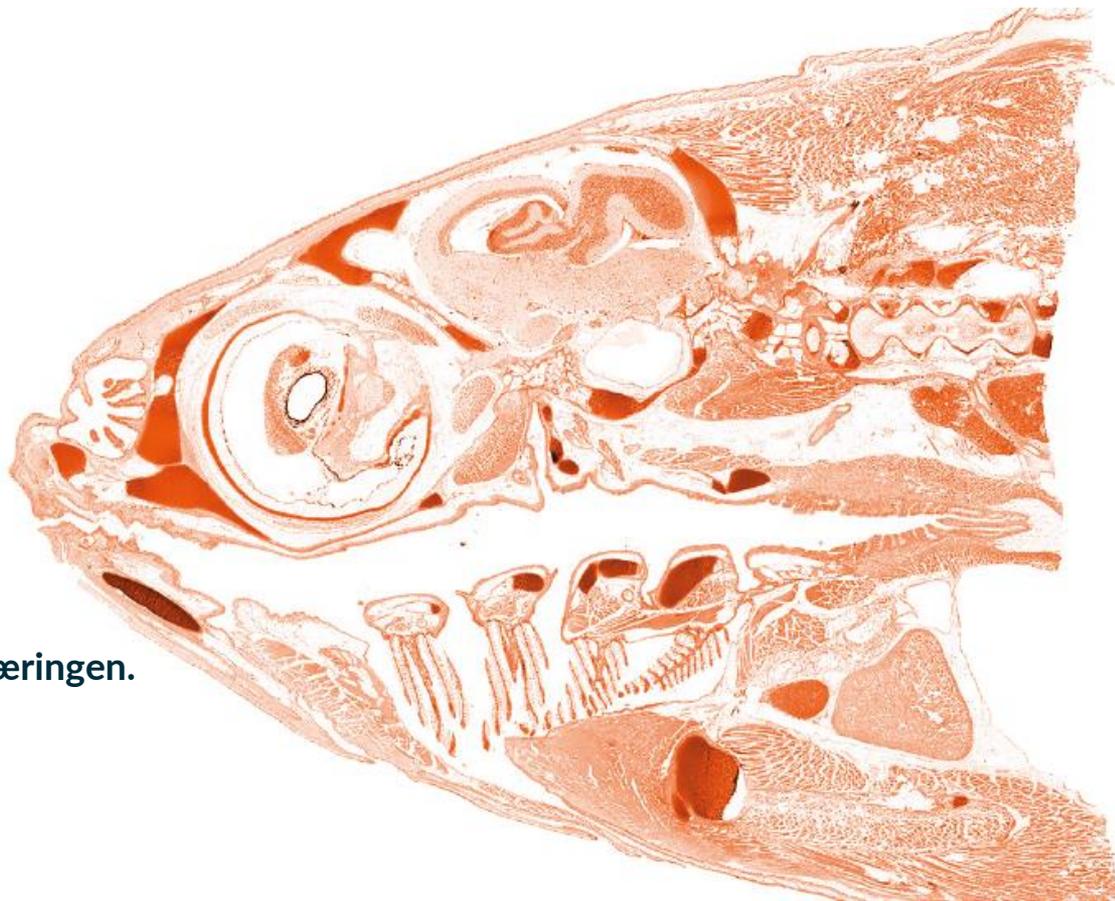


GillRisk FHF 901515

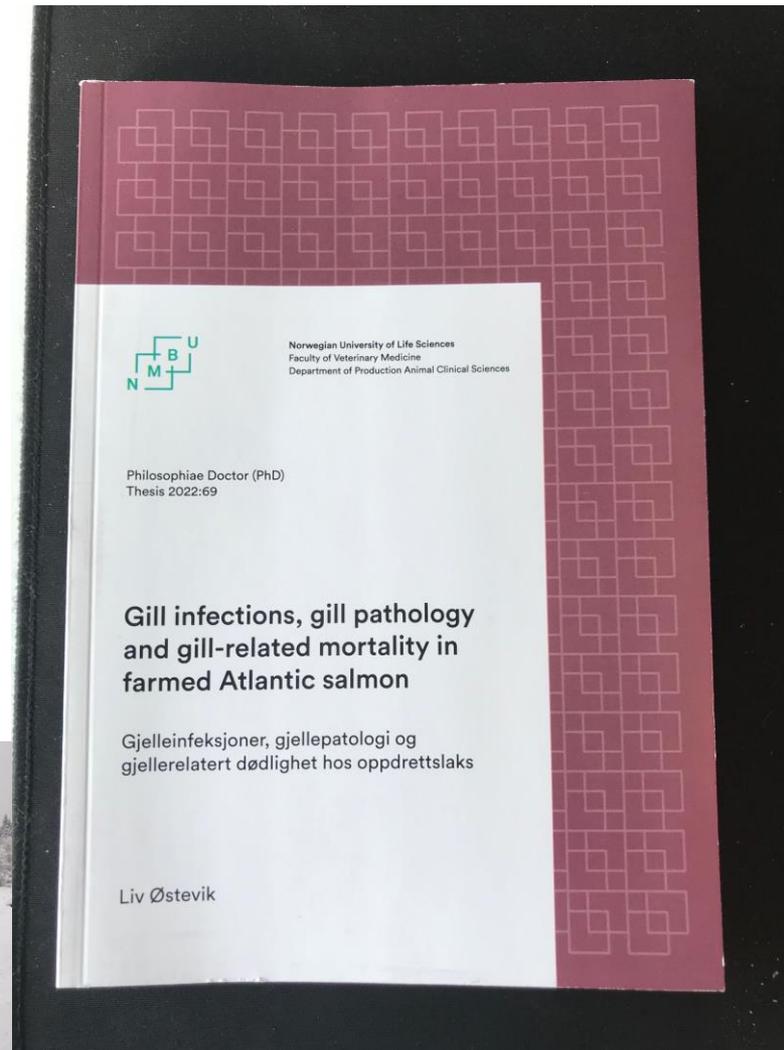
Arbeidsmøte om gjelleutfordringer i laksenæringen.
Trondheim, Mars 2023

Marta Alarcón (marta.alarcon@zoetis.com)



Agenda

- Article 1: Cohort study
- Article 2: Net cleaning
- Article 3: Thermal and mechanical delousing
- Conclusions



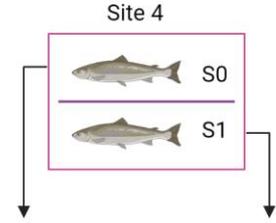
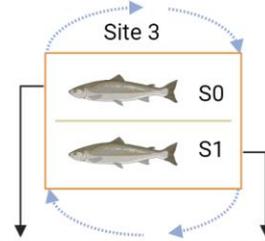
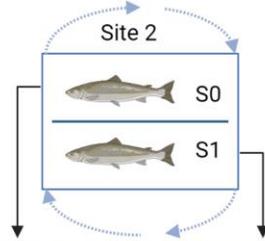
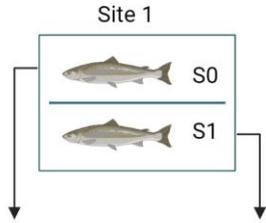
RESEARCH ARTICLE |  Open Access |    

A cohort study of gill infections, gill pathology and gill-related mortality in sea-farmed Atlantic salmon (*Salmo salar* L.): A descriptive analysis

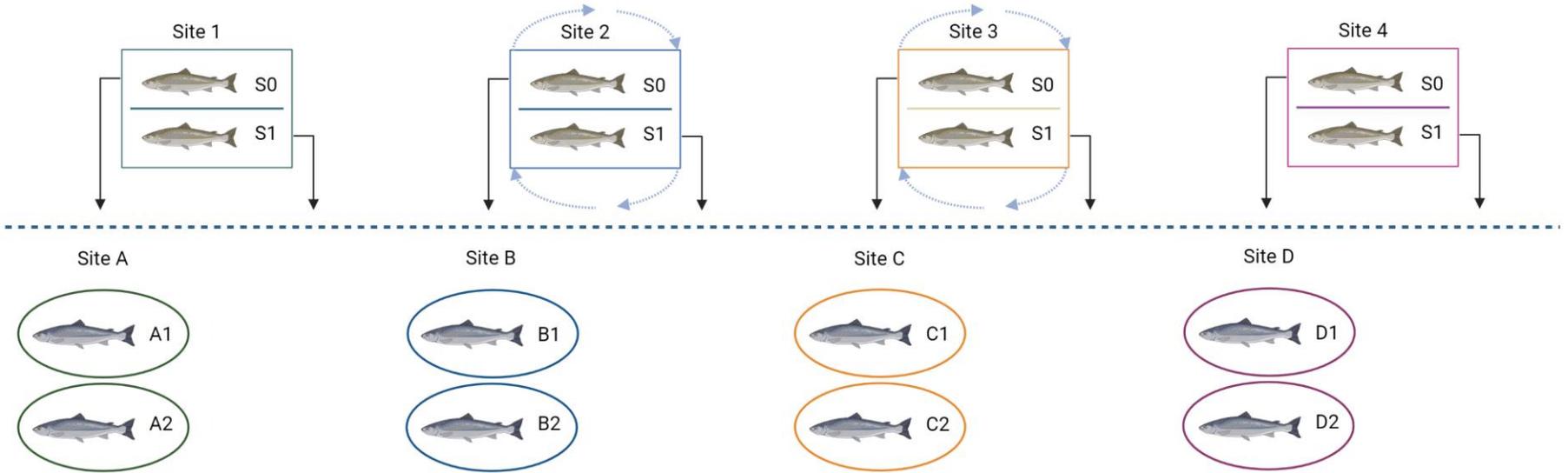
Liv Østevik , Marit Stormoen, Hege Hellberg, Marianne Kraugerud, Farah Manji, Kai-Inge Lie, Ane Nødtvedt, Hamish Rodger, Marta Alarcón

First published: 16 June 2022 | <https://doi.org/10.1111/jfd.13662>

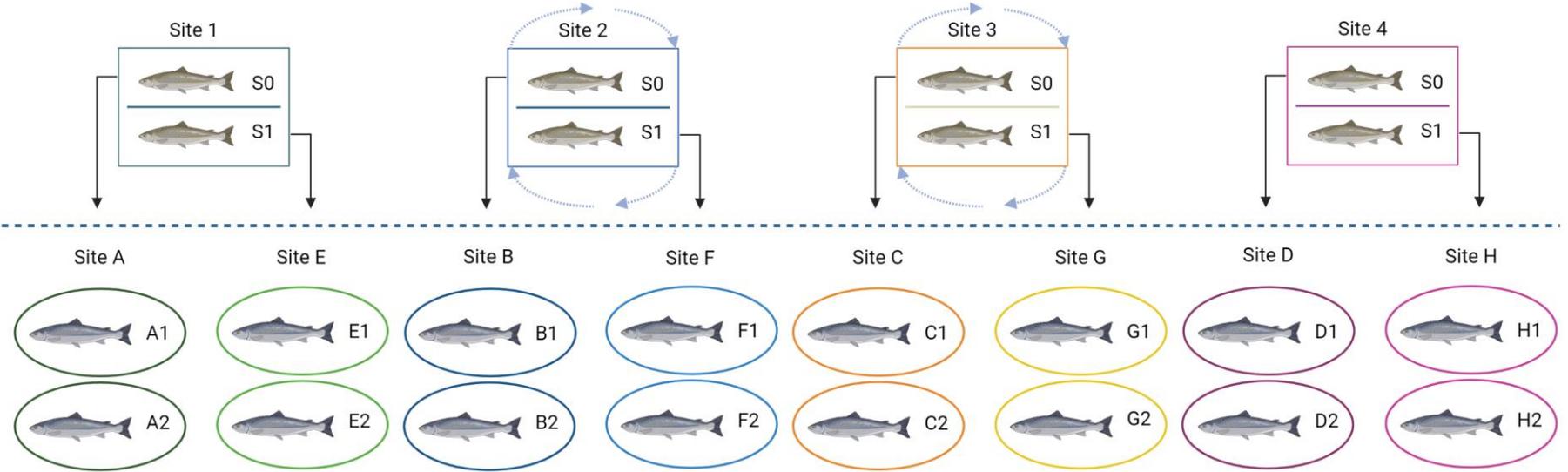
Design cohort study



Design cohort study

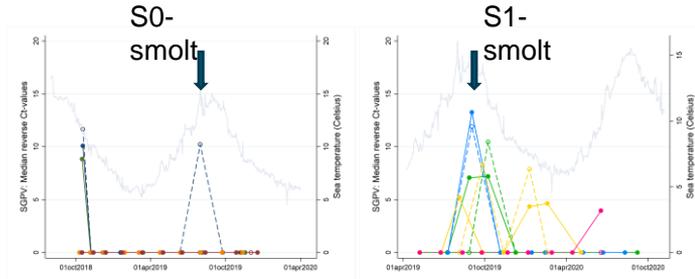


Design cohort study

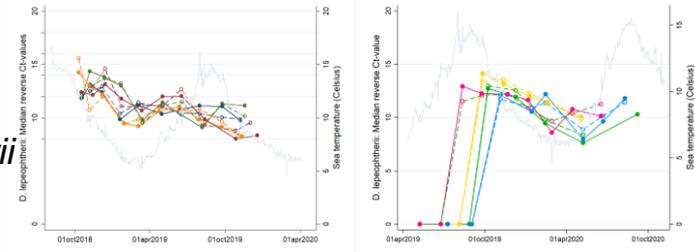


Histology n=4247 , qPCR n=4311 , gross gill score n=15553, water samples n=323

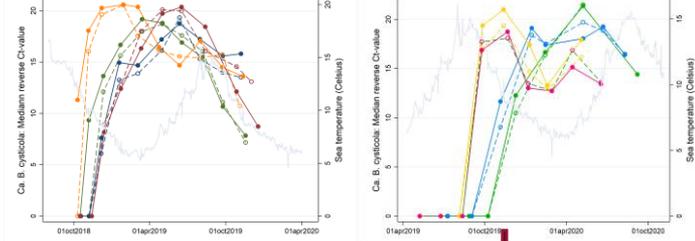
SGPV



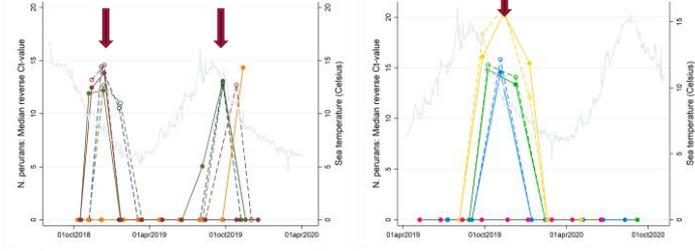
D. lepeophtherii



Ca. B. cysticola



N. perurans



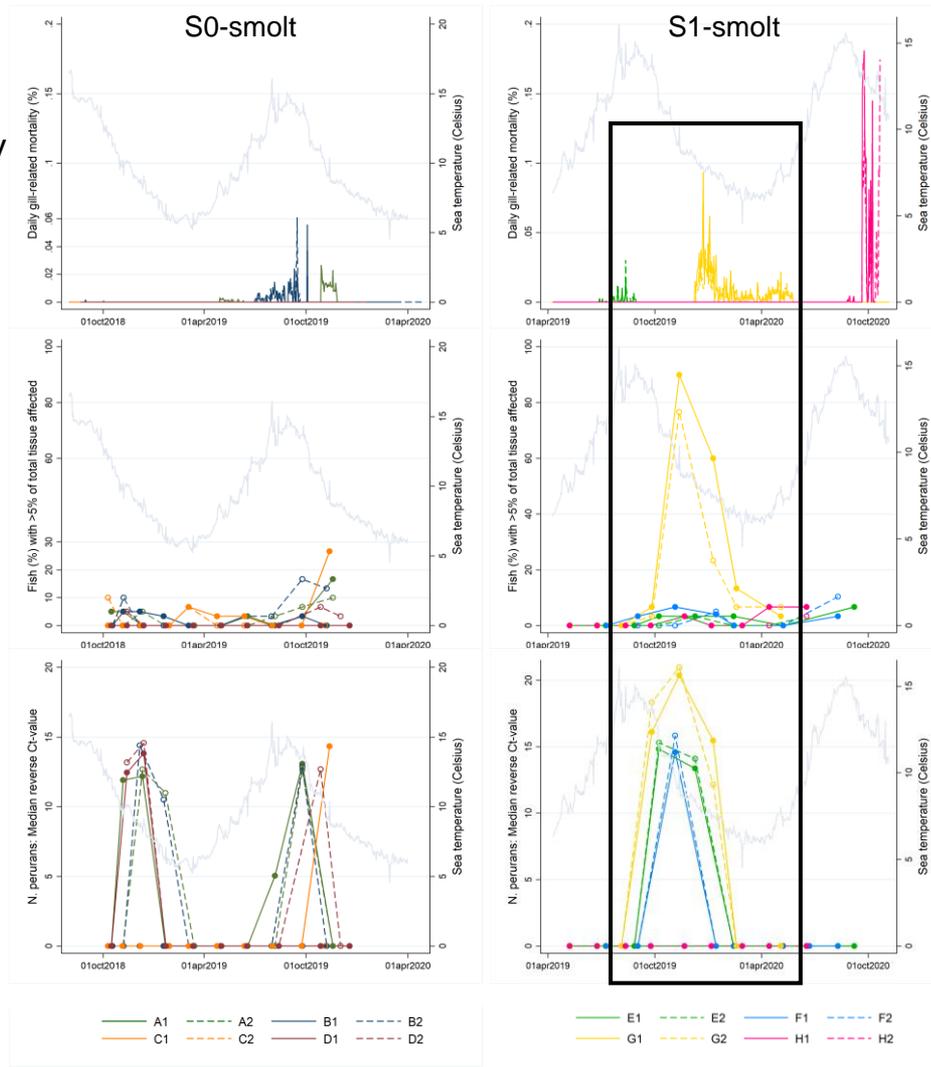
Temporal development of these infections follow different patterns



Daily gill-related mortality

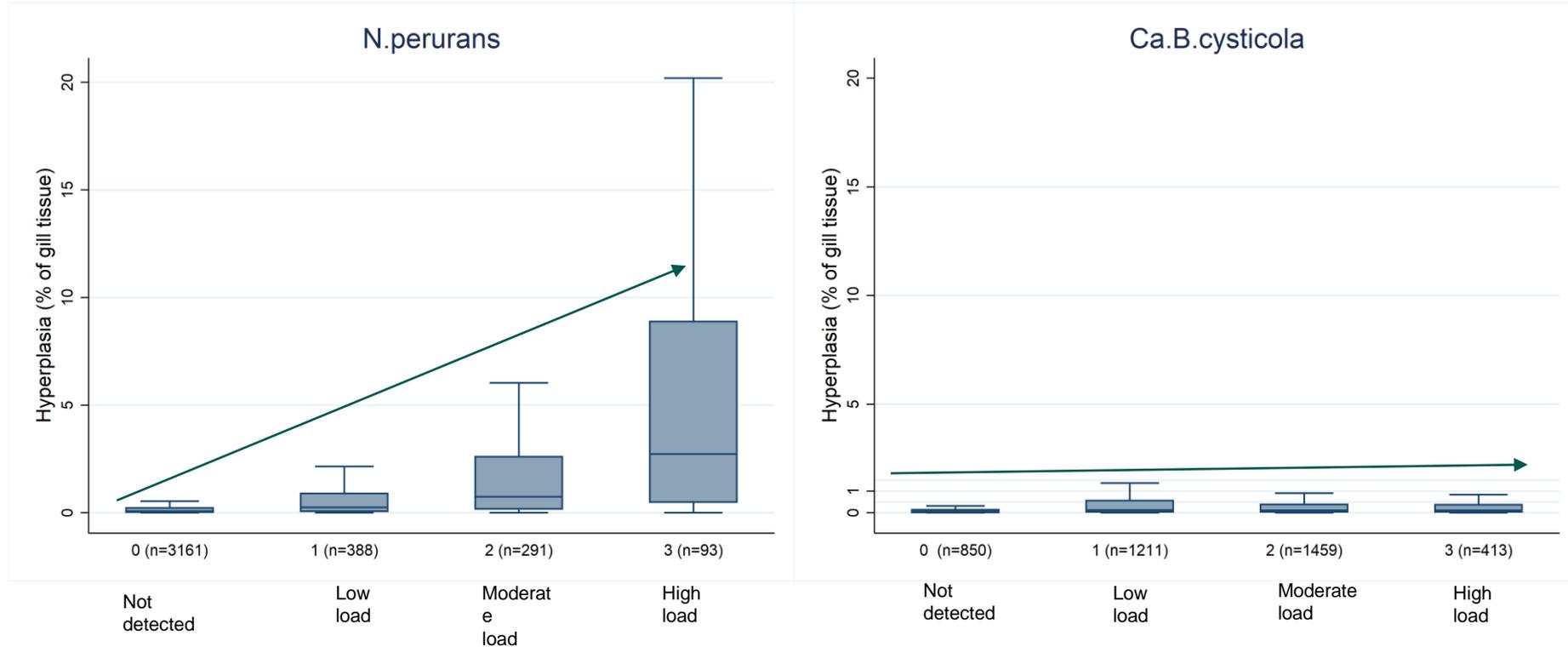
Fish (%) >5% of gill tissue affected (histology)

N. perurans



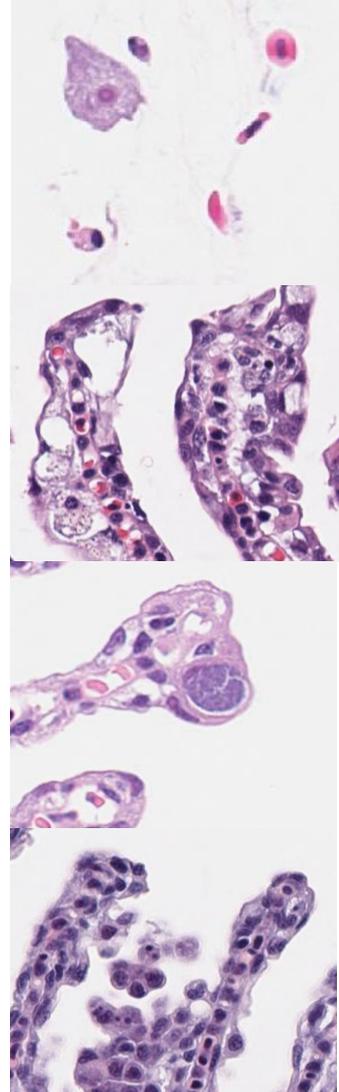
High loads of *N. perurans* coincide with gill pathology and gill-related mortality

Increasing level of pathology (hyperplasia) with increasing load of *N.perurans*, but not *Ca. B. cysticola*



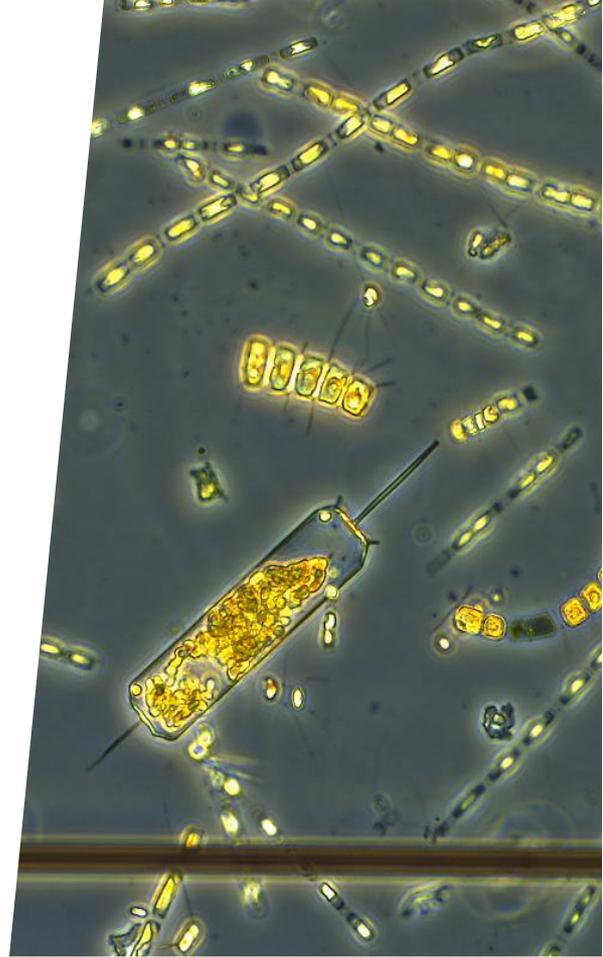
Temporal development of gill infections

- ***D. lepeophtherii* and *Ca. B. cysticola***
 - All fish-groups infected after sea-transfer
 - Infections persists through out production
 - No clear seasonal variation
- ***N. perurans* and amoebic gill disease (AGD)**
 - Clear seasonal variation in pathogen prevalence and load
 - All fish-groups positive by PCR, most AGD on histology
 - Disease resolve with fallling temperatures
- **SGPV**
 - Tendency for seasonal variation, disappearing and reappearing within groups
 - All fish-groups infected independent of infection status in freshwater
 - Horizontal transfer at sea



Gill disease, plankton and gill infections

- *N. perurans*
 - Most important cause of gill pathology
 - Moderate association with epithelial hyperplasia
- **SGPV, *Ca. B. cysticola* and *D. lepeophtherii***
 - Low or no association with extent gill pathology
 - Exception: epithelial cell necrosis and apoptosis clearly associated with SGPV (and *Ca. B. cysticola*)
- **Jellyfish and phytoplankton**
- **Pasteurellose**
- **Co-infections**





Assessment of acute effects of *in situ* net cleaning on gill health of farmed Atlantic salmon (*Salmo salar* L)

[Liv Østevik](#)^a  , [Marit Stormoen](#)^b, [Ane Nødtvedt](#)^b, [Marta Alarcón](#)^a, [Kai-Inge Lie](#)^a, [Andreas Skagøy](#)^c, [Hamish Rodger](#)^d

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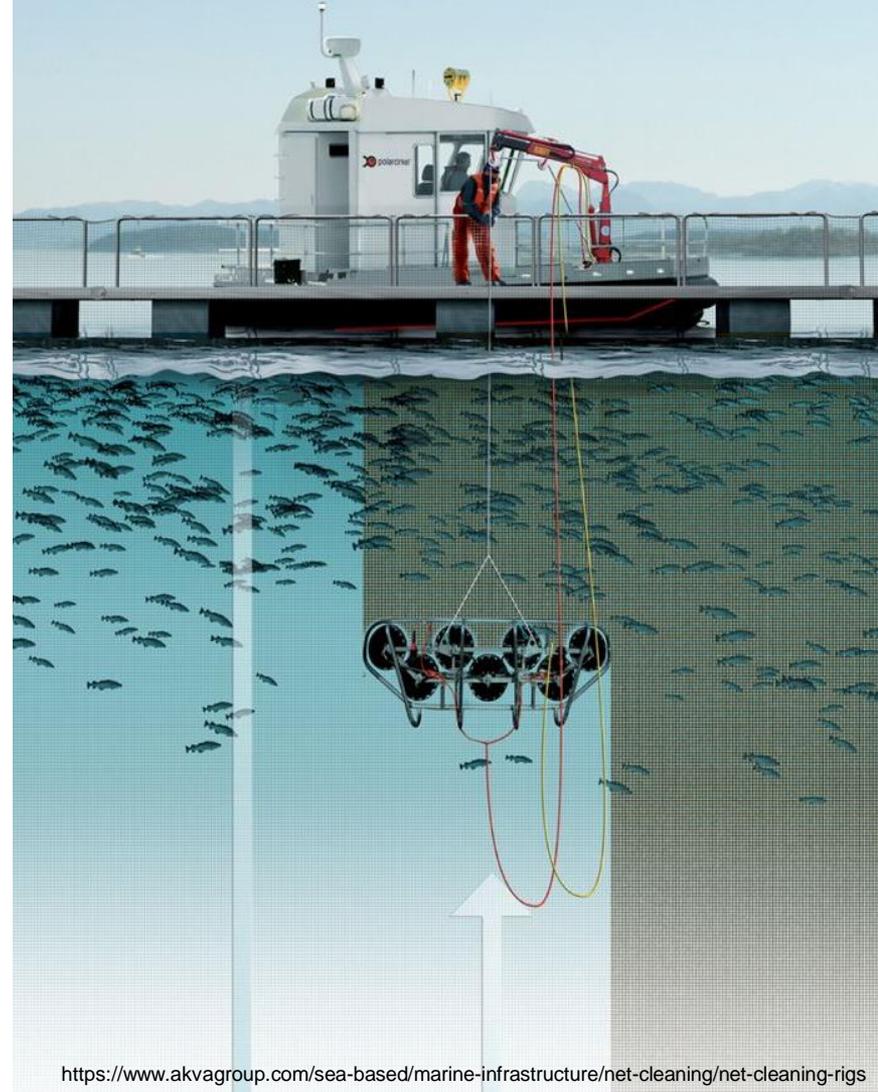
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<https://doi.org/10.1016/j.aquaculture.2021.737203> ↗

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Net cleaning

- Design - historical control trial
 - 3 pens
 - ≤ 24 hours pre- and post-treatment
 - 8 days after treatment
 - 30 fish per time point/pen
- Microscopic assessment
- Data on daily total mortality, specific feed rate and specific daily growth rate



Net cleaning and gill health

- Across all groups no significant difference
- More fish with gill thrombi at one day after net cleaning of moderately fouled pens
- No difference at eight days
- No difference in total daily mortalities, specific feed rate or specific daily growth rate



Effects of thermal and mechanical delousing on gill health of farmed Atlantic salmon (*Salmo salar* L.)

[Liv Østevik](#)^a  , [Marit Stormoen](#)^b, [Øystein Evensen](#)^c, [Cheng Xu](#)^c, [Kai-Inge Lie](#)^a, [Ane Nødtvedt](#)^b, [Hamish Rodger](#)^d, [Andreas Skagøy](#)^e, [Farah Manji](#)^f, [Marta Alarcón](#)^a

Show more 

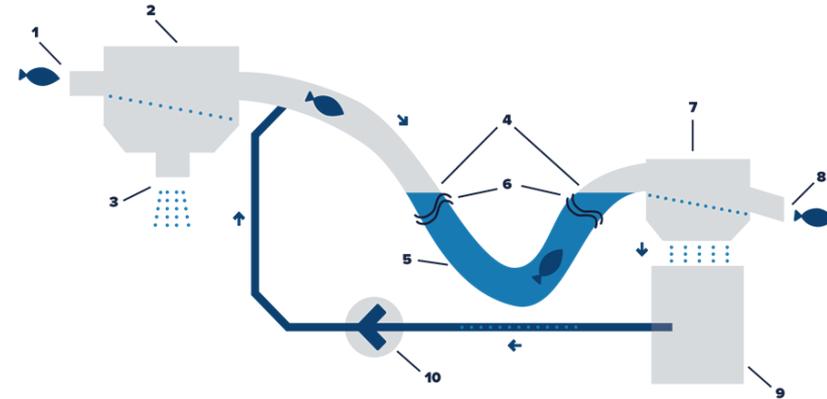
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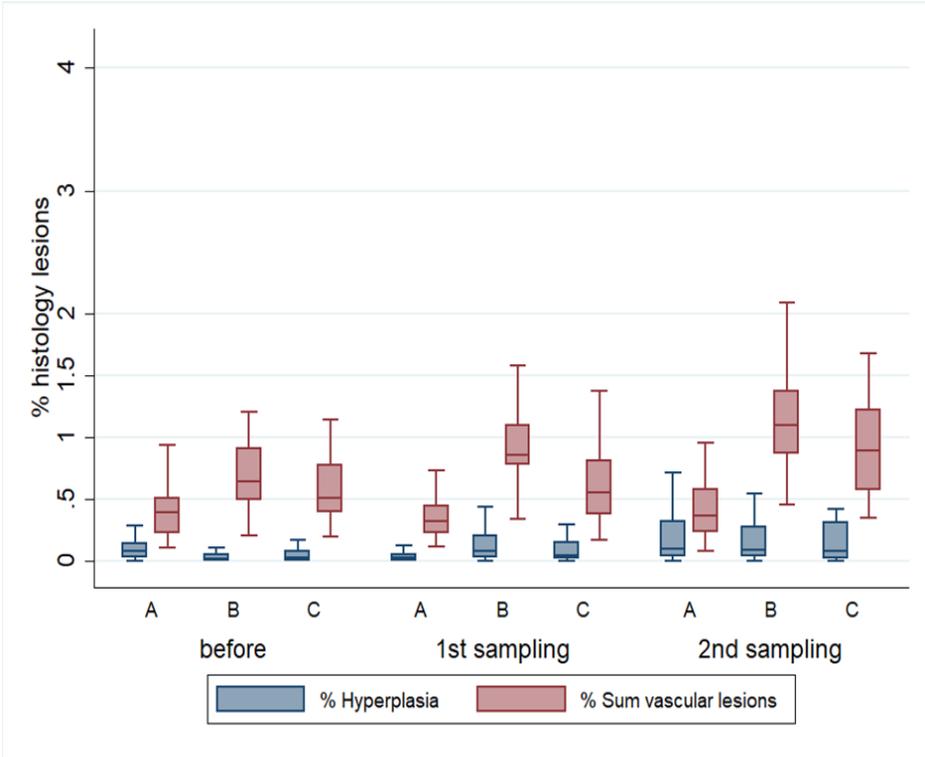
Thermal and mechanical delousing

- Design - historical control trial
 - 3 pens
 - ≤24 hours pre- and post-treatment
 - 6-9 days after treatment
 - 30 fish per time point/pen
- Microscopic assessment
- Total daily mortality data
- PCR-analysis microbes (thermal delousing)
- Gene-expression (thermal delousing)

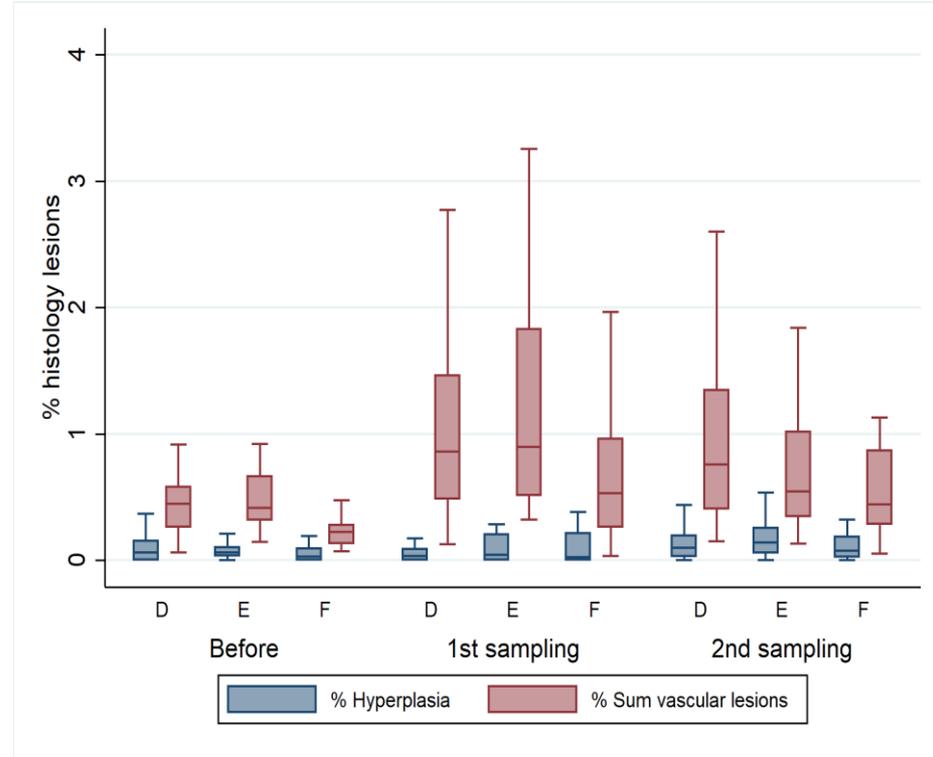


<https://scaleaq.no/produkt/thermolicer/>

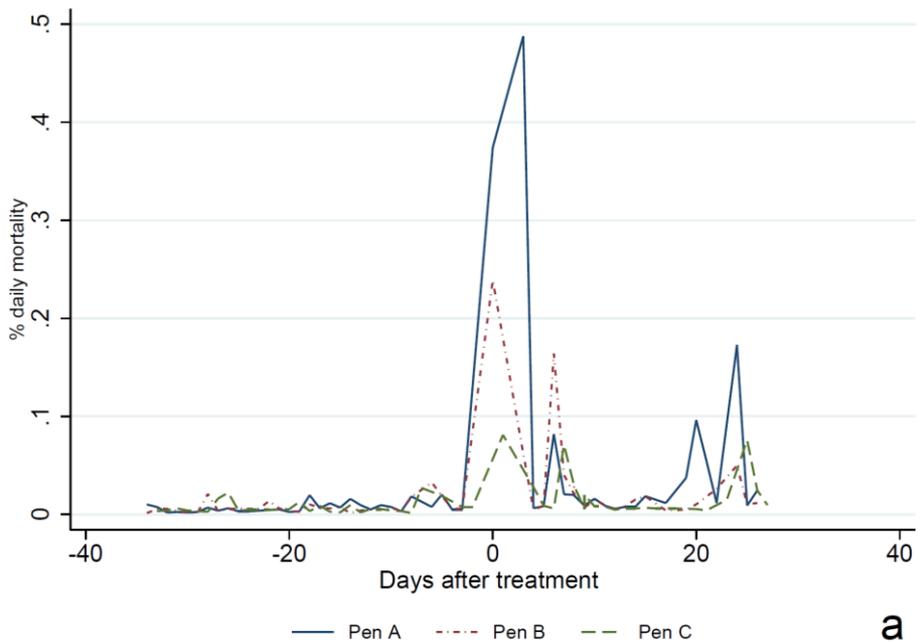
Thermal delousing



Mechanical delousing

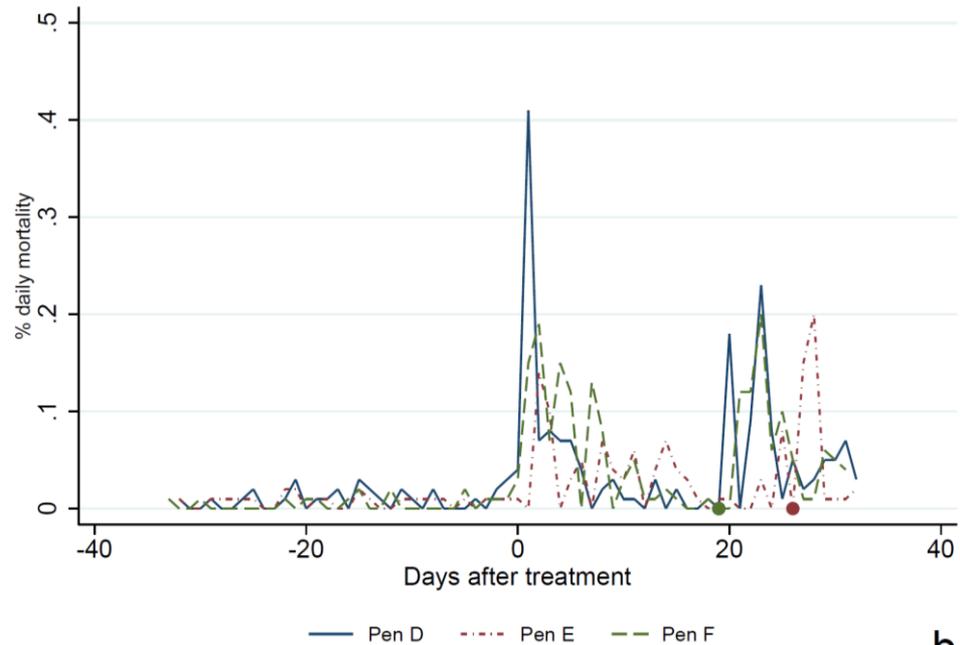


Thermal delousing



a

Mechanical delousing

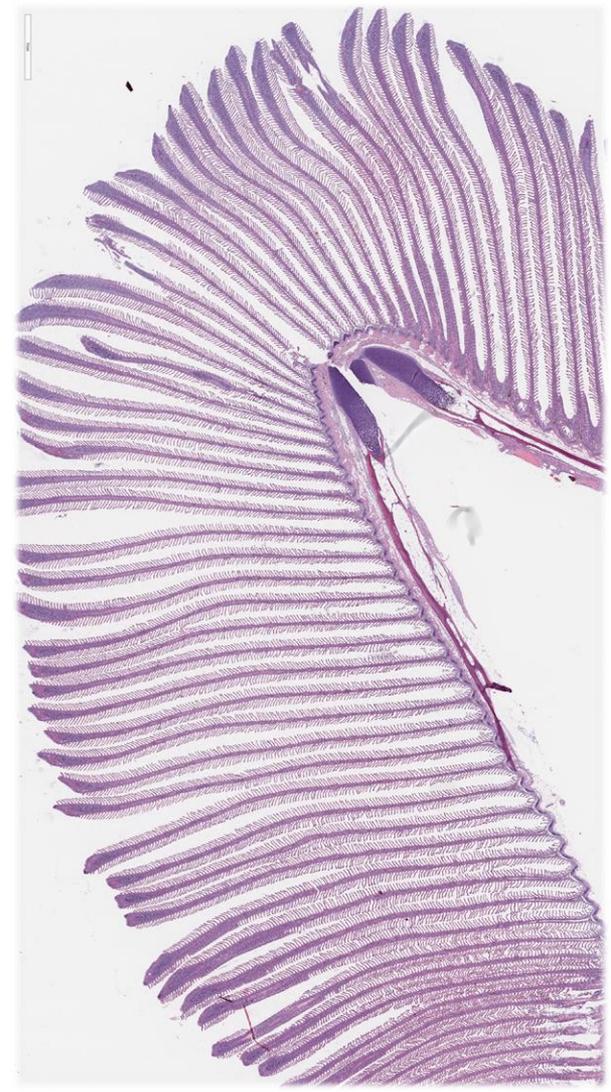


b

Increased mortality during and after delousing

Thermal and mechanical delousing and gill health

- More vascular and hyperplastic gill lesions
- More fish with microorganisms
- More *Ca. B. cysticola*
- Altered gene expression
- Daily mortality and mortality rates increased





Conclusions GillRisk

(epidemiologisk artikkel pågående)

- Seasonal pattern or tendency for seasonal pattern *N. perurans* and SGPV
- Persistent infection *Ca. B. cysticola* and *D. lepeophtherii*
- *Neoparamoeba perurans* most important cause of gill disease
- Phytoplankton and gelatinous zooplankton no impact on gill health
- Increased risk of lamellar thrombi after *in situ* net cleaning
- Thermal and mechanical delousing
 - Acute gill damage
 - Differential gene expression
 - Changes in pathogen prevalence and load

Thanks to supervisors, project partners, co-authors and funders

PhD: Liv Østevik

Main supervisor: Marit Stormoen

Co-supervisors: Ane Nødtvedt, Kai-Inge Lie and Hamish Rodger

Project partners and co-authors: Marta Alarcón, Hege Hellberg, Marianne Kraugerud, Farah Manji, Benedicte Simensen, Andreas Skagøy, Øystein Evensen, Cheng Xu, PA/FVGN histology og PCR team

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