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FINAL REPORT

DERELICT FISHING GEAR IDENTIFICATION AND REMOVAL PROJECT PORT SUSAN

PREPARED FOR:

STILLAGUAMISH TRIBE

PREPARED BY:

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Introduction

Abandoned, lost and discarded fishing gear can present safety, liability, nuisance and environmental impact issues in marine waters. Identification, location and safe removal of derelict fishing gear can reduce these impacts. The Northwest Straits Commission (NWSC) recently teamed with the National Oceanic and Atmospheric Administration (NOAA) to address the issue of derelict fishing gear in north Puget Sound and the Strait of Juan de Fuca. The result of this project is a comprehensive program to safely remove derelict fishing gear from the marine environment in an environmentally acceptable manner. The Washington Department of Fish and Wildlife (WDFW) has recently published guidelines for derelict fishing gear removal in Washington marine waters based on the NOAA/NWSC project.

The Stillaguamish Tribe sought to locate and remove derelict fishing gear in Port Susan at the mouth of the Stillaguamish River. The Stillaguamish Tribe contracted with Natural Resources Consultants, Inc., (NRC) to manage the derelict fishing gear project. NRC subcontracted the Innerspace Exploration Team for sidescan sonar and diver gear recovery services. The derelict fishing gear survey and removal project followed the guidelines established by the WDFW and the NWSC and was conducted in collaboration with the WDFW, the Stillaguamish Tribe and the Tulalip Tribe.

Scope of Work

This project focused on the identification and removal of derelict nets and crab pots in Port Susan. It was a follow-up project to a similar survey and removal project conducted in September 2003.

A derelict fishing gear removal plan was prepared and submitted to the WDFW. The plan was approved by the WDFW on July 11, 2005. Side-scan sonar and SCUBA diver surveys were conducted to locate derelict fishing gear in July 2005.

Derelict fishing gear (mainly crab pots) was recovered by divers using SCUBA gear in Fall 2005 and Spring 2006. A demonstration of the feasibility of using a remote operated vehicle to conducted deepwater derelict crab and shrimp pot removal was conducted in Spring 2006.

Gear retrieved during the course of this project was treated in line with the Washington State Abandoned Property Rights Law and other salvage laws when applicable. The owners of the derelict fishing gear recovered, if

identified, were contacted and provided an opportunity to recover their property. Derelict fishing gear that could not be identified to an owner was donated to educational organizations, recycled or disposed of in the Snohomish County landfill.

Methodology

Sidescan Sonar Survey

The Innerspace Exploration Team performed the sidescan sonar surveys during the project. A Marine Sonic Sidescan Sonar System operating at 600 kHz and a differential global positioning system (DGPS) were used during the survey to locate derelict fishing gear. The sonar system employed a heavy towfish towed off the bow of a 24-foot survey vessel. A hydraulic wench and cable controlled the depth of the towfish. The survey image was projected on a monitor onboard the vessel and recorded onto a computer hard drive for later processing.

Generally, the sidescan sonar survey was conducted at 4.63 km/hr (2.5 knots) with a path width of 50 m on either side of the boat for an approximate area swept of 90 m (295 ft). The survey path width was occasionally decreased to 10 to 20 m on either side of the boat in shallow water (less than 5 m deep) or when a more detailed image of an object was desired. Survey depths generally ranged from about 1 m (3 ft) to 64.0 m (210 ft) in order to identify derelict fishing gear within the dive depth capabilities of the recovery team (<32 m or <105 ft) and also assess the scope of the derelict gear problem in deeper water.

The intent of the sidescan sonar survey was to cover as much of the fishing grounds in Port Susan for derelict fishing gear in order to estimate the total amount of derelict fishing gear in the area and to provide locations of derelict fishing gear for recovery operations. The project budget did not allow for comprehensive survey coverage of all of the deepwater fishing grounds but nearly all (95%+) of fishing grounds within the operational depth range of the divers was surveyed.

Derelict crab pots were readily identified on the sidescan sonar images (Figure 1). Counts and precise locations of derelict fishing gear were recorded during post-survey processing of the data that allowed greater time to examine the images. The survey products included the total area surveyed, the track line the vessel followed during the survey and a list of location of possible derelict gear targets with latitude and longitudes.

Gear Recovery

The Innerspace Exploration Team conducted the diver recovery of the derelict crab pots encountered. Two divers equipped with SCUBA operated off a 24-foot dive support and gear recovery vessel. The list of the precise locations of derelict crab pots detected during the sonar survey was used by the dive team to locate the derelict pots. Highest priority was given to locations with multiple derelict pots to maximize the number of derelict pots recovered during each dive operation. The dive team used a wide area augmented GPS system (WAAS) to locate the derelict gear locations. The dive support vessel was anchored in the vicinity of the reported derelict gear location. A clump weight with a line and float were deployed as near as possible to the derelict gear location. A 30 m (100 ft) length of rope was passed through a loop on the clump weight with one end of the rope attached to the support vessel and the other end held by one of the divers. When poor water visibility conditions were encountered, the diver would drag the 30 m rope around the clump weight in a circle until it tangled with the derelict fishing gear and then the diver worked back along the cable to the gear.

Once the diver found the derelict gear, a recovery line was attached to the gear and it was hauled aboard the recovery vessel by hand or with the aid of a hydraulic winch. In some cases the diver attached an air lift bag to the derelict pot and floated the pot to the surface where it was recovered by the vessel. Upon recovery of the derelict fishing gear a variety of information was recorded to describe the condition of the derelict gear and the associated organisms. Information collected included whether the derelict gear was commercial or sport, whether it was fishing or disabled, whether it was equipped with rot cord (pots), whether the rot cord was intact or not, the number of live and dead Dungeness crab, other crab and fish entrapped and notes about the condition of the gear. The derelict fishing gear was stored on the deck of the recovery vessel and deposited in one or four shallow water dumpsites until it was convenient to transfer it to shore where it was stored in a secure location until returned, recycled or disposed.

Results

Sidescan Sonar Survey

The sidescan sonar survey was conducted over a four-day period on July 17-19 and 24th, 2005. One day of post-survey data processing was conducted. A total of 11.6 km^2 or 95% of the area within the fishing grounds at depths of between 3.7 m and 32 m (12 to 105 feet) was surveyed with sidescan sonar

(Figure 2). The sidescan sonar survey identified 403 derelict gear targets (Figure 3). Based on the area surveyed and the number of derelict pots detected by sidescan sonar, the density of derelict crab pots observed was approximately 35 targets per square kilometer of seabed. Derelict gear targets were identified at water depths as shallow as 2 m (6 ft) and as deep as 73 m (240 ft).

Gear Removal

A total of 14 days of diver gear removal operations were conducted during the project. In 2005, removal operations were conducted on July 27 and 28, September 26, 27, 28 and 30 and on October 4. In 2006, removal operations were conducted on May 16 and 31, June 1, 2, 12, 13 and 14.

Of the 403 derelict gear targets identified in the sidescan sonar survey, a total of 293 (73%) were investigated. A total of 110 derelict gear targets remain uninvestigated, most of which are located in water deeper than divers can safely operate (Figure 4). Of the 293 targets investigated, 34 were found to be post-season actively fishing longlined crab pots left by Tulalip Tribal fishers and those pots were removed by Tulalip Tribal enforcement. A total of 168 derelict gear targets were identified as derelict gear are either disabled and left in place or removed. A total of 8 derelict gear targets were identified as debris items and not derelict gear and 14 targets were duplicates of targets recorded on overlapping sonar survey passes. A total of 69 targets were investigated but nothing was found. This may have resulted from derelict crab pots being buried in the mud or rusting away between the sidescan sonar survey and the removal operations.

In addition to the 168 derelict gear items removed from the sidescan target list, 6 additional derelict crab pots not listed on the sidescan sonar target list were encountered and removed during the operation. These six crab pots were likely lost after the sidescan sonar survey was conducted and were in the vicinity of known derelict gear targets being investigated. Of the total of 174 derelict gear items removed during the project, 168 were crab pots, 5 were sport crab rings and one was a sport shrimp pot. Since the crab rings present no fishing threat they were eliminated from further analyses. The shrimp pot was capable of catching crab and other animals and, therefore, was lumped with the derelict crab pots for analyses.

The 168 derelict crab pots and one shrimp pot consisted of 104 (62%) commercial and 65 (38%) sport pots (Table 1). Of the 104 commercial crab pots recovered, 60 (58%) were still actively fishing and 44 (42%) were no longer fishing. Of the 65 sport crab pots recovered, 14 (22%) were still actively fishing and 51 78%) were no longer fishing. Overall, 74 (44%) of the

derelict crab pots recovered were still actively fishing and 95 (56%) were inactive.

Of the 104 commercial crab pots recovered, 55 (53%) were equipped with rot cord, 42 (40%) were not equipped with rot cord and on 7 pots (7%) it could not be determined if rot cord had been use or not. Of the 60 commercial crab pots still actively fishing, 39 (65%) did not have rot cord or had rot cord made of synthetic material and 21 (35%) did have legal rot cord that had either had yet to disintegrate (13 pots) or had disintegrated but the pot was not disabled (8 pots). Of the 44 commercial crab pots recovered that were not fishing, 34 (77%) were equipped with rot cord that had either disintegrated (33 pots) or the rot cord was still intact but the pot had been otherwise disabled (1 pot).

Of the 65 sport crab pots recovered, 45 (70%) were equipped with rot cord, 14 (21%) did not have rot cord and for 6 (9%) it was impossible to determine if rot cord had or had not been used (Table 1). Of the 14 sport crab pots still actively fishing, 6 (43%) had rot cord that had not yet disintegrate (4 pots) or had disintegrated but the pot was still fishing (2 pots) and 8 (57%) had no rot cord or rot cord made of synthetic material. Of the 51 sport pots no longer actively fishing, 39 (76%) had rot cord, 6 (12%) did not have rot cord and for 6 (12%) pots it was impossible to determine if rot cord had been used or not.

A total of 1,012 crab were recorded from the 169 pots recovered including 990 Dungeness crab (*Cancer magister*) and 22 red rock crab (*Cancer productus*) (Table 1). Of the 990 Dungeness crab encountered 900 were alive and 90 were dead. Four of the 22 red rock crab encountered were found dead and 18 were alive. The catch rate of Dungeness crab was 5.86 crab per pot over all pots recovered. The catch rate of red rock crab was 0.13 crab per pot.

The 104 commercial pots recovered had a total 907 Dungeness crab (69 dead and 838 live) for an overall catch rate of 8.72 crab per pot. The 65 sport pots recovered had a total of 83 Dungeness crab for an overall catch rate of 1.27 crab per pot.

The 60 actively fishing commercial pots accounted for 858 crab out of the 990 encountered or 87% of the Dungeness crab recovered (Table 1). The overall catch rate for actively fishing commercial pots was 14.30 crab per pot. The 14 actively fishing sport pots accounted for 55 crab out of the 990 encountered or 6% of the Dungeness crab recovered and a catch rate of 3.93 crab per pot. Actively sport and commercial pots accounted for 913 or 92% of the total Dungeness crab encountered compared with 77 (8%) crab found in pots not actively fishing. Although commercial and sport pots not actively fishing did have 13 dead Dungeness crab.

Of the total of 990 Dungeness crab recovered, there was a total of 783 male (79%), 189 female (19%) and 18 crab (2%) for which the sex could not be determined.

A total of eighteen derelict crab pots were given to the Tulalip Tribal enforcement officers for return to their owners. None of the non-Tribal commercial crab pots owner choose to recover their pots. The remaining crab pots were disposed of in the Port Angeles landfill. The disposed of pots weighed a total of 2,533 lbs.

Remote Operated Vehicle Demonstration

On May 30, 2006, a demonstration of the feasibility of deepwater derelict pot recovery using a remote operated vehicle (ROV) was conducted. A Phantom 2+2 was equipped with a scanning sonar, video camera, lights, an articulated arm and claw and a lift bag, air bottle and snap shackle. A derelict crab pot was located in a water depth of 37 m (120 ft). The vessel was anchored in the vicinity of the crab pot location and the ROV was launched. The ROV was flown to the seabed and the scanning sonar displayed the image of the seabed around the ROV out to about 50 m (165 ft). The crab pot was readily identified on the scanning sonar image and the ROV operator maneuvered the ROV in the direction of the pot using an compass mounted below the video camera. When the ROV was within 3 m (10 ft) of the crab pot, the video camera was tilted up and the crab pot became visible on the video monitor. The ROV operator maneuvered the ROV up to the crab pot, attached the snap shackle to the rim of the pot and backed the ROV away from the pot deploying the air lift bag and small air supply bottle. The lift bag inflated and floated the derelict crab pot to the surface, were it was recovered by the ROV and returned to the vessel. The time elapsed from ROV launch to recovery was approximately 15 minutes.

Conclusions

The sidescan sonar survey effort covered most of the nearshore set gillnet fishing grounds and about 95% of the crab fishing grounds between 2 and 32 m (6 to 105 ft) depth range. A Tulalip Tribal shellfish biologist (M. McHugh pers. comm.) reported that crab pot fishing and shrimp pot fishing occurs at deeper depths in Port Susan out to 100 m (325 ft) or deeper. This area was not completely surveyed since it was beyond the project budget. However, of the deepwater area that was surveyed approximately 100 derelict gear targets were identified at depths up to 73 m (240 ft).

The density of derelict crab pots encountered during the project was higher on the mainland shoreline than on the Camano Island shoreline.

It is difficult to make projections about the total annual mortality resulting from either the recovered and/or projected remaining derelict fishing gear encountered during the survey. Assumptions about entrapped animal survival time, pot deterioration, pot self-baiting rates and seasonal animal densities in the area would be necessary to estimate the total annual impact of the derelict fishing gear on the mortality of the species they entrap. Developing estimates for each of these assumptions is beyond the scope of this study but should be addressed in future research. However, the results of the project indicate that some level of continuous mortality is occurring for Dungeness and other crab due to derelict crab pots in Port Susan.

It is clear that the impacts of derelict pots could be reduced by fishers complying with the regulations for the use of rot cord in all pots and by following best fishing practices.

The ROV deepwater derelict gear recovery feasibility test demonstrated that this technique holds promise for a safe and effective way of removing derelict pots and traps beyond the safe operational depth limits for divers.

Recommendations

Based on the observations and the results of the Port Susan derelict fishing gear project, the following are recommendations to further reduce the impact of derelict fishing gear on the marine environment of Port Susan.

- **Further sidescan sonar surveys should be conducted in areas not covered during the project.**

Sidescan sonar effort was concentrated within areas and at depths that the divers were capable of working. Additionally, there was insufficient time and budget in the project to survey deeper water areas where commercial crab and shrimp pot fishing occurs. It would be useful to survey these deeper areas and determine the density of derelict fishing gear. There may be other means available to recover deepwater derelict pots and traps such as by a remote operated vehicle.

- **Fishing gear regulations should be enforced in commercial and recreational crab fisheries.**

Nine of 37 or 65% of the derelict crab pots recovered were not equipped with rot cord. The use of rot cord is essential to minimize the impact of derelict crab and shrimp pots.

- **Regulations against vandalism of commercial and subsistence crab pots should be strictly enforced.**

Tulalip Tribal commercial crab fishermen and Tulalip Tribal Fishery Enforcement Officers contacted during the project reported that floats on commercial and subsistence pots are repeatedly cut by vandals. Tribal fishermen have resorted to longlining multiple crab pots together and setting the gear without surface floats. They grapple for the line between the pots to recover the gear. If the longlined pots are not recovered, this may result in multiple pots being lost. Stricter enforcement of laws against fishing gear vandalism would allow for setting single pots.

- **Further work should be conducted to determine the feasibility of ROV use for deepwater crab and shrimp pot removal.**

Depending upon the scope of the problem of derelict crab and shrimp pots in deepwater beyond the safe operational limits for divers, further ROV feasibility studies could be conducted. A feasibility test of four to five days in length with establish the daily removal rate for deepwater derelict pots using this technique.

Table 1. Number of derelict pots recovered, type of pot (commercial or sport), fishing status (actively fishing or not) and numbers of live and dead organisms observed during the Stillaguamish Tribe Derelict Fishing Gear Project, 2005/2006. Source: NRC.

Fishing/Not Fishing	Actively Fishing			Not Fishing				All Pots*			
	Rot Cord	No Rot Cord	Total	Rot Cord	No Rot Cord	Unknown	Total	Rot Cord	No Rot Cord	Unknown	Total
Commercial											
# Pots Recovered	21	39	60	34	3	7	44	55	42	7	104
# Dungeness Crab Dead	14	47	61	8	0	0	8	22	47	0	69
# Dungeness Crab Alive	164	633	797	39	2	0	41	203	635	0	838
# Red Rock Crab Dead	1	0	1	0	0	0	0	1	0	0	1
# Red Rock Crab Alive	4	4	8	3	0	0	3	7	4	0	11
# Total Crab Dead	15	47	62	8	0	0	8	23	47	0	70
# Total Crab Alive	168	637	805	42	2	0	44	210	639	0	849
Sport											
# Pots Recovered	6	8	14	39	6	6	51	45	14	6	65
# Dungeness Crab Dead	10	6	16	3	0	2	5	13	6	2	21
# Dungeness Crab Alive	23	16	39	23	0	0	23	46	16	0	62
# Red Rock Crab Dead	0	0	0	0	0	3	3	0	0	3	3
# Red Rock Crab Alive	0	0	0	1	0	6	7	1	0	6	7
# Total Crab Dead	10	6	16	3	0	5	8	13	6	5	24
# Total Crab Alive	23	16	39	24	0	6	30	47	16	6	69
All Pots											
# Pots Recovered	27	47	74	73	9	13	95	100	56	13	169
# Dungeness Crab Dead	24	53	77	11	0	2	13	35	53	2	90
# Dungeness Crab Alive	187	649	836	62	2	0	64	249	651	0	900
# Red Rock Crab Dead	1	0	1	0	0	3	3	1	0	3	4
# Red Rock Crab Alive	4	4	8	4	0	6	10	8	4	6	18
# Total Crab Dead	25	53	78	11	0	5	16	36	53	5	94
# Total Crab Alive	191	653	844	66	2	6	74	257	655	6	918
# Total Crab	216	706	922	77	2	11	90	293	708	11	1,012

* The status of rot cord on 6 commercial and 6 sport pots recovered could not be determined.

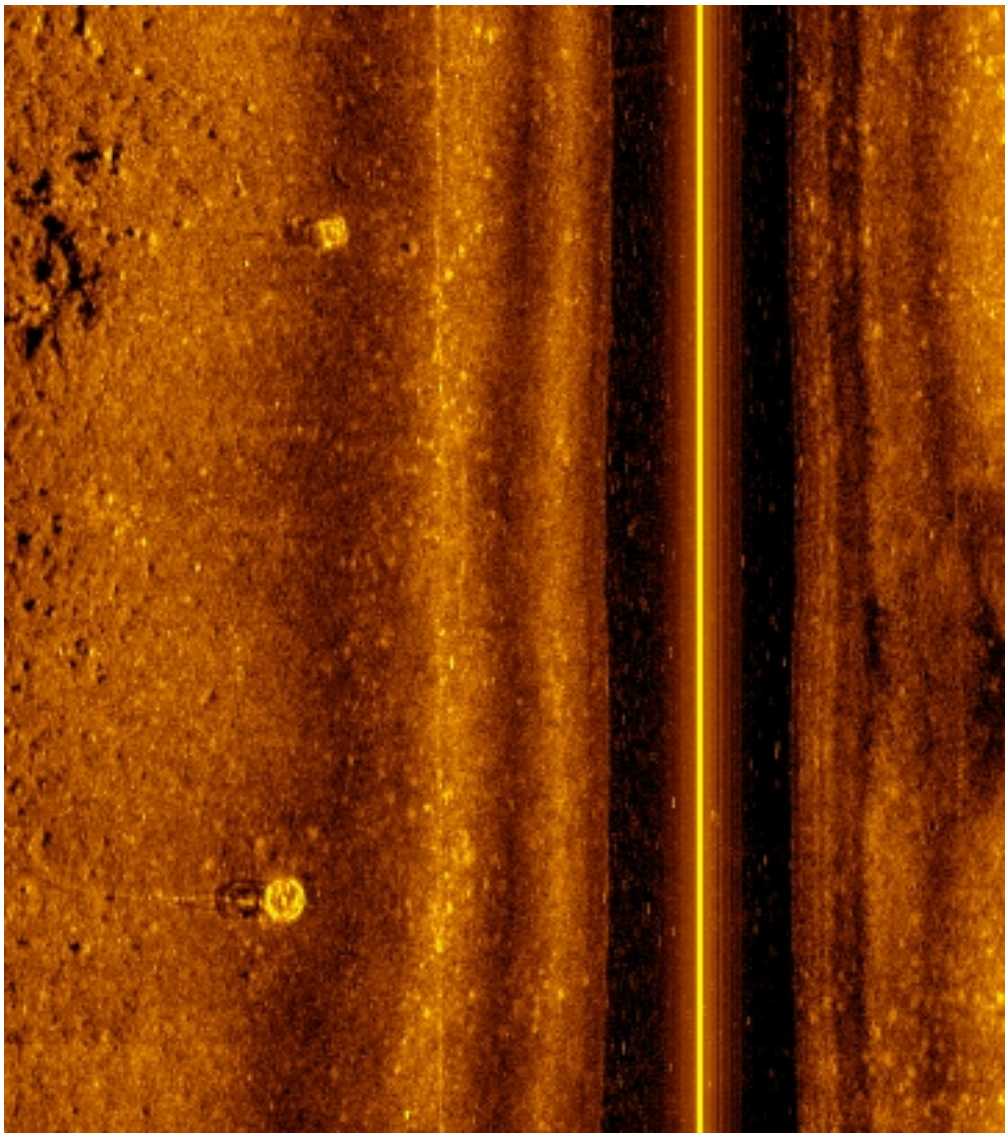

Figure 1. An example of a sidescan sonar image of derelict crab pots. (Square sport pot in upper image and round commercial pot with line in lower image). Source: Innerspace Exploration Team.

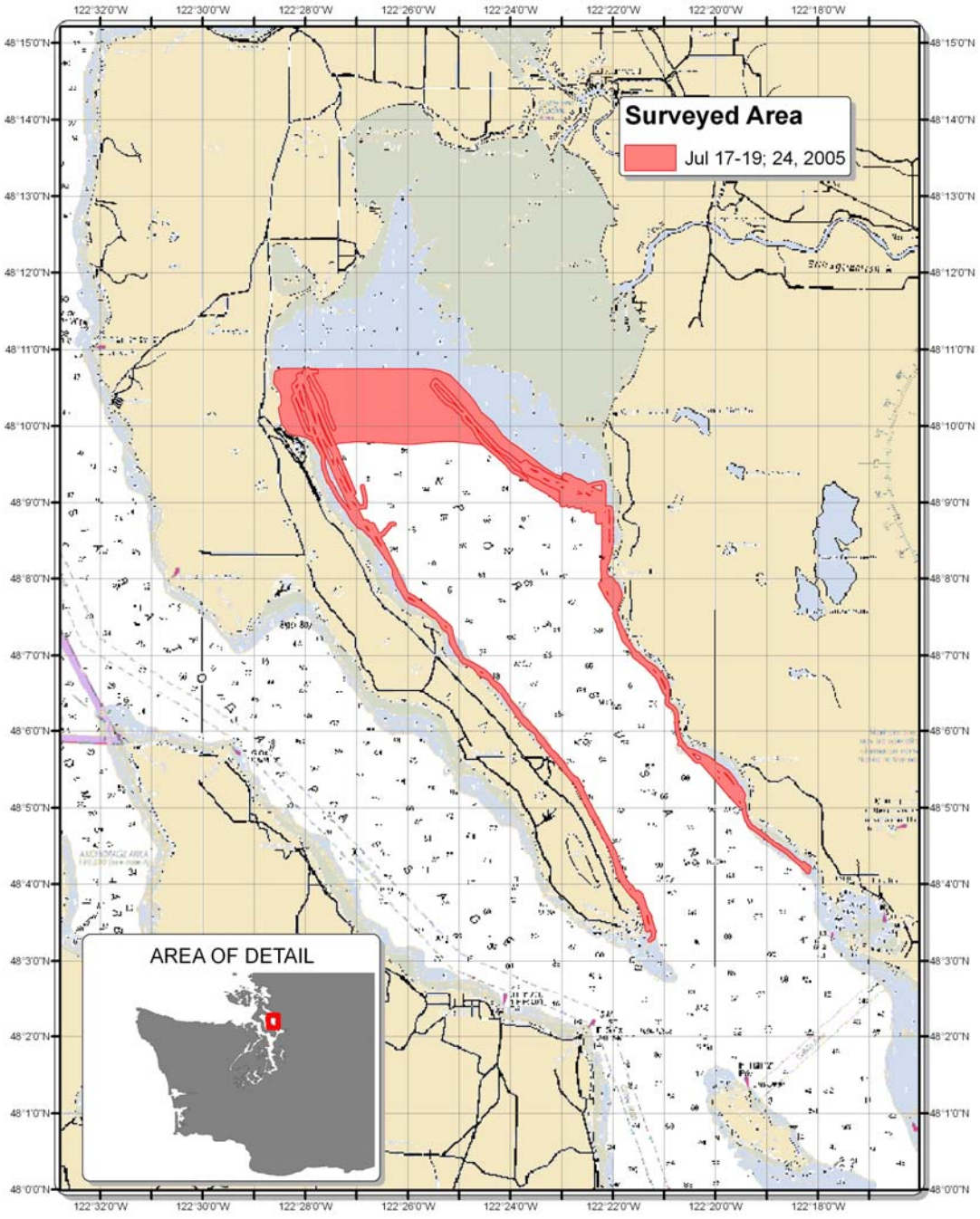

Figure 2. The location of sidescan sonar survey effort conducted during the 2005/2006 Stillaguamish Tribe Derelict Fishing Gear project in Port Susan. Source: NRC and the Innerspace Exploration Team.

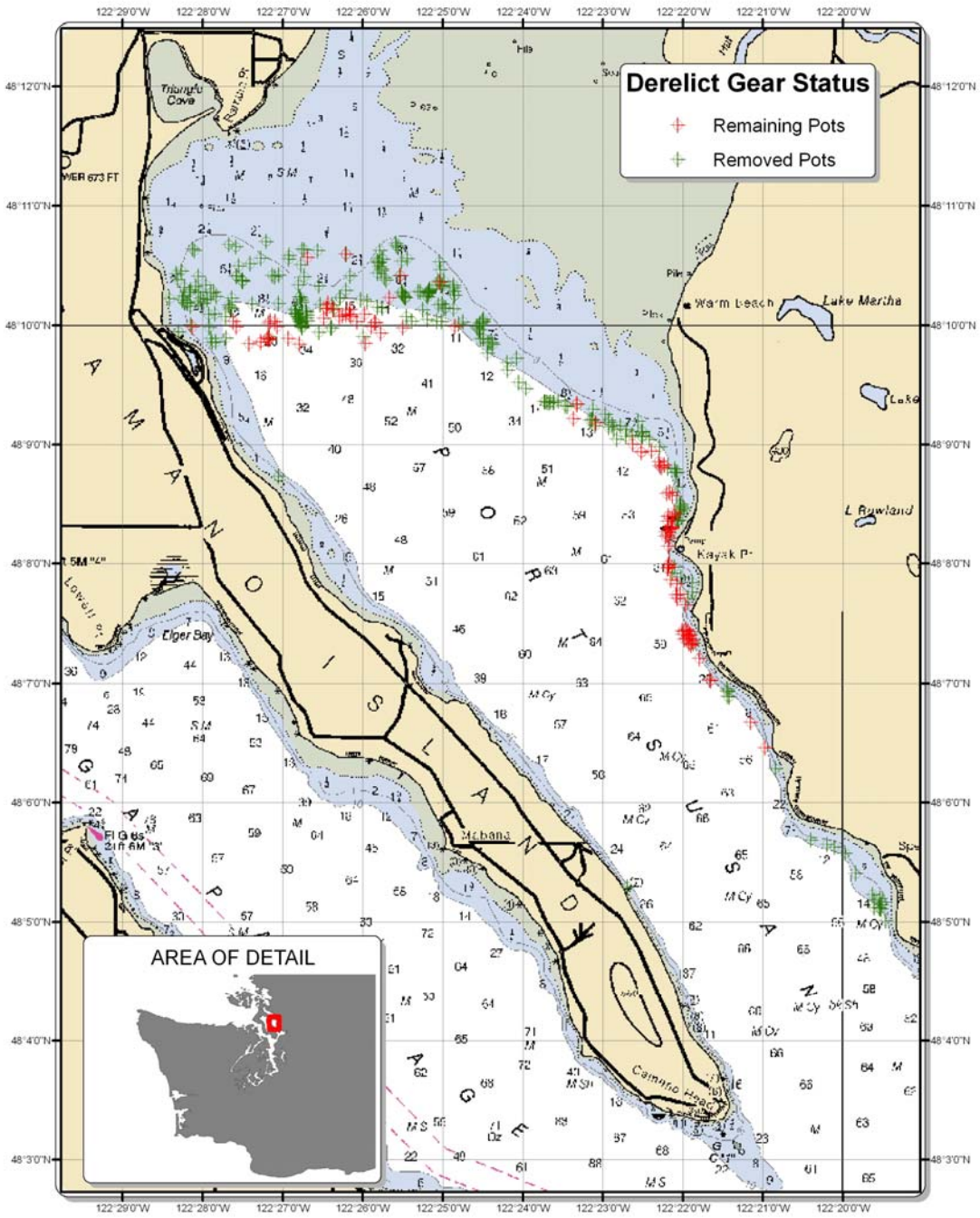

Figure 3. The location of removed and remaining derelict gear targets in Port Susan. Source: NRC and the Innerspace Exploration Team.

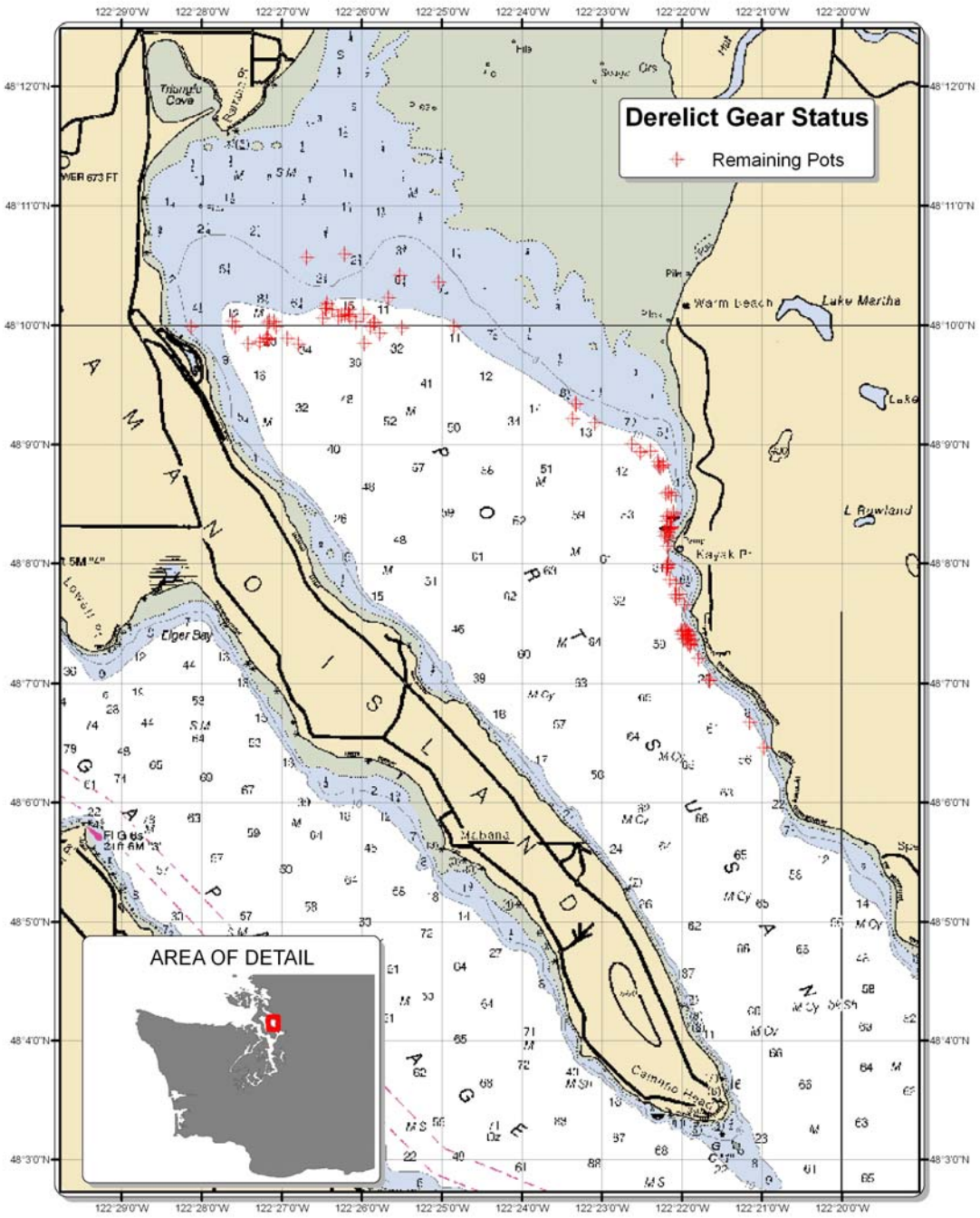

Figure 4. The location of derelict gear targets remaining to be investigated in Port Susan. Source: NRC and the Innerspace Exploration Team.