

# Juvenile salmon migration report; northern Strait of Georgia to Johnstone Strait

— Hakai Institute Juvenile Salmon Program 2019 —

## Aim

To provide in-season summaries of juvenile salmon migration characteristics and oceanographic conditions in the northern Strait of Georgia to Johnstone Strait region in B.C. Canada.

## Background

The Hakai Institute Juvenile Salmon Program was launched in the spring of 2015 in a collaborative partnership with UBC, SFU, U of T, Salmon Coast Field Station, 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 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
- Lengths
- Parasite Loads
- Oceanographic Conditions

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).

The Hakai Institute embraces an “Open Science Policy”; to that end you can review, make suggestions or report issues with the R code written to produce this report by visiting <https://github.com/HakaiInstitute/jsp-in-season-reports>

See our interactive data explorer for more information <https://hecate.hakai.org/shiny/JSP/>

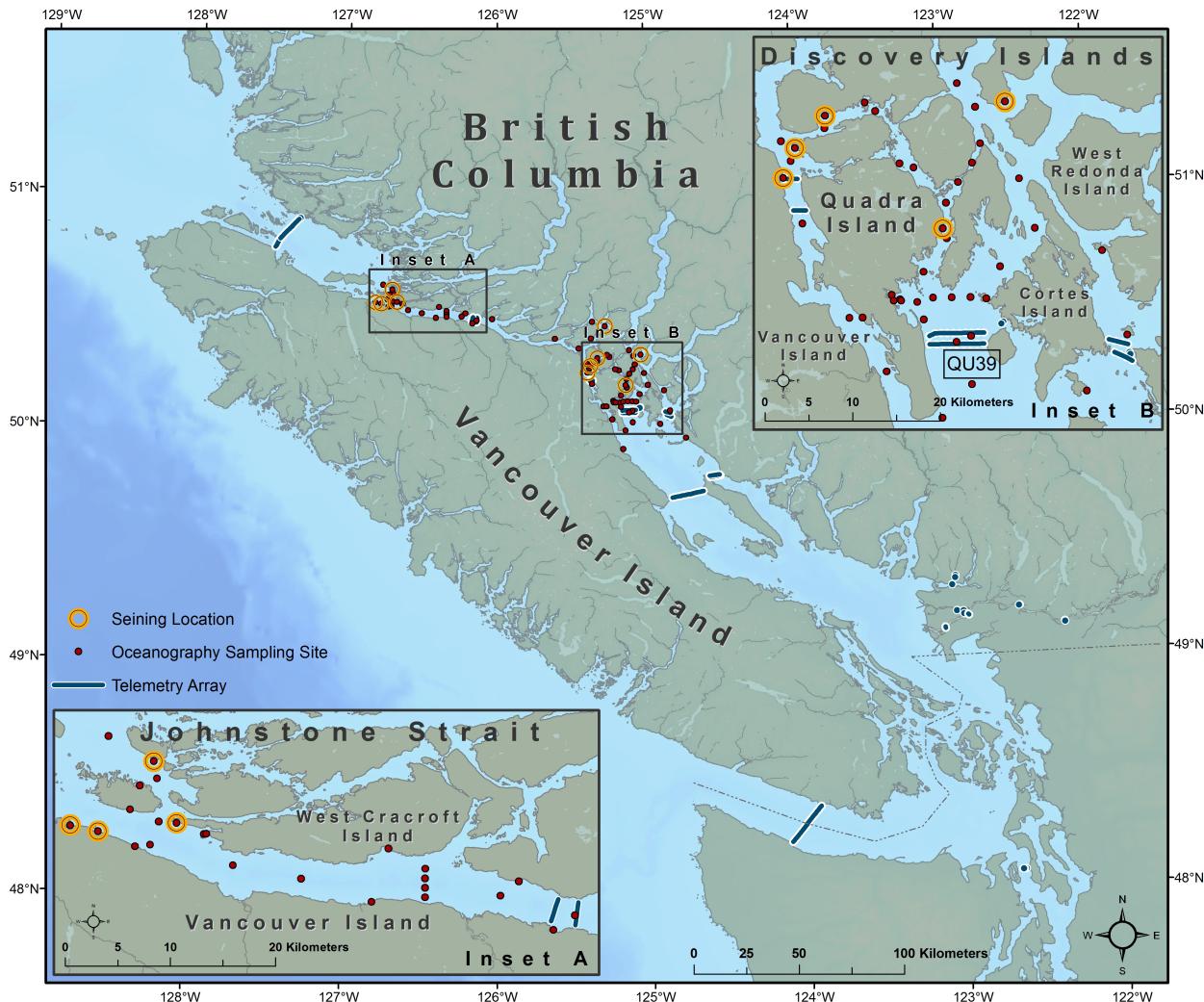


Figure 1: Salmon sampling locations in the Discovery Islands and Johnstone Strait in 2019.

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## Migration Timing

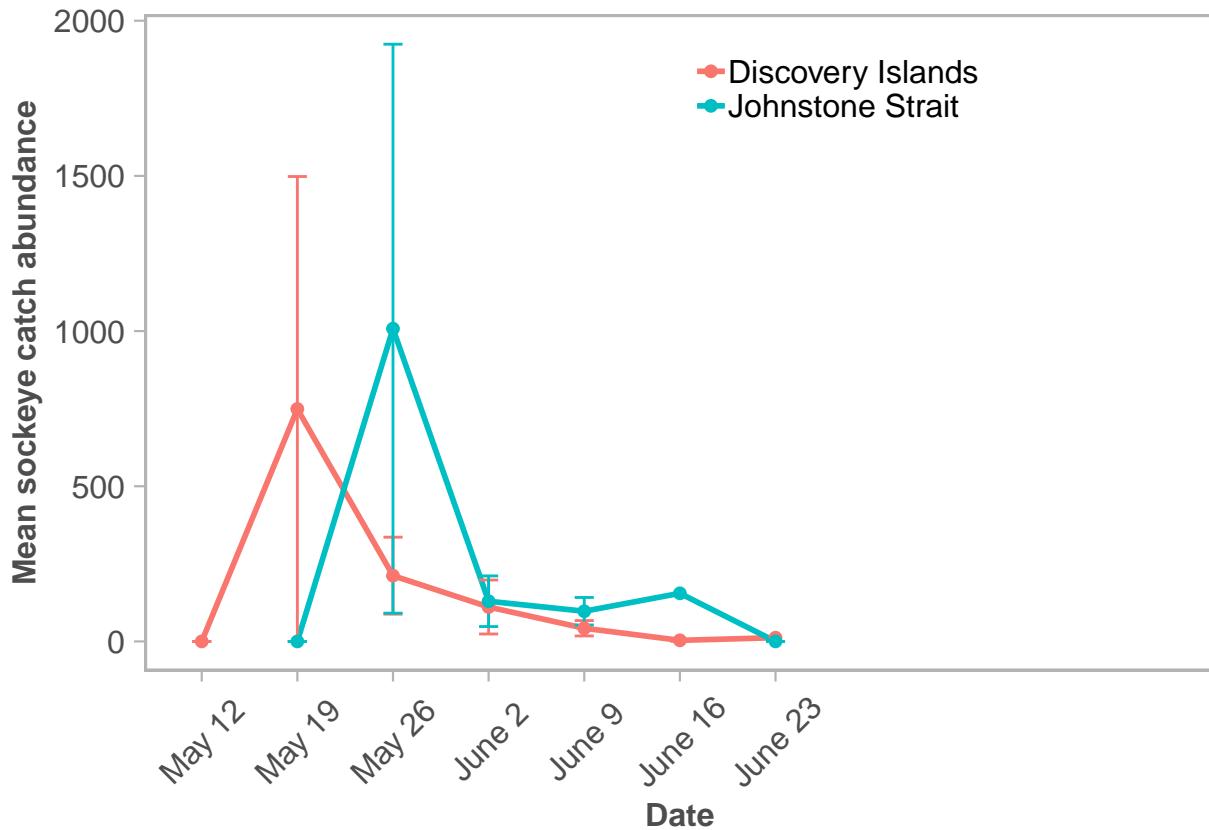


Figure 2: Average number ( $\pm 1$  SE) of juvenile sockeye salmon caught in each seine in 2019 averaged over one week periods for each region and represented by the middle day of each week.

## Fish lengths

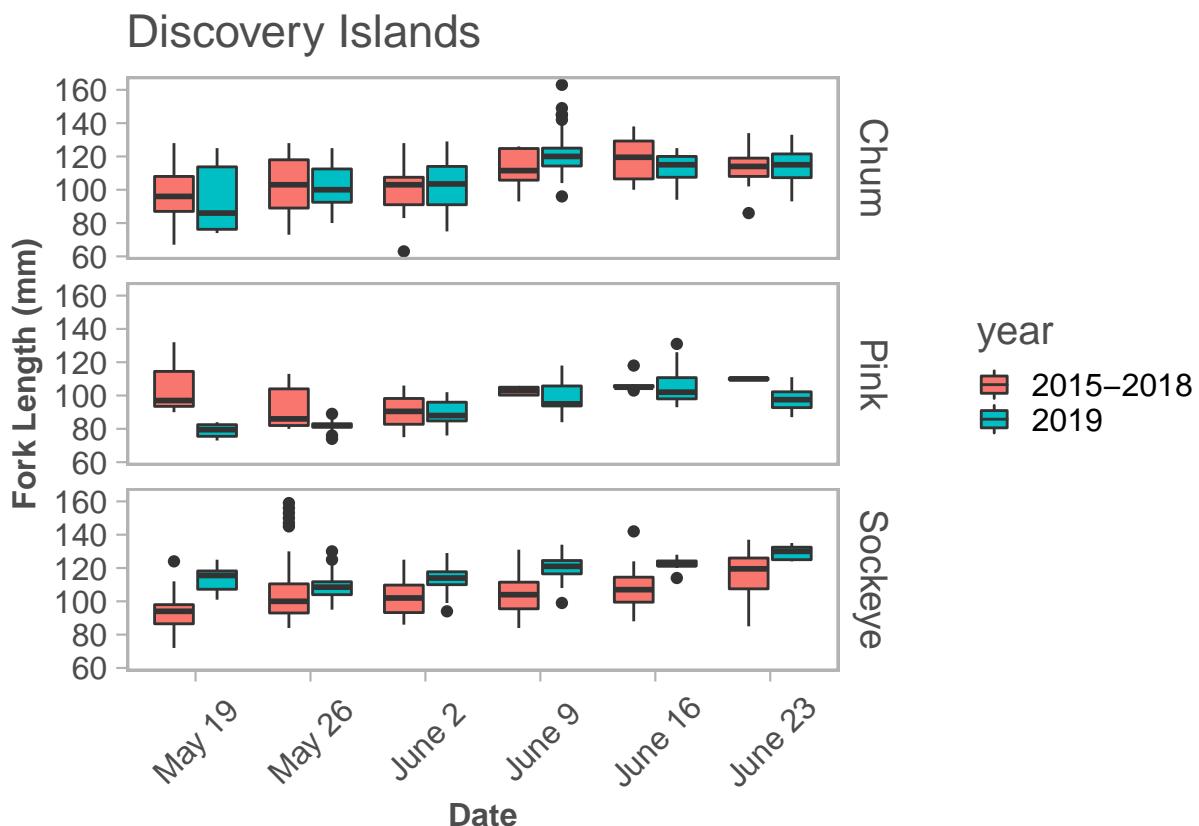


Figure 3: Fork length boxplots of juvenile salmon in the Discovery Islands in 2019 grouped by week, and represented by the middle day of each week, compared to the average length from 2015-2018.

## 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.

*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.

*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).

### Motile Sea Lice Prevalence

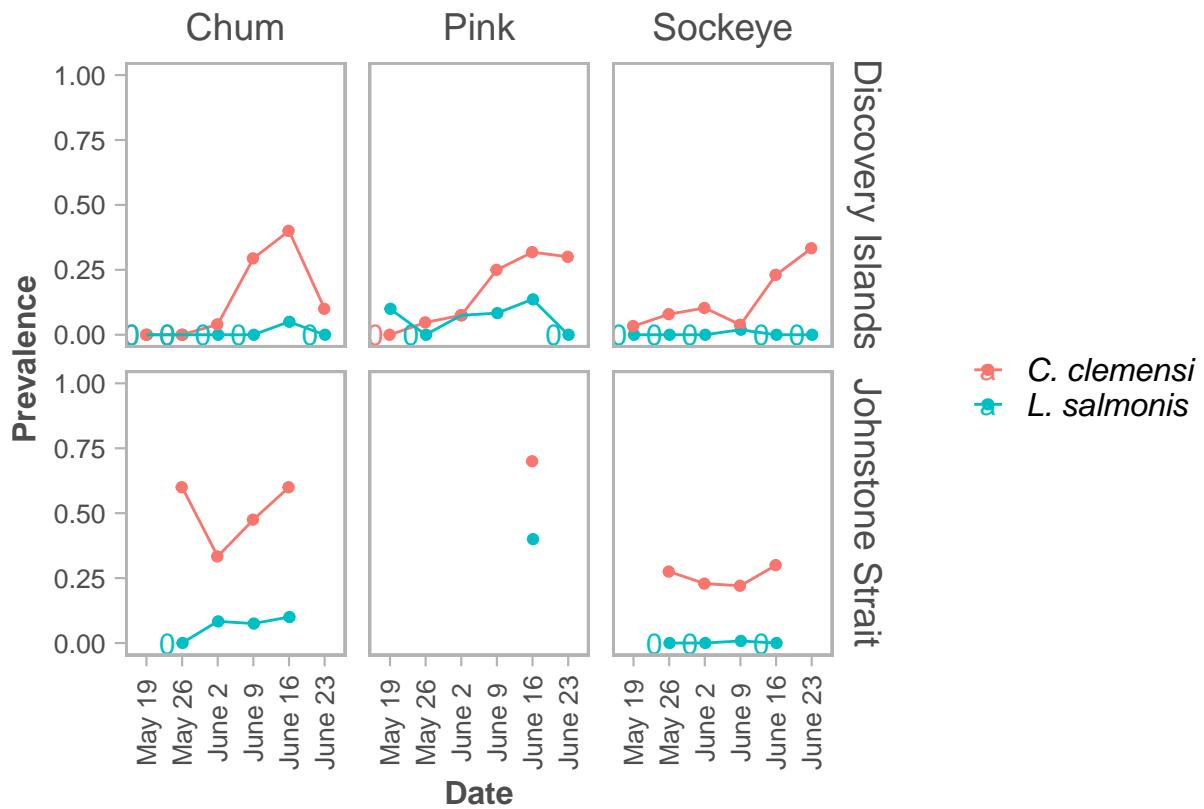


Figure 4: The proportion of juvenile chum, pink and sockeye that had at least one motile sea louse of either *Lepeophtheirus salmonis* and *Caligus clemensi* in the Discovery Islands (DI) and Johnstone Strait (JS) in 2019. Instances of zero prevalence are labelled as such.

<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.

## Motile Sea Lice Abundance

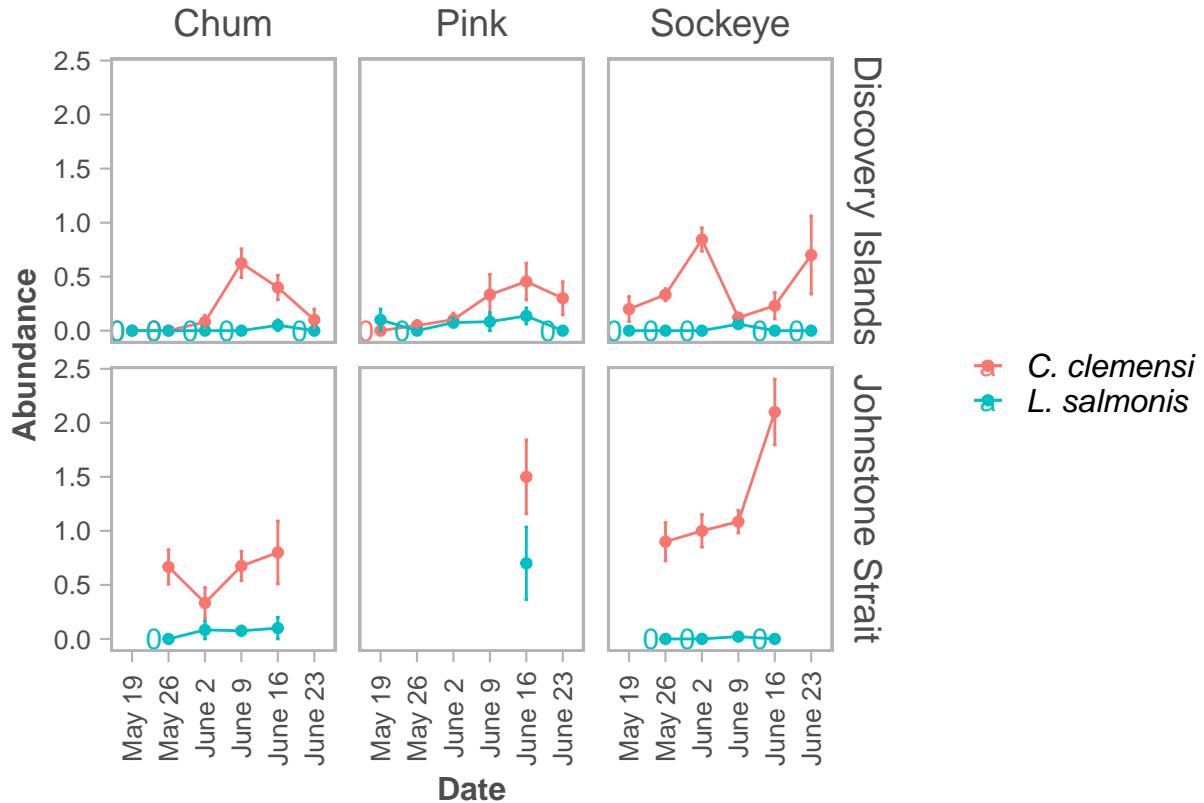


Figure 5: The abundance  $\pm$  SE of motile *Lepeophtheirus salmonis* and *Caligus clemensi* sea lice combined infecting juvenile chum, pink and sockeye salmon in the Discovery Islands and Johnstone Strait in 2019.

## Motile Sea Lice Infection Intensity

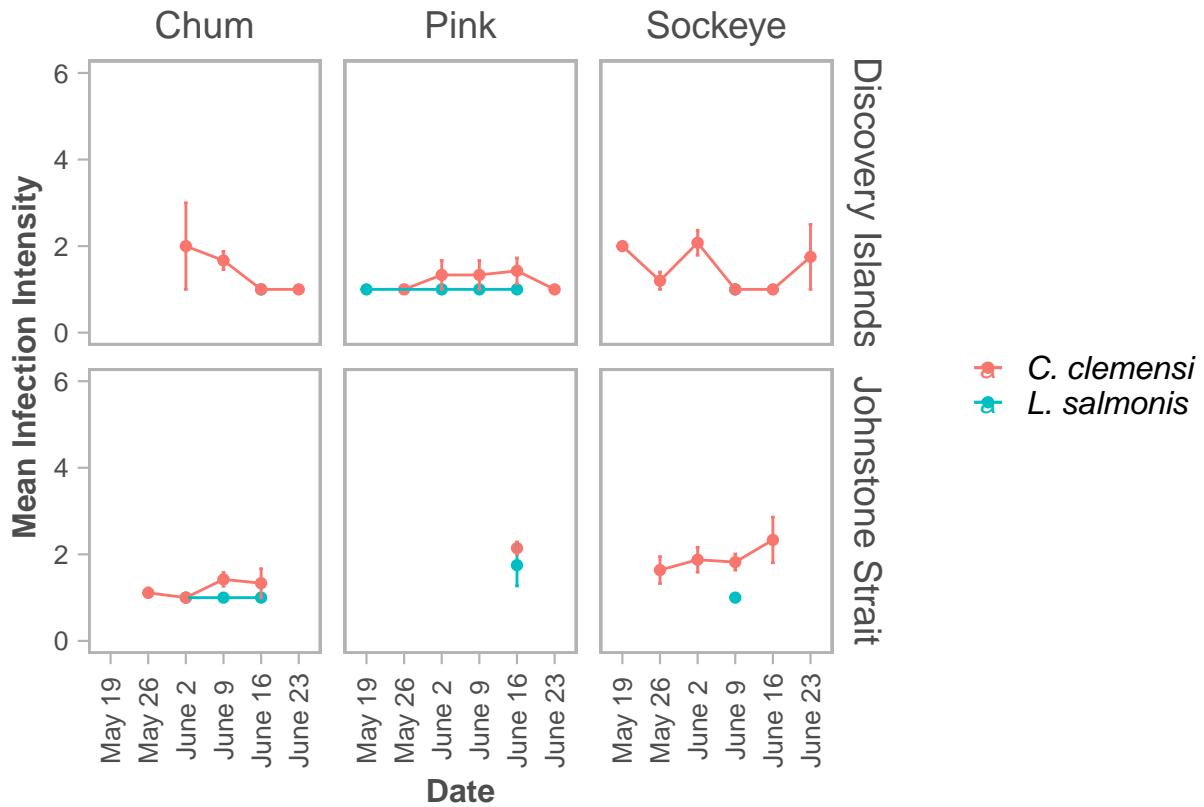


Figure 6: The mean infection intensity  $\pm$  SE of **motile** *Lepeophtheirus salmonis* and *Caligus clemensi* sea lice per juvenile salmon infected with one or more motile *Lepeophtheirus salmonis* and *Caligus clemensi* louse in 2019.

## Oceanography

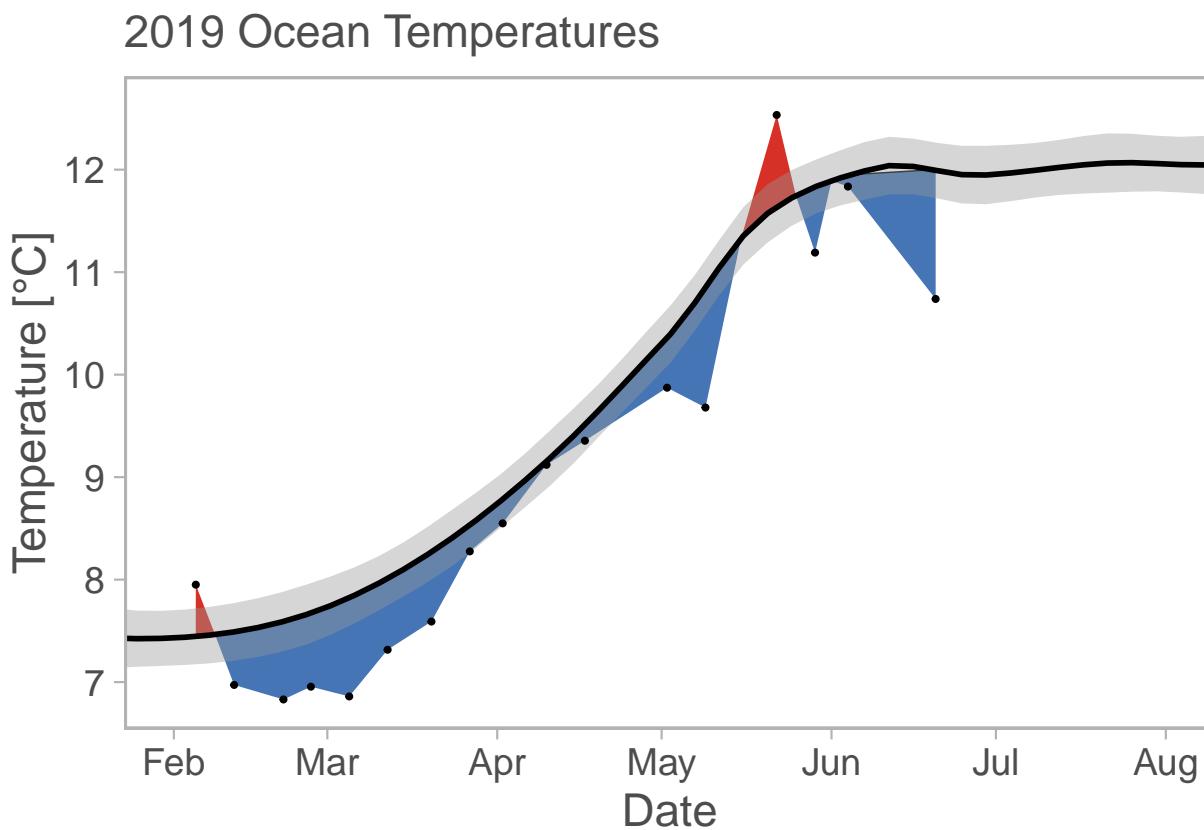


Figure 7: Ocean temperatures (top 30 m) at station QU39 in the northern Strait of Georgia between Quadra and Cortes Island. The solid black line is a LOESS regression based on temperatures from 2015-2018, representing the study period average. The shaded grey area is 1 SE of the LOESS regression. Blue areas represent temperatures from 2019 that are below average and red areas represent above average temperatures.

## Highlights

- Sockeye migration timing in 2019 is later than in 2015, 2016 and 2018, and similar to 2017
- Sockeye are large this year
- High sea-lice loads, especially on sockeye
- Ocean temperatures are colder than those observed in 2015, 2016, and 2018