NRC
NATURAL RESOURCES CONSULTANTS, INC.

1900 W. NICKERSON, STE. 207
SEATTLE, WASHINGTON 98119-1650, U.S.A.
TELEPHONE: (206) 285-3480
TELEFAX: (206) 283-8263
E-Mail : jjune@nrccorp.com (corporate)

FINAL REPORT

CLALLAM COUNTY 2006 DERELICT FISHING GEAR PROJECT

PREPARED FOR:

NORTHWEST STRAITS COMMISSION
AND
CLALLAM COUNTY

PREPARED BY:

NATURAL RESOURCES CONSULTANTS, INC.

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Introduction

The Washington Department of Fish and Wildlife (WDFW) and Tribal Fishery Departments report that commercial crab and shrimp pot gear is commonly fished over a variety of water depths from tidal out to 300 ft and deeper throughout Clallam County and in other areas of Puget Sound. Each year some of this gear is lost due to entanglement with debris, vessel hits and vandalism. Previous derelict fishing gear survey and removal operations have concentrated effort in water depths where diver removal operations are feasible (0 to 105 ft) without expensive dive equipment such as a decompression chamber. Several sidescan sonar transects conducted in deeper water during previous derelict gear surveys have found derelict crab and shrimp pots in Dungeness Bay and Port Angeles Harbor at depths beyond diver removal. However, the extent and abundance of derelict pots beyond cost effective diver removal depths is unknown. Additionally, remote operated vehicles may provide a cost effective method of removing derelict shrimp and crab pots in water deeper than divers can operate. Also unknown is the rate at which crab and shrimp pots are lost within areas previously cleared of derelict gear. Finally, derelict gear surveys have documented derelict pots that have yet to be removed from Clallam County waters. The destructive impacts of derelict fishing gear have been demonstrated in derelict gear removal projects previously conducted in Clallam and other counties within the NWSC operation area.

The goals of the 2006 Clallam County derelict gear project are (1) to assess the extent of the problem of derelict crab and shrimp pots in water deeper than removal divers can reach, (2) determine the feasibility of deep water derelict crab and shrimp pot removal using a remote operated vehicle (ROV), (3) measure the loss rate of derelict crab and shrimp pots in areas were derelict pot removals have occurred, and (4) continue to locate and remove derelict fishing gear in Clallam County.

Funding from the NOAA Marine Debris Program and other sources was provided by the Northwest Straits Commission (NWSC). NWSC contracted with Natural Resources Consultants, Inc. (NRC), to manage the derelict fishing gear project. The removal operations were coordinated with the WDFW, Clallam County, Tribal governments, NOAA, the U.S. Fish and Wildlife Service (USFWS) and the U.S. Coast Guard (USGC).

Scope of Work

Task 1: Assess the extent of the derelict fishing gear problem at depths beyond diver operational feasibility.

A deep water sidescan sonar survey was conducted in Dungeness Bay to determine the concentration of derelict crab and shrimp pots in water deeper than divers can safely operate (>105 ft). Originally, a similar deep water sidescan sonar survey was planned for Port Angeles Harbor, however, this proved to be infeasible due to extensive concentrations of log debris on the bottom threatening the loss of the sonar towfish. The results of the deepwater derelict gear survey conducted in Dungeness Bay are compared with similar surveys for derelict fishing gear previously conducted in shallow water and the extent of the deep water derelict gear problem assessed.

Task 2: Assess the feasibility of ROV removal of derelict crab and shrimp pots.

An ROV was equipped with a scanning sonar head to allow the surface operator to located previously surveyed derelict pots. The ROV was tested in a removal mode, where the ROV grabs the derelict pot and pulls it to the surface or attaches an auto inflating airlift bag to float the pot or trap to the surface. The number of pots that can be removed or disabled per day was estimated. The daily operation costs of the ROV pot removal are compared with diver removal operations to assess both operational and cost-effective feasibility of using ROVs for derelict pot/trap removal.

Task 3: Determination of loss rates of derelict crab and shrimp pots; year two.

Previous survey and derelict shrimp and pot removal projects conducted by Clallam County and the NWSC have significantly reduced or eliminated derelict pots from some commonly fished commercial, Tribal and recreational crab fishing areas. Re-surveying some of these areas provided an estimate of the reoccurrence loss rate of derelict pots in these fisheries. This information is valuable to WDFW and Tribal fishery managers in assessing the overall impact of derelict fishing gear in the area and provides additional information for public information programs aimed to reduce fishing gear loss.

Task 4: Further removal of known derelict fishing gear

Additional removal of known derelict fishing gear was continued in Clallam County building on the success of previous removal projects that have significantly reduced the impact of derelict fishing gear in the area.

Methodology

Sidescan Sonar Survey

Fenn Enterprises performed the sidescan sonar surveys associated with Tasks 1 and 3 during the project. A Marine Sonic sidescan sonar system operating at 600 kHz with a differential global positioning system (DGPS) was 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 in the re-survey of Dungeness Bay and Port Angeles Harbor where previous crab pot removal work had been conducted generally ranged from about 3 m (10 ft) to 32 m (105 ft) in order to identify derelict fishing gear within the dive depth capabilities of the recovery team. Survey depths in the deepwater survey of Dungeness Bay ranged from 32 m (105 ft) to 100 m (325 ft).

The intent of the shallow water survey in Dungeness Bay and Port Angeles Harbor was to re-survey the area first surveyed in June 2003 where nearly all of the derelict gear had been removed in order to determine loss rates of crab pots. The intent of the deepwater survey in Dungeness Bay was to assess the density of pots and traps at water depths beyond diver removal capabilities.

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 products from the sidescan sonar survey included a trackline file of the area surveyed, calculation of the area of the fishing grounds

covered and the positions (latitude and longitude) of likely derelict fishing gear targets found.

Remote Operated Vehicle Removal Feasibility

Fenn Enterprises performed the remote operated vehicle feasibility testing during the project. A Phantom 2+2 equipped with a surface displayed scanning sonar head, video camera and an articulated arm and claw equipped with a snap shackle, airlift bag and small air bottle were deployed to test the feasibility of ROV removal of deepwater derelict fishing pots and traps.

The feasibility test involved locating pre-deployed derelict gear pots or traps and recovering the gear to the surface with an ROV. Pots and traps were set prior to the feasibility test to assure that accurate locations of the derelict gear were known. The intent of the feasibility testing was to determine the effectiveness of the ROV and not the vessel's ability to locate and remove derelict fishing gear, which has been proven in a number of previous removal projects. Under high production removal operations in deepwater, the sidescan sonar towfish used in the survey would be equipped with an acoustic tracking device to accurately calculate layback and side drift relative to the differential GPS antenna on the vessel which provides sub-meter accuracy of target locations. During removal operations, the ROV would be equipped with the same acoustic tracking device allowing the operator to accurately guide the ROV to the immediate vicinity of the derelict gear target, similar to that simulated during the feasibility tests with the pre-set derelict gear.

Once the ROV was lowered to near the bottom in the vicinity (within 100 ft) of the derelict gear target, the scanning sonar on the ROV was used to locate the derelict gear item and the surface operator guided the ROV to the target. Targets were readily seen on the scanning sonar at distances of 100 to 150 ft. Once within 10 to 15 ft of the target, the optical video camera onboard the ROV displayed a visual image of the derelict gear target. It was readily apparent whether the derelict gear target was indeed derelict gear or other debris. The ROV was maneuvered close enough to the derelict gear item to allow the manipulator arm to attach a snap shackle attached to a small air tank and airlift bag. Upon backing away from the derelict pot or trap, the bag and air bottle were deployed and the derelict pot or trap was slowly lifted to the surface. Under full removal operations, the ROV would be connected to the surface by as heavy lift umbilical and instead of an airlift bag, the ROV would grab the derelict gear with an articulated arm and the ROV and gear

would be quickly brought to the surface by a winch on the vessel. Alternatively, if derelict pots or traps were mostly buried in the seabed, the ROV could have a second alternative tool that could cut through the pot or trap and leave it partially buried but not capable of further fishing. Although testing disablement was originally part of objective of the project, budget and schedule did not allow sufficient time to deploy this equipment.

The time required to locate and remove derelict pots with the ROV was calculated and an estimate of the number of derelict pots and traps that could be removed in a typical workday estimated. The gear removal rate and daily cost of the ROV operation was compared with that of shallow water diver removal operations to determine the cost/benefit of ROV removal.

Gear Recovery

Doug Monk Diving was contracted to conduct the dive recovery operations on crab pots in Dungeness Bay. Although a shallow water sidescan sonar survey for derelict pots and traps was conducted in Port Angeles Harbor, there was insufficient project budget to conduct removal operations. WDFW believed that the predominately commercial crab pot gear in Dungeness Bay was the highest priority for removal operations and, as such, all removal effort was directed there.

Two divers equipped with surface supplied air operated off a 40-foot dive support and gear recovery vessel, the F/V *Bet-Sea*. A list of the precise locations of derelict crab pots detected during the shallow water sidescan sonar survey was used by on onboard biologist and dive team to locate derelict pots using a WASSGPS and electronic chart software (Nobeltec®). Derelict gear target locations derived from the sidescan sonar survey were transferred into the Nobeltec charting software as waypoints and plotted over a navigation chart of Dungeness Bay.

Highest priority was given to locations with multiple derelict gear targets to maximize the number of derelict gear units recovered during each dive operation. Using the WASSGPS system, the dive support vessel was directed to the exact location of the potential derelict gear target identified by the sidescan sonar survey. As the vessel arrived at the target location a clump weight with a line and float were deployed as near as possible to the derelict gear location. The dive support vessel was then anchored in the vicinity of the clump weight or drifted nearby and a single diver was deployed. The other diver stood by on deck as a safety backup diver. A 30 m (100 ft) length

of rope was passed through a loop on the rope near the clump weight and the other end was held by the diver. 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 rope to the gear.

Prior to recovery of the derelict fishing pot a variety of information was reported to the biologist on board the support vessel by the diver. Information collected included whether the derelict pot was commercial or sport, whether it was fishing or disabled, whether it was equipped with rot cord (pots), whether the gear was actively fishing or not, the number of live and dead Dungeness crab, other crab and fish entrapped. Also reported was information about the overall condition of the gear and the depth and type of seabed where the gear was located. Gear to be recovered was freed by hand by the diver, a recovery line from the vessel was attached and it was hauled aboard the recovery vessel by the aid of a hydraulic winch. Pots buried more than 1/3 of their height in the seabed were disabled and left in place. The onboard biologist further inspected the gear at the surface and looked for owner identification information.

The derelict fishing gear was stored in the fish hold of the recovery vessel until offloaded at a secure location and either returned to the owner or disposed of in a landfill.

Results

Task 1: Assess the extent of the derelict fishing gear problem at depths beyond diver operational feasibility.

A deepwater sidescan sonar survey of derelict pots and traps was conducted in Dungeness Bay mid-way between the end of the Dungeness Spit and Protection Island (Figure 1) on June 6 and 7, 2006. WDFW reported that significant non-Tribal and Tribal commercial crab pot and shrimp trap fishing efforts occurs in deep water in this area. The depth ranges surveyed ranged from 100 ft to 325 ft. A total of 0.86 nm^2 (3 km^2) was surveyed. A total of 22 derelict gear targets were identified and likely included both crab pots and shrimp traps. Figure 2 shows a sidescan sonar image of a string of what is believed to be three shrimp traps longlined together on the bottom in 240 ft of water in Dungeness Bay.

The density of derelict gear targets in deepwater in Dungeness Bay was

estimated at 7.46 targets/km^2, almost one-third the density of 20.2 derelict gear targets/km^{2}estimated during a shallow water survey of Dungeness Bay in June 2003 (Final Report, 2003 Clallam County Derelict Gear Project, August 2003). Densities of shallow water derelict gear targets found in Sequim Bay and Port Angeles Harbor in June 2003 found derelict gear target densities of 37.1 targets/km^2 and 134.3 targets/km^2, respectively, were are also much higher than the density of derelict gear targets found in deepwater in Dungeness Bay. A similar deepwater sidescan sonar survey conducted in Port Gardner in 2006 found a density of commercial and sport crab pot and shrimp trap targets of 115.7 targets/km^2 that was similar to the density of derelict gear targets, 135.8 targets/km^2, found in shallow (3 to 105 ft) in the same area.

Task 2: Assess the feasibility of ROV removal of derelict crab and shrimp pots.

The feasibility of using a remote operated vehicle to locate and remove derelict crab pots and shrimp traps was conducted on June 8, 2006 in Port Angeles Harbor. Four derelict crab pots, two commercial and two sport pots, recovered from Dungeness Bay were positioned on the seabed at depths ranging from 60 ft to 100 ft near the entrance to the Port Angeles Boat Haven.

A total of seven pot recoveries were attempted during the ROV feasibility test. All seven pot recoveries attempted with the ROV were ultimately successful. Five pot recoveries were conducted using the ROV to grab and hold the crab pot and then recovering the ROV using the umbilical and two recoveries were conducted deploying the airlift bag recovery method. Problems with the deployment of the airlift bag system significant increased the average time (25 minutes) required for that method of recovery. The first airlift bag recovery required 19 minutes from the time the vessel was anchored until the derelict pot was recovered to the vessel and the ROV was stored back on deck. The second air lift bag recovery required 31 minutes and the airlift bag did not deploy properly and the pot was recovered with the ROV grab and haul method. The five pot recoveries using the grab and haul method averaged 13 minutes from time of vessel anchoring until the pot and ROV were back on deck. The shortest recovery time was 11 minutes using the grab and haul method.

Divers, operating in shallow water are typically able to recovery, on average 25 to 30 derelict crab pots per 8 hour work day or 3 to 3.75 pots per hour.

In high density derelict pot and trap areas, previous removal operations have demonstrated that approximately 10 minutes are required to travel from one derelict target location to another and anchor the recovery vessel and about 8 to 18 minutes for the diver to locate, remove the pot and return to the vessel. When visibility in the water is good (> 10 ft) diver recovery time is reduced to 5 to 10 minutes and when visibility is poor (<3 ft), dive recovery time increases to 20 to 25 minutes per pot. Assuming the same 10 minute average transit time and anchoring for the recovery vessel between derelict gear targets in deepwater and the average of 13 minutes of ROV operation per recovery for the grab and haul method, a deepwater ROV recovery effort could be expected to remove 2.5 to 3.0 derelict crab pots per hour or 20 to 25 crab pots per day. Experience and the addition of the acoustic tracking device to the ROV might decrease the recovery time per pot or trap and increase the number of pots or traps recovered per day to that similar with shallow water diver removal.

On average the cost differential between ROV and diver operations is about $1,300 per day with the ROV being more expensive to operate. Assuming the ROV is able to remove 20 crab pots per day, the additional cost per pot of a deepwater ROV operation is approximately $65 per crab pot.

Task 3: Determination of loss rates of derelict crab and shrimp pots; year two.

Rates of new crab pot loss were assessed in shallow water areas of inner Dungeness Bay and Port Angeles Harbor. A sidescan sonar survey was conducted in Dungeness Bay on June 5 and 6th, 2006 (Figure 3). The survey covered 2.6 km^2 of inner Dungeness Bay and detected 43 derelict gear targets (crab pots). Divers investigated all but 4 of the derelict gear targets (four targets were too deep for divers). Three additional derelict crab pots were found adjacent to targets identified during the June 2006 survey.

The same area had first been sidescan sonar surveyed in June 2003 and 53 derelict gear targets were detected. Derelict gear removal operations conducted in August 2003, February 2004 and May 2005 removed 32 crab pots, 9 targets were investigated by divers but not found and 12 derelict gear targets remained uninvestigated. Comparing the locations of the derelict gear targets and their removed/remain status, it was determined that two of the crab pots surveyed in June 2006 were first surveyed in June 2003. The other 10 derelict gear targets identified during the June 2003 survey and remaining after the removal operations were not found in the June 2006 survey and presumably deteriorated to the point that they were undetectable

with the sidescan sonar. Comparing the two survey results and accounting for gear removed indicates that over the three year period from June 2003 to June 2006, 41 crab pots became derelict in the survey area in Dungeness Bay or approximately 13.7 crab pots per year or 5.26 crab pots per year per square kilometer. The 43 derelict gear targets identified in the June 2006 survey were quite similar to the 53 derelict gear targets identified in the first survey in June of 2003. WDFW reports that hundreds of crab pots are fished each year in the area surveyed in Dungeness Bay during the recreational and commercial fishing seasons. The estimated loss rate of 13.7 crab pots per year is low compared with the number of pots fished.

A similar assessment of crab pot loss was conducted in Port Angeles Harbor in front of the entrance to the Port Angeles Boat Haven. A sidescan sonar survey was conducted June 8, 2006 (Figure 4). The survey covered 2.3 km^2 and detected 30 derelict gear targets (crab pots). There was insufficient funding to allow divers to investigate the derelict gear targets in Port Angeles, but it was assumed that all were derelict crab pots.

The same area had first been sidescan sonar surveyed in June 2003 and 117 derelict gear targets were detected. Derelict gear removal operations conducted in August 2003, February 2004 and May 2005 removed 40 crab pots, 2 targets were investigated by divers but not found and 75 derelict gear targets remained uninvestigated. By comparing the locations of the derelict gear targets and their removed/remain status, it was determined that six of the crab pots surveyed in June 2006 were first surveyed in June 2003. The other 69 derelict gear targets identified during the June 2003 survey and remaining after the removal operations were not found in the June 2006 survey and presumably deteriorated to the point that they were undetectable with the sidescan sonar. Comparing the two survey results and accounting for gear removed indicates that over the three year period from June 2003 to June 2006, 24 crab pots became derelict or approximately 8.0 crab pots per year or 3.5 crab pots/km^2. The 30 derelict gear targets identified in the June 2006 survey were only 25% of the 117 derelict gear targets identified in the first survey in June of 2003. Inner Port Angeles Harbor is a popular recreational crabbing area and hundreds of pots are fished in this area each year. Port Angeles is also a major industrial port with significant commercial and recreational vessel traffic. The estimated loss rate of 8 crab pots per year in the area surveyed is low compared with the number of pots fished and the likelihood of vessel encounters and loss. However, results of the removal operations conducted after the June 2003 survey indicated that many of the crab pots lost in Port Angeles Harbor are severely damaged probably by

dragging or entanglement in propellers. These pots may deteriorate more rapidly than undamaged pots and become undetectable by the sidescan sonar.

Derelict Crab Pot Removal

Derelict fishing gear was removed from Dungeness Bay on June 18 and 19, 2006 (Figure 5). A total of 39 (91%) of the 43 derelict gear targets identified during the June 2006 sidescan sonar survey were investigated. Three additional commercial crab pots were found adjacent to derelict gear targets identified during the survey and removed for a total of 42 crab pots removed. Four targets remained uninvestigated due to water depth (over 100 ft) (Figure 5).

Of the 42 derelict crab pots removed, 11 (26%) were determined to be still actively fishing and 31 (74%) were no longer fishing (Table 1). Commercial crab pots totaled 35 (83%) and sport crab pots totaled 7 (17%). Of the 42 pots recovered, 6 (14%) were not equipped with rot cord or had illegal synthetic rot cord, 35 (83%) had legal rot cord and for 1 (2%) pot, it was so deteriorated that it was not possible to determine if rot cord had been used or not. Of the 35 pots equipped with legal rot cord, the rot cord had disintegrated on 28 (94%) pots and was still intact on 2 (6%) pots.

All of the seven sport crab pots recovered were equipped with proper rot cord, whereas 6 (17%) of the 35 commercial pots recovered were not equipped with proper rot cord or had synthetic rot cord (1 pot). Of the 11 crab pots found to still be fishing, 6 (55%) were not equipped with proper rot cord and 5 (45%) pots had legal rot cord that had yet to deteriorate. One of the two pots previously detected in the June 2003 sidescan sonar survey was a commercial crab pot that was not equipped with rot cord and was found to be still actively fishing 1,087 days after first detected. The pot contained 10 live and 1 dead Dungeness crab and numerous crab shells were observed by the diver around the pot.

Of the 42 derelict pots recovered, 17 (40%) pots contained a total of 119 Dungeness crab (*Cancer magister*), and 7 red rock crab (*Cancer productus*) (Table 1). Of the 119 Dungeness crab recovered, 100 (84%) were live and 19 (16%) were dead. Five (71%) of the red rock crab recovered were live and 2 (29%) were dead. Derelict pots determined to be still actively fishing contained 111 Dungeness crab (16 live and 95 dead) and 3 live red rock crab. Pots determined to be no longer actively fishing contained 8 Dungeness crab

(5 live and 3 dead) and 2 dead and 2 live red rock crab. Crab pots without legal rot cord contained 93 (78%) Dungeness crab (79 live and 14 dead) and 1 (14%) of the red rock crab (1 live) recovered.

Conclusions

Each of the four tasks in the project was successfully completed.

The results of Task 1, assessing the density of derelict gear targets is water deeper than divers can safely work, indicated that in Dungeness Bay deepwater derelict pots and traps are much lower in density, 7.46 derelict gear target/km^2 than in adjacent shallow water areas (20.2 derelict gear targets /km^2) and much lower than other shallow water areas in Clallam County and deepwater areas in Port Gardner (115.7 derelict gear targets/km^2. WDFW reported that most of the deepwater crab and shrimp pot effort in Dungeness Bay is Tribal and non-tribal commercial fishing. Commercial fishers may be more careful in setting and retrieving their fishing gear than recreational fishers. Additionally, the deepwater area fished for crab and shrimp in Dungeness Bay is not a high vessel traffic area and, therefore, the interactions of vessels with crab and shrimp gear and resulting gear loss may be lower. Other deepwater areas in Clallam County (Port Angeles Harbor) and other areas in Puget Sound likely have higher densities of derelict gear in deep water.

The results of Task 2, assessing the feasibility of ROV removal of derelict crab and shrimp pots, indicate this removal method is likely feasible and cost effective in deepwater and may be comparable with costs of diver removal in shallow water. Removal rates calculated during the feasibility testing indicated that 20 to 25 derelict crab or shrimp pots could be removed from deep water using an ROV each work day, which is similar to the average removal rate experienced in shallow water with divers. The cost of the ROV operation is about $1,300 more per day than diver removal operations or about $65 more per pot removed. Although an expensive ROV is at risk during removal operations, the operation is safer than diver removal.

The results of Task 3, assessment of recent (three year) crab pot loss rates in Dungeness Bay and Port Angeles Harbor, indicate that loss rates varied between the two areas from a low of 3.5 crab pots/km^2/year in Port Angeles to 5.26 crab pots/km^2/year in Dungeness Bay. Loss rates in the areas surveyed in both areas were relatively low over the three-year period accounting for

only 41 pots in Dungeness Bay and 30 pots in Port Angeles Harbor. The results indicate that the high densities of crab pots found in popular fishing areas in Puget Sound probably represent the accumulation of lost gear over a number of years. The recovery of one crab pot in Dungeness Bay in June 2006 that was still fishing and contained 11 Dungeness crab 1,087 days after first surveying it in June 2003, indicates the importance of the use of legal rot cord and the longevity of commercial crab pots.

Task 4 continued the derelict gear removal work in Clallam County. An additionally 42 crab pots were removed from Dungeness Bay. The shallow water area (3 to 100 ft) in inner Dungeness Bay is essentially free from crab pots with only four pots remaining in deeper water. The crab pots removed contained 126 crab (21 dead and 105 alive). Six crab pots fished illegally with no rot cord contained 94 (75%) of the crab found in all of the pots removed indicating the importance of compliance with rot cord regulations.

Recommendations

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

- **Surveys of other deepwater sport and commercial crab fishing areas in Puget Sound should be conducted to further assess the extent of the derelict gear problem in deepwater.**

- **Conduct additional tests of ROV recovery of deepwater derelict crab and shrimp pots under full-production methods.**

- **The use of legal rot cord on crab pots should be enforced and possibly an escape cord education program similar to that being conducted in Snohomish County should be conducted throughout Puget Sound.**

Table 1. Number of derelict pots recovered, type of pot (commercial or sport), fishing status (actively fishing or not), rot cord use and numbers of live and dead organisms observed during the 2006 Clallam County derelict fishing gear project. 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	2	6	8	26	0	1	27	28	6	1	35
# Dungeness Crab Dead	1	14	15	3	0	0	3	4	14	0	18
# Dungeness Crab Alive	15	79	94	2	0	0	2	17	79	0	96
# Red Rock Crab Dead	0	0	0	1	0	0	1	1	0	0	1
# Red Rock Crab Alive	0	1	1	2	0	0	2	2	1	0	3
# Total Crab Dead	1	14	15	4	0	0	4	5	14	0	19
# Total Crab Alive	15	80	95	4	0	0	4	19	80	0	99
Sport											
# Pots Recovered	3	0	3	4	0	0	4	7	0	0	7
# Dungeness Crab Dead	1	0	1	0	0	0	0	1	0	0	1
# Dungeness Crab Alive	1	0	1	3	0	0	3	4	0	0	4
# Red Rock Crab Dead	0	0	0	1	0	0	1	1	0	0	1
# Red Rock Crab Alive	2	0	2	0	0	0	0	2	0	0	2
# Total Crab Dead	1	0	1	1	0	0	1	2	0	0	2
# Total Crab Alive	3	0	3	3	0	0	3	6	0	0	6
All Pots											
# Pots Recovered	5	6	11	30	0	1	31	35	6	1	42
# Dungeness Crab Dead	2	14	16	3	0	0	3	5	14	0	19
# Dungeness Crab Alive	16	79	95	5	0	0	5	21	79	0	100
# Red Rock Crab Dead	0	0	0	2	0	0	2	2	0	0	2
# Red Rock Crab Alive	2	1	3	2	0	0	2	4	1	0	5
# Total Crab Dead	2	14	16	5	0	0	5	7	14	0	21
# Total Crab Alive	18	80	98	7	0	0	7	25	80	0	105
# Total Crab	20	94	114	12	0	0	12	32	94	0	126

* The status of rot cord on 1 commercial pot recovered could not be determined.

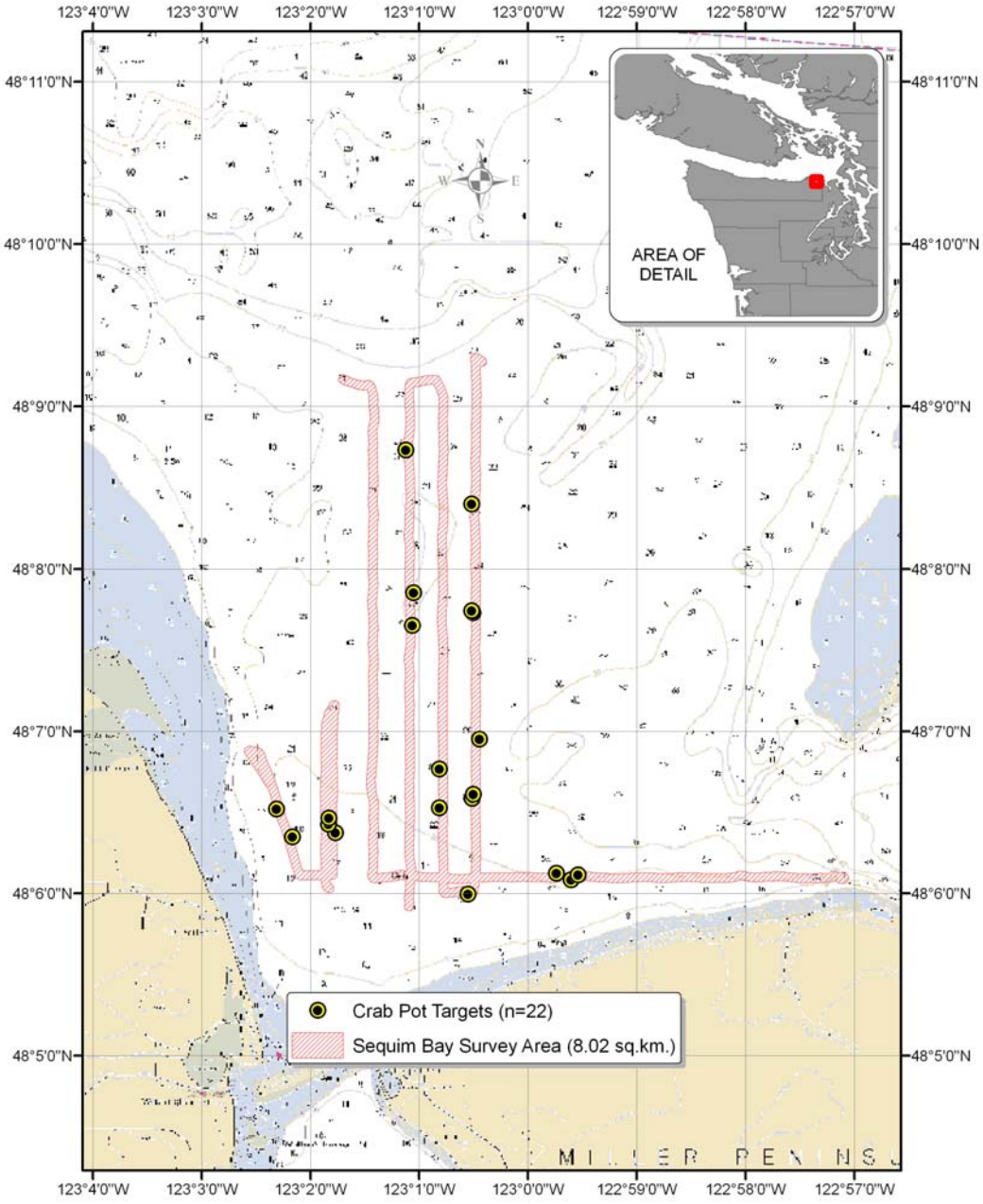

Figure 1. The deepwater survey area covered and targets identified in Dungeness Bay during the 2006 Clallam County

derelict gear project. Source: NRC, Inc. and Fenn Enterprises.

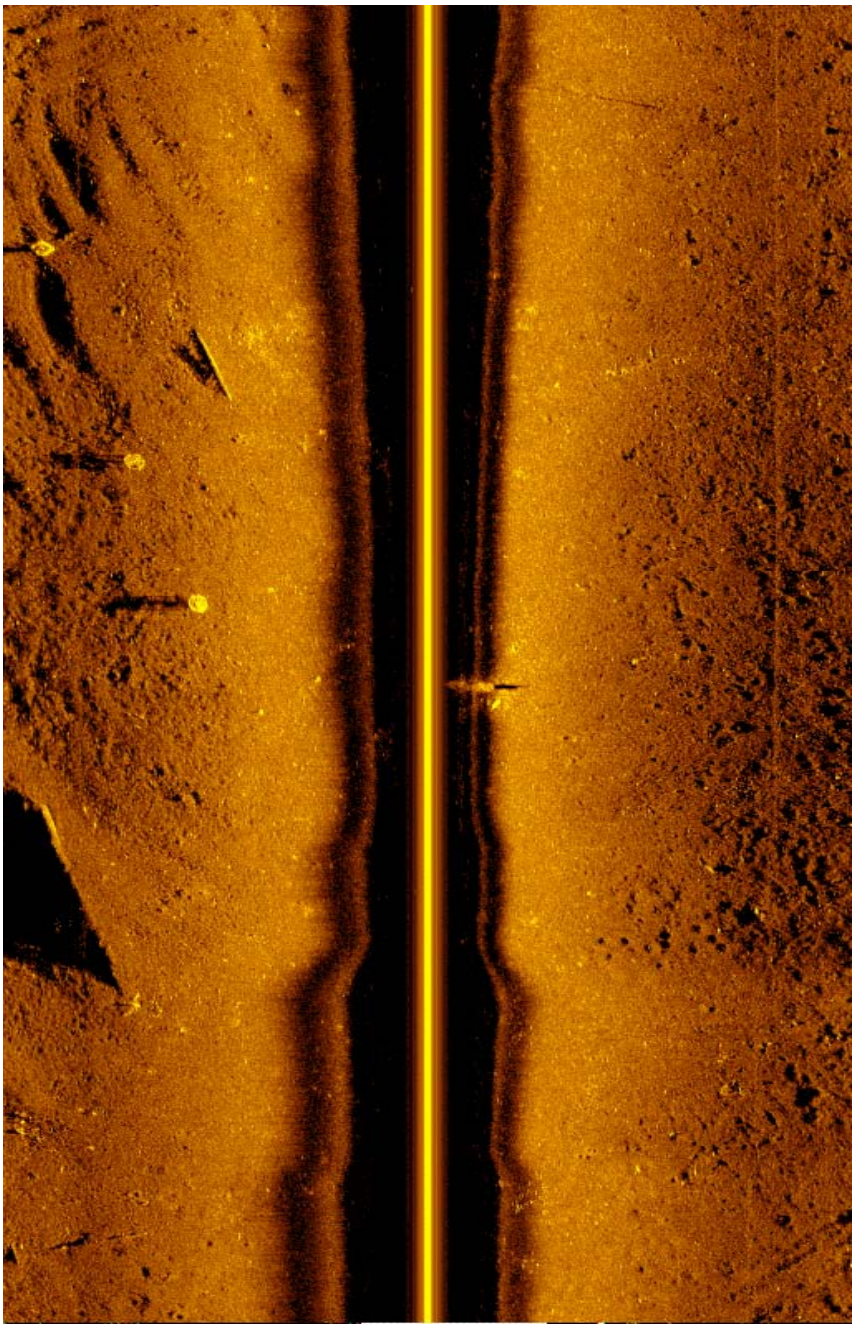

Figure 2. An example of a sidescan sonar image of possibly three longlined derelict shrimp traps in deepwater in Dungeness Bay. Source: Fenn Enterprises and NRC, Inc.

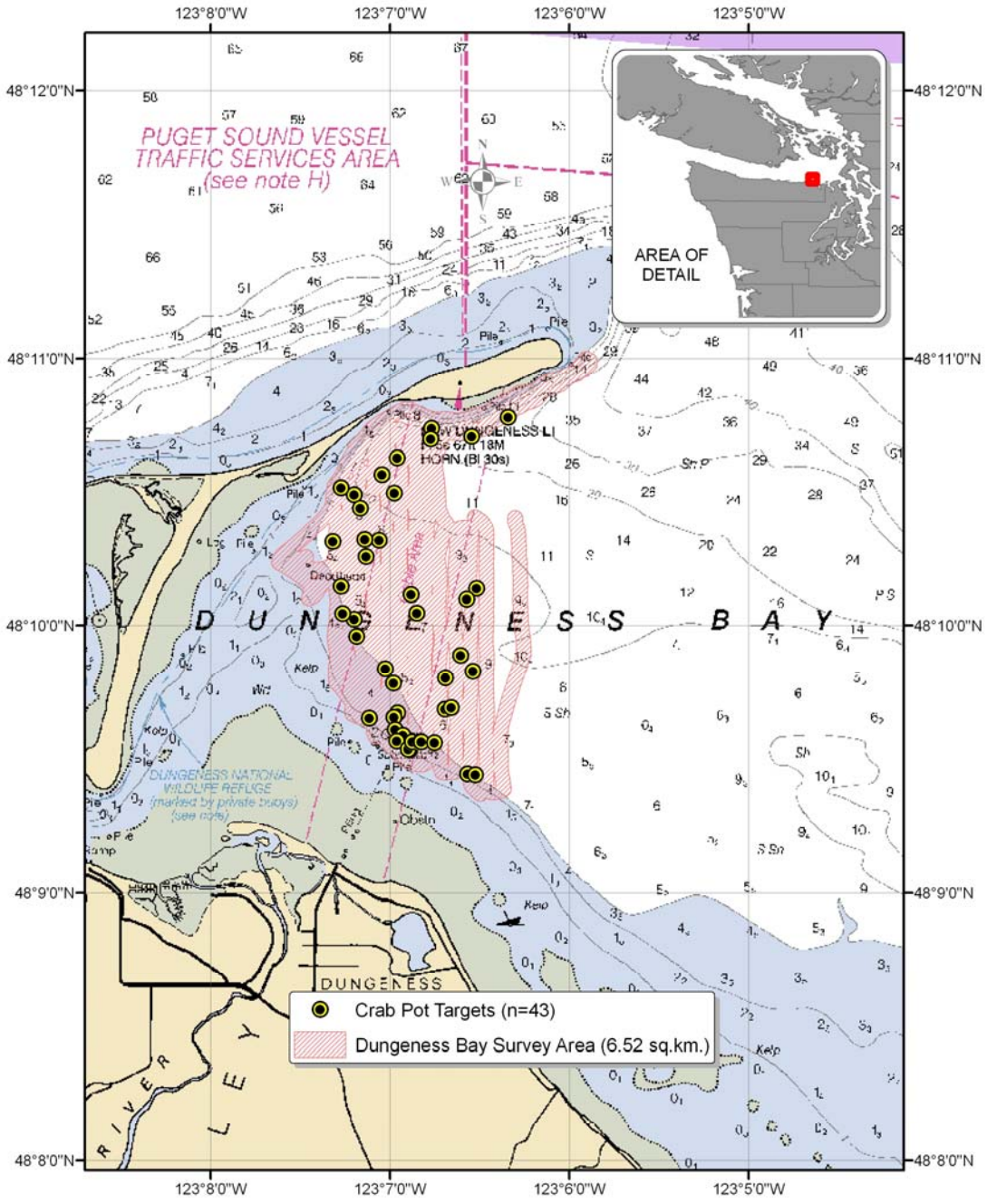

Figure 3. Location of sidescan sonar survey effort and derelict crab pot targets found in shallow water in Dungeness Bay during the

2006 Clallam derelict fishing gear project. Source: Fenn Enterprises and NRC, Inc.

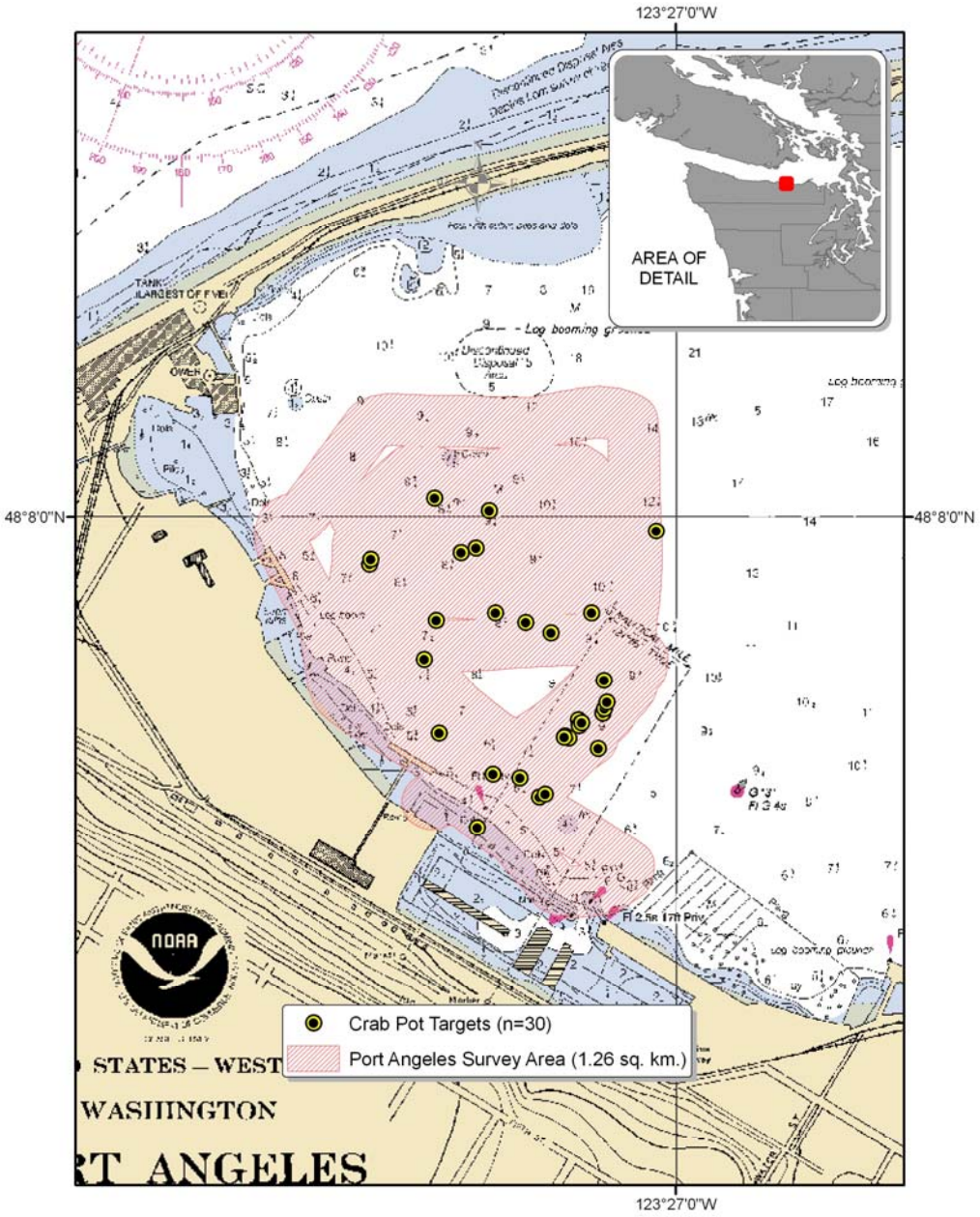

Figure 4. The location of sidescan sonar survey effort and derelict crab pot targets found in shallow water in Port Angeles Harbor during the 2006 Clallam derelict fishing gear project. Source: NRC, Inc. and Fenn Enterprises.

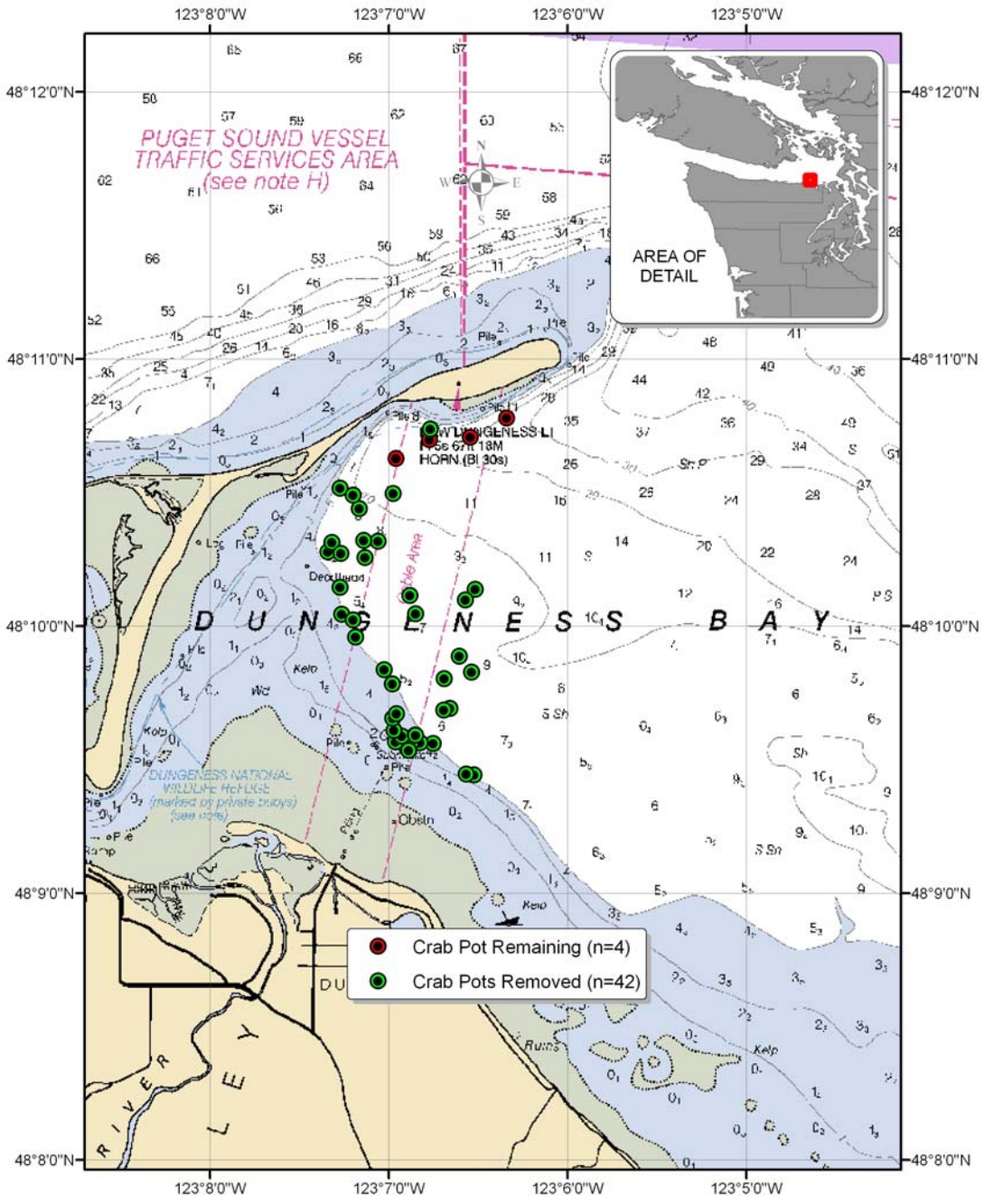

Figure 5. The location of crab pots removed and remaining in Dungeness Bay after the 2006 Clallam County derelict fishing gear project. Source: NRC, Inc.