Economic Analysis of a Columbia River Fish Hatchery Program

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Presentation

- Economic analyses of Col R. hatcheries done before - beginning in the late 60s and early 70s

- Use example of Col R. Mitchell Act (MA) funded hatcheries to examine some economic issues associated with large scale hatchery fish production

- Describe economic measures and show estimates prepared using recent information on MA hatcheries

- A similar paper on this subject is available on the Native Fish Society website. A later version has been submitted to an AFS journal

- A background paper on the economics of North Pacific salmon fisheries is available at the Wild Salmon Center website
Salmon Natural and Hatchery Abundance Trends in the North Pacific - 1990 to 2007

1. Abundance is expressed in adult fish counts for harvest plus freshwater escapement.
2. Major harvesting nations are the U.S., Russia, Japan and to a lesser extent Canada and ROK.
Columbia River Focus

- In contrast to the whole North Pacific, Columbia River Basin stocks’ harvest contributions are about 3/4th hatchery origin.

- Concerns about effects of large scale hatchery production on ESA listed stock populations expressed in literature, state & federal reviews and recovery planning.

- Recommendations on modifications to methods for operating parts of Col R hatchery programs are under active consideration.

- Revisit issues that economic analysis of hatcheries in the Columbia River may suggest.
Federal Funding for MA Activities in 2005

- **Hatcheries**: $11.5 million
  - NMFS
  - Yakama
  - IDFG
  - WDFW
  - USFWS
  - ODFW

- **Fish Screens and Fishways**: $4.5 million

Source: IDFG et al. (2005).
Hatchery Costs

- Specific example presented for MA hatchery costs
- Good cost info now available
- Cost components:
  - Operations & Maintenance (O&M) of hatcheries
  - Administrative/management costs
  - Capital costs - such as construction costs
Annual Fish Production Costs (x $000) at MA Hatcheries

- **Capital Costs**
- **Hatchery Operations & Administration**

<table>
<thead>
<tr>
<th>Species</th>
<th>Capital Costs</th>
<th>O&amp;M + Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Chinook</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Spring Chinook</td>
<td>$2,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>Coho</td>
<td>$12,000</td>
<td>$12,000</td>
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<tr>
<td>Summer Steelhead</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Winter Steelhead</td>
<td>$1,000</td>
<td>$1,000</td>
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<tr>
<td><strong>All Species Total</strong></td>
<td><strong>$20,000</strong></td>
<td><strong>$20,000</strong></td>
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Hatchery Production & Fisheries Contributions

- Smolts hatchery produced and released to migrate downriver
- Smolt to adult survival rates (SAR) influenced by
  - River flow regime and hydro system management
  - Predators and other passage problems
  - Ocean conditions affecting survival
- Harvest contributions
  - Migration patterns
  - Fisheries management regimes & regulations
Harvests of MA Funded Hatchery Production by Species and Fishery

Total Hatchery Contribution to Harvests: 267.9 thousand fish

<table>
<thead>
<tr>
<th>Species</th>
<th>Tribal</th>
<th>Inriver Sport</th>
<th>Inriver Comm.</th>
<th>Ocean Sport</th>
<th>Ocean Comm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA fall Chinook</td>
<td></td>
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<tr>
<td>MA spring/summer Chinook</td>
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<td>MA coho</td>
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<tr>
<td>MA winter steelhead</td>
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<tr>
<td>MA summer steelhead</td>
<td></td>
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</table>
Annual Financial Flows Associated With Smolt Production and Adult Harvest

- Expenditures on hatchery operations and administration
- Harvest - Fisheries-related financial flows
  - Recreational angler expenditures
  - Commercial ex-vessel values
  - Value added at processing level
- Regional Economic Impacts (REI) in harvest regions’ economies
  - Input – Output models and economic models of industries
  - Estimate Personal Income (direct, indirect & induced) Impacts
  - Translates to # FTE Jobs
Regional Economic Impacts (REI)

- **Regional Economic Impact estimates from study**
  - Depend on program costs and fisheries contributions
  - Harvests depend on smolt survival to harvestable adult (SARs)
  - $50 million annually in income using Baseline SAR estimates
  - 46 % from fisheries vs. 54 % from hatchery operations + admin

- **At SAR that is Double x baseline**
  - $74 million annually in total personal income
  - 63 % from fisheries vs. 37 % from hatchery operations + admin

- **At SAR that is Half x Baseline**
  - $39 million annually in total personal income
  - 30 % from fisheries vs. 70 % from hatchery operations + admin
REI From Hatchery Spending, Fisheries, & Hatchery Returns for Baseline Conditions and Two SAR Scenarios

Baseline Conditions SAR
- Hatchery spending: 54%
- Marketable hatchery returns: 15%
- Inriver ETA sport: 8%
- Inriver mainstem sport: 8%
- Inriver tribal: 4%
- Inriver commercial gillnet: 7%
- WC ocean: 3%
- Alaska plus BC ocean: 0.5%
- Total: $50.3 million personal income

Low SAR
- Hatchery spending: 54%
- Marketable hatchery returns: 15%
- Inriver ETA sport: 8%
- Inriver mainstem sport: 8%
- Inriver tribal: 4%
- Inriver commercial gillnet: 7%
- WC ocean: 3%
- Alaska plus BC ocean: 0.3%
- Total: $38.7 million personal income

High SAR
- Hatchery spending: 54%
- Marketable hatchery returns: 15%
- Inriver ETA sport: 8%
- Inriver mainstem sport: 8%
- Inriver tribal: 4%
- Inriver commercial gillnet: 7%
- WC ocean: 3%
- Alaska plus BC ocean: 0.3%
- Total: $73.5 million personal income
Economic Values & Benefit - Cost Analysis

- Appropriate for **Non-Treaty** areas and fisheries only
- Benefits and costs accounted for at national level
- Looks at the **benefits** compared to what it **costs** to get those benefits (What do we get for what we give up?)
- Recreational fishing benefits based on net willingness to pay (WTP)
- Commercial industry benefits based on harvest values – harvest costs
- Overall Benefits minus Costs are positive when the recreational and commercial net benefits (“NEVs”) exceed the costs to society of producing those benefits

- **Note:** Effects of hatchery fish on naturally produced fish are ignored in this analysis!
All Species Total Net Benefits at Different SARs
For Both Capital Cost Assumptions

Baseline SAR

Low SAR (1/2 Baseline)

High SAR (2 x Baseline)

Baseline SAR & Capital Costs Included

Baseline SAR With No Capital Costs

Low SAR & Capital Costs Included

Low SAR With No Capital Costs

High SAR & Capital Costs Included

High SAR With No Capital Costs

SAR & Capital Cost Situation
Conclusions, Issues and Questions - 1

• If funded from outside the region, REI from hatchery costs and fisheries activity have positive economic impacts (income & jobs) at any SAR, but REI increases as SAR increases.

• In Benefit – Cost analysis: Net benefits depend importantly on:
  (1) SARs and (2) how we account for hatchery productions costs
    – Net benefits from fishing tend to increase as SARs increase
    – Costs appear lower if we ignore fixed costs - construction costs

• If hatchery fish adversely affect naturally produced fish, there is an external effect from hatchery production that tends to reduce B – C
  – If measureable, reflect it in benefit – cost analysis
  – May ultimately affect “existence values” (ESA)
  – Over time increasing natural production through modification or reduction in hatchery production could make sense
Conclusions, Issues and Questions - 2

• Can we determine what the effects of hatchery production are on naturally produced fish in the short term and over time?

• Does it matter if MA program purpose is mitigation or fisheries enhancement?

• Can fisheries scientists improve estimates of SARs?

• Is it possible to alter production schedules to reduce costs during poor ocean condition years, but increase releases in good years?

• Should we allocate more funds to habitat improvement work to benefit naturally produced fish and less to hatchery production?

• How will fisheries and the associated economies be affected if we try to transition to a situation where natural production is enhanced and hatchery production deemphasized or modified significantly?

• This study suggests such a transition may make good economic sense