



NORTHWEST STRAITS
marine conservation foundation

Preventing the Loss of Gillnets in Puget Sound Salmon Fisheries

Prepared for

NOAA Protected Resources Division

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with

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EXECUTIVE SUMMARY

Over 4,000 derelict fishing nets have been removed from the Puget Sound over the past decade at a cost of several million dollars. Most of these nets were gillnets used in salmon fisheries. Lost nets have been found to entrap numerous aquatic species, and may have a particularly severe impact on benthic fishes such as rockfish. This report provides recommendations to prevent the loss of nets in order to avert the re-accumulation of gillnets in current and future saltwater gillnet fisheries. We sought ideas and recommendations from commercial fishermen and fishing gear experts, to both prevent the loss of nets and establish the quick retrieval of derelict gillnets. The methods used to gather this information ranged from personal interviews, letters, and email exchange to an anonymous online survey. In addition, we conducted a literature review of derelict gear prevention initiatives throughout the world. We binned our findings into three categories: 1) best practices to prevent net loss (actions would not require significant changes to contemporary fishing methods), 2) actions that may require changes to contemporary fishing methods, and 3) actions that would require changes to existing practices as well as applied research. We recommend four areas that should be pursued to further reduce gillnet loss in the Puget Sound: 1) develop a comprehensive guide to best fishing practices that is tailored to each gillnet fishery, and, where possible, includes bathymetric information specific to local areas of high relief, 2) provide a free and annual training on ‘trade secrets’ for newcomers to the gillnet fishery 3) develop a collaborative fisheries research project that is designed to test the efficacy of mesh limits/net depth restrictions in local gillnet fisheries, and 4) establish a peer-based incentive system to monitor gillnet gear that would otherwise be left unattended, prioritizing areas where the likelihood of net entanglement and/or loss is high. Our findings are intended to provide recommendations and catalyze further discussion among the fishing industry and stakeholders around the prevention and tracking of lost gillnets in Puget Sound.

INTRODUCTION and BACKGROUND

This report is the result of a cooperative effort between the Northwest Straits Marine Conservation Initiative (Northwest Straits Initiative-NWSI) and the Northwest Indian Fisheries Commission, the National Oceanic and Atmospheric Administration (NOAA), commercial fishermen in Puget Sound, and Natural Resources Consultants (NRC). The goals of the project were to: 1) evaluate best practices to prevent the loss of commercial gillnets in marine waters of Puget Sound, and 2) evaluate systems and technologies to improve derelict net tracking and enable their quick retrieval¹.

¹ In 2011 NOAA reviewed the Puget Sound Chinook harvest plan (under limit 6 of the PS Chinook 4(d) rule). The harvest plan is developed by the Washington State Department of Fish and Wildlife and Puget Sound Tribes. This project addresses the Terms and Conditions 2(c) in the 2011 Biological Opinion on “Derelict Gear Prevention,” whereby the Bureau of Indian Affairs, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, in collaboration with the State and tribes, are to continue to conduct outreach and evaluate technologies and practices to prevent the loss of commercial fishing nets and systems to track lost nets.

From 2003 to 2009 an average of 653 treaty and non-treaty boats participated in gillnet fisheries in Puget Sound (NRC 2010). We do not know what absolute percentage of nets become derelict, but based on limited interviews with fishermen it is estimated that 3 to 5 percent of fishermen lose one net per year (NRC 2010). Prior to 2010, it is estimated that 16 to 42 nets were lost annually in the Puget Sound salmon drift gillnet fisheries, depending on the level of fishery participation in a given year (NRC 2010). Derelict nets from the purse seine and set-gillnet fisheries have also been identified and removed through the Northwest Straits Initiative derelict gear program; however, there are currently no loss rate estimates for these gear types.

Derelict nets can entangle and kill rockfish and alter their habitats because most nets hang on bottom structure that is also attractive to rockfish (Good et al. 2010). This structure consists of high-relief rocky substrates or boulders located on sand, mud, or gravel bottoms (Good et al. 2010). Nets can cover habitats used by rockfish for shelter and pursuit of food, rendering the habitat unavailable, and can reduce the abundance and availability of rockfish prey that include invertebrates and fish (Good et al. 2010).

For the purposes of this document, the term ‘net’ refers to portions of any component of net gear (webbing, leadline, corkline, or any combination thereof), and does not necessarily infer a full or complete net. The majority (approximately 97%) of derelict nets found in Puget Sound marine waters are from gillnet fisheries (Good et al. 2010), and consist of a combination of leadline and webbing, where length and depth are usually a fraction of the full extent of the net. Surveys to quantify these losses have been conducted using sidescan sonar, drop camera, and divers.

Monofilament gillnets in Puget Sound are used primarily in salmon fisheries and were also in herring fisheries. The monofilament line is of variable mesh size depending upon the target species. In the non-tribal salmon fishery, buoys at the ends of the net must be labeled for ownership. Net fishing effort has been correlated with salmon catch, and, with some exceptions, effort also appears to correlate with net loss. Gillnets are lost more frequently in areas with obstructions that can entangle nets, proximity of effort to shore, areas of high and variable currents, and areas subject to changes in wind and wave direction. While derelict nets have been documented in some of the river systems in the Puget Sound Basin, this project focused on gillnets in Puget Sound marine waters as defined by the outer boundaries of Puget Sound Salmon Management and Catch Reporting Areas (WAC 220-22-030).

Per Washington State law, non-treaty drift gillnets cannot exceed 1,800 feet in length, with no restriction on net depth. These nets are commonly up to 100 feet deep; some have been reported approaching 200 feet deep. Set nets used in tribal fisheries are generally 25 to 30 feet deep. Non-treaty skiff gillnet fisheries that operate in a few specific locations are limited to a net length of 600 feet, and a maximum depth of 90 meshes (WAC 220-47-302).

Legislation passed in 2012 (SB 5661) mandated the reporting of lost gear to the Washington Department of Fish and Wildlife (WDFW) within 24 hours of the loss. Commercial net fishermen must report lost net fishing gear by telephone (1-855-542-3935) or online (<http://www.derelictgear.org/reportgear.aspx>). This legislation builds on a law passed a decade earlier (SB 6313), establishing the Derelict Fishing Gear Removal Program, and mandating that

WDFW submit a report on ways to prevent derelict fishing gear. Tribal fishermen participate in tribal reporting systems that are typically separate from those of non-tribal fishermen.

METHODS

In preparing this report, eight methods were used to collect and elucidate information on derelict net prevention:

1. In-person and telephone conversations about the project with more than 50 individuals.
2. A letter describing the project (Appendix A) was sent to treaty fishermen and fisheries co-managers, followed by an email from NWIFC staff inviting response.
3. The letter had a weblink to an online survey, which was open for 30 days and also posted on the NWSI website.
4. Email correspondence with fishermen, fishery managers, and gear technology experts identified through a snowball approach.
5. Literature review.
6. Web-based research.
7. Announcement to Alaska Independent Fishermen's Marketing Association Newsletter (many recipients of which fish in Puget Sound).
8. Solicitation of ideas from tribal and state fishery management programs and individual fisheries management biologists.

We contacted individual fishermen and other experts involved in and familiar with ongoing derelict gear outreach and removal efforts, and invited their assistance in identifying people with relevant knowledge and expertise using a snowball sampling approach. Snowball sampling is a special non-probability method used when the desired sample characteristic is rare. Snowball sampling relies on referrals from initial subjects to generate additional subjects. While this technique can dramatically lower search costs, it may introduce bias because the technique itself reduces the likelihood that the sample will represent a meaningful cross section of the population. This project was designed to generate practical recommendations from tribal and non-tribal fishermen, fisheries managers, and other experts, focusing on the following questions:

1. What recommendation(s) do you have to reduce the likelihood of losing gear when gillnetting in Puget Sound?
2. Can you think of potential modifications to gillnets used in Puget Sound that would reduce the likelihood of losing gear?
3. In the event that a gillnet snags or is lost, are there technologies or gear modifications that could improve tracking to enable quick retrieval?

We collected information via telephone and dockside interviews and a simple online survey using the three questions above, along with an open-ended question inviting additional ideas. The online survey also included an option to provide personal contact information. These methods require gathering Local Ecological Knowledge (LEK), a methodology in the field of ethnoecology that is accepted and used by many natural resources agencies (Hall-Arber et al. 2002). LEK can include knowledge of local distributions of fishes and habitats, ecological interactions, local fishing businesses, social dynamics of fishing, fishing communities' territories

of use, local economics and networks of regional economies of which communities are a part, and local fishing culture (Hall-Arber et al. 2002).

RESULTS OF LITERATURE REVIEW: DERELICT NET PREVENTION EFFORTS IN OTHER REGIONS

We found several initiatives to prevent and retrieve derelict fishing gear outside of the Puget Sound. General recommendations from Europe and New England include biodegradable nets and periodically sweeping areas for lost nets (Humborstad et al., 2003; Hareide et al., 2005; Brown and Macfadyen, 2007). In the Maldives, the Seychelles, and other parts of the world, a variety of economic incentives to reduce the loss of nets are being explored. In Australia, an alliance of indigenous communities administers a government program which supports local indigenous rangers to remove monofilament nets from local beaches and nearshore waters.

In Virginia, unemployed fishermen were provided the equipment, procedural instructions, and pay to successfully remove over 18,000 items of derelict fishing gear, most of it blue crab pots (Havens et al. 2011). In the Gulf of Maine, captains and crew in the lobster fishery were hired to retrieve derelict traps during the slow season of their fishery (Ludwig et al. 2011). However, these two examples required the use of grappling for removal, rather than divers, and therefore would not be allowed in Puget Sound (per WDFW regulation).

In Bristol Bay, Alaska, actively fishing drift gillnet gear must have at each end (except the end attached to the vessel) a red keg, buoy, or cluster of floats plainly and legibly marked with the permanent vessel license plate number of the vessel operating the gear. Marking must be in permanent symbols at least 4 inches high with lines at least 1/2-inch wide, in a color that contrasts with the background, and at least one cork every 10 fathoms along the corkline that is plainly and legibly marked with the vessel license plate number of the vessel operating the gear². Additionally, a permit holder fishing in the Bristol Bay Area must report the loss of a gillnet, or portion of a gillnet, to the local department office in Dillingham or King Salmon within 15 hours of the loss. This report must be made directly to a local representative of the department in person or by radio or telephone³.

RESULTS

To the furthest extent possible, information and recommendations were obtained from tribal and non-tribal commercial fishermen, and are intended to be both practical and applicable to the gillnet fisheries in Puget Sound.

² A few individuals have stated that this cork-ID is also required in Puget Sound; however, no supporting documentation was found for this report. Few end buoys or corks have been found in derelict gear removal operations by the Northwest Straits Initiative, so current methods of net identification in Puget Sound do not aid derelict gear recovery.

³ Similar to the legislation implemented in Washington state on July 1, 2012 (SB 5661).

Direct contact was made with several Washington State residents who hold decades of commercial fishing experience and are currently engaged in the Puget Sound, Bristol Bay, and Cordova, Alaska salmon net fisheries; two marine supply companies; one local net maker; several state and Federal fishery managers; and several fishing gear technology experts in the cities of Seattle, Bellingham, and San Diego; the New England region, and in Canada, Australia, and Italy.

Nine tribes responded to the letter inviting ideas and recommendations. Natural resources staff with Tulalip Tribes, Suquamish Tribe, Puyallup Tribe, Lummi Nation, Makah Nation, Swinomish Tribe, Lower Elwha Klallam Tribe, Jamestown S’Klallam, and Port Gamble S’Klallam Tribe provided useful input on derelict gear reporting processes.

We report three general categories of recommendations in support for gear loss prevention/retrieval. The first consists of best practices to avoid gear loss (and could be implemented without gear modifications or major changes to fisheries practices). The second category contains elements that may require gear modifications, and/or education or materials in order to implement. The third category consists of methods that would require additional gear modifications and applied field research prior to implementation.

Category 1: Best practices to avoid gear loss:

Note that these ideas do not represent a comprehensive list of best practices to avoid gillnet loss, but rather common themes that were mentioned during the course of information gathering for this report.

- *Attend to gear* – staying near and observing deployed nets will reduce the chances of pleasure craft or drift logs fouling gear and currents moving gear to areas with potential snags.
- *Understand the tidal fluctuation and current patterns* prior to setting gear - anticipate the drift and location where the gear will be hauled.
- *Know the bathymetry of the area before fishing*; use a Global Positioning System to avoid areas of complex bathymetry, and fisheries managers should explore providing local bathymetry information (i.e. weather resistant charts) to fishermen on areas of highest accumulation, easily available to sectors of the fleet lacking electronics on board.
- *Avoid reef edges, rocky shorelines, and rock piles* unless the fisherman has experience at that site. An experienced fisherman can find sets against the shore, but knows to haul as soon as the tide starts running.
- *In the event of a snag* on the bottom, wait out the tide if possible. Be patient, haul the tangled gear only on a slack tide, and begin haul from the opposite end as set.

Category 2: Actions that would entail changes to fishing practices:

- *Explore practical ways for fishermen to monitor set net gear* that would otherwise be left unattended. For example, establish in-fleet procedures for routine gear checks, particularly in areas with high tidal exchange and where floating driftwood and other debris are common.
- *Secure a standby vessel during fishery openers* from which fishermen in a discrete area can request rapid assistance in freeing up and retrieving tangled gear. This could be particularly beneficial during sockeye fishery openers, when the window of fishing opportunity may be very short.

Category 3: Possible changes to gear:

Note that these ideas may require research/experimentation to determine effectiveness prior to wide-spread use.

- *Use longitudinal suspender lines* (i.e., Chehalis and Columbia River fisheries), which are heavier and allow more force to be applied from the surface to the leadline during the recovery of an entangled net⁴.
- *Use a breakaway leadline* as used in Alaska and Columbia River fisheries. This enables a net to drift over a snag without hanging up the entire net, although does not provide a fisherman the solid pull that can help free leadline from a snag (and thus beyond the spot where another portion of gear might get hung up).
- *Low frequency pingers* (e.g., Fumunda) attached elsewhere than the corkline could assist in locating lost gear with hydrophones; a lower frequency carries farther distance for tracking purposes.
- *Use a corrosive link to attach sections of leadline to a recovery float*. For example, a line rolled inside a tube with a trigger mechanism attached to a corrosive link, whereby a tube opens and float inflates with gas capsules.
- *Use biodegradable webbing* to avoid the long-term persistence of derelict nets.
- *Explore the efficacy of mesh depth restrictions* as in the salmon gillnet fisheries in British Columbia and Alaska (i.e., change net gear depth limit such that the vertical mesh count is restricted, limiting the extended distance between corkline and leadline to.- 60 or 90 meshes deep).

⁴ If suspenders were allowed by WDFW in the Puget Sound drift gillnet fishery, the length to hanging ratio would have to be monitored (i.e., length of suspenders can be no less than 1.1 times the depth of the net from float line to leadline.)

DISCUSSION

An important outcome of discussions with fishermen is increased awareness about the problems associated with derelict gear. Several people interviewed agreed that preparation of this report provided them a simple means of asking questions, sharing opinions, and generally engaging in problem-solving.

In addition to commonly citing increased awareness of derelict gear problems, three common themes emerged:

- *Industry perception:* Several respondents remarked that although they do not think derelict gear is an important issue within the broader context of fisheries problems, they do know *other* fishermen who should be making a better effort to prevent the loss of gear.
- *Distinction between industry profiles:* The gillnet and purse seine fisheries in Puget Sound are very different. Several gillnet fishermen interviewed feel that they are an artisanal industry and “get the short end of the stick” with regard to the derelict gear issue. It appears that purse seine fishermen have a much larger initial financial investment in gear, and tend to either hire divers or use grapple gear to recover nets. Purse seines also target fish in deeper water (~200 feet), and therefore are less likely to snag on shallow rocky reefs.
- *Fear of further regulation:* Though this project was not intended or designed to assess or to elicit recommendations for enforcement tools or fishery regulations relating to derelict fishing gear, participants unanimously expressed concern that any ideas offered in the course of discussion for the project could result in further regulation of the gillnet fisheries.

RECOMMENDATIONS

A concerted effort was made to solicit input from relevant stakeholders on how to prevent future loss of gillnets in Puget Sound salmon fisheries, and it is clear that there is no single and simple preventative measure to reduce or eliminate gillnet losses. Solutions need to be developed that align with the economics of the tribal and non-tribal gillnet industry, and that do not infringe on treaty rights. The most common recommendations provided by participants in this project are:

1. *Prepare a comprehensive guide to best fishing practices* that is tailored to each gillnet fishery, and, where possible, include bathymetric information specific to local areas of high relief. Make such a guide widely available through port offices and fishing gear supply stores in Bellingham, Anacortes, Seattle, Friday Harbor, and elsewhere.
2. *Provide free, annual two-hour training on ‘trade secrets’ for newcomers to the fishery.* For example, new non-treaty gillnetters in Puget Sound are required to take a “Fish Friendly”

class provided by WDFW if they fish in areas 7/7A. There are more newcomers to the treaty fisheries; perhaps training could be offered in concert with a community event.

3. *Conduct a collaborative fisheries research project* that is designed to test the efficacy of mesh limits/net depth restrictions, etc. in local gillnet fisheries.
4. *Establish a peer-based incentive system* to monitor gillnet gear that would otherwise be left unattended, prioritizing areas where the likelihood of net entanglement and/or loss is high.

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ONLINE RESOURCES (all accessed between June and December 2011)

- Fumunda Marine <http://www.fumunda.com/>
- GhostNet Australia, an Indigenous Derelict Fishing Gear Programme <http://www.ghostnets.com.au/>
- Northwest Straits Initiative Derelict Fishing Gear Removal Program www.derelictgear.org
- Wash. Admin. Code § 220-47-302. Puget Sound – Lawful Gear – Gill net. (2010)
- Wash. Admin. Code § 220-22-030. Puget Sound Salmon Management and Catch Reporting Areas. (1995)
- Washington Department of Fish and Wildlife (WDFW) Salmon Management <http://wdfw.wa.gov/fishing/salmon/chum/pugetsound/fishery.html>
- Washington State Legislature RCW 77.12.870 <http://apps.leg.wa.gov/rcw/default.aspx?cite=77.12.870>

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- 2012 New England Derelict Fishing Gear Workshop Proceedings *Conversations Leading to Collaboration*. New Hampshire Marine Debris to Energy Project, Blue Ocean Society for Marine Conservation.

APPENDIX A

Text of Letter Sent to Tribal Chairs Requesting Input on Ways to Reduce Gill Net Loss in Puget Sound

The National Marine Fisheries Service is working with the Northwest Indian Fisheries Commission and the Northwest Straits Initiative to identify ways to reduce the loss of gill nets in the marine waters of Puget Sound. We plan to complete a final report by the end of this year. We are relying primarily on Commission staff to get input from tribal fisheries managers and individual tribal fishermen. The Northwest Straits Initiative also has a website where individuals can provide input (<http://www.surveymonkey.com/s/JPBRZQ3>). If you'd like to learn more about this project, I invite you or your staff to contact us to arrange a meeting or schedule a call.

Reducing the loss of gill nets is an important component of protecting the habitats, fish, invertebrates, and other biota of the Puget Sound. In our review of the Puget Sound Treaty Tribes' and the Washington State Department of Fish and Wildlife's joint Resource Management Plan for harvest of Puget Sound Chinook salmon we identified the prevention of new derelict gill nets as a way to help minimize adverse effects to the U.S. portions of the Puget Sound/Georgia Basin Distinct Population Segments (DPSs) of threatened canary rockfish (*Sebastes pinniger*), yelloweye rockfish (*Sebastes ruberrimus*), and endangered bocaccio (*Sebastes paucispinis*). In addition, the reduction of future derelict gill nets would benefit Endangered Species Act-listed salmon, green sturgeon, marine mammals, and numerous non-listed marine biota and their habitats. We are coordinating with the Washington State Department of Fish and Wildlife to include input from non-tribal fishermen of the Puget Sound, and hope to work with those experienced with regional fisheries to find ways to reduce future lost nets, while enabling economically and culturally vital fisheries to thrive.

If you have any questions or are interested in scheduling a meeting or a conference call, please call Keith Lutz, Northwest Indian Fisheries Commission at 360-528-4326 (lutz@nwifc.org), Caroline Gibson, Northwest Straits Initiative at 360-428-1057 (gibson@nwstraits.org), or Dan Tonnes, National Marine Fisheries Service at 206-526-4643, (dan.tonnes@noaa.gov).

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