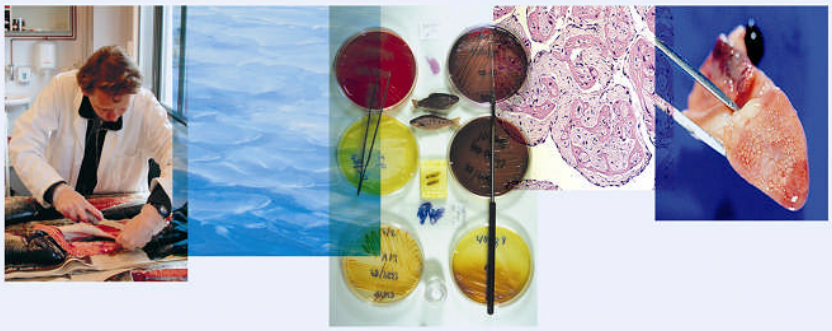
Diseases in cod - an overview

Hege Hellberg



Veterinærinstituttet
National Veterinary Institute

30.09.2008, Reykjavik

Overview

- National Veterinary Institute
- Annual Norwegian Fish Health report
- Diseases in cod
  - Bacterial – vibriosis, francisellosis
  - Viral - nodavirus
  - (Parasitic)
  - (Other)

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Nation-wide research institute

- Animal health
- Food safety
- **Fish and shellfish health**
  - Disease diagnostics
  - Surveillance
  - Risk assessment
  - Advice

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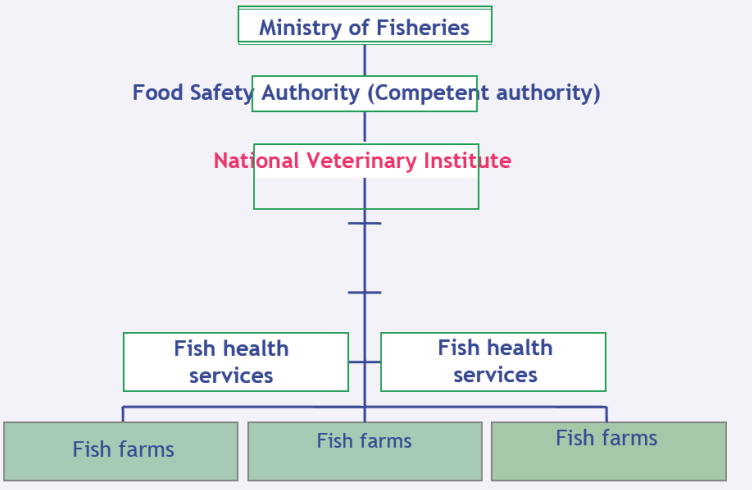

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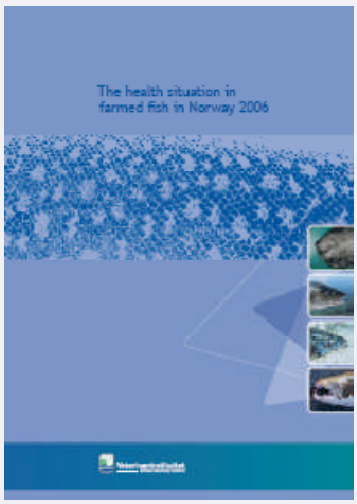
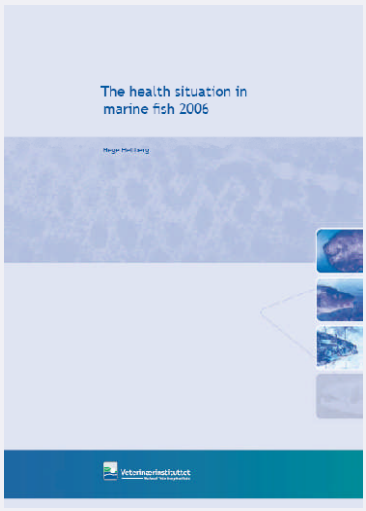
Annual fish health report





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Background and numbers

2007 Cod diseases report

- 250 cases/submissions
- 80 different cod farms
- 213 active cod farming licenses in 2006

Production of farmed Atlantic cod in Norway has increased from 170 t in 2000 to 12000 t in 2007

Summary of important diseases

Number of cod farming localities with diagnosed viral or bacterial diseases

	2005	2006	2007
IPN	Not found	Not found	Not found
VNN (nodavirus)	Not found	3	6
Atypical furunculosis	3	13	9
Francicellosis	4	7	8
Vibriosis *(Vibrio anguillarum)*	18	19	19
Cold Water Vibriosis *(Vibrio salmonicida)*	2	Not found	1
Infection with *Vibrio ordalii*	1	Not found	3*
Infection with *Vibrio logei/Vibrio logei-like*	2	1	2
Infection with *Photobacterium sp.*	3	3	6

In two cases the bacterium was identified as a mixed infection with *Vibrio anguillarum* O2a biotype II, while in the remaining case it constituted the sole infectious agent.

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Vibriosis

Infection with *Vibrio (Listonella) anguillarum*

- Still a significant problem despite vaccination
- Mainly type O2β, but new serotype (O2α biotype II or O2x) has been observed
- Outbreaks often temperature/stress related
- Treated with antibiotics
- Reduced sensitivity to oxolinic acid in some cases

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Vibriosis

Number of cod farming localities with diagnosed *Vibrio (Listonella) anguillarum* during 2003-2007

TYPE	2003	2004	2005	2006	2007
Total*	19 (26)	27 (37)	18 (18)	19 (30)	19 (54)
O1	Not found	Not found	Not found	Not found	Not found
O2 α	6	9	1	5	5
O2 α biotype II	-	-	-	3	6
O2 β	11	18	17	15	15

* Some isolates has not been serotyped/biotyped. In some localities more than one serotype/biotype has been found.

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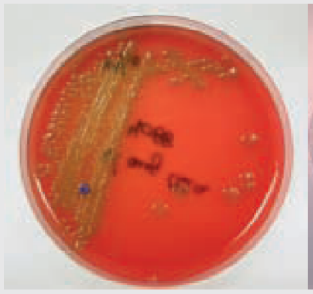
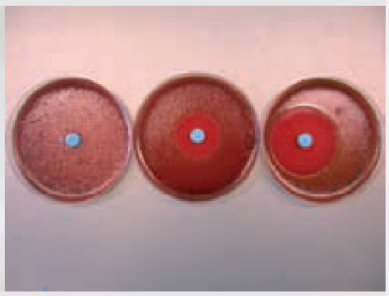
Vibriosis



Vibrio (Listonella) anguillarum cultured on blood agar. The bacterium grows rapidly with relatively large colonies which discolour the surrounding agar green.



Isolates of *Vibrio (Listonella) anguillarum* O2β with different degrees of sensitivity to oxolinic acid (blue tablet). Resistant isolate on left, sensitive on right.

Francisellosis

Francisella philomiragia subsp. *noatunensis*

- Intracellular bacteria
- Chronic infection
- Granulomas in skin, muscle and internal organs
- All age groups
- Mortality, reduced growth and downgrading
- Difficult to treat
- No efficient vaccine
- Reservoir in wild fish
- 2008 – made notifiable in Norway

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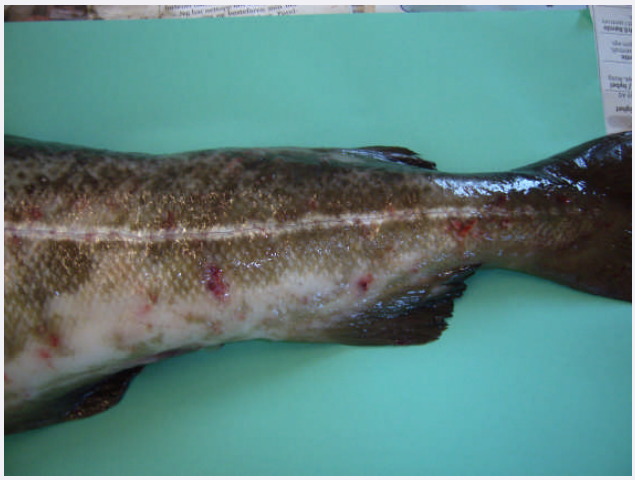
Francisellosis



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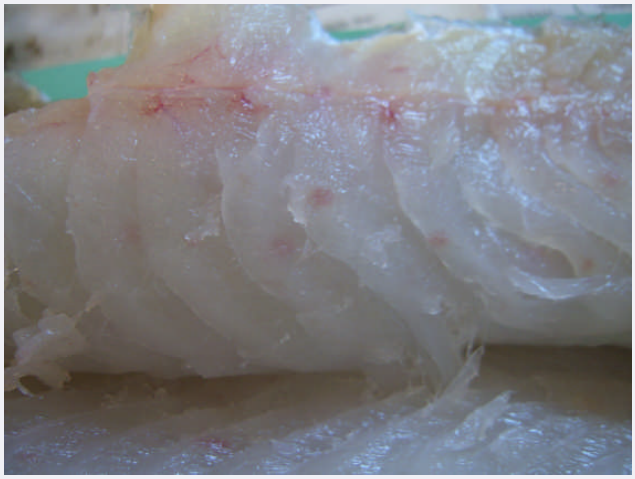
Francisellosis



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Francisellosis

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Francisellosis

Photo: Anne Berit Olsen

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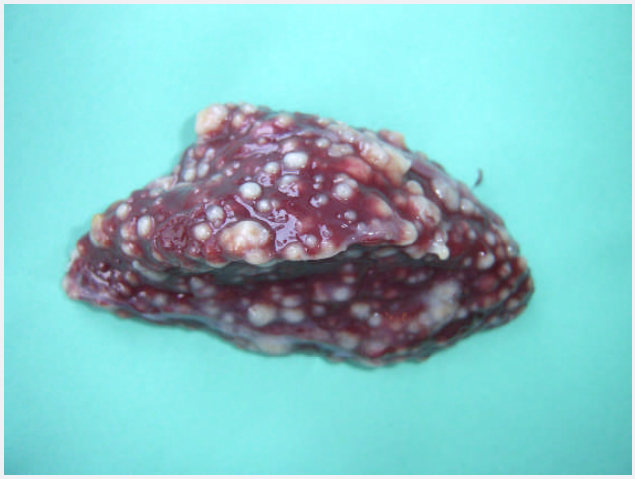
Francisellosis



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Francisellosis

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Francisellosis

Infection trials

100% morbidity by cohabitation infection!!

(Personal communication: Duncan Colquhoun, Anne Berit Olsen & Jarle Mikalsen, NVI)

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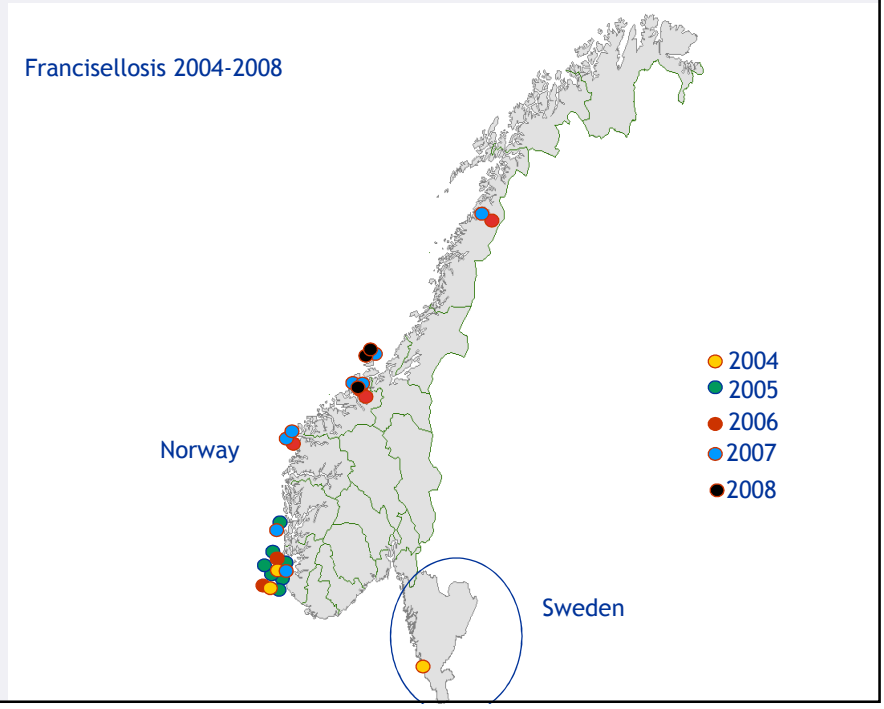

Francisellosis

Will this disease be a major obstacle for cod farming?

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Viral nervous necrosis (VNN)

Nodavirus – a small, unenveloped RNA virus

- Lesions in central nervous system – brain and eye
- Disease mainly occurs in larvae and young juveniles
- >30 marine fish species + some fresh water
- Differences between isolates - 4 main groups
- Broad host range – transmission between species, but varying patogenicity
- Vertical transmission –subclinically infected broodfish
- Horizontal transmission between groups/farms
- Horizontal transmission between wild and farmed fish

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Viral nervous necrosis (VNN)

VNN has been diagnosed in cod in Canada, Scotland and Norway

- Canada: larvae - high, acute mortality approaching 100%
- Scotland: juveniles (1.5-3.5 g) - moderate, chronic mortality
- Norway: juveniles and adults (5 g-1,5 kg) – moderate, chronic mortality

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Viral nervous necrosis (VNN)

Outbreak in 2006

- Juveniles 5-30 g
- Increased mortality
- Water temperatures at 18-19ºC for extended period
- Treated for vibriosis with little effect
- Clinical signs:
  - Anorexia, empty gut
  - Problems with equilibrium
  - Spiral swimming pattern
  - Inflated posterior swim bladder chamber

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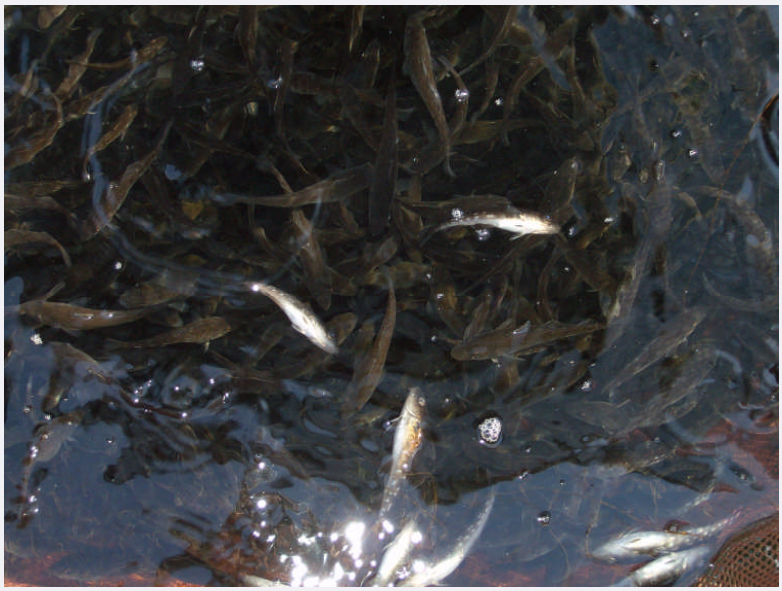
Viral nervous necrosis (VNN)



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Viral nervous necrosis (VNN)

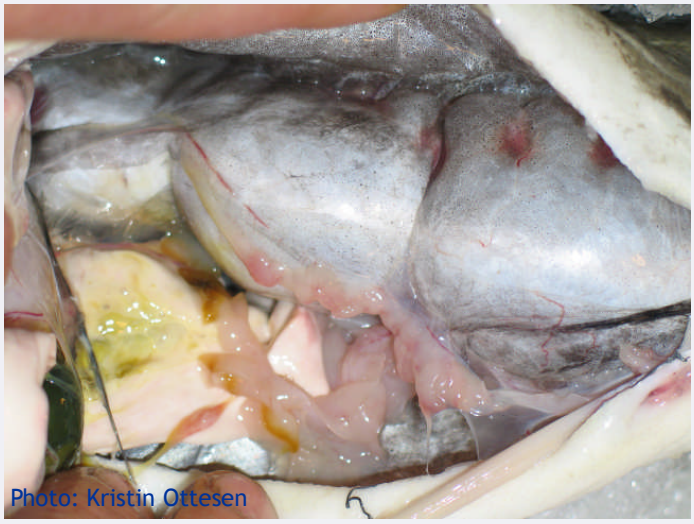

Photo: Kristin Ottesen

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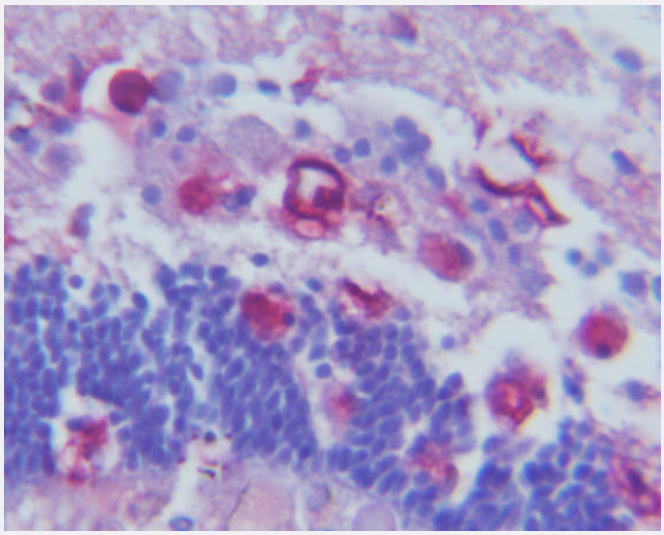
Viral nervous necrosis (VNN)



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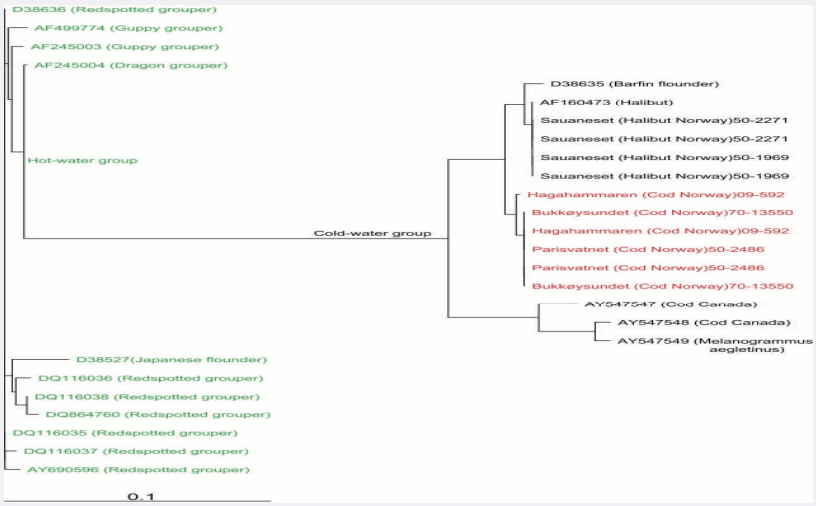
Viral nervous necrosis (VNN)

> 96% homology with nodavirus isolates from halibut



Viral nervous necrosis (VNN)

The virus is present in the marine environment

- Importance of wild fish as reservoir is unknown
- Importance of vertical transmission is unknown
- Importance of subclinically/persistently infected fish is unknown

Moving infected fish will spread the disease

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Parasites

Ectoparasites on skin and gills main problem

- *Trichodina*
- *Ichthyobodo* (”Costia”)
- *Cryptocotyle* (”Black spot”)
- Monogeneans on gills (*Gyrodactylus marinus*)

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Other

- Deformities
  - ”Broken neck”
  - Spinal deformations
- Lateral line necrosis
- Intestinal lesions
  - ”Colic”
  - Enteritis
- Egg-bound females

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Lateral line necrosis

Photo: Anne Berit Olsen

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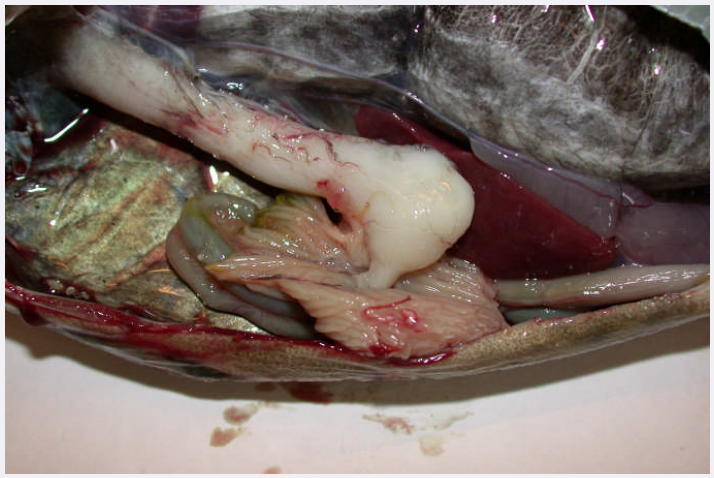
Normal intestine



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Normal intestine

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”Colic”

Photo: Arve Nilsen

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Egg-bound females

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Egg-bound females

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Summary

Yes, diseases can cause serious losses and welfare problems in cod farming!

But:

- Industry is working to improve farming practices
- Researchers are working to characterize diseases and develop vaccines and treatments

General health can be improved, losses minimized and diseases prevented through good management practices!

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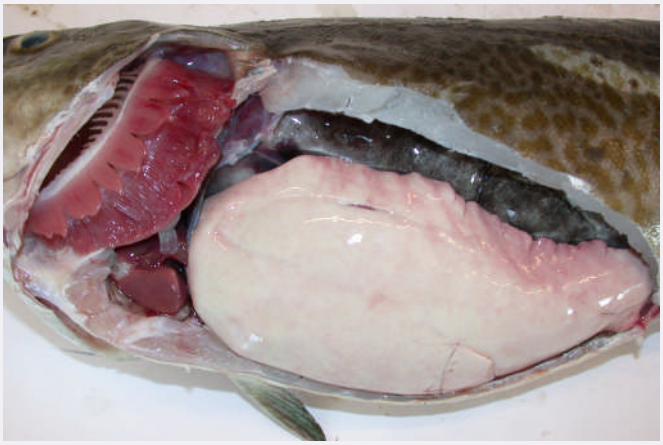
The goal is a healthy, farmed cod



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