



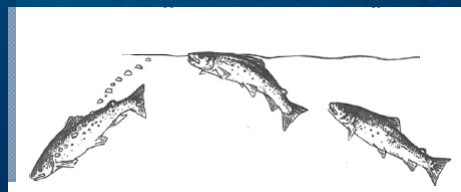
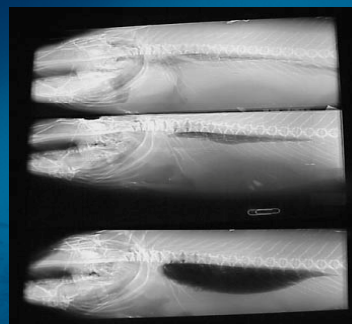
Early prototypes

Salmon – swim bladder

Salmon have an open swim bladder, and must swallow air in the surface to refill it.

Salmon deprived off access to the surface will have empty swim bladders after 2-3 weeks:

- Increased swimming speed
- Tilted swimming
- Reduced appetite, growth, K, FCR
- Increased fin and snout wear
- Compressed vertebrae
- Unacceptable welfare




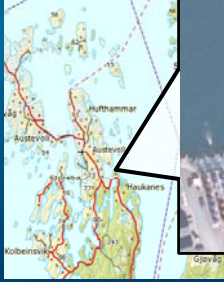

Drawing: Stein Mortensen




Research trial 1

- Three cages with snorkel
- Three standard cages as controls
- Ca 3000 Atlantic salmon (89g ± 23) in each cage.

Performed at Austevoll Research Station (IMR), June to August 2012.

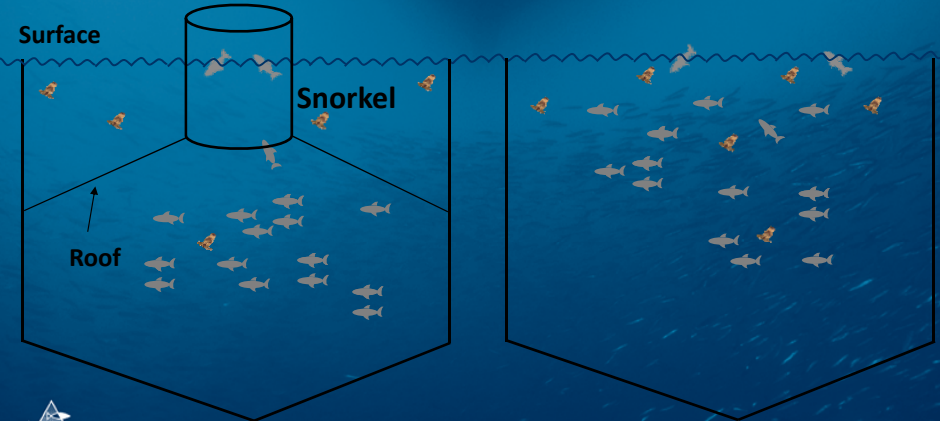


■ = Snorkel ■ = Kontroll



Aim: test lice infestation in 'snorkel' cages

Salmon in snorkel cages are prevented from swimming in the upper 3-5 meters, but may re-fill swim bladders through the snorkel




Surface

Roof

Snorkel

Cage with snorkel

Control cage



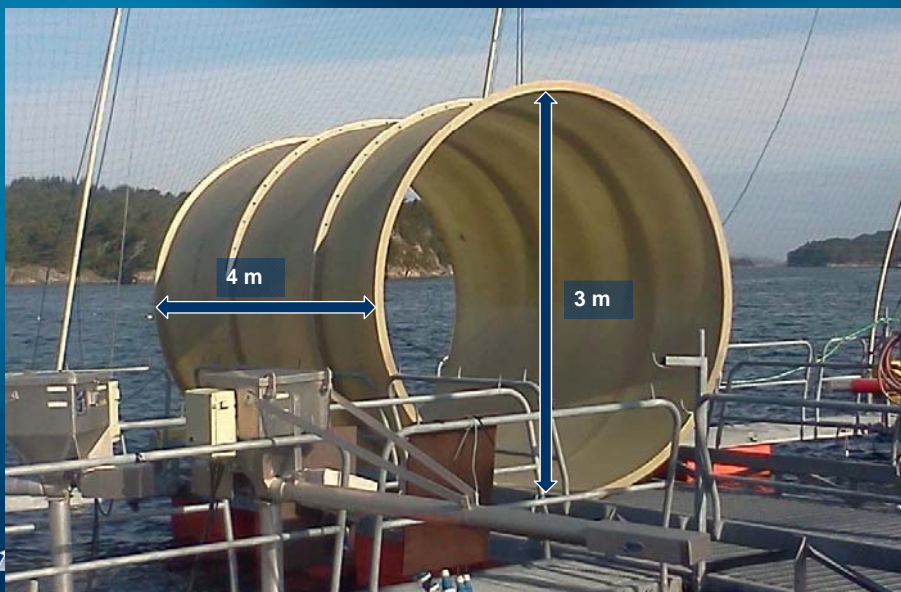
Start of trial 1

- Three cages with snorkel
- Three standard cages as controls
- Ca 3000 Atlantic salmon (89g ± 23) in each cage.



 = Snorkel  = Kontroll

Start of trial 1 – snorkel



Start of trial 1 - roof



Start of trial 1 – deploying snorkel



Start of trial 1 – snorkel and roof in place



Start of trial 1 – few fish in the snorkel



Counting lice

We counted and classified the lifestage of the lice on 20 salmon every third week.

Life stages:

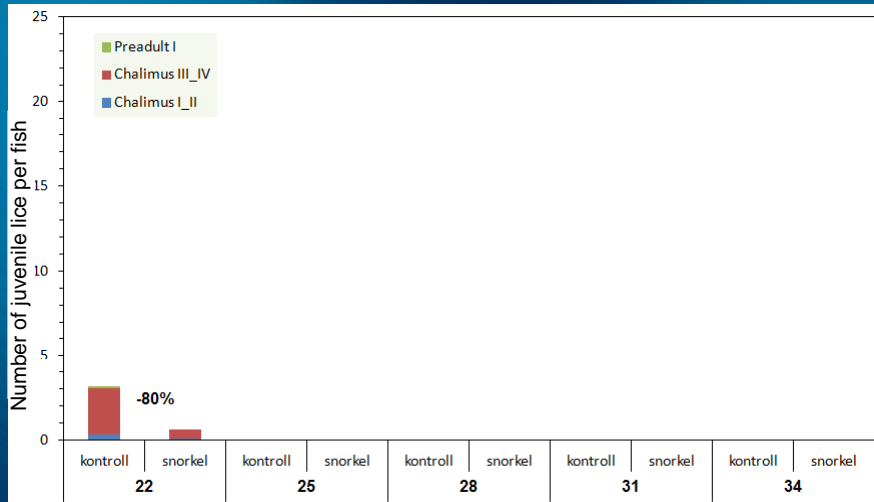
- Chailums I-II
- Chailimus III-IV
- Preadult 1
- Preadult 2 male
- Preadult 2 female
- Adult male
- Adult female

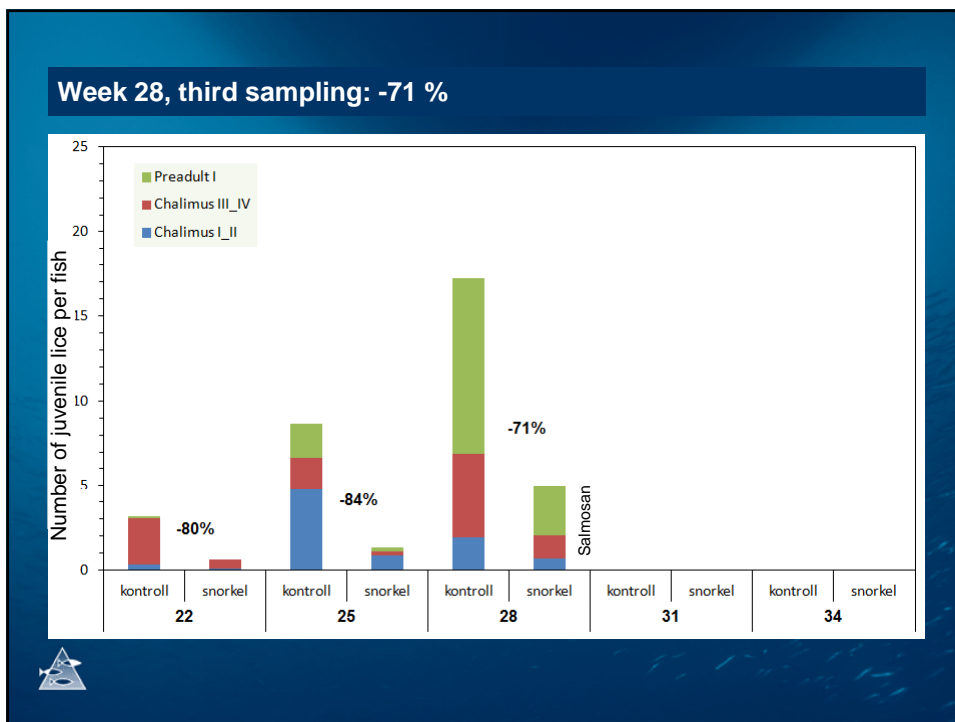
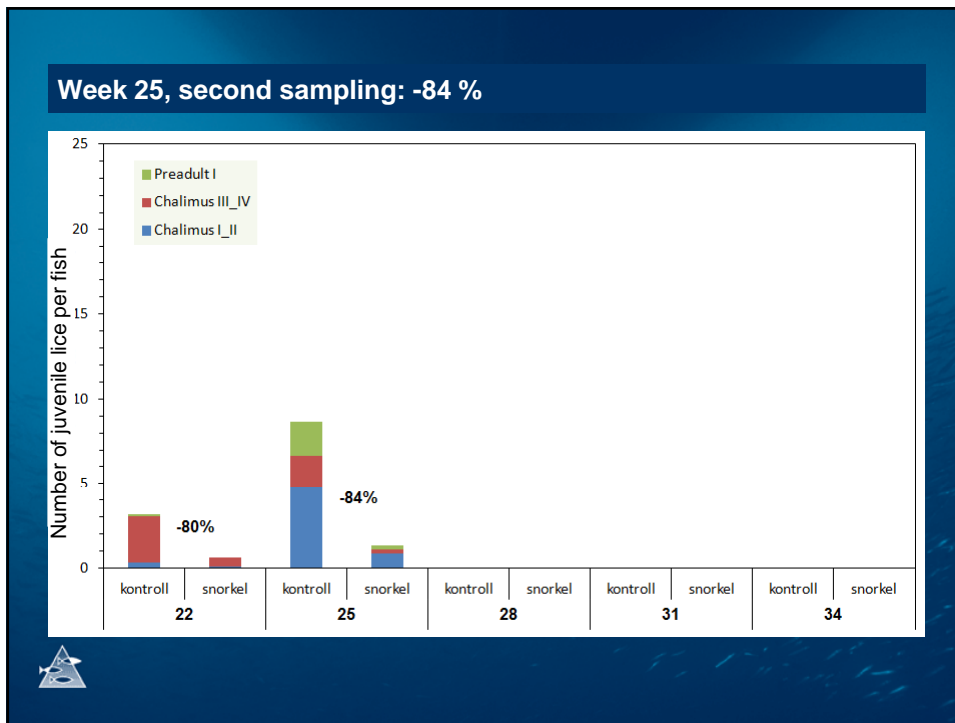


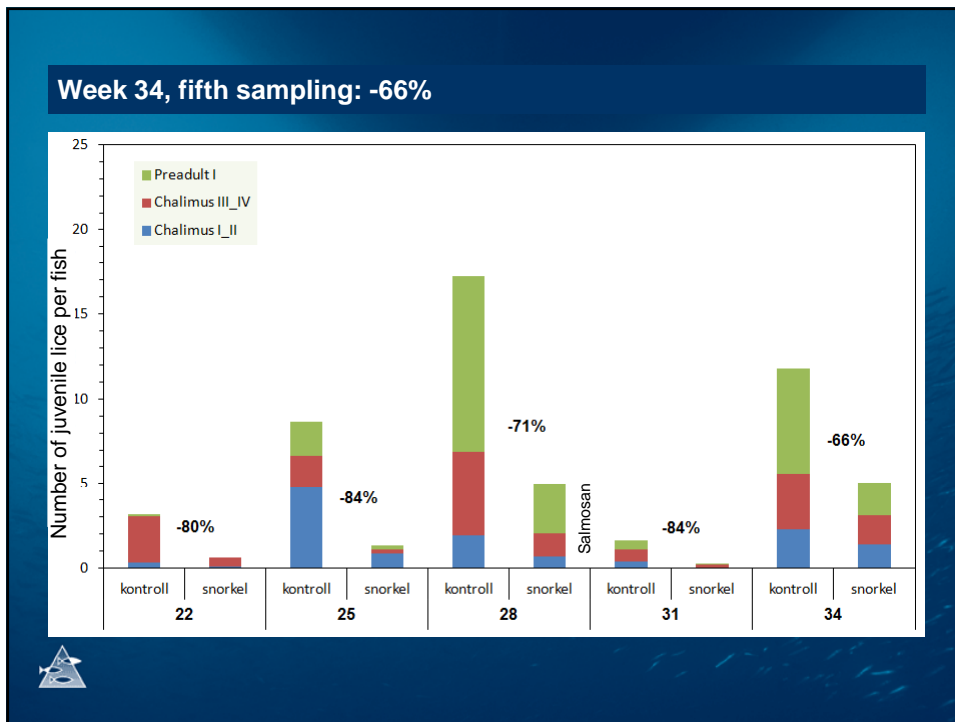
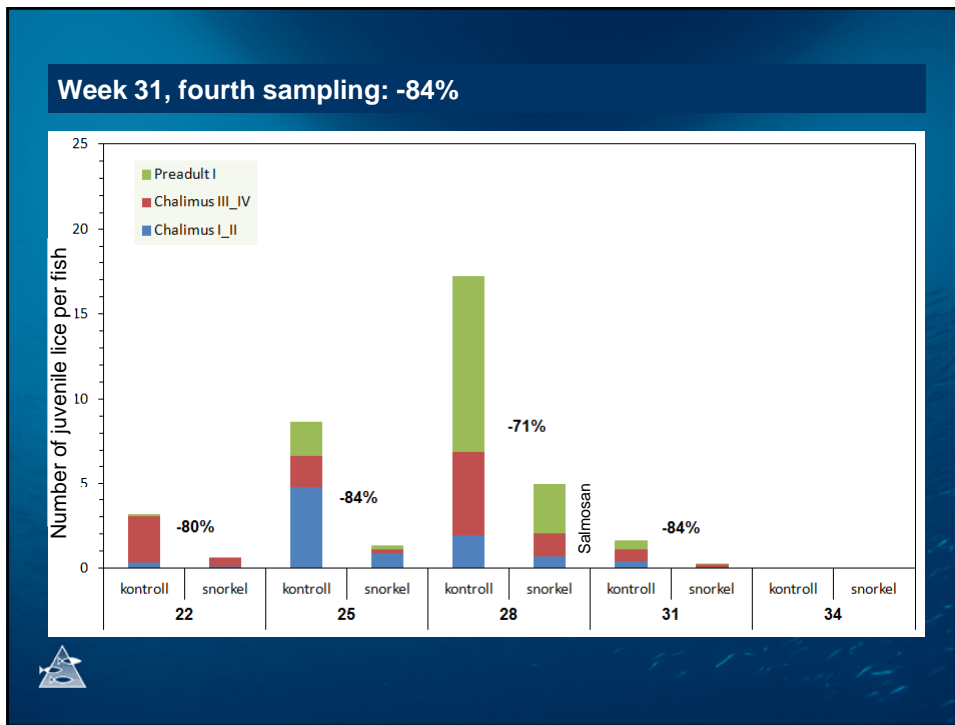
BESTEMMELSESSKJEMA FOR LAKSELUS

		Størrelse	Foto	Form	Størrelse 1:1
FASTSITTENDE STADIER	Copepoditt	Størrelse: ca 0,7 mm Beskrivelse: Influere fisken. Holder seg fast med antenner og et lite en festefødd			
	Chailimus 1	Størrelse: ca 1,1 mm Beskrivelse: Alle Chailimus stadier er forankret til fisken med en festefødd			
	Chailimus 2	Størrelse: ca 1,3 mm			
	Chailimus 3	Størrelse: ca 2,1 mm			
	Chailimus 4	Størrelse: ca 2,3 mm			
BEVEGELIGE STADIER	Halvoksen Hann 1 (Preadult)	Størrelse: ca 3,4 mm Beskrivelse: På dette stadiet er det mulig å skille kjønnet. Hannens kjønnsorgan er sirkulært tønneformet, bredest på midten.			
	Halvoksen Hunn 1 (Preadult)	Størrelse: ca 3,6 mm Beskrivelse: Hannens kjønnsorgan er betydelig bredere enn hannens og alltid bredest bakant.			
	Halvoksen Hann 2 (Preadult)	Størrelse: ca 4,3 mm			
	Halvoksen Hunn 2 (Preadult)	Størrelse: ca 5,2 mm			
	Voksen Hann (Adult)	Størrelse: ca 5,6 mm Beskrivelse: Hannen er mindre, men utvikler seg raskere enn hunnen.			
	Voksen Hunn (Adult)	Størrelse: ca 8-12 mm			

Week 22, first sampling: -80 %

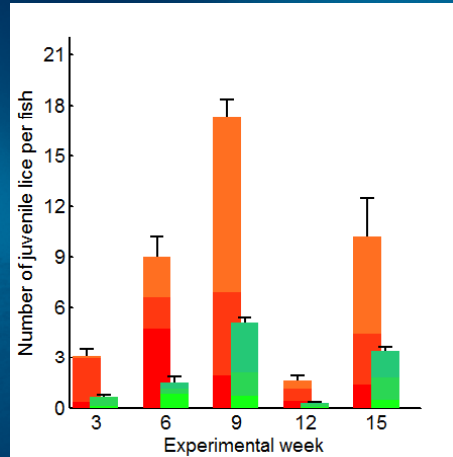






Snorkelforsøk, et pilotstudie

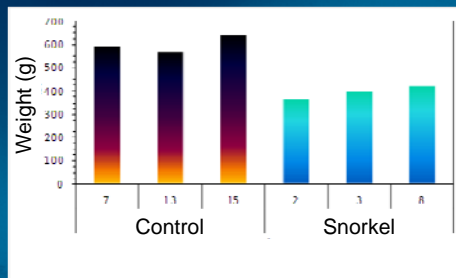
Conclusion: The salmon in the cages with snorkel became significantly less infested with lice than the salmon in the control cages.



Snorkelforsøk, et pilotstudie

Conclusion: The salmon in the cages with snorkel became significantly less infested with lice than the salmon in the control cages.

But! The end weight was reduced by 33 % compared to controls.





Trial 1

Conclusion: The snorkel functioned as planned and we got significantly less lice infestation.

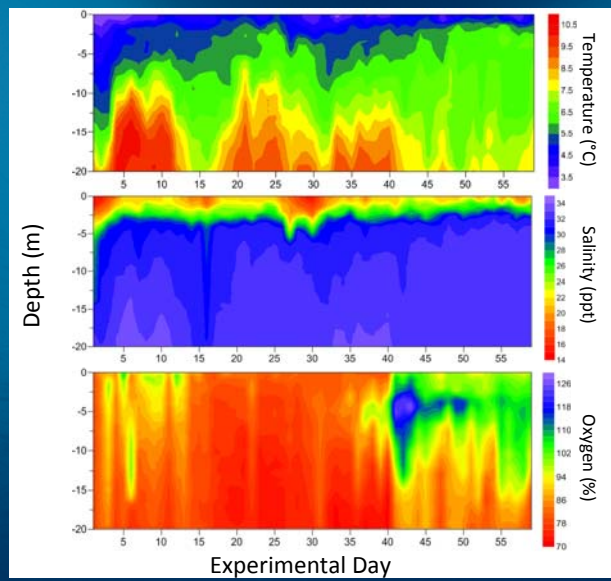
But! More studies are needed to further develop the technology in regards to feeding and keeping the roof clean.



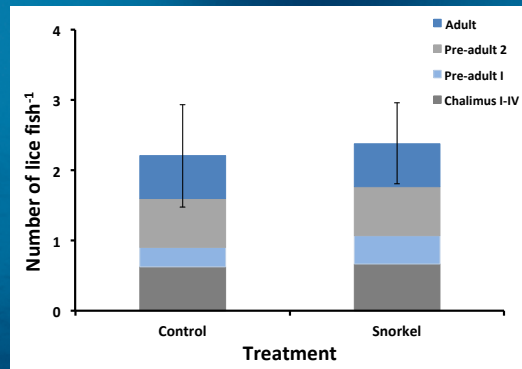
Trial 2 – Feeding trial



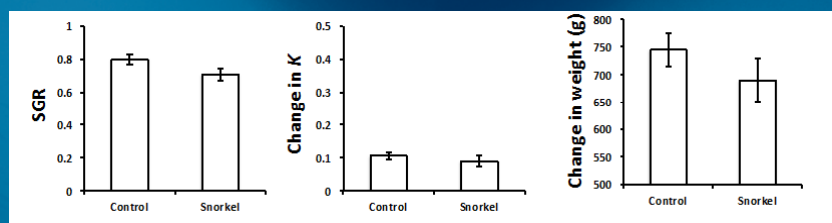
Trial 2 - Fjord site



Trial 2 - Fjord site



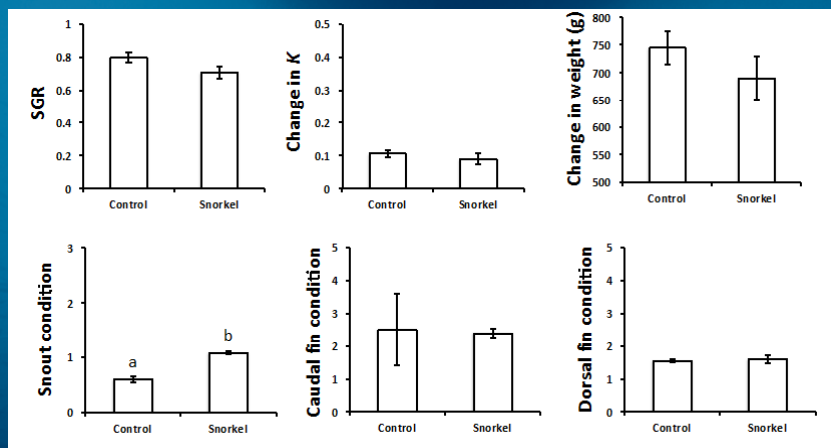
Trial 2 - Fjord site



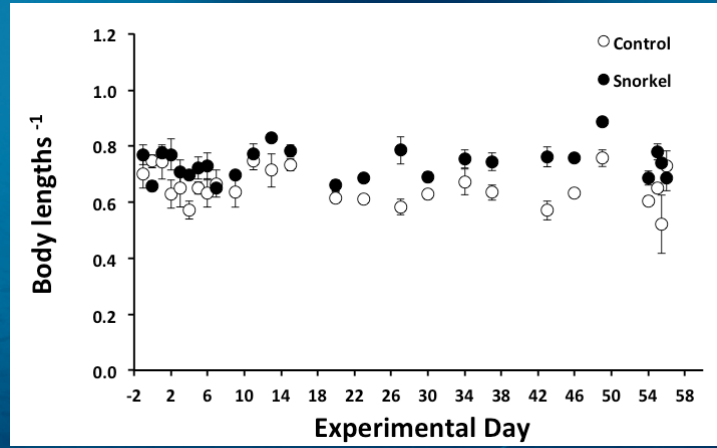
Trial 2 - Fjord site



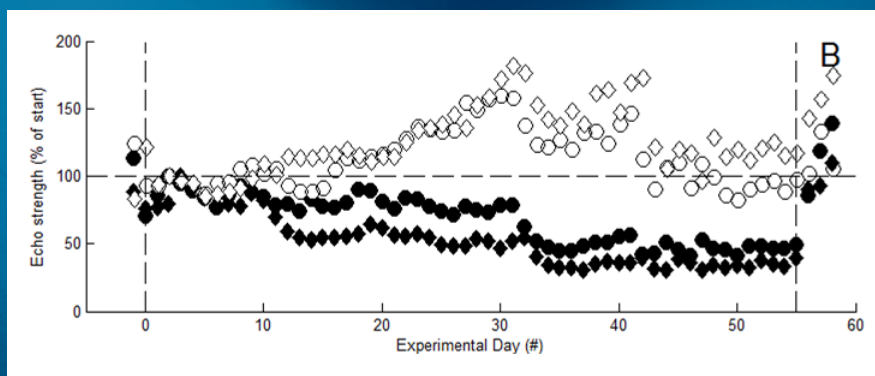
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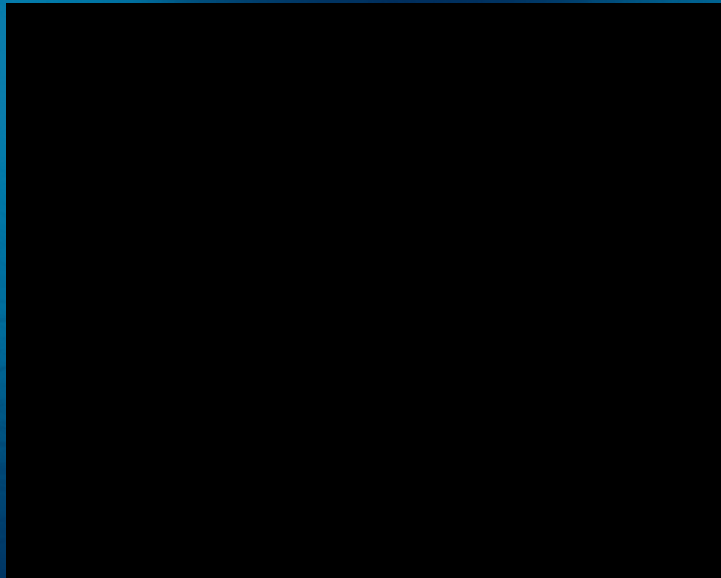
Trial 2 - Fjord site



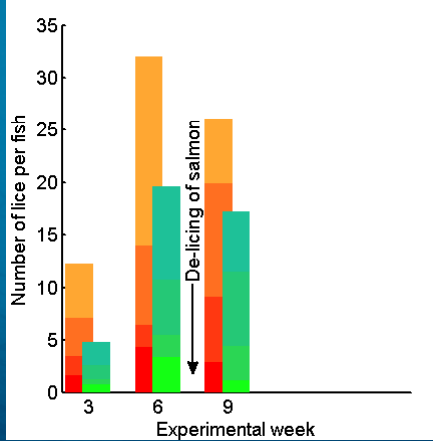
Trial 3 – Costal site-large fish – ongoing trial



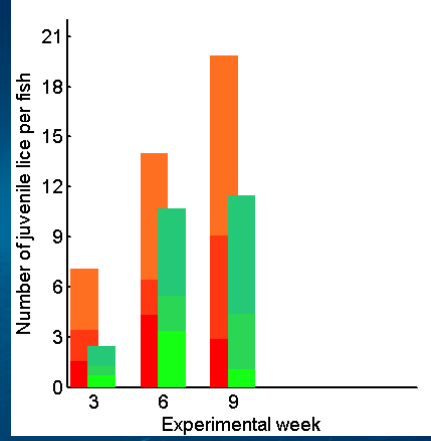
Trial 3 – Costal site-large fish – ongoing trial



Trial 3 – Coastal site



Reduction all stages is respectively 61, 39 and 34 % for snorkel vs. control



Reduction juvenile stages is respectively 65, 15 and 52% for snorkel vs. Control.

Egersund Net, large scale trial

