Impacts of halibut bycatch and wastage on halibut coast-wide yield and spawning biomass

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April 24, 2012

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Objectives

Provide an alternative investigation into the effects of halibut bycatch and wastage in the GOA and BSAI groundfish fisheries.

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Research Question:
What are the impacts of bycatch reductions on future estimates of halibut **biomass**, **yield**, **spawning biomass** and **wastage** by age–size categories over a fifteen year time horizon?

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Provide an alternative investigation into the effects of
halibut bycatch and wastage in the GOA and BSAI
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Research Question:
What are the impacts of bycatch reductions on future
estimates of halibut **biomass**, **yield**, **spawning biomass** and
wastage by age–size categories over a fifteen year time
horizon?

To answer this question:
Developed a deterministic sex/age-structured simulation
model using IPHC assessment outputs to parameterize the
model.

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Simulation model overview

- 2 genders, 30 age-classes, 1996–2026 (or longer).

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- Area based CEY's based area specific harvest rate.
- Commercial fishery share: CEY - (other removals).
- Reduction in bycatch translates to increase in commercial catch.

Model outputs

Exploitable Biomass (EBio):
Start of year biomass vulnerable to the commercial gear.

Model outputs

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Exploitable Biomass (EBio):
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Spawning Biomass (SBio):
Start of year female mature biomass.

Model outputs

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Spawning Biomass (SBio):
Start of year female mature biomass.

Commercial Yield (YBio):
Weight of commercial landings (excluding wastage).

Model outputs

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Weight of dead discarded undersized fish in commercial fishery.

Model outputs

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Spawning Biomass (SBio):
Start of year female mature biomass.

Commercial Yield (YBio):
Weight of commercial landings (excluding wastage).

Wastage (WBio):
Weight of dead discarded undersized fish in commercial fishery.

Lost Yield (LBio):
Difference between YBio with *no* bycatch & *with* bycatch.

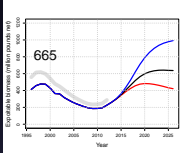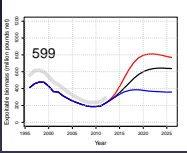# Model outputs

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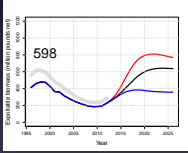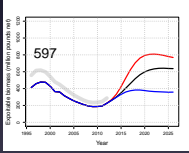
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Wastage (WBio):
Weight of dead discarded undersized fish in commercial
fishery.

Lost Yield (LBio):
Difference between YBio with *no* bycatch & *with* bycatch.

Yield Loss Ratio (YLR):
Ratio between the yield loss and the bycatch.

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Growth & Recruitment Scenarios (states of nature)

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1. Poor (60% below average recruitment)
2. Average
3. Good (60% above average recruitment)

Growth:

Growth & Recruitment Scenarios (states of nature)

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Growth:

1. Density-independent (using 2011 average length-at-age)
2. Density dependent.

Policy Scenarios

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Three alternative policies:

1. Status quo: 2011 BSAI bycatch levels
2. 50% Reduction in BSAI bycatch (4ABCDE)
   - decrease from 5.535 million lb to 2.765 million lb.
3. 50% Reduction in GULF bycatch (3AB)
   - decrease from 5.752 million lb to 2.876 million lb.

Summary plots
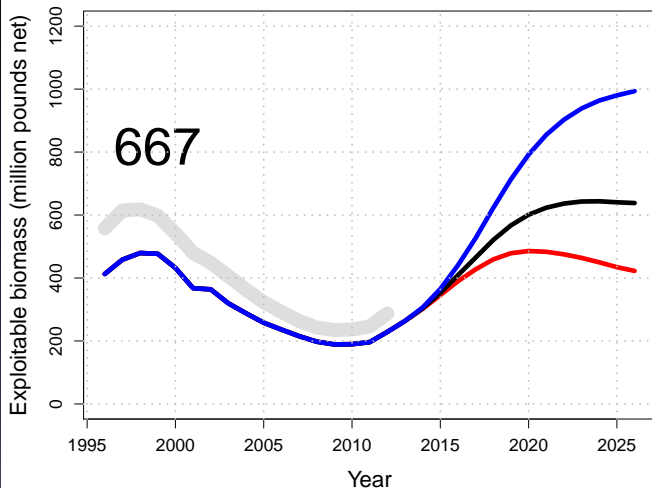
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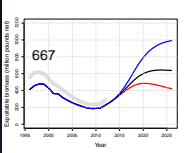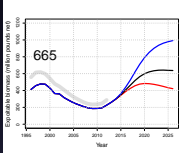
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Decision table: EBio

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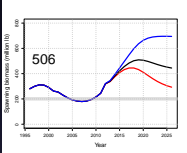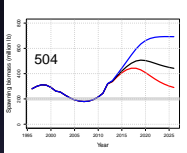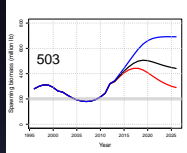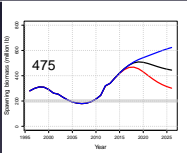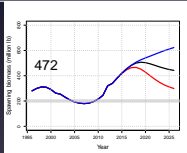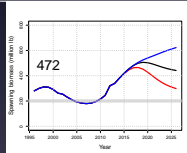
Effect of bycatch reduction on Exploitable Biomass

Policy	Status quo	50% BSAI	50% GULF
DI Growth	667	665	665
DD Growth	599	598	597
Average	633	631.5	631

Decision table: SBio

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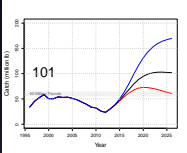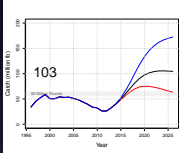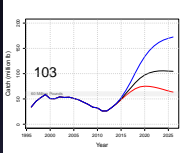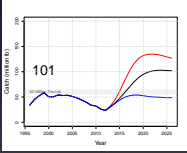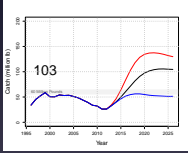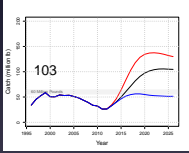
Effect of bycatch reduction on Female Spawning Biomass

Policy	Status quo	50% BSAI	50% GULF
DI Growth	506	504	503
DD Growth	475	472	472
Average	490.5	488	487.5
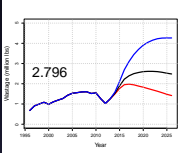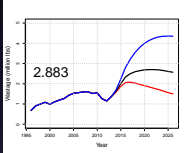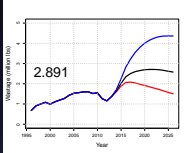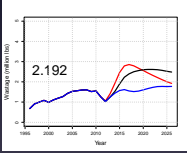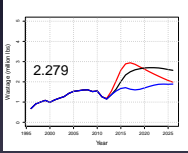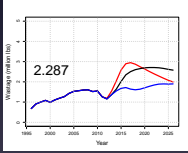
Decision table: Commercial Yield

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Effect of bycatch reduction on Commercial Yield

Policy	Status quo	50% BSAI	50% GULF
DI Growth	101	103	103
DD Growth	101	103	103
Average	101	103	103
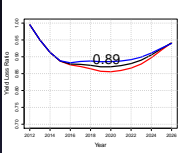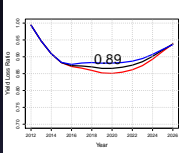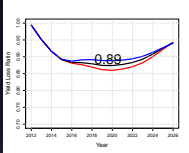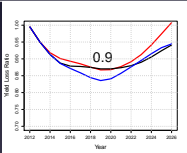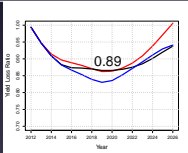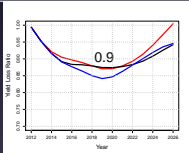
Decision table: Comm. Wastage

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Effect of bycatch reduction on Commercial Wastage

Policy	Status quo	50% BSAI	50% GULF
DI Growth	2.796	2.883	2.891
DD Growth	2.192	2.279	2.287
Average	2.494	2.581	2.589

Decision table: Yield Loss Ratio

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Effect of bycatch reduction on Yield Loss Ratio

Policy	Status quo	50% BSAI	50% GULF
DI Growth	0.89	0.89	0.89
DD Growth	0.9	0.89	0.9
Average	2.494	2.581	2.589

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- Density-dependent growth dominates the scale of EBio in comparison to recruitment trends.

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- Exploitable and spawning coastwide biomass are largely insensitive to BSAI and GULF bycatch.

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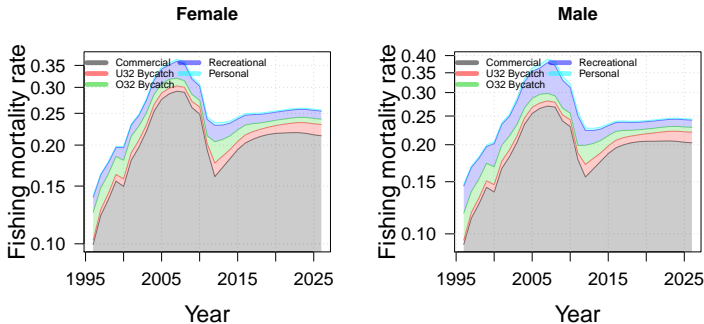
Summary

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- Exploitable and spawning coastwide biomass are largely insensitive to BSAI and GULF bycatch.
- Fishing mortality is dominated by the directed commercial fishery.
- Reducing bycatch in BSAI or Gulf by 50% (≈ 2.7 million lb) results in a ≈ 2 million lb yr^{-1} increase in the directed fishery.

Acknowledgments

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IPHC staff
At-sea Processors Association
United Catcher Boats
Pacific Seafood Processors Association
Alaska Groundfish Data Bank
Marine Conservation Alliance
Groundfish Fourm
Alaska Whitefish Trawlers