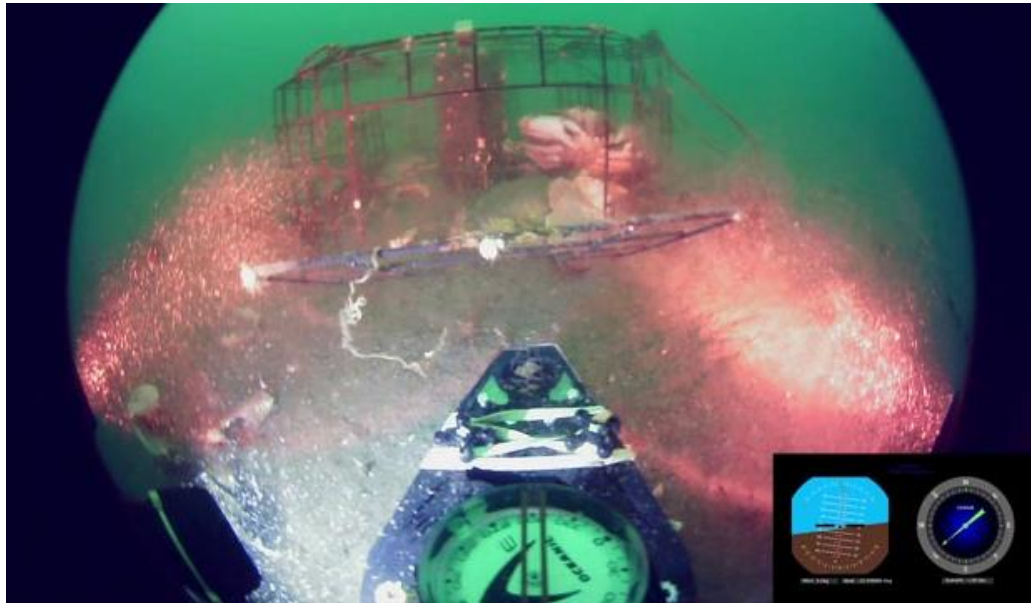


Photo captured from the ROV of one of the recovered derelict crab pots, with crab trapped inside. Photo by the Sea Dragons.

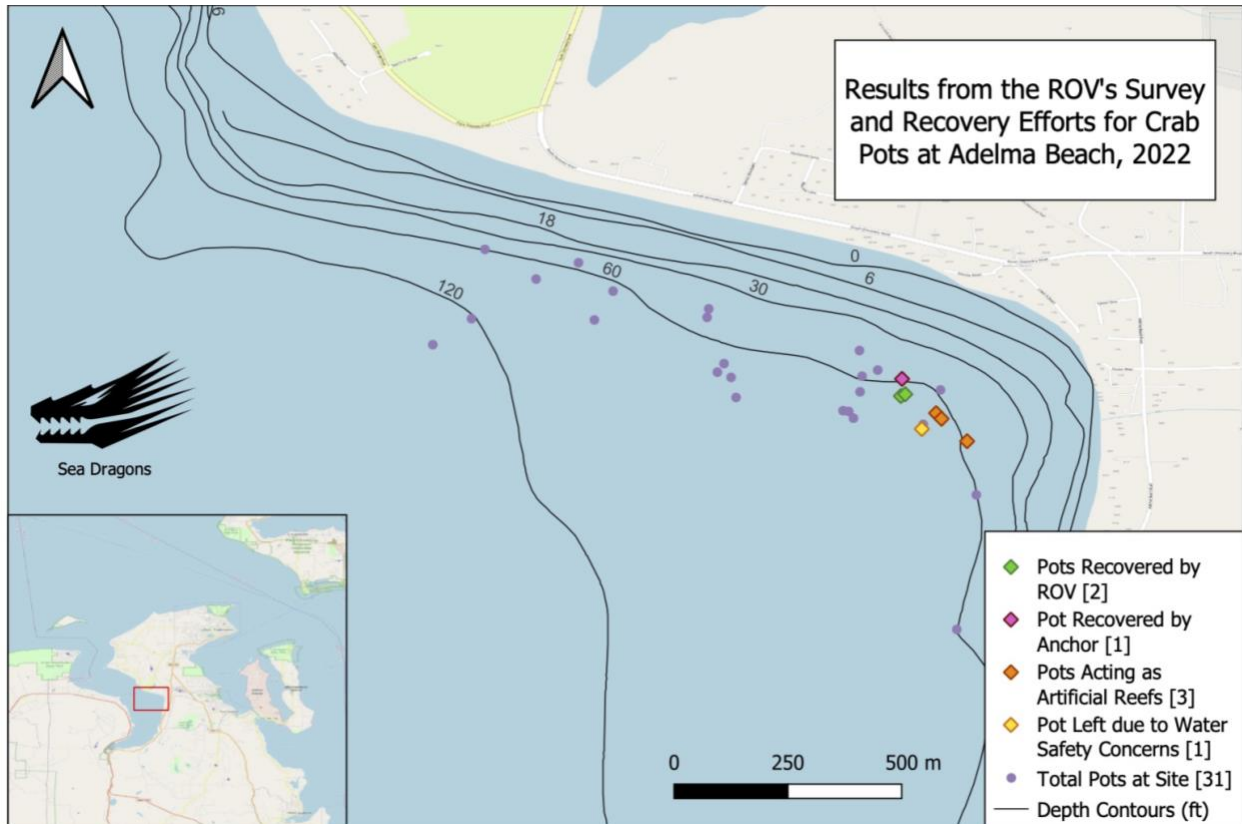
On June 21, the team located one derelict crab pot but opted not to recover it due to changing weather conditions and prioritizing safety on the water. This was the last opportunity for the team to conduct removal efforts before the Tribal crabbing season opened.

By partnering with the Sea Dragons, the MRC was able to engage high school and university students in applying their skills to a local environmental stewardship effort. Riley Forth joined the team to aid with spatial mapping of crab pots and shared, “I was excited to join this research project in order to apply all the concepts I’ve been learning to a real-world problem. It was great to be a part of a team, with so many moving parts, and immediately accomplish meaningful work.” With a short on-the-water window to test and refine methods, the Sea Dragons successfully demonstrated the ability of a submersible ROV to relocate and recover derelict crab pots and at greater depths than divers are permitted to go. By listening to community concerns and utilizing the unique skillsets of local youth, the MRC acted as an incubator for testing a new and innovative approach to a common marine conservation issue.

The MRC and Sea Dragons also sought to provide the public with education about the consequences of losing crab pots and the extent of this issue in our local waters. Nathaniel Ashford shared, “While we have proven that an ROV is effective in recovering derelict crab pots from the Salish Sea, this is only part of the overall problem. No matter how much garbage is removed, none of that will matter if ten times that amount is put back in... Our main focus in all of this is to raise awareness of what’s going on in the oceans and engage our community in ocean stewardship.” Following the summer’s derelict crab pot removal efforts, the team submitted a press release to the local newspaper which then published an article about the project on July 7th ([link to article here](#)). Ella created a presentation and shared project results to the MRC at the August 2nd monthly public meeting. Ella and Riley also developed a StoryMap ([link here](#)),

which is still being refined before sharing more widely, and which will be added to as this project grows. Also in development is a project video, being created by the MRC Project Lead, Jeff.

The MRC plans to continue growing its partnership with the Sea Dragons, to enhance the ROV's capabilities to operate at even greater depths, remove pots in other locations across East Jefferson County, refine ROV survey methods for pots with unknown locations, and eventually, advise other communities with access to a robotics team and interest in adopting similar efforts.



Map of recovered (2-green, 1-pink) and remaining pots (28-orange, yellow, purple) at Adelma Beach. Map created by the Sea Dragons.

Photos



June 14 – Ella and Nathaniel operating the ROV and tethered hook from the vessel. Photo by Monica Montgomery.



June 14 – Logan removing fishing line that was caught in the ROV's thruster. Photo by Monica Montgomery.



June 20 – Logan handling the tethered hook for retrieving derelict crab pots; Nathaniel and Ella operating the ROV, running circular transects around the anchor; and Riley navigating the team using known crab pot coordinates. Photo by Monica Montgomery.



June 20 – Logan and Ella (and Jeff) posing with the first derelict crab pot recovered using the ROV. Photo by Monica Montgomery.



June 21 – Jeff taking video footage of the team from a separate dinghy (used for support and storing recovered pots). Photo by Monica Montgomery.



June 21 – Ella, Riley, Logan and Nathaniel posing with the ROV and the two derelict crab pots recovered (the previous day) using the ROV. Photo by Monica Montgomery.