

# Speciation of Sonar Data

Arthur Barros

2025-02-07

## Table of contents

Objectives

2

## Objectives

My goal with this write up is to provide examples of ways auxiliary data can be used to inform the speciation of sonar fish imaging data. This is part of an ongoing effort by the California (Coastal) Monitoring Plan (CMP) Sonar Subgroup to provide support to survey efforts using sonar to estimate abundances of migrating adult salmonids. Often distinguishing species for a given fish using a sonar image can be difficult due to images that are low-resolution and at an angle that makes identification difficult. The difficulty of accurate speciation can be compounded in systems when many different species are present at the same time, especially if those fish are of similar size classes and produce similar acoustic profiles.

I do not aim to provide a “blanket” method for species apportionment that can be applied to all sonar imaging studies. Each watershed is different, and has different auxiliary data available for use. Also, the methods detailed do not aim to replace visual identifications made by scientists with local knowledge and identification experience. Instead, this document will provide examples of statistical methods that can utilize auxiliary data to aid in assigning species identifications to sonar movement data where visual identification is not possible. Some of these methods have been briefly described in Atkinson, Lacy, and Bellmer (2016), and I hope the following methodology provides additional helpful detail on how to implement the techniques.

We will begin with the most simple methods, incorporating the barest of auxiliary data sets, and build upon those with increasingly more complex methods and data sets. Hopefully by the end, the reader can better evaluate how to tackle their sonar imaging data and what auxiliary data they can use to increase the accuracy of species apportionment.

This will be a “living” document, with continues updates and edits being made while we continue to explore and test various speciation methods. Throughout this document, various chunks of R code will be presented in the following format:

```
print("hello reader")
```

```
[1] "hello reader"
```

These chunks are designed for users to copy and paste, or rewrite entirely, into their own R scripts to replicate the methods.

Atkinson, Kristine, Michael K Lacy, and Russell Bellmer. 2016. “Dual frequency identification sonar (DIDSON) deployment and preliminary performance as part of the California coastal salmonid monitoring plan.”

DRAFT