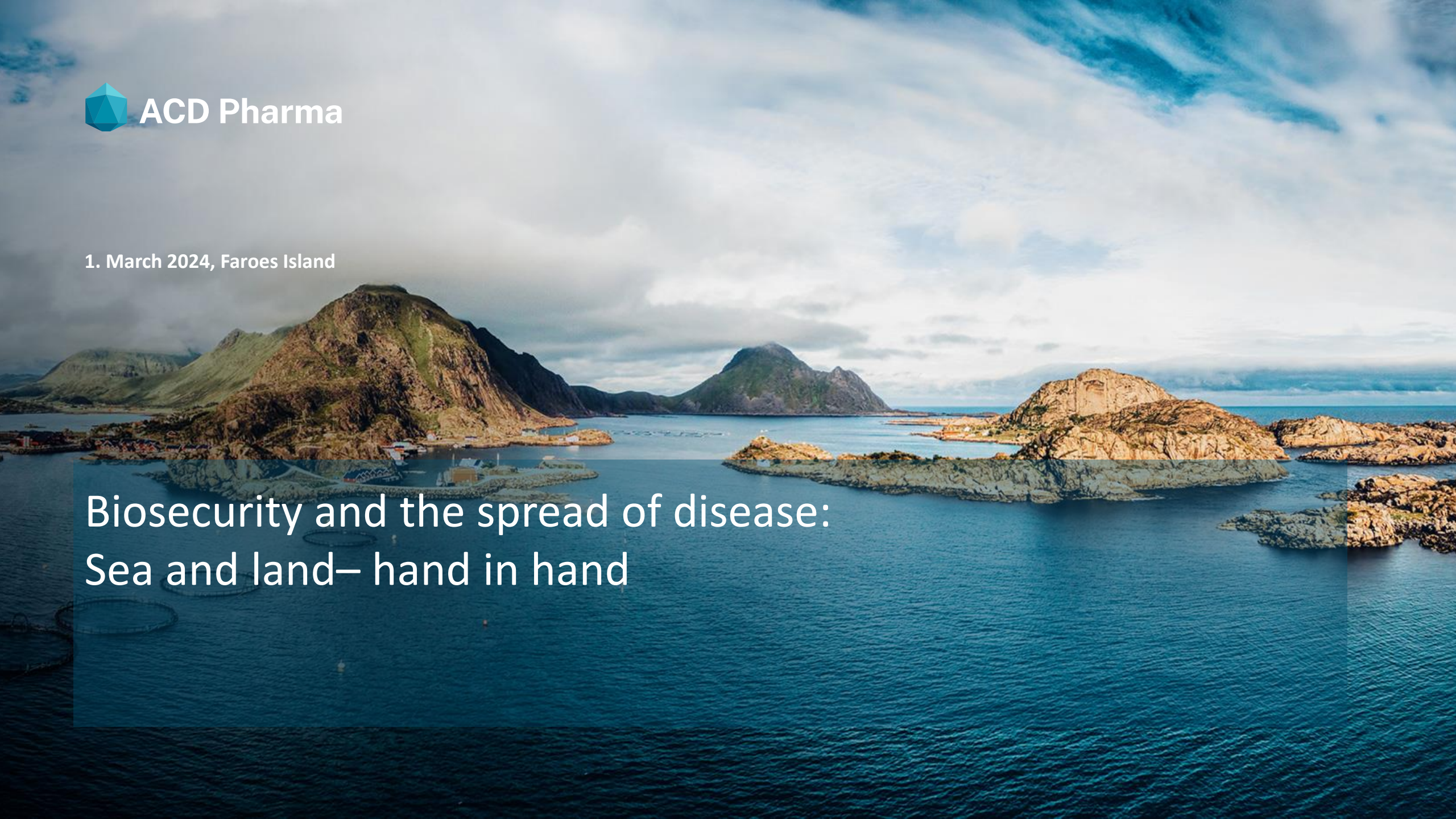
ACD Pharma

1. March 2024, Faroes Island

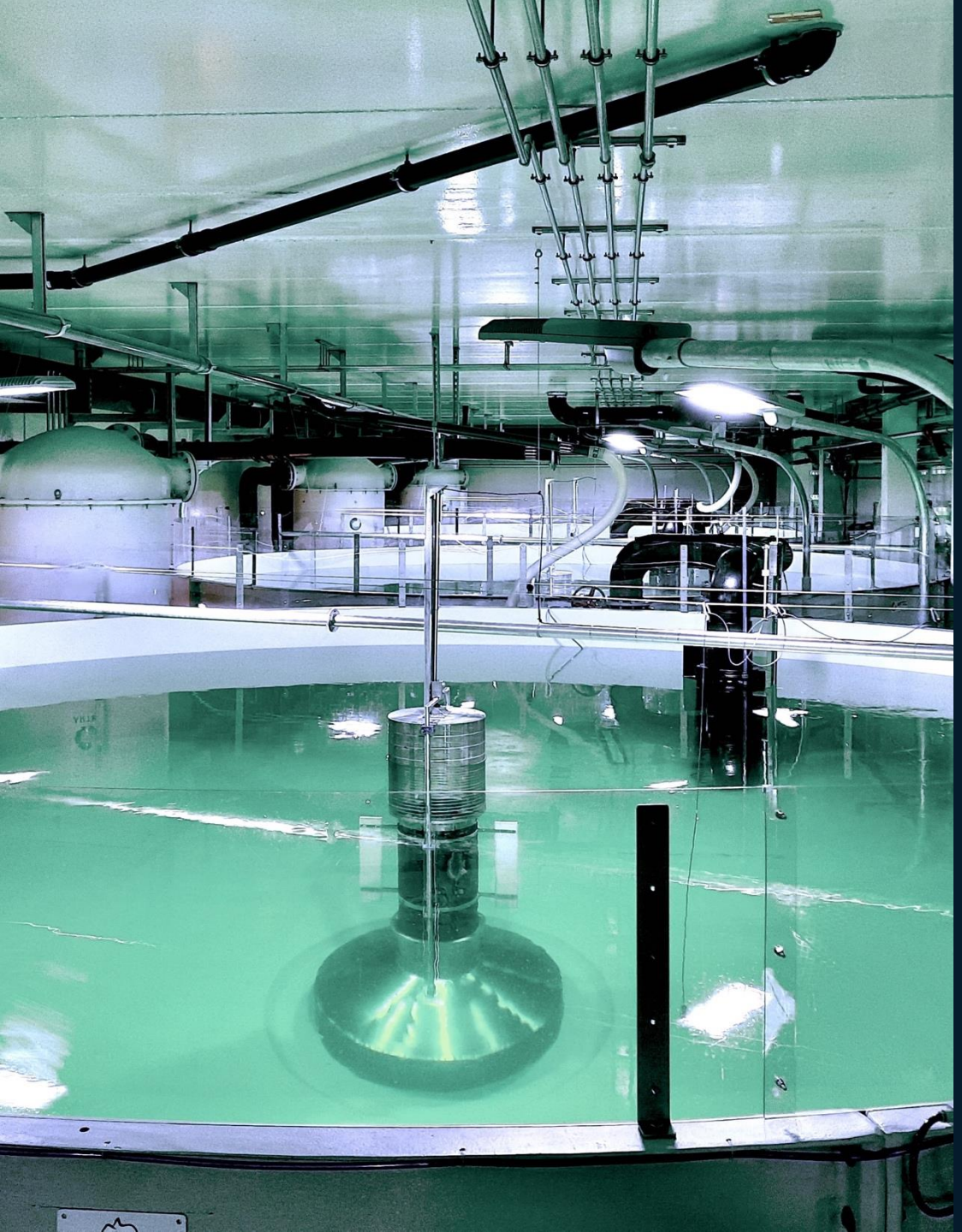
Biosecurity and the spread of disease: Sea and land– hand in hand



Agenda

- Infections in fresh water and the hatchery
- Environmental – DNA for screening of infections at population level
- Asymptomatic carriers of infection
- Critical points of infection in the production
- Bacteriophages for bio-control of critical points of infection

Infections in fresh water and the hatchery



Introduction of infection in freshwater (hatchery)

Viruses

- ISAV
- IPNV
- HSMI (PRV)
- CMS (PCMV)
- Salmon Gill Pox virus (SGPV)

Bacterias

- *Yersinia ruckeri* O1 (CC1)
- BKD (*Renibacterium salmoninarum*)
- Winter ulcer, post smolt brackish water(*Moritella viscosa*)

Environmental – DNA (eDNA)

screening of infections at population level

Veterinærinstituttet

Vitenskapet

KUNNSKAP OM FISKEHELSE
I denne spalten vil Veterinærinstituttet i hvert nummer bidra med oppdatert kunnskap om fiskehelse.
Ansvarlig for spalten er forsker Mona Gjessing
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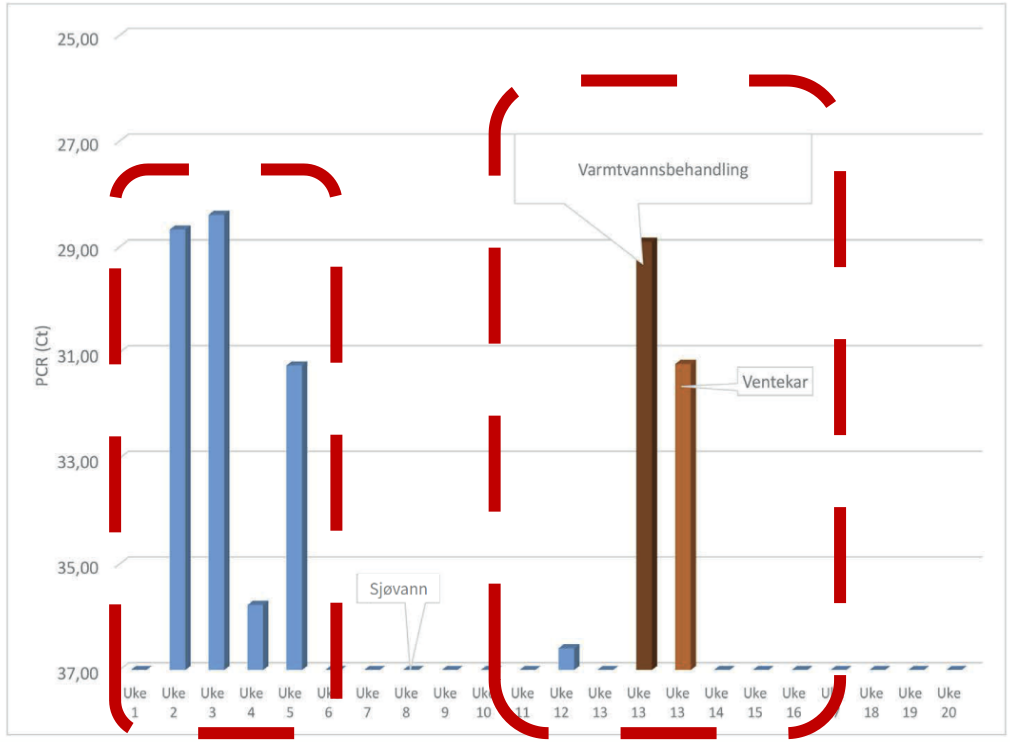
Veterinærinstituttet
Norwegian Veterinary Institute

Miljø-DNA sporing

av *Yersinia ruckeri* hos norsk oppdrettslaks



eDNA for screening

- PCR – diagnostics on water
- Infection status at population level
- Relevant for most infectious diseases
- Measure of the spread of infectious agents from asymptomatic carriers of disease

Asymptomatic carriers of infection

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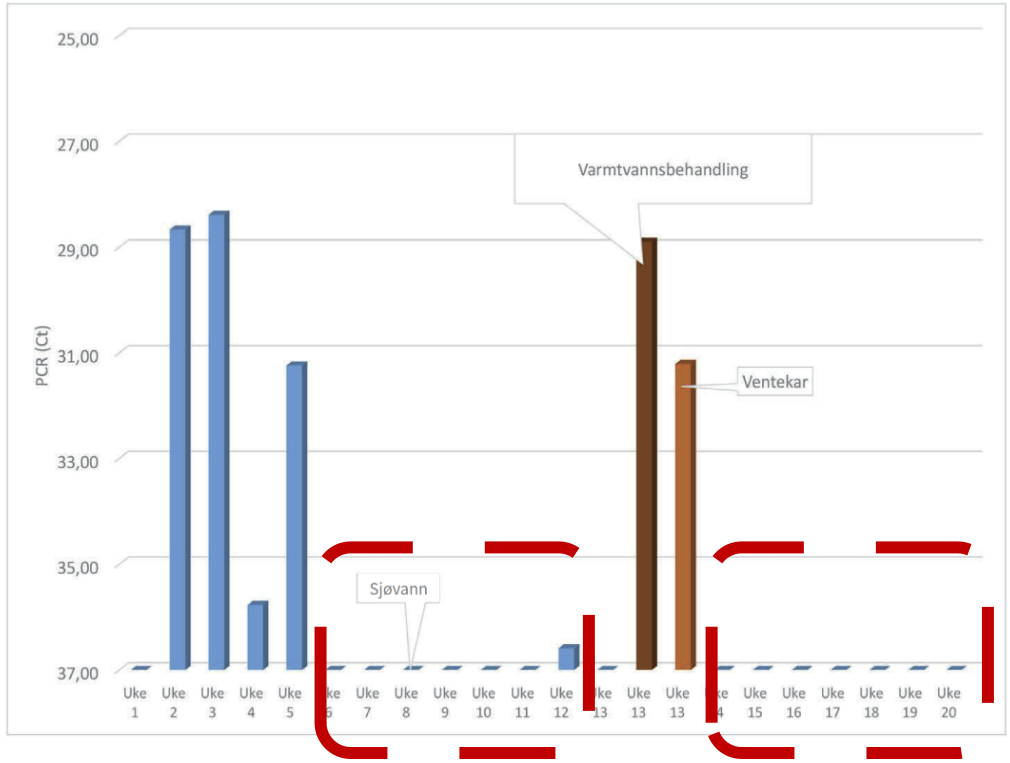


Asymptomatic carriers of infection

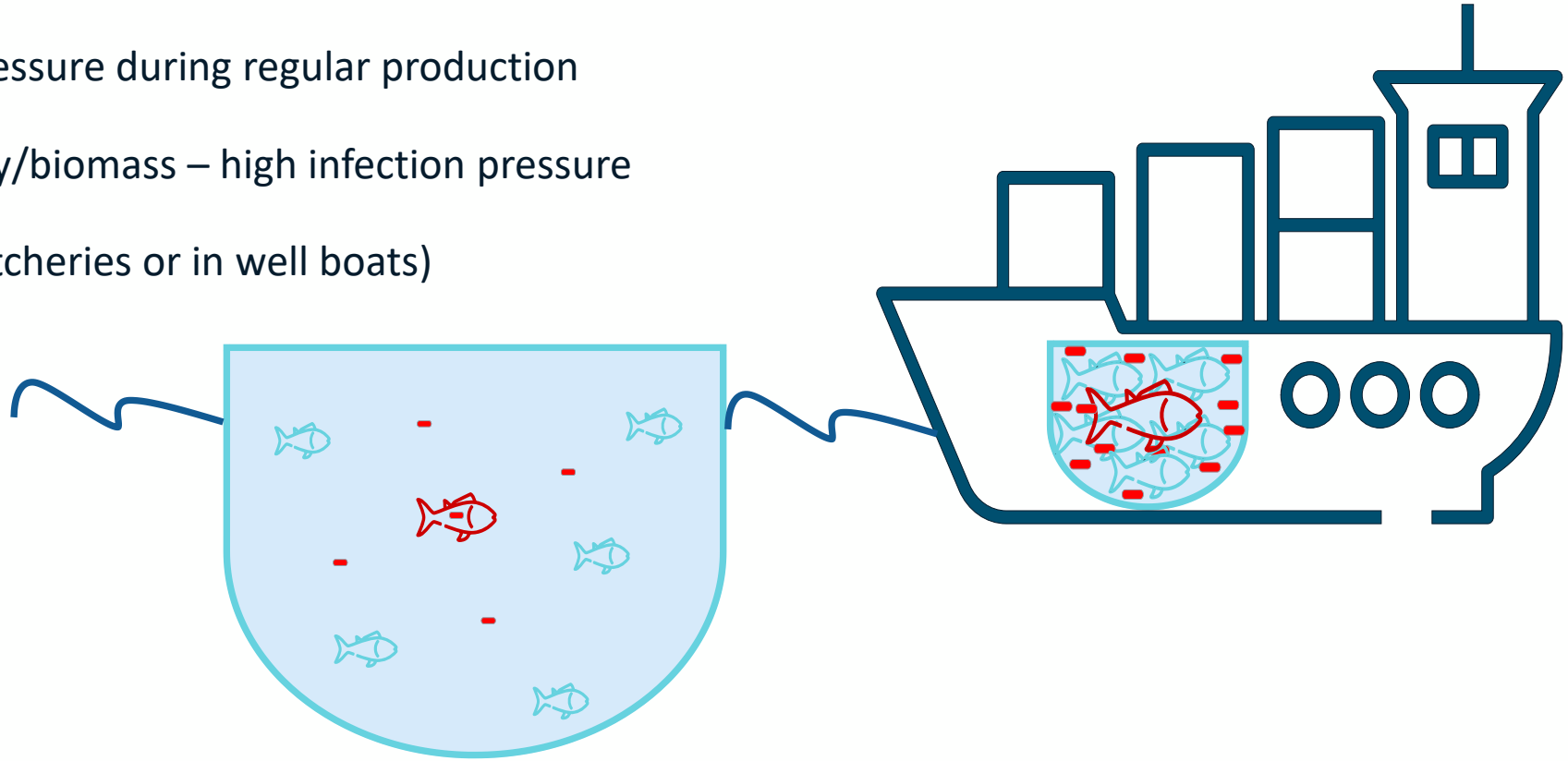
- Infected but clinical healthy fish
- Pathogen below detection limit for PCR (in the host)
- Acute and chronical stress reactivates the pahtogen
    - Stress hormones associated to reactivation
- Outbreaks may occur long after the host is infected

When does an infection become a disease?

Critical points of infection in the production

Critical points of infection

- Operations with crowding, pumping and handling
    - Triggers acute stress in the fish
- No or low infection pressure during regular production
- Crowding: High density/biomass – high infection pressure
    - (e.g Sorting in hatcheries or in well boats)



eDNA and *Yersinia ruckeri*

Infection pressure in wellboat during de-licing (Freshwell)

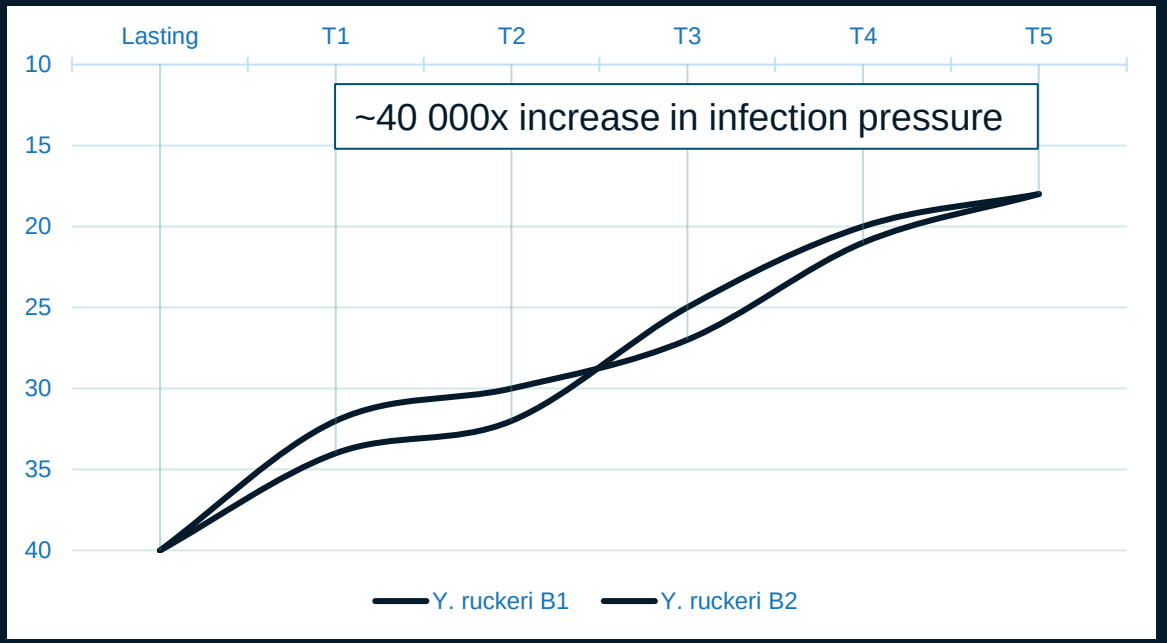
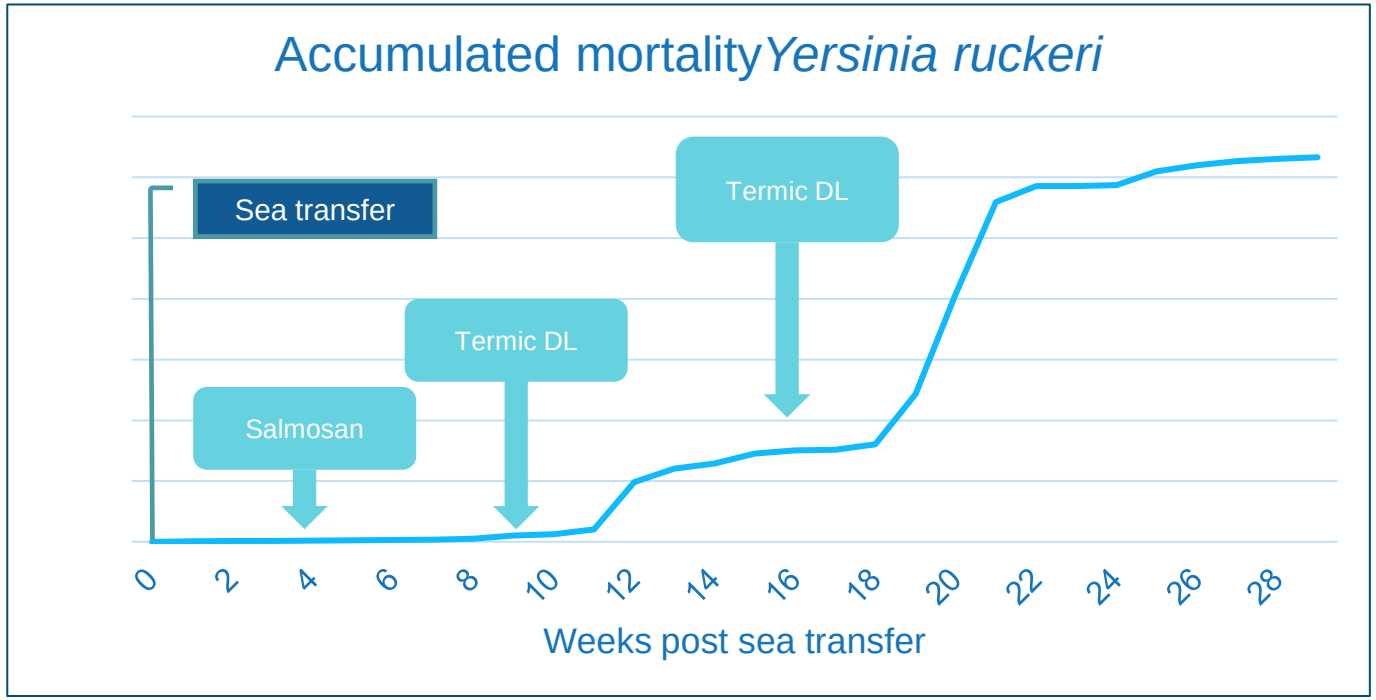


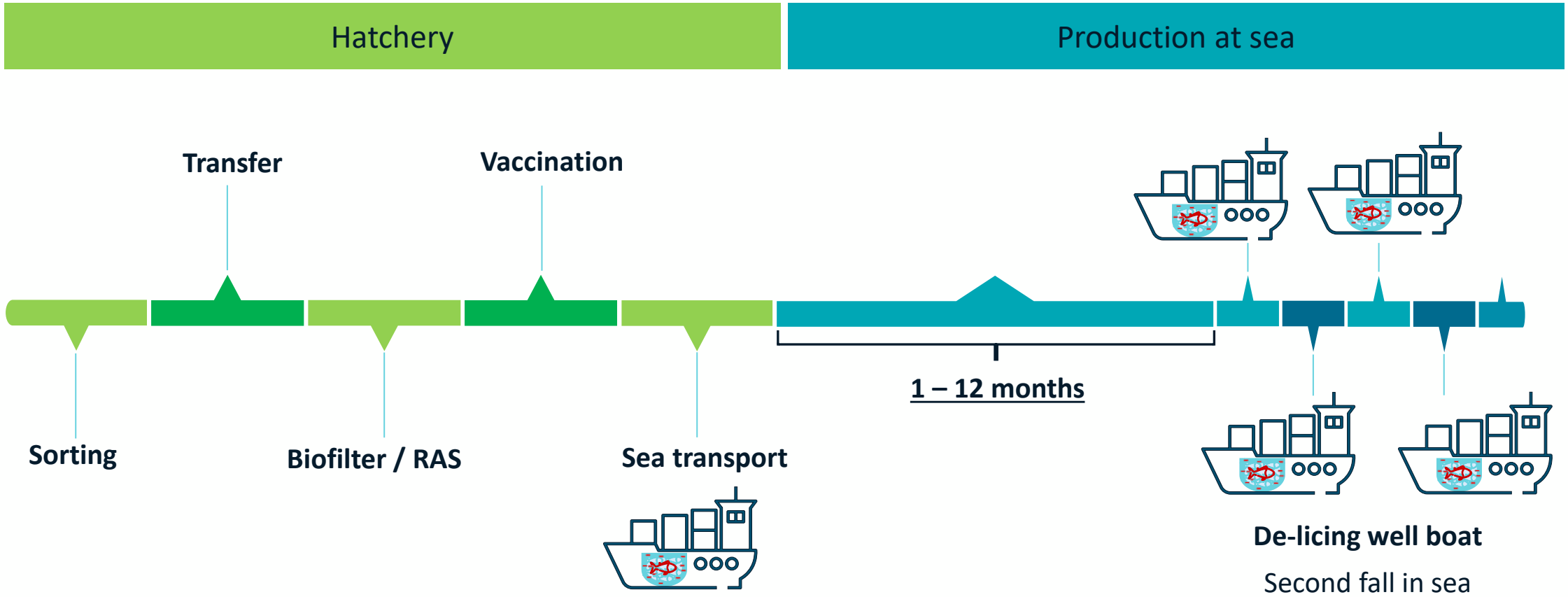
Fig.: Development of infection pressure in wellboat during de-licing

Increased mortality during repeated handlings

- Every handling is a critical point of infection
- Repeated infections increase the risk of outbreaks
- Short recovery time between operations increases the risk of outbreaks



Critical points of infection - from fry to harvest

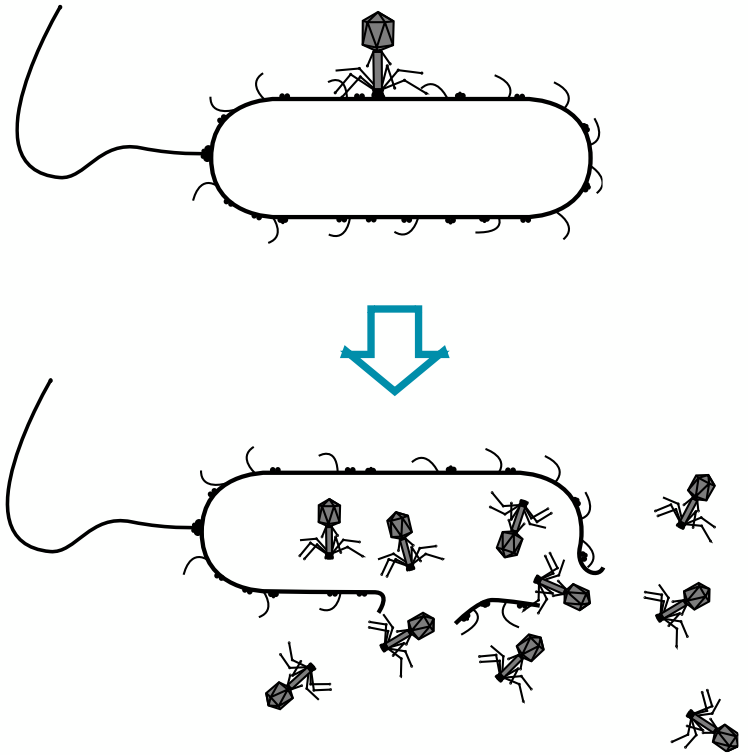


Bacteriophages:

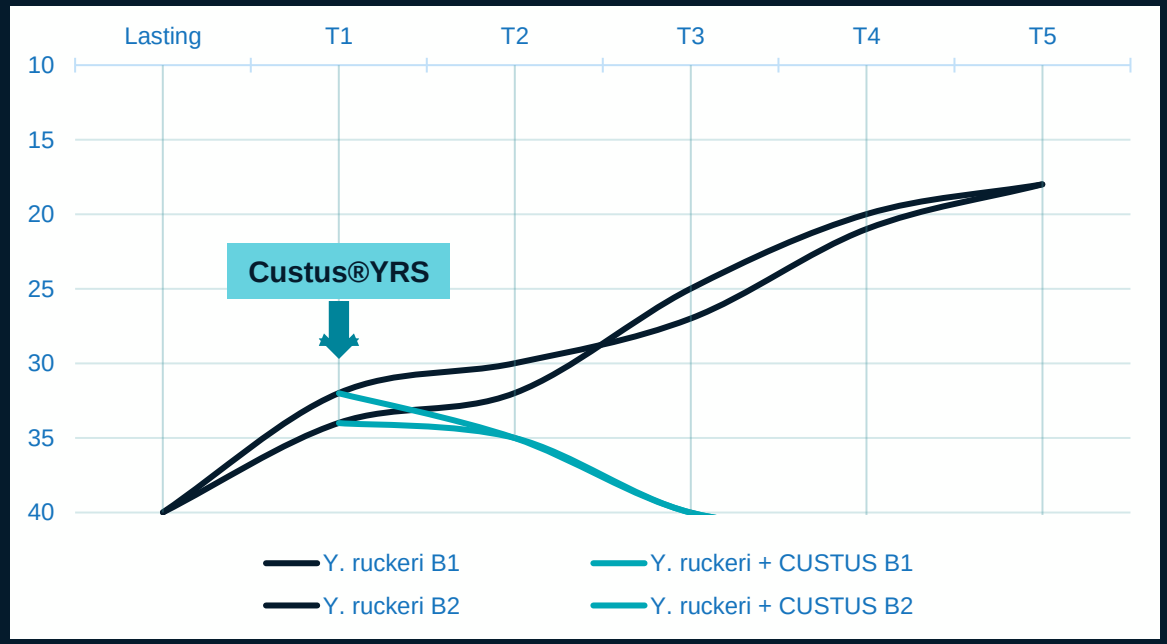
Biocontrol of critical points of infection

Custus®YRS and Custus®MVS

- Naturally occuring bakteriophages (viruses) for
  - *Yersinia ruckeri* O1 (Atlantic salmon)
  - *Moritella viscosa* CC1
- Removes infection pressure in water
- Protects uninfected fish during stressful operations

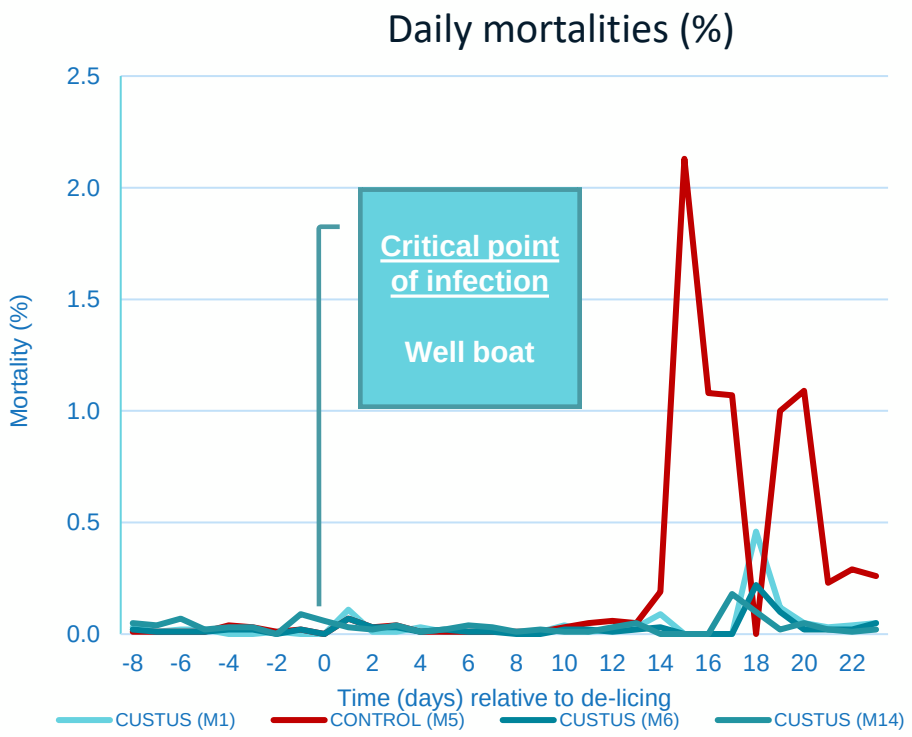


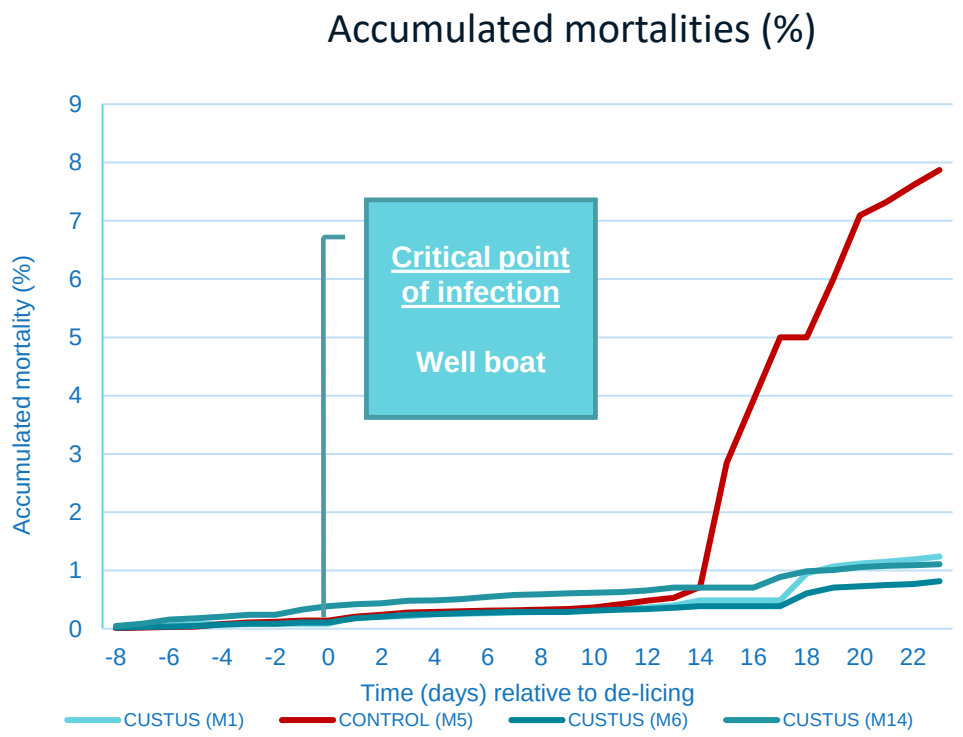
Custus®YRS controls infection pressure from asymptomatic carriers



Custus®YRS removes *Yersinia ruckeri* in the water to levels below detection limits for PCR

Use of Custus®YRS at de-licing in well boats

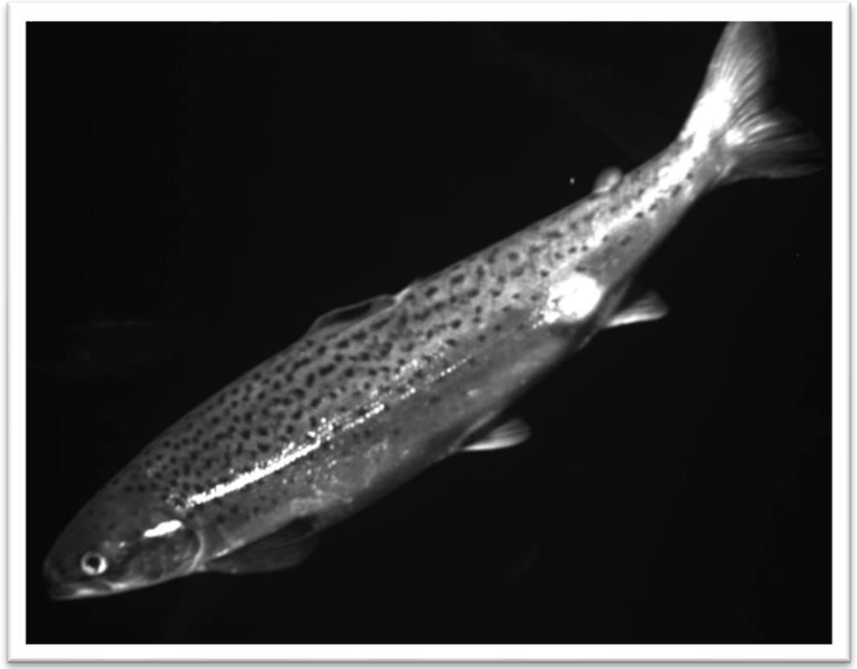




Mo J, Kleppen H P, Frantzen C, Bårdsen E, Støtvig I og Gillund B; «**Bruk av bakteriofagproduktet Custus®YRS til smittepresskontroll og sykdomsforebygging hos atlantisk laks**» Norsk Vet. Tidskr. 3-2023.

Moritella viscosa:

A systemic bacterial infection that can turn into winter ulcers

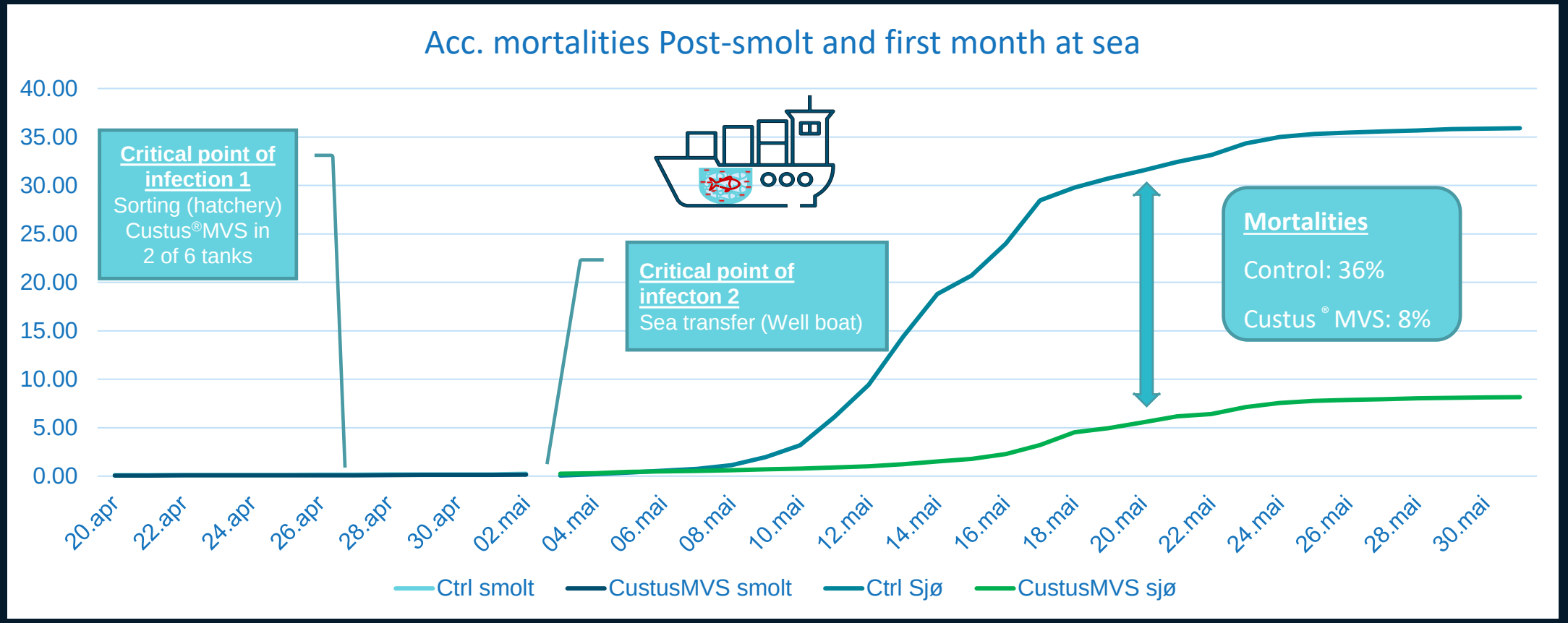


Early stages of systemic infection

Our hypothesis:

- Boils / blisters in the skin
- Local inflammation below the skin
- *Moritella viscosa* CC1 in the boils
    - (mono-culture at plating)
- CC1 and CC3 in head kidney (low levels)
- Winter ulcers starts as a traditional and systemic bacterial infection

Field trial of Custus®MVS for *Moritella viscosa* CC1



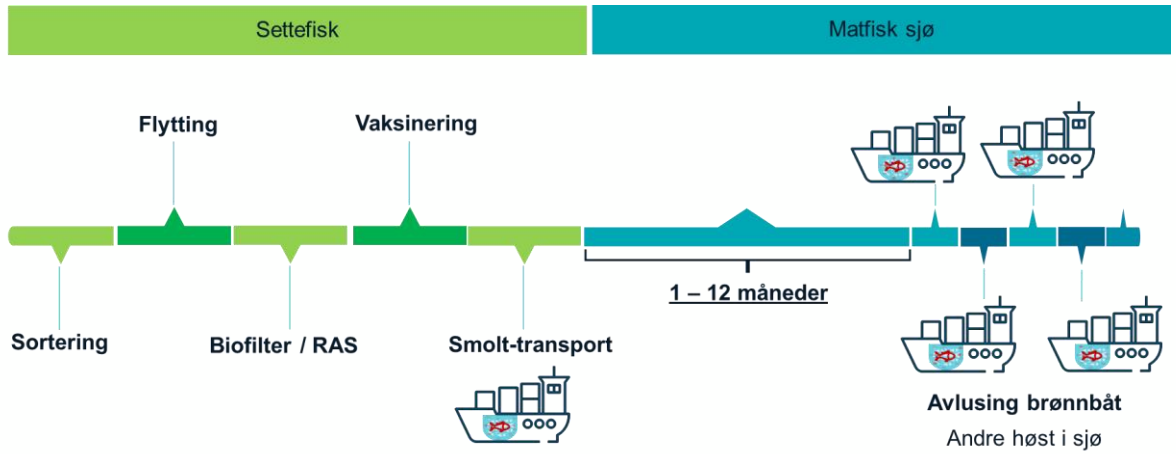
- Sorting and Custus®MVS treatment: 6 days prior to sea transfer
- Start mortalities ~5 days post sea transfer
- Mortalities due to sepsis from Moritella viscosa (no winter ulcers)

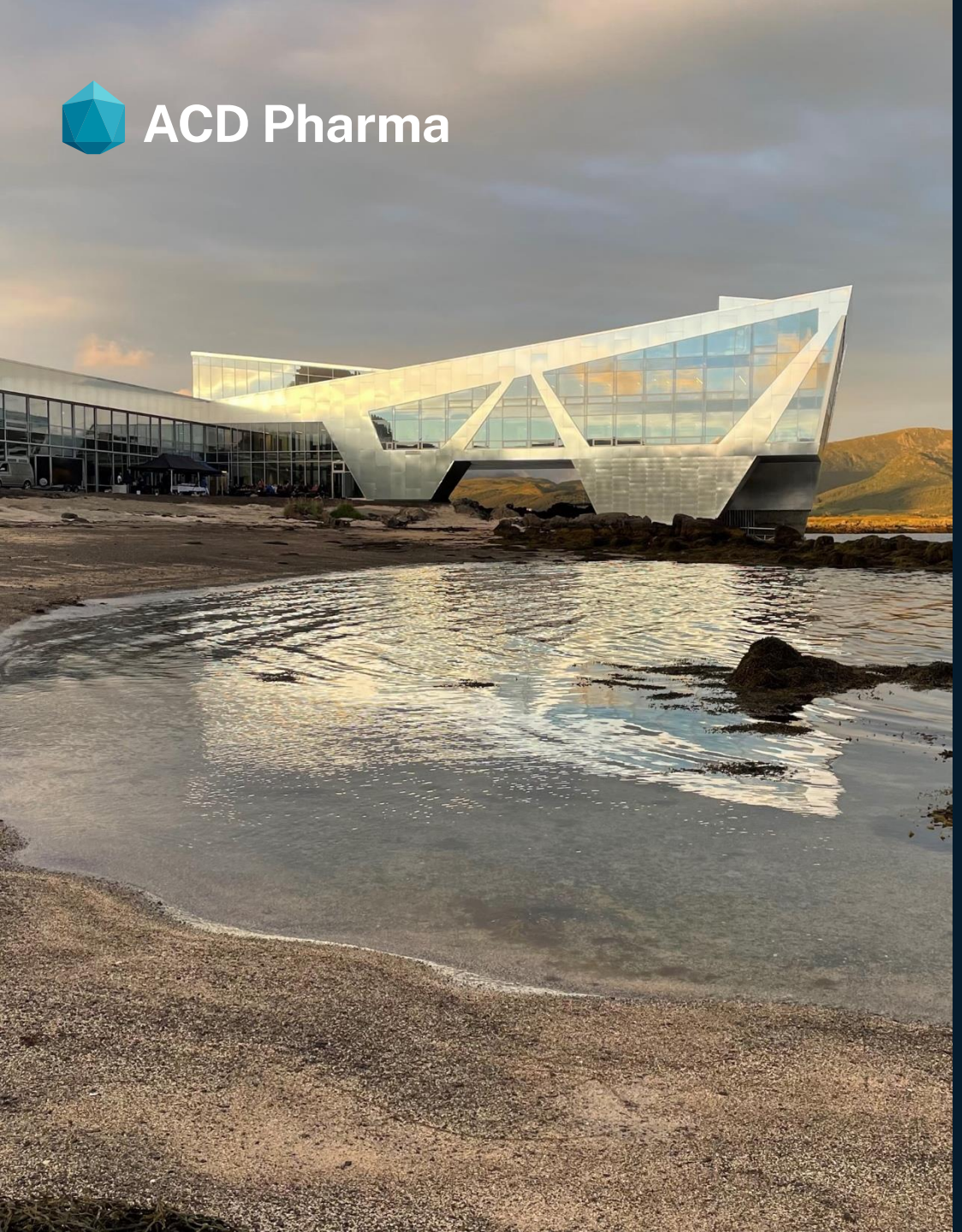
Conclusions

- Infection introduced in FW - phase can cause disease up to harvest
- Asymptomatic carriers of infection

  -A hidden risk in the entire value chain
- Spread of infection related to critical points of infection

  – Not continuous infection pressure
- eDNA – A new tool for the identification of critical points of infection and prediction of disease
- Bacteriophages (Custus®) for control of the infection pressure at critical points of infection





Thank you!