

Bruken av ferskvann for å kontrollere infeksjoner av lakselus *Lepeophtheirus salmonis* K på Atlantisk laks *Salmo salar*.

Short-term exposure tests to elucidate handling effects

June 2014



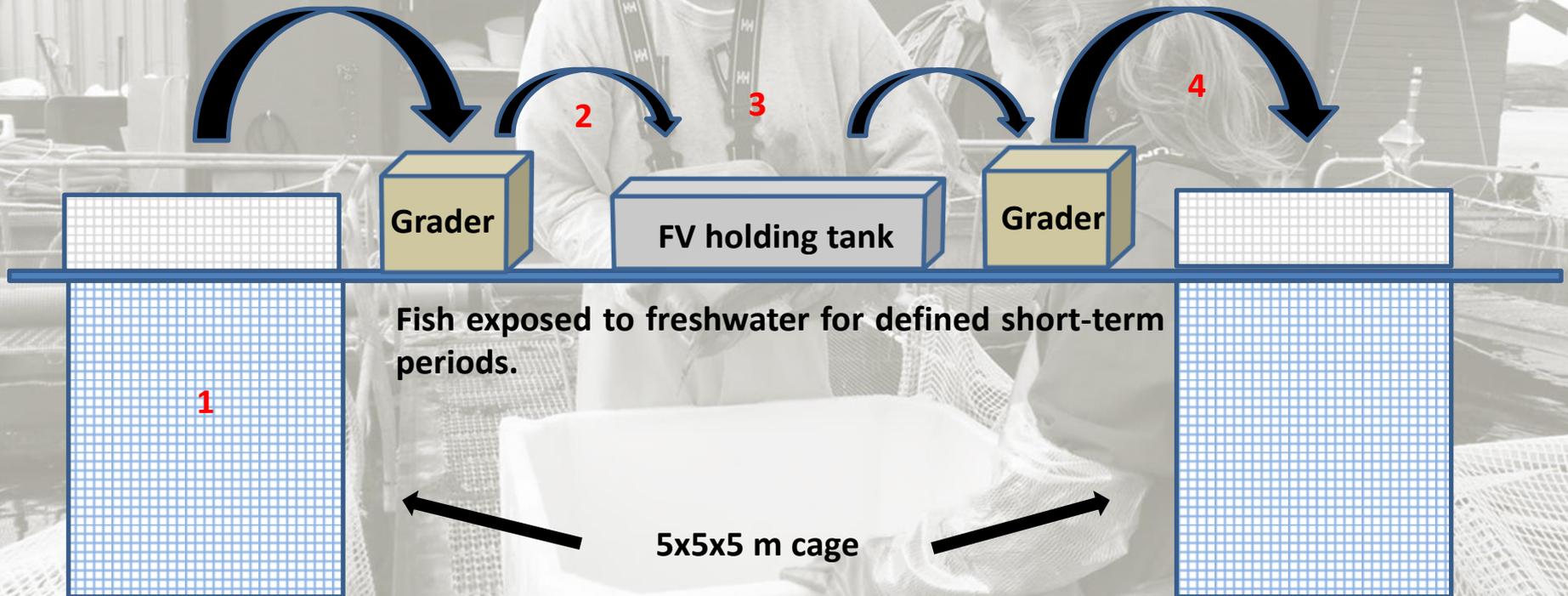
Aims and methods

- If sea lice levels can be reduced by up to 40% due to the effects of physical contact before exposure to freshwater then short-term exposure to freshwater may be sufficient if the fish are pumped back into the cage after exposure using the same method
- Elucidate the effects on physical removal of sea lice as fish are pumped/transferred from a cage to a well containing freshwater and back to the cage.
- Determination of physical effects over a range of exposure times from 15 minutes up to one hour.
- Sea lice infestation levels will be recorded prior to each test and immediately after transfer, after exposure and immediately after transfer back to the cage
- Water samples taken from the freshwater tank before and during treatment for full chemical analysis
- Blood samples drawn from fish exposed to freshwater and immediately before and after treatment to investigate issues relating to fish welfare.

Aims and methods

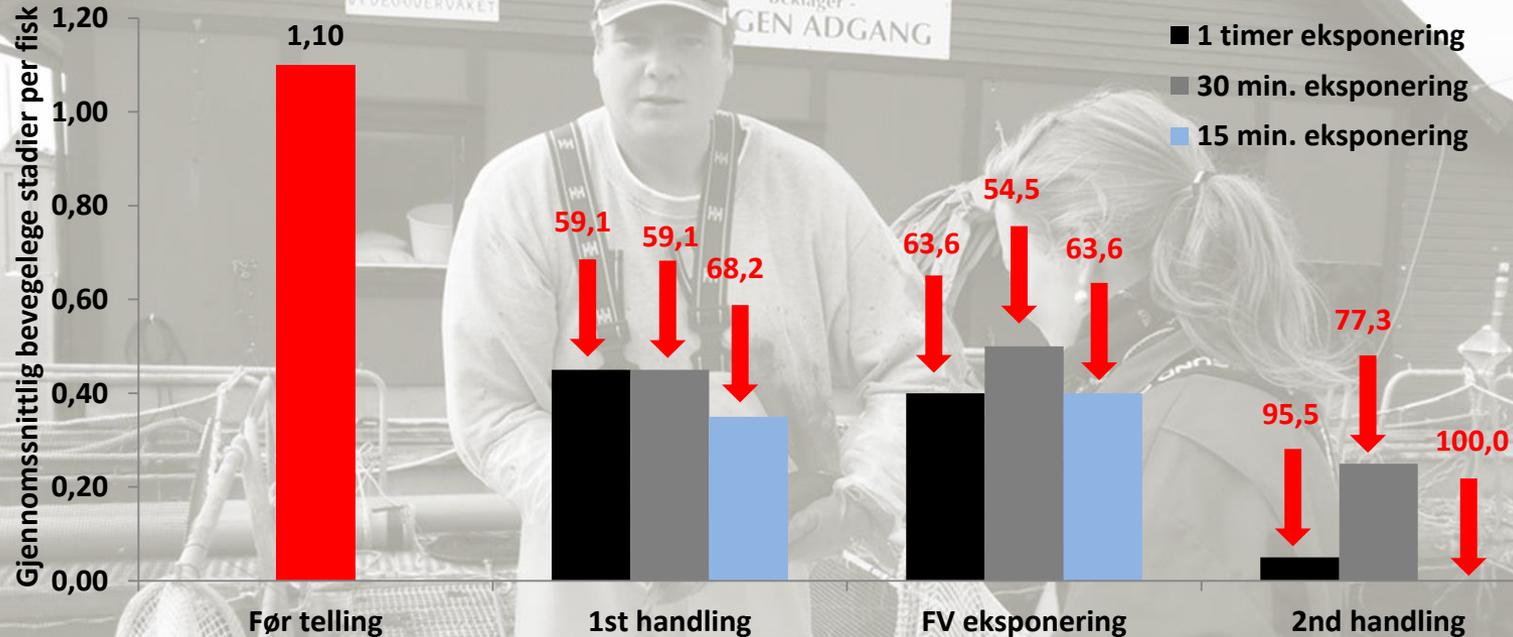
Fish pumped from cage and over a grading system into holding tank filled with freshwater.

Fish pumped from holding tank over a grader into cage after exposure.



Results

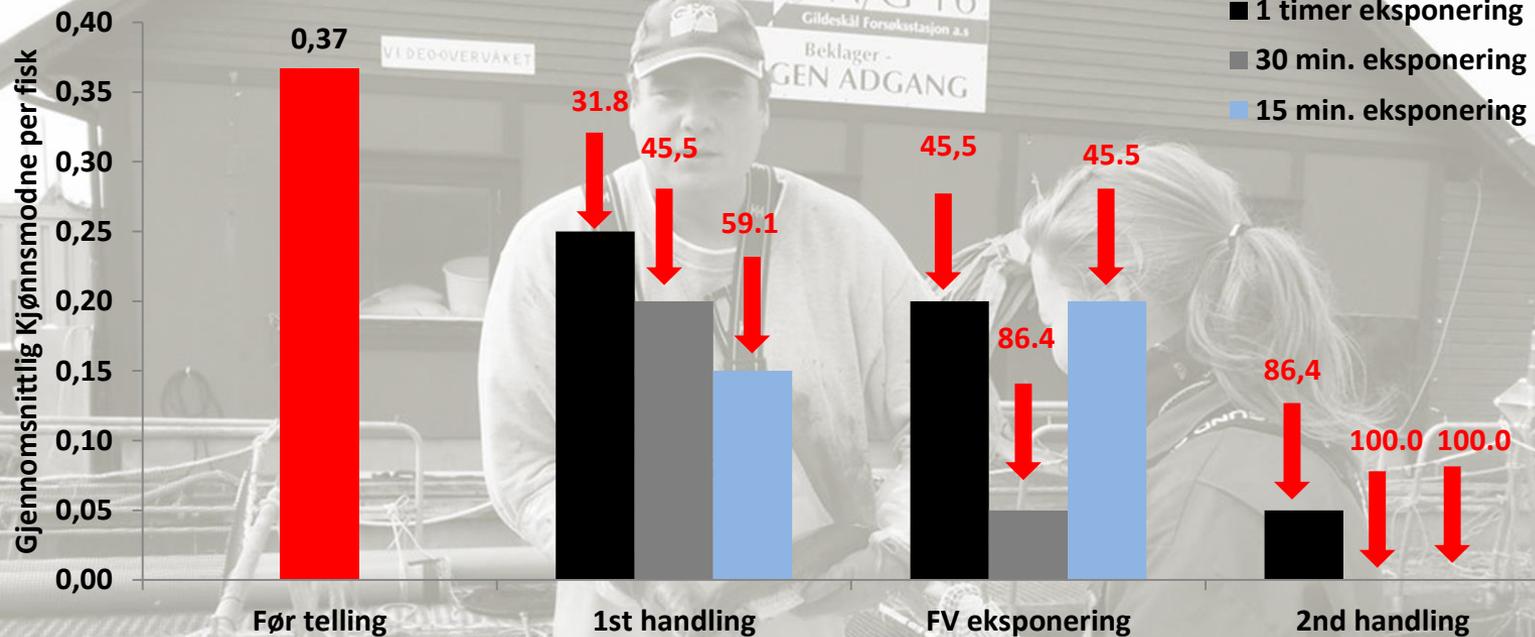
Bevegelege



- Percentage reductions after first handling between 59.1 and 68.2%.
- No further reductions after exposure to freshwater.
- After second handling, percentage reductions were 77.3 and 95.5% for 30 and 60 minutes treatments respectively.
- 100% reduction for the fifteen minute treatment after second handling.

Results

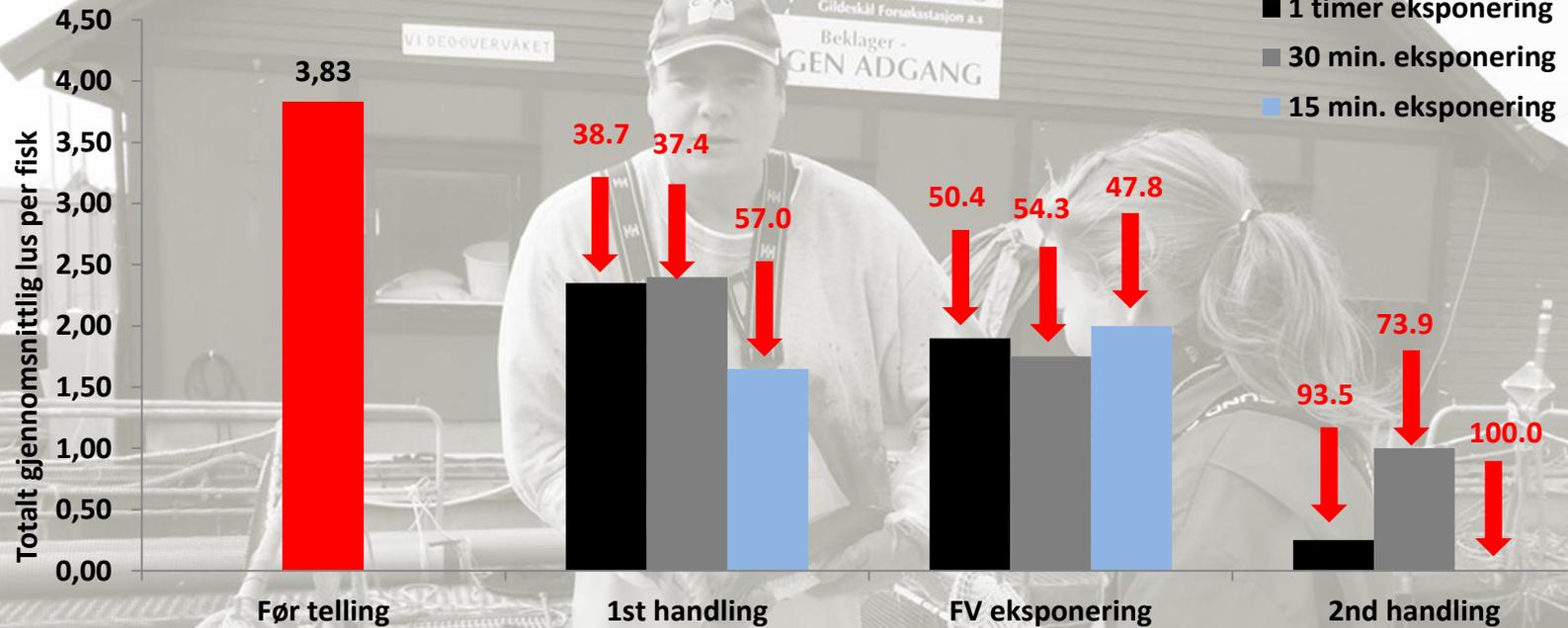
Kjønnsmodne:



- Reduction after the first handling and before exposure to freshwater was between 31.8 and 59.1%.
- After freshwater exposure values ranged between 45.5 and 86.4%.
- After second handling, exposure to freshwater for 60 minutes resulted in a reduction of 86.4%.
- Fish exposed for 30 and 15 minutes had 100% reduction of mature female lice.

Results

Totalt lus



- After second handling, reductions for fish treated for 60 minutes was 93.5%.
- 30minute treatments, a reduction of 73.9%.
- 15minutes a percentage reduction of 100% was recorded.
- No fast stages present

Results

Water quality

Sixty minute freshwater exposure:

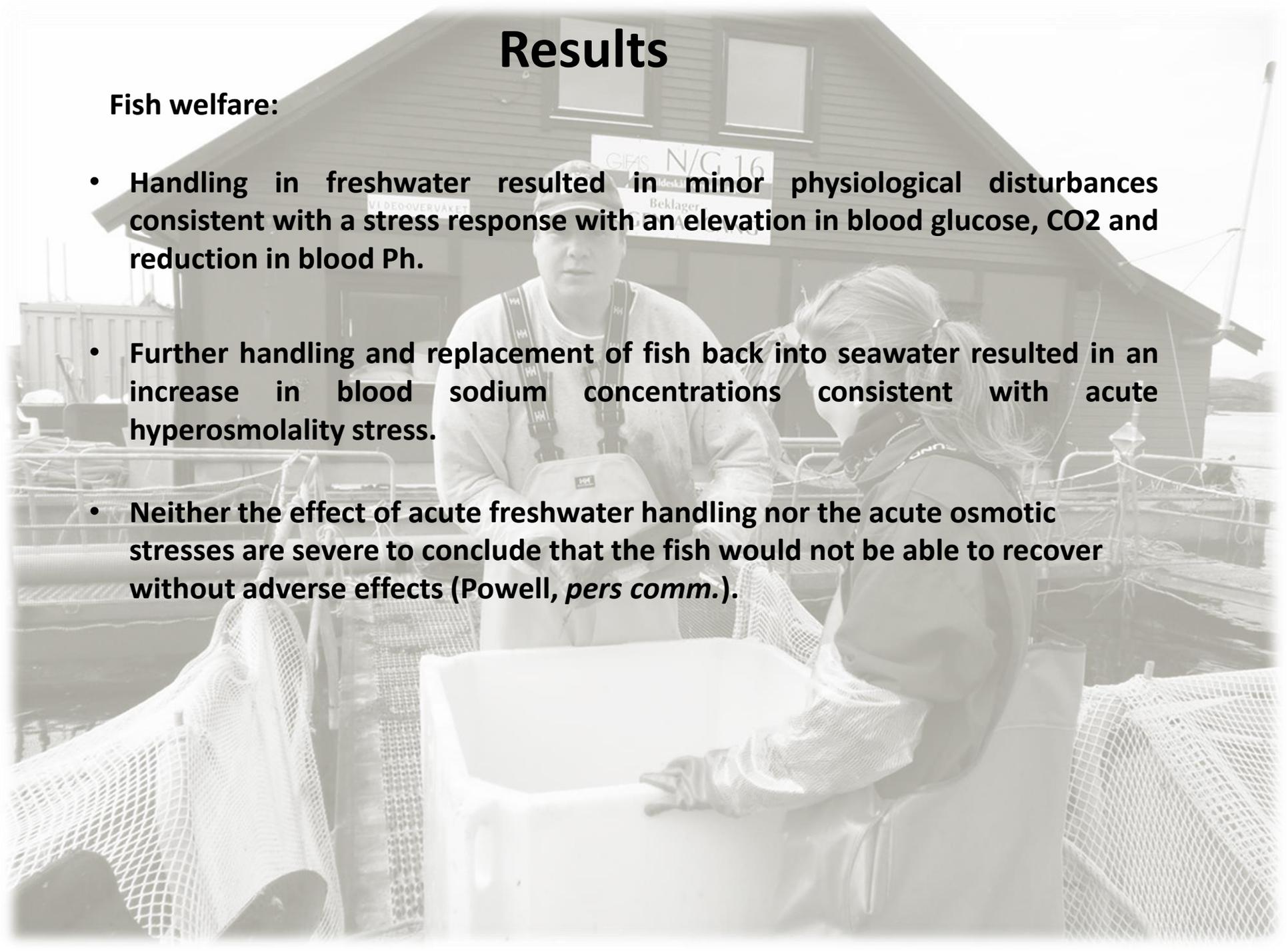
Time	Oxygen (%)	pH	Salinity (ppt)	Temperature (°C)
0	89,10	8,10	0,16	13,1
10	89,30	8,20	0,16	13,0
15	82,90	8,10	0,17	13,1
20	76,90	8,40	0,19	13,2
30	74,20	7,90	0,19	12,9
40	75,50	7,80	0,18	12,8
50	82,10	7,70	0,18	12,9
60	85,10	7,60	0,17	13,1

- Water quality maintained throughout all tests.
- Freshwater continually replaced.
- Temperature in the tank containing freshwater was comparable to that of the seawater (13°C for freshwater compared to 13.8 °C for seawater).

Results

Fish welfare:

- Handling in freshwater resulted in minor physiological disturbances consistent with a stress response with an elevation in blood glucose, CO₂ and reduction in blood Ph.
- Further handling and replacement of fish back into seawater resulted in an increase in blood sodium concentrations consistent with acute hyperosmolality stress.
- Neither the effect of acute freshwater handling nor the acute osmotic stresses are severe to conclude that the fish would not be able to recover without adverse effects (Powell, *pers comm.*).



Conclusions

- The percentage reduction attained for all infective stages of sea lice found on Atlantic salmon exposed to freshwater would be considered to be a successful treatment outcome.
- Results may indicate that fish can be exposed to freshwater under commercial-scale conditions for shorter time periods than previous studies had shown as long as the fish are passed over grader systems before and after exposure .
- The reductions recorded during these tests may be attributed to the stress effects of freshwater on attached stages of *L.salmonis*.
- However, the reductions may also be purely attributed to the physical effects of handling the fish two times with no contributing effects from freshwater exposure. A repeat of these tests using seawater would elucidate these effects fully.
- The clearance rates recorded for all tests are not attributed to acute changes in water temperature or pH.
- Neither the effect of acute freshwater handling nor the acute osmotic stresses are severe to conclude that the fish would not be able to recover without adverse effects

A photograph of a fishing boat deck. In the foreground, a large metal tray with a slatted bottom is filled with several fish, including what appear to be salmon and a larger, darker fish. The tray is situated on the deck, which is cluttered with various pieces of equipment, including blue hoses, a yellow ladder, and other fishing gear. The background shows the open sea and the upper part of the boat's superstructure. The text "Thank You" is overlaid in the center of the image in a bold, black, sans-serif font.

Thank You