

Western Alaska Salmon Committee

Research Recommendations

General Recommendations:

1. *Develop state bycatch research priorities, ~~possibly across departments~~, to share with funding entities that would help identify and acquire research funds.*

2. *Implement strategies to encourage and facilitate industry/agency cooperation research to reduce bycatch and associated mortality.*

3. *Create methods, ~~such as an annual workshop~~, to collaborate for collaboration with other research entities to better track bycatch research proposed or funded, along with ~~collaboration~~ developing opportunities for cooperative projects and ~~findings of funded research~~ combined reporting of findings.*

Specific Research Recommendations:

The committee received several presentations on research, gaps and future needs for Western Alaska salmon stocks. Research was identified in areas to improve bycatch mitigation measures and use of technology to reduce bycatch. Research entities and managers, such as the Alaska Department of Fish and Game, Alaska Fisheries Science Center and Bering Sea Fisherman's Association also provided research recommendations on salmon ecology.

Three areas of research were identified.

- 1.) **Research that helps us understand the relative importance of particular mechanisms for driving abundance of Western AK Chinook and chum**
- 2.) **Research that can provide an additional (non-adult) abundance estimate.**
- 3.) **Research in gear technology to reduce bycatch**

Research that helps us understand the relative importance of particular mechanisms for driving abundance of Western AK Chinook and chum

Studies that help us understand the relative role of marine interceptions and **bycatch**

i. Improved information on marine migration patterns and its relation to fishery locations and timing

1. The projects AFSC mentioned that Sabrina (Chinook) and Wes (chum) are leading in the Bering Sea

Model ocean distribution and migration of AK Chum and Chinook salmon stocks in the Bering Sea to predict distribution and hotspots

2. A tagging project of immature chum salmon in the North Pacific Ocean to help us understand their destination, timing and maturity

3. A synthesis of marine migration information from fishery dependent data sources, marine surveys, and tagging studies, and how these patterns have changed with a changing climate
- ii. Improved information on the characteristics of fishery catches
 1. There are still improvements that can be made in the ability to assess age, and specifically stock-specific age of Chinook and chum salmon caught in any marine fisheries.
- iii. Improved information to help understand fishery impacts
 1. Improved AEQ modeling through 'stock specific' Chinook and Chum salmon bycatch. Particularly for western AK chum salmon, AEQ analyses are limited by:
 - a. age classification data gaps in adult chum abundance across all of the WAK stock reporting group. So studies that improve the ability to estimate abundance of all chum in the WAK stock reporting group. Continued genetics work is needed.
 - b. and/or the ability to break up that reporting group. This might be remedied by using technologies that go beyond genetic assignment alone (use of pathogens, stable isotopes, etc.).

Research that can provide an additional (non-adult) abundance estimate.

This will be really powerful for helping triangulate which life stages are most important for determining good or poor productivity.

- a. Understand critical survival periods for western Alaska salmon through integrated ecosystem assessment surveys. An excellent example of this is the northern Bering Sea pelagic trawl survey.
- b. We are also planning to conduct similar research in the southern Bering Sea so we can have a more comprehensive assessment of Western Alaska Chinook and chum.

(Neither of these projects are funded beyond 2023)

Ecosystem indicators: summer sea temperature, phytoplankton/zooplankton community structure; salmon and pelagic fish catch per unit effort, distribution, energy density for fitness, size, stomach contents.

These indicators are being utilized to understand climate impact on the northern Bering Sea ecosystem, fish fitness and survival. The recent information from the northern Bering Sea pelagic trawl survey suggests that the marine heat wave within the NBS during 2016 to 2019 negatively affected juvenile Chum salmon fitness (shift to low quality prey, increased metabolic rates due to higher SST), likely leading to high winter mortality. The data suggest that Chinook salmon abundance is impacted by factors affecting them in freshwater and early marine residence.

- c. Studies that help us understand how ocean/climate conditions impact future runs
 - i. Marine pelagic trawl surveys in the northern and southern Bering Sea can help us address this (see above)
 - ii. NOAA and ADF&G are collaborating on using International Year of the Salmon (IYS) catches and samples to examine immature AYK chum salmon in the North Pacific Ocean during winter. **(This is not yet funded.)**

iii. Immature salmon surveys (like the IYS surveys) in the Bering Sea and North Pacific Ocean.

There is currently no funding support for charter vessel to conduct the survey, collecting and processing samples or paying for gear and supplies.

- d. Studies that help us understand the role of diet, health and disease on the survival and spawning success of Western AK Chinook and chum.
- i. Understanding vectors of Ichthyophonus infection for Yukon Chinook salmon, and whether it is causing significant en route mortality during the spawning migration
 - ii. Understanding diet, nutrition and condition of Western AK Chinook and chum stocks at juvenile (marine pelagic trawl surveys in the northern and southern Bering Sea – see above), immature (IYS surveys, industry catches, etc.), and adult life stages (returning samples from lower river test fisheries- pilot work started for Yukon Chinook, but only funded through 2022)

Research in gear technology to reduce bycatch

- a. Support Cooperative Research opportunities to modify gear and pursue other technology to avoid salmon.

Alaska Department of Fish and Game
Salmon Ocean Ecology Program

<https://www.adfg.alaska.gov/index.cfm?adfg=salmonoceanecology.main>

Alaska Fisheries Science Center

North Pacific Fishery Management Council

<https://www.npfmc.org/how-we-work/research-priorities/>
<https://research.psmfc.org/>

Bering Sea Fishermen's Association

North Pacific Research Board

<https://www.nprb.org/core-program/about-the-program/>

I am still working on incorporating these recommendations into the list above. Items in Yellow have been included above.

Density-dependent effects and overcompensation

- Comparative stock-recruitment analyses
 - Comparison of metrics to produce biological reference points
 - Density-dependent processes
2. Freshwater mortality
 - Environmental variables in streams
 3. Ocean mortality
 - Forecasting adult salmon returns
 - Early marine survival
 4. Anthropogenic changes to marine ecological processes
 - Stressors to abundance and productivity
 5. Escapement quality
 - Causality of genetic changes vs. environmental variables
 - Variables affecting spawning and reproductive fitness
 6. Pathogens
 - Past and current status of Ichthyophonus infections
 - Lethal and sub-lethal effects of Ichthyophonus infections