Processing boats- an improvement for fish health and fish welfare?

Seminar on biosecurity and transportation of fish
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Biosecurity in the industry – The goal

An industry that operates and is regulated according to best biosecurity practises built on knowledge about biological infection principels, thus

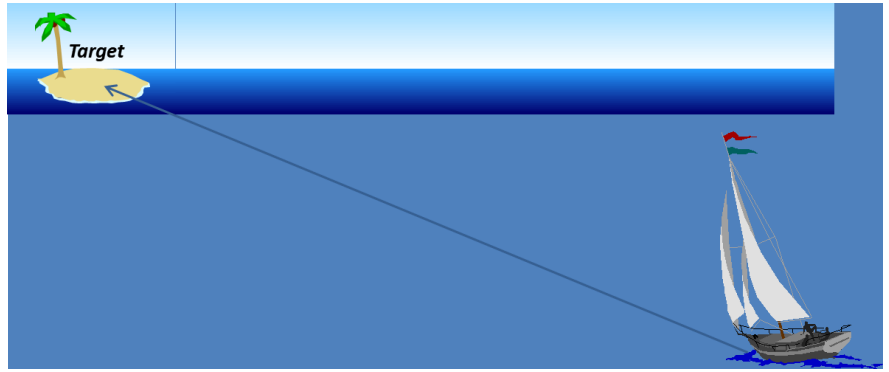
- *limits spread of infectious agents*
- *reduces infection pressure from existing, known agents, but also*
- *reduces risk of introduction and establishment of new infectious agents*
- *ensures predictability and flexibility in logistics (zones, borders, harvest plant structure)*
- *permits realization of a sustainable aquaculture growth*

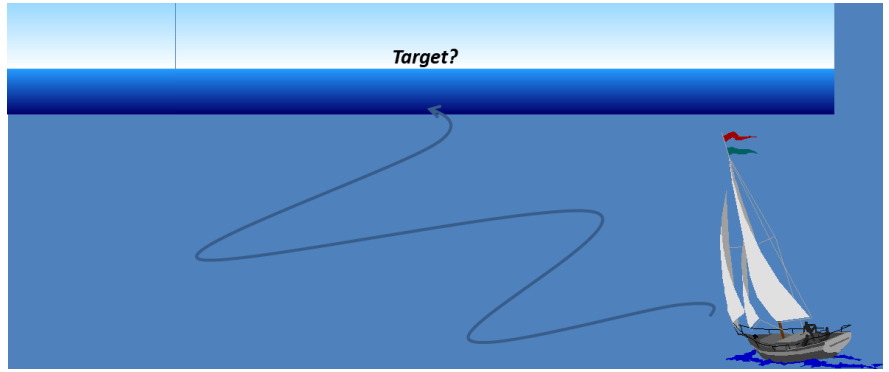
Biosecurity in the industry – The tool

<u>Establish a common goal picture</u>; describe where we should be in 5-10 years time- define best biosecurity practices- ensure stepwise implementation

Thereby also

- *taking care of the <u>totality</u>*- the sum of measures matters
- *ensuring <u>predictability</u>* – allows for investment planning, identifying development needs





Processing boats- an improvement for fish health and fish welfare?

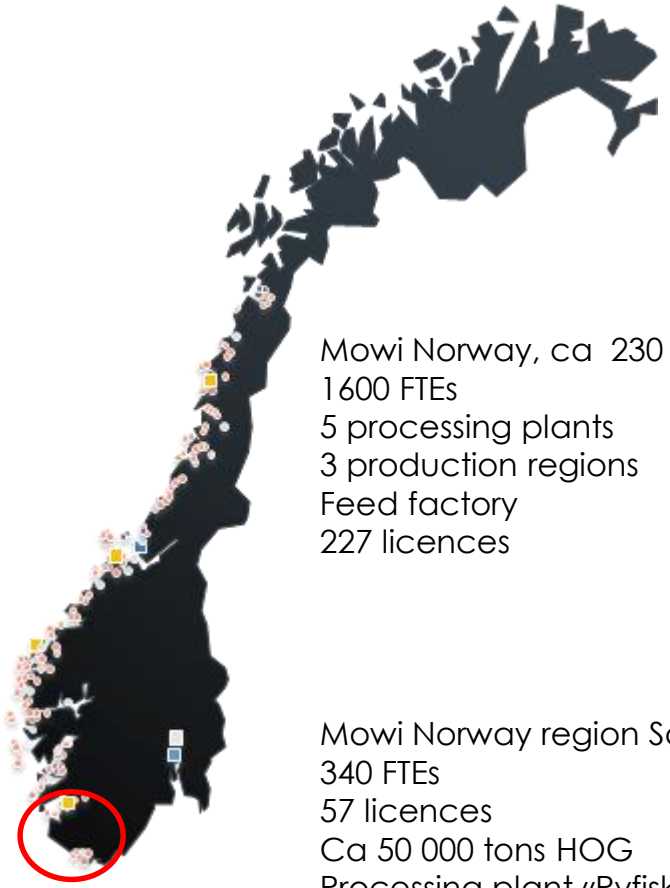
- Definitely YES, but certain key criteria that need to be met

S&B – experience Mowi Norway reg South

- Fish welfare challenges in southern part of Norway 2005-2007
  - High sea temperatures
  - Mortality during crowding, loading and transport as well as in waiting cages
  - PD in Rogaland and Hordaland

- Well boat Tauranga re-built to S&B boat in 2008
  - Idea from fra Canada- operated with S&B boats from 2006
  - Stopped use of waiting cages in 2014- S&B 3 days, direct delivery 2 days

- Ryfisk processing plant re-build for 100% S&B -Q1 2018
  - Aqua Merdø (S&B) addition from May 2018



Mowi Norway, ca 230 000 tons HOG
1600 FTEs
5 processing plants
3 production regions
Feed factory
227 licences

Mowi Norway region South
340 FTEs
57 licences
Ca 50 000 tons HOG
Processing plant «Ryfisk» in Rogaland

Processing boats- what is it?

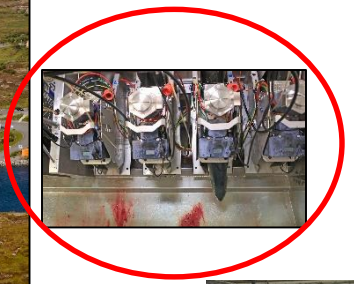
- The harvesting process, the stunning and bleeding (killing step) happens at pick-up at the farm

- The fish is transported dead to the packing station (bleeding out in chilling tanks, or chilled as gutted fish in RSW water)

- **Stun & Bleed boat (S&B)**
- **Processing boat**
  - **On site harvest**

Tauranga 2009 (Napier)

Processing boats- what is it?



FARM

Traditional well-boat concept

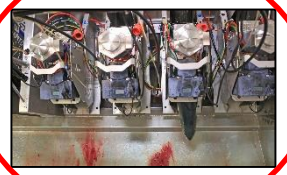
Pumping → Well boat → Transport → Pumping → Waiting cage → Pumping → Stunning

Pumping

Processing boat concept

Pumping → Stunning → Processing boat → Transport → Pumping

PACKING STATION



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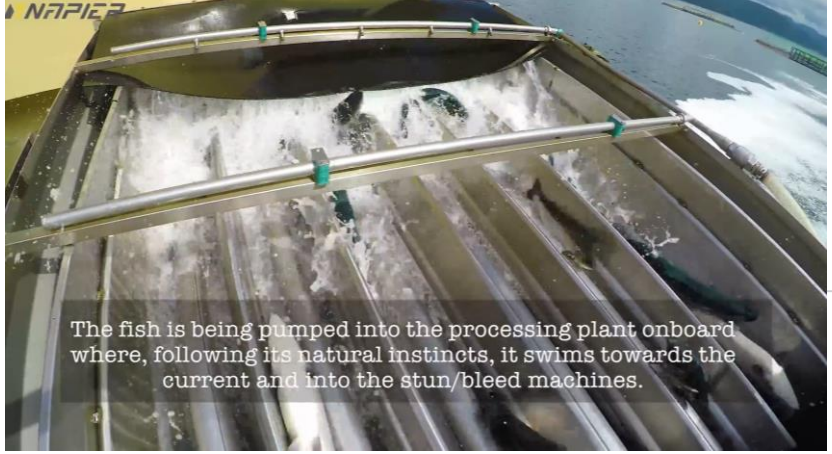
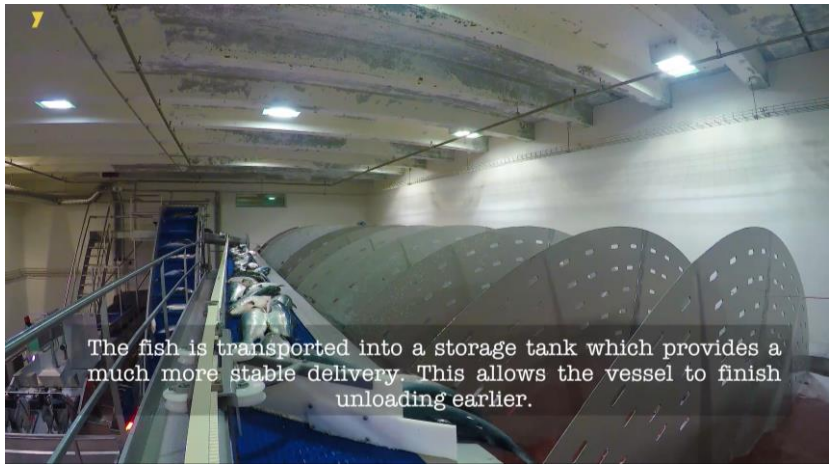

The fish is being pumped into the processing plant onboard where, following its natural instincts, it swims towards the current and into the stun/bleed machines.


The fish is quickly cooled down to 0.5°C to ensure the quality of the fish until it gets to the onshore processing plant.


There is a drainage tank on land which seperates the bloodwater from the fish. The bloodwater is returned to the vessel.


The fish is being pumped into the processing plant onboard where, following its natural instincts, it swims towards the current and into the stun/bleed machines.


The fish is quickly cooled down to 0.5°C to ensure the quality of the fish until it gets to the onshore processing plant.

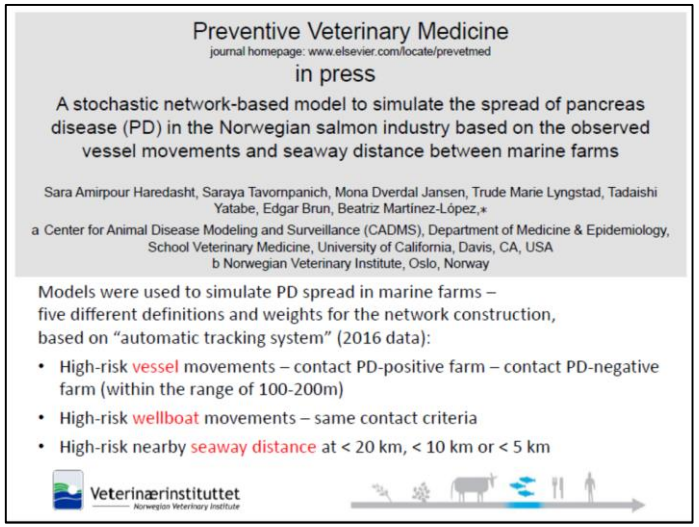

The fish is transported into a storage tank which provides a much more stable delivery. This allows the vessel to finish unloading earlier.


Every fish is manually controlled and, if neccessary, stunned/bled again.


http://www.napier.no/
While unloading of the fish, the onboard processing plant gets washed, disinfected and prepared for the next harvest.

Harvest transport by well boats – biosecurity risk factors

- Vessel systems, tanks and circulation system represents a common contact point for all fish in the well (known and unknown disease carriers)
- Potential pathogen spread via transport water
  - Open transport known disease (intended)
  - Open transport unknown disease (unintended)
  - Unintended failure in closed systems or in disinfection of transport water.
- Potential pathogen spread due to insufficiency or failure in sanitation procedures.
  - Cross contact harvest fish and smolt – same vessel
  - Cross contact with production fish by delousing, all fish sizes
  - Cross contact with production fish by loading of harvest fish – circulation of water in contact with insufficiently cleaned pipes, pumps, RSW systems etc
- Contamination to fish placed in open waiting cages.


Preventive Veterinary Medicine
journal homepage: www.elsevier.com/locate/prevetmed
in press

A stochastic network-based model to simulate the spread of pancreas disease (PD) in the Norwegian salmon industry based on the observed vessel movements and seaway distance between marine farms

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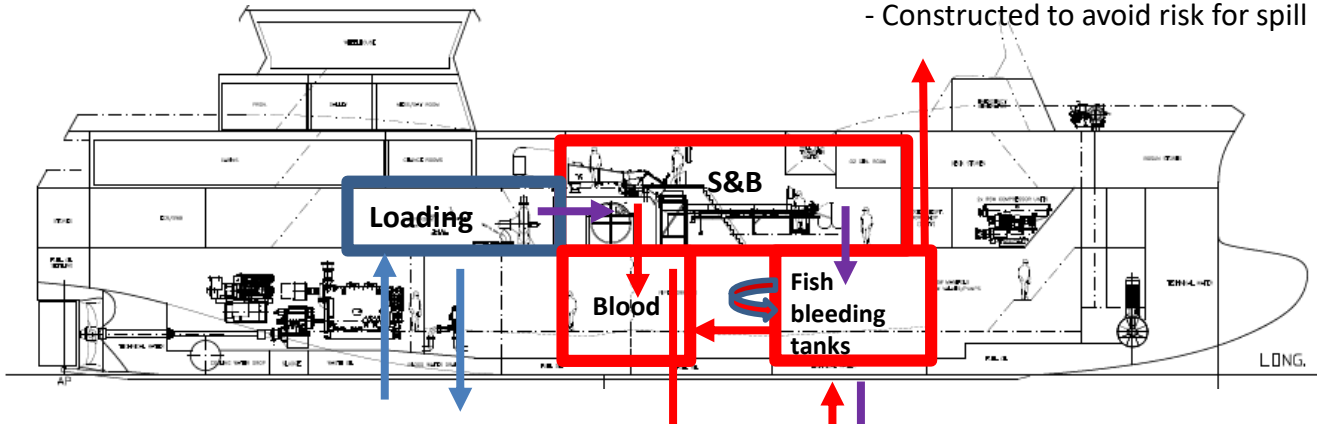
Models were used to simulate PD spread in marine farms –
five different definitions and weights for the network construction,
based on "automatic tracking system" (2016 data):

- High-risk vessel movements – contact PD-positive farm – contact PD-negative farm (within the range of 100-200m)
- High-risk wellboat movements – same contact criteria
- High-risk nearby seaway distance at < 20 km, < 10 km or < 5 km

Veterinærinstituttet
Norwegian Veterinary Institute

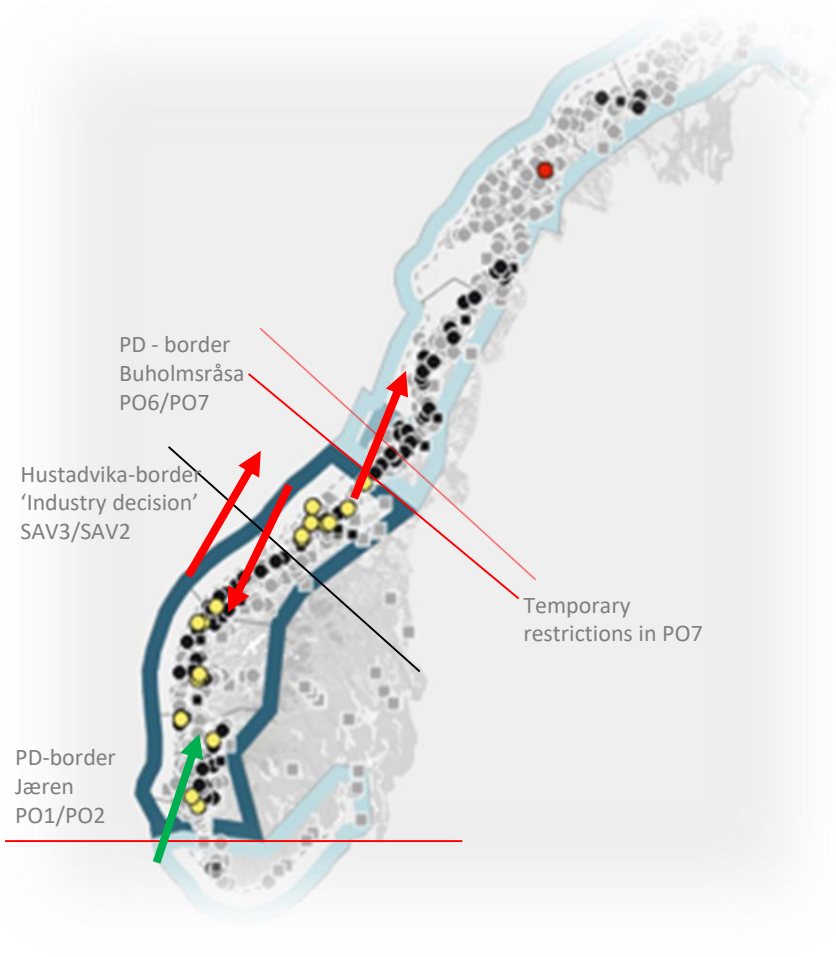
Schematic overview- S&B boats

- Separate loading and un-loading system
- Washing/ disinfection at site
- No sea contact with well or circulation systems- no valves
- Double assurance against leakages at fish delivery
- Processing water, blood water and transport water need to be pumped out of the boat
- CIP cleaning



Sea Harvest in combination with a more robust zone structure can play an important role for a better control with infectious diseases

- SAV2/SAV3-borders seems clear. Borders for new agents we don't know, yet – we need to behave and opetrate like all harvest fish is infected in order to control introduction and spread of potential new pathogens.
- Processing boats/S&B boats represent standards for fish transport equal to or even stricter than requirements for «sanitation harvest».
- Eliminates contact between harvest fish and smolt or production fish.
- Eliminates waiting cage challenges



Processing boats- current fleet

Tauranga (Napier) 2009, 280t LW
-operating for Mowi

Taupo (Napier) 2019, 200t LW

Taupiri (Napier) 2019, 200t LW
- Operating for Mowi

AquaMerdø (DESS) 2018, 400t LW
- Operating for Mowi

Norwegian Gannet (Havline) 2019, 1 200t LW

Others;
- **Seihaust (Seistar) 2019**, 420t LW
- Some smaller S&B boats
- Several being planned

Processing boats and S&B boats- other key aspects

- **Improved fish welfare**
  - Reduced mortality (transport/ waiting cage)
  - Less handling of live fish (1 step vs 2 or 3)
  - No transport of live fish
  - No transport mortality

- Less carbon emmissions during transport
  - Allows for fifferent hull construction-less fuel consumption
  - Faster boats
  - Higher capacity

- Less costly boats
  - Can transport more fish vs water
  - Smaller tanks/ smaller boats

- **The best biosecurity option- «Sanitary slaughter» as routine**

- Less flexibility
  - Not multi-purpose boats
  - Until now, limited back-ups, but starting to get there
  - Processing plants need to be set up for receiving stunned and bled fish
  - What is harvested need to be packed

- Low stress harvest/ long pre-rigor time and first in-first out important to avoid in rigor processing

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Processing boats and S&B boats- summary

- **S&B/ Processing boats can and should play an integral part in establishing more robust biosecurity practices for transport of harvest fish in the industry**

- **Key design criteria and routines need to be a pre-requesite**
  - No cross contact or common pipe-or pump systems for live fish and dead-fish- separate loading and unloading systems
  - Discharge of blood water to treatment plants with known discharge points
  - Double protection against leaks to avoid events that can cause blood spills

- **Predictability and flexibility, key to incentivise investments-** need to meet highest possible biosecurity standards

Thank you for your attention!

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AquaMerdø (DESS) 2018

Taupiri (Napier) 2019