

# Standard Operating Procedure for Diagnosing and Addressing Predator Detections in Salmon Telemetry Data

**Study Period**  
2022 – 2025

Funded By



**Delta  
Science  
Program**

DELTA STEWARDSHIP COUNCIL

## About this Project

Acoustic telemetry is a widely used method for tracking fish migration. Small tags surgically implanted in fish emit acoustic location signals captured by stationary telemetry receivers. There is a vast network of telemetry stations within the Delta that provides detailed information on the survival and movement of juvenile salmonids, including residence time, daily distance traveled, and common passage routes.

While acoustic telemetry is a highly effective research and monitoring tool, tag predation is one of the greatest challenges for interpreting the data. When predators eat a tagged juvenile salmon, they ingest the telemetry tag along with the fish. Even after the tagged fish is digested, the telemetry tag will continue to transmit location data if it is in the predator's gut, so the data represents predator movement instead of the target species. Scientists needed a method for determining if a juvenile salmon with a tag was eaten.

This project addressed this challenge by characterizing predatory fish movement patterns from existing telemetry data in the Sacramento-San Joaquin Delta (Delta) and developing a standard operating procedure (SOP) for diagnosing and handling detections of eaten tags in salmon telemetry studies. Recommendations were implemented in an R software package that includes code, a "library" of expected predator behaviors, and example vignettes to assist researchers in analyzing and interpreting their telemetry data.

## Lead Investigators



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## Project Objectives

- Analyze existing telemetry data from predatory fish in the Delta and generate characterizations that other researchers can use
- Develop standard methods for diagnosing detections of predated tags in telemetry data
- Enable other researchers to use the new methods and recommendations easily



*Lauren Yamane (USFWS) - at the Salmon Conservation and Research Facility with a hatchery raised spring-run Chinook.*



*Bryan Matthias (US Fish and Wildlife Service) at the Coleman National Fish Hatchery tagging juvenile late fall-run Chinook Salmon.*

## Management Application

The new SOP and software package will greatly improve telemetry studies' effectiveness and collaborative potential in the Delta. By facilitating timely and reproducible results, these tools will reduce subjectivity and enhance the value of telemetry studies for adaptive management. They will also aid in evaluating the effects of water operations on salmon populations. Furthermore, the SOP will promote collaborative data synthesis and scientific research concerning native fish populations in the Delta.

## Next Steps

The SOP and documentation will be shared with Central Valley researchers and managers for feedback that will be integrated as the project develops. The R software package will include a library of predator movement characterizations that researchers can use as a reference to identify and remove predated tags from their data. The package will be available to download for free on the Columbia Basin Research website at the University of Washington ([www.cbr.washington.edu](http://www.cbr.washington.edu)).

## Connections to the 2017-2021 Science Action Agenda

- 1: Invest in Assessing the Human Dimensions of Natural Resource Management
- 2: Capitalize on Existing Data Through Increasing Science Synthesis
- 5: Modernize Monitoring, Data Management, and Modeling