

## **National Fish and Wildlife Foundation Final Programmatic Report**

**Project Name and Number:** Puget Sound Derelict Crab Pot Assessment, 2007-0088-010

**Recipient Organization/Agency:** Northwest Straits Marine Conservation Foundation

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### **1) Summary**

*In four to five sentences, provide a brief, cumulative summary of the project.*

More than 6,000 education cards and lengths of escape cord were distributed to recreational crabber during the summer of 2008. These cards educated the crabbers about the need to use escape cord and the impacts of lost crab pots on marine resources in Puget Sound. An evaluation indicated that 98% of crabbers approached intend to sue escape cord from then on. Twenty-four crab pots were deployed in two study areas in Puget Sound to simulate derelict crab pots. Catch rates were monitored for twelve months. These data and economic and crab pot loss information were combined to determine that derelict crab pots can catch up to 50 crab per year, costing the Puget Sound crab fishery approximately \$820,000 annually in lost revenue.

### **2) Introduction**

*Describe the original conservation need and objectives.*

The Northwest Straits Initiative has adopted a long-term goal of ridding the Puget Sound of derelict fishing gear through removal, prevention, and research. Our project involved research and prevention activities to assess the economic and biological impact of derelict crab pots on the Dungeness crab resource and to increase by thirty per cent the number of recreational crabbers using escape cord on their pots.

Derelict fishing gear is an acknowledged problem in Puget Sound. The Northwest Straits Initiative identified derelict fishing gear as a high priority problem in 2001. Soon thereafter, the Washington Department of Fish and Wildlife (WDFW) developed a *Derelict Fishing Gear Reduction Plan*. The Puget Sound Partnership identified derelict fishing gear removal as an immediate, priority action to restore marine habitat in Puget Sound in its final recommendations to the Governor, *Sound Health, Sound Future: Protecting and Restoring Puget Sound* in 2006.

As of June 20, 2007, the Northwest Straits Initiative had removed 1,245 derelict crab pots from Puget Sound. The Stillaguamish Tribe has removed or disabled 462 derelict pots from Port Susan (a bay in Puget Sound). There are still 2,725 known derelict crab pots identified in the state's derelict fishing gear database. This number represents

only a fraction of actual derelict crab pots. In high density crabbing areas, side-scan sonar surveys have detected as many as one derelict crab pot per square meter.

Dungeness crab is an important economic resource in Puget Sound and also a significant biological resource. Studies have indicated that Dungeness crab larvae can make up as much as 60% of juvenile salmon diets. The crab fishery in Puget Sound is a rising industry. The average Dungeness crab landings from 1998-2001 were 2.3 million pounds, up from 1.8 million pounds in preceding years. Previous derelict crab pot removal efforts in Dungeness Bay indicated that up to three per cent of the allowable crab harvest may be lost in derelict pots. This represents both a sizeable reduction in the amount of crabs available for harvest, as well as a sizeable loss of reproductive capability of the crab population.

The impact of derelict crab pots on the Dungeness crab resource was little understood. In our previous removal efforts, we found 2,204 crabs (mostly Dungeness) and other animals, representing only a fraction of the actual impact. See the attached photo of a derelict crab pot full of crab. This research project was undertaken to quantify the impact of these derelict crab pots over a year.

One way to reduce the impact of derelict crab pots on the Dungeness crab resource is by using 'escape' cord in crab pots. Escape cord is made of biodegradable cotton and is affixed to the escape hatches of crab pots to keep the hatches closed when fishing. If a pot becomes derelict, this cord will eventually rot away, opening the escape hatch and disabling the pot. The use of escape cord in crab pots is mandated by state law. Nevertheless, derelict crab pot removal efforts conducted by the Northwest Straits Initiative since 2001 have shown that 24% of all derelict crab pots recovered do not have the required escape cord.

The Snohomish County Marine Resources Committee piloted a recreational crabber outreach and education program in the summer of 2005 to educate recreational crabbers about the need to use escape cord in their crab pots. The project team distributed 650 educational cards with lengths of escape cord to crabbers at popular boat launches. The team distributed 1000 cards in 2006. The response from crabbers has been very positive. The team learned through this effort that over one third of recreational crabbers do not use or know about using escape cord in their crab pots.

#### Objectives:

1. Quantify the economic and biological loss to the Dungeness crab fishery of derelict crab pots in Puget Sound.
2. Educate tribal and non-tribal commercial crabbers and the state's crab resource co-managers about the impacts of derelict crab pots in Puget Sound.
3. Educate 5,000 recreational crabbers about the effects of derelict crab pots and the need to use escape cord in their crab pots.
4. Distribute escape cord to 5,000 recreation crabbers in the Northwest Straits.
5. Increase by 5000 the number of recreational crabbers using escape cord on their pots in the Northwest Straits.

### **3) Methods**

*Describe all activities and methods. Give a yearly breakdown if this is a multi-year grant.*

This project had two distinct components. The first component was the Northwest Straits Foundation's Recreational Crabber Escape Cord Education Project aimed at increasing the use of escape cord by recreational crabbers in northern Puget Sound counties. The second component was a crab mortality study to determine the biological and economic impacts of derelict crab pots in Puget Sound. This report will describe both project components separately.

#### Recreational Crabber Escape Cord Education Project

The Northwest Straits Foundation's Recreational Crabber Escape Cord Education Project was completed in October, 2008. The project was carried out in partnership with the regional Washington State University (WSU) Beach Watcher program. The Beach Watcher Program is a marine education and volunteer training program that boasts hundreds of well-trained citizen volunteers throughout the Northwest Straits. These volunteers take on projects aimed at public education, habitat restoration, and scientific research and monitoring.

The project began with each county Beach Watcher coordinator being trained in outreach techniques by the Beach Watcher coordinator from Snohomish County, who had helped to launch the program in 2005. Two trainings were offered – one in Jefferson County and the other in Skagit County. The trainings covered the logistics and methods of recreational crabber education and outreach, as well as the methods of conducting evaluation surveys as a part of this project.

Each county coordinator then recruited and trained citizen volunteers to conduct the outreach at local boat launches, marinas, and other venues. One hundred twenty-eight volunteers participated in the trainings.

Escape cord education cards were developed and printed. A website, [www.escapecord.org](http://www.escapecord.org) was launched. Lengths of escape cord sufficient to retrofit a standard crab pot were attached to each card in biodegradable collectors' envelopes.

Card distribution began on July 2, the earliest crab opening day, and continued into October. Outreach methods were as diverse as the individuals involved in the effort. Venues were boat launches, docks in marinas, local festivals and fairs, and Fourth of July parades to name a few.

#### Crab Mortality Study

The goal of this study was to determine the economic impact of derelict crab pots on the crab fishery Puget Sound as well as to determine the annual rate of mortality to Dungeness crab from derelict crab pots.

We conducted a study of mortality rates of simulated derelict crab pots in Dungeness Bay for one year. Equal numbers of recreational and commercial crab traps were initially baited, deployed, and then monitored by divers weekly until the bait was consumed and then bi-weekly for one year. Crabs caught were individually tagged. Catch, escapement, retained catch and mortality rates were estimated. We were fortunate

to be able to combine our data with that of an identical study conducted in Port Susan Bay by the Stillaguamish Tribe.

Using these data, we determined the annual catch rate of derelict crab pots. We then estimated the total number of crab pots that are lost annually by commercial and recreational crabbers in Puget Sound. Using the catch rate and the annual number of lost pots, we were able to determine the number of crabs lost annually in derelict crab pots and the number of crabs lost in those pots. We then estimated the economic value of those crabs based on average exvessel value and harvest costs to determine how much revenue is being lost due to derelict crab pots.

The final report of this study is attached. It contains more detailed methods and data analysis description.

Part of this project component included removing derelict crab pots from Dungeness Bay to offset the mortality to Dungeness crab caused by our research study. We removed 83 derelict crab pots from Dungeness Bay as well as a huge aquaculture net from Port Angeles Harbor that was killing a variety of marine animals, including crabs. Removal operations followed state approved guidelines for the removal of derelict fishing gear. A removal plan was prepared and approved by the Washington Department of Fish and Wildlife. Divers, using surface supplied air retrieved derelict crab pots from depths less than 105 feet in Dungeness Bay. The pots had been detected using side-scan sonar on previous days. The same methods were used to recover the derelict aquaculture net. All animals found entailed in the gear were documented and then returned to the water. Removed gear was disposed of in a local landfill.

#### **4) Results**

##### **a) Outputs**

- i) Using the logic framework model presented with your application (Fig. 1), enter in actual values of short-term outputs. Enter in any additional indicators not included in the full proposal used in the analysis. If your application did not include the logic framework, describe project outputs, any realized post-project outcomes and quantify the results using indicators and baselines.*

**Fig. 1: Logic framework table with indicators.** For additional guidance and examples, see <http://www.nfwf.org/evaluation/>.

Activities	Project Outputs	Post-Project Outcomes	Indicator	Baseline Value	Predicted Value Project Output	Actual Value of Project Output	Predicted Post-Project Outcome
Monitor D. crab impacts of 20 deployed derelict crab pots over one year	Development of estimate of numbers of D. crab and economic opportunity lost in derelict crab pots over time	Greater understanding of impacts of derelict crab pots on D. crab	Catch rate of non-escape cord derelict pots (crabs/pot/year)	75 crab/year	TBD	50/crab/Year  30/retained crab/year	TBD
			\$ loss / year	\$250/yr/pot	TBD	\$43-\$70/yr/pot	TBD
Disseminate report of D. crab impact assessment monitoring	Increased understanding among resource managers and crab fishermen about the impacts of derelict crab pots	Improvements in D. crab management	Distribution of results to primary stakeholders (County Marine Resource Committees, tribes, WDFW)	NO	NO	YES	YES
			Results used in harvest management decisions?	NO	NO	TBD	YES
Mitigate D. crab impact of impact assessment by removing 125 derelict crab pots from Puget Sound	Reduction of mortality of D. crab by derelict crab pots	Renewed use of habitat by marine species without harm from derelict crab pots	# of crab 'protected' from derelict pots / year, based upon results from Activity 1	0	TBD	2,490 – 4,150	TBD
Distribute escape cord and education cards to 5000 recreational crabbers	Increase by 5,000 the number of recreational crabbers using escape cord	Greater awareness among recreational crabbers about the impacts of derelict crab pots and the need to use escape cord	# of crabbers given cards and cord	0	5000	6,202	5,000

Activities	Project Outputs	Post-Project Outcomes	Indicator	Baseline Value	Predicted Value Project Output	Actual Value of Project Output	Predicted Post-Project Outcome
Conduct post-distribution survey of recreational crabbers	Increase by 60% the number of recreational crabbers using escape cord	Greater awareness among recreational crabbers about the impacts of derelict crab pots and the need to use escape cord	Awareness and $\Delta$ in behavior as measured by % increase in positive survey results	20%	80%	98%	80%
Post impact assessment results on NWSI website and website of Puget Sound Crabber Association	Information on impacts of derelict crab pots available to website visitors	Better understanding of impacts of derelict crab pots on D. crab	# of visitors accessing this information on NWSI website	0	50	533 <a href="http://www.escapecord.org">www.escapecord.org</a> 1598 <a href="http://www.derelictgear.org">www.derelictgear.org</a>	100
Disseminate project results (through peer-reviewed journals, presentations and education events)	Greater understanding of impacts of derelict crab pots on D. crab among scientists and resource managers	Improvements in D. crab management	# of peer-reviewed articles published	0	1	0	1
			# of papers and presentations	0	1	1	2
			# of presentations given	0	2	1	3

ii) Attach any supplemental graphs, maps, photos and other types of analytical output for the project evaluation.

Recreational Crabber Escape Cord Education Project

Table 1. Distribution of cards and cord by County and venue

County	Boat Launches & Marinas	Other Venues	# of Cards given out	# of Extra Cords given out
Whatcom	322	358	680	25
Jefferson	45	755	>800	25
Skagit	196	464	660	94
Snohomish	700	1174	1874	638
Clallam	240	223	463	103
San Juan	590	125	715	157
Island	225	785	1010	0
<b>Totals</b>	<b>2318</b>	<b>3884</b>	<b>6202</b>	<b>1042</b>



Jefferson County WSU Beach Watcher coordinators and volunteers prepare to storm the boat launches.





San Juan County volunteer educates a crabber about where to install escape cord.

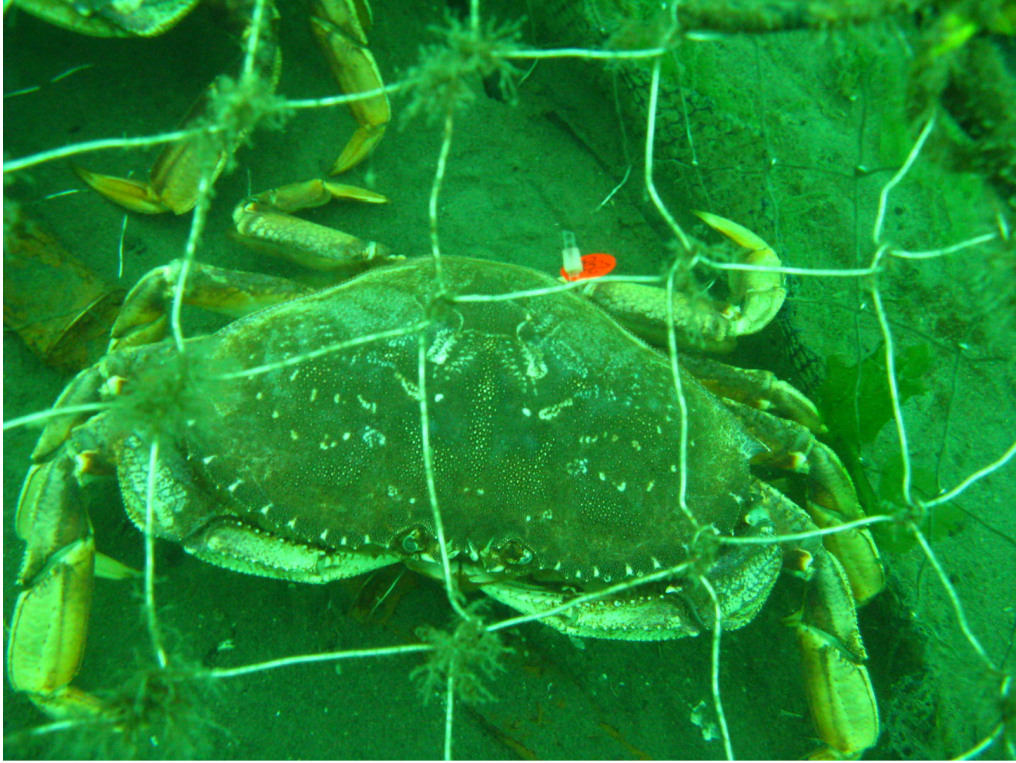
Attached please find the final evaluation report for our Escape Cord Outreach Project, *Northwest Straits Foundation: Escape Cord Outreach Evaluation*, by Jull and Blaney, of Applied Research Northwest. The report includes detailed descriptions of the methods used as well as expanded discussion of results.

### Crab Mortality Study



Measuring and tagging crab found in pots during Crab Mortality Study





Tagged crab in pot underwater



Monitored pot full of crab

Also attached please find the final report of our crab pot mortality study, *Mortality of Dungeness crabs (Cancer magister) due to lost traps in Dungeness Bay and Port Susan, Washington, and the cost benefit of removal*, by Antonelis, et al. This report includes thorough discussion of methods and results, including comprehensive tables and charts illustrating the data collected and analyzed.

*iii) Identify and briefly explain discrepancies between what actually happened compared to what was predicted to happen in the grant proposal using information presented above.*

### Recreational Crabber Escape Cord Education Project

Card distribution began on July 2, the earliest crab opening day, and continued into October. Six thousand two hundred two (6,202) education cards were distributed to crabbers directly or at locations where crabbers were likely to pick them up. An additional 1,042 bagged escape cord samples were distributed. Distribution by county was consistent with County size, as well, with more cards given out in more populated Snohomish County and less in rural Clallam County. **The project goal of distributing 5,000 crabs was exceeded.**

Our goal was to increase the use of escape cord by 30% to 80%. We assumed that 50% of crabbers were using escape cord. Our assumptions were based on previous outreach experience as well as data from removed crab pots. However, discussions with crabbers during outreach showed us that 80% of crabbers were already using escape cord. We theorize that some per cent of those crabbers using escape cord were first-time crabbers who purchased their pots with cord already attached. Nevertheless, it was clear that the use of escape cord, though not consistent in all counties, exceeded our baseline expectations.

Our evaluation survey indicated that 98% of those surveyed intended to use escape cord in the future. This would increase escape cord use by 18%, rather than 30%.

We were able to exceed our predicted outreach to the general public measures by effectively using the internet. We created two new websites, one devoted to educate crabbers about escape cord and proper fishing practices and one devoted to educate and inform the public about derelict fishing gear. This second site, [www.derelictgear.org](http://www.derelictgear.org), was particularly successful because we were awarded a large grant of economic stimulus funds for derelict net removal in Puget Sound. The publicity associated with this award helped to increase the visits to this website.

### Crab Mortality Study

Previous observations had indicated the about 75 crab are caught in derelict crab pots per year. This was our baseline value. The data showed that about 50 crabs are caught per year, but that some escape. The retained catch rate was 30 crabs per pot per year. Our baseline value of the annual economic loss of this derelict pot bycatch was \$250 per pot. This was a very rough estimate based on exvessel value of crab, with no accounting for the cost to the fisher of harvesting extra crab, and based on the higher predicted catch rate. In fact, the economic loss ranged from \$43 to \$70 per pot per year, depending on whether one uses the higher or lower cost of harvest numbers. We also

were able to incorporate into that loss estimate the number of crab pots lost each year by commercial and recreational crabbers. This number was estimated at 12,193.

Dissemination has gone as planned, with a journal article being prepared for submittal. We anticipate it appearing sometime in the next year.

Eighty-three (83) derelict crab pots were removed from Dungeness Bay and one huge aquaculture net was removed from Port Angeles Harbor. From 2,490 – 4,150 crabs were saved annually from capture and death in these derelict pots. These numbers are based on the range of 30 -50 crabs caught and retained in the crab pots monitored during our research. The aquaculture net removed from Port Angeles Harbor measured 1.3 acres and was made from plastic, which would not have degraded for many years in the marine waters. It is likely that this net would have continued to fish for decades, killing thousands of crabs each year, though it is inappropriate to predict future mortality based on our crab pot study.

**b) Post-project Outcomes**

- i) The logic framework presented in the full proposal additionally included a final column where predicted values of post-project outcomes were to be provided. If your application did not include a logic framework, please identify any medium- to long-term results that may occur after the project ends.*
- ii) Describe any progress towards achieving these post-project outcomes at this time.*

Both project components aimed at better management of Dungeness crab in Puget Sound as a post-project outcome, as well as a greater understanding of the impacts of derelict crab pots on Dungeness crab. We are achieving these outcomes by informing resource managers about the use, or lack thereof, of escape cord by recreational crabbers and by involving them in our research study. We will continue to disseminate the results of this project at conferences, meetings, and conversations with tribal and non-tribal resource managers to ensure that management decisions are informed by the results of the project.

We intend to present the results of the crab pot study at the next Puget Sound/Georgia Basin research conference. We intend to submit an edited version of the final report to the *North American Journal of Fishery Management* in early 2010.

Another post-project outcome was renewed use of marine habitat without the threat of capture by derelict crab pots. We have achieved this by removing derelict crab pots and an aquaculture net. A previous report of long-term habitat recovery after derelict gear removal indicated that areas where gear was removed were used by a variety of marine species immediately after gear was removed.

Recreational Crabber Escape Cord Education Project

This project component specifically aimed at greater awareness among recreational crabbers about the impacts of derelict crab pots and the need to use escape cord as a post-project outcome. We believe the project make progress toward that goal

by showing that crabbers contacted would increase their use of escape cord. Continued visits to our websites also indicate that the project message is continuing to reach the public.

*iii) Will there be continued monitoring of post-project outcomes beyond the life of this grant? Are there adequate resources (staff and funding) for continued evaluation and monitoring? If not, briefly describe the additional resources needed.*

Our organization intends to stay very involved in derelict fishing gear issues in Puget Sound. We currently have some funding to maintain a presence related to both removal and policy issues. We recently advised a state legislator on new legislation that would help with enforcement issues for escape cord as well as set up a fund for removing lost crab pots. Although this legislation did not move forward, it sets the stage for future work.

We are currently providing funding for a pilot education program aimed at reducing lost pots by recreational crabbers in Snohomish County. Additional funding to expand this project throughout the Northwest Straits may be needed in the future.

*iv) Describe any revisions in the indicators, methods and data that may be needed for post-project monitoring.*

None anticipated at this time.

## **5) Discussion & Adaptive Management**

### **a) Lessons Learned and Transferability**

*i) Describe the lessons learned about effective and ineffective conservation practices associated with this project. Which of these key lessons should be shared with other conservation organizations?*

#### Recreational Crabber Escape Cord Education Project

We learned that direct outreach at boat launches was a very effective way to reach recreational crabbers, but that other venues, such as distribution of materials at marinas and during holidays parades (such as Fourth of July events) were also good uses of time. The key ingredient to being effective is to have a very focused message. Giving out actual lengths of escape cord so crabbers could use them on the spot was greatly appreciated. We had many crabbers asking for extra cords for friend and for other pots they owned. Focusing on why cord should be used rather than on the fact that it was required by law was imperative. It also helped to be just a little bit silly (see attached photos) so crabbers would not be put on their guard, but would be at ease with the volunteers delivering the message.

## Crab Mortality Study

We learned that the straight economic value of crabs lost in derelict pots may not be an accurate description of the impacts of derelict pots. In particular, we recognized during data analysis that the true value of recreational crabbing may far exceed the value of the crab caught.

In addition, the biological value of these lost crabs, in terms of trophic interactions, is little understood.

- ii) To what extent did the evaluation and monitoring activities for this project inform your organization about effective conservation practices, and what lessons were learned from an evaluation perspective?*

## Recreational Crabber Escape Cord Education Project

The evaluation survey for the crabber outreach project was less effective than hoped because it could only predict that some crabbers would use escape cord in future, rather than document whether they did use it. We were unable to get contact information for recreational crabbers from the Washington Department of Fish and Wildlife, for privacy reasons, and so were unable to do any follow up phone surveys, which would have more effectively shown changed behavior.

- iii) Based on these lessons learned, what are your organization's next steps?*

## Recreational Crabber Escape Cord Education Project

Armed with a better understanding of compliance with escape cord rules and experience educating recreational crabbers, our next step is to widen our education effort to include, not only escape cord use, but best fishing practices to avoid pot loss altogether. The Snohomish MRC is currently developing an education program that will inform crabbers about ways to prevent pot loss in county waters. The materials include maps of bathymetry as well as tips about proper use of weighted lines and buoys. This pilot project will be launched in the summer of 2010.

## Crab Mortality Study

Our organization is interested in increasing outreach to crab fishermen regarding the findings of this study. We also may proceed with advocating tightening of enforcement abilities related to the use of escape cord. Currently, a fisherman cannot be fined for having a pot on board that is not equipped with escape cord. He can only be fined if he is fishing with such a pot. Additionally, we will explore changing the required size of escape cord, especially for recreational crabbers, to a smaller width that will rot sooner.

We would also like to pursue a more comprehensive approach to preventing loss of crab pots by both commercial and recreational crabbers, but this approach would require dedicated funding that we do not have right now.



Finally, we are interested in quantifying more effectively the value of recreational crabbing in Puget Sound.

**b) Dissemination**

- i) Describe the extent of information communicated to the general public, key partners, other practitioners, scientific experts. Wherever possible estimate the extent of the outreach using appropriate quantifiable indicators such as meeting attendance, publication circulation figures etc.

Recreational Crabber Escape Cord Education Project

Project press coverage included a public service radio announcement on Port Angeles’ KONP radio and coverage in *Peninsula Daily News*, *Adventure Northwest Magazine*, *Canadian E-zine*, *Bellingham Herald*, *Whidbey News Times*, *San Juan Journal*, and *Anacortes American*. Posters and displays were created and used in various locations throughout the Northwest Straits counties.

A website devoted to educating the public about using escape cord and other best fishing practices was developed for this project. The site, [www.escapecord.org](http://www.escapecord.org), was launched in October, 2008. The site has had over 500 visitors since launch date. Another site, [www.derelictgear.org](http://www.derelictgear.org), was developed to educate the public and resource managers about the problem of derelict fishing gear, including derelict crab pots. This site was launched July, 2009. This was roughly the same time the Northwest Straits Foundation was awarded a large economic stimulus grant to complete the removal of derelict nets from Puget Sound. Because of the excellent publicity that project has received, this site has received about 1,600 hits, with 700 of them coming from a link to the Northwest Straits Initiative website ([www.nwstraits.org](http://www.nwstraits.org)). Both those sites emphasize best fishing practices for crab fishermen.

Escape cord education cards were distributed at boat launches and a number of other venues. Outreach was also accomplished at a number of different venues and through the media. The table below summarizes these activities.

County	Outreach Event Description	Other distribution venues
Whatcom	Catalina 42 Fleet Association Drayton Harbor Customer Appreciation Day Drayton Harbor Maritime Festival Reefnet Festival	Articles appeared in <i>Adventures NW Magazine</i> , the <i>Whatcom Watch</i> , the <i>Northern Lights</i> and the <i>Bellingham Herald</i> and <i>Shore Steward</i> newsletter. Cards and posters were left with three fishing supply and licensing outlets. Whatcom County Cards and poster were left with WSU Extension,
Jefferson	Jefferson County Fair	Cards and posters left with Port Townsend Boat Haven, state parks (Fort Flagler, Mystery Bay, Fort Worden), Port Hudson Marina, West Marine Boat, Inn at Port Hadlock, Carol’s Buidling Supply, Swains (license sites), Port



County	Outreach Event Description	Other distribution venues
		Townsend Marine Science Center, Nordland Store, Cape George and Port Ludlow moorage facilities, Olympic National Forest visitor center and WSU Extension
Skagit	Samish Island Fourth of July Parade Similk Bay Neighborhood meeting	Upper Skagit Nation, Swinomish Tribe, Guemes Island Hardware Store, Fidalgo Bay RV Park, Sportman's Warehouse, Ace Hardware, Northern Sales, Cap Sante Harbor Master. Articles appeared in the <i>Samish Island News</i> and <i>Anacortes American</i> .
Snohomish	Picnic Point Beach Expo Three Coast Guard Auxiliary Days Power Squadron Gathering Mukilteo Beach Expo Edmonds Night Out Against Crime Kayak Point Beach Expo Mukilteo Lighthouse Park Grand Opening Celebration Festival of the River Warm Beach Summer Fest Evergreen Fair Mukilteo Lighthouse Festival Clean Marina Day	Cards left with Port of Edmonds for new tenant packets, Bud Bait Shop (Edmonds), City of Mukilteo Planning Department and Edmonds Beach Naturalist program. An article appeared in the Shore Steward newsletter.
Clallam		A volunteer recorded a Public Service Announcement at Port Angeles' KONP radio station which aired several mornings of opening week. <i>Penninsula Daily News</i> Sports Columnist Matt Schubert included an escape cord giveaway in his weekend column, generating several calls to Beach Watcher Coordinator. Cards were distributed at a Marine Life Center and Swains Outdoor. A Puget Sound Angler also distributed cards at a meeting.
San Juan	Fourth of July Parade Clean Marina Day	Cards were left with the Port of Friday Harbor Assistant Harbor Master, King Marine, Ace Hardware. All Roche Harbor Store crab pots had card attached through season, with information on bulletin boards. Articles in Canadian E-

County	Outreach Event Description	Other distribution venues
		zine (Suite 101) and two local newspapers.
Island	Utsalady Parade Stanwood Camano Fair Island County Fair Cama Beach State Park Nature Walks	Cards were distributed at multiple marine equipment and local county stores on Whidbey and Camano Islands.

### Crab Mortality Study

Outreach to tribes and WDFW, co-managers of the shellfish resource in Washington state, was critical throughout the crab pot mortality study. The Foundation and its contractors communicated the planned study to the tribes and Clallam Marine Resources Committee prior to pot deployment. Tribal fisheries officers notified our contractor when tribal fishers caught crabs with tags, which happened several times.

Preliminary findings from the study were communicated to the Northwest Straits Commission at a meeting in Clallam County. Staff from WDFW was consulted during the study and provided valuable data on pot loss in both the non-tribal commercial fishery and in the recreational fishery. The draft final report was circulated to WDFW and other marine science experts.

The final report was uploaded onto the website of the Northwest Straits Initiative. It was also referenced on the Facebook pages of the Initiative and the derelict fishing gear removal project. It will be put onto the website of the Puget Sound Crab Association as well. An edited version will be submitted for publication to the *North American Journal of Fishery Management* sometime in early 2010.

The following outreach regarding mortality of crabs in derelict crab pots was conducted:

Date: June 4, 2008

Location: Everett

Group: Ms. Kari Neumeyer, Northwest Indian Fisheries Commission

Topic: Crab Mortality Study

Duration: 6 hours on boat in Port Susan with photos

# People: NWIFC Newsletter Article in June

Date: June 5, 2008

Location: Everett

Group: Everett Herald Newspaper and Internet

Topic: Lost Crab Pots Killing Off Resource

Duration: Two page newspaper article and Internet Report

# People: Everett Herald Circulation

Date: June 5, 2008

Location: Bellingham

Group: Bellingham Herald Newspaper and Internet

Topic: Lost Crab Pots Killing Off Resource  
Duration: Two page newspaper article and Internet Report  
# People: Bellingham Herald Circulation

Date: July, 2009  
Location: Sequim  
Group: Northwest Straits Commission  
Topic: Crab Pot Mortality Study  
Duration: 45 minutes + Q&A  
#People: Approximately 20 people

*ii) Attach any publications, brochures, videos, outreach tools, press releases and other appropriate “products” that resulted from this project.*

Attached please find: escape cord brochure, escape cord education card; final report of outreach evaluation; and final report of crab pot study.

**c) NFWF Adaptive Management**

*i) Offer any suggestions for NFWF to help guide improvement of our project administration.*

We have no suggestions for improvement. Everything seemed to work well for us.

**6) References**

*i) Attach a list of secondary references used in conducting the project, including the evaluation.*

Armstrong, D.A., T.C. Wainwright, J. Orensanz, P.A. Dinnel, and B.R. Dumbauld. 1987. Model of Dredging Impact on Dungeness Crab in Grays Harbor, Washington. Fisheries Research Institute, University of Washington, School of Fisheries; FRI-UW-8702.

Barry, S. 1984. Coastal Dungeness crab study. State of Washington, Department of Fisheries Project Progress Report, Project Number 1-135-R (3), October 1, 1979 to September 30, 1980.

Breen, P.A. 1987. Mortality of Dungeness crabs caused by lost traps in the Fraser River Estuary, British Columbia. North American Journal of Fisheries Management 7: 429-435.

Brennan, J.S., K.F. Higgins, J.R. Cordell, and V.A. Stamatiou. 2004. Juvenile salmon composition, timing, distribution and diet in marine nearshore waters of central Puget Sound in 2001-2002. King County Department of Natural Resources and Parks, Seattle, WA. 164 p.

- Bullimore, B.A., P.B. Newman, M.J Kaiser, S.E. Gilbert, and K.M. Lock. 2001. A study of catches in a fleet of “ghost-fishing” pots. *Fisheries Bulletin* 99: 247-253.
- Fresh, K.L., R.D. Cardwell and R.R. Koons. 1981. Food habits of Pacific salmon, baitfish, and their potential competitors and predators in the marine waters of Washington, August 1978 to September 1979. State of Washington Department of Fisheries, Progress Report No. 145, August 1981. 58p.
- High, W.L. 1976. Escape of Dungeness crabs from pots. *Marine Fisheries Review* 38(4): 19-23.
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