Alaska Hatchery Research Program: Background & Overview

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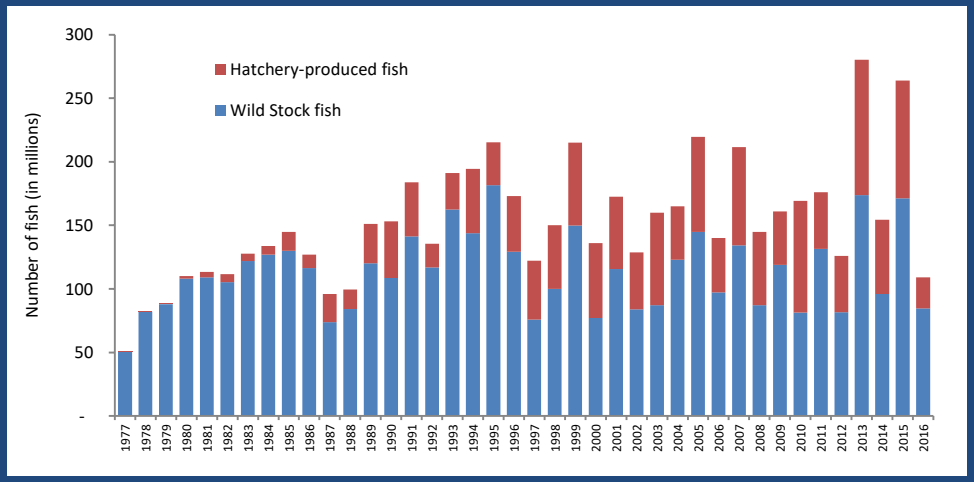
March, 2018
Board of Fisheries, Statewide Meeting, Anchorage

- *Why the program was initiated*
- *Program structure*
- *Key questions addressed*

RC 3, Tab 3

Background

- Private non-profit (PNP) hatcheries account for ⅓ of the commercial harvest
- Alaska hatchery releases:
  - 39% are pink salmon in PWS
  - 28% are chum salmon in SEAK
- Hatchery straying documented in both regions
- Unknown if these hatchery strays affect fitness of wild salmon
- Previous research found fitness impacts to wild stocks, but:
  - Other species
  - Other practices



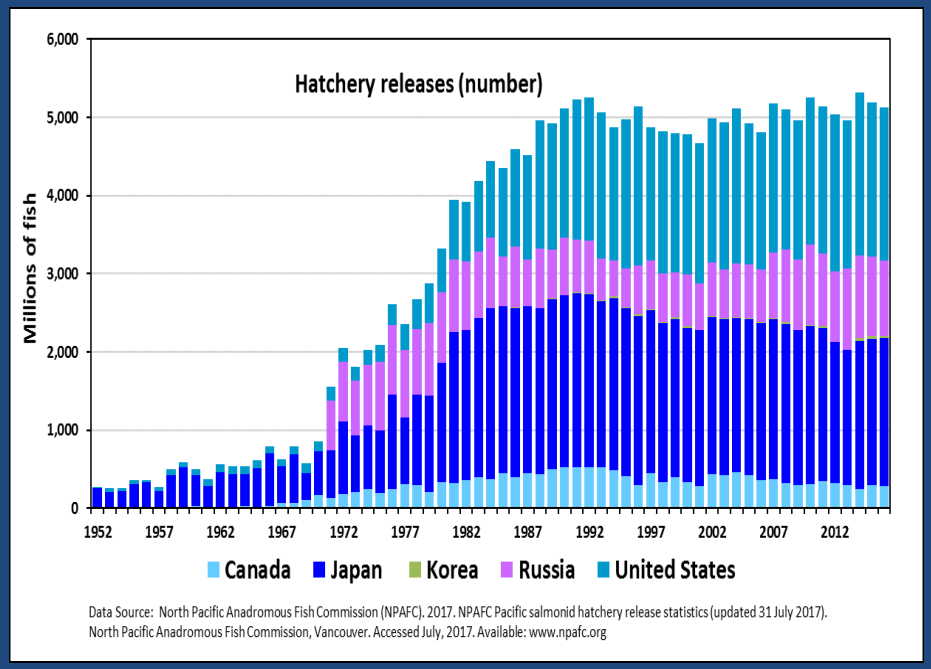
Alaska commercial harvest of wild and hatchery salmon, 1977 2016.

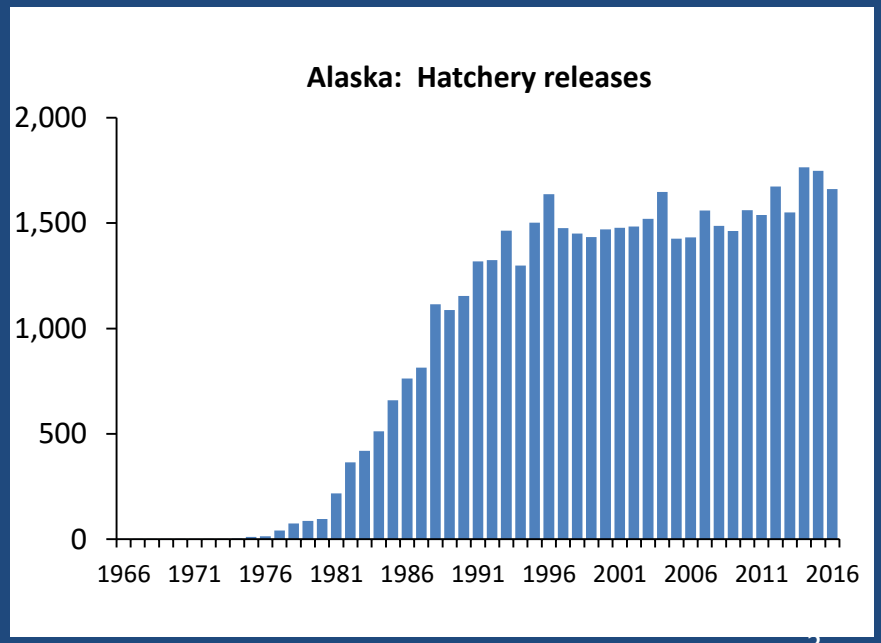
Stopha, M. 2017. Alaska fisheries enhancement annual report 2016. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J17 04, Anchorage.

- Alaska policy mandates sustainable productivity of wild stocks
- PNP operators proposed that ADF&G organize a science panel of experts to design and implement a long term research project to inform future resource management decisions

Why pursue this research?

- Large scale salmon releases raise concerns for wild stock impacts. Information is needed.
  - Do hatchery fish detrimentally impact productivity and sustainability of wild stocks?





Stopha, M. 2017. Alaska fisheries enhancement annual report 2016. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J17 04, Anchorage.

Protections for Wild Fish

- Management of Wild and Enhanced Stocks of Fish (AS 16.05.730)
  - *Fish stocks in the state shall be managed consistent with sustained yield of wild fish stocks*

- Policy for the Management of Mixed Stock Salmon Fisheries (5 AAC 39.220)
  - *...conservation of wild salmon stocks consistent with sustained yield shall be accorded the highest priority*

- Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222)
  - *Effects and interactions of introduced or enhanced salmon stocks on wild salmon stocks should be assessed*

  - *Wild salmon stocks and fisheries on those stocks should be protected from adverse impacts from artificial propagation and enhancement efforts*

- Alaska Salmon Hatchery and Enhancement Regulations (5 AAC 40.860)
  - *… hatchery does not significantly impact wild stocks in a negative manner.*

Protections for Wild Fish

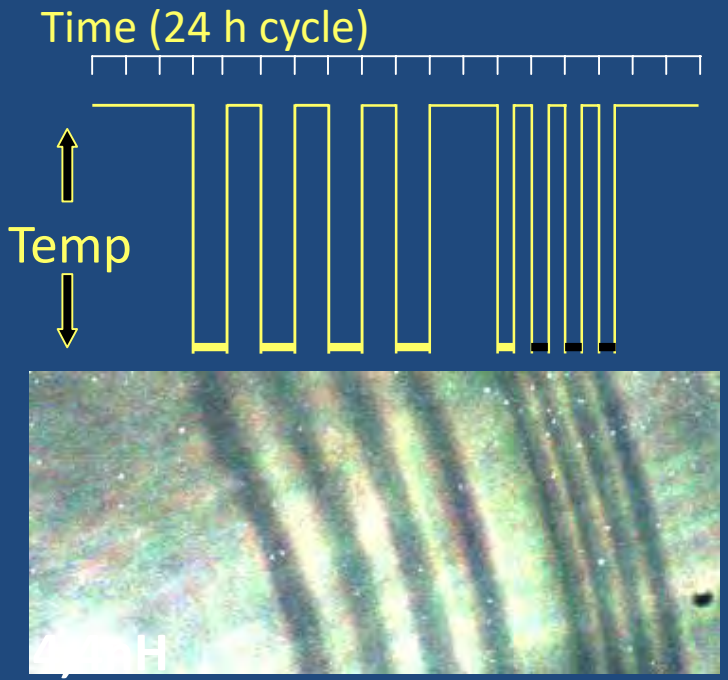
ADF&G Genetics Policy (Davis et al., 1985)

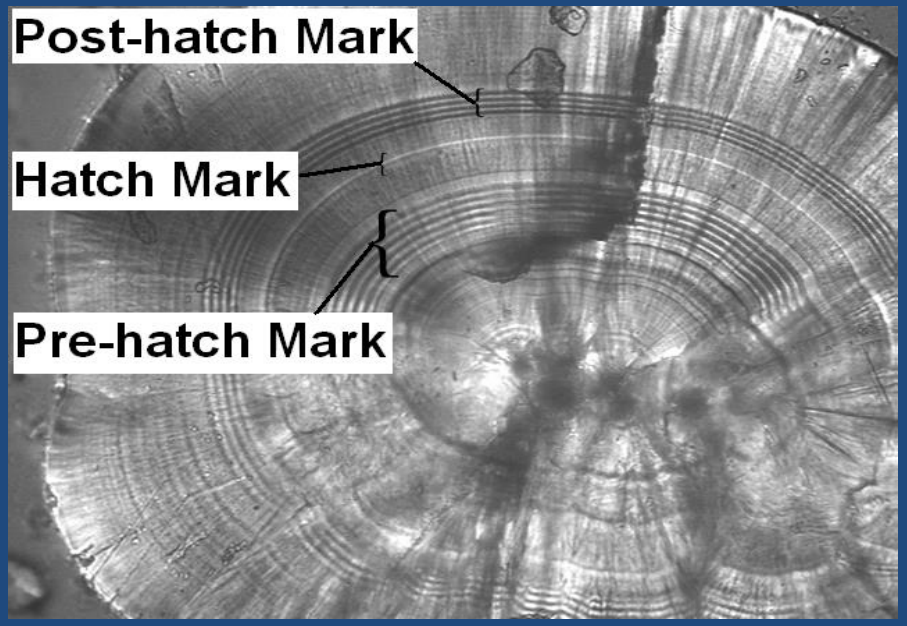
- *priority will be given to protection of wild stocks from possible harmful interactions with introduced stocks.*
- Reduce gene flow from hatchery to wild

- Pathology (5 AAC 41.010, 020; Meyers et al., 1988)
  - Disease history, control and inspection

- Fish Transport Permits (5AAC 41.005,010)

Otolith Thermal Marking



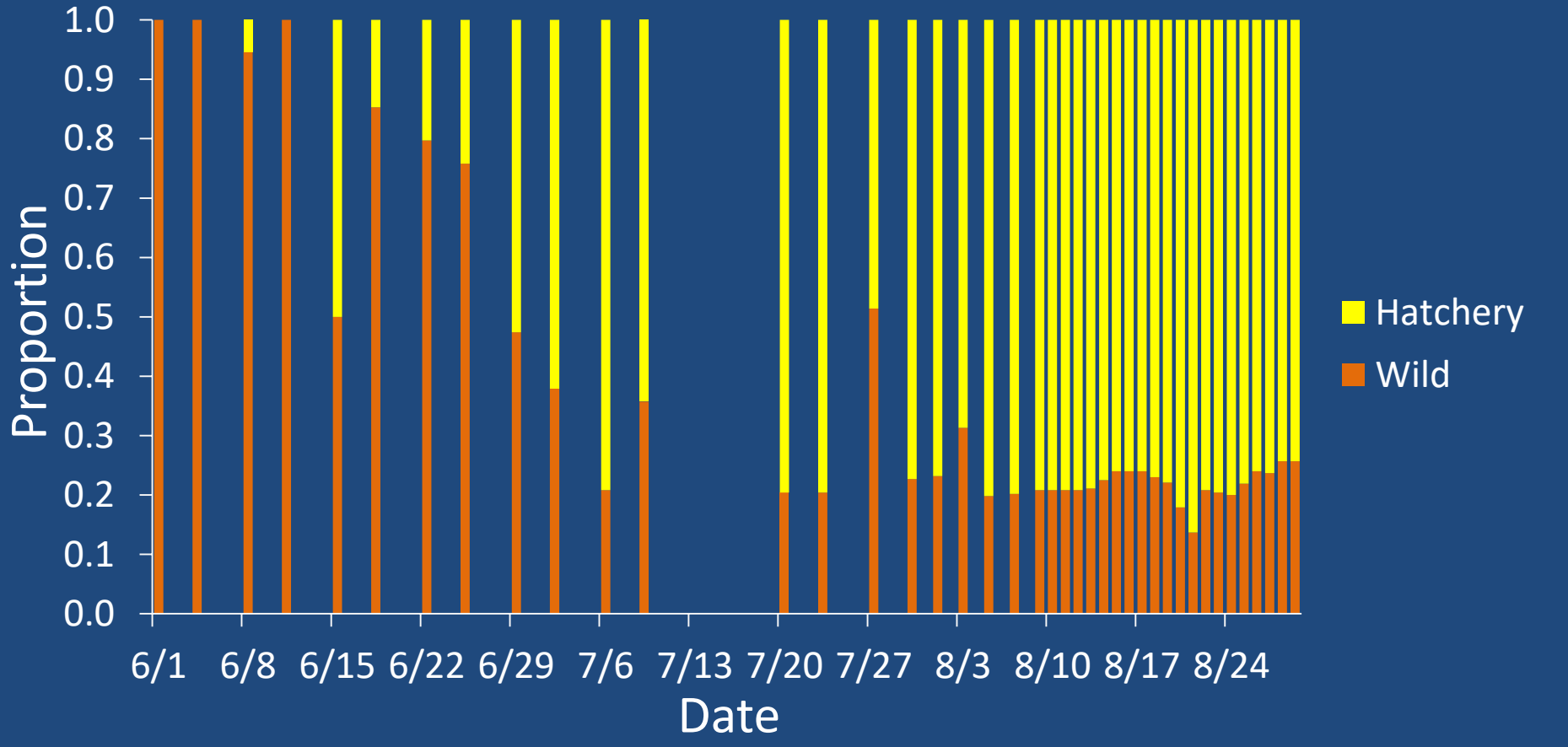


Alaska marks > 80% of hatchery fish ~ 1.2 Billion
(100% for PWS and SEAK pink and chum)

■ NPAFC Voucher DB (Images & Data): http://npafc.taglab.org/MarkSummary.asp

In Season Harvest Monitoring:

Example: Pink salmon, Southwestern District, 2015.



Haught, S., J. Botz, S. Moffitt, and B. Lewis. 2017. 2015 Prince William Sound area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 17 17, Anchorage.

Quantify Straying

Are hatchery fish straying? If so, how many fish are straying?
Measuring straying-in rates (hatchery proportions)

- Southeast Alaska chum
  - Heinl and Piston (2008-2010)
- Prince William Sound pink, chum and sockeye
  - Joyce and Evans (1997-1999)
  - Moffitt and Brenner (2004-2010)
- Lower Cook Inlet pink
  - Otis and Hollowell (2014-2017)
- AHRP (current study)

Quantify Effect of Straying

Are there effects of straying on productivity?

Numerous studies, but most with other species (Chinook, coho, steelhead) under different conditions

- Different life history
  - Freshwater residence time
  - Life span and age structure
- Different hatchery practices
  - Local broodstock
  - 10,000 + parents spawned
  - Limited holding or feeding

AHRG formed to design and execute a research program

- Tripartite funding partnership
- Fundamental questions aimed at examining impacts of hatchery straying on fitness of wild stocks

  ✓ pink and chum salmon PWS
  ✓ chum salmon SEAK

Science Panel Formed

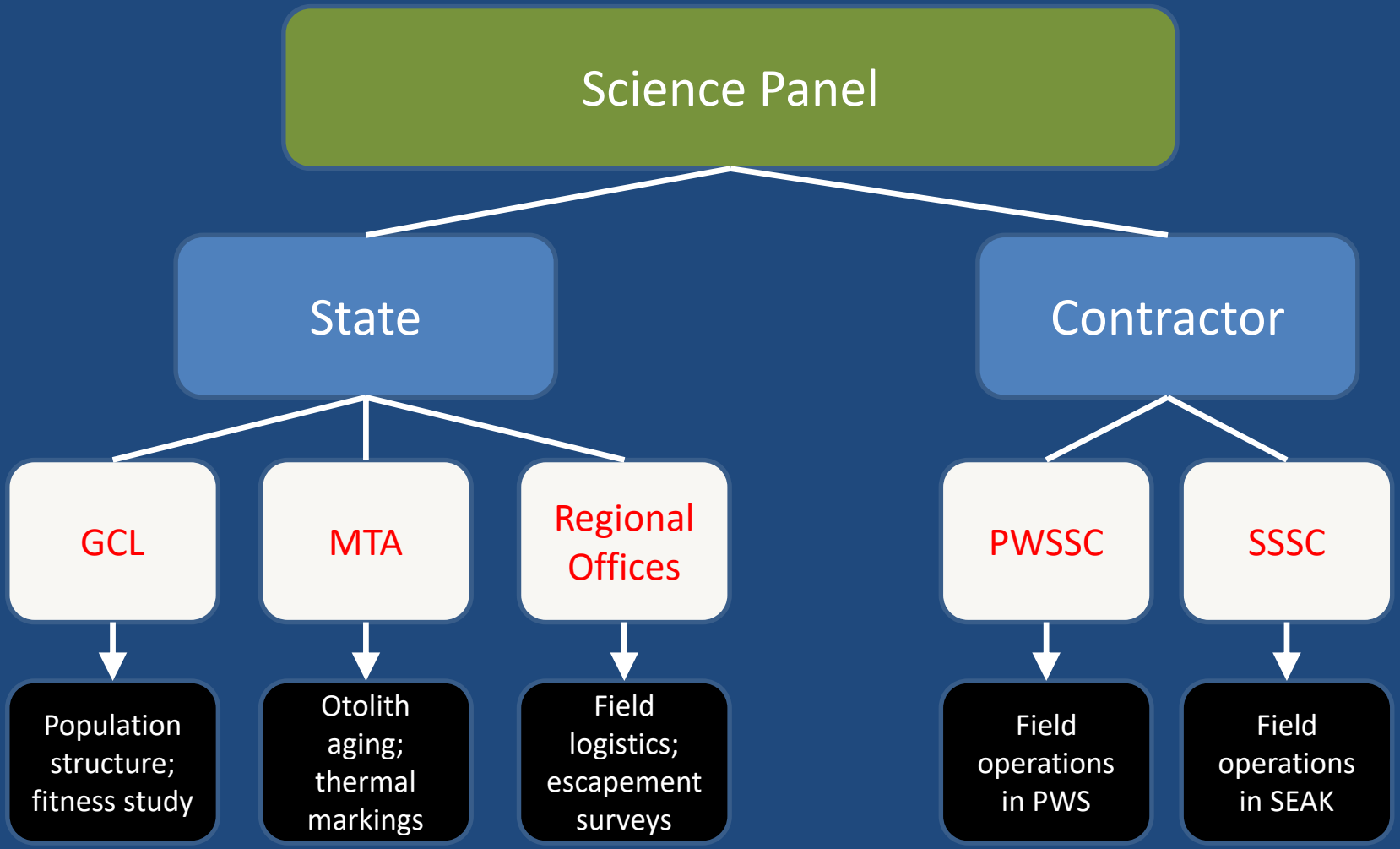
Panel Charge –

Translate questions into specific research projects. Develop a framework for research that could be used to address these questions.

Panel Makeup – 13 members:

- Alaska Department of Fish and Game
- National Marine Fisheries Service
- University of Alaska
- Aquaculture associations

Structure of AHRG



Specific Research Questions

1) What is the genetic stock structure of pink and chum in PWS and SEAK?

2) What is the extent and annual variability of straying?

3) What is the impact on fitness (*productivity*) of natural pink and chum stocks?

Components of Study Design

1) What is the genetic stock structure of pink and chum in PWS and SEAK?

- Pink Salmon in PWS
  - Previous work: ecologically important, but shallow, structure in even-year (1990s)
  - Current work:
    - Even and odd year stocks
    - Compare 1990s structure to contemporary structure
- Chum salmon in PWS and SEAK
  - Previous work: temporal and regional structuring within SEAK and PWS (1990s).
  - Current work:
    - Examine finer-scale structure

Field and laboratory work completed; analysis ongoing

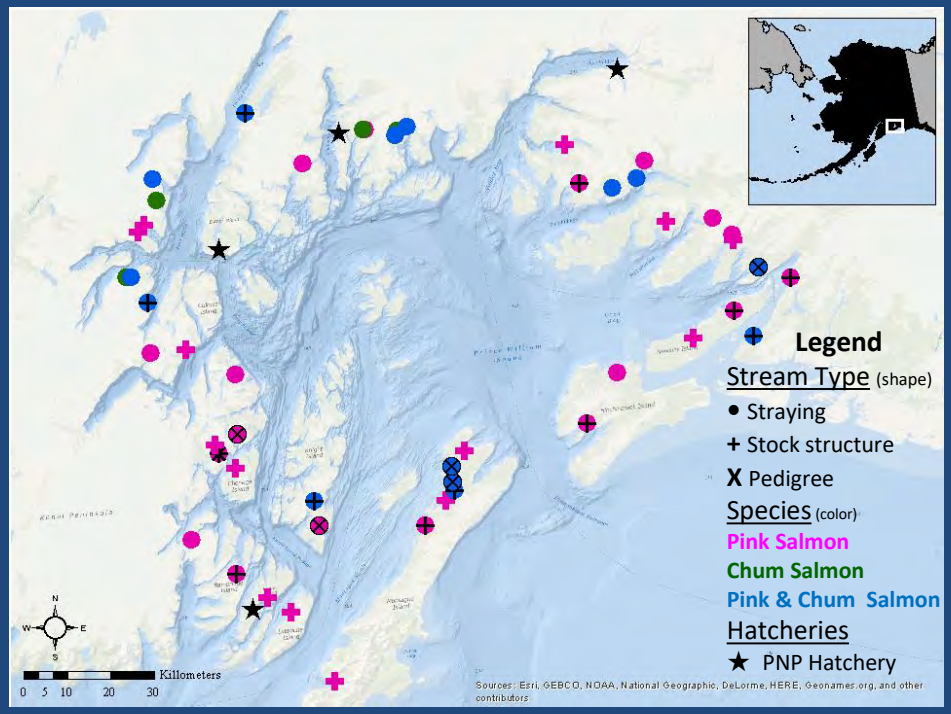
Components of Study Design
2) What is the extent and annual variability of straying?

- Ocean sampling (PWS only)
  - Proportions of hatchery and wild fish in **run**
  - Results from 2013 – 2015 (annual averages):
    - Pink salmon: 55-86%
    - Chum salmon: 51-73%
- Stream sampling
  - Proportions of hatchery fish in **streams**
  - 32 streams in PWS; 32 streams in SEAK
  - Results from 2013 – 2015 (annual weighted averages; ranges by stream)
    - PWS
      - Pink salmon: 4-15%; 0% - 92%
      - Chum salmon: 3%; 0% - 97%
    - SEAK
      - Chum salmon: 5-9%; 0% - 87%

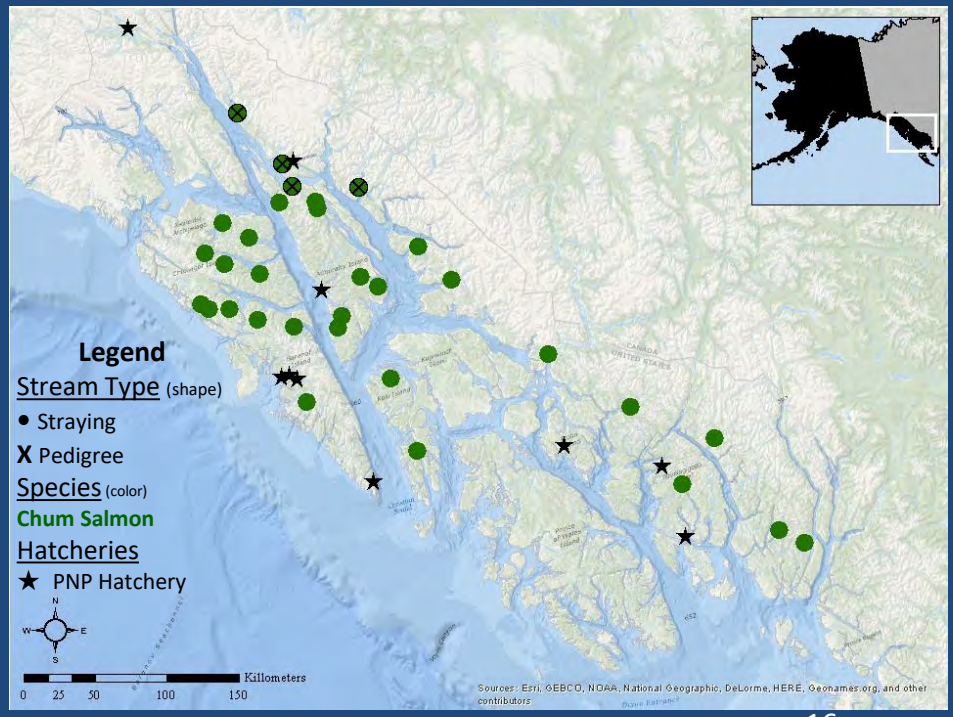
Knudsen E., P. Rand, K. Gorman, J. McMahon, B. Adams, V. O'Connell, and D. R. Bernard. 2016. Interactions of Wild and Hatchery Pink Salmon and Chum Salmon in Prince William Sound and Southeast Alaska, Progress Report for 2015 for Alaska Department of Fish and Game, Contract IHP 13 013, Volume 1, Juneau, Alaska

Study Locations

Prince William Sound



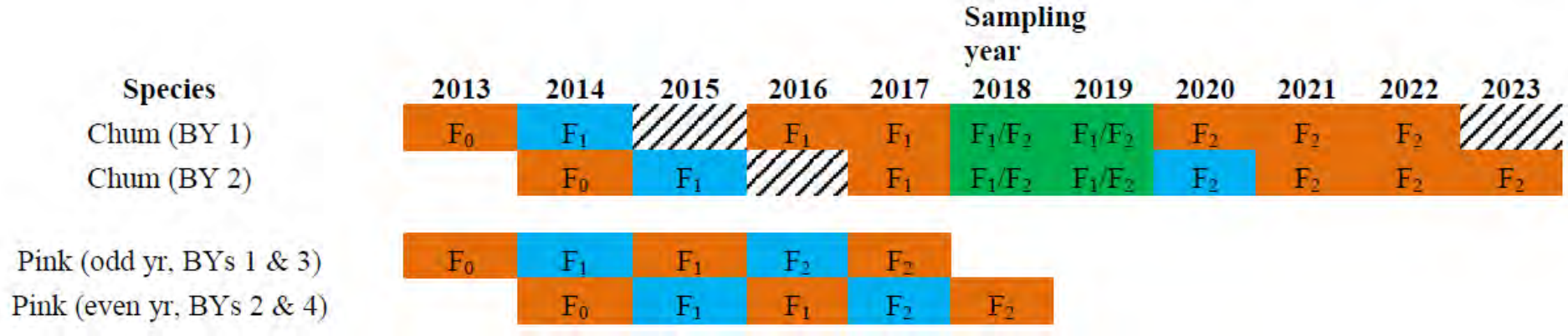
Southeast Alaska



Components of Study Design

3) What is the impact on fitness (productivity) of natural pink and chum stocks?

- Relative reproductive success
  - Fitness = productivity; measured as relative reproductive success
  - How?
    - Read otoliths of parents to determine hatchery/natural origin,
    - Genotype parents and offspring to build pedigrees,
    - Examine number of offspring produced by hatchery- and natural-origin parents
  - Streams for fitness study: 6 streams for pink salmon in PWS and 4 streams for chum salmon in SEAK
  - Sampling begun 2013 and will continue



Technical Document Series

- Focused discussion of single topic
- Mechanism for Science Panel input to complex and fundamental aspects of the project
- Facilitate internal and external communication
- Web-site
  http://www.adfg.alaska.gov/index.cfm?adfg=fishingHatcheriesResearch.main

Summary

- Key information gaps exist to adequately address impacts of hatchery production on wild stocks in PWS and SEAK

- AHRP designed to address three specific research questions to evaluate the interactions of hatchery and wild fish

- Questions?

Acknowledgements

- Field work for this project is conducted by Prince William Sound Science Center in PWS and Sitka Sound Science Center in SEAK.
- Otolith samples are analyzed by ADF&G Region II staff in Cordova for PWS and the ADF&G Mark Tag & Age Laboratory in Juneau for SEAK.
- Scale samples for Chum Salmon in SEAK are analyzed by ADF&G Region I staff in Juneau.
- Genetic samples are genotyped and analyzed by the ADF&G Gene Conservation Laboratory in Anchorage.
- The overall study plan is overseen by a Science Panel of experts from ADF&G, University of Alaska, National Marine Fisheries Service, and representatives from the private-non-profit aquaculture associations.
- Panel members have broad experience in salmon enhancement, management, and hatchery-wild salmon interactions.

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