

Geotermisk energi i oppdrett – på godt og vondt

Morefish sin konferanse - Risiko i Landbasert Oppdrett

Trondheim, 6. og 7. november 2023

Kristrún H. Kristþórsdóttir, veterinær

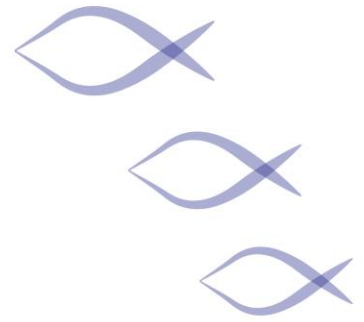
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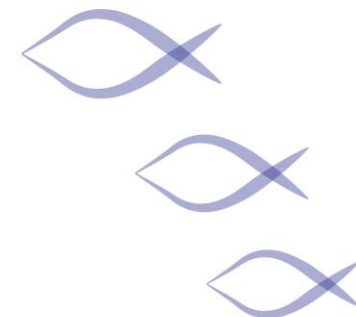


Agenda

- Introduksjon
- Oppdrett på Island
- Geotermisk energi
- utfordringer med gassovermetning



Introduksjon - VETAQ



Bernharð Laxdal



Krístrún Helga Kristþórsdóttir



Dan Roger Lid



Lína Björk Magnúsdóttir



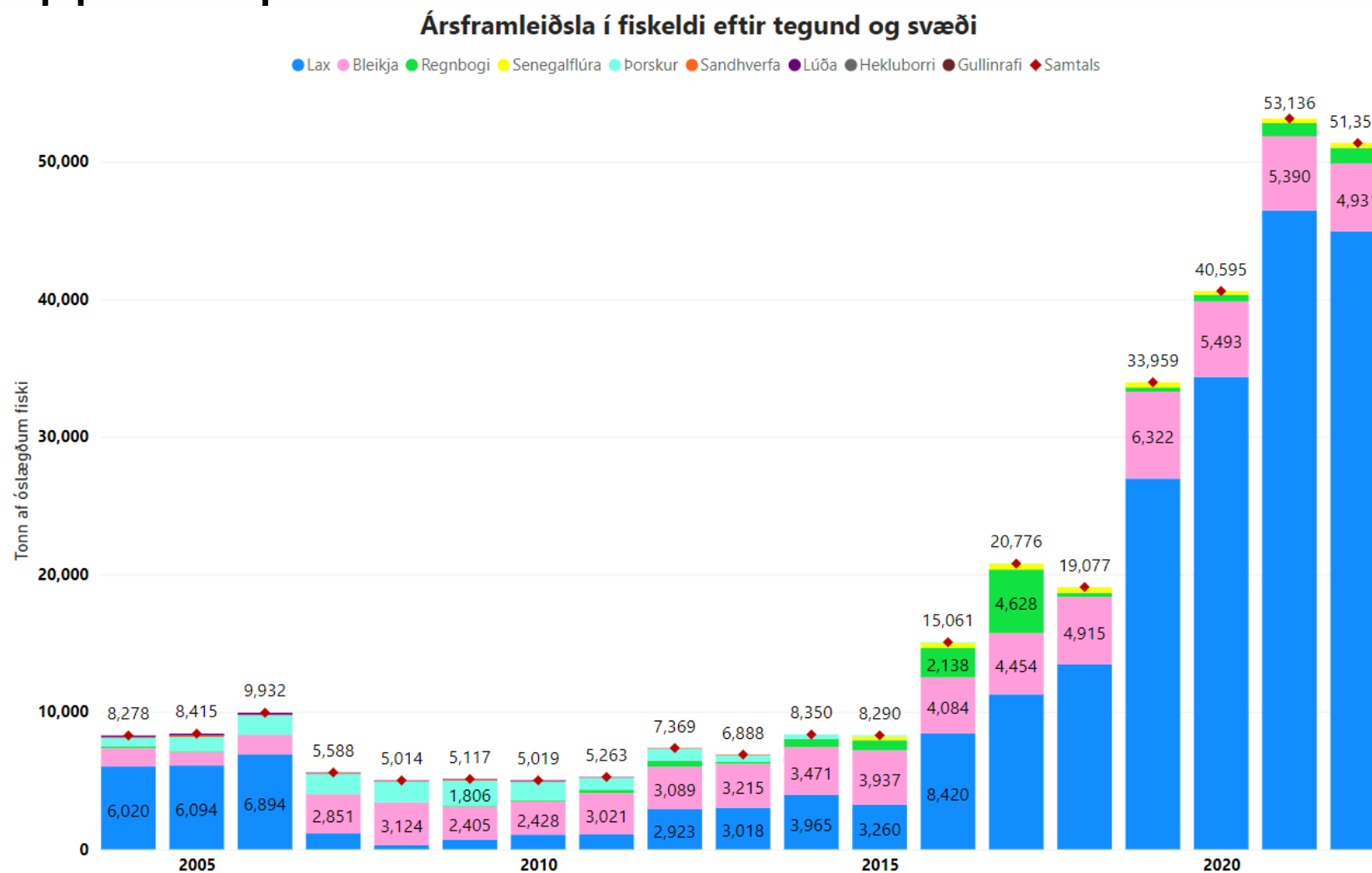
Guðrún Hrefna Guðjónsdóttir



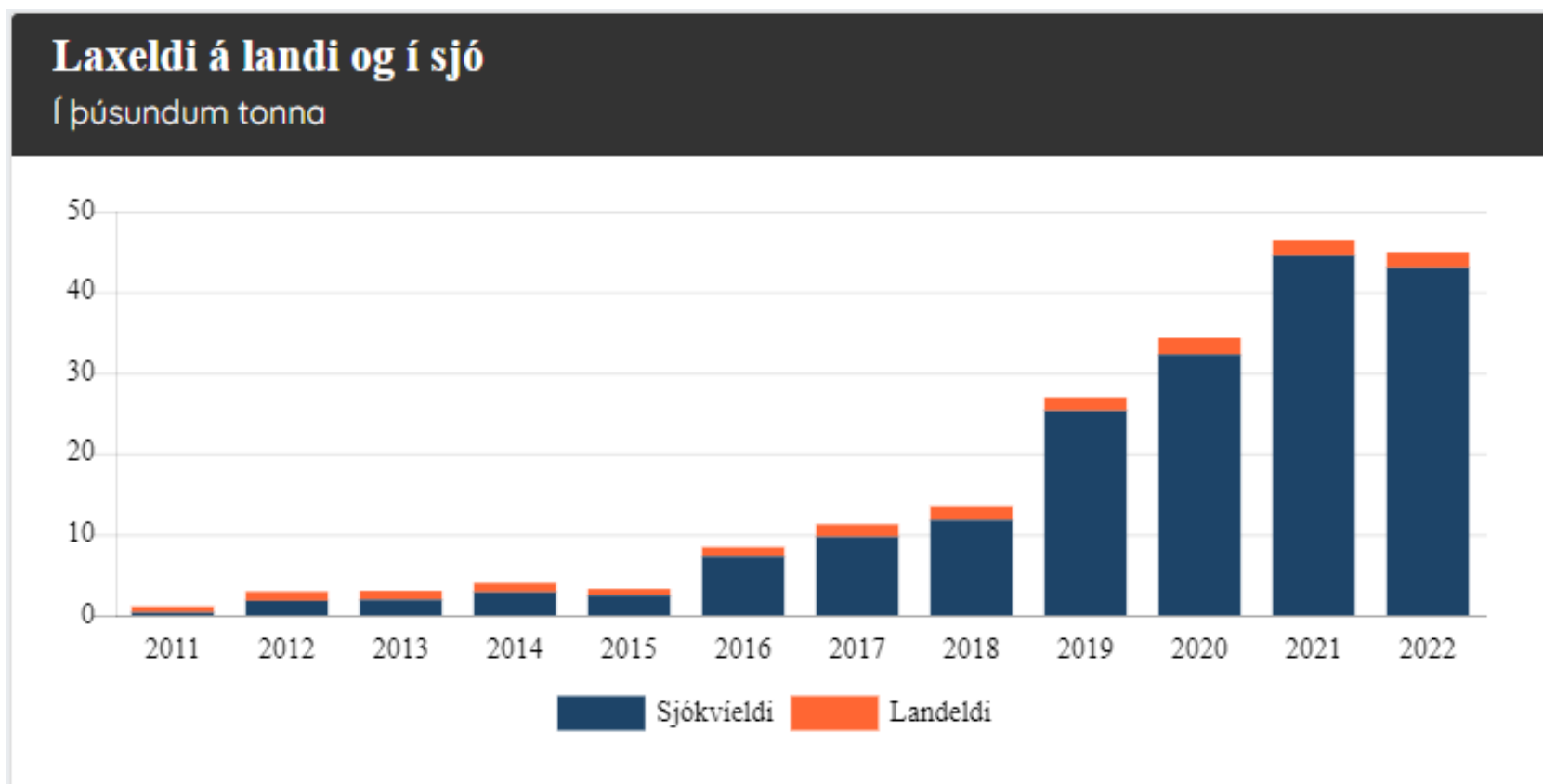
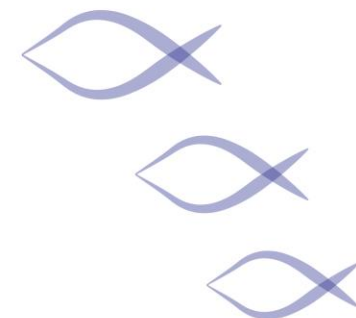
Gunnhildur Pétursdóttir

Fiskeoppdrett på Island

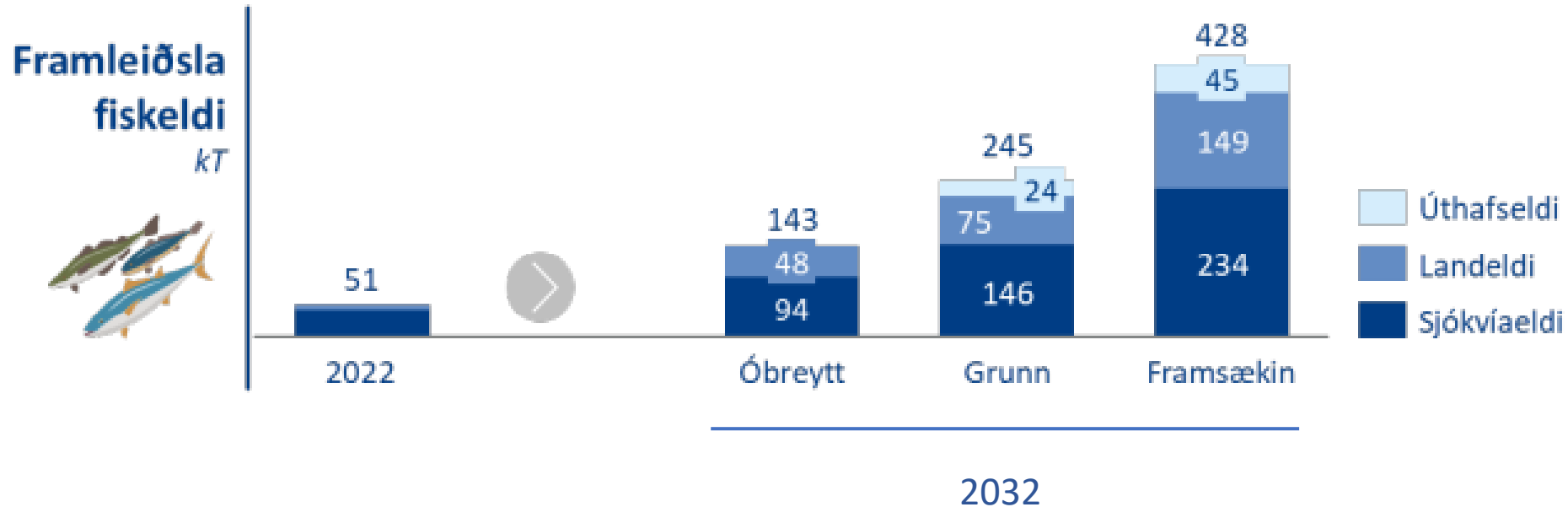
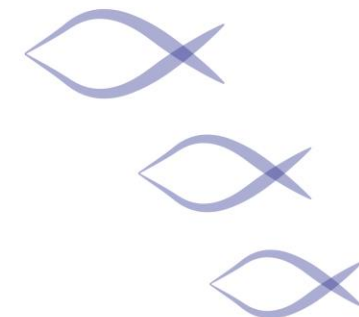
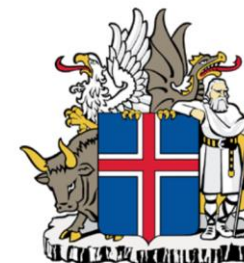
Tillatt biomasse i sjø i 2023: 103.300 MT



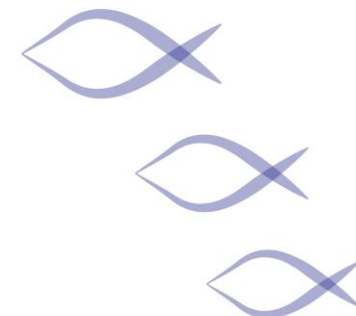
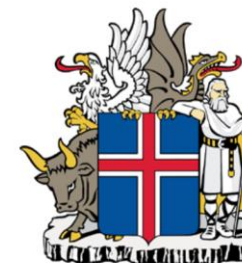
Fiskeoppdrett på Island



Fiskeoppdrett på Island

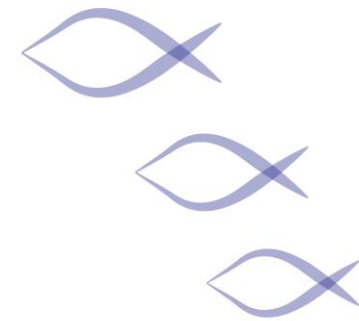


Landbasert oppdrett på Island



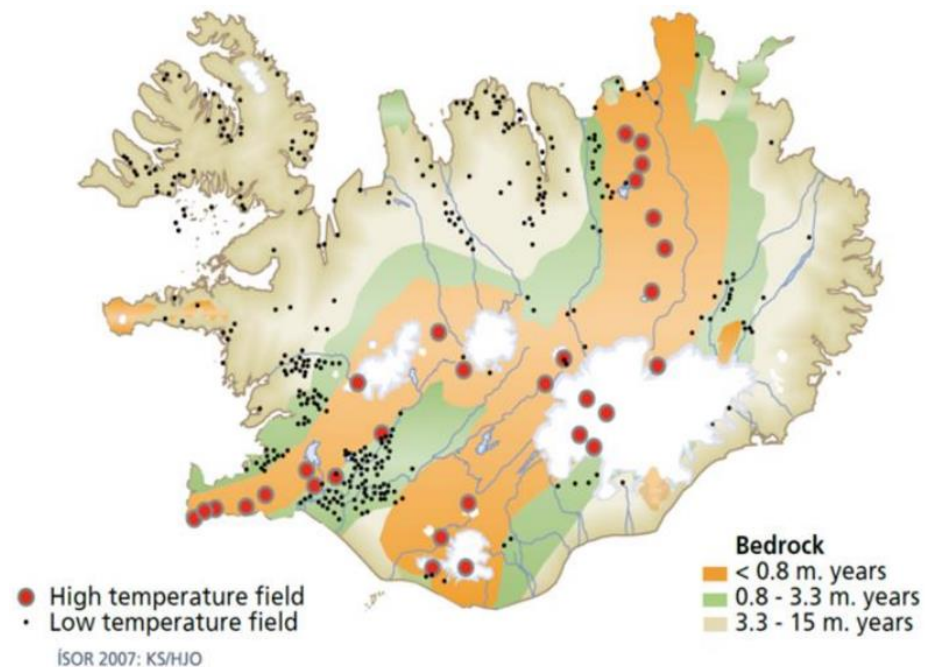
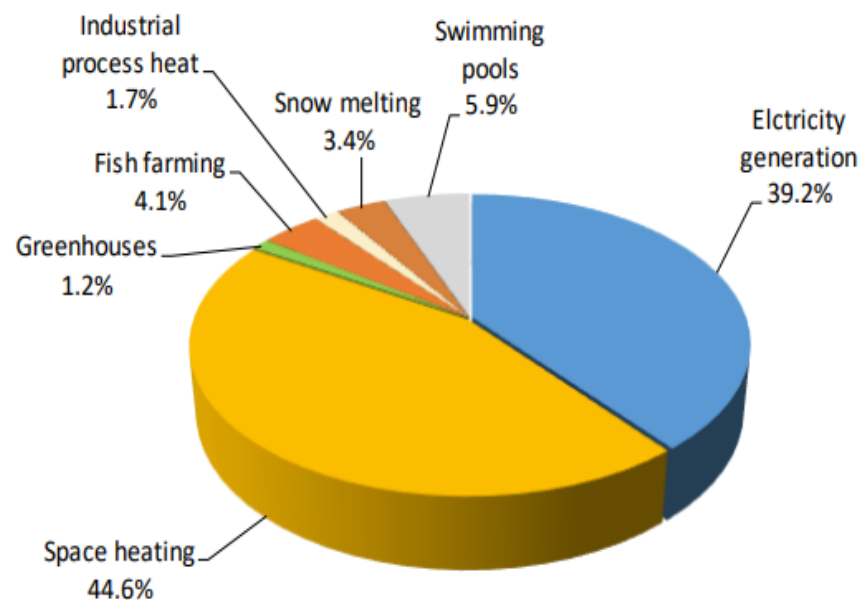
MYND 5.5: VALDIR AÐILAR OG VERKEFNI Í LAXELDI Á LANDI (TONN)²⁵³



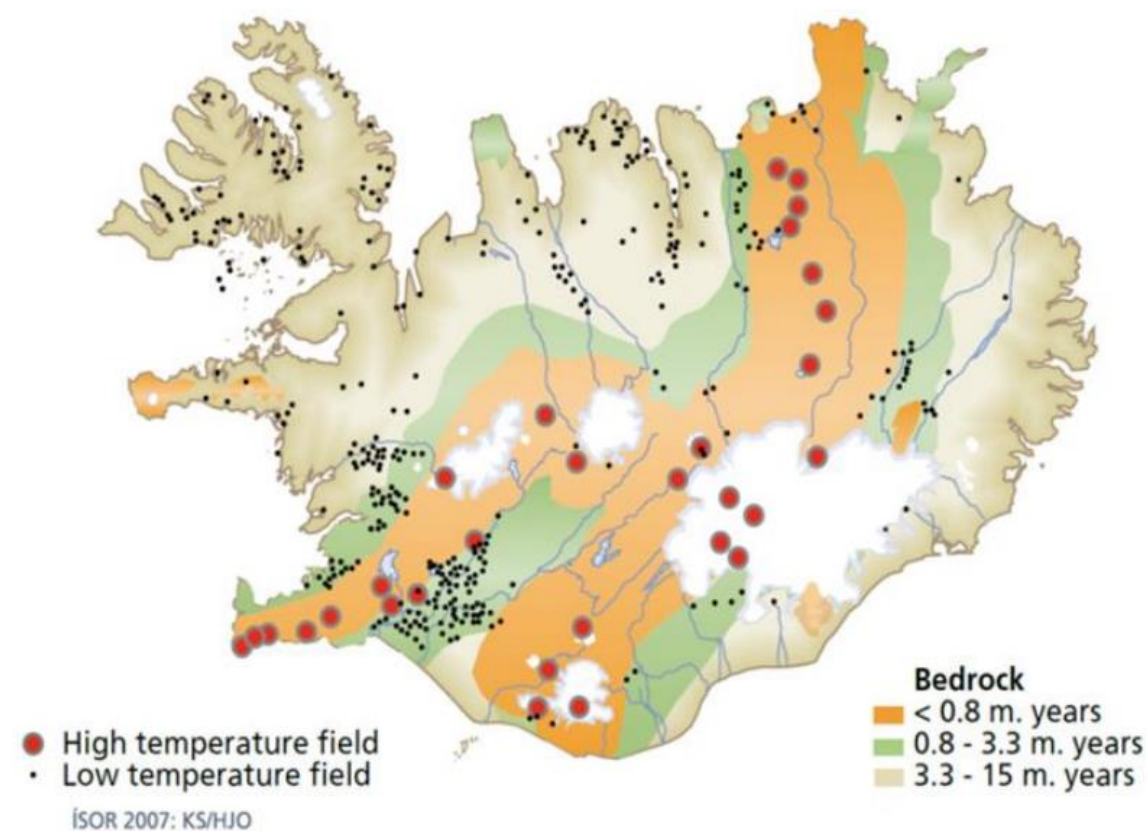
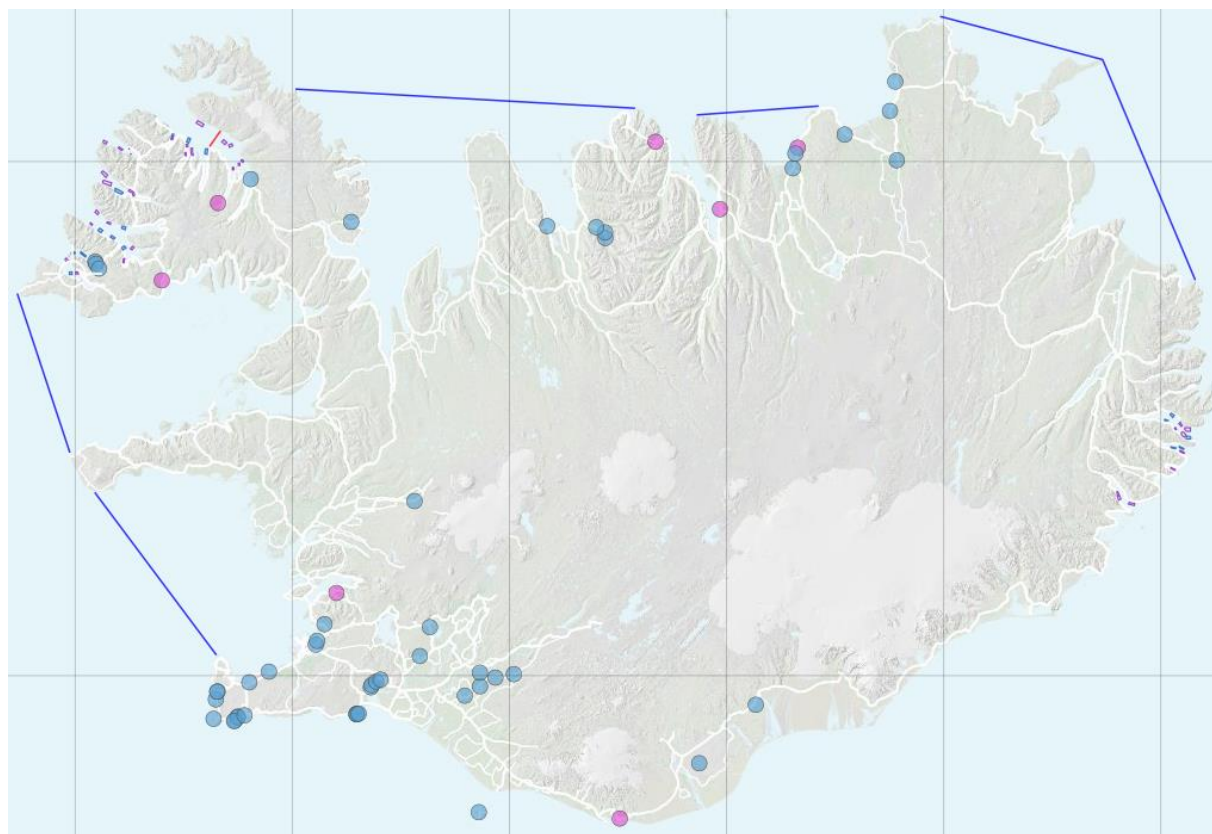
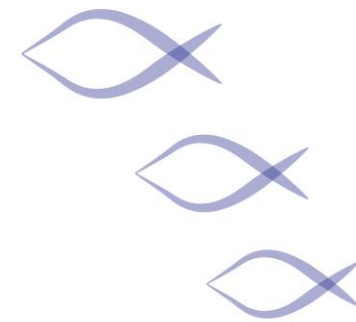


Geotermisk energi

- Over 66% av alle hus på Island er varmet opp med varmt vann.
- Geotermisk strømproduksjon dekker 25% av det islandske strømbehovet.



Fiskeoppdrett på Island

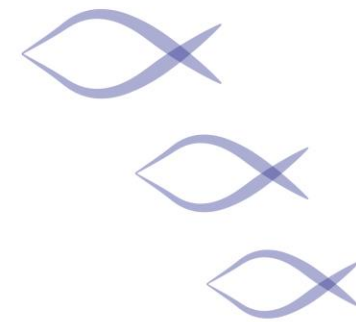




Mulige konsekvenser av geotermisk energy i oppdrett...

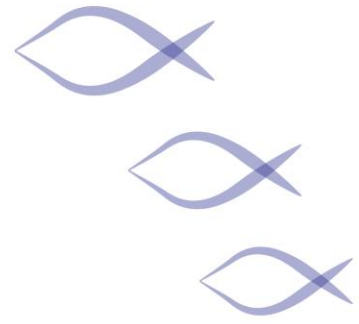
- Høyere vanntemperatur
- Stabil temperatur gjennom året
- Strømbesparende





The good, the bad and the...

Mulige konsekvenser av geotermisk energy i oppdrett...



Gassblæresyke

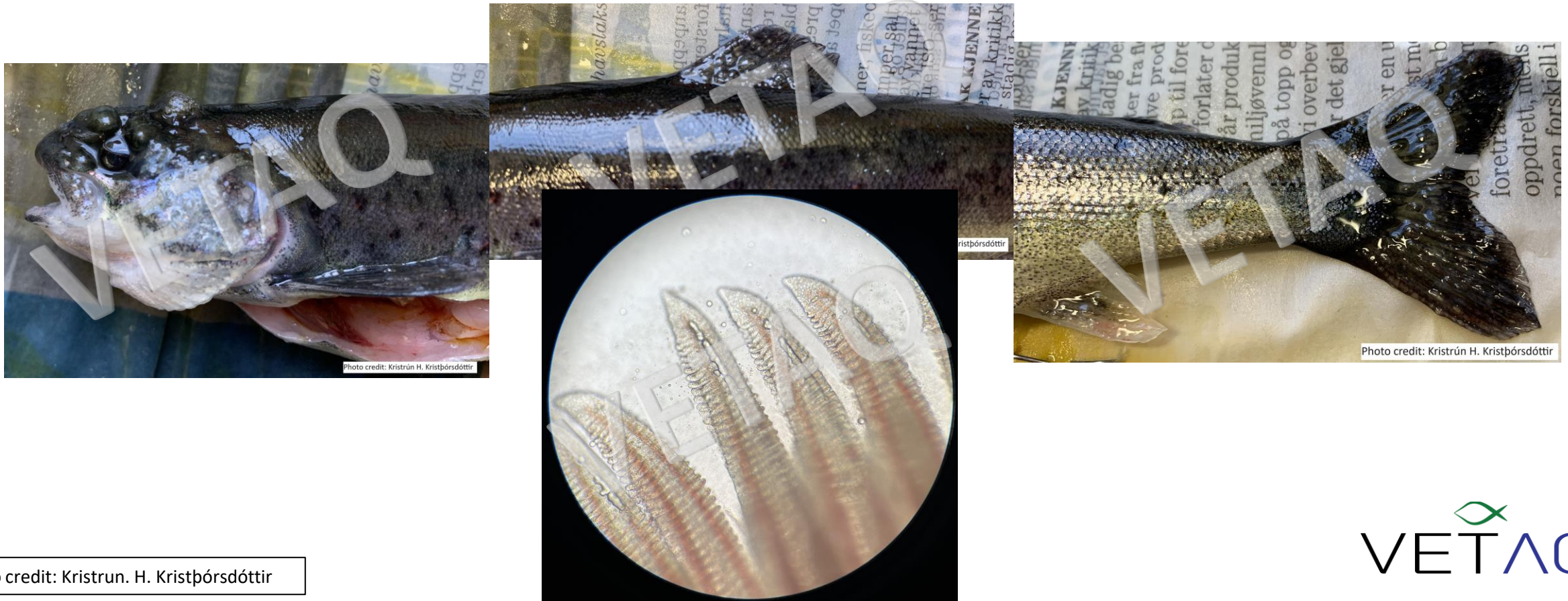


Photo credit: Kristrun. H. Kristþórsdóttir

Gassblæresyke

- Høy **T**otal **G**as **P**ressure (RES, nitrogen)
 - Varme
 - Trykk
- Kaldt vann har en større evne til å holde på gasser enn varmt vann

Kaldt vann + varme = varmere vann + gassovermetning

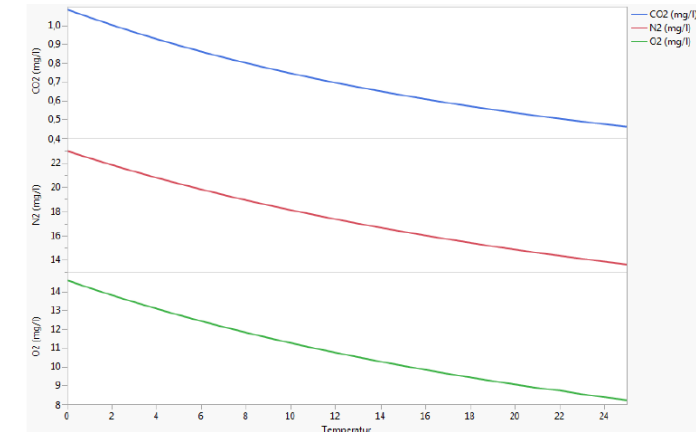
- Gassbobler dannes i fiskeblodet og blir til gassembolier i kapillærer
- Fisken sliter med å kvitte seg med gassemboliene
- Søker dypere i karet/merden
 - 1 atm ved vannoverflaten: 16,4 mg/L nitrogen
 - 2 atm på 10 m dyp: 32,8 mg/L nitrogen
- Blir i mange tilfeller med smolten ut til sjøen



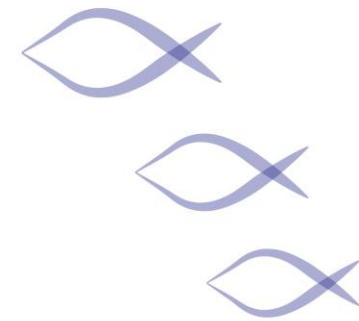
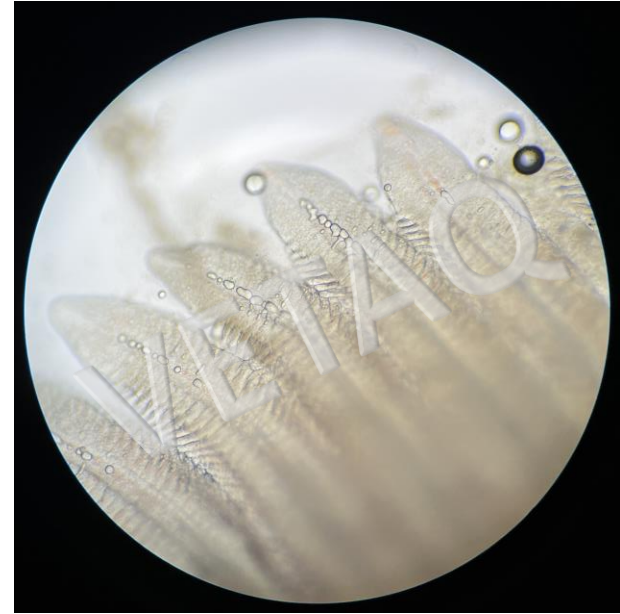
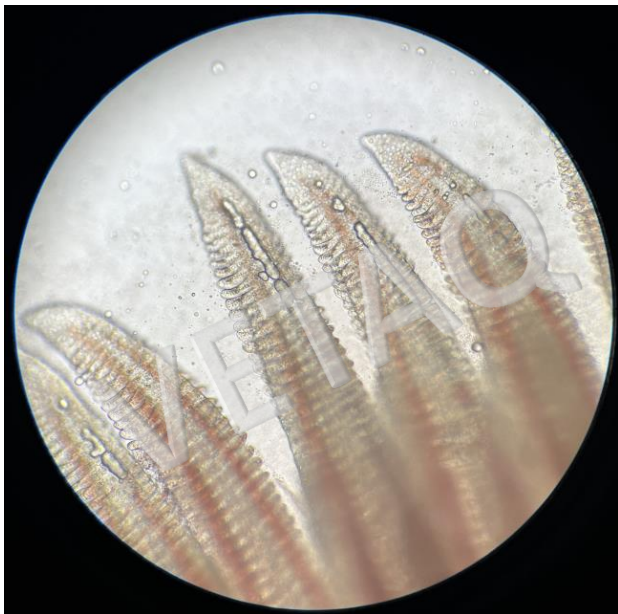
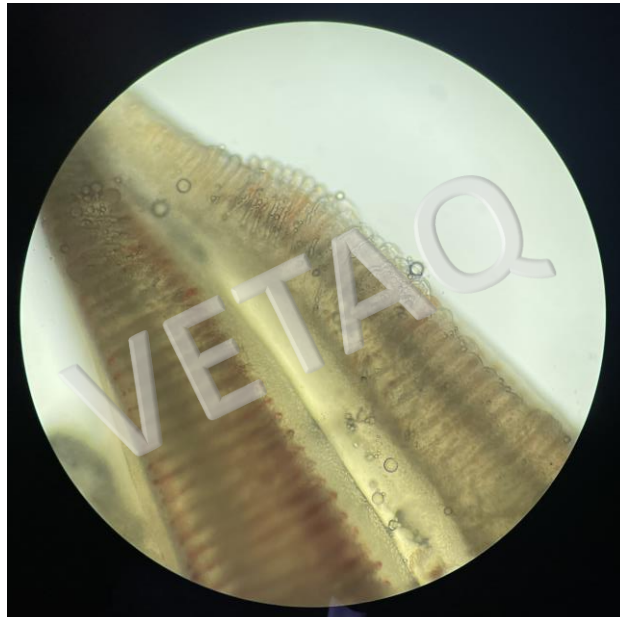
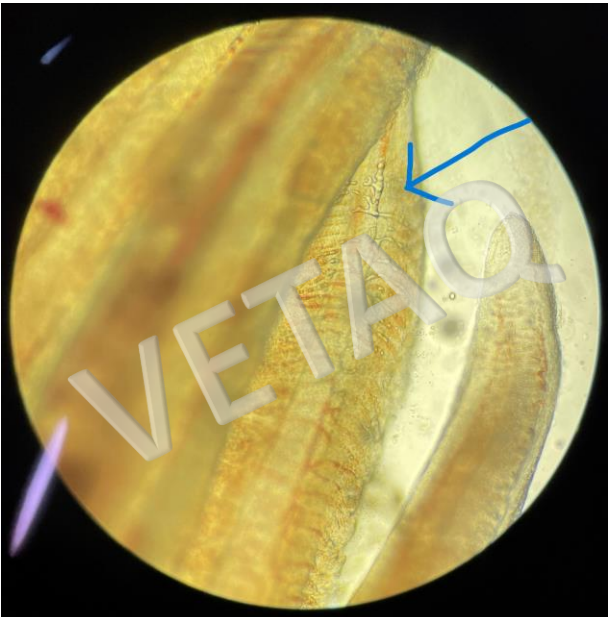
Photo credit: Kristrun. H. Kristþórsdóttir



Forhold mellom konsentrasjon av gass og temperatur (ferskvann)



Kilde: T. Kristensen, Nord University



Sjónlegg

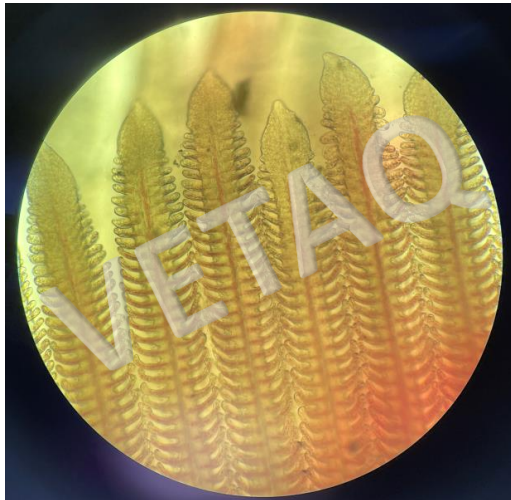
Settefisk

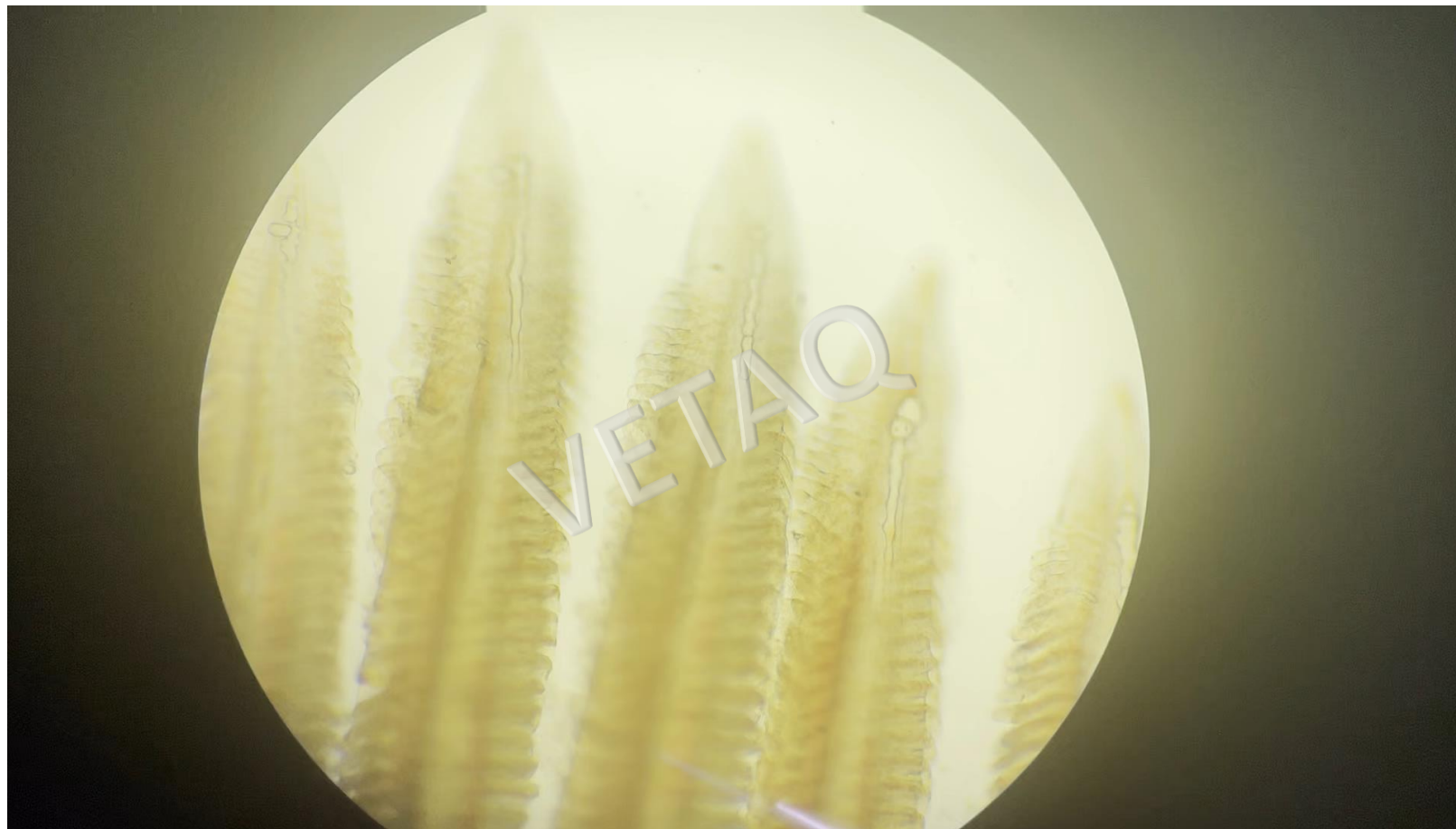
Photo credit: Krístrun. H. Krístþórsdóttir



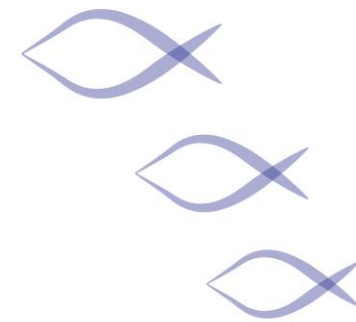
Gassblærescore

- Score for alvorlighetsgrad av gassebolier
 - Score fra 0-3
 - Størrelse på gassblærene
 - Prevalens i gjellefilamentene
- Kun et mikroskop og et par øyne trenges for å score gjeller!





Gassblærescore

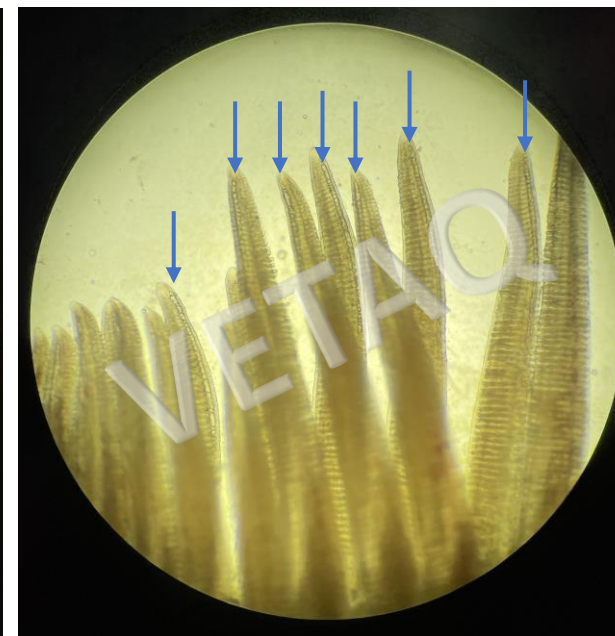
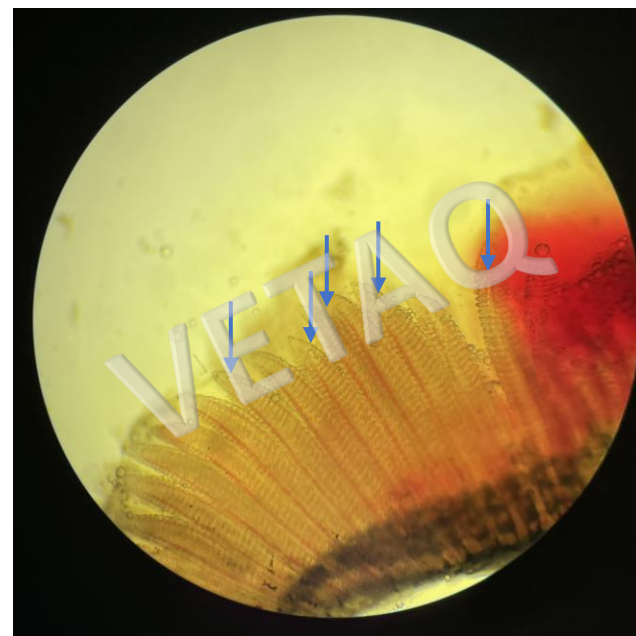
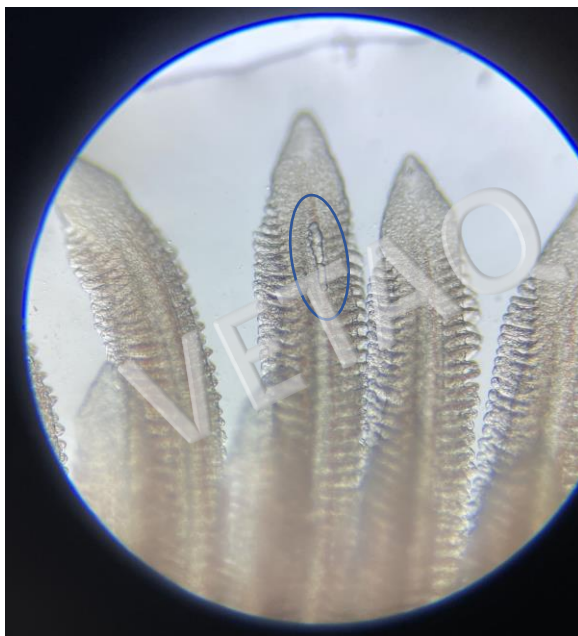


0,5

1

2

3

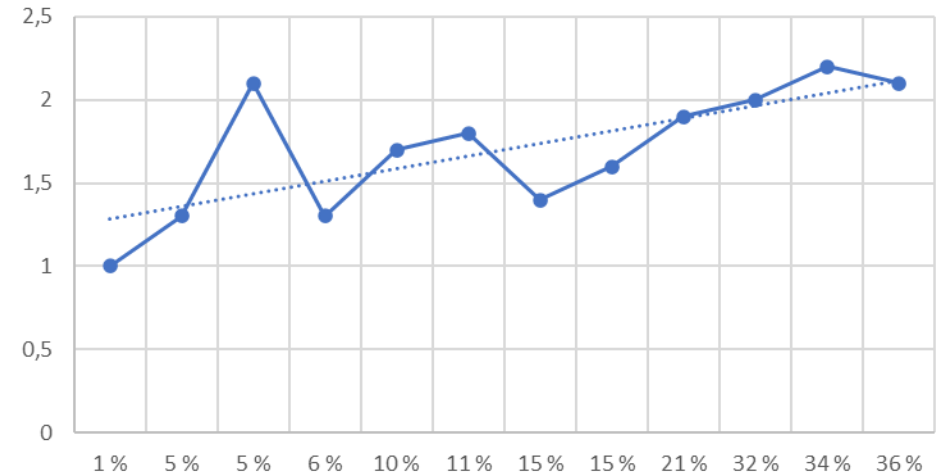




Gassblæresykdom i smolt ved utsett

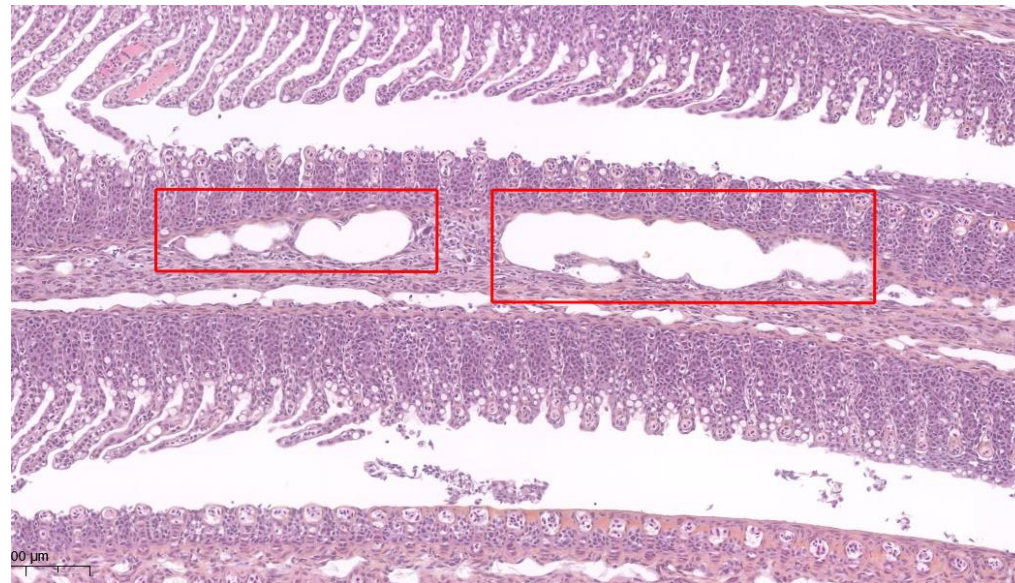
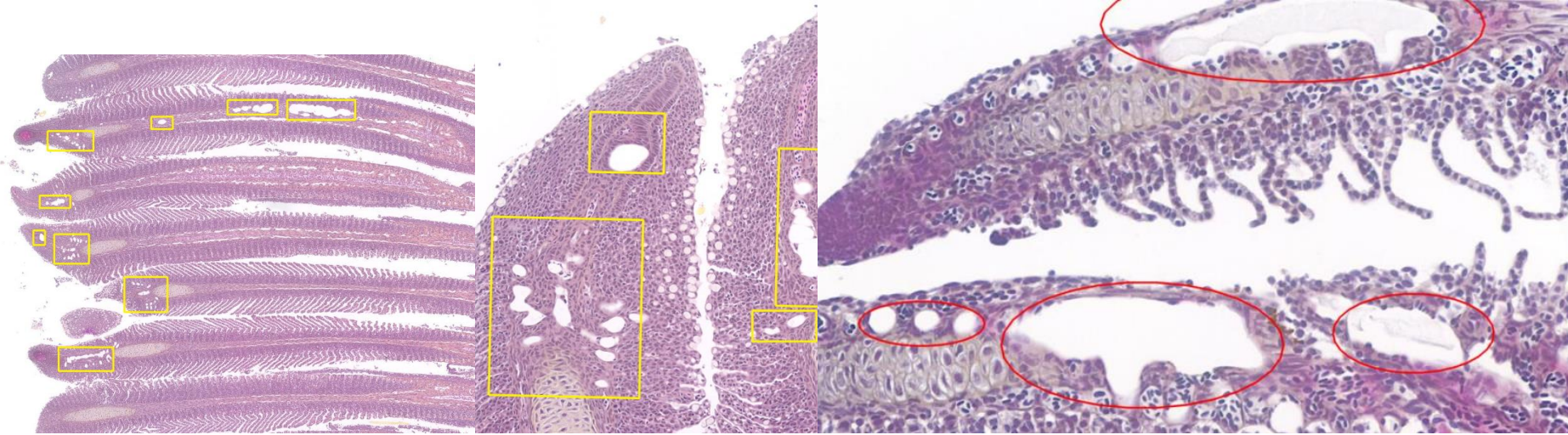
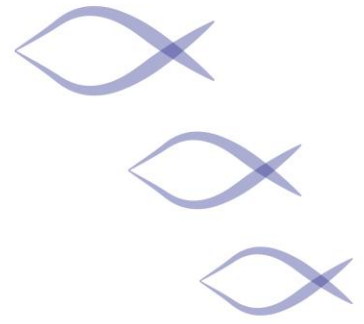
- Alvorlighetsgrad av gassebolier i gjeller scoret fra 0-3
- Det ser ut til å være sammenheng mellom gassblære score og utsettsdødelighet
 - MEN, n var ikke stort nok for at resultatet ble statistisk signifikant.

Gasbubbles in gills (0-3)

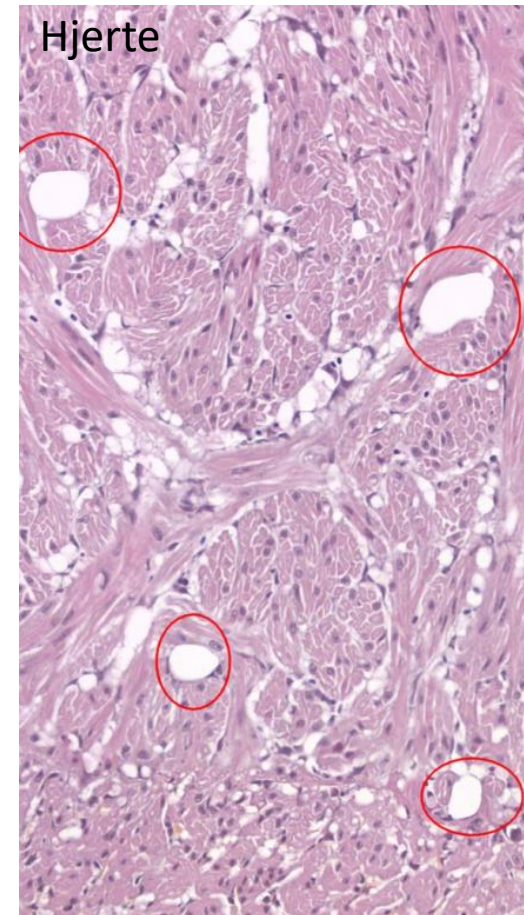
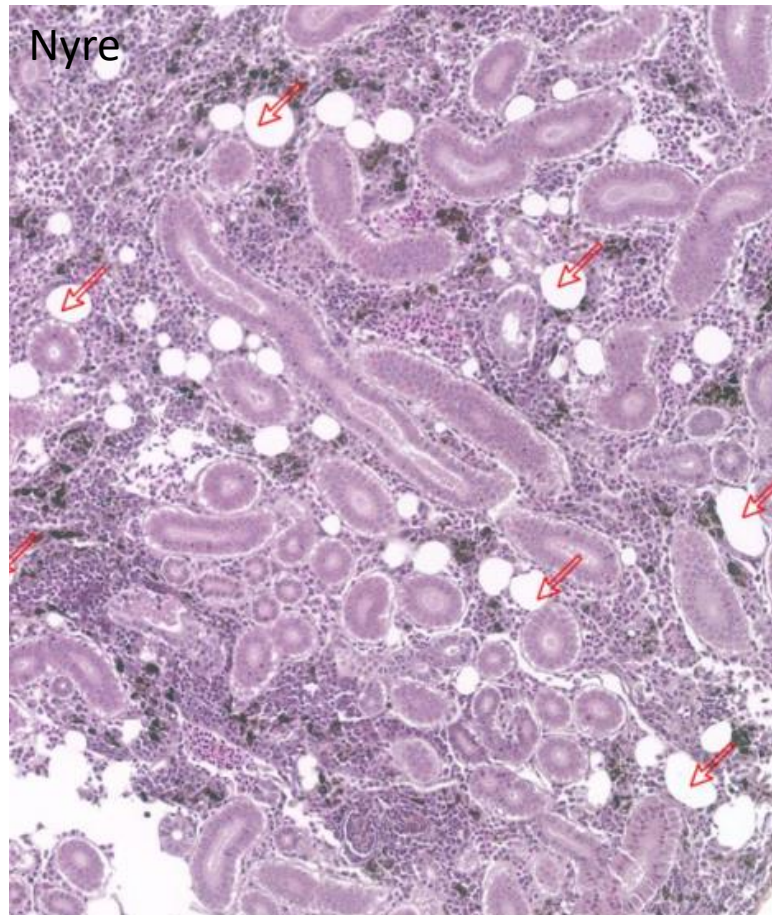


Cage	Acc. mort. 60 d	Gasbubbles in gills (0-3)
1	32 %	2
2	5 %	1,3
3	10 %	1,7
4	21 %	1,9
5	5 %	2,1
6	1 %	1
7	36 %	2,1
8	6 %	1,3
9	34 %	2,2
10	15 %	1,4
11	11 %	1,8
12	15 %	1,6

Gassembolier (?) i gjeller - Histo



Gassembolier (?) i indre organer - Histo





Men hvorfor skjer dette?

Avdeling A



- Vacumlufter
- TGP verdier <100%
- Ingen gassbobler observert før flytting
- Lav dødelighet

Pumping

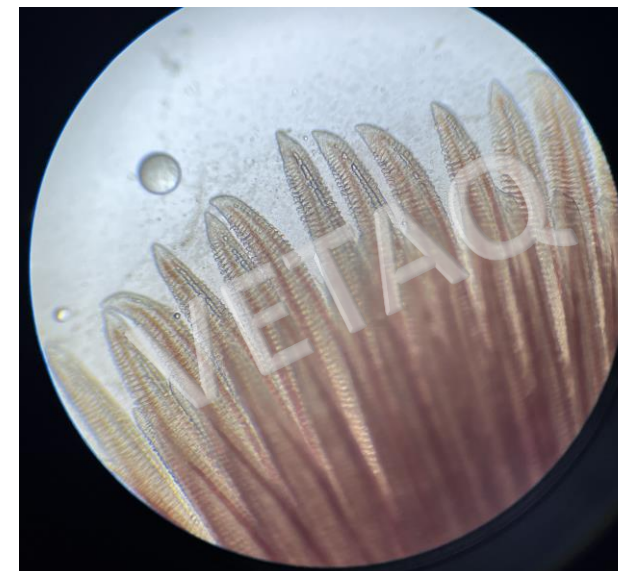
Sortering

+ Vaksinerings

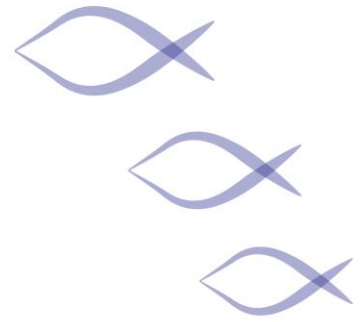
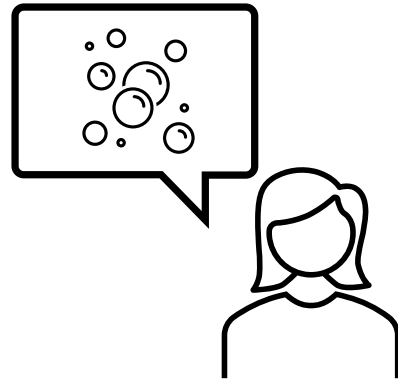
Pumping

Trykkfallssyke?

Avdeling B



- Vacumlufter
- TGP verdier <100%
- Gj.sn gassblærescore 1,3
- Høyeste gassblærescore 3
- Alle dødfisk gapende



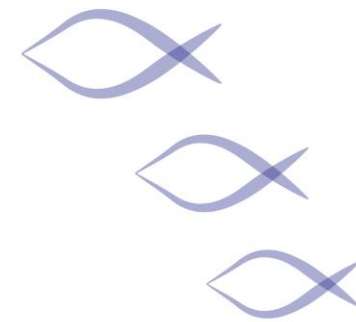
Wanna talk bubbles?



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Tusen takk for oppmerksomheten!

