Investigating sea lice dispersal in loch Linnhe

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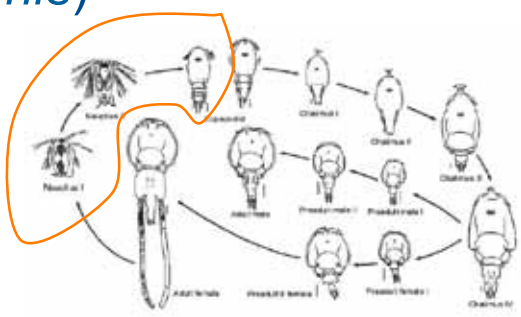
Sea lice (*Lepeophtheirus salmonis*)

- Graze on the skin of both farmed and wild fish
- Control in Scotland costs £35m y^{-1}
- Coordinated practices occurs in farm management areas
- Plankton stages transported by water movements
- Temperature influences maturation
- Salinity effects mortality



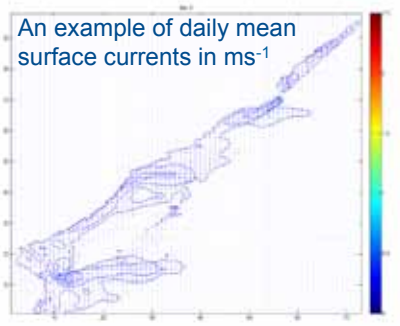
L. salmonis life-cycle with highlighted dispersal stages (Schram 1993)

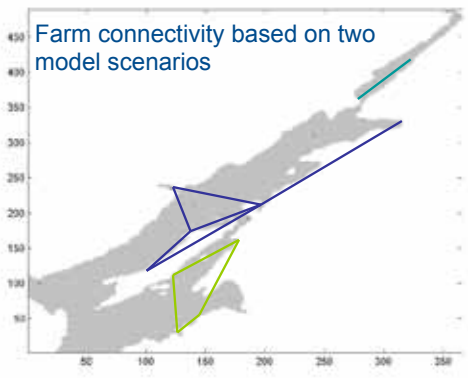
Loch Linnhe

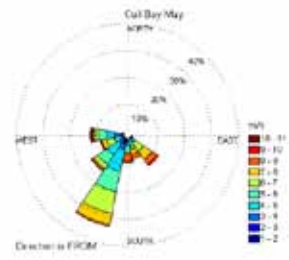
- >60km long in SW– NE direction
- 10 active Salmon farms
- Two farm management areas
- ~10% Scotland's salmon production
- Wild salmonid populations

Modelling dispersal in loch Linnhe

- POLCOMS hydrodynamic model with 100m fixed grid
- Forced by tides, freshwater input and meteorological conditions for May 2011
- Lice particles mature and suffer mortality
- Particles moved by surface vectors and followed by a particle tracking algorithm
- Predict distributions, transmission and farm connectivity
- Particles could be transported up to 30km across farm management areas
- Lice can become infective away from parent host
- Planktonic lice are likely to be widespread in the Loch
- Transmission could occur between some farms



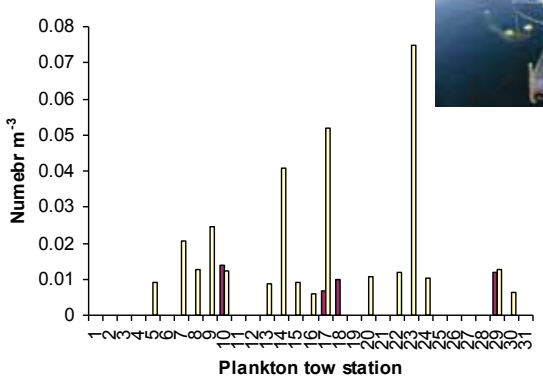




Wind rose during validation period May 2011

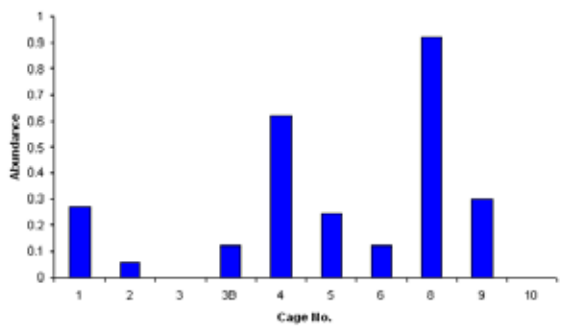
Model assessment

Plankton tows



Correlation between rank predicted and observed copepodid stage lice on sentinel fish (p=0.049, ρ= 0.71)

Sentinel caged fish



Wild fish

Abundance

Frequency

- Salmon (•) and sea trout (•) movements tracked
- Salmon spent similar time at similar abundance in the inner loch
- Trout were recorded in greater numbers and for longer periods near release sites
- Inform lice distributions from wild fish

Future work

- Development of model for Autumn 2011 forcings and data
- Collect additional forcing data during 2012
- Assess models with biological and physical data
- Include rod catch data as a wild source of lice
- Conduct management scenario simulations

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Underwater centre
Local landowners

Reference

Schram TA, 1993. Supplementary descriptions of the developmental stages of *Lepeophtheirus salmonis* (Copepoda: Caligidae) In: Pathogens of wild and farmed fish: sea lice. (Boxshall GA, Defaye D) Ellis Horwood, W. Sussex pp. 30-47.