Migratory behaviors and route choices of Atlantic salmon migrating through the Norwegian Sandsfjord toward the Suldalslågen river system

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Introduction

Atlantic Salmon Biology:

- Anadromous and iteroparous migratory species
- Distribution in marine and freshwater systems in the Northern Atlantic
- Enter spawning rivers in the winter months where females will typically over-winter prior to outward migrations in April/May

Spawning Rivers in Norway:

- Large and highly studied spawning rivers include;

Vosso, Alta, Gaula, Orkla, and **Suldalslågen**

- Researchers analyzed diving behaviours, navigational cues, olfactory senses, and foraging cues to determine migratory choices

Risks to Migration Patterns:

- Marine infilling

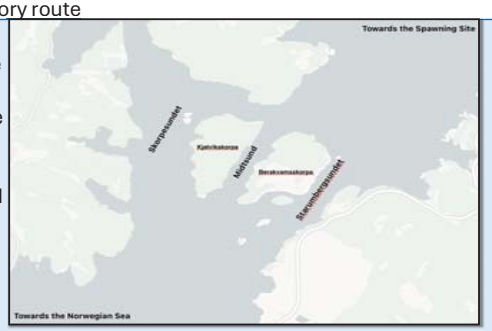
Migratory obstruction

- Climate change

Temperature changes
Water level rise/Terrestrial erosion

Study Objectives:

- Determine residence index through the three swim-ways
- Determine quantity of individual salmon that transit through each swim-way for comparison with residence times
- Determine any trends in the tag sensors
- Determine variables within the fjord that influence their migratory route



Labelled map of the study site around the islands in the Sandsfjord

Research Question

How does this Norwegian population of Atlantic salmon establish their navigational routes around the islands (Kjølvikskorpa and Berakvamsskorpa) in the Sandsfjord to reach their spawning grounds in the Suldalslågen River?

Methods

Study Site:

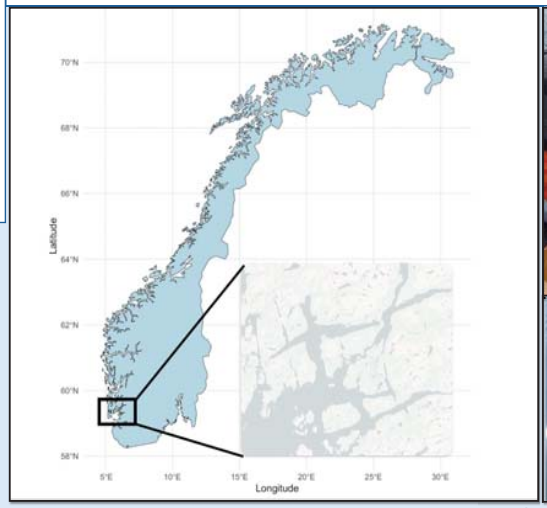
- Sandsfjord in the southwest of Norway, extending from the village of Jelsa, Rogaland to the village of Sand (25 km), the observed study site is 15 km from the Bay of Hebnes to the mouth of the River
- The River Suldalslågen is the spawning site for this transiting population (22 km long)

Experimental Design:

- Adult Atlantic salmon returning from the Norwegian Sea were captured using Kilenot's (summer of 2023) in the Bay of Hebnes
- Thelma MP13-ADT acoustic tags (37.4 mm) were implanted into 80 individual salmon
- Temperature, depth, and acceleration sensors

Data Analysis:

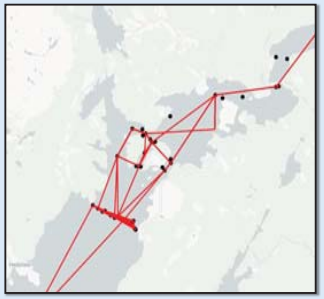
- Statistical coding program RStudio
- Calculation of the residence index around the receivers in the swim-ways
- Determining random effects in the fjord to plot against the response variable



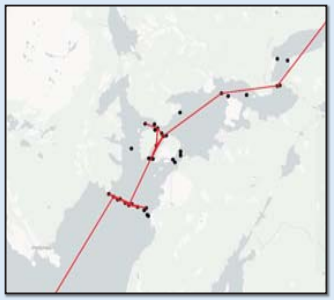
Location of the study site in the southwest of Norway

tagging Atlantic salmon in the Bay of Hebnes

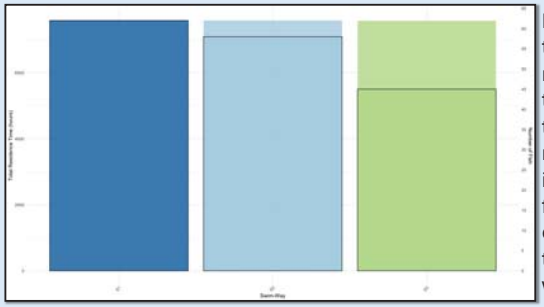
Results



Route track of fish ID 8980



Route track of fish ID 9445



Bar plot of total residence times with the total number of individual fish through each of the three swim-ways

Residence times (June-October)

Swim-Way 1 (S1): **Skorpesundet** = 7584 hours
Swim-Way 2 (S2): **Midtsund** = 7584 hours
Swim-Way 3 (S3): **Starumbergsundet** = 7574 hours

Total number of fish through each swim-way (June-October)

Swim-Way 1 (S1): **Skorpesundet** = 62 individuals
Swim-Way 2 (S2): **Midtsund** = 58 individuals
Swim-Way 3 (S3): **Starumbergsundet** = 42 individuals

Significance

To determine the variables in the Starumbergsundet swim-way that account for these individuals (i.e 42) having a total residence time that is approximately equal to those observed in the other swim-ways. The significance of analyzing these behaviours prompting their route choices through the fjord will aid in conservation and management purposes

Acknowledgements

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