Gear-based approaches to breaking the depredation reward cycle

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INTRODUCTION

Whale depredation of captured fish is a growing problem among many hook and line fisheries worldwide. In the North Pacific Ocean, both Killer (*Orcinus orca*) and Sperm (*Physeter macrocephalus*) whales are involved in depredation behavior in the Pacific halibut (*Hippoglossus stenolepis*), sablefish (*Anoplopoma fimbria*), and Greenland turbot (*Reinhardtius hippoglossooides*) longline fisheries. Whale interactions with longline catches lead to increased costs to fishers, challenges to estimating removals for fisheries managers, and can lead to potential risks to whales including physical injury due to being near vessels and gear, disruption of social structure, and developing an artificial reliance on non-primary food items. In early 2022, the IPHC initiated a project to investigate and develop useful strategies aimed at protecting Pacific halibut caught by longline from whale depredation. The first phase of the project involved identifying effective methods for protecting hook captured fish from depredation, and the second phase involves the development and pilot testing of two different promising designs.

PROJECT OBJECTIVES

- Collaborate with international harvesters and research scientists addressing depredation issues to identify promising approaches.
- Identify successful design features while minimizing problematic elements.
- Develop two unique catch protection devices for pilot testing.
- Pilot testing to investigate (1) logistics of setting, fishing, and hauling the two devices, and (2) the basic performance of the protected gear on catch rates and fish size compared to unprotected gear.

Figure 1. Common depredation damage

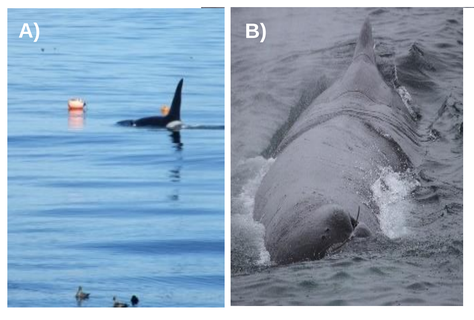

Figure 2. Killer (A) and Sperm (B) whales waiting for the haul

Phase 1 – 1st International Workshop on Protecting Fishery Catches from Whale Depredation

- Virtual workshop 9 February 2022.
- 74 research scientists and active harvesters from 6 countries.
- Devices concepts: deploy during hauling, short gangions, small form factor on deck, minimize damage to discardable catch.
- Data needs: costs: device, time (set/haul), crew needs, stowage needs), safety profiles, catch (rates, size profiles, injury).
- Alternatives: different gear, spatial monitoring / closures, other deterrents (OrcaSaver, Targeted Acoustic Startle Technology).

Workshop report and recording at:

Phase 2 – Device Development and Pilot Testing

1. **<u>Underwater Shuttle:</u> remove catch from the hooks near the bottom, and securely transporting the catch to the surface inside the device.**
   - Modeled after Sago Extreme:
     - 2.6 m long x 0.80 m diameter; 100 kg in weight.
     - Deployed during hauling, not soaked as currently deployed.
   - Vessel requirements: fixed gear, crane/boom/winch capability, prefer open deck.

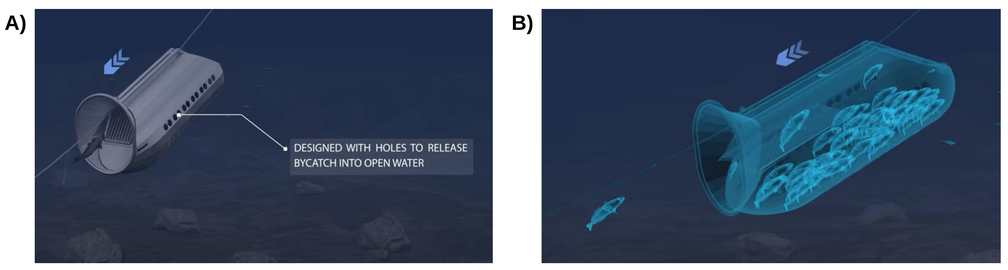

Figure 3. Schematic of underwater shuttle device, as it slides down the groundline (A) and cross-sectional view of fish released and contained within the device (B) (images from Sago Solutions presentation).

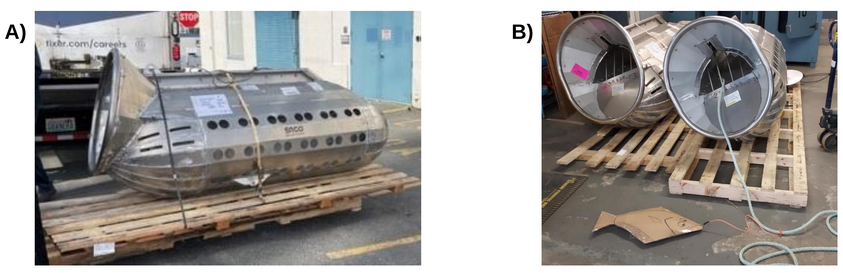

Figure 4. Prototype underwater shuttle device, in profile (A) and frontal (B).

2. **<u>Underwater Shroud:</u> slide over a cluster of captured fish, and to cover/hide them as they are brought to the surface.**
   - Unit dimensions: 2.0 m long x 1.0 m diameter; 12 kg in weight.
   - Snap gear attached to branchlines, 1 shroud/10 hooks.

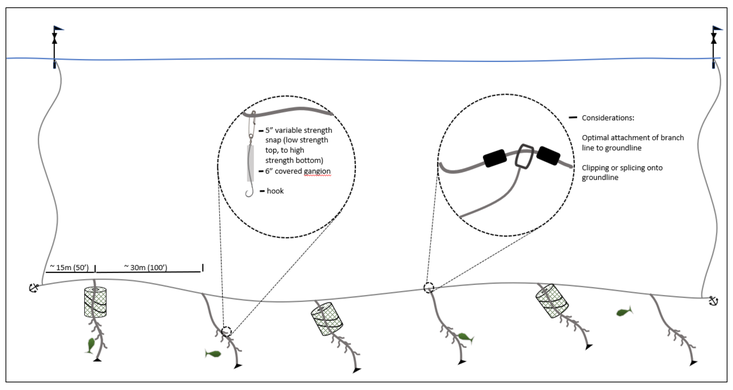

Figure 5. Schematic (not to scale) of branchline gear as viewed from the side during the soak. Branchlines are 15 m (~48ft) long and are affixed at 30m (~100 ft) spacing. Ten (10) short covered gangions with hooks are snapped to the branchlines on 1.2m (4') spacing. Three branchlines will have a shroud device meant to slide over the gear and catch upon retrieval.

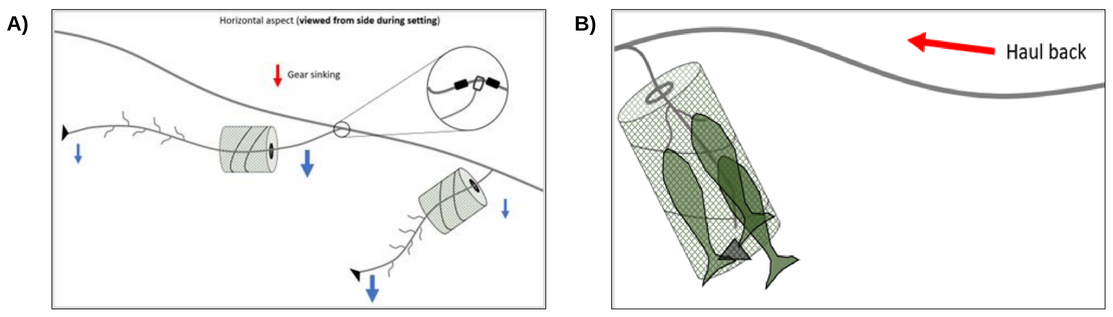

Figure 6. Schematic of branchline gear as it is deployed (A) such that the shrouds do not cover the baited hooks and (B) with the shroud covering the catch during retrieval .

SYNOPSIS

- Catch protection has the greatest chance of breaking the reward cycle of depredation
- Encapsulating the catch is crucial in preventing access to the depredator
- Pilot gear will consist of 1) an underwater shuttle, and 2) an underwater shroud
- Testing objectives will focus on characterizing:
  - Logistics of setting, fishing and hauling of the devices
  - Effects of the gear on catch rates and fish size profiles in comparison to control gear

ACKNOWLEDGEMENTS. This study is being conducted with funding from the IPHC, and NOAA Fisheries Bycatch Reduction Engineering Program (Project NA21NMF4720534).

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