



**PACIFIC SALMON  
FOUNDATION**

# Hatchery Effectiveness Review

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# Outline

Project background

Project components

Highlights

Challenges and Limitations





# Project Background

## Importance:

- Growing concerns for declining salmon production
  - Increasing fishing restrictions
  - Climate change and changing ocean conditions
  - Broader ecological considerations (e.g., SRKW)
  - Several calls for assessment of enhancement
- **BCSRIF Funded (2019-2022)**
  - **3 Main Components**



Perform a comprehensive review of hatchery effectiveness, including production for harvest and rebuilding, the role of community hatcheries, trends in biological traits, and hatchery-wild interactions

# Comprehensive Review

## Components

- Systematic Literature Review
- Role of community hatcheries
- Trends in biological traits
- Hatchery effectiveness
- Hatchery-wild interactions



# Hatchery-Wild Interactions Literature Review

## Goal

- What is the current state of the literature concerning the effects of hatchery-origin salmon on wild salmon?

## Preliminary findings

- Most studied category, by far, is **genetic effects**
  - **Competition** the focus of 2<sup>nd</sup> most studies
  - Other categories include **fish health** and **fishery mixing**
- Majority of studies find a **negative** effect on wild fish
- Common recommendations:
  - Hatchery releases are a tool to be used sparingly, and as part of a larger enhancement or rebuilding strategy
  - Hatchery management must be adaptive, and ongoing evaluation of impacts on wild fish is essential

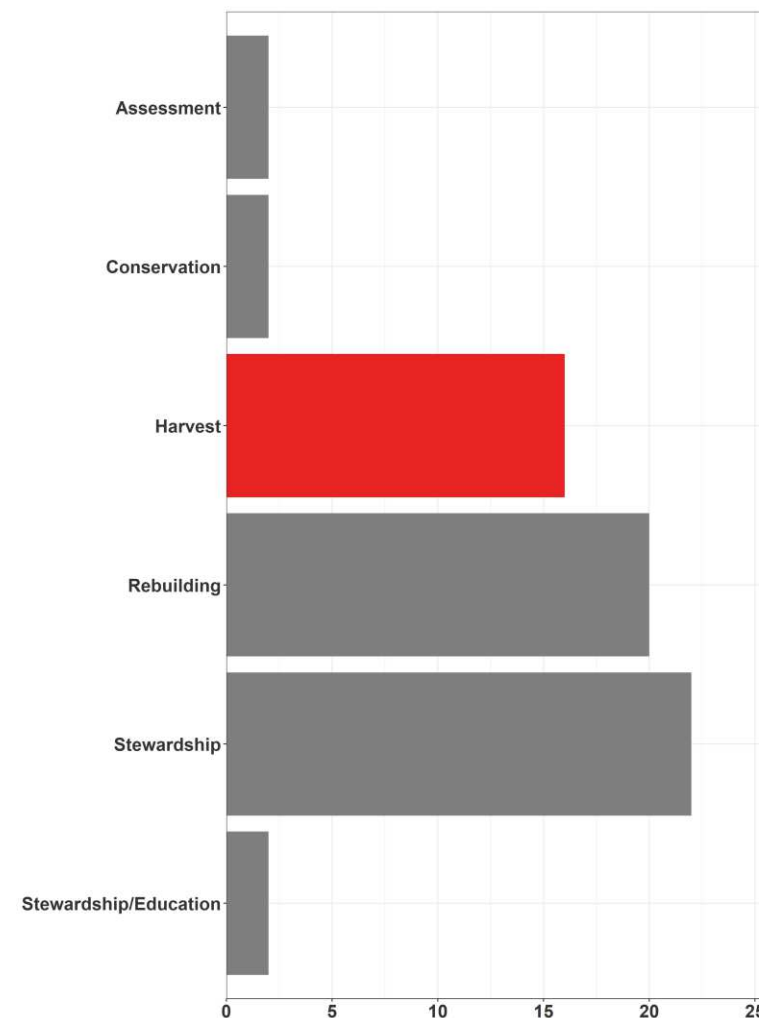
# Community Hatcheries

## Objectives

- Summarize current practices and needs
- Were goals achieved?
- Provide recommendations for SEP to improve the CIP

## Findings

- Over half of CIP facilities have harvest as one of their objectives
- Community hatcheries also have value outside of production (e.g., education and stewardship)
- Majority say they lack operational funding





# Trends in Biological Traits

- Widespread declines in size-at-age, age-at-maturity in Chinook
- We looked more in depth at BC populations
  - Largely from enhanced populations, few wild systems
  - Used a large database of SEP and STAD individual fish records
- Preliminary Findings
  - Declines in size-at-age evident in most populations for males and females of all ages
  - Likely declines in age-at-return as well
- Changes in chum, coho, and sockeye should be explored



# Hatchery Effectiveness-Questions

How effective is production for different objectives (i.e. harvest and rebuilding)?

## Harvest Questions

- What are enhanced contributions to harvest?
- Where are enhanced fish caught?
- Are some hatcheries more effective than others at producing catch?

## Rebuilding Questions

- Does enhancement increase TOTAL and/or NATURAL ORIGIN spawner abundance?
- What happens when enhancement stops?
- Are there differences in rebuilding production efficiency?
- How is this different across regions and species?



# Hatchery Effectiveness-Findings

## Production for Harvest

- Enhanced contributions are variable, and depend on fishery, species and region
- Hatchery fish provide significant contributions to many fisheries, but there are changes over time and areas

## Production for Rebuilding

- In systems that have rebuilding as an objective:
  - Total spawner abundance typically increases, but not natural origin
  - When enhancement stops, spawner abundance declines
  - Areas/systems have mixed responsiveness
- No standardized assessment objectives



# Hatchery-Wild Interactions

Many hatchery and wild interactions are identified in the literature

## Questions

- What influence do hatcheries have on wild salmon productivity in BC?
- What effect does enhancement have on productivity in enhanced systems?
- Can we use Stock-Recruit data and hatchery covariates to identify this?
  - Using single stock and hierarchical multi-stock models to explore
- Are there more localized effects of hatchery enhancement on nearby wild systems?

→ In progress



# Challenges and Limitations

## Challenges

- Quantity of data
- Scope of review (all BC, coho, Chinook, chum, sockeye channels, etc.)
- Few integrated precedents/methods to follow (although many specific papers etc.)

## Limitations

- Capacity within SEP and StAD
- Data quality and accessibility (e.g., coho, chum, and wild stock biodata, stock specific information: ages, harvest, productivity, enhanced contributions)



## So what does all this mean?

- Data compilation, management, and analysis at this scale is complicated
- Assessment of effectiveness is hampered by data limitations

## Recommendations

- Recommendations will be focused around how to design assessment programs that support evaluation of objectives (e.g., harvest, rebuilding, interactions)
- Enhancement activities must be properly planned with appropriate assessment
- Any new enhancement must be considered in the context of the larger picture

## Timelines and Reports

- Reporting will be completed summer/fall 2022 – look for them on the PSF Website at [www.marinescience.ca](http://www.marinescience.ca)

# For more information



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