Viral Haemorrhagic Septicemia (VHS) in wild and farmed fish in Norwegian waters

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VHS – Rhabdovirus affect both cultured and wild fish

Photo: Garth Traxler,
St. Lawrence River, 2007
(genotype 4b)

Photo courtesy of Andy Noyes, NYSDEC
Pacific herring, Pacific sardines
(genotype 4a)

Viral Hemoragic Septicaemia Bleedings, Rainbow Trout

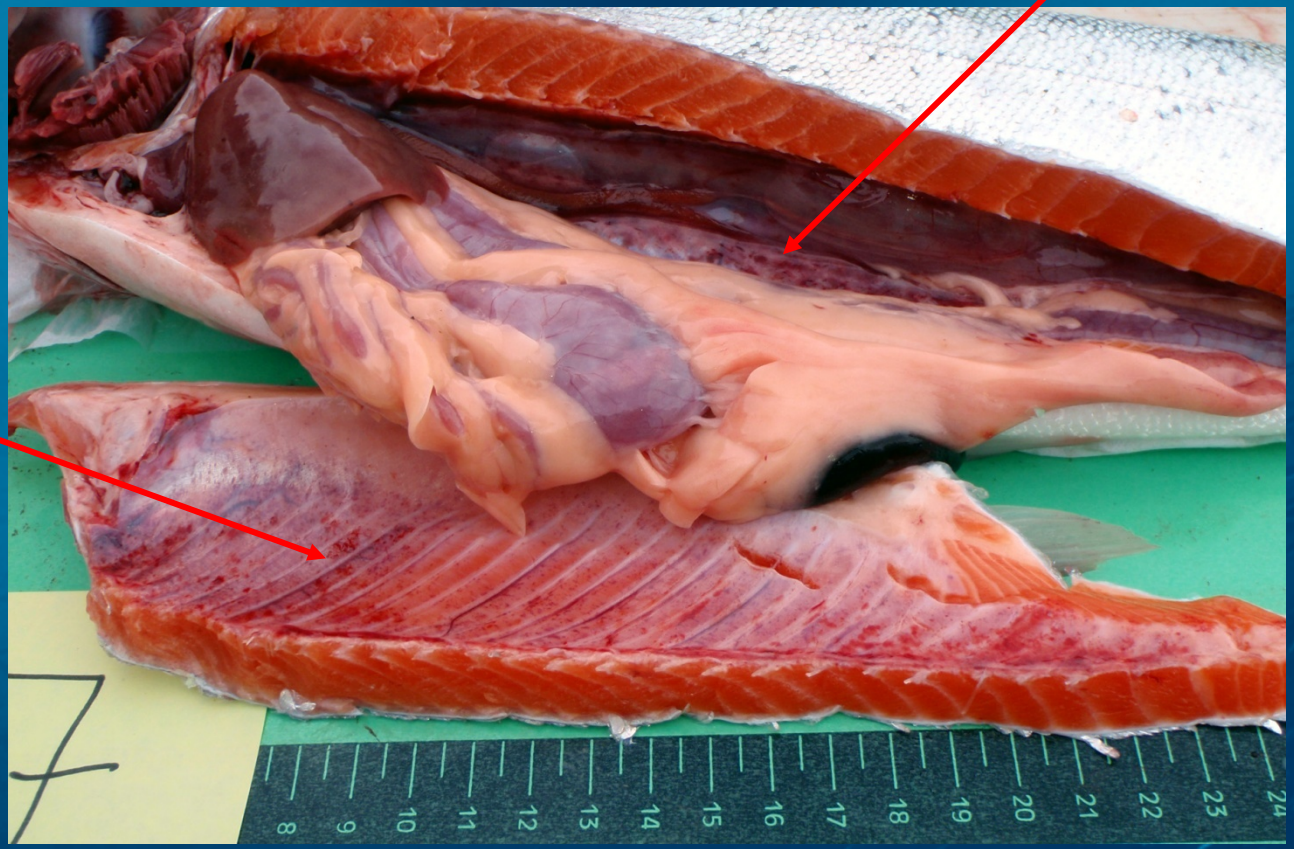
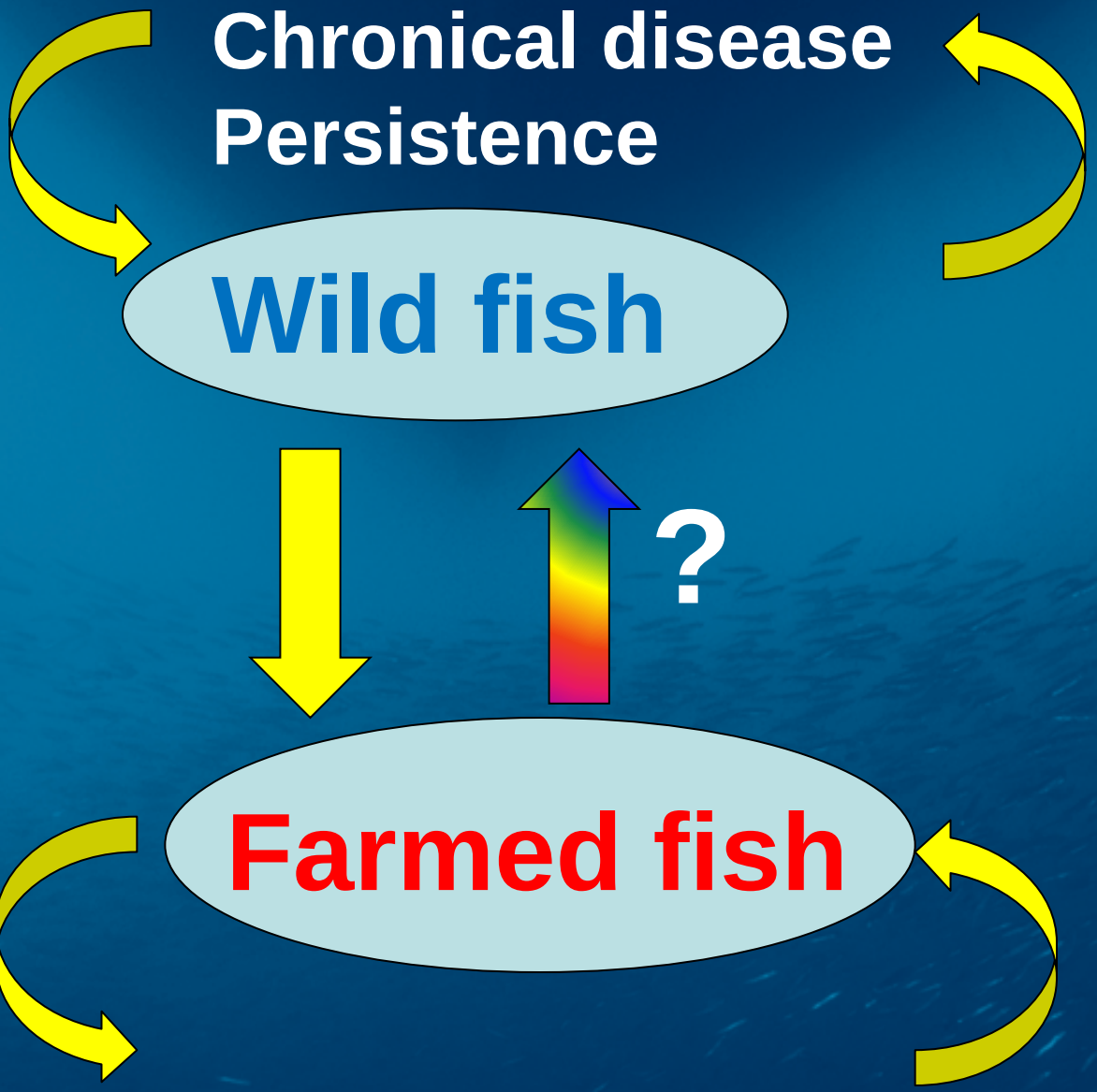


Photo: Ole Bendik Dale


Chronical disease
Persistence
Wild fish
?
Farmed fish
Proliferation
Enhancement of virulence?

Genotypes of VHSV

- Genotype 1a
  - Most isolates from farmed rainbow trout
- Genotype 1b
  - Mostly Baltic, wild herring
- Genotype 1d

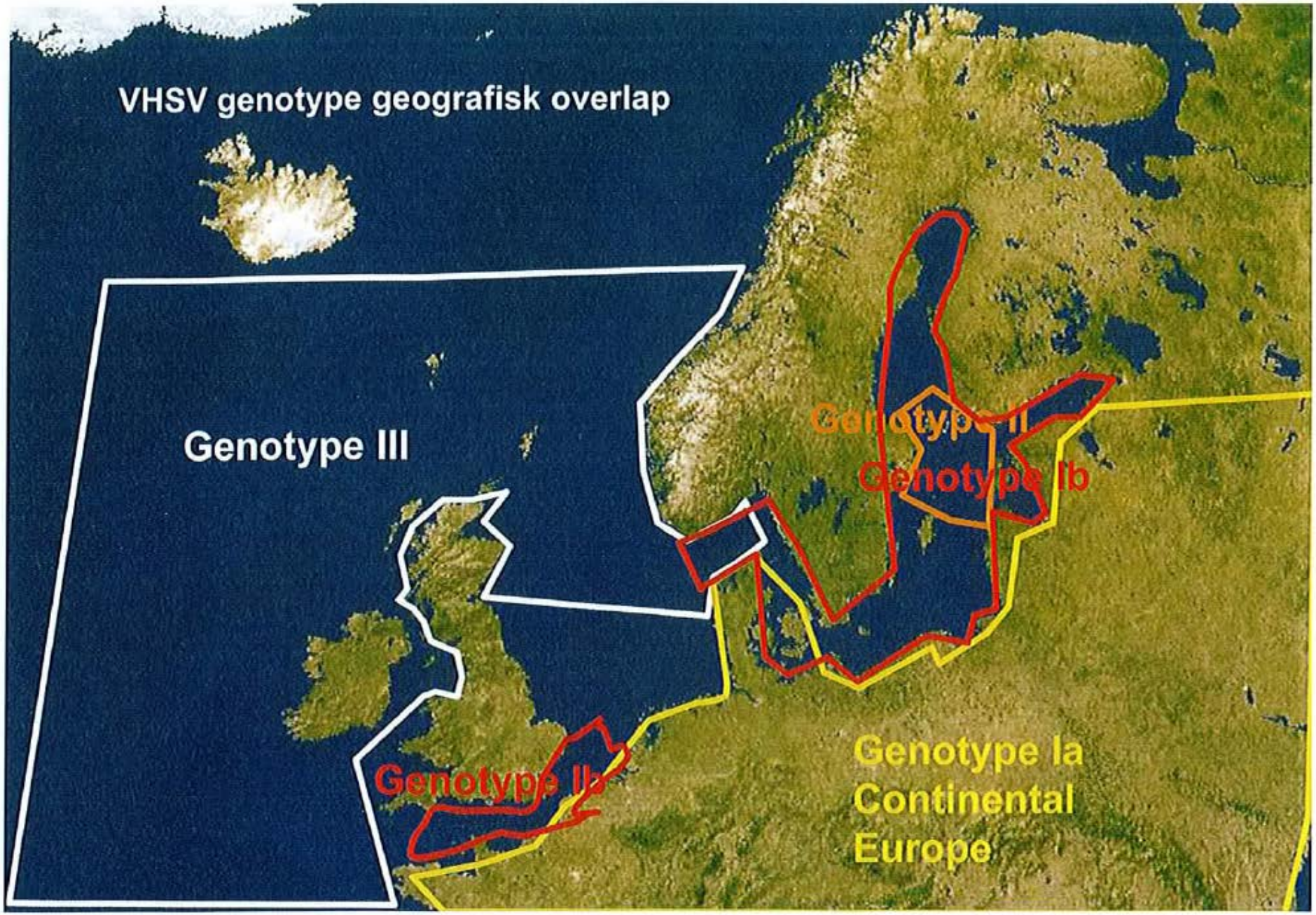
  Old Norwegian isolates, Finnish rainbow trout
- Genotype 2
  - Baltic herring
- Genotype 3
  - European marine isolates
- Genotype 4
  - Restricted to North America and Asia

Marine VHSV – a threat?

- Genotype more related to geography than host
- No suitable genetic virulence marker
- Generally, marine isolates (1a, 1b, 1d) are pathogenic to rainbow trout following i.p. challenge
- Marine VHSV are considered a potential threat to aquaculture

VHS so far isolated from 82 species

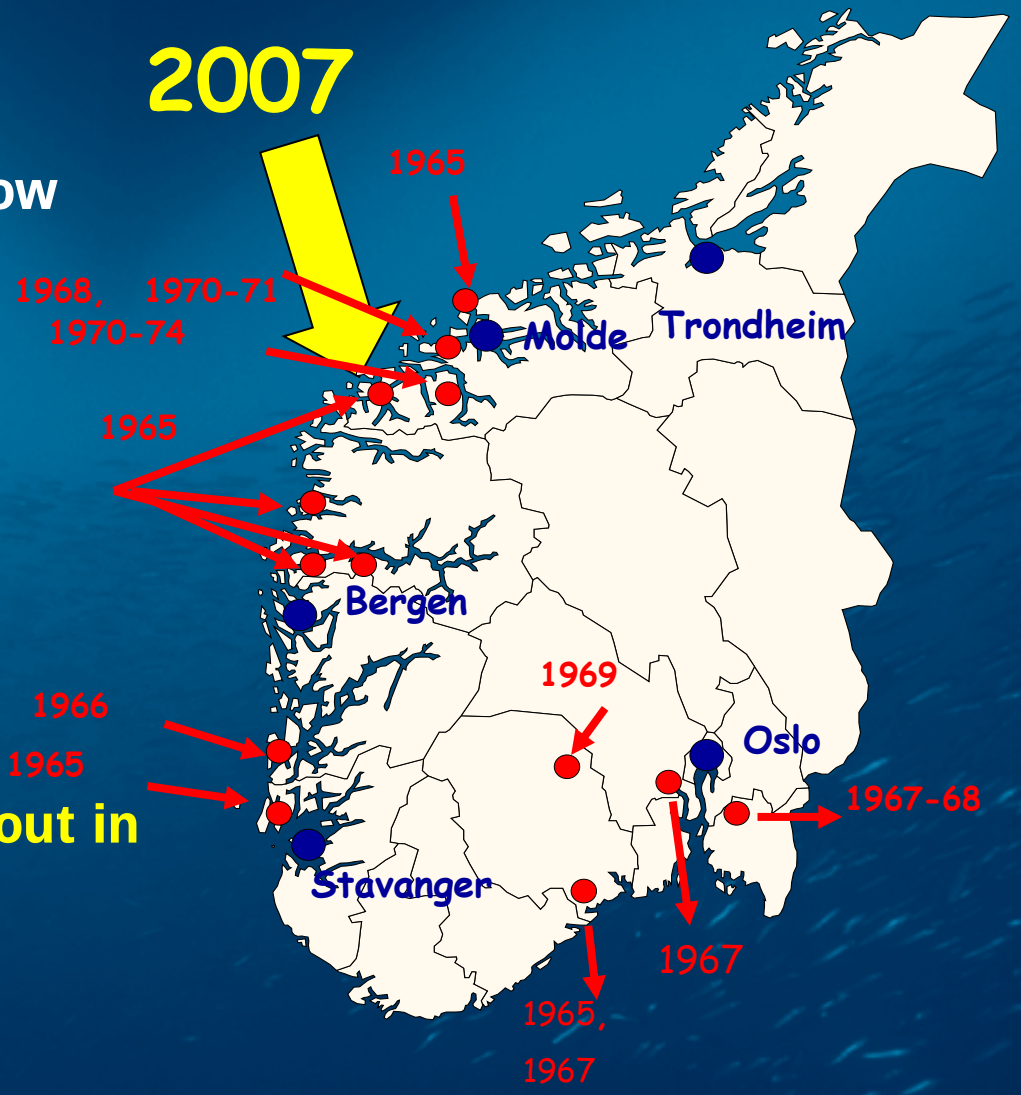
(Figure: N.J. Olesen, EU reference lab. Århus, Denmark)



Oversikt over havområder hvor ulike geneotyer av VHS virus er påvist (illustrasjonen hentet fra presentasjonen til NJ Olesen).

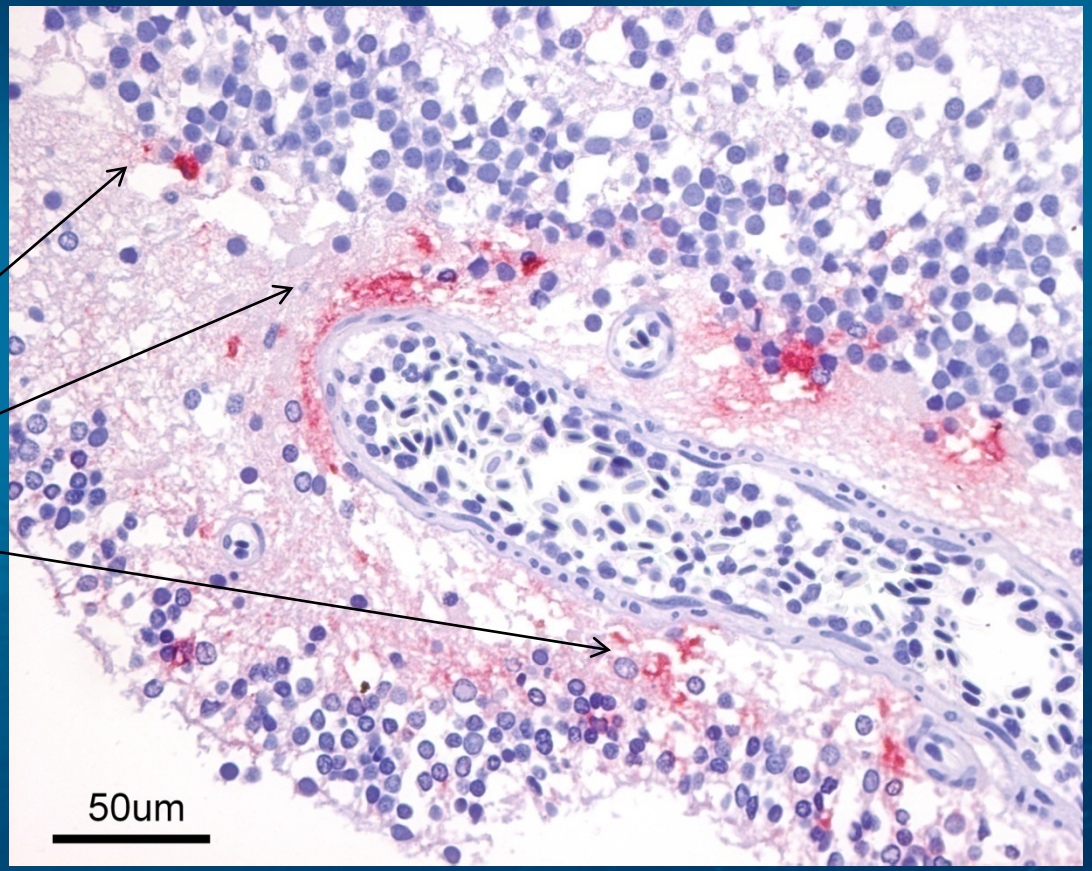
VHS in Norwegian aquaculture

- 1964 first registered VHS outbeak in Norway
- 1964-74: 13 outbreaks in Rainbow trout hatcheries
- 1994 – 2008:
  Norwegian surveillance program
  - 30 fish per farm biannually
  - No VHSV detected
  - (intensified from 2008)
- 2007 New outbreak: Rainbow trout in a marine farm in Storfjorden



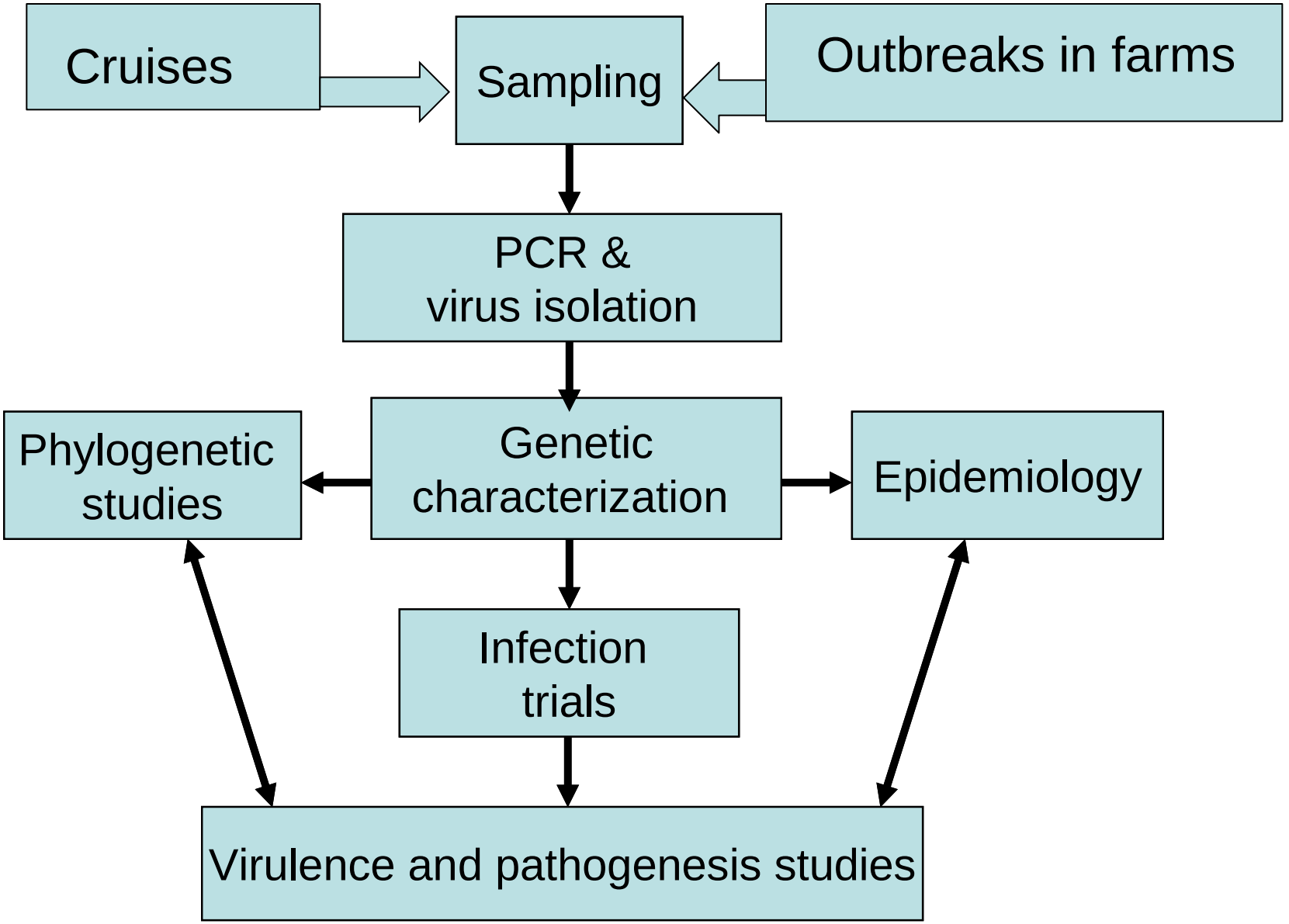
VHS-virus in brain from rainbow trout, Storfjorden, Norway

Red colour = immunohistochemical visualisation of virus



New findings:

- The virus is VHSV genotype 3
  - First isolation ever from rainbow trout
  - First isolation of this genotype in Norwegian cultured fish
  - Hitherto, this genotype has been considered pathogenic to marine species only

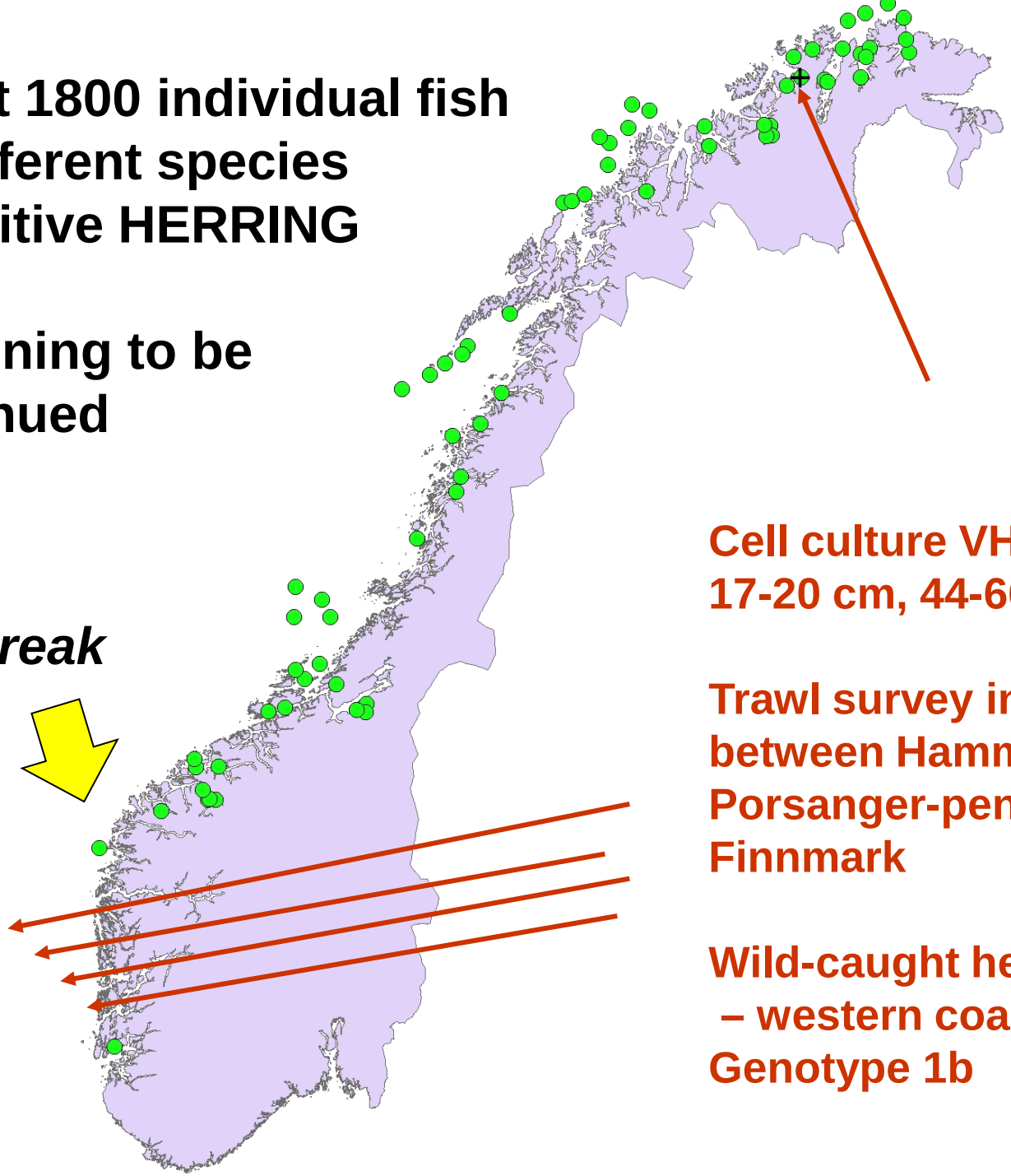

Cruises
Sampling
Outbreaks in farms
PCR &
virus isolation
Phylogenetic
studies
Genetic
characterization
Epidemiology
Infection
trials
Virulence and pathogenesis studies

New cruises

- Improved cell cultures, RT-PCR
- Surveys along the coast

About 1800 individual fish
36 different species
- positive HERRING

Screening to be continued



Outbreak

Cell culture VHSV on herring 17-20 cm, 44-66 gram

Trawl survey in Revsbotn between Hammerfest and the Porsanger-peninsula, Finnmark

Wild-caught herring – western coast Genotype 1b

Challenge experiment on cod yolk sac larvae

- Rearing of larvae in multiwell dishes
- 72 independent parallel wells
- One egg/larvae per well
- Larvae hatches in well, lives until end of yolk sac period
- Protocol evolved from various challenge experiments during two decades:
  - Bergh et al. 1991 J. Fish Dis.
  - Sandlund et al. 2010 Dis. Aquat. Org.

Challenge of cod juveniles

- Cod – about 15g
- Challenge with the Storfjorden VHSV
- Mortality confirmed,
  - as virulent as with rainbow trout

Needle in a haystack

- Still no Norwegian wild genotype III reservoirs found
- Suspect marine fish reservoir
  - deduced from UK and Danish findings
  - King et al. 2001 a,b *Dis. Aquat. Org*
  - Skall et al. 2005 *Dis Aquat. Org (review)*
- Herring reservoir confirmed (type 1b)

Tentative conclusions:

- Prevalence of VHSV low
  - Wild reservoirs of VHSV do exist
- The threat from VHSV towards aquaculture is real,
- Outbreaks in cultured populations may in turn put wild populations at risk
  - *”Stamping out” is the option?*