

# 2018 Hakai Institute Juvenile Salmon Program Report

— Hakai Institute Juvenile Salmon Program —

## Aim

To provide regular in-season summaries of juvenile Fraser salmon migration catch statistics, health indices, and oceanographic conditions in the northern Strait of Georgia to Johnstone Strait region.

## Background

The Hakai Institute Juvenile Salmon Program was launched in the spring of 2015 in a collaborative partnership with UBC, SFU, Salmon Coast, Pacific Salmon Foundation, and DFO. The program operates in the Discovery Islands and Johnstone Strait (Figure 1) and thus provides information on the health of juvenile Fraser River salmon after passage through:

- 1) Strait of Georgia – stratified high plankton biomass zone; and
- 2) Discovery Islands & Johnstone Strait – highly-mixed low-plankton-biomass zone, and area of high wild-farmed fish interactions.

## Program Objectives

- 1) Determine migration timing and pathways;
- 2) Migration habitat mapping - oceanographic conditions along the migration route;
- 3) Understand the dynamics of the plankton food-webs that underpin juvenile salmon growth and health;
- 4) Understand parasite and pathogen infection dynamics and their impact on juvenile salmon growth and health.

## Key Parameters Reported

- Catch Statistics
- Length and Weight
- Parasite Loads
- Oceanographic Conditions

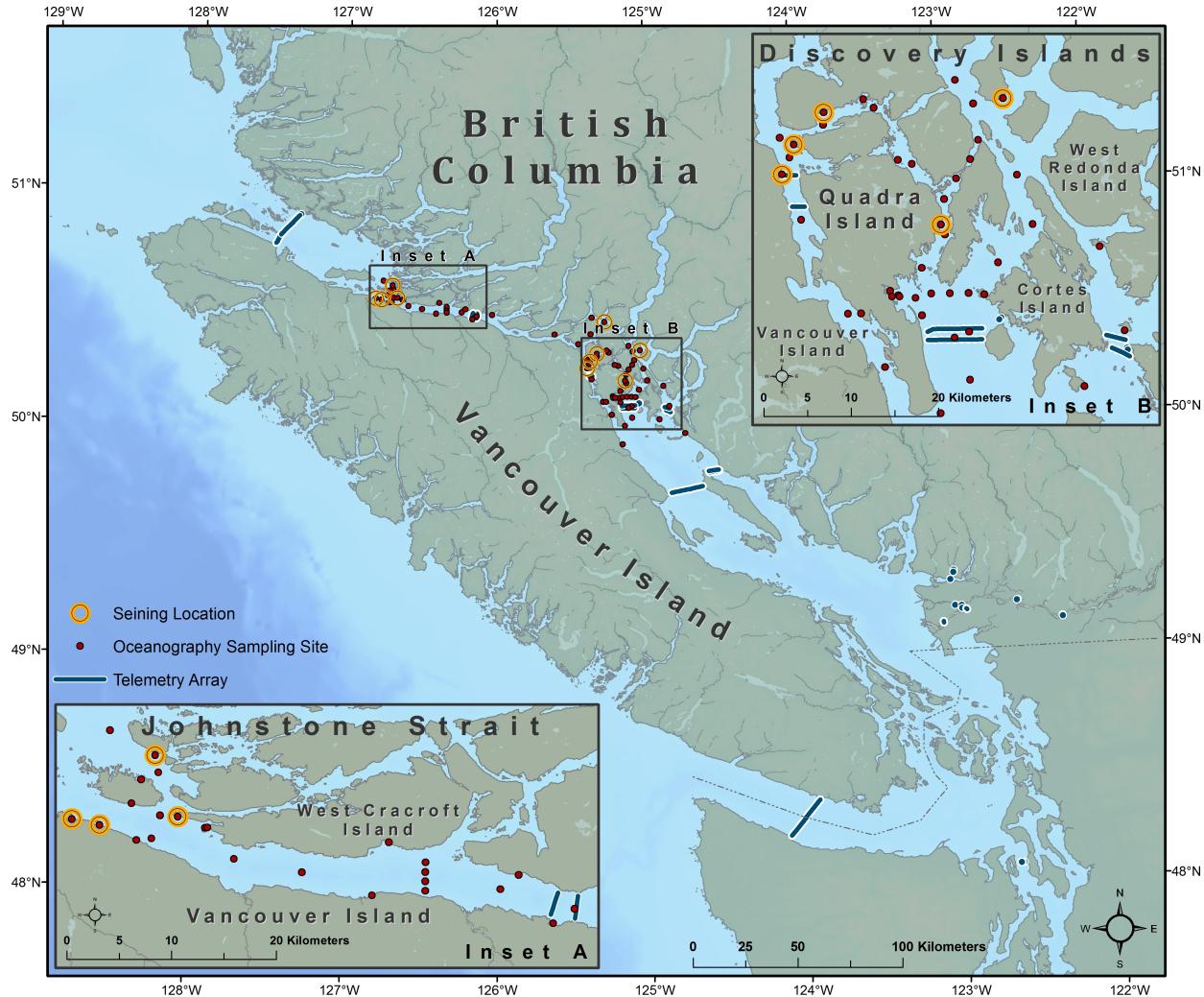


Figure 1: Salmon sampling locations in the Discovery Islands and Johnstone Strait in 2018 (yellow circles).

The following plots are subject to change as the underlying data are preliminary and subject to further quality assurance.

We are endeavouring to provide useful information for the entire salmon research community. As such we welcome any feedback. Please direct questions or comments to Brian Hunt (B.Hunt@oceans.ubc.ca) and/or Brett Johnson (Brett.Johnson@hakai.org).

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**Updated:** 2018-06-08

## Catch Statistics

### Sockeye Abundance and Timing

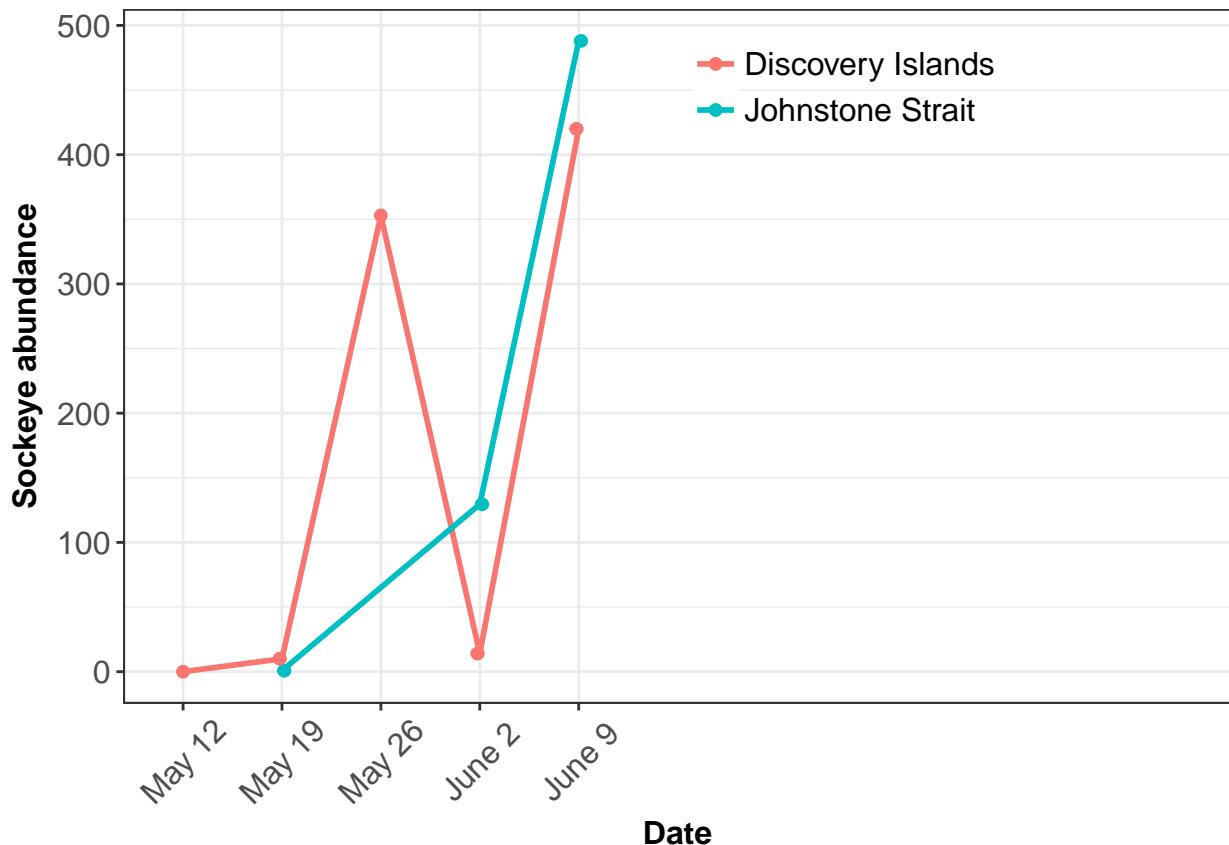


Figure 2: Average number of juvenile sockeye salmon caught in each seine in 2018 averaged over one week periods for each region.

## Cumulative Abundance of all Species

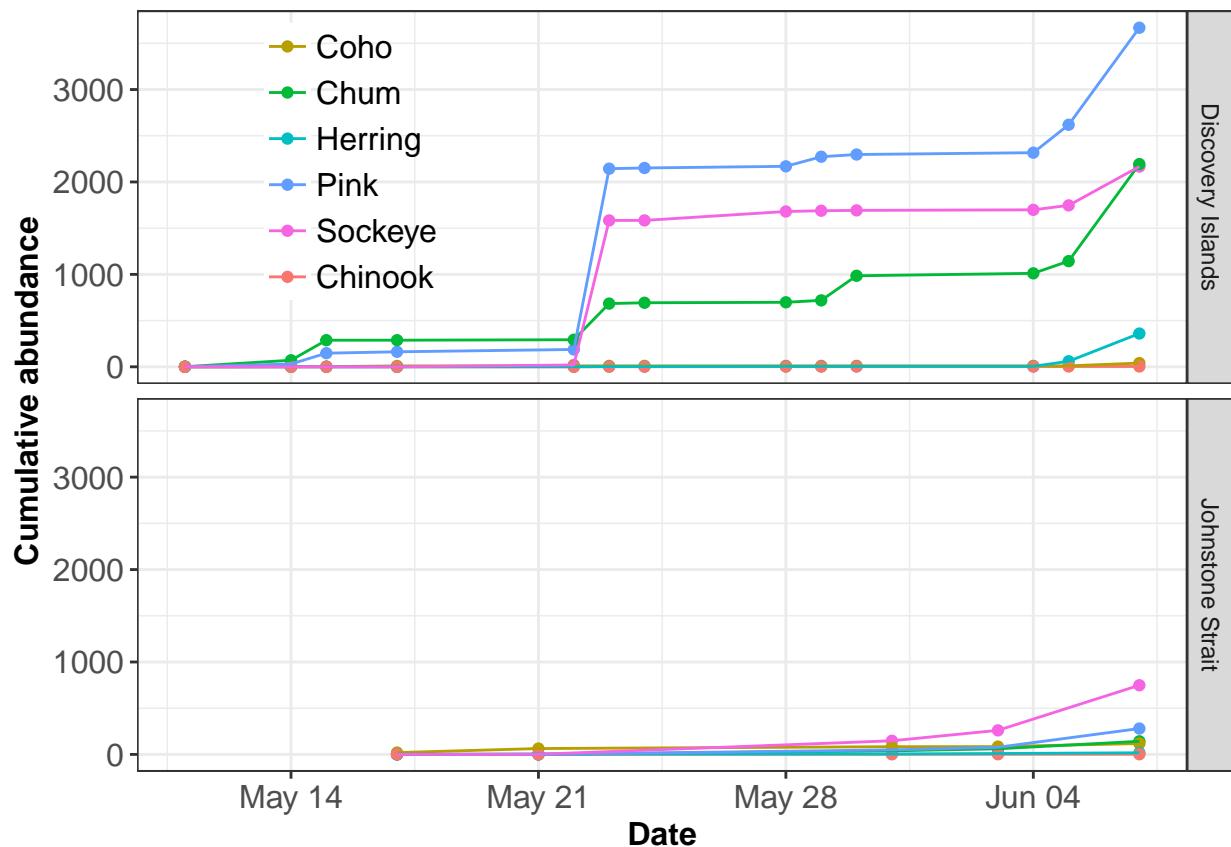


Figure 3: The cumulative abundance of fish captured in the Discovery Islands and Johnstone Strait in 2018.

## Fish Lengths

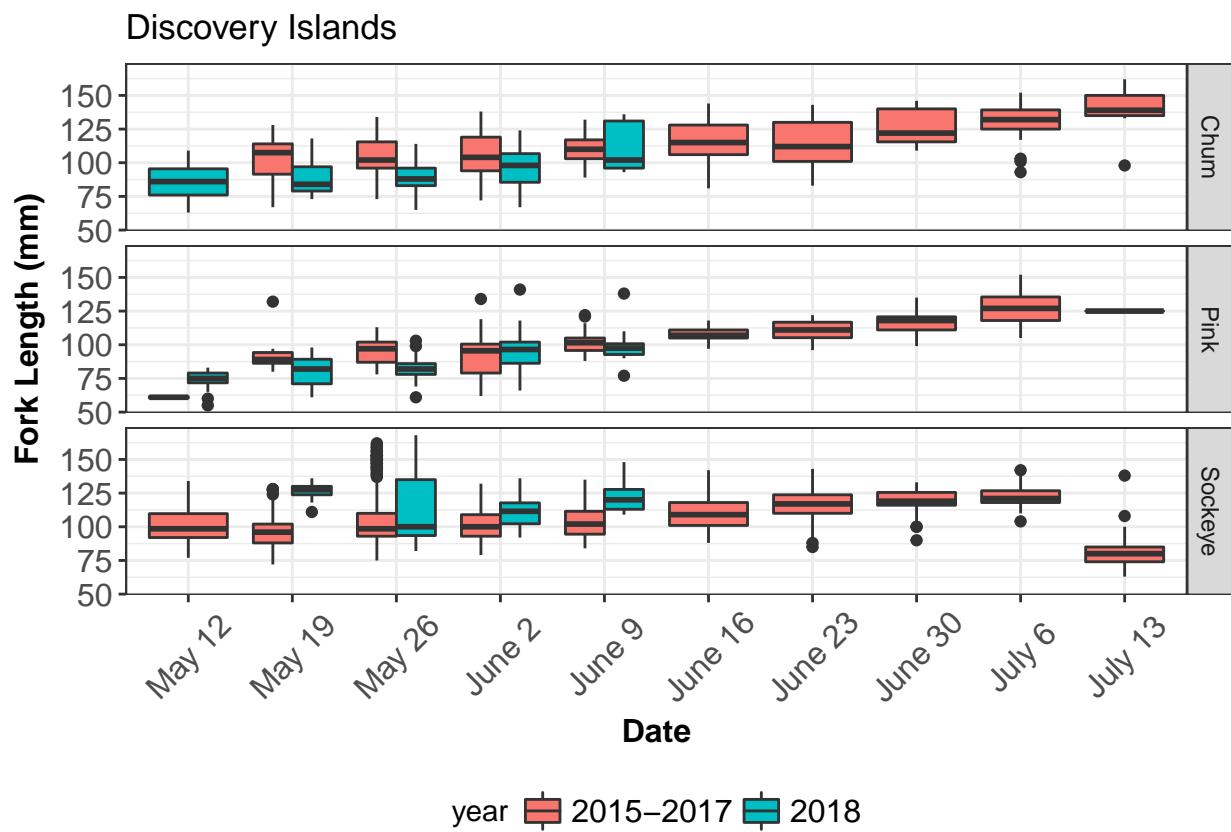


Figure 4: Fork length boxplots of juvenile salmon in the Discovery Islands in 2018 grouped by week compared to the average length from 2015, 2016 and 2017.

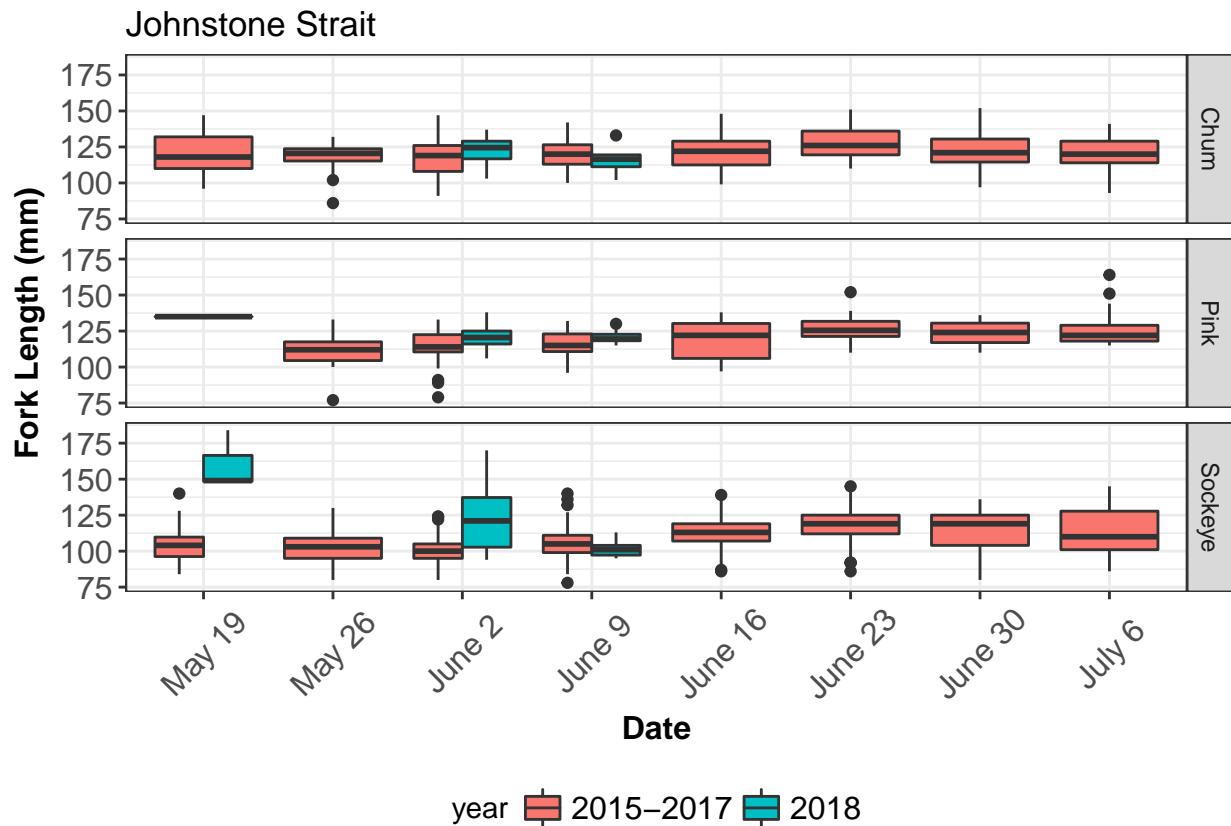


Figure 5: Fork length boxplots of juvenile salmon in Johnstone Strait in 2018 grouped by week compared to the average length from 2015, 2016 and 2017.

## Parasite Loads

### Definitions<sup>1</sup>

*Prevalence:* Number of individuals of a host species infected with a particular parasite species  $\div$  Number of hosts examined.

*Mean Infection Intensity:* Total number of individuals of a particular parasite species in a sample of a host species  $\div$  Number of infected individuals of the host species in the sample (= Mean number of individuals of a particular parasite species per infected host in a sample).

*Abundance:* The total number of individuals of a particular parasite species in a sample of hosts  $\div$  Total number of individuals of the host species in the sample.

### All Sea-lice Life-stages Infection Abundance on Sockeye

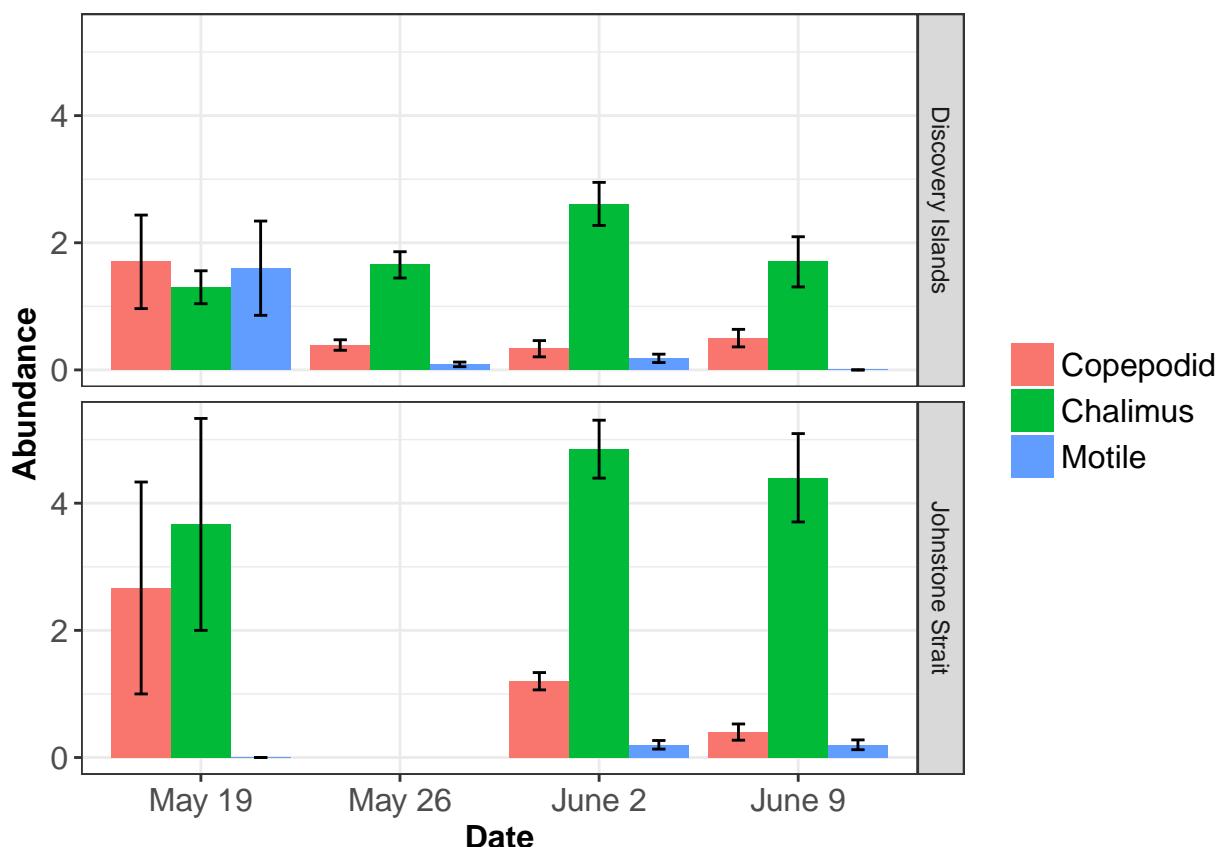


Figure 6: The abundance  $\pm$  SE of all three developmental stages of combined *Lepeophtheirus salmonis* and *Caligus clemensi* sea lice per juvenile sockeye salmon in 2018.

<sup>1</sup>Margolis, L., Esch, G.W., Holmes, J.C., Kuris, A.M. and Schad, G.A. (1982). The use of ecological terms in parasitology: report of an ad hoc committee of the American Society of Parasitologists. *J. Parasitol.* 68:131–133.

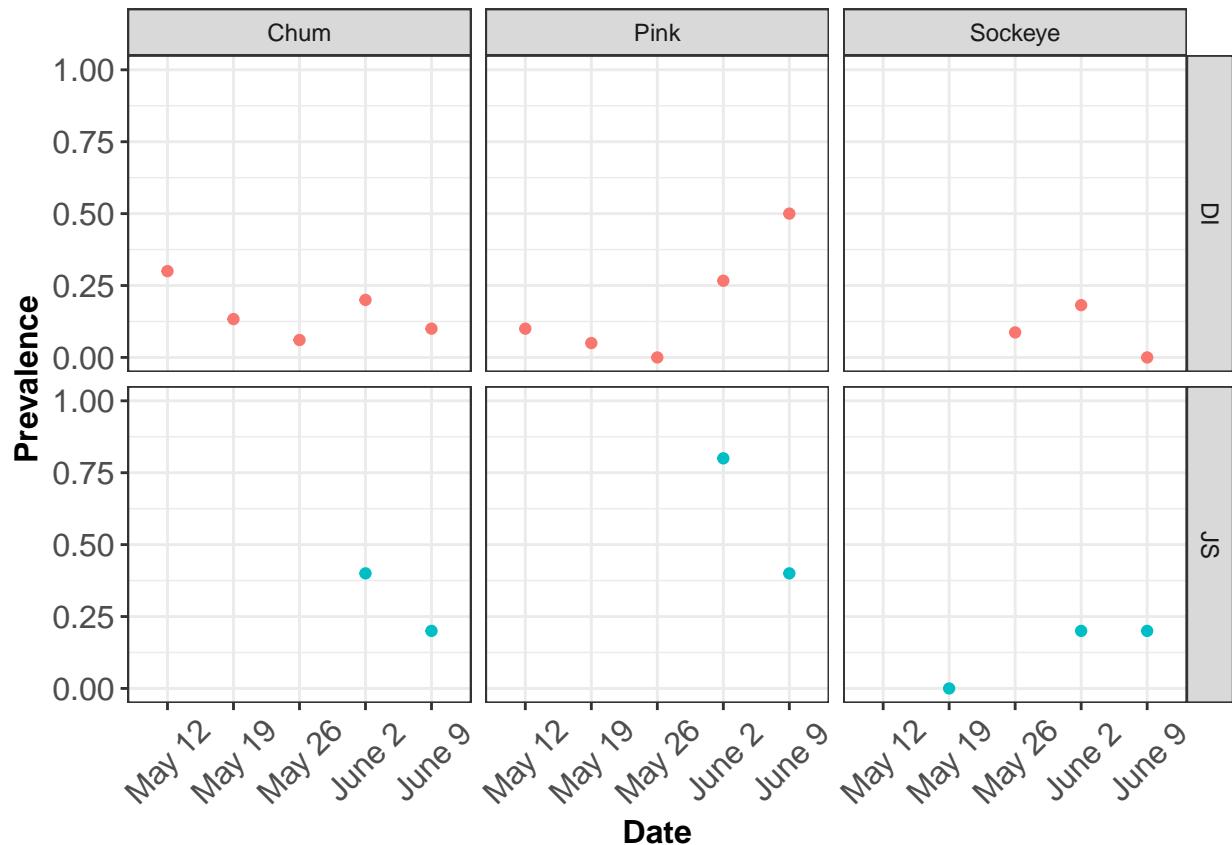
**Sea Lice Prevalence**

Figure 7: The proportion of juvenile chum, pink and sockeye that had at least one motile sea louse of either *Lepeophtheirus salmonis* and *Caligus clemensi* in the Discovery Islands (DI) and Johnstone Strait (JS) in 2018.

## Motile Abundance for Chum, Pink, and Sockeye

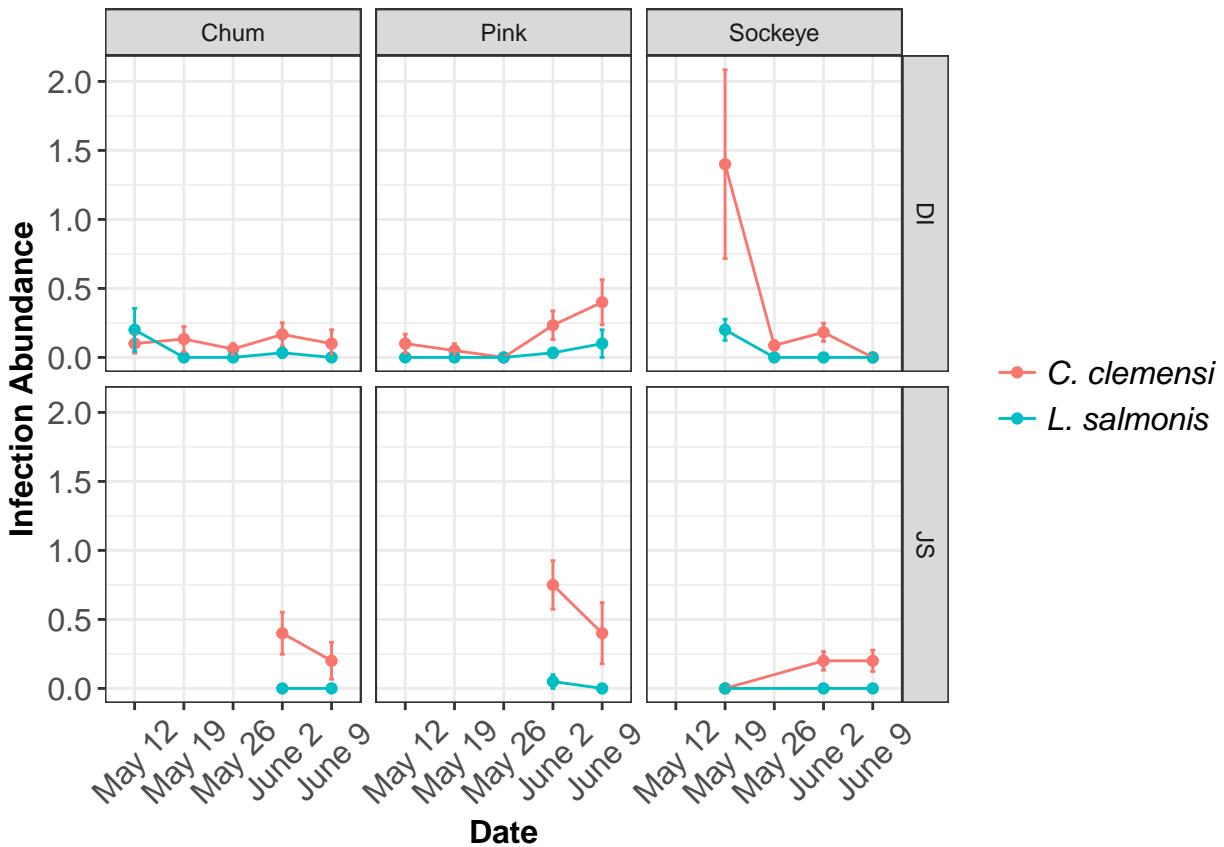


Figure 8: The abundance  $\pm$  SE of motile *Lepeophtheirus salmonis* and *Caligus clemensi* sea lice combined infecting juvenile chum, pink and sockeye salmon in the Discovery Islands and Johnstone Strait in 2018.

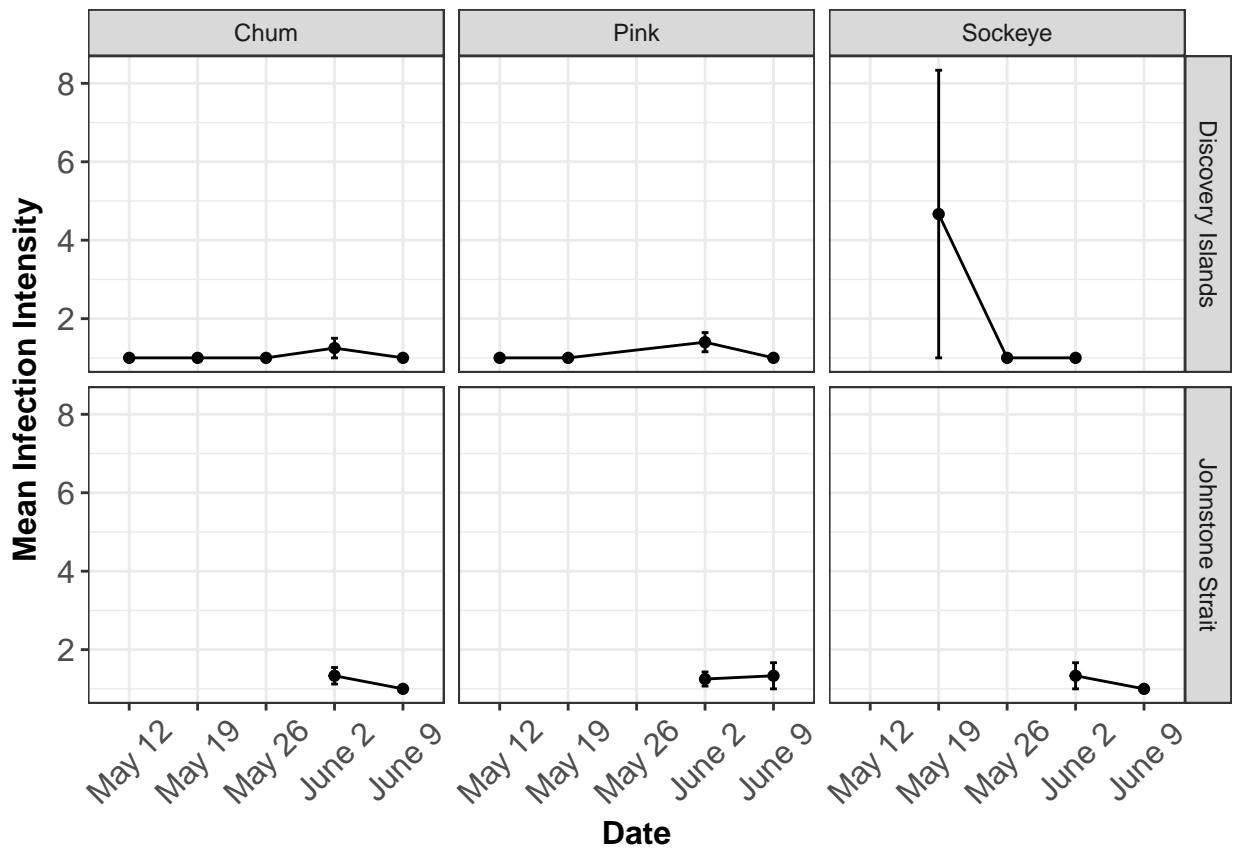
Motile *Caligus clemensi* Infection Intensity

Figure 9: The mean infection intensity of motile *Caligus clemensi* sea lice per juvenile sockeye salmon infected with one or more motile *Caligus clemensi* in 2018.

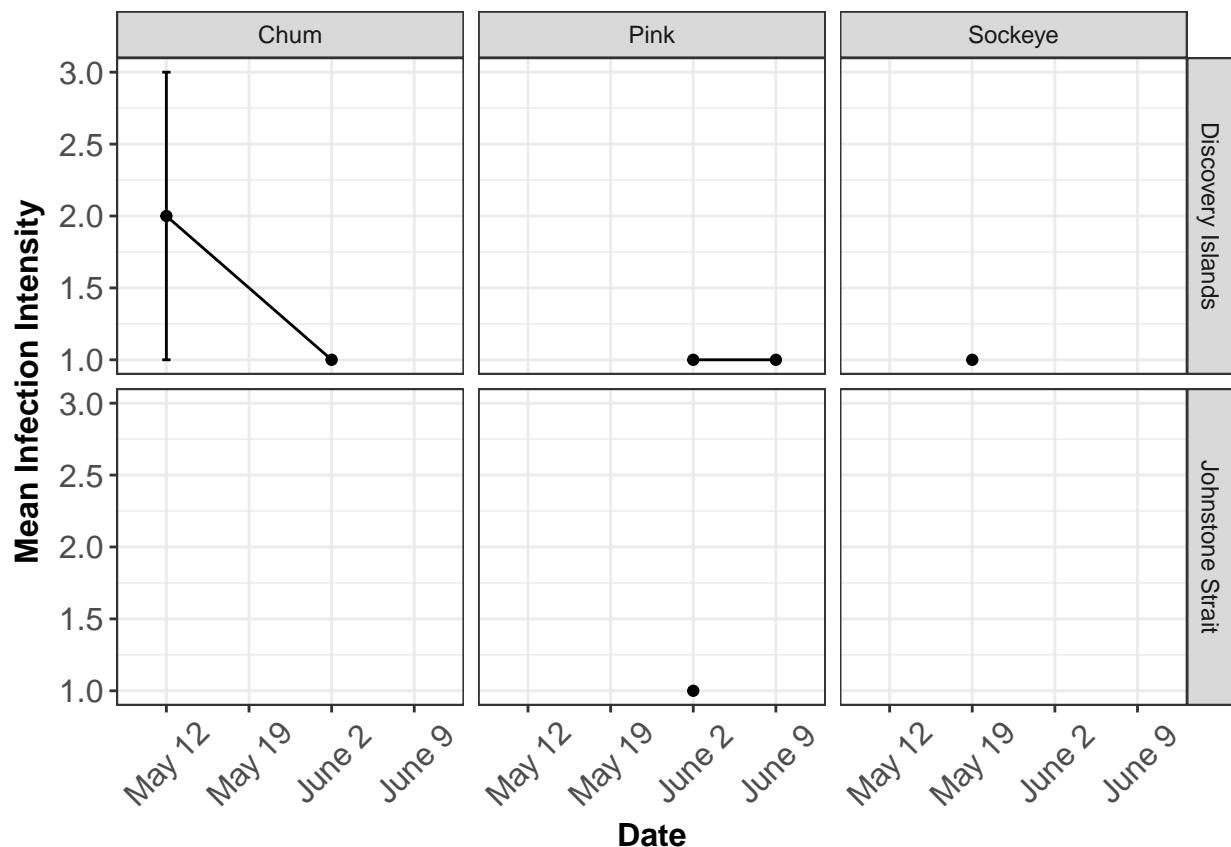
Motile *Lepeophtheirus salmonis* Infection Intensity

Figure 10: The mean intensity of **motile** *Lepeophtheirus salmonis* sea lice per juvenile sockeye salmon infected with one or more motile *Lepeophtheirus salmonis* in 2018.

## Oceanography

### Northern Strait of Georgia vs. Discovery Islands

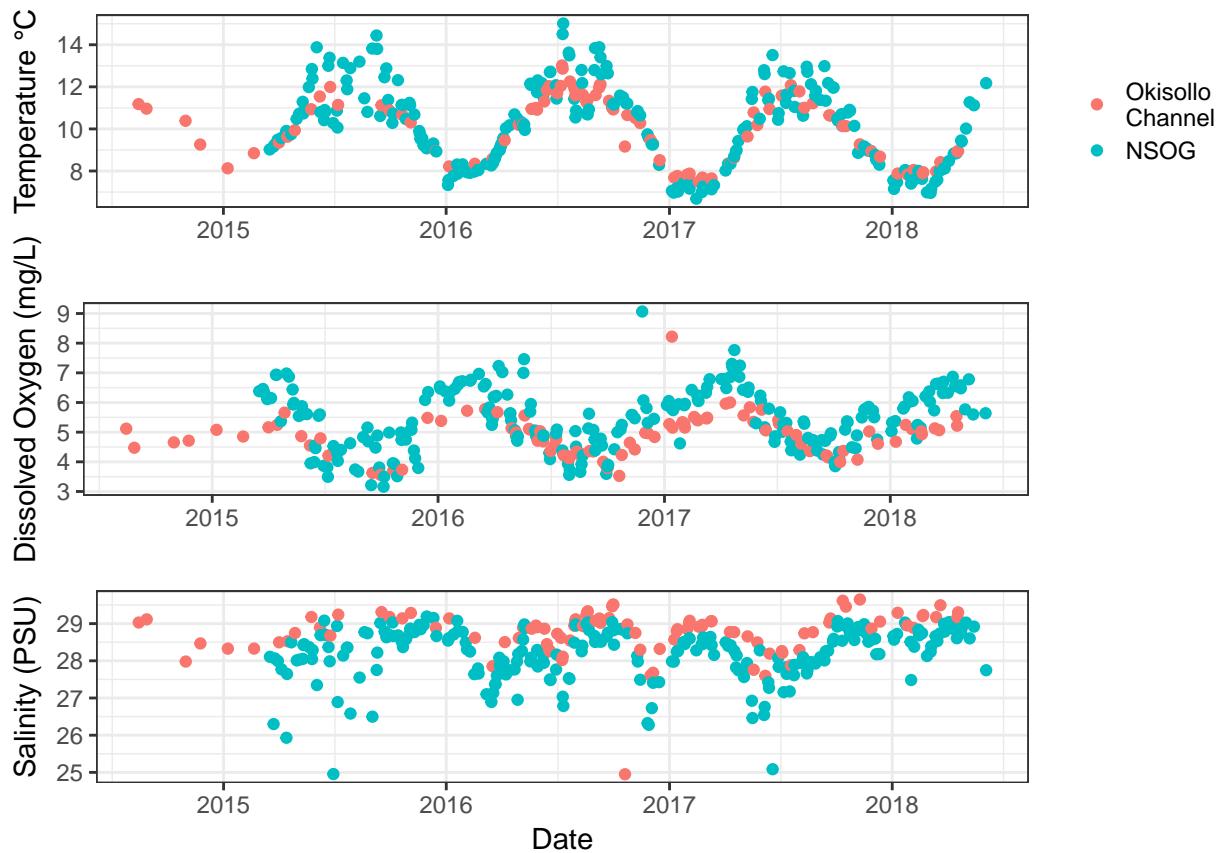


Figure 11: Oceanographic time series in the Discovery Islands and the Northern Strait of Georgia from averaged from the top 30 m

## Discovery Islands Migration Corridors

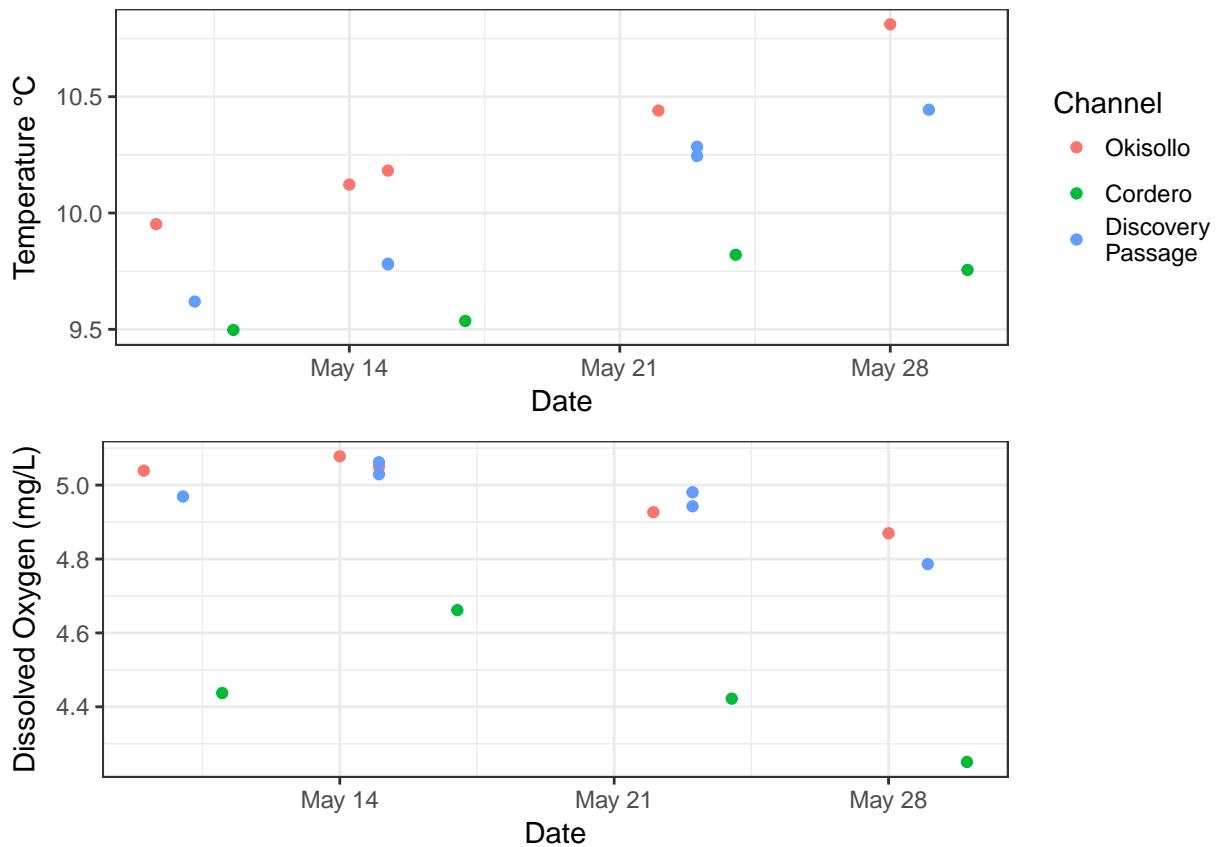


Figure 12: Temperature and Dissolved oxygen averaged in the top 30 m of water in the three main migration corridors in the Discovery Islands, in 2018.