Ocean salmon management implications of mass marking / mark-selective fisheries

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Outline

Current practice

- Management measures designed so all stocks meet conservation objectives and ESA consultation standards
- If a stock is not forecast to meet its conservation objective, fisheries impacting the stock must be closed
- Generally, there is one or more "weak" stocks that constrain fisheries
- Seasons constructed such that fishing opportunity is maximized, subject to the conservation objective / consultation standard constraints

MM and MSF linked

If mass marking were to be implemented:

- The principle of maximizing harvest opportunity, subject to constraints, would continue
- In some years, fishing opportunity could be increased by harvesting only marked fish (i.e., MSF)
- For these reasons, we believe that MM will lead to intense pressure for MSF

Outline

Unmarked stock mortality

Will MSF allow for increased fishing opportunity with lower impacts on unmarked stocks?

- MSF could lead to increased opportunity
- MSF will not likely lead to better protection of natural origin and/or listed stocks
- This prediction is based on the principle that opportunity is maximized given FMP and ESA constraints

Unmarked stock mortality, contd.

Fishing mortality rate (μ) is a function of the contact rate (c) and the mortality rate per contact (r):

$$\mu_{nat} = c \times r$$

Assuming all fish are legal size and no MSF:

$$\mu_{nat} = c \times 1$$

With MSF, unmarked fish must be released:

$$\mu_{nat} = c \times 0.31 \qquad \text{commercial}$$
$$\mu_{nat} = c \times 0.19 \qquad \text{recreational, troll}$$
$$\mu_{nat} = c \times 0.47 \qquad \text{recreational, mooching}$$

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Result: μ_{nat} constraint remains, c increases owing to increased effort

Commercial MSF in California

- MSF may lead to increased opportunity in some times/areas
- Increased opportunity likely in San Francisco–Monterey region
- More northern areas may be constrained by coho impacts
- Catch could increase or decrease, based on the mark rate

Recreational MSF in California

- MSF will likely lead to little increased opportunity
- Recreational closures occur primarily in "disaster years" when there are low abundances of natural and hatchery origin fish
- If opportunity stays roughly constant, catch would likely decrease since unmarked fish must be released
- May be pressure to ban mooching due to high release mortality rates

End marking of listed stocks?

- In the CV some listed stocks are marked and tagged to provide information on stock distribution and mortality rates
- This practice would need to end with MM/MSF since targeting a listed stock is not permissible
- With no winter run marking, the ability to estimate impact rates becomes impossible since released fish provide no data

Outline

Estimation of impacts

Marked hatchery stocks

- Estimation of harvest/impacts (and associated rates) is straightforward for marked hatchery stocks
- This is necessary to ensure adequate hatchery fish return to meet egg take goals

Unmarked natural stocks

- Assessments assume that the natural component of a stock shares harvest/impact rates with the hatchery component
- This is plausible with current fisheries since marked and unmarked fish are both retained
- This breaks down when unmarked stocks must be released and the marked and unmarked groups have separate mortality rates

Unmarked stock impacts estimation under MSF

- Unmarked stocks released- no data collected from them
- Unmarked, released fish could have tissue samples and scales collected for Genetic Stock Identification and age determination
  - This could provide a somewhat similar level of information as a CWT
  - Expensive
  - Observers needed to collect data on released fish?
  - May result in increased release mortality rates
  - Low resolution for some stocks with GSI data

Assessment models for MSF

- Models of the depth and breadth used to currently assess KRFC and SRFC do not exist for MSF
- Models do not exist for utilizing GSI data for released fish
- The PFMC Scientific and Statistical Committee has cautioned that the mark-selective Chinook FRAM is suitable for modeling MSF of "low intensity"
  - "Low intensity" was defined as fisheries with overall exploitation rates on marked stocks of less than 30 percent (Lawson and Sampson 1996)
  - CA ocean fishery exploitation rates generally are much greater than this
- These are not trivial technical issues; this is a complete (and untested) restructuring of salmon assessment

Forecasting mark rates

- Forecasting the ratio of marked to unmarked fish will be difficult and highly imprecise
- With adequate data, it is difficult for a single stock (with a hatchery and natural component) in terminal fisheries
- Very difficult for a large, mixed stock ocean fishery
- Chinook fisheries are particularly difficult since mark rates differ by age as well as stock
- Methods need to be developed to forecast the change in mark rates as high intensity fisheries retain marked fish (and impact unmarked fish)

Outline

Fishing and our recent salmon disasters

2006: KRFC

- KRFC forecast to not meet the conservation objective of 35,000 natural-area spawners in the absence of fishing
- All fisheries impacting the stock must be closed under this scenario
- Fishing occurred because NMFS approved an emergency rule
- Abundance issue: MSF would only have been allowed with the same emergency rule

Fishing and our recent salmon disasters

2008: SRFC

- SRFC escapement forecast to be less than one half of the lower end of the conservation objective goal range (122,000 hatchery and natural area adult spawners)
- Severe abundance problem
- Concerns existed about meeting hatchery egg take goals
- MSF would not have affected the decision to close 2008 fisheries
- Note that the conservation objective is in terms of natural and hatchery escapement

Conclusions

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- The purported fishery benefits of MM/MSF are highly uncertain
  - Commercial fishing opportunity may rise in some areas
  - Recreational opportunity will not likely rise
  - Catch may increase or decrease, depending on many factors

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  - The salmon management system creates pressure for MSF, given MM
- The purported fishery benefits of MM/MSF are highly uncertain
  - Commercial fishing opportunity may rise in some areas
  - Recreational opportunity will not likely rise
  - Catch may increase or decrease, depending on many factors
- The purported conservation benefits of MM/MSF for listed stocks is highly uncertain
  - Unmarked or listed stocks will likely experience similar levels of impacts with MSF
  - We do not foresee the promise of simultaneously increasing catch while decreasing unmarked stock impacts

Conclusions, contd.

- The low level of data produced for unmarked stocks is problematic
  - Extensive new programs would need to be created to collect data for unmarked stocks
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- MM/MSF would not have allowed for fishing during the recent salmon disasters