SHARING THE CONSERVATION BURDEN

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Key Points

- New 2016 halibut PSC limit for BSAI is 3,515 mt.
- 2016 limit is a 21% decrease from previous limit.
- Under a fixed PSC limit there is no incentive to avoid small halibut.
- Three options for allowing PSC limits to vary with abundance:
  1. allocate a fraction of the annual yield,
  2. allocate yield per recruit (YPR),
  3. or, allocate mortality per recruit (MPR) to each sector.
- Allocation based on MPR creates and incentive to avoid small halibut.
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Introduction

Annual catch limits for the northeast Pacific halibut fishery are set by the International Pacific Halibut Commission.In Alaska, halibut bycatch mortality is managed under a Prohibited Species Catch (PSC) cap. Halibut abundance in the Eastern Bering Sea (EBS) is at a record low and the directed fisheries in this region is facing a potential shutdown. In order to avert the potential crisis, the North Pacific Fisheries Management Council (NPFMC) took final action in June 2015 to reduce the halibut PSC limits by 21%.

Indexing PSC limits to halibut abundance poses several challenges. First, if the PSC limit is set as a fraction of the available biomass, then a catch sharing plan (allocation) must be specified *a priori*. The harvest policy for Pacific halibut must reflect this allocation arrangement. Fisheries reference points (targets, limits, and thresholds), and PSC limits developed in the harvest policy, must also vary with changes in fisheries selectivity, changes in size-at-age, changes in discard mortality rates.

Mitigation is the process by which the directed fishery catch is reduced to accommodate bycatch fisheries. Historically, one pound of U26 inch bycatch is approximately equal to one pound of lost yield (O32) in the directed fishery. This 1:1 ratio was based on an approximation and did not take into consideration the cumulative effects of successive removals and was based on historical size-at-age (coastwide) and historical bycatch selectivities.

Methods

Use an equilibrium model to find a vector of fishing mortality ($\boldsymbol{f}$) rates for each sector that satisfies the following objective function:

$$0 = (\boldsymbol{a} - h(\boldsymbol{f}))^2 + (\text{SPR} - \phi(\boldsymbol{f}))^2$$

where $\boldsymbol{a}$ is a vector of proportions allocated to each fishery, $h(\boldsymbol{f})$ is a function that for the proportion of total yield or total mortality per recruit, SPR is the target spawning potential ratio and $\phi(\boldsymbol{f})$ is the SPR as a function of the vector of fishing mortality rates $\boldsymbol{f}$.

Objective

- Explore ways to index BSAI halibut PSC limits to a metric of halibut biomass.
- Describe methods for setting PSC limits based on allocating catch to each sector.
- Describe methods for setting PSC limits based on allocating life-time total mortality rate to each sector.

Option (1) catch allocation

- This option allocates a proportion of the total catch to each sector. In this case, the total allowable catch (TAC) in each regulatory area is based on the apportioned biomass and the target harvest rate. Each sector (incl.the PSC limit) would receive a portion of the TAC.
- Similar arrangements already exist with catch sharing plans, and allocations to the recreational fisheries.
- Under this option, the IPHC would set the PSC limits on an annual basis once the initial allocation has been established.

Option (2) fishing mortality rate allocation

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This is my note

Mitigation

Examination of the partial derivatives show how changes in yield from one fishery affect the changes in yield in another fishery.

$$\frac{\partial Y_k}{\partial Y_{\dot{k}}}$$

Discussion

There is nothing particular about setting the PSC limits using an abundance based approach versus an SPR-based approach. It is entirely feasible to determine the proportions for each method that result in the same long term average yield. What uniquely different between the two approaches is the potential for the SPR-based approach to incentivise behaviour that would maximize the net benefits for all participants in the fishery. Participants are rewarded for efforts that minimize mortality on the present and future spawning biomass, and by maximizing the yield per recruit, by recieving a larger portion of the total available surplus. In contrast, the abundance-based PSC limits has no built in incentive that rewards maximizing the yield per recruit. In fact, if the PSC-limits are in units of weight, then there is an incentive to growth overfish and increase total mortality. This is also the case for fixed PSC-limits.

In the catch allocation method there is no feedback in the calculations to adjust the PSC limits. Requires Council intervention to change the PSC limits. The total mortality rate allocation does have the built in feedback that allows the PSC limits to vary both with abundance and changes in selectivity.