Conservation Engineering Work in U.S. West Coast Groundfish Fisheries (Scientists and Fishermen Collaborating to Reduce Bycatch in West Coast Fisheries)

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Overview

Through key regional collaborations with the Pacific States Marine Fisheries Commission, Oregon Department of Fish and Wildlife, Alaska Fisheries Science Center, and the fishing industry, the NWFSC has been able to pursue a wide-ranging array of conservation engineering projects relevant to reducing bycatch in the west coast groundfish and ocean shrimp trawl fisheries. In the past several years, these projects included: 1) Reducing Chinook salmon, eulachon, rockfish, and Pacific halibut bycatch in midwater and bottom trawl fisheries using BRDs, 2) Providing loaner video camera systems to the fishing industry, and 3) Examining selectivity characteristics of codends that differ in mesh size and configuration in the bottom trawl fishery. Much of our current work has been in response to the fishing industries concerns over catches of overlooked rockfishes and Pacific halibut (Individual Bycatch Quote) allocated in the Pacific coast Groundfish Trawl Rationalization Catch Share Program. The trawl rationalization program, starting in January 2011, established formal Annual Catch Limits (ACLs) and individual catch share quotas. In addition to ACLs, fishing opportunities may also be limited by hard caps or iCQs for non-groundfish species (e.g., Pacific halibut). Bycatch of overlooked and prohibited species in the west coast groundfish trawl fishery has the potential to constrain the fishery such that a substantial portion of available harvest may be left in the ocean.

Light stimulus to enhance Chinook salmon escapement in the Pacific hake fishery

Collaborative research in 2009 and 2010 suggested that there is potential for reducing Chinook salmon bycatch in the Pacific hake fishery using open escape window BRDs (Lomeli and Wakefield 2012). During this initial research, the use of artificial light was also noted to influence the behavior of Chinook salmon (82.4% of 34 salmon exited the escape window where the artificial light was directed [P<0.003]). In 2013, we conducted a dedicated study to further investigate light as a tool to enhance escapement. Six of 7 Chinook exited the illuminated escape window where the artificial light was positioned on two of the BRDs escape windows, during each deployment.

Fishermen’s Loaner Camera System

We provide loaner video camera systems to fishermen to support their evaluation of industry-designed approaches to reduce bycatch and reduce impacts to benthic habitats. Loaner camera systems greatly facilitate science and industry collaborations.

Groundfish Bottom Trawl Fishery Codend Selectivity Research

- Examined the size selectivity characteristics of three codends that differed in mesh size and configuration
  - 4.5” diamond mesh, 4.5” and 5.5” T90 mesh
  - Manufacturer: NET Systems (Seattle)
- Objective was to reduce discards of juvenile and undersized-sized fish
- Collaborators: Daniel Eckert (ODFW) and Owen Hamel (NWFSC)
- Gear Testing / Sea Trials in 2012:
  - No TrawlCam system, JT
- Applications to date: Pacific hake fishery (ESA salmon & English sole), ocean shrimp (juvenile groundfish & ESA eulachon), Pacific halibut, and ocean rockfish

Results

- 4.5” diamond mesh
  - Pros: relatively effective at reducing discards of small fishes
  - retained only 20% of all marketable-sized target spp.
  - Cons: relatively high loss of marketable-sized flatfishes
  - retained 30% of Dover sole and 49% of rex sole
- 4.5” T90 mesh
  - Pros: retained the highest % of marketable fishes
  - retained 86% of all marketable-sized target spp.
  - Cons: least effective at reducing discards of small fishes
  - retained 55% of undersized target fishes
- 5.5” T90 mesh
  - Pros: extremely effective at reducing discards of small fishes
  - retained only 18% of all undersized target species
  - Cons: exhibited a high loss of marketable-sized fishes
  - loss of 58% of flatfishes and 33% of roundfishes

Testing Pacific Halibut Excluders

To address fishermen’s concerns about reaching their Individual Bycatch Quota for Pacific halibut before reaching their groundfish catch share quotas, we began testing a series of flexible sorting grid excluders (Lomeli and Wakefield 2014). Most recently, we tested two excluders: 1) a simple downward-facing flexible horizontal grid excluder for common use in the Pacific NW deepwater OTS complex fishery* with 5.5 X 4” (14.0cmX15.2cm) rectangular openings, and 2) a novel flexible grid design constructed of two vertical panels where the grid openings are vertical narrow slots (1.75” high X 8” wide, 4.4cmX20.3cm) for use in the nearshore flatfish fishery. Results for both excluders are shown below. The vertical grid specifically addresses fishermen’s need for a halibut excluder that would also exclude roundfishes (e.g., sablefish and rockfishes) while retaining flatfishes (e.g., Dover and petrale soles).

Results

- % Retention (marketable-sized fish)
  - Vertical Flexible Grid 1.75" X 8" slots
  - Horizontal Flexible Grid 1.75"X4" "slots*

<table>
<thead>
<tr>
<th>Species</th>
<th>% Retention (marketable-sized fish)</th>
<th>Vertical Flexible Grid 1.75&quot;X8&quot; slots</th>
<th>Horizontal Flexible Grid 1.75&quot;X4&quot; &quot;slots*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dover</td>
<td>87</td>
<td>99</td>
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<tr>
<td>Petrale</td>
<td>92</td>
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<td>English</td>
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<td>Arrowtooth flounder</td>
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<td>Sablefish</td>
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<td>Shortspine thornyhead (SSTH)</td>
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<td>Darkblotched rockfish</td>
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<td></td>
</tr>
<tr>
<td>Other rockfishes</td>
<td>25</td>
<td>99</td>
<td></td>
</tr>
</tbody>
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*Bycatch of eulachon: sablefish, rockfish, petrale soles.

Fork Length (cm) Mean selectivity curves for the three codends tested for five groundfish species.

A Postscript on Selectivity


