

# The Fish Health Barometer 2023

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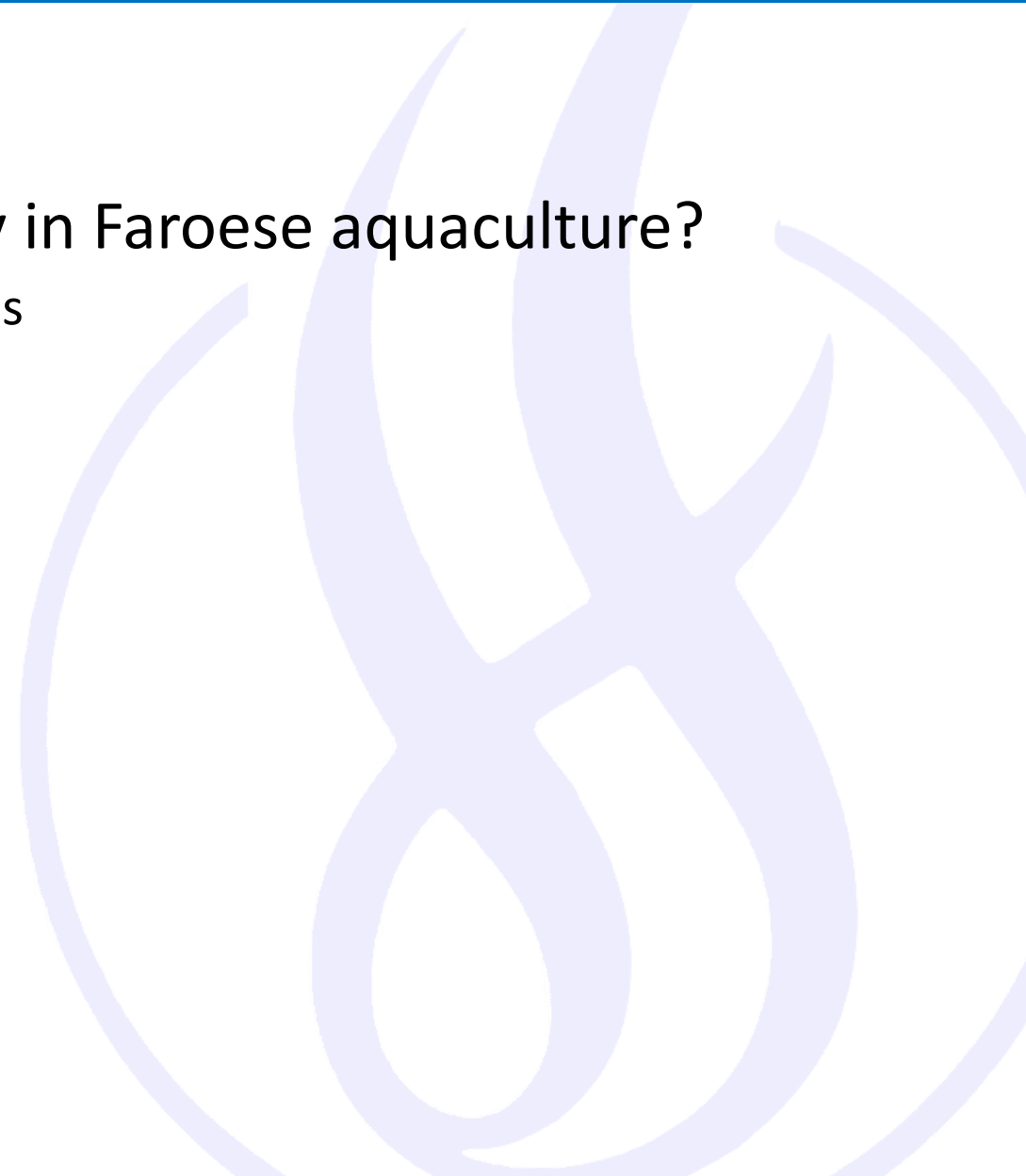
Mynd: Peter S. Østergaard

# Agenda

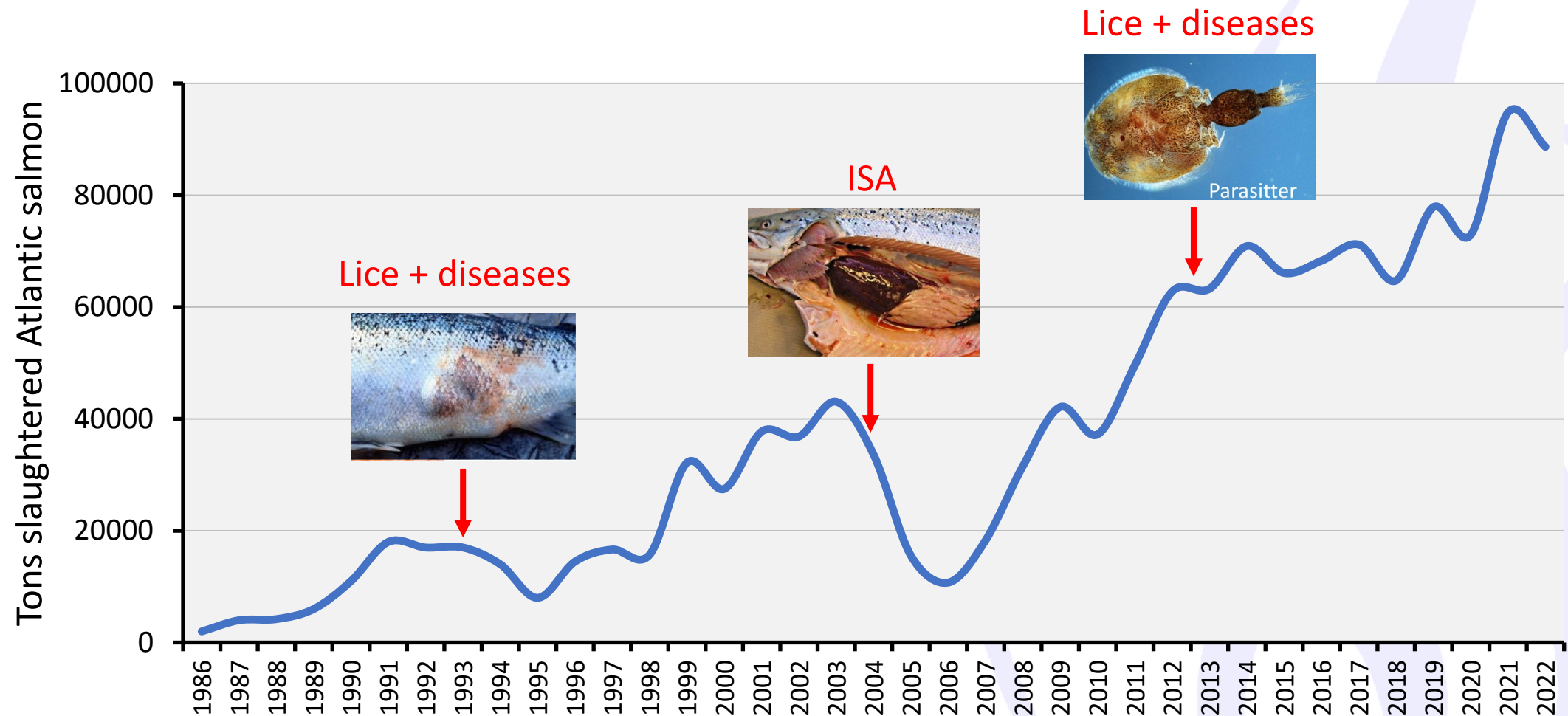
## 1. What are the main drivers for mortality in Faroese aquaculture?

- Three latest production cycles at all marine farms
  1. *Production cycle 2016 – 2019*
  2. *Production cycle 2018 – 2021*
  3. *Production cycle 2020 – 2022*

## 2. Some of the most important diseases



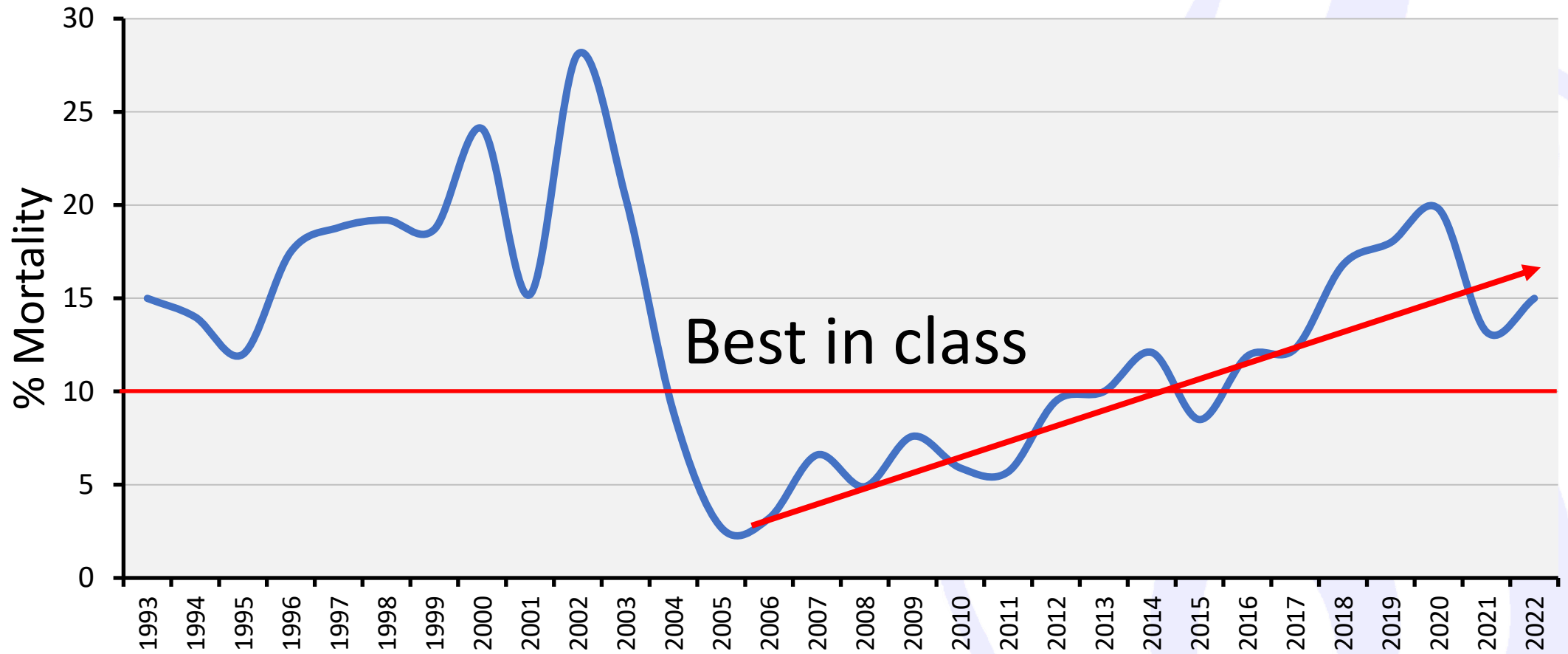
# Growth, setbacks and stagnation



Rúni Dam, Avrik

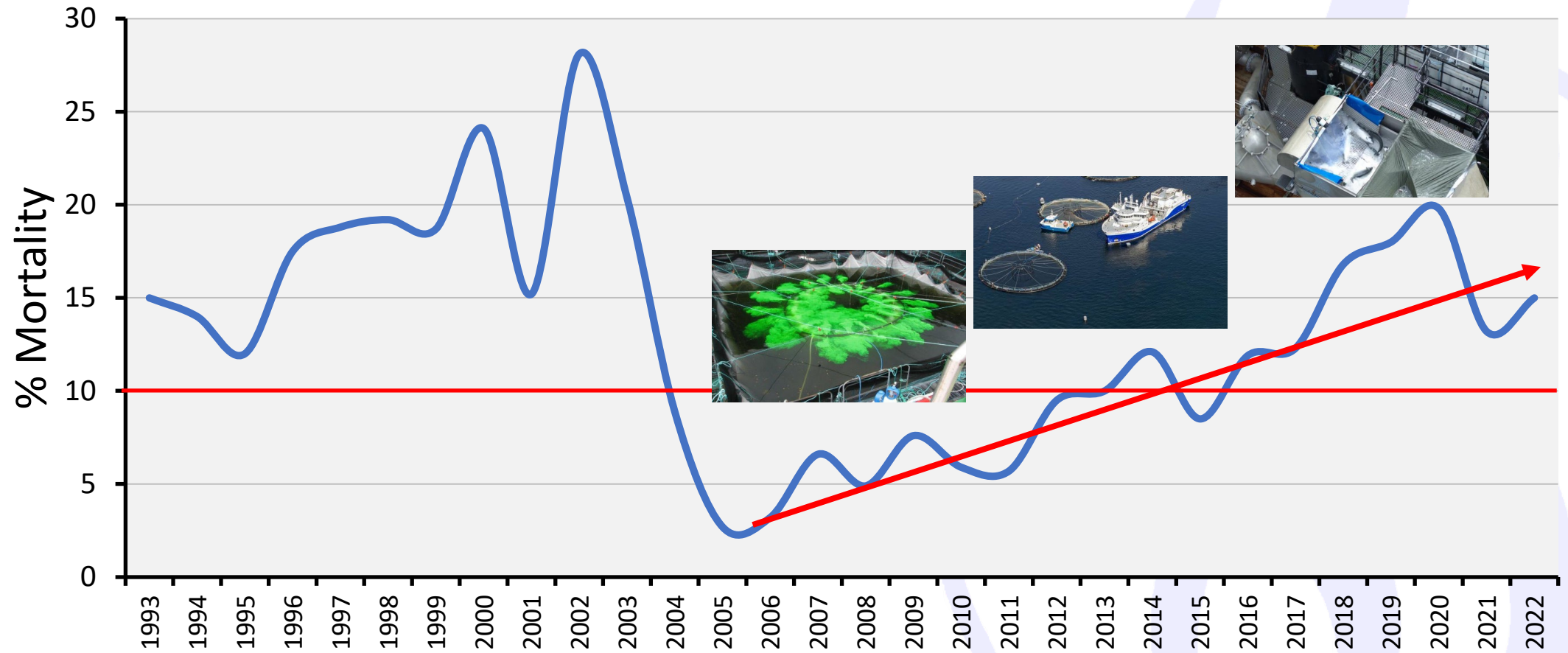


# Mortality as an indicator of fish health and welfare



Rúni Dam, Avrik

# Main drivers are resistance and mechanical delousing

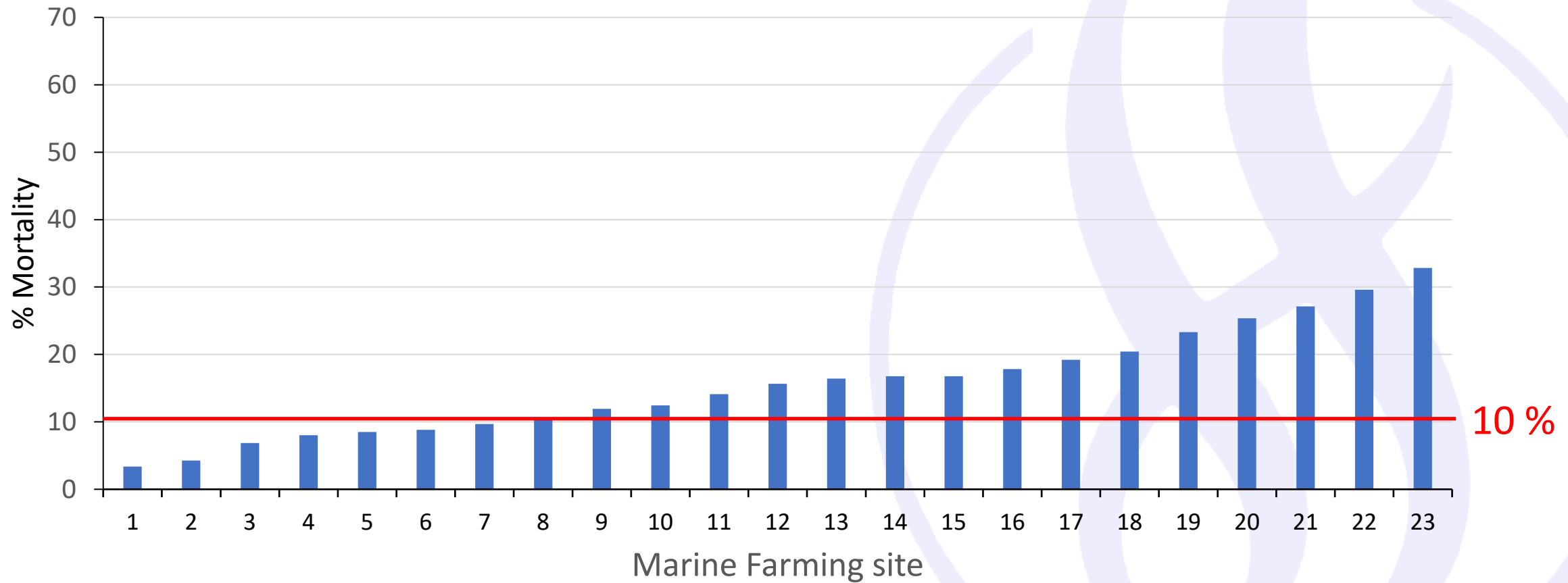


Rúni Dam, Avrik

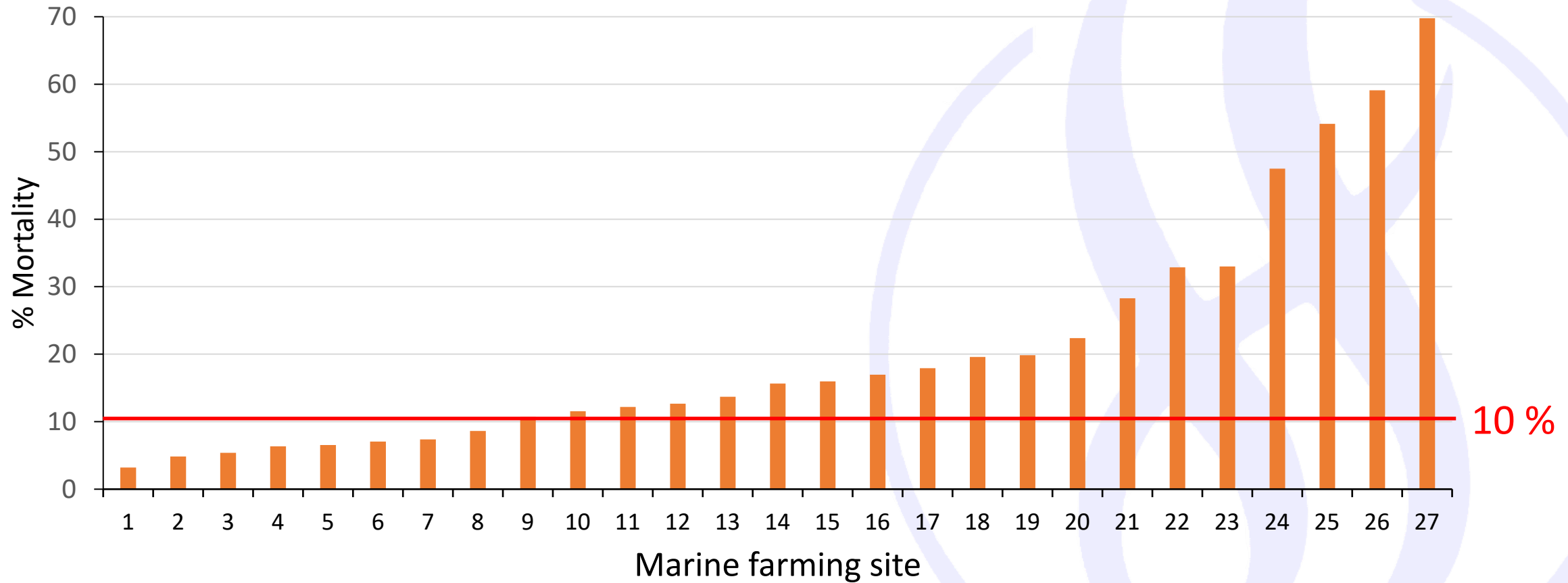
# Production and mortality

	1. Production cycle 2016-2019	2. Production cycle 2018-2021	3. Production cycle 2020-2022	Total 2016-2022
Sites	23	27	28	78
Stocked	28,3 mill	32,2 mill	32,6 mill	93,1 mill
Slaughtered	23,7 mill	25,7 mill	27,9 mill	77,3 mill
Morts (n)	4,6 mill	6,5 mill	4,7 mill	15,8 mill
Morts (%)	16,3 %	20,1 %	14,3 %	17 %

# Mortality per site for production cycle 2016 – 2019

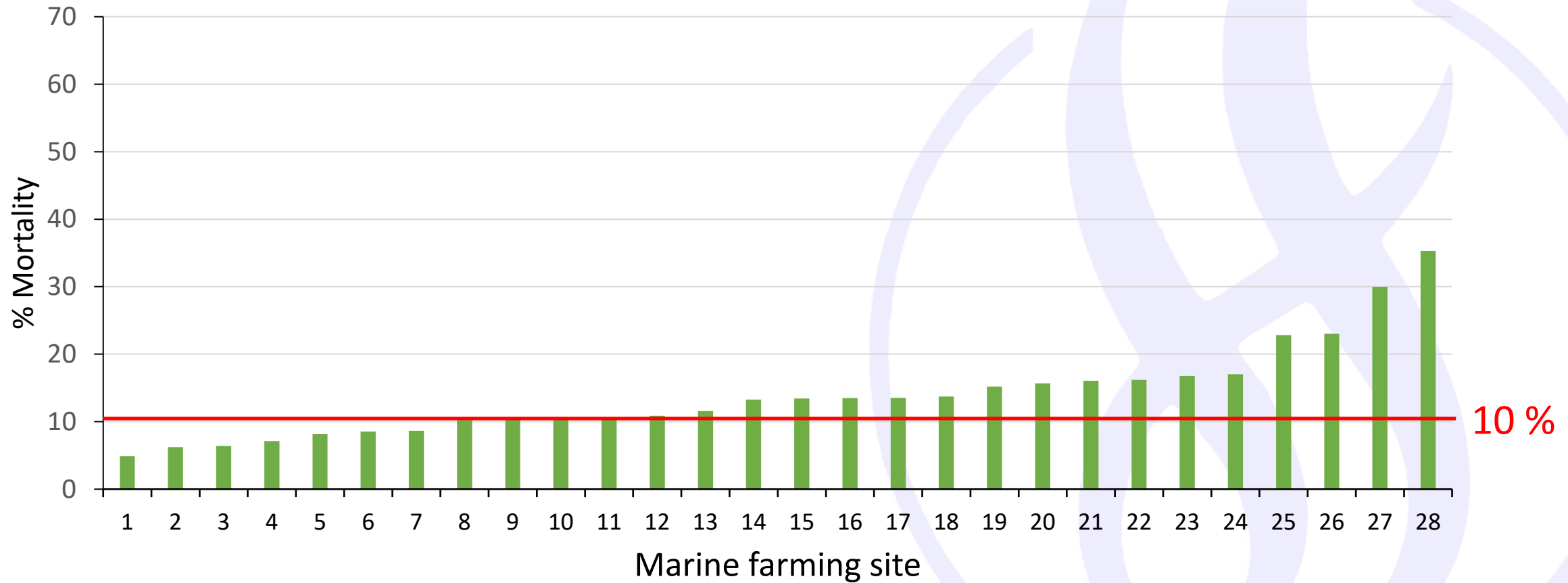


# Mortality per site for production cycle 2018 – 2021

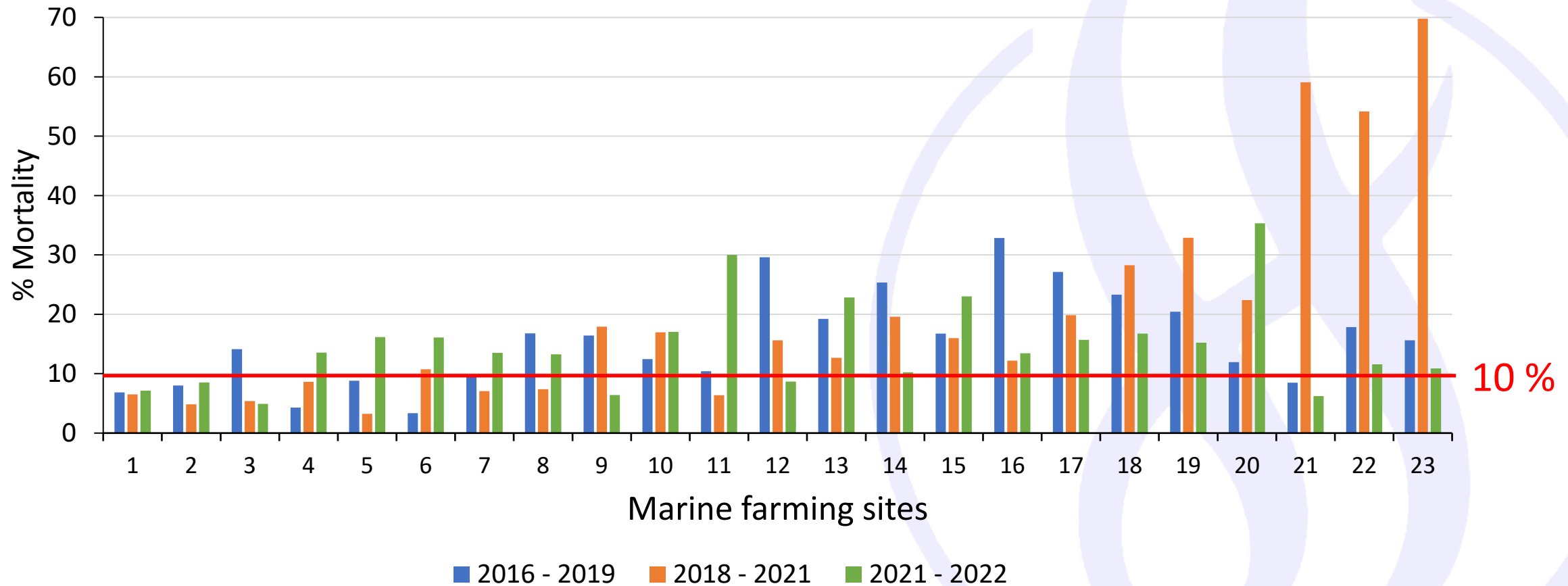




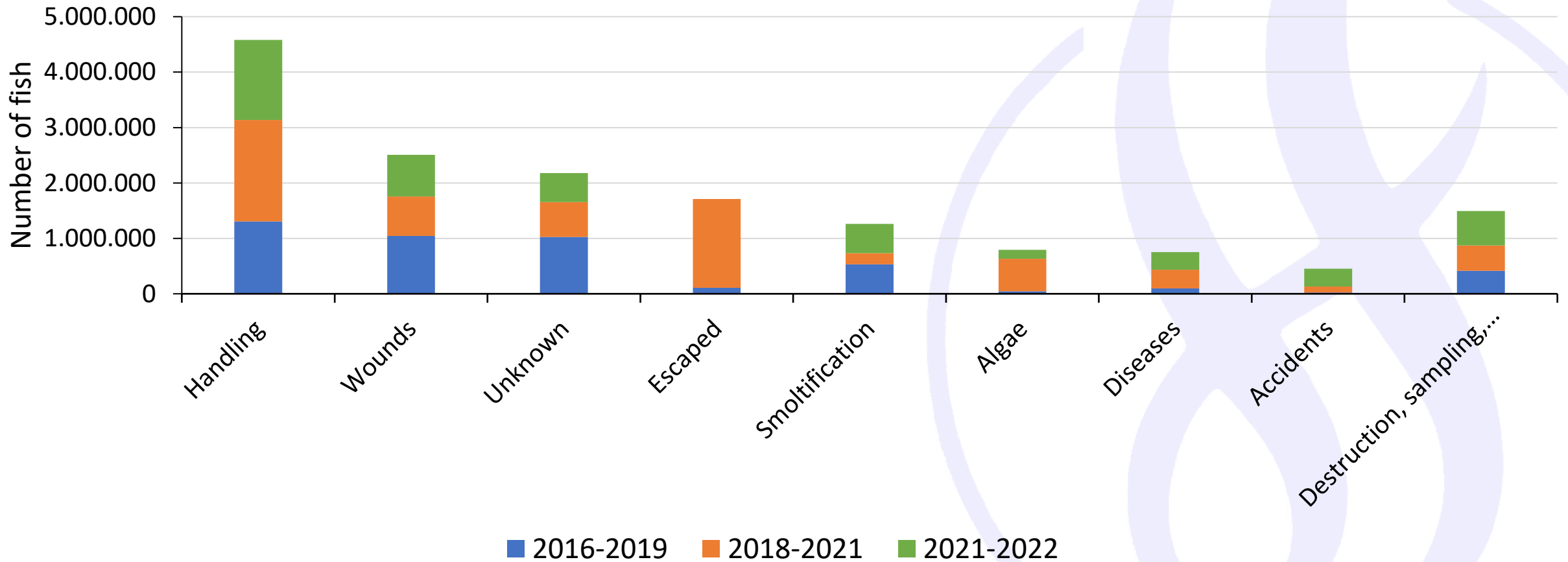
# Mortality per site for production cycle 2020 – 2022



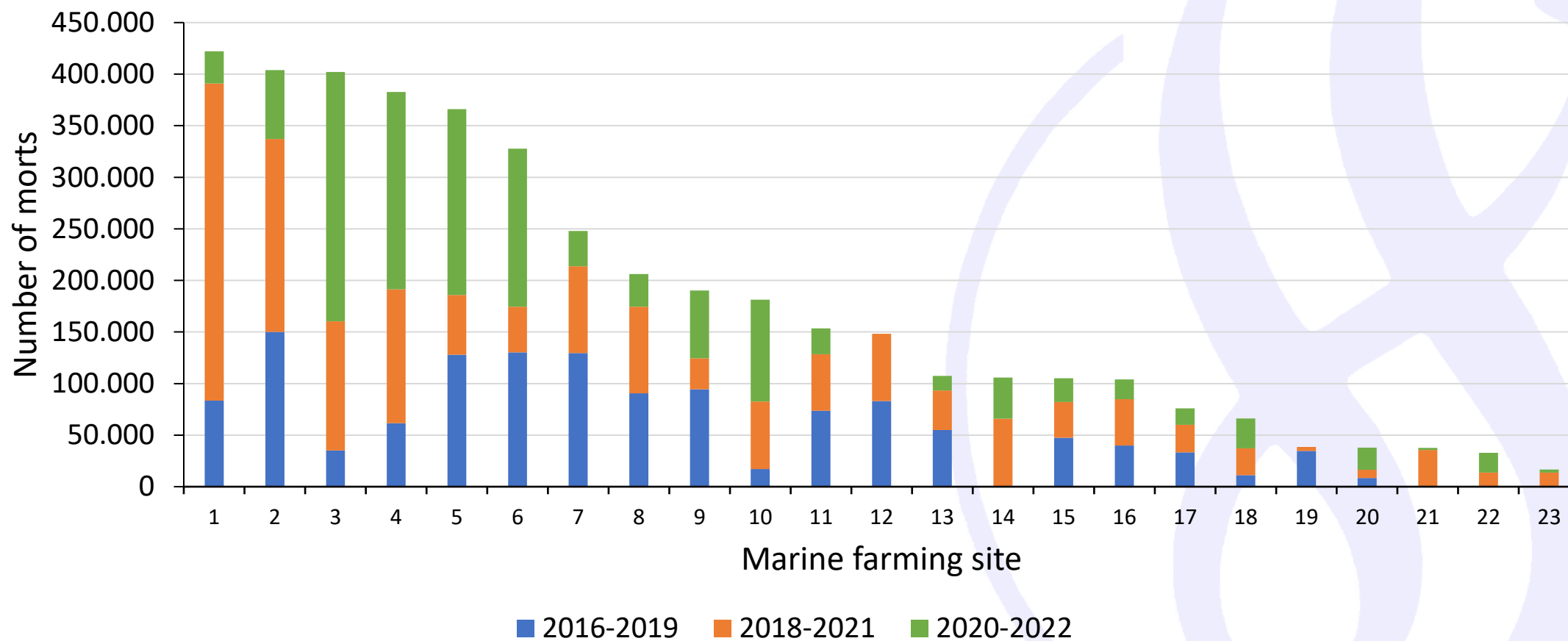
# Mortality per site for all three production cycles



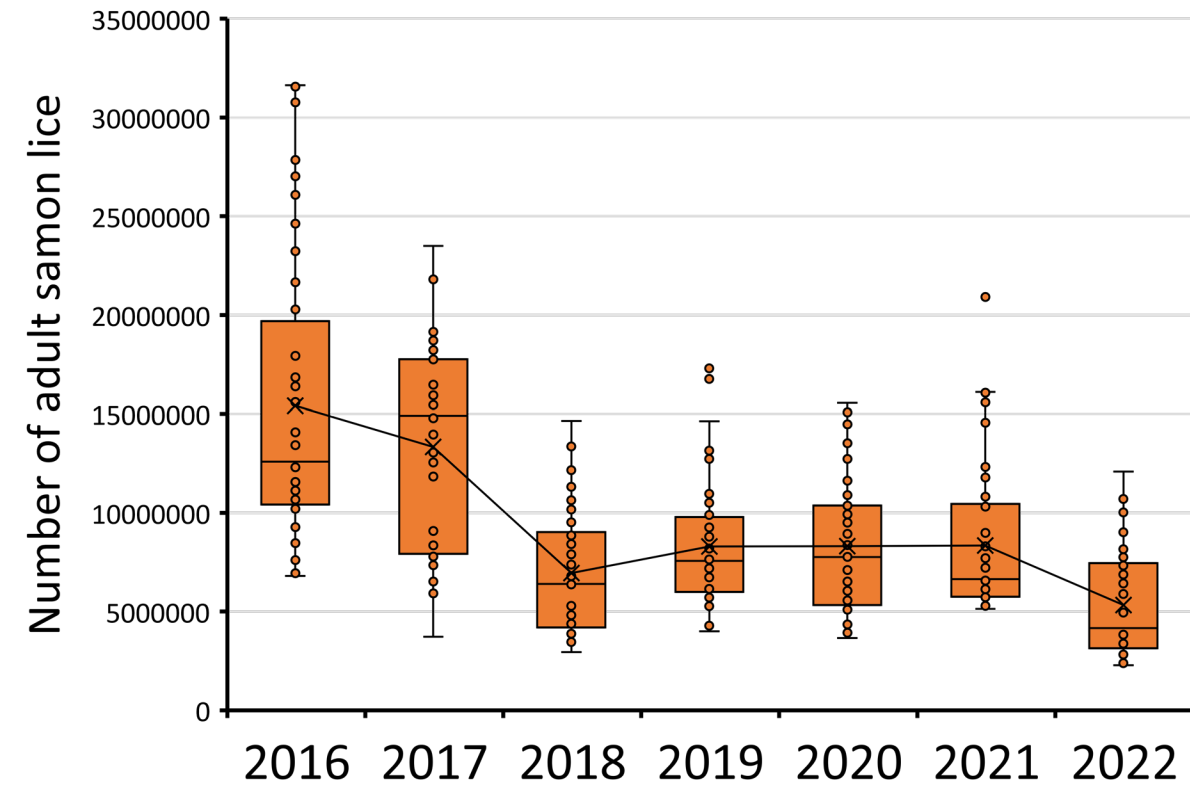
# What is the cause of the 15.8 mill morts?



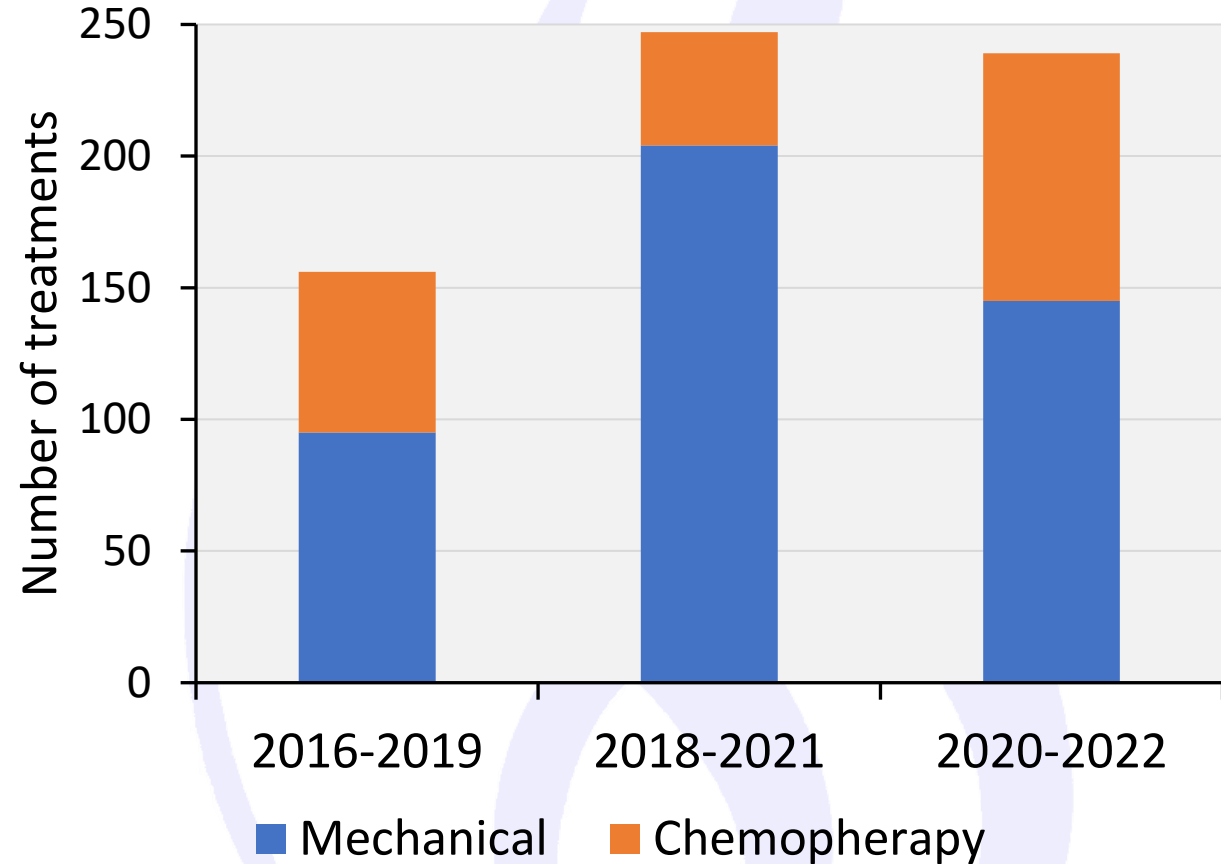
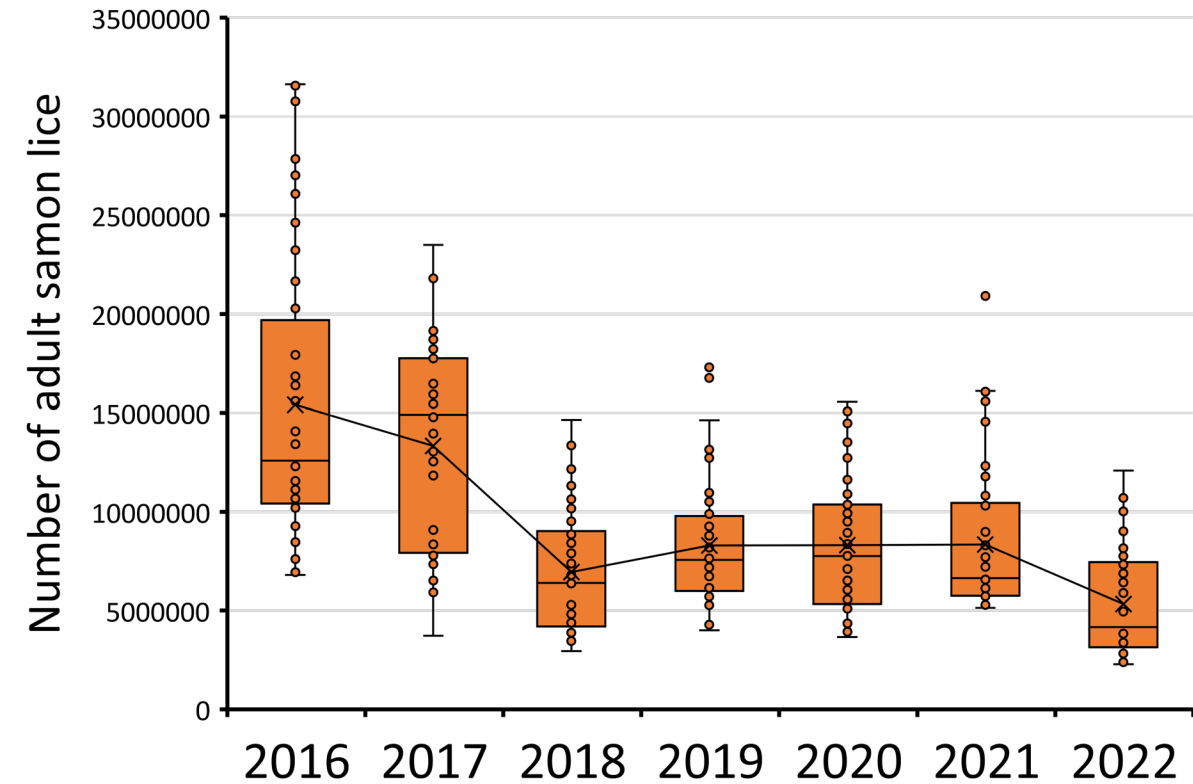
# Mortality caused by handling



# Number of lice has decreased

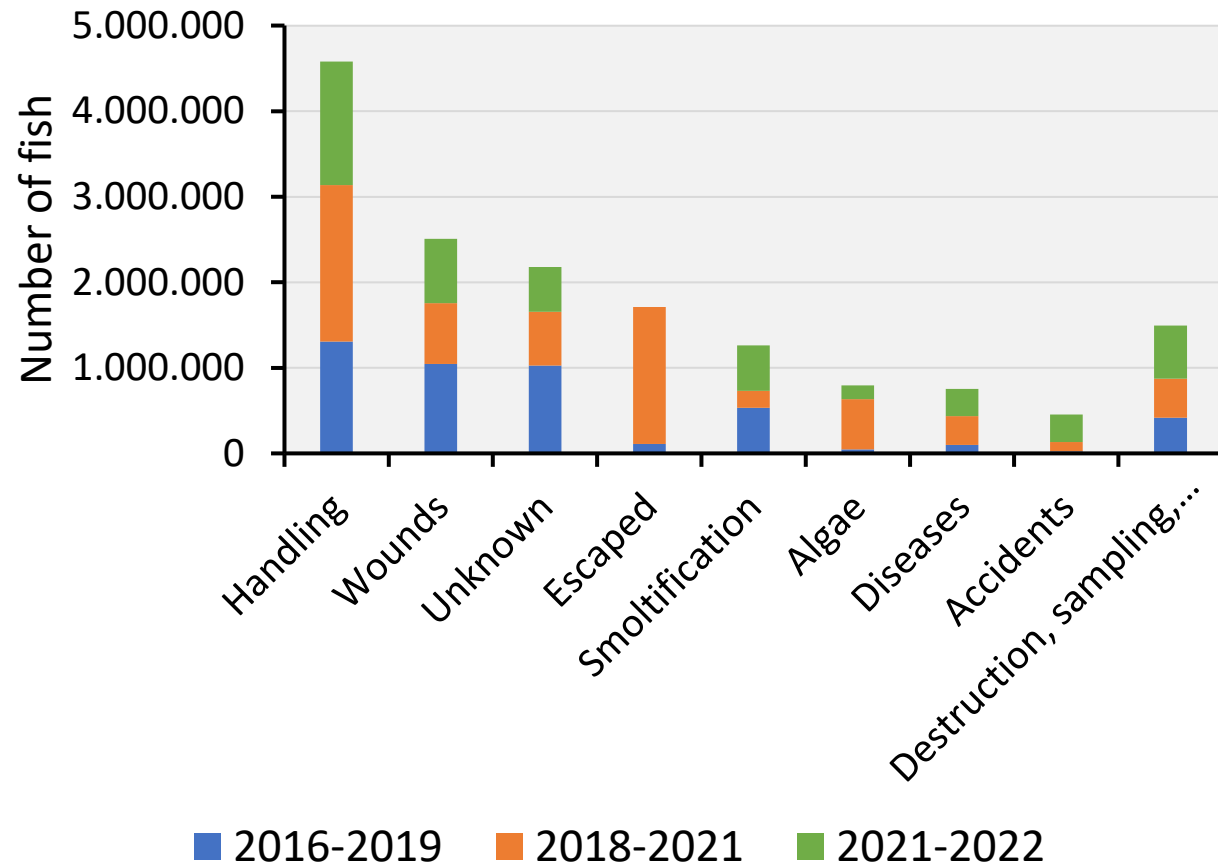


# The number of treatments has increased

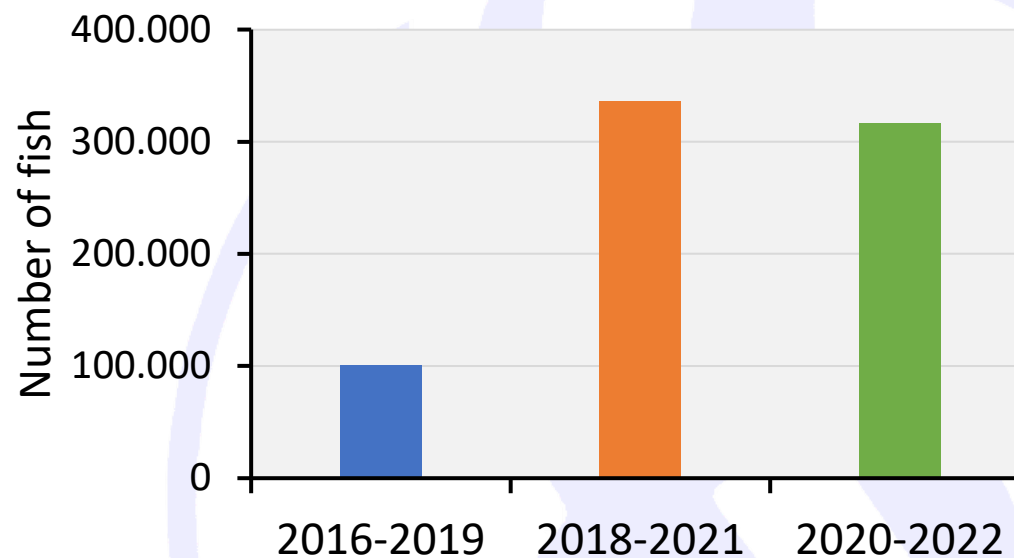
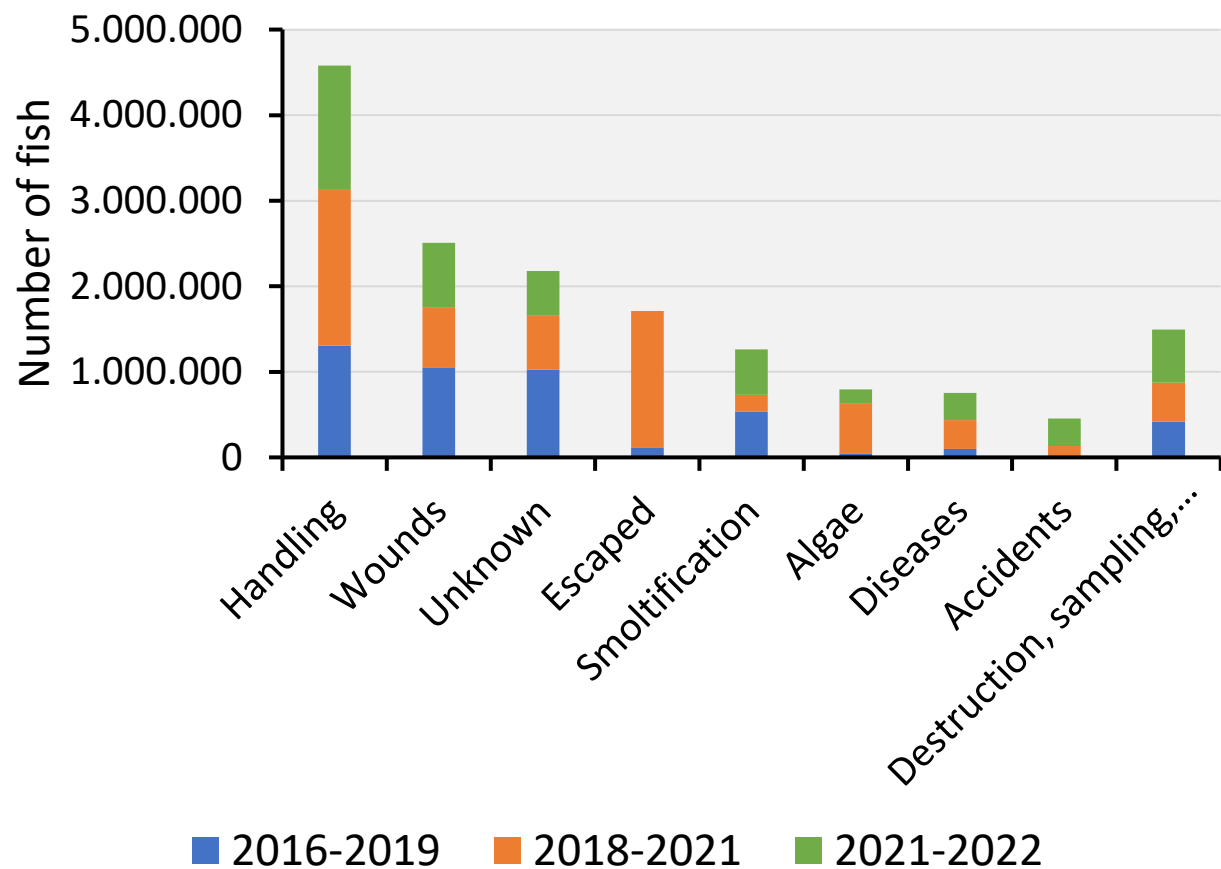




# Diseases are underreported by the farmers



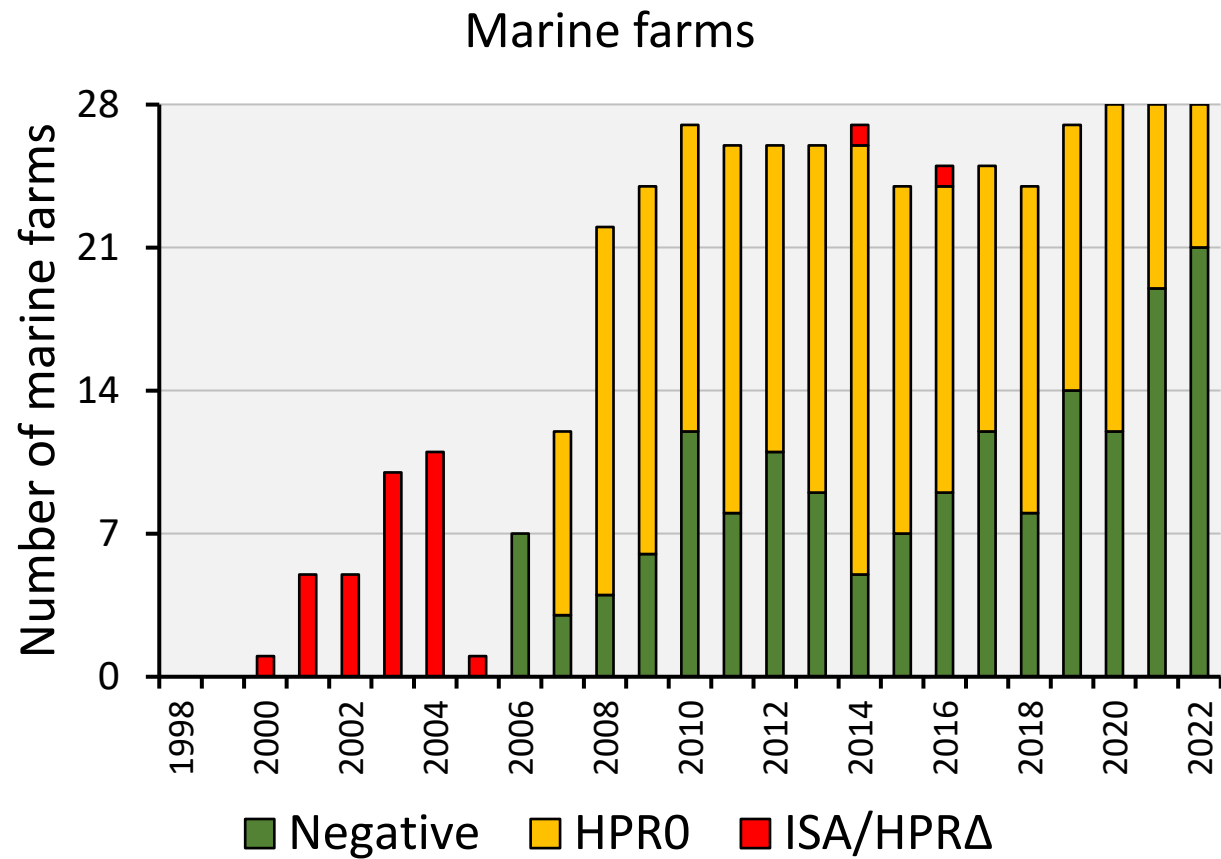
# Increasing number of fish have died because of diseases



# Important diseases/infections in RAS and Marine sites

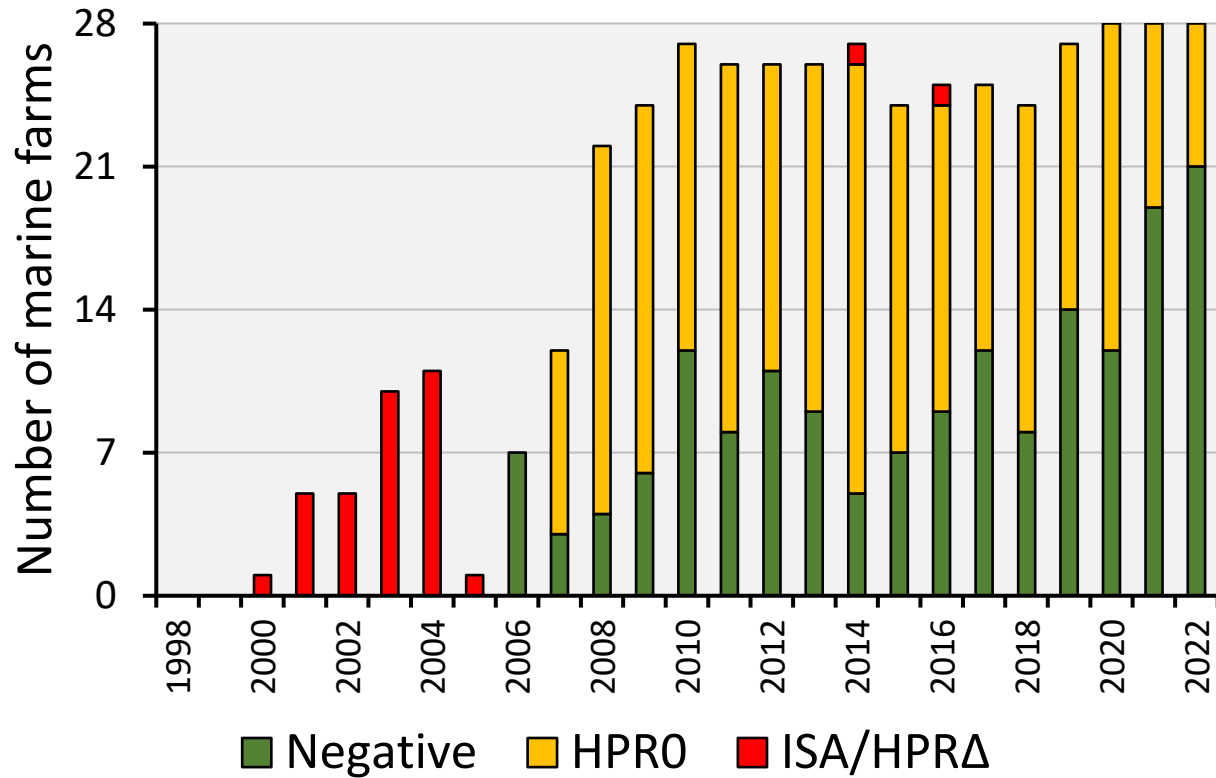
Marine sites	RAS smolt farms
Infectious salmon anaemia (ISA/ISAV)	Infectious pancreatic necrosis (IPN/IPNV)
Cardiomyopathy syndrome (CMS/PMCV)	Salmon gill pox virus (SGPV)
Bacterial kidney disease (BKD/RS)	Hearth and skeletal muscle inflammation (HSMI/PRV-1)
Hearth and skeletal muscle inflammation (HSMI/PRV-1)	Nefrocalsinosis

# ISA and ISAV

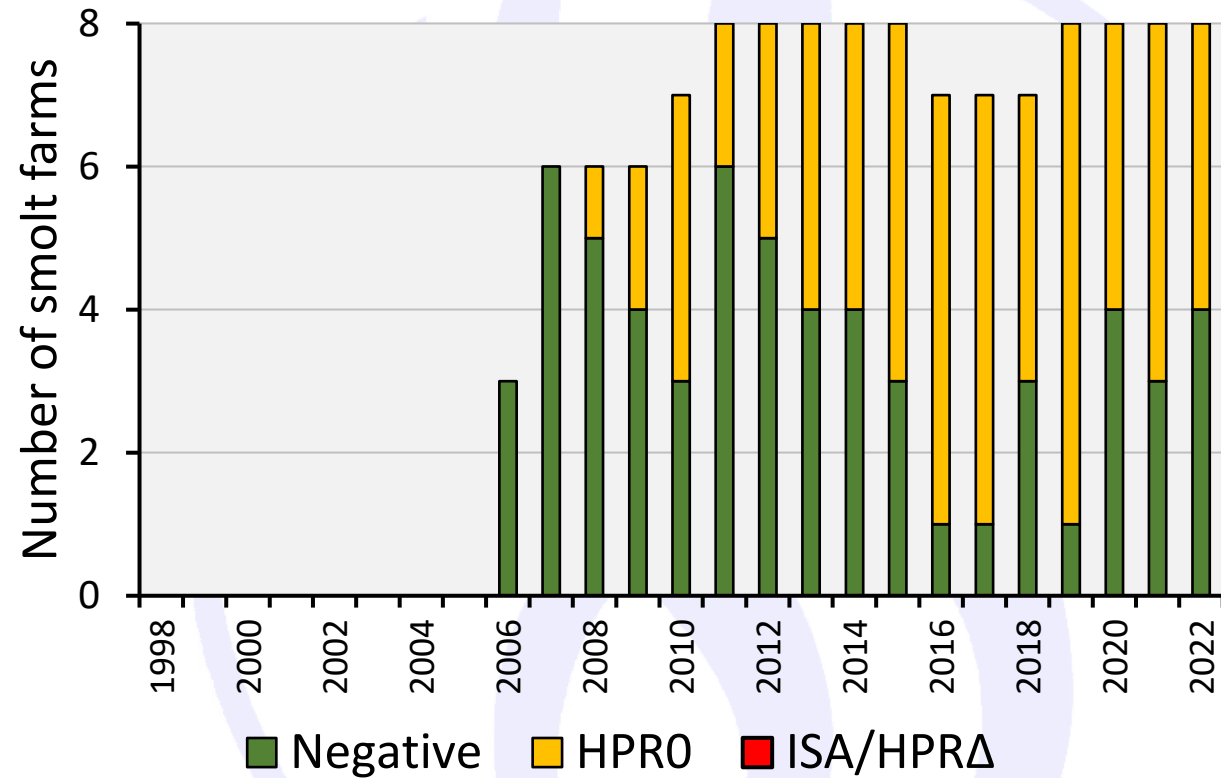


# ISA and ISAV

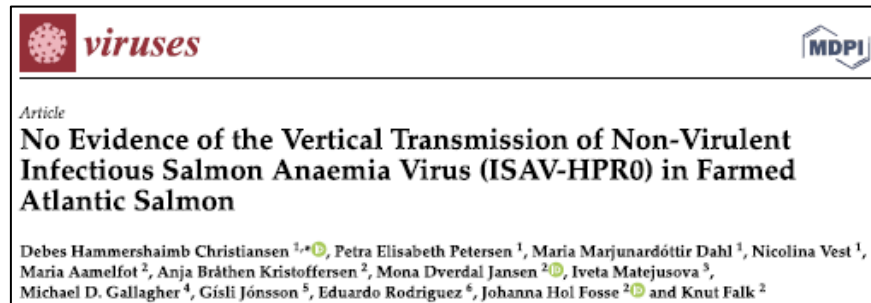
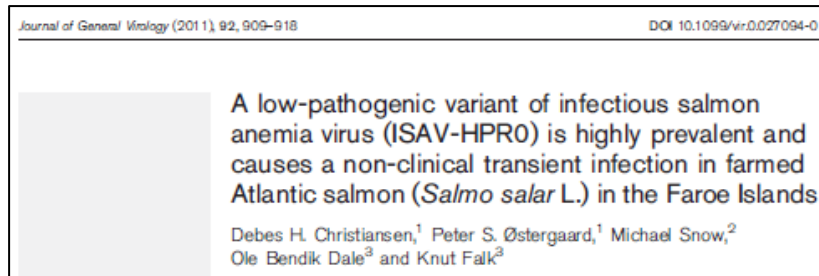
## Marine farms



## RAS smolt farms



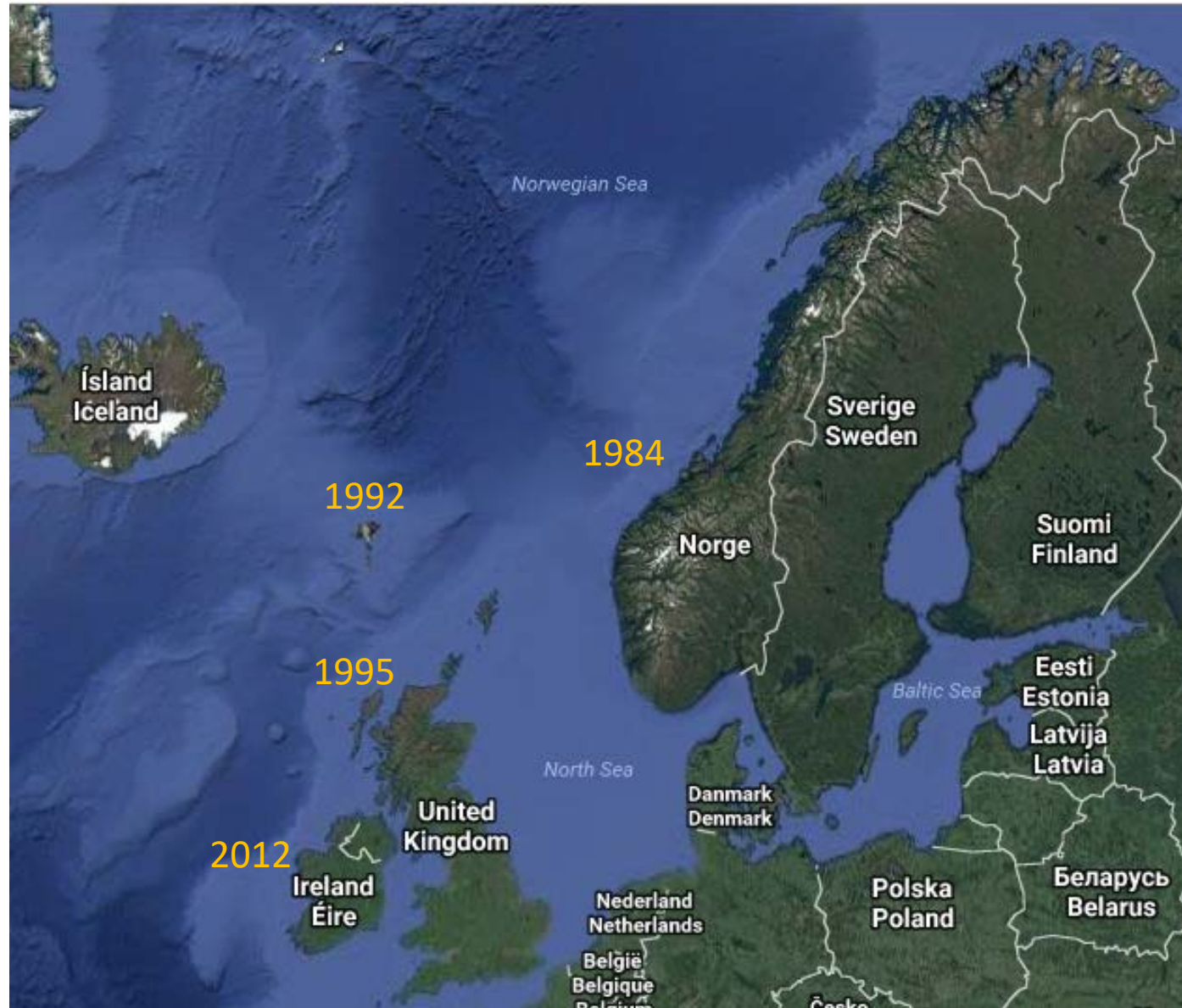
# What do we know about HPR0?



1. HPR0 is the progenitor to all HPRΔ
2. HPR0 causes a transient infection of epithelial cells in all marine production cycles
3. HPR0 is not transmitted vertically and can establish house-strains in RAS smolt farms
4. Production of large smolt in RAS with HPR0 may facilitate spread of HPRΔ

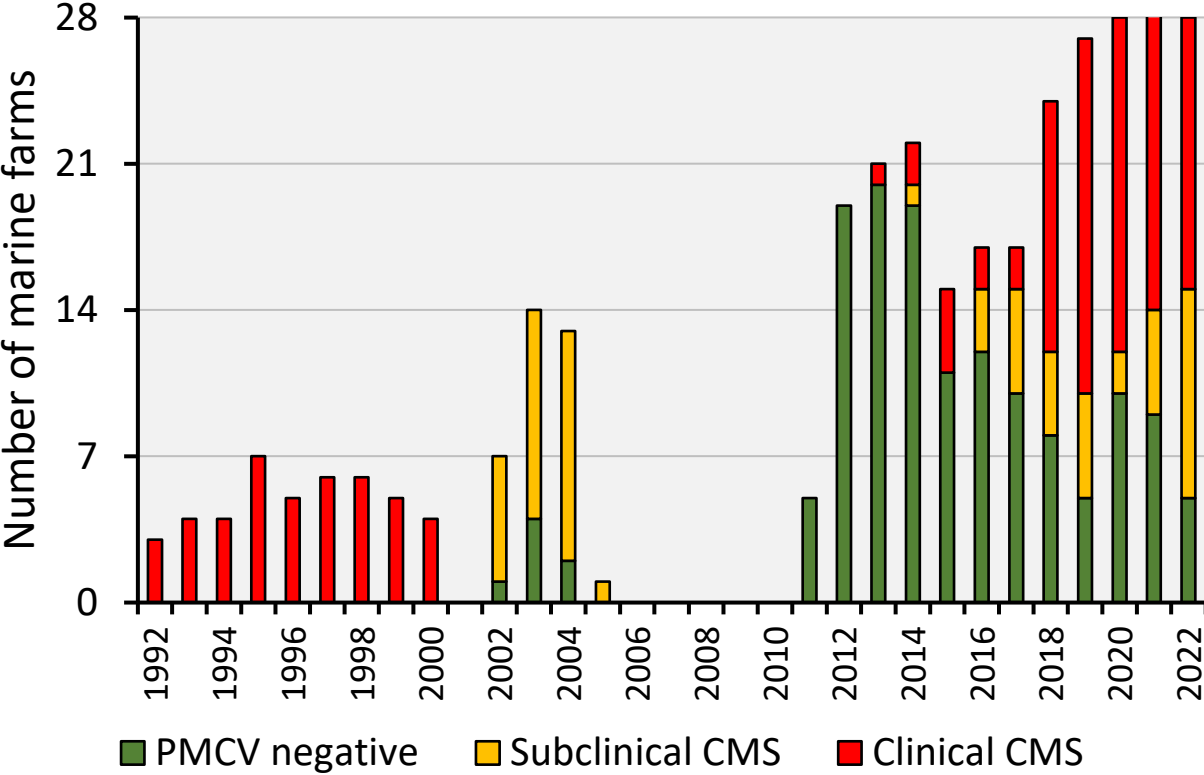


# Cardiomyopathy syndrome (CMS)



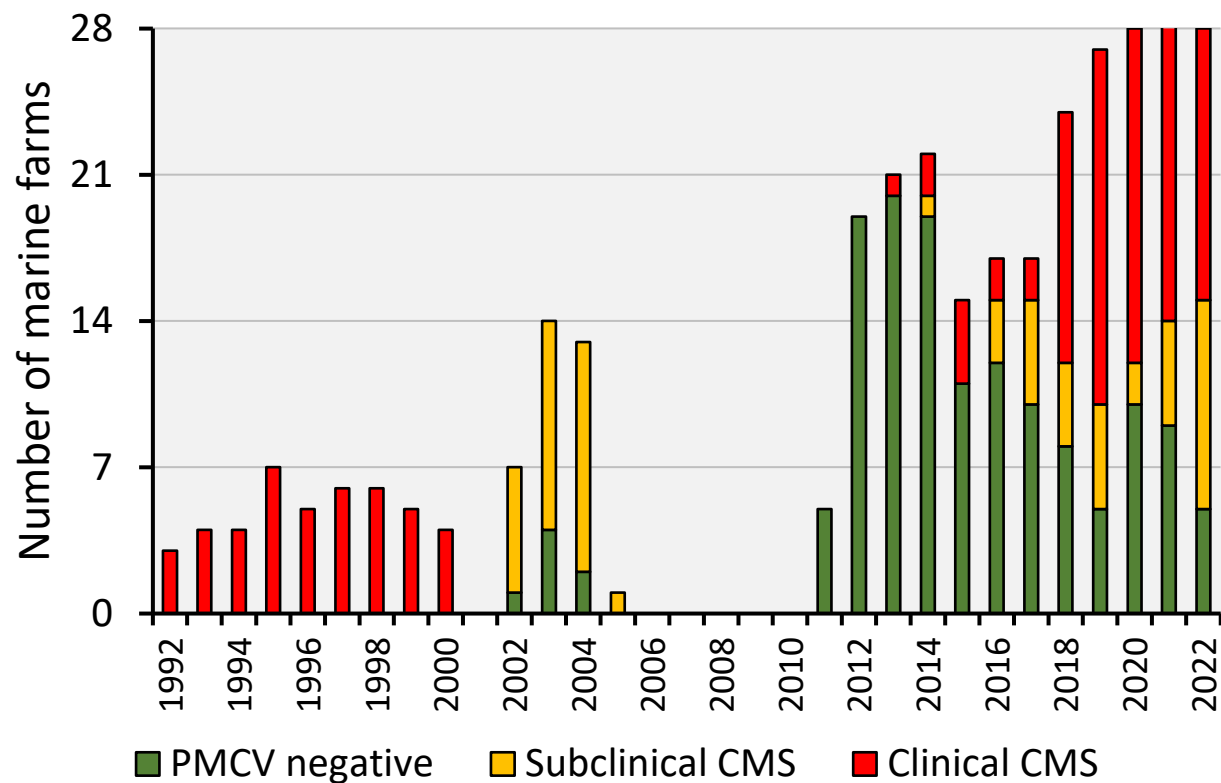
# Cardiomyopati syndrome (CMS)

Marine farms

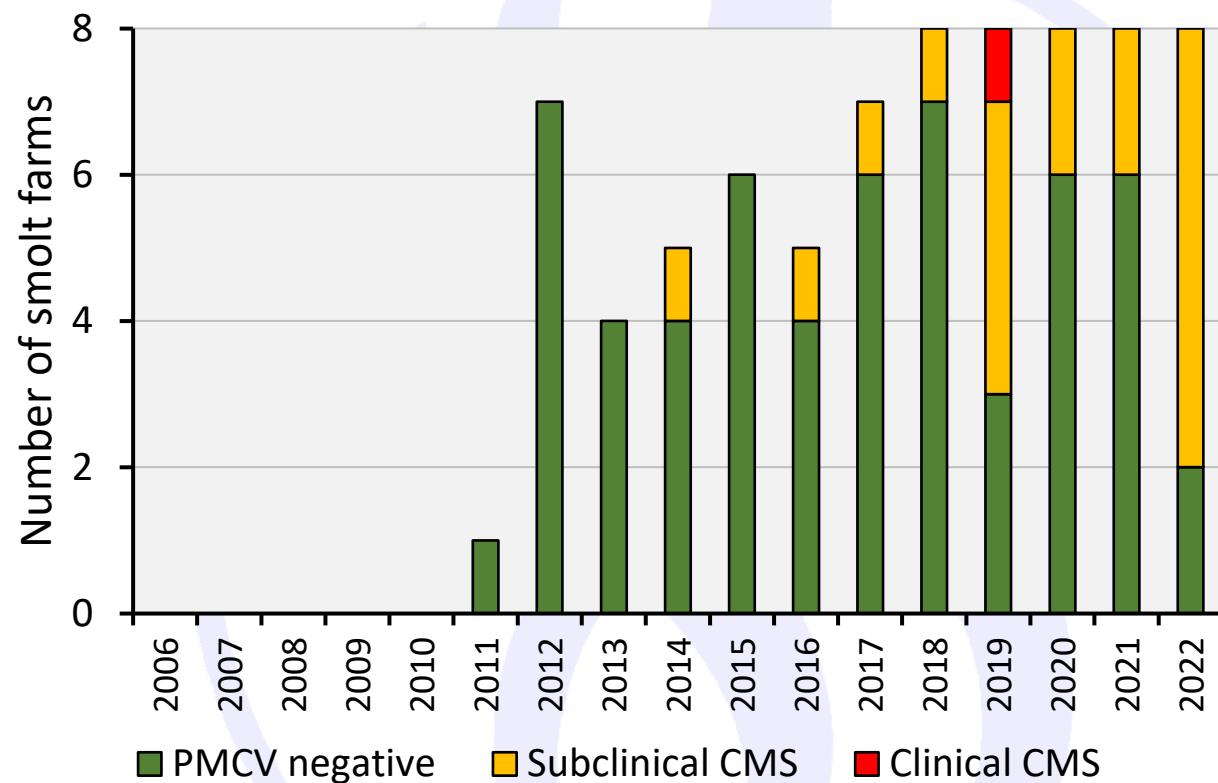


# Cardiomyopati syndrome (CMS)

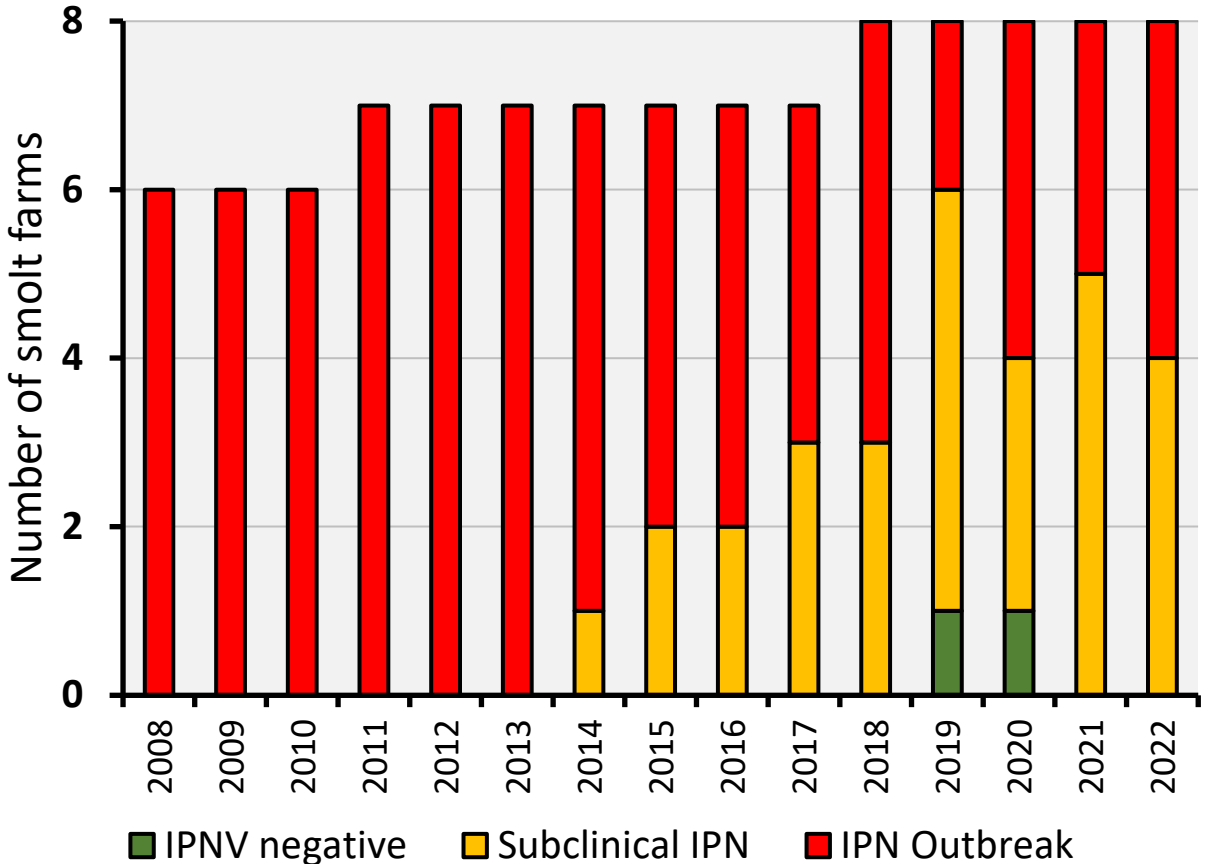
## Marine farms



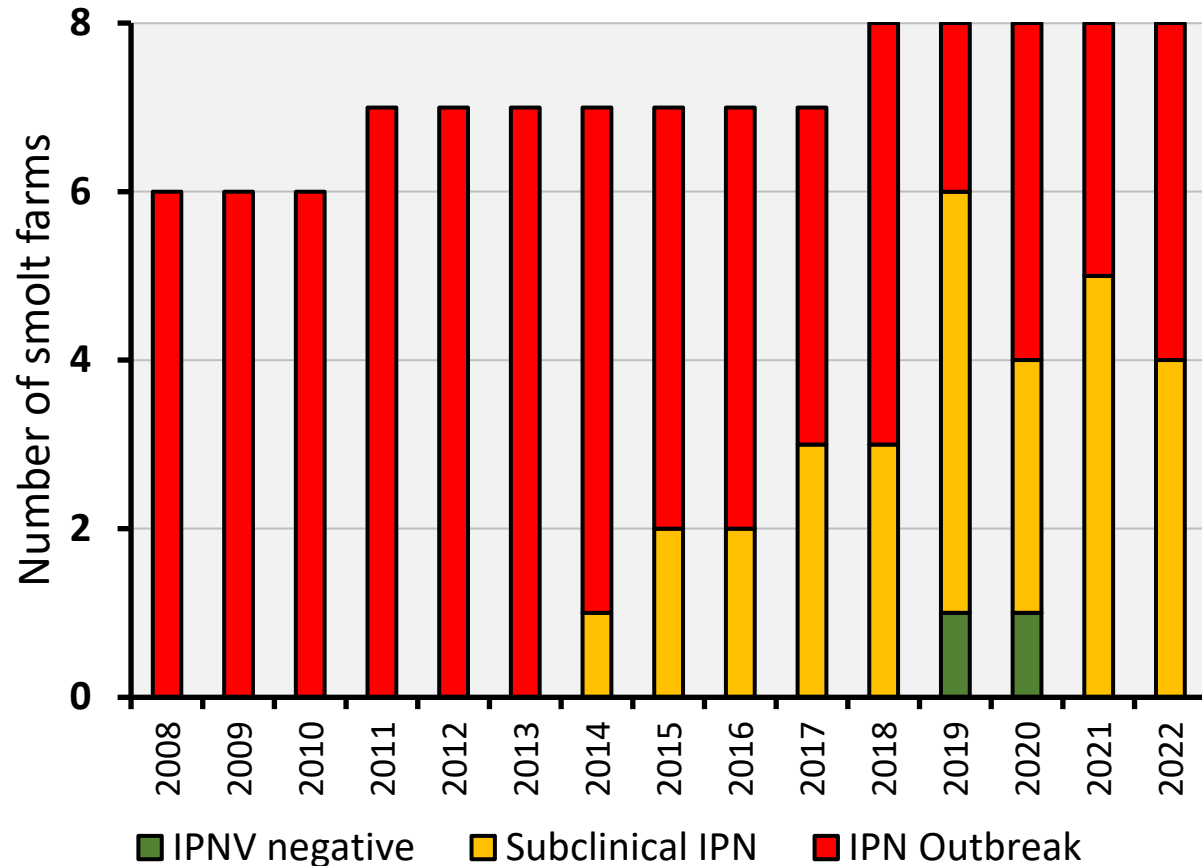
## RAS smolt farms



# IPN in RAS



# Do we have a new IPNV variant that can escape IPN-QTL?



frontiers  
in Genetics

ORIGINAL RESEARCH  
published: 26 November 2021  
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## Identification of a New Infectious Pancreatic Necrosis Virus (IPNV) Variant in Atlantic Salmon (*Salmo salar* L.) that can Cause High Mortality Even in Genetically Resistant Fish

Borghild Hillestad, Stein Johannessen, Geir Olav Melting and Hooman K. Moghadam\*  
Benchmark Genetics Norway AS, Bergen, Norway

pathogens

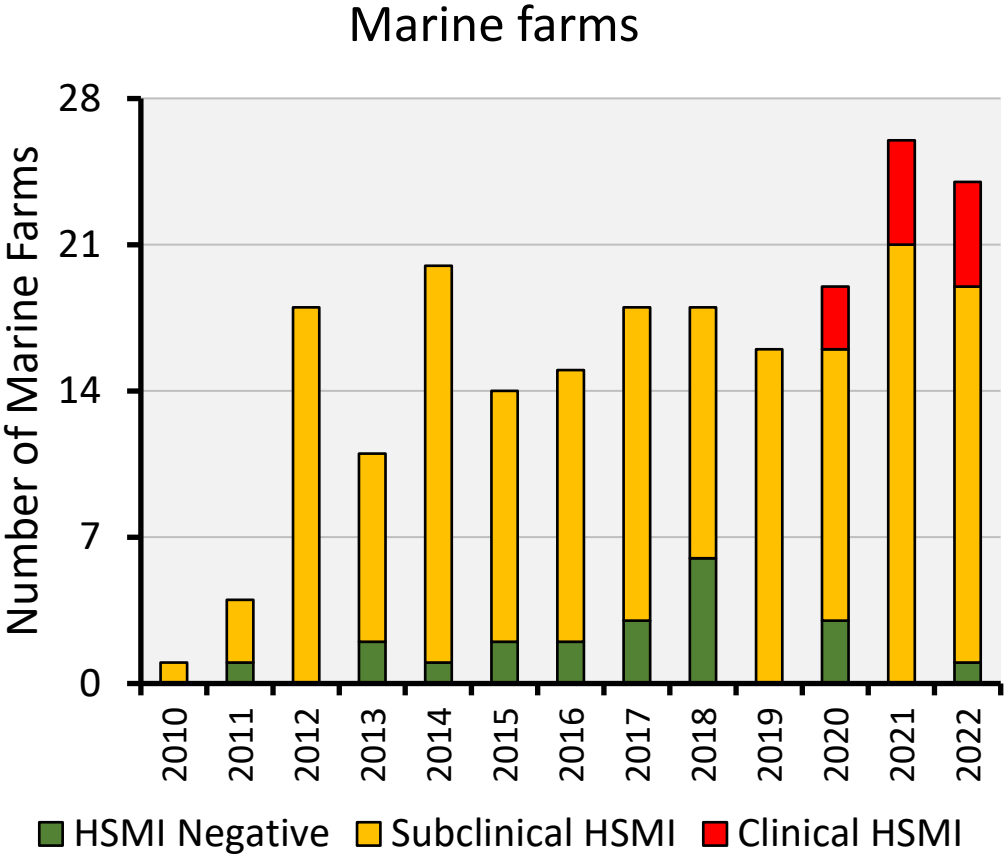


Article

## Isolation of a New Infectious Pancreatic Necrosis Virus (IPNV) Variant from Genetically Resistant Farmed Atlantic Salmon (*Salmo salar*) during 2021–2022

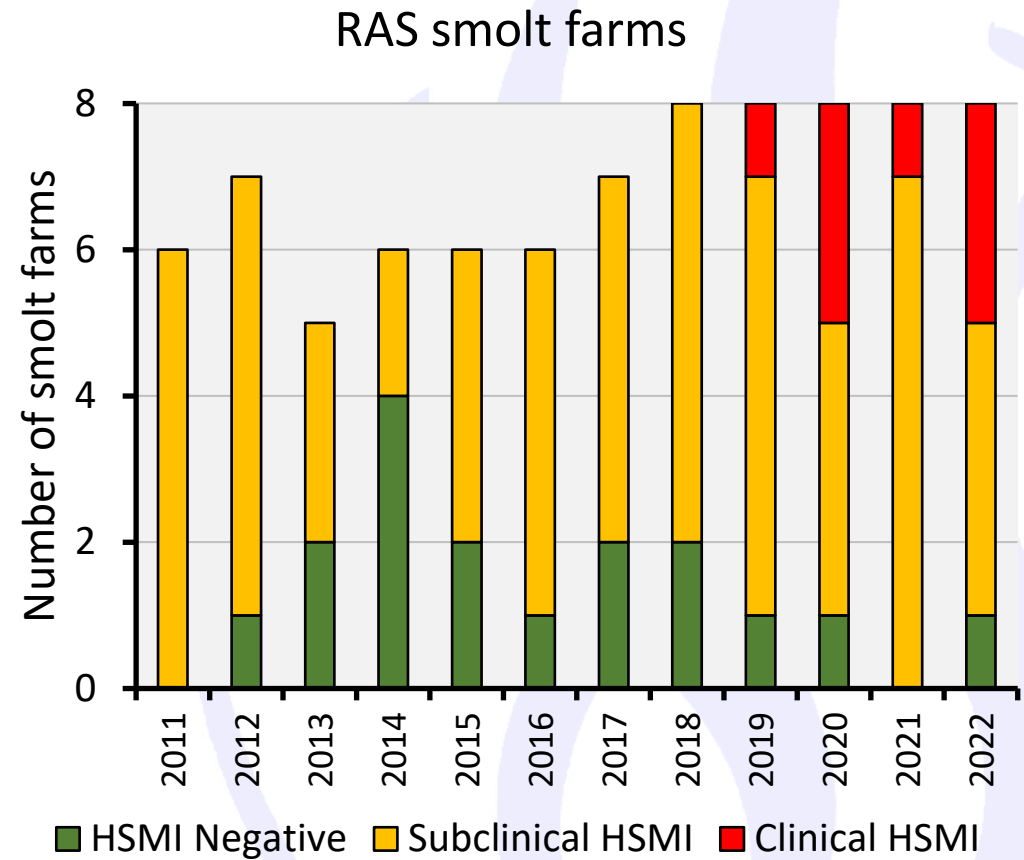
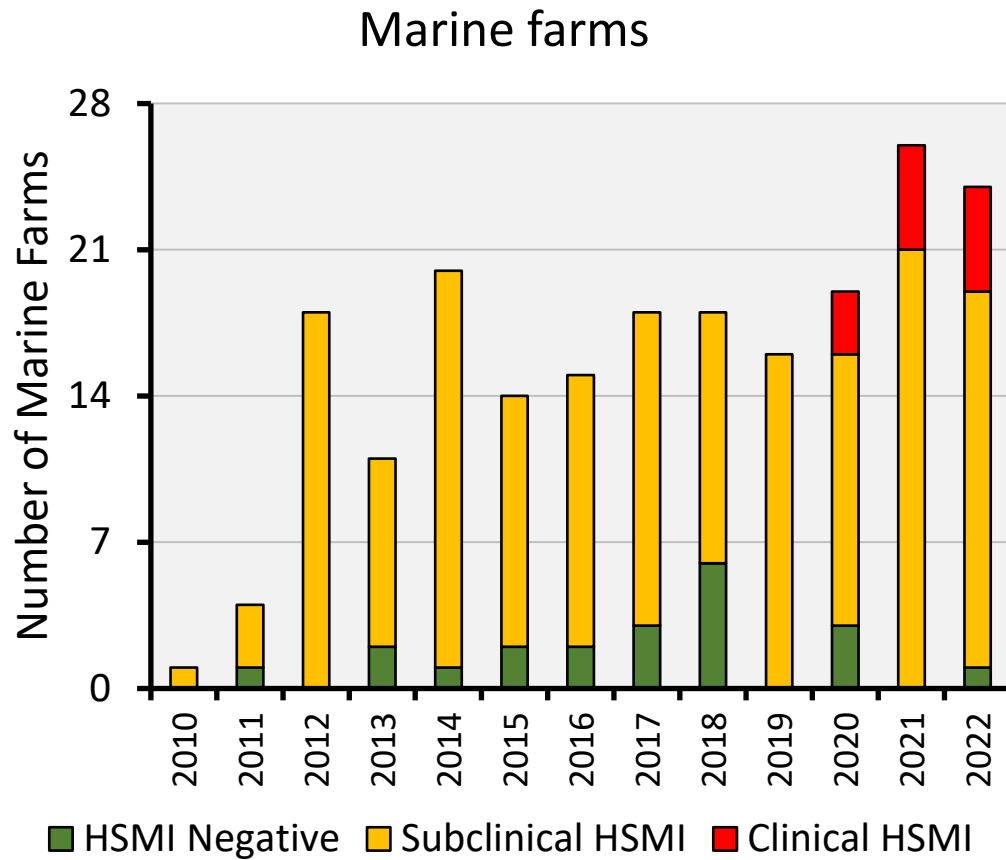
Marcos Godoy<sup>1,2,\*</sup>, Molly J. T. Kibenge<sup>3</sup>, Marco Montes de Oca<sup>2</sup>, Juan Pablo Pontigo<sup>1</sup>, Yoandy Coca<sup>4</sup>, Diego Caro<sup>2</sup>, Karina Kusch<sup>2</sup>, Rudy Suarez<sup>5</sup>, Ian Burbulis<sup>6</sup> and Frederick S. B. Kibenge<sup>3</sup>

# Hearth & skeletal muscle inflammation (HSMI)





# HSMI



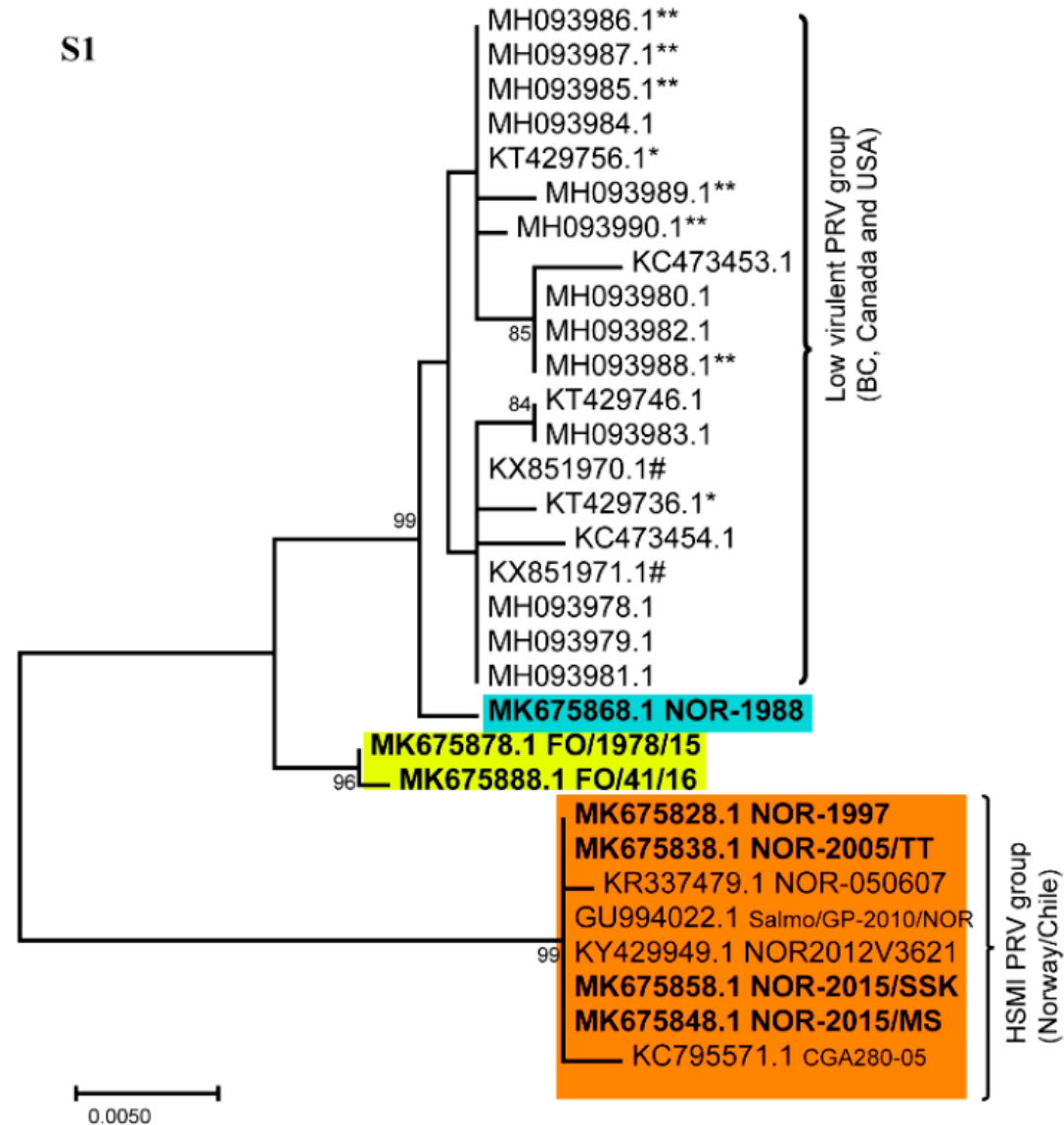
# Low and high virulent PRV-1



Article

## Evolution of the *Piscine orthoreovirus* Genome Linked to Emergence of Heart and Skeletal Muscle Inflammation in Farmed Atlantic Salmon (*Salmo salar*)

Kannimuthu Dhamotharan <sup>1</sup>, Torstein Tengs <sup>2</sup>, Øystein Wessel <sup>1</sup>, Stine Braaen <sup>1</sup>, Ingvild B. Nyman <sup>1</sup>, Elisabeth F. Hansen <sup>1</sup>, Debes H. Christiansen <sup>3</sup>, Maria K. Dahle <sup>4</sup>, Espen Rimstad <sup>1,\*</sup> and Turhan Markussen <sup>1</sup>



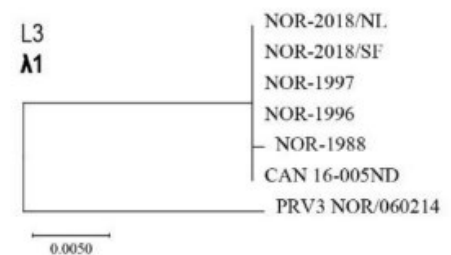
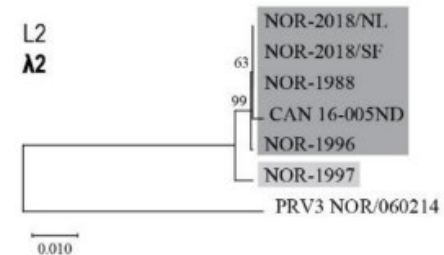
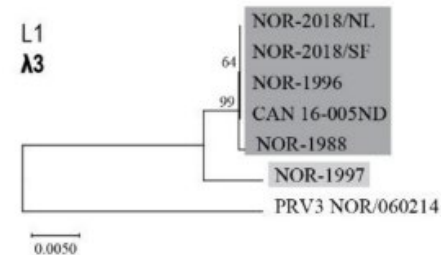
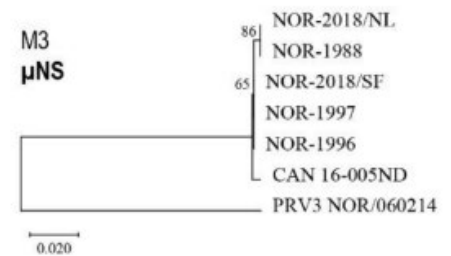
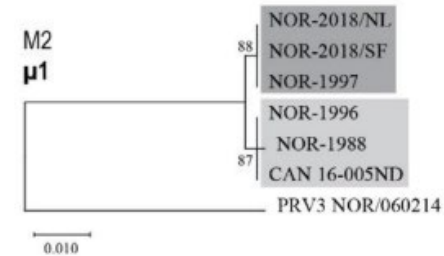
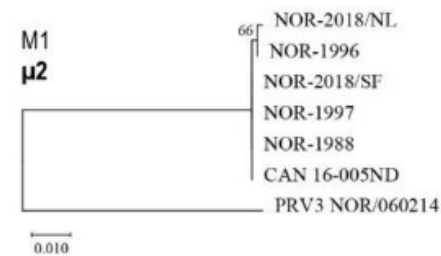
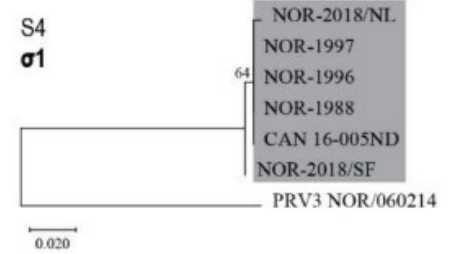
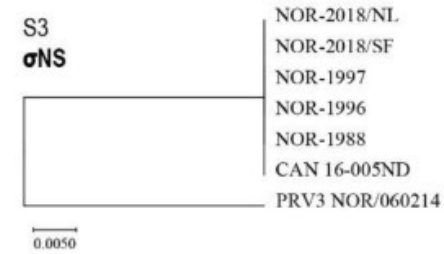
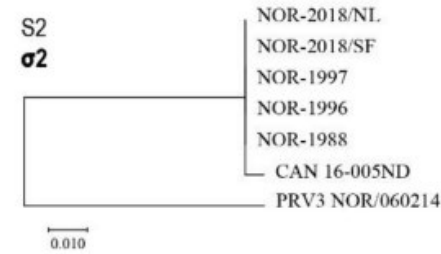
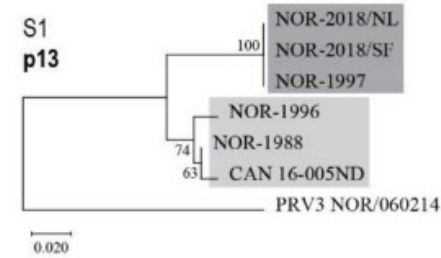
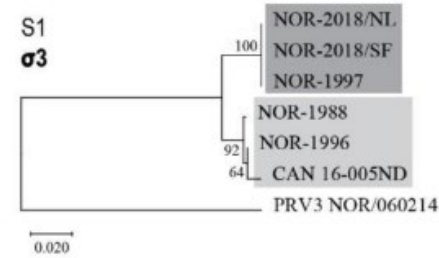
# Low and high virulent PRV-1



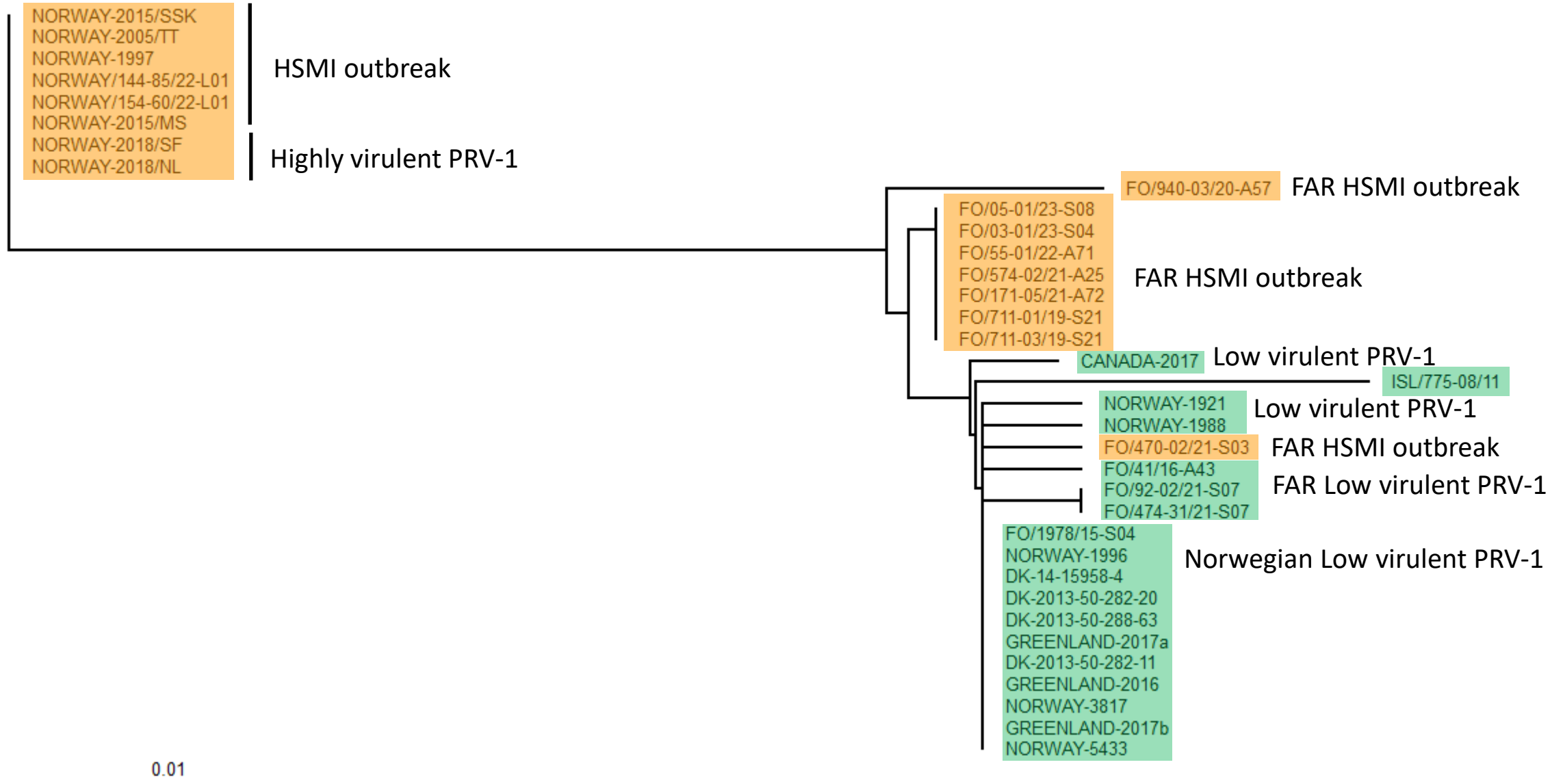
Article

## Piscine Orthoreovirus-1 Isolates Differ in Their Ability to Induce Heart and Skeletal Muscle Inflammation in Atlantic Salmon (*Salmo salar*)

Øystein Wessel <sup>1,\*</sup>, Elisabeth E Hansen <sup>1</sup>, Maria K. Dahle <sup>2</sup>, Marta Alarcon <sup>3</sup>, Nina A. Vatne <sup>1</sup>, Ingvild B. Nyman <sup>1</sup>, Karen B. Soleim <sup>2</sup>, Kannimuthu Dhamotharan <sup>1</sup>, Gerrit Timmerhaus <sup>4</sup>, Turhan Markussen <sup>1</sup>, Morten Lund <sup>5</sup>, Håvard Aanes <sup>5</sup>, Magnus Devold <sup>5</sup>, Makoto Inami <sup>6</sup>, Marie Løvoll <sup>6</sup> and Espen Rimstad <sup>1</sup>

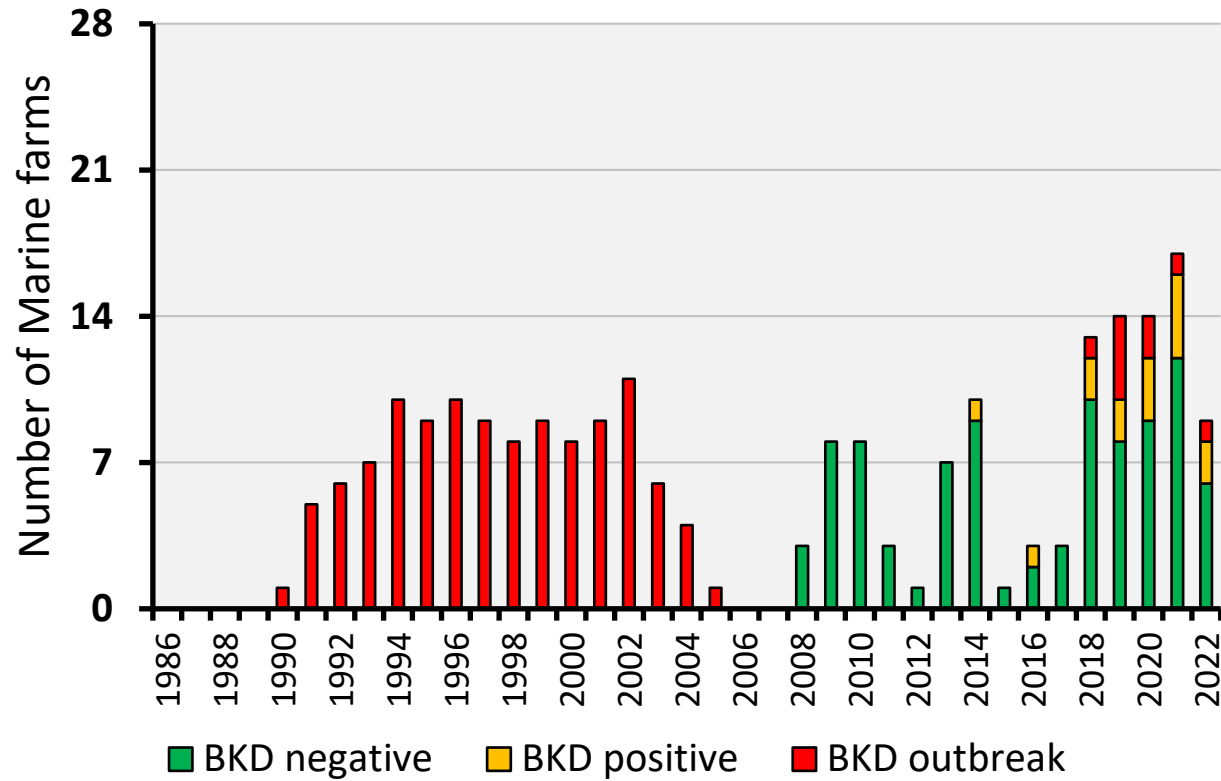


# Phylogenetic of the p13 protein of Faroese PRV-1 isolates



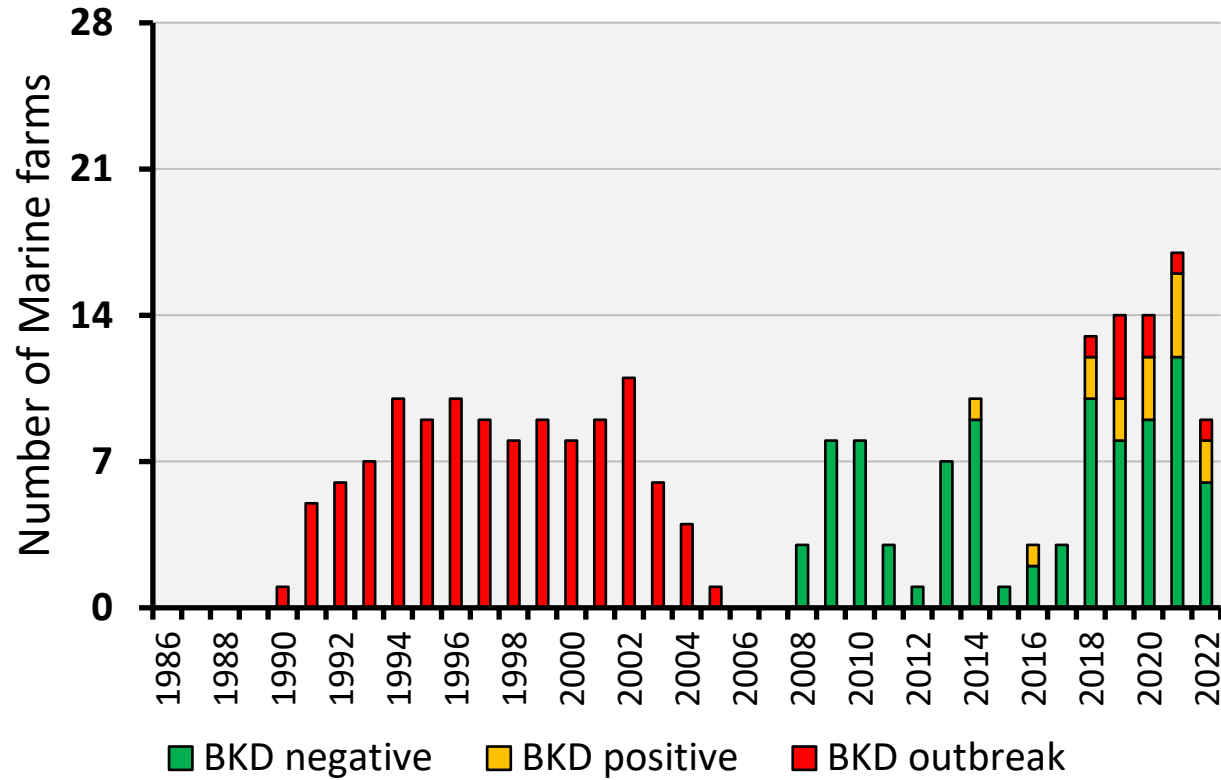
# Bacterial kidney disease (BKD)

Marine Farms

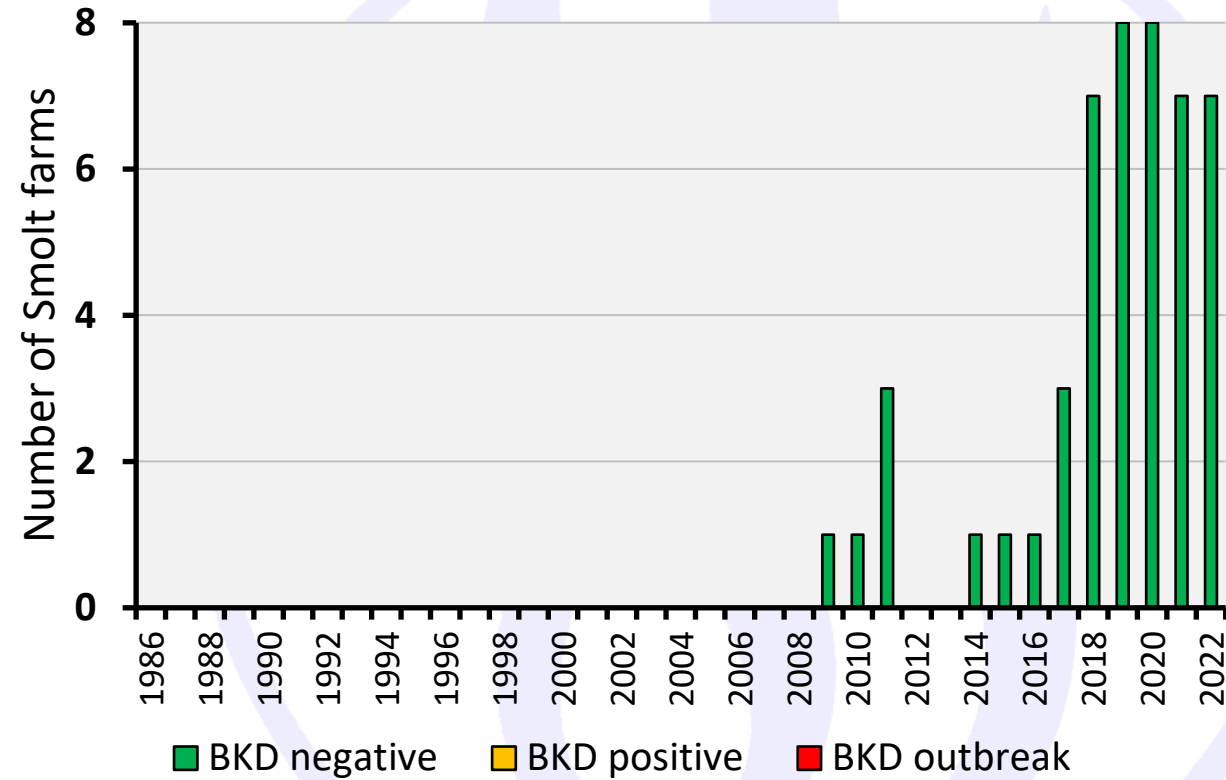


# Bacterial kidney disease (BKD)

## Marine Farms



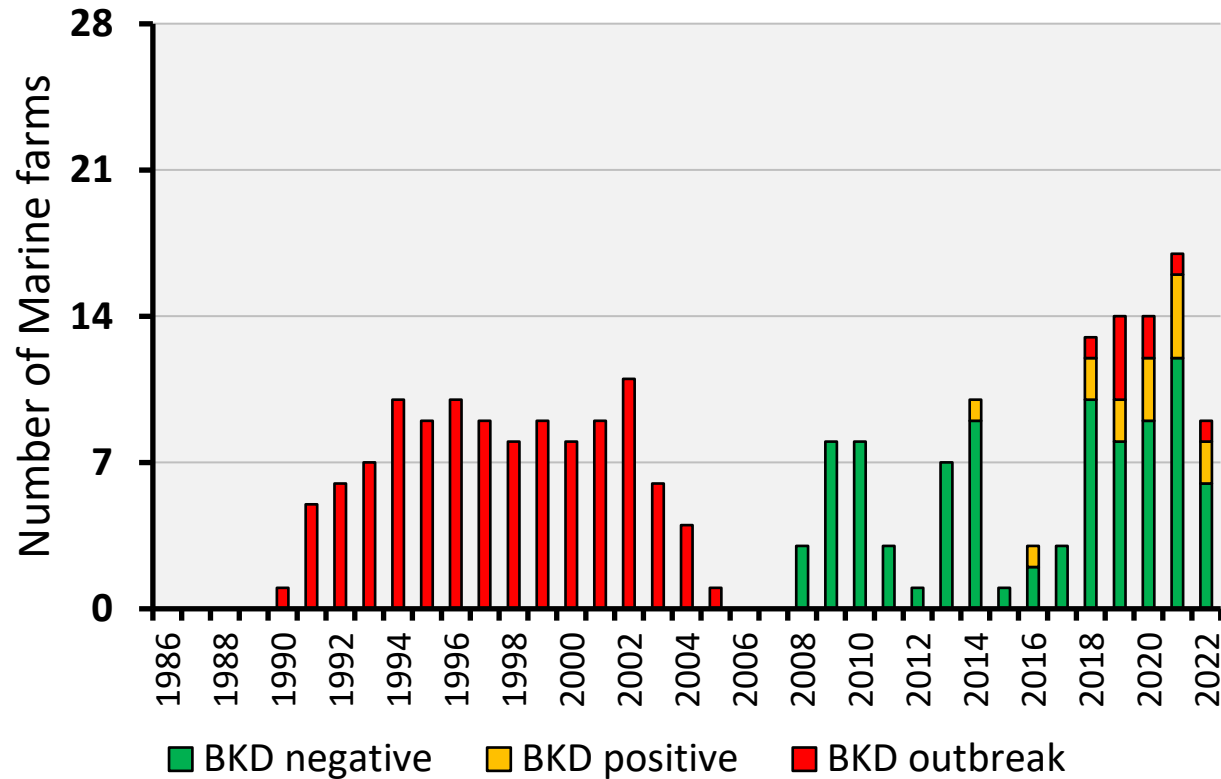
## RAS smolt farms



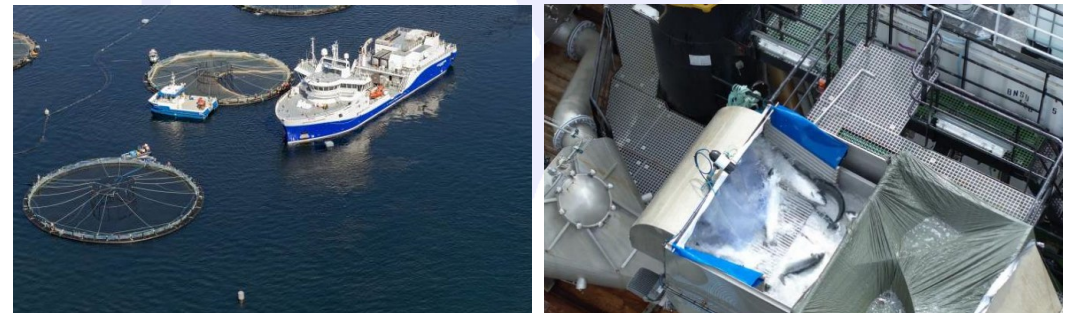


# BKD transmission pathways

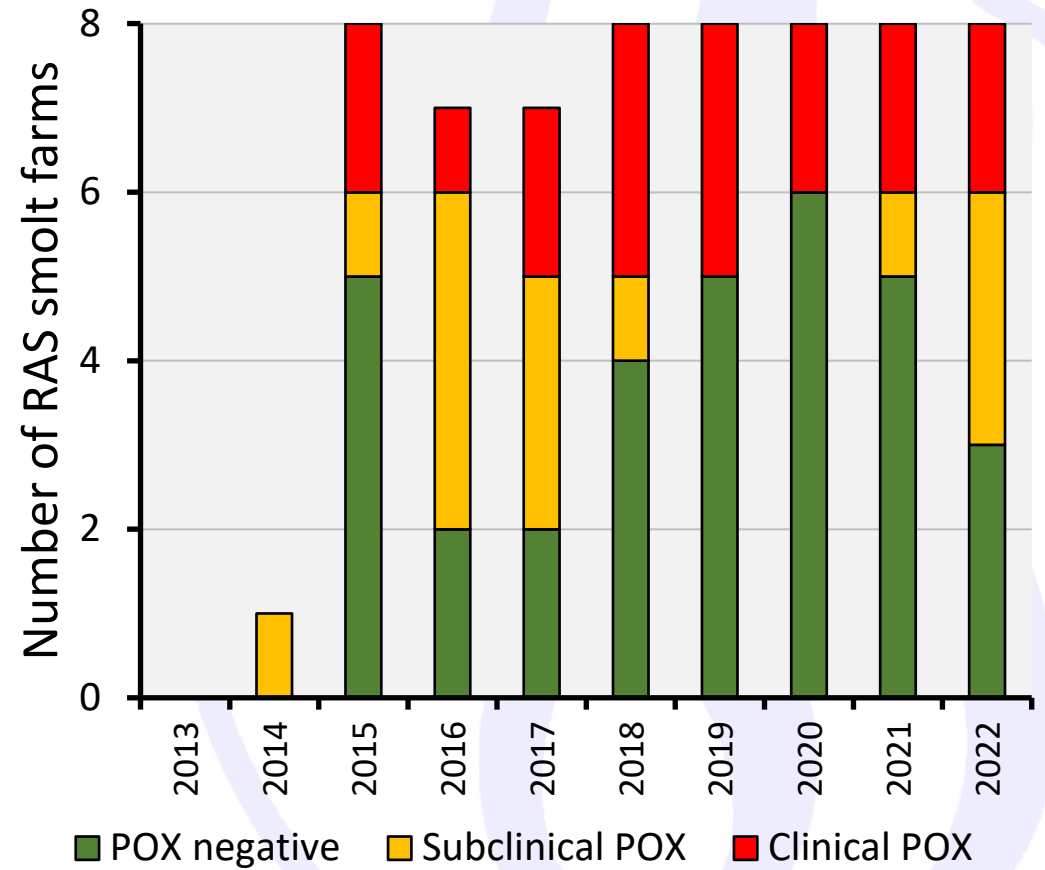
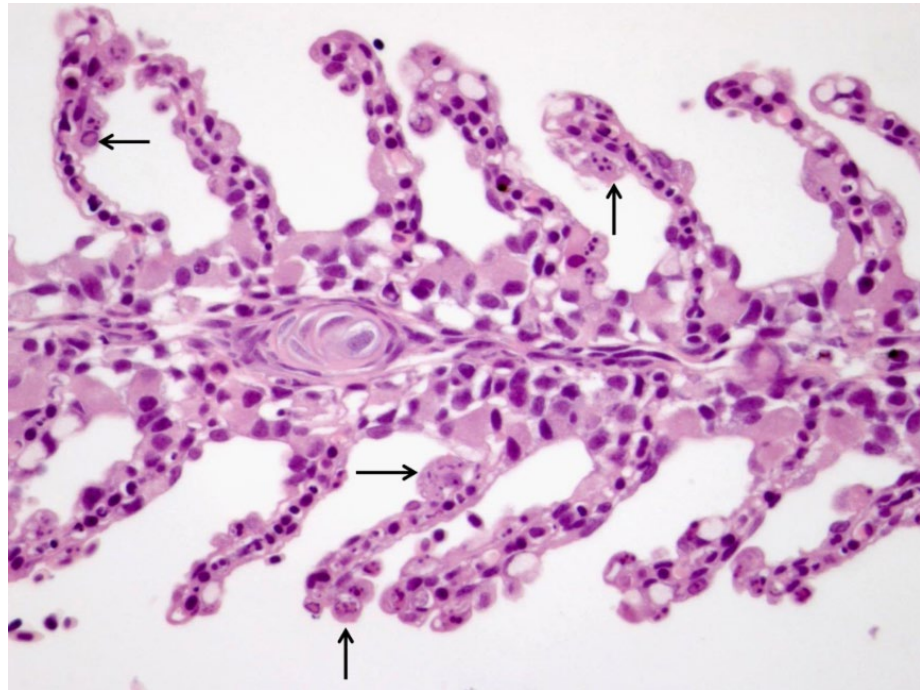
Marine Farms



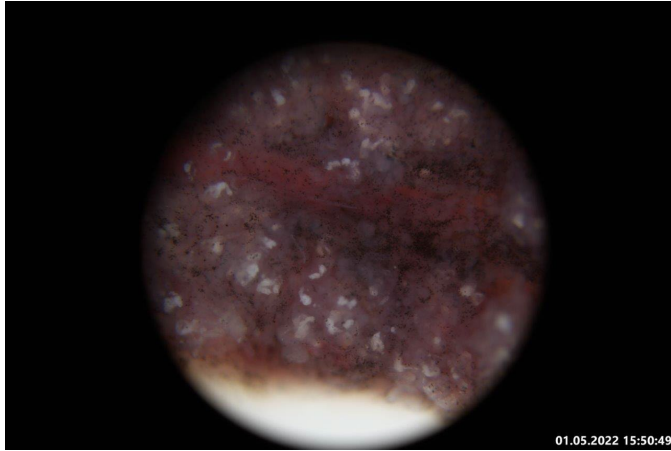
- Introduction:
  - *Most likely from the local environment*
- Spread
  - *Movement of equipment and vessels between affected farming sites for mechanical delousing*



# Salmon Gills Poxvirus (SGPV/POX)



# Nefrokalsinosis



- Norwegian Fish Health Report 2021
  - *The largest health issue in Norwegian smolt farms*
- Both in FT og RAS
- Also a major health issue in Faroese smolt farms.
  - Little knowledge because of no systematic surveillance

# Important diseases in Faroese salmon farming

Heilsutrúppulleikar	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
ISA					1		1						
HSMB										1	6	4	6
IPN	6	7	7	7	6	5	5	4	4	4	4	4	6
CMS					1	1	1	5	10	15	16	16	13
POX						2	1	2	3	3	2	2	3
BKD					1		1		3	6	3	5	2
Furunkulosa										4	1		
PD													
Winter ulcers							?	?	?	?	?	?	?
Nefrokalsinosis									?	?	?	?	?
Treatments for lice													





Thanks