

Workshop 4: Reducing or eliminating depredation through gear modifications

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The focus of this workshop was to discuss gear modifications for pot fisheries, demersal longlining, pelagic longlining, and sport fishing that might reduce depredation. Different fishing methods were discussed, including where the gear was used and in which fishery. We made an effort to develop gear modifications that could be beneficial. We did not exclude ideas based on cost or safety which allowed even the most radical ideas to be recorded. Additionally, we did not consider prohibitions by marine mammal protection regulations in our brainstorming session.

Pot fishing gear

Pot gear is a fishing method in which baited mesh pots are deployed from a vessel and allowed to soak on the bottom. Fish as large as or greater than the legal size swim in and cannot exit the pot. This type of fishing is commonly used in the Aleutian Islands in the North Pacific, Southern Ocean, British Columbia and Australia. The main advantage of pot gear is its efficiency as quotas can be filled in a very short time. In some areas switching from longlining to pot fishing has resulted in higher yields. The gear is inexpensive, although the cost of switching from longline to pot gear can be prohibitively expensive. Vessels need to be modified to hold pots and more crew are needed to deploy them. The disadvantages of pot gear are by-catch including non-targeted species and undersize fish, as well as loss of gear on the bottom. This “ghost gear” can lead to difficult snarls with longline operations and the two methods usually cannot be employed in the same fishing area.

Around the Falkland Islands there have been experiments with the use of demersal longlines and pots in the Patagonian toothfish fishery. Depredation of pot gear in the Southern Oceans currently does not occur. Some fishermen report significant by-catch problems and entanglement issues with seals and whales. In Australia marine protected areas determine the type of fishing gear to be used in each area. Currently depredation on pot gear is minimal. In Canada pot gear is used to achieve a reasonable yield and decrease rock fish by-catch with the objective of eventually using pot gear to catch halibut. Evidence of depredation in the North Pacific includes sperm whales following pot vessels and eating discarded by-catch, and possibly killer whales crushing pots to steal catch.

Improvements and modifications of pot gear to reduce depredation mainly focus on reducing by-catch and include thickening escape rings and dumping offal away from the fishing grounds. Fishermen report that the size of the average fish caught is decreasing which leads to a greater need to minimize the catch of undersize fish through alterations of escape rings. Dumping offal away from fishing grounds severs the positive feedback whales receive when they associate with vessels that dump food in front of them.

Possible changes to methodology and equipment include the use of live bait, reduction of soak time to limit the amount of time available for mammal interactions, and the use of excluder bars. Comparing depredation rates between longlines and pot gear with excluder bars was proposed. Large scale solutions such as re-designing fishing areas with fewer boats and re-allocating quotas may be possible but will vary regionally with respect to bathymetry, stock size, politics, and current fisheries. In general pot gear does

not experience the quantity or severity of depredation that are seen in longline fisheries, but it is still valuable to examine the fishing method for any possible mitigation methods to reduce depredation.

Demersal longline fisheries

Demersal longline fishing employs the use of a ground line with attached hooks that, like pot gear, is deployed by a vessel and allowed to soak for the desired amount of time on the bottom of the ocean and then retrieved hook by hook. Different methods are used to attach hooks and spacing distances can vary. The advantage of demersal longline fishing operations includes lower environmental impact compared with other commercial and industrial fishing methods. The disadvantages of longlining can include costly gear losses when line becomes snarled or tangled and must be cut, and occasional entanglement of marine mammals due to depredation activities.

Demersal longline fishing operations exist in most of the world's oceans and experience widespread depredation. A variety of animals, including killer whales, sperm whales, pilot whales, elephant seals, sharks, etc. may depredate, but species vary both spatially and temporally. It can be difficult to determine how much catch is lost due to depredation because gear sits on the bottom and it is not clear if fish are consumed, or lost due to snagging.

Strategies to reduce depredation

Three main strategies emerged during this session and include:

- 1) deployment of alternative types of gear with physical modifications,
- 2) change of vessel and operator behavior to reduce acoustic clues for animals, and
- 3) regulatory changes to reduce the amount of time and space animals and fishing operations share.

However, it is important to remember that any strategy to reduce depredation needs to be evaluated in terms of harm to whales, ocean pollution, and elevated by-catch rates. No ideas were excluded from this discussion with regards to these concerns.

Modifications to demersal longline gear

Gangion length

Currently one third of halibut fishermen use gangions or clip on gear in the North Pacific while only a few vessels in South Georgia do so. It is possible that clip on gear may be somewhat of a deterrent to whales, although gangion was found in the stomach of a killer whale. Experimentation with gangion length may shed light on the acoustic clues that are used by depredating whales.

Floating the longline

Floating a longline off the bottom may allow the continued use of traditional longline gear with attached hooks. Floating the line reduces the chance of snagging fish on the bottom which would help quantification efforts. Unfortunately a floated line takes longer to sink and raises the risk of bird by-catch. Australia enforced 25% observer coverage when floated longlines were on trial to look for potential increases in bird by-catch. It was found that birds were not at a higher risk but there was an increase in grenadier by-catch (a non-targeted fish species), which may be in part due to its high abundance that year.

Friendly octopus

In the Ross Sea fishermen are experimenting with a longline gear set-up called the 'Friendly Octopus' which was first used in the Falklands with some success. This method uses a mother line with lines coming off- like a traditional longline- but then each line has two additional lines stemming off. The intersection line that is attached to the mother line has dangling ropes attached to it so that when the line is being hauled the ropes shield the baited hooks. The whales don't like the hanging ropes and it deters them from trying to remove fish.

Moving crucifier

A variation of the Friendly Octopus is to use a cage that encases the fish. The cage is attached to the line at the vessel when it is time to haul and it would slide down the line and shake fish into it. When the 'Moving Crucifier' reaches the end of the line it would be hauled up and whales would not be able to pick fish off as they are hauled. If the cage could not support an entire set, it may be more effective and efficient to use multiple cages or a fixture that would clump sections of the line. The bushel method may increase the difficulty of depredation. Any of these methods could be used in conjunction with a weighted mother line that would disguise or reduce acoustic clues that reveal the presence of a line in the water.

Additions to the longline brainstorming session: Modifying gear

This discussion was a brainstorming session and no ideas were excluded, nor did we constrain ourselves by considering proposals that would be prohibited under any marine mammal protection regulations.

- 1) Visual deterrence methods include adding flashers or snarls. Adding a piece that would flutter would change the sound the line makes in the water and may give fishermen a window to fish without experiencing depredation before the whales adapt to the new sound.
- 2) Lines could be outfitted with firecracker-type devices that could ping when a whale got too close. The cracker could be heat sensitive so that it would go off only when warm-blooded mammals approached.
- 3) The suggestion of placing a J-hook every ten hooks and attaching a chili pepper dart generated a lot of conversation.
- 4) Soaking the line in a solution that repelled whales, as has been used for sharks.
- 5) Knots of rope or spacers added periodically to the line could prevent sperm whales from "flossing" the line, thereby stopping the whale from knocking off fish as the line runs up inside its mouth during hauling.
- 6) The addition of dummy hooks to a line so that fish are only present on every other hook.
- 7) Acoustically it might be beneficial to set a turbine next to a longline that could create turbulence and hide the sound of the line.
- 8) Place a robot next to the line to be used to guard the line through visual or acoustic tactics by remote control.
- 9) If killer whale depredation is the main problem hauling the line through the hull of the boat can be effective not only for killer whales but also for bird avoidance. This 'Moon Pool' set up has been tried in South Georgia.

Modifications to Vessel Operator Behaviour

Acoustic signals attract whales to longline operations, and changes in hauling speed and vessels shifting in and out of gear are cues that whales associate with access to fish. Experiment with reducing these sounds may help to reduce the ease with which whales discover fishing activity.

Leave the fishing grounds before dumping offal.

Experiment with the type or distribution or weights may be worthwhile. Longlines are weighted every 40 m, and these weights need to be removed which takes time therefore increasing a whale's opportunity to depredate. Generally the last portion of the longline to be hauled experiences less depredation, likely because the line is straight. Lines that are curved or have a bow (due to currents) as they are hauled likely make it easier for the whales to depredate. Straightening the line with anchors or different weight patterns may change the line trajectory and reduce depredation.

Regulatory Changes

Using regulatory changes to reduce depredation lowers the amount of time whales are in the same vicinity as fishing operations. Shortening seasons and therefore not fishing year-round teaches whales that depredation on fishing gear is not a reliable food source. In Alaska there are relatively few depredation incidences from February through May, but increases in June and July. Ending the season earlier in the year may reduce depredation, although the weather can make fishing more difficult. Splitting the season such that there is a break during historically high depredation months may also prove effective.

Pelagic longline fisheries

Pelagic longlining occurs in the swordfish fishery in Brazil and also in the Indian Ocean. Some of the first cases of depredation were reported in the tuna fishery in the South Pacific. The South Pacific is especially complicated because of new, fledgling countries with overlapping territories, and little assessment or regulation ability. The issue of depredation is further complicated by the presence of large fishing fleets from Korea and Taiwan in the area.

A major difference between demersal and pelagic gear is that demersal gear is mostly depredated upon during the haul, whereas pelagic longlines are depredated at other times. It is not always possible to see the animals depredating the line when it is pelagic - it may only be noticed at the end of the haul. In general deeper lines usually experience fewer depredations than shallower lines, but this varies by target species and location. In pelagic longlining the rate and incidence of depredation is affected by whether the gear is set inward or outward of the continental break.

Modifications to Pelagic Longline Gear

There are many potential gear modifications from demersal longlining that can be applied to pelagic longlining. Additionally, the majority of participants in the discussion had demersal longline backgrounds. Along with the need to evaluate gear modification for the effects on whales, by-catch, and pollution, it was also necessary to consider how changes in gear may affect the marketability of the targeted species. Especially in tuna fisheries, the quality and condition of the catch when brought to market is critical financially for fishermen. For example, the length of the gangion has a measurable effect on the quality of tuna for the Japanese sashimi market.

Suggested modifications include shortening the main line to reduce the amount of gear in the water and shorten hauling time. Hauling and setting different lines at full speed has been tried but it is potentially dangerous because there is little time for fishermen to rest. Experimenting with hauling and setting times may be effective to determine if depredation is more likely to occur during dark or light hours. However, in

Brazil, when the fishery focused on new target species, the hauling and setting times had to change, but before long depredation started again. Hook spacing and vessel operation techniques as discussed for demersal gear have the potential to reduce depredation. Switching to a rod and line fishery or pot gear would be impossible because the size of the fish caught can reach up to 80kg.

Trolling and sport fisheries

Trolling and sport fisheries operate on a smaller scale than longline and pot gear operations. In recent years depredation on commercial and sport troll gear has increased in British Columbia. The outside lines, those that run farthest abeam of the boat, suffer the most amount of depredation presumably because they are farthest from the vessel and therefore there is less gear to get snagged or caught up with. The only solution being employed to date is to pull the lines when whales are present. Possible gear modifications include using a dummy line outside the outside line without gear to protect inner lines from depredation or run shorter lines that end closer to the vessel. Overall, the same need to increase our understanding of the process of depredation exists for sport and commercial trolling fisheries.