

# Epidemiological study of CMS

An ongoing research project in Norway

Julie Christine Svendsen

*Photo credit: Johan Wildhagen*



**Veterinærinstituttet**  
Norwegian Veterinary Institute

# An outline of today's talk:

- Introduction
- A brief history of CMS
- Epidemiology
- Knowledge gaps
- Work packages



# Introduction - Purpose and aims

- The Norwegian Seafood Research Fund
- PMCV transmission routes and course of infection
- Risk factors associated with PMCV infection and development of CMS
- Summary of current state of knowledge
- Form advice to limit the spread of PMCV and clinical outbreaks of CMS
- Communicate knowledge
  - Peer-reviewed articles
  - Fact-sheet
  - Workshops

# Participating partners

- The Norwegian Veterinary Institute
  - Britt Bang Jensen (Project manager. Cand.med.vet., PhD)
  - Åse Helen Garseth (Cand.med.vet., PhD)
  - Anja B. Kristoffersen (Dr. scient., senior researcher)
  - Thijs Van Son (PhD)
  - Camilla Fritsvold (Cand.med.vet., PhD-student)
- Pharmaq analytic
- Marine Harvest
- Lerøy Midt
- Salmar
- Cermaq

# PHARMAQ

## Analytiq



# *cermaq*





# A brief background of CMS

- Atlantic salmon
- Geographical distribution
- Infectious nature and viral etiology
- Sudden death or chronic manifestation
- Atlantic salmon in the second year of the sea water phase

Photo credit: Trygve Poppe



# Epidemiology

- Transmission and reservoirs
- Descriptive epidemiology
- Analytic epidemiology



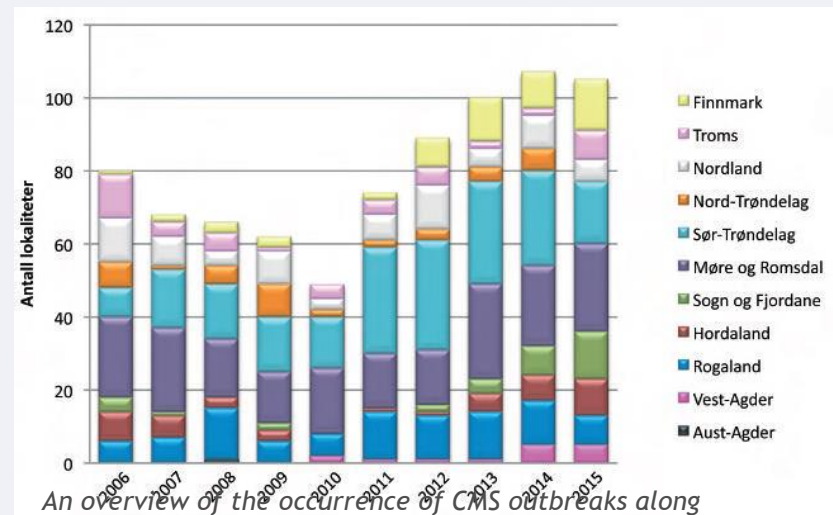
# Transmission and reservoirs

- Vertical transmission
  - Cannot be excluded.
- Horizontal transmission
  - Experimental challenge; Haugland, Mikaelson et al. 2011
  - Genetic variation of PMCV in Norway; Wiik-Nielsen et al., 2013
- Reservoirs
  - Atlantic salmon
  - Less likely: other marine species and wild Atlantic salmon
  - More studies into: environment

# Descriptive epidemiology

## ■ Occurrence of PMCV-virus and CMS outbreaks in farms

- Majority in mid-Norway
- Seasonal variations



An overview of the occurrence of CMS outbreaks along the Norwegian coast, subdivided into counties, from 2006-2015 (Source: The fish health report 2015)

## ■ Occurrence of PMCV-virus and CMS outbreaks in hatcheries

- "RNA may be transferred from the parental fish to the progeny, but whether RNA is contained in a viral particle is not known." Wiik-Nielsen et al., 2012.
- ## ■ Occurrence of PMCV in wild salmon
- 0,25% prevalence. Garseth et al., 2012.



# Analytic epidemiology

- Risk of introducing virus
  - Ongoing research
  - Preventative husbandry practices
- Risk of CMS outbreaks
  - Length of time in the sea, increasing cohort size, infection pressure, CMS in previous cohorts. Bang Jensen et al., 2013.
  - Stressful operations
- CMS and other virus infections
  - Viral co-infections: PMCV, SAV, PRV and ASCV. Wiik-Nielsen et al., 2016.

# Knowledge gaps

*«The more you know, the more you know you don't know»*

*Aristotle*



# Knowledge gaps

- Infection pathways
- Triggers for disease
- Disease development
- Tissue tropism
- Biophysical qualities of the virus
- Economic consequences



# Work packages

- WP1: Vertical transmission
- WP2: Disease development in the seawater phase
- WP3: Risk factors for infection with PMCV and development of CMS
- WP4: CMS review
- WP5: Possibilities for limiting CMS

# WP1:

## ■ Aim:

- Determine whether PMCV is transmitted vertically from broodfish to hatcheries, and then follows the smolt into the seawater phase.

## ■ Method:

- Testing of broodfish and offspring

## ■ Current status:

- Sampling almost concluded → analysis and communication

# WP2:

## ■ Aim:

- Map the course of a PMCV infection in the sea phase.

## ■ Method:

- Smoltgroups are sampled before stocking, and then on regular intervals until harvest. High risk vs. low risk sites.

## ■ Current status:

- Sampling is ongoing, and will continue until the last fish groups are harvested



# WP3:

## ■ Aim:

- To determine risk factors for infection with PMCV, as well as risk factors for developing clinical CMS.

## ■ Method:

### ● Historical data

- All 4 companies, all groups of fish from spring 2012 - fall 2013.
- Information: origin, feed, vaccines, growth, weight, number, handling, diseased, mortality, environmental factors, cleaner fish, locality-related factors.

### ● New data

- Fall 2016 and spring 2017
- Hitra, Nordmøre and Finnmark
- Sampling after stocking, at 12 months and at harvest

## ■ Current status:

- New data: follow sites. Historical data: gathering and analysis.

# WP4:

## ■ Aim:

- Review of knowledge on PMCV and CMS, with focus on epidemiology and disease development.

## ■ Method:

- Google, pubmed., etc., and gather unpublished knowledge

## ■ Current status:

- ✓ First draft for the english review
- Make a norwegian report
- Complete review - aim to publish

# WP5:

## ■ Aim:

- To provide advice on available opportunities for limiting the spread of PMCV and clinical outbreaks of CMS

## ■ Method:

- Presentations
- Workshops
- Seimnars
- Publising

## ■ Current status:

- Planning first workshop on vertical transmission in march 2017





**Thank you for your kind attention!**

