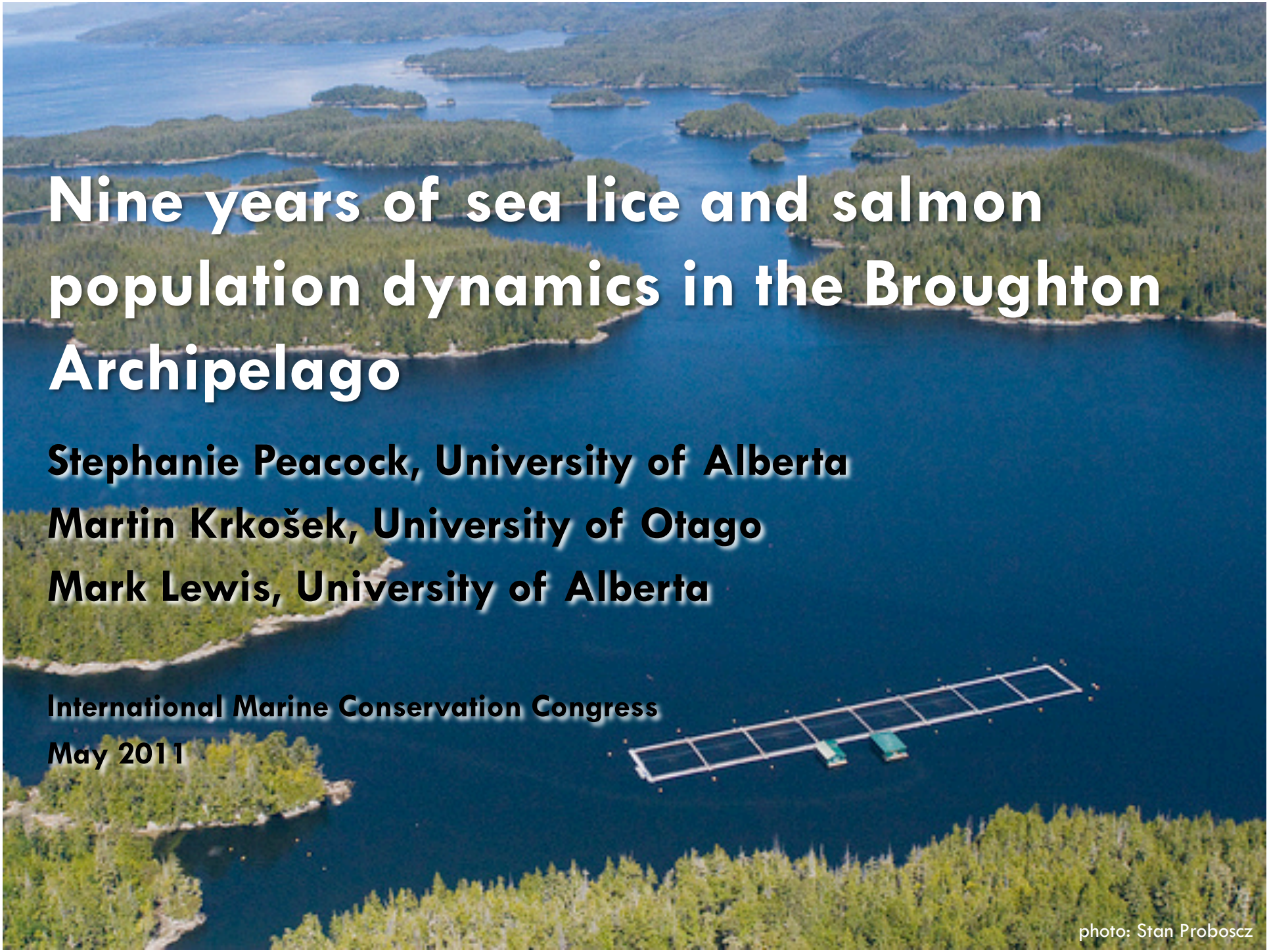


Nine years of sea lice and salmon population dynamics in the Broughton Archipelago

Stephanie Peacock, University of Alberta

Martin Krkošek, University of Otago

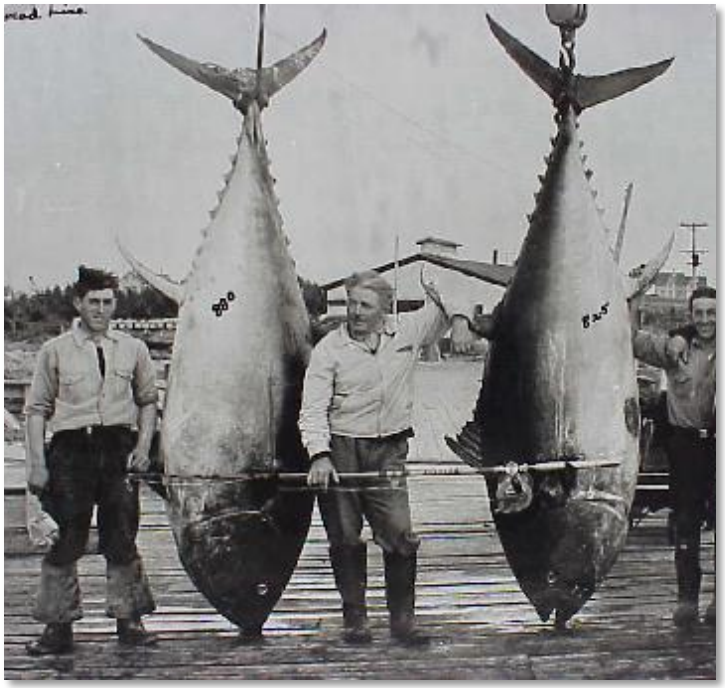
Mark Lewis, University of Alberta

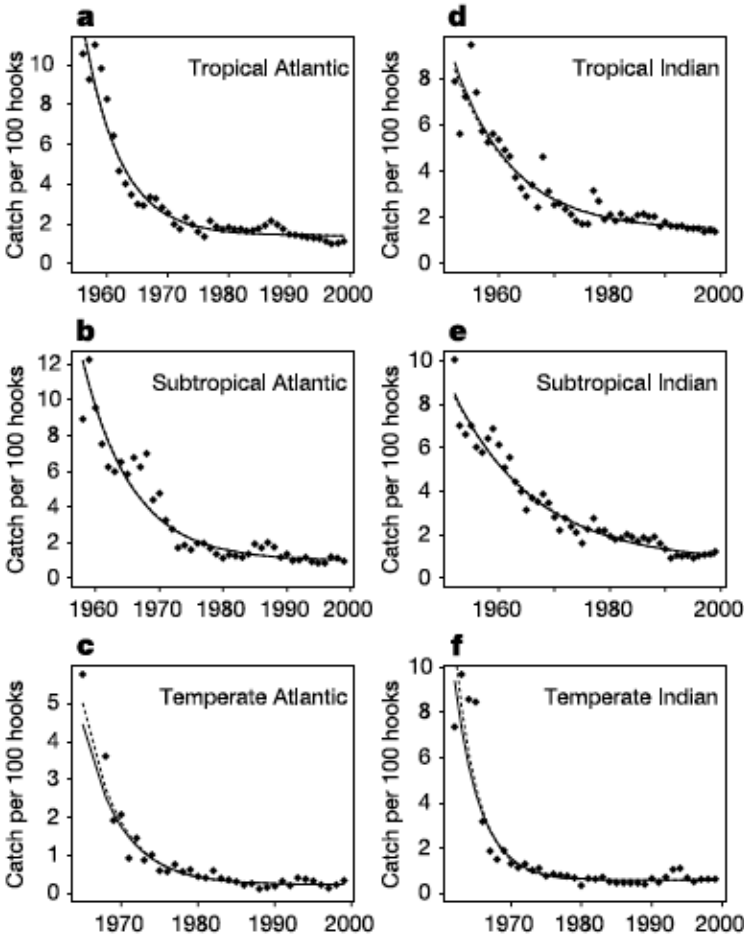
International Marine Conservation Congress

May 2011

photo: Stan Proboscz

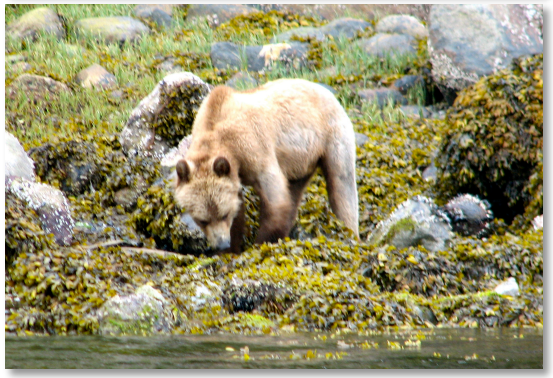
Introduction

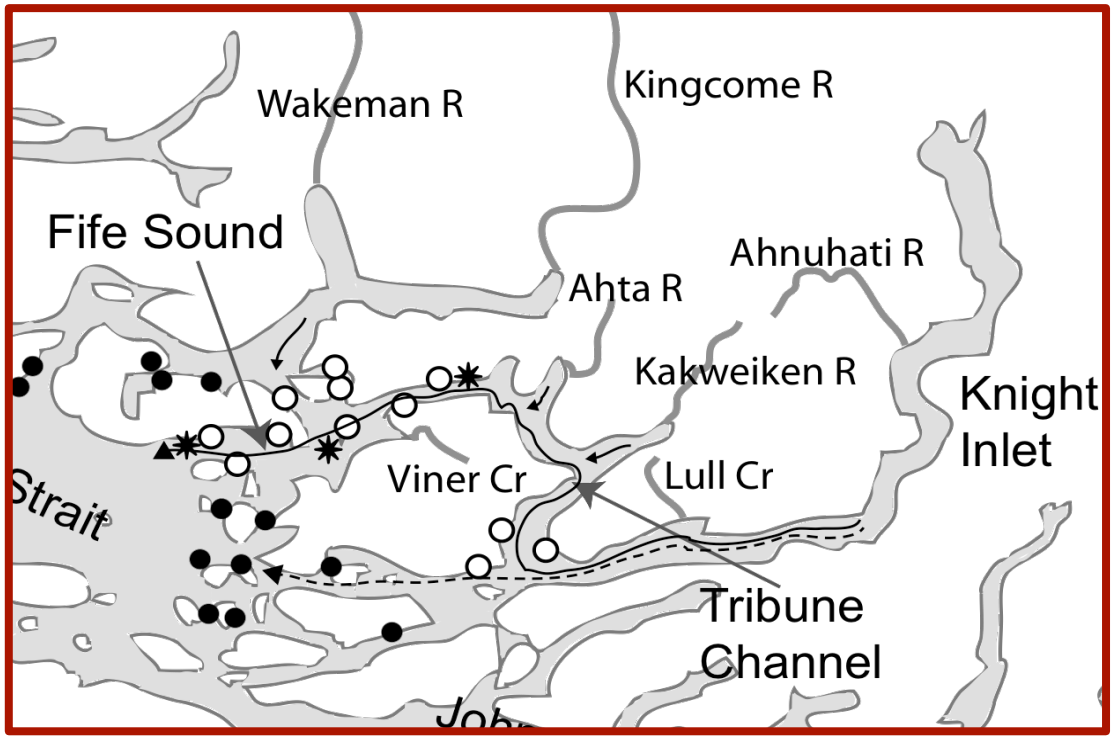




Myers and Worm 2003

Introduction





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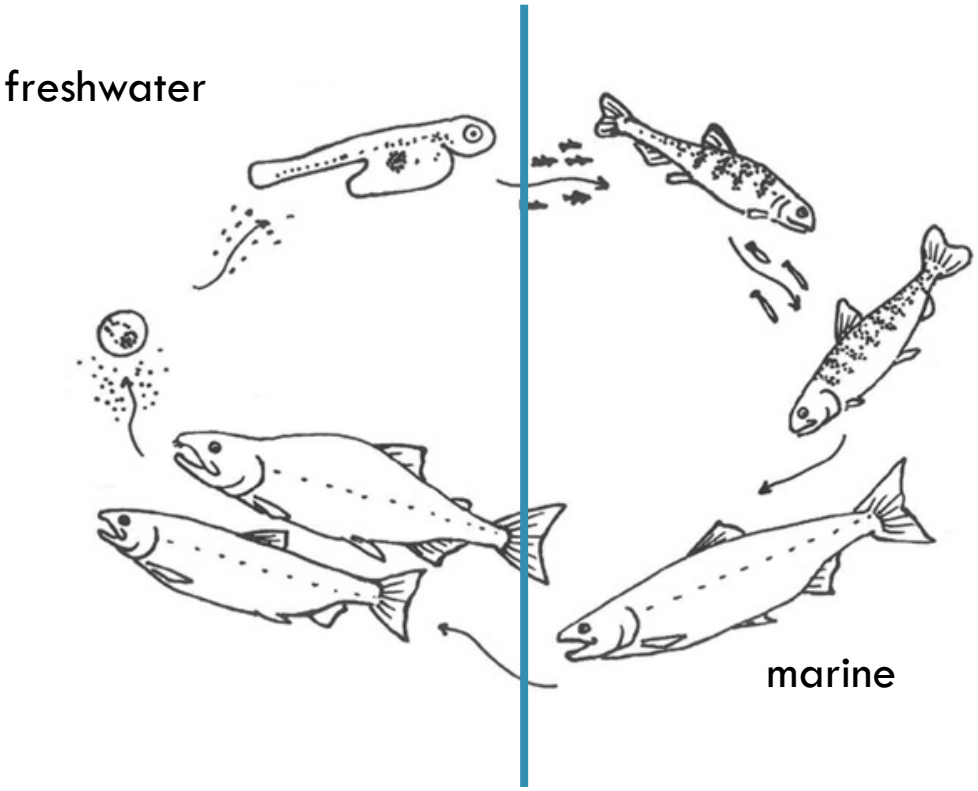

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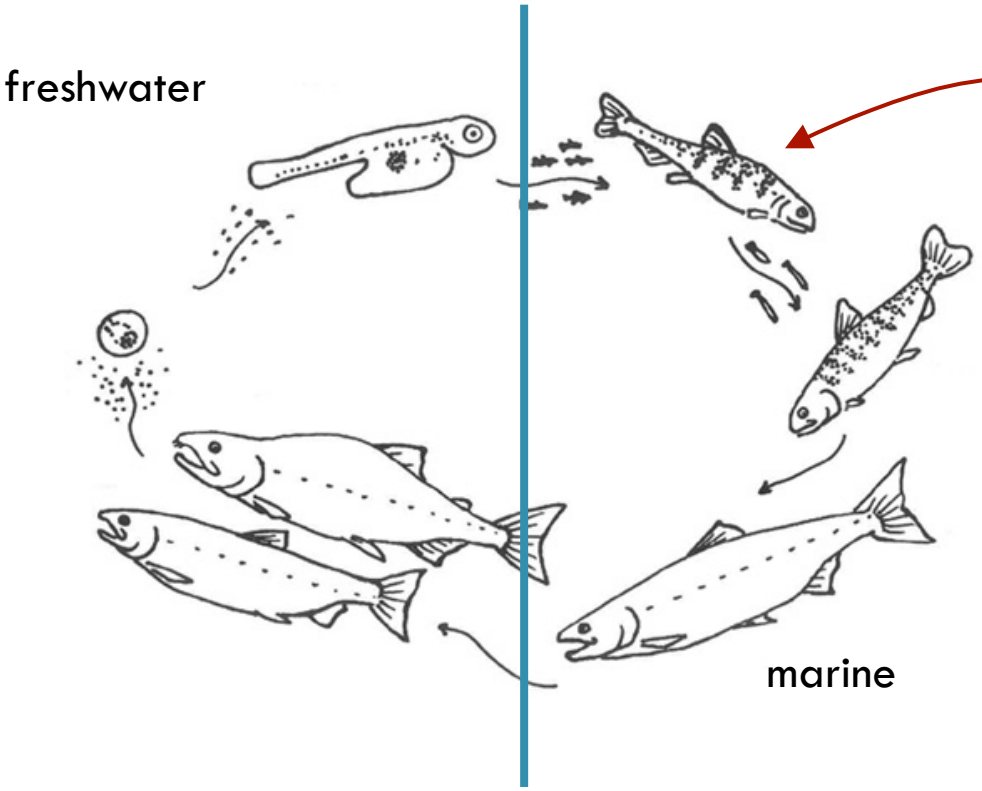

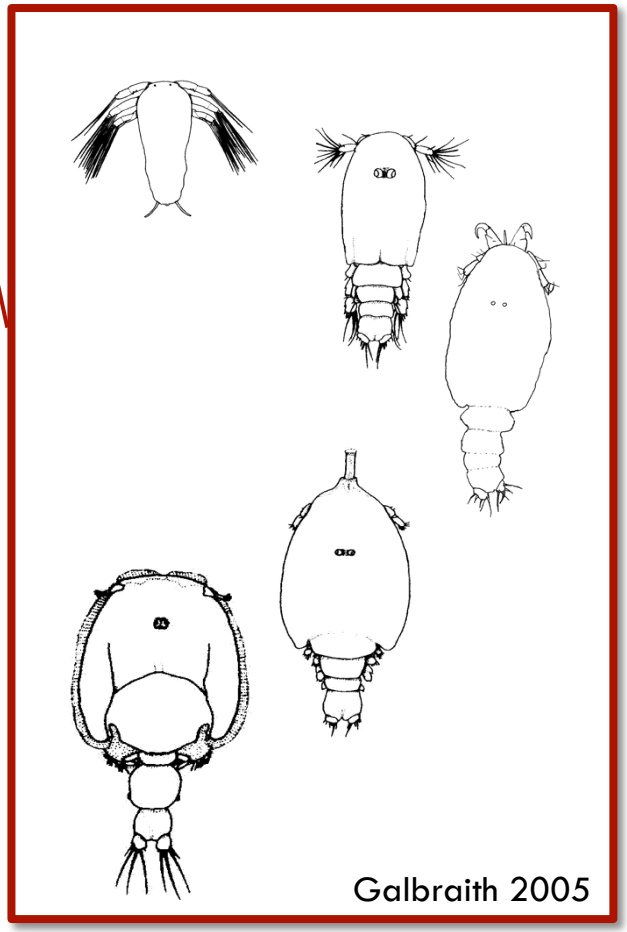

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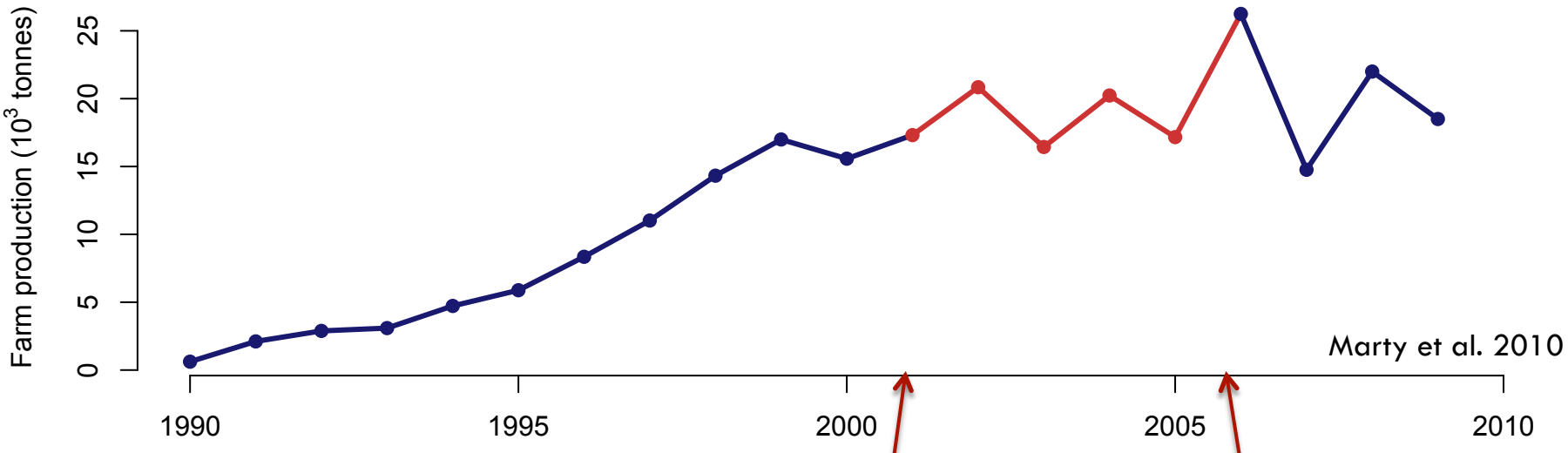
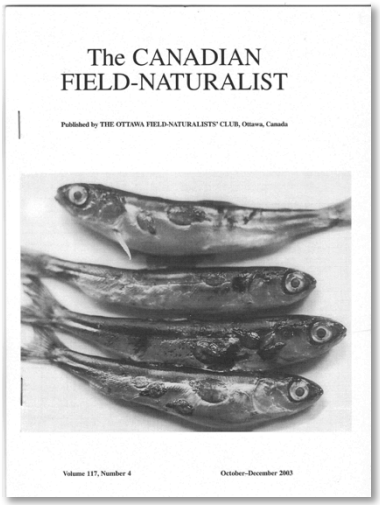
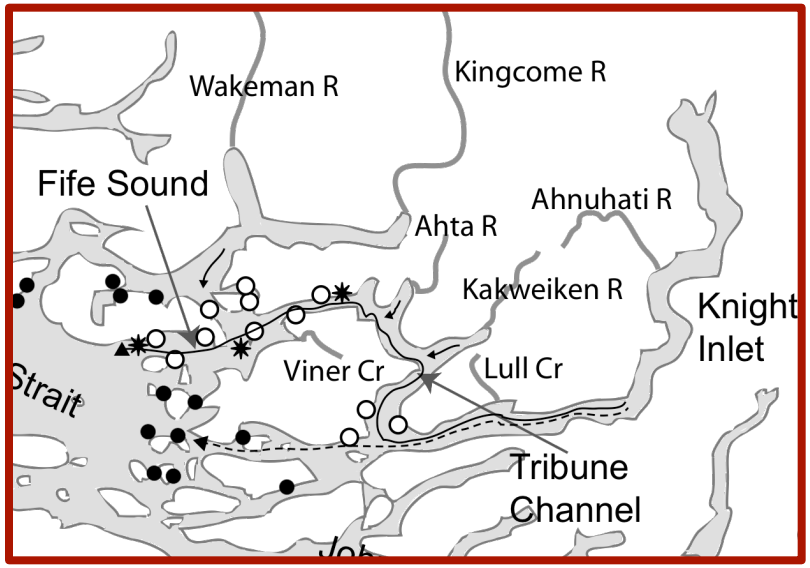


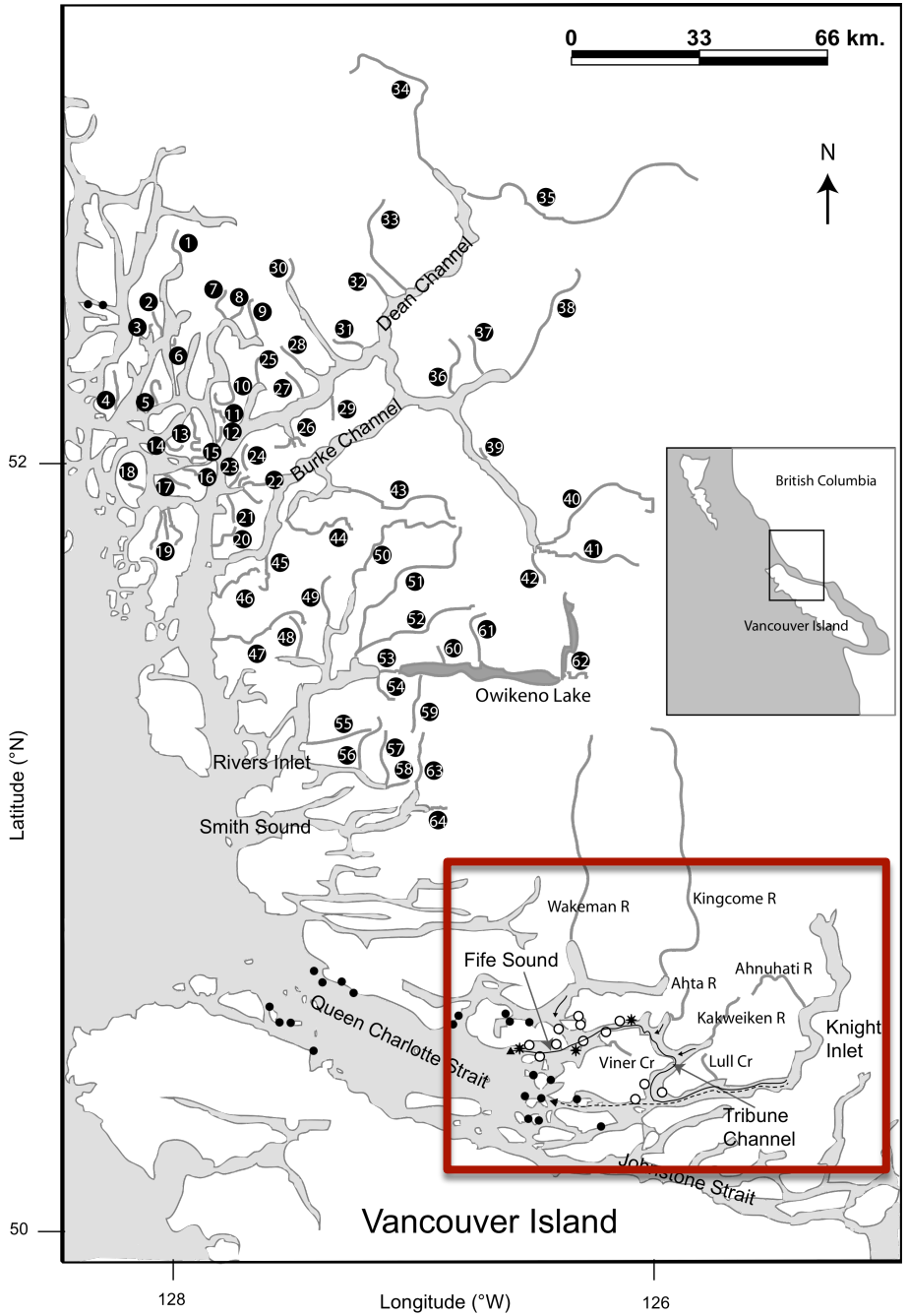


first reported sea lice infestation of wild salmon
(Morton and Williams 2003)

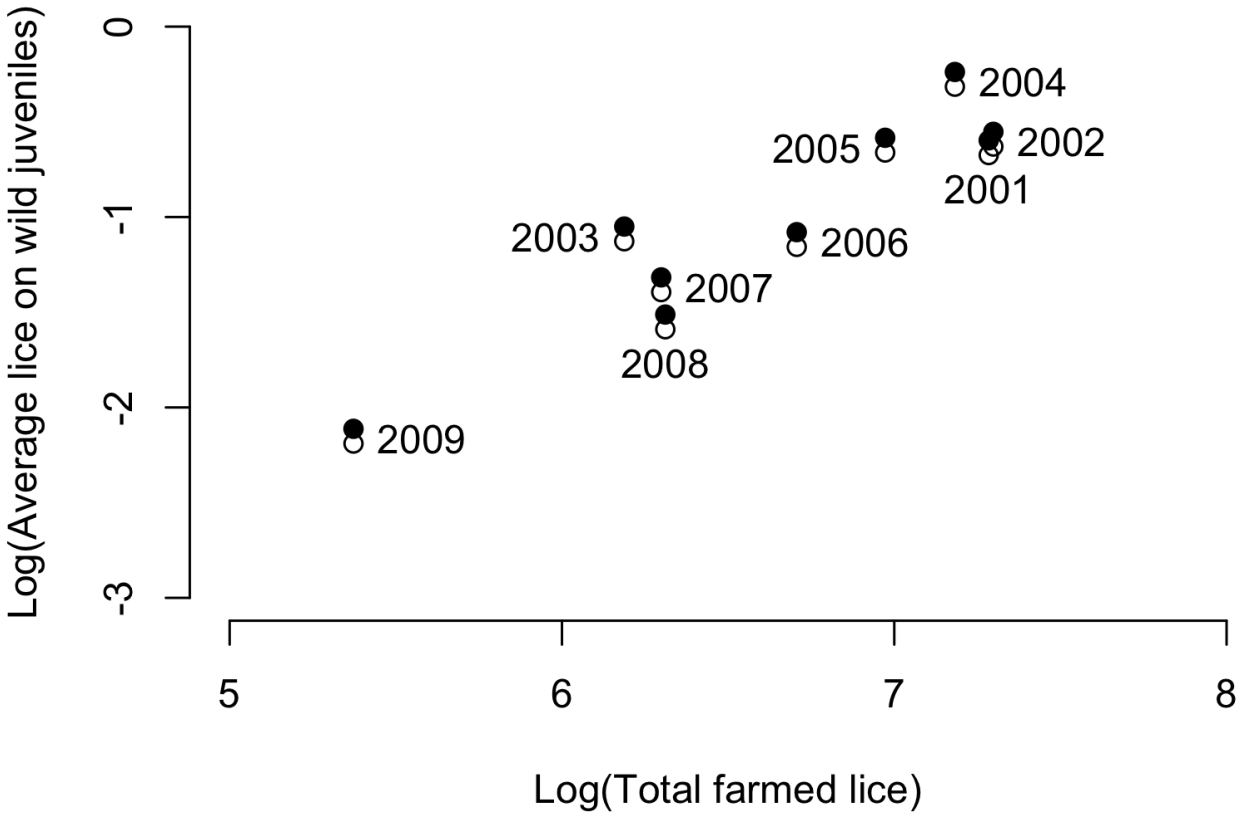
precautionary SLICE™ treatments begin

Methods

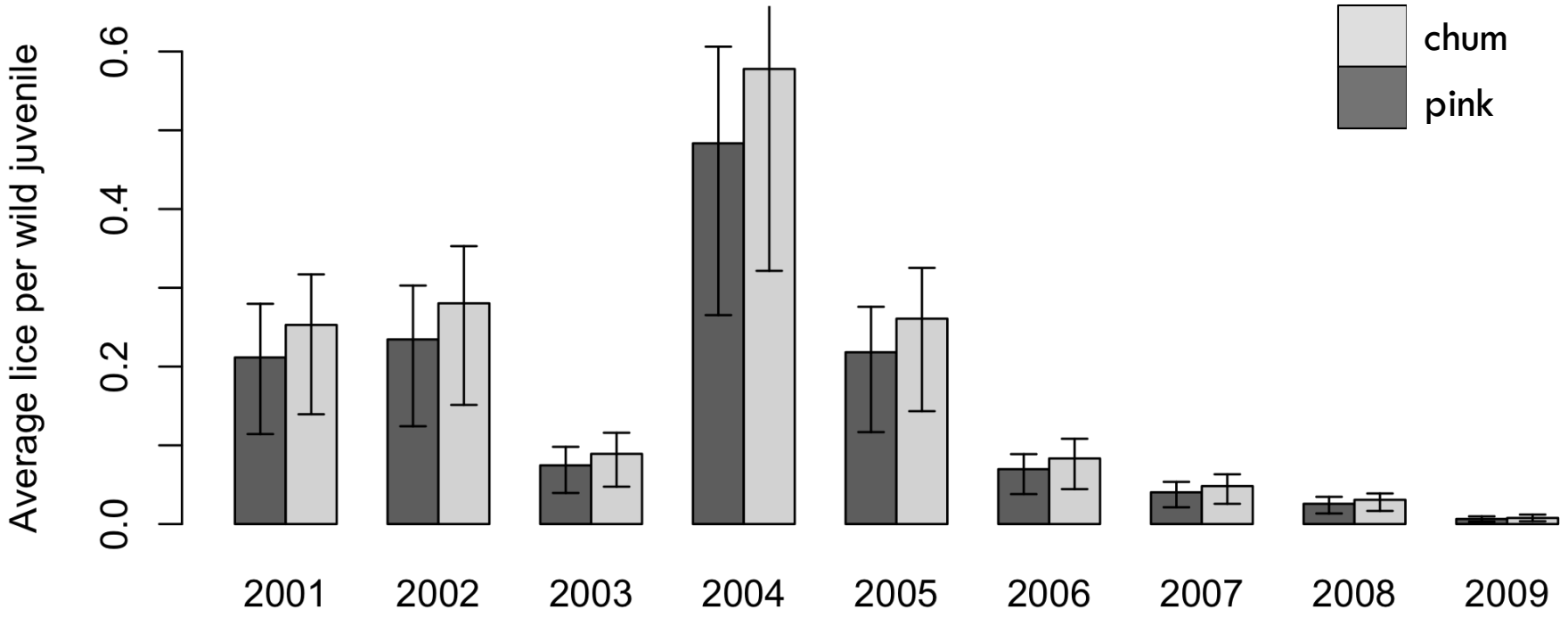

Wakeman R
Kingcome R
Fife Sound
Ahnuhati R
Ahta R
Kakweiken R
Knight Inlet
Viner Cr
Lull Cr
Strait
Tribune Channel


0
33
66 km.
N
Dean Channel
Burke Channel
British Columbia
Vancouver Island
Owikeno Lake
Rivers Inlet
Smith Sound
Wakeman R
Kingcome R
Fife Sound
Ahnuhati R
Ahta R
Kakweiken R
Knight Inlet
Viner Cr
Lull Cr
Tribune Channel
Queen Charlotte Strait
Vancouver Island
52
50
128
126
Latitude (°N)
Longitude (°W)

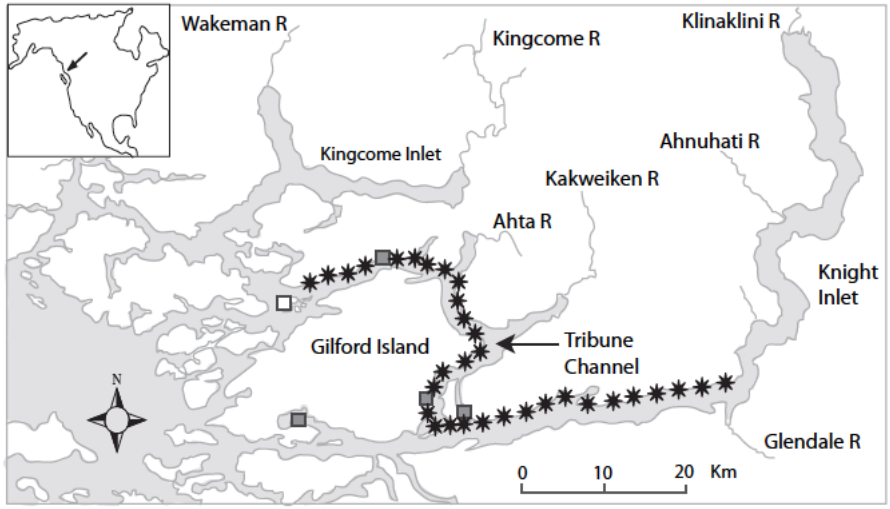
Results: farm & wild

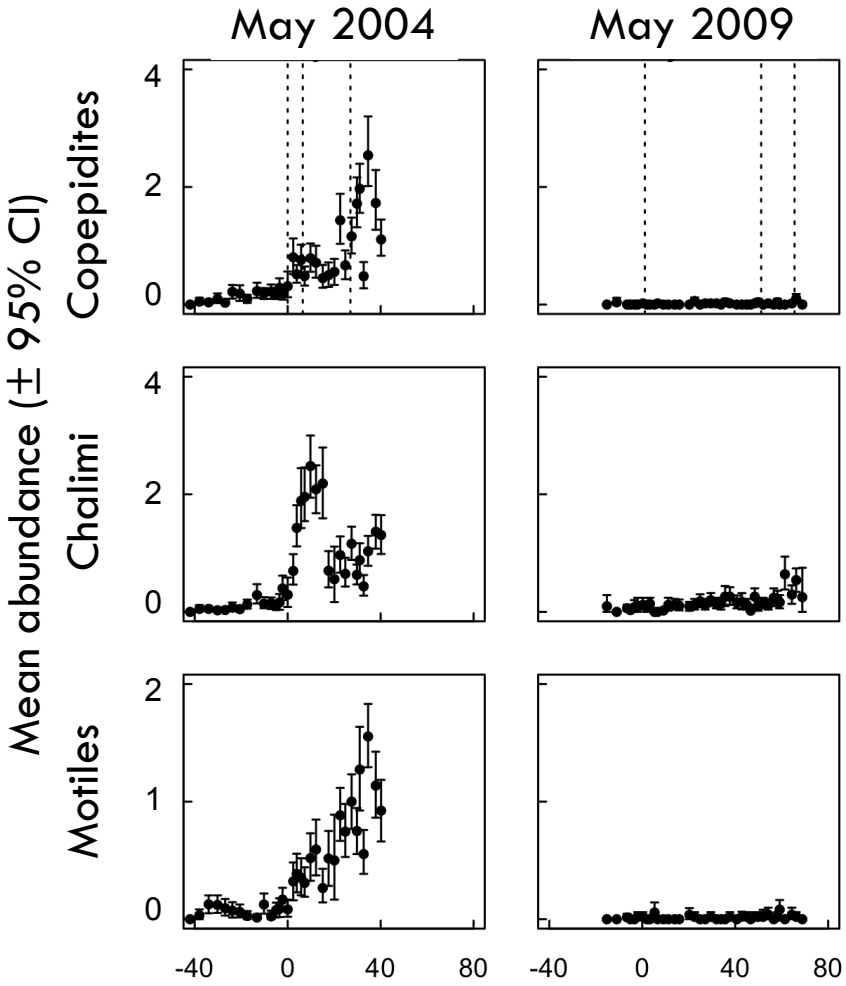


Results: wild



Results: farm & wild

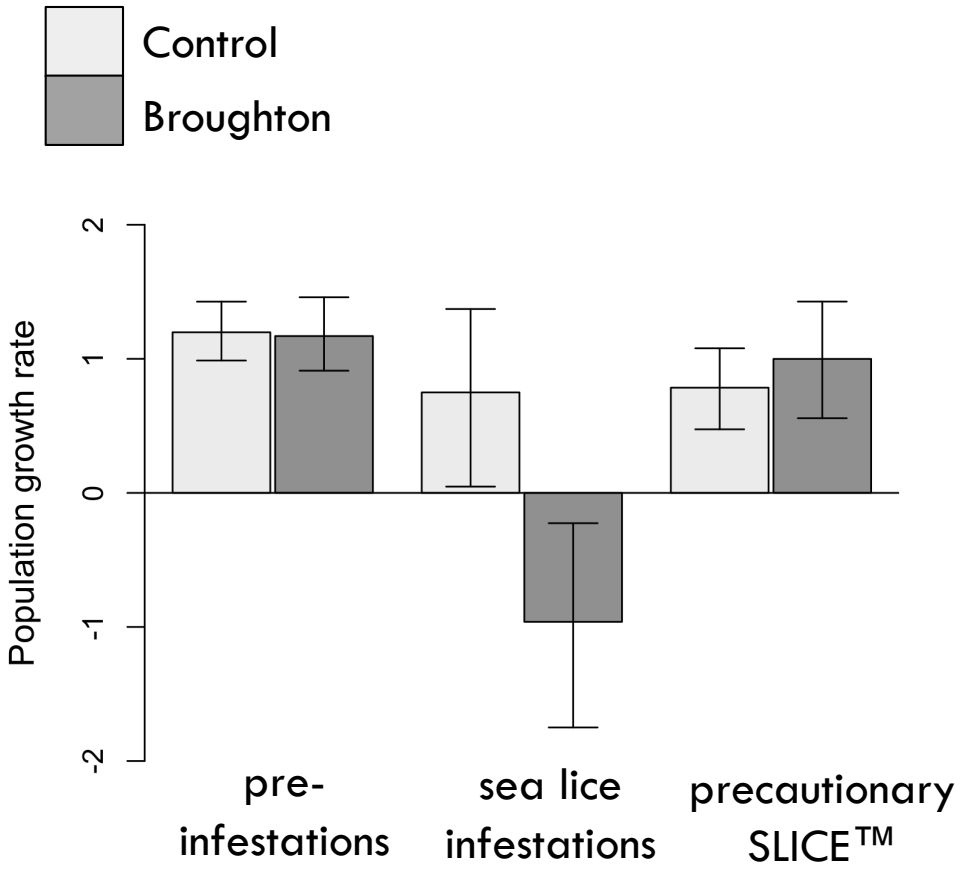


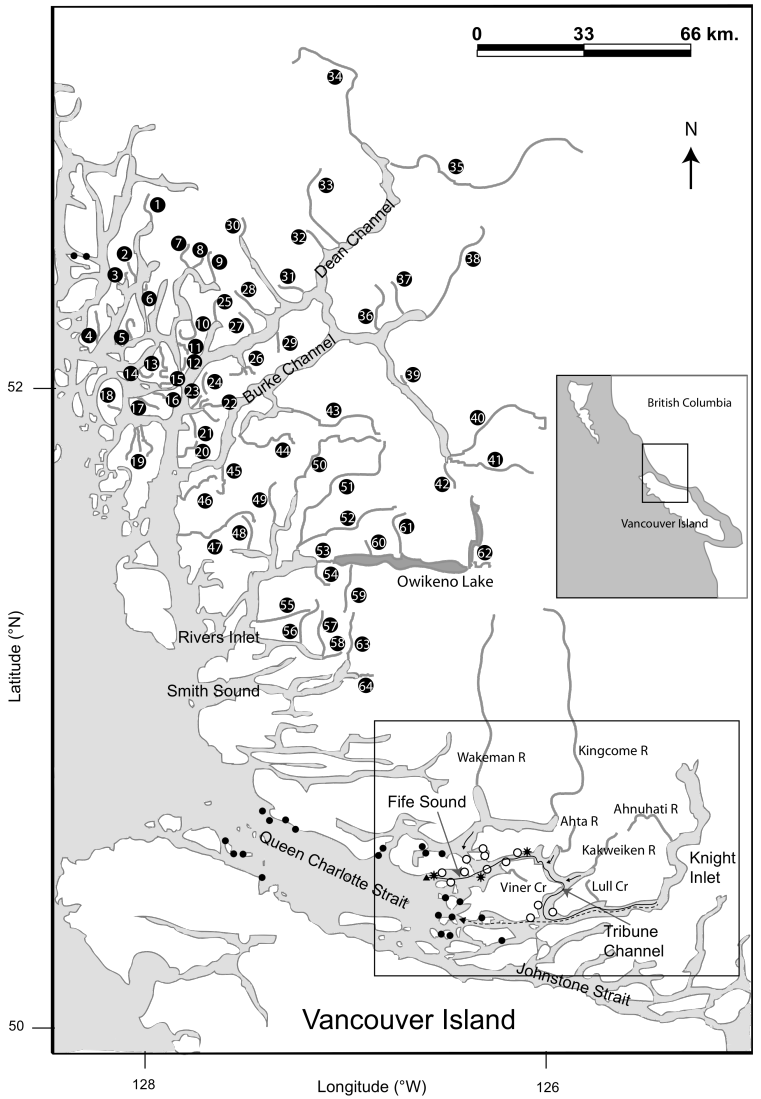


Krkošek et al. 2006

Results: population

$$R_{i,t} = N_{i,t-2} \exp\left[r_j - bN_{i,t-2} \right]$$





Connors et al. 2010, Krkosek and Hilborn 2011

Summary

- Lice on wild salmon correlated with lice on farm salmon
- Sea lice infestations correspond to pink salmon population declines
- Precautionary SLICE™ treatments can mitigate effects
- BUT:
  - effects of SLICE™ on non-target species
  - concerns about resistance to SLICE™

(Bravo et al. 2008, Saksida et al. 2010)

Thank you

Alexandra Morton
Craig Orr
Stan Proboscz

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Funding and support

University of Alberta — Quaecumque Vera

University of Otago — Sapere Aude

NSERC CRSNG

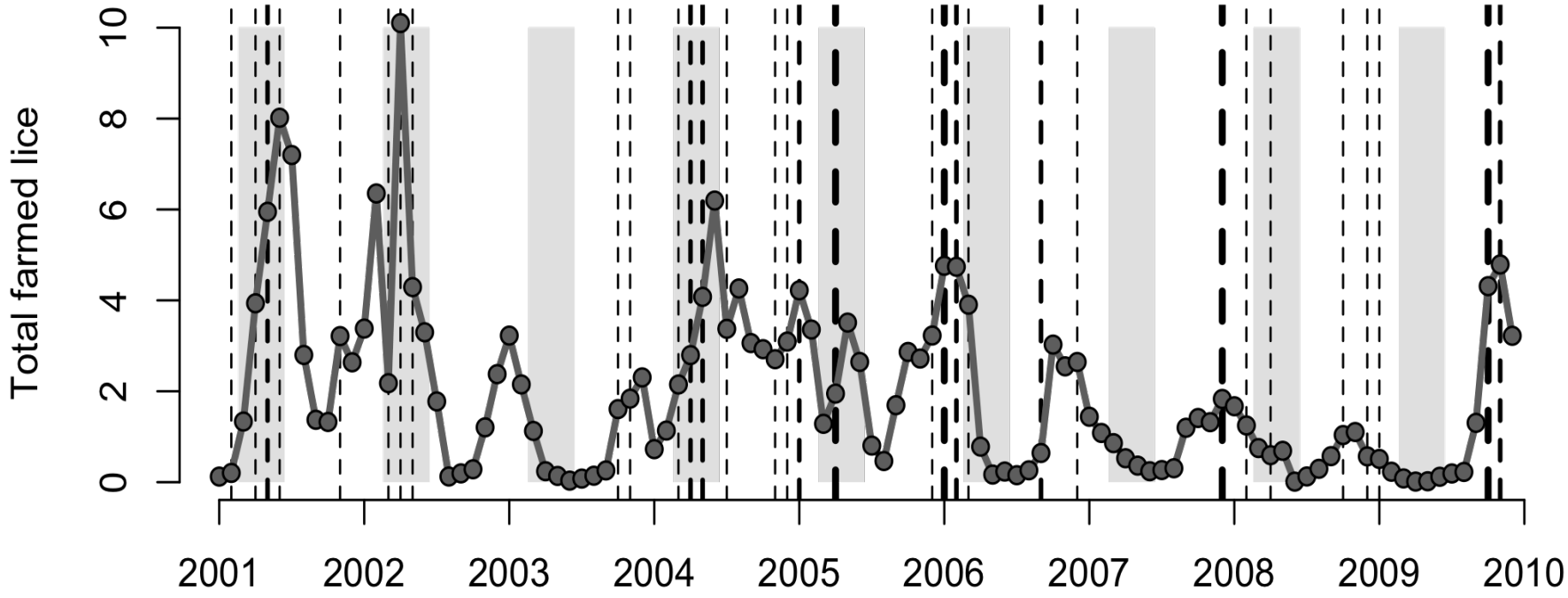
pims

Alberta Innovates Technology Futures

BC Innovation Council

Salmon Coast Field Station

Results: farm



Methods - Analysis

Farm

- total lice per region was production × avg. lice per fish, summed over all farms (Orr 2007, Marty et al. 2010)

$$L_f = \sum_i P_i \bar{l}_i$$

Wild

- average number of lice per wild juvenile salmon was predicted by a hierarchical generalized linear model with Poisson errors fit to weekly louse monitoring data

$$L_w = \beta_0 + \beta_1 \bullet \text{year} + \beta_2 \bullet \text{species} + \theta_{\text{location}} + \theta_{\text{week}} + \varepsilon$$

- transmission dynamics between wild and farm salmon were modeled using an established sea lice transmission model (Krkosek et al. 2005, 2006, Morton et al. 2010) and results compared between 2004 and 2009.

Methods - Analysis

Pink salmon productivity

- applied a hierarchical Ricker model to stock-recruit data from rivers in the Broughton Archipelago (exposed to salmon farming) and central coast (control region). (Connors et al. 2010, Krkošek and Hilborn 2011)

$$R_{i,t} = N_{i,t-2} \bullet \exp[r_j - bN_{i,t-2} + \varepsilon_{i,t}]$$

- also included a random effect for year and nested random effect for DFO management area within year

$$R_{i,t} = N_{i,t-2} \bullet \exp[(r_j + \theta_t + \theta_{t,a}) - bN_{i,t-2} + \varepsilon_{i,t}]$$