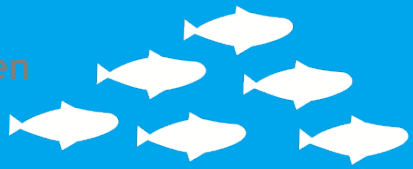
Veterinærinstituttet
Norwegian Veterinary Institute

Molecular tracing of ISAV in Norway in 2020

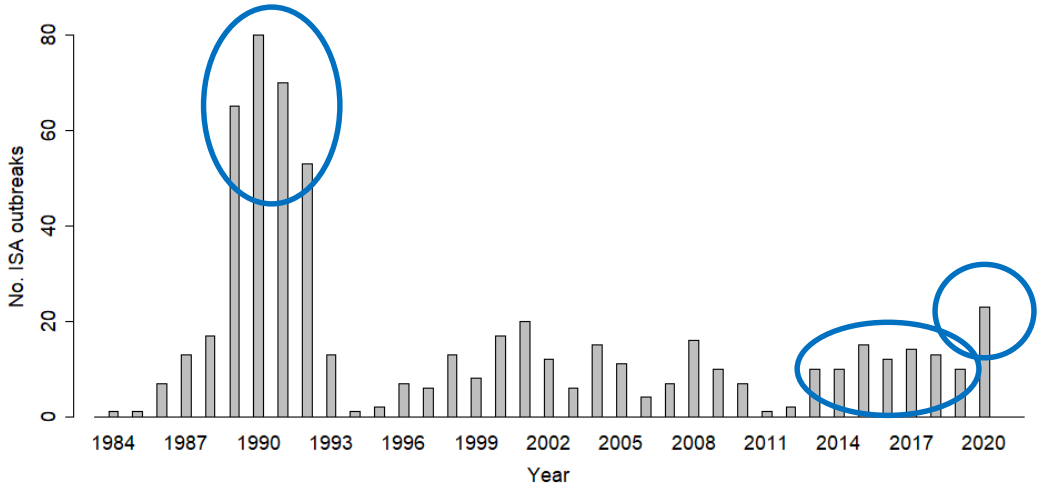
EURL-meeting 1st of June 2021

Torfinn Moldal, Britt Gjerset, Monika Hjortaas and Mona Dverdal Jansen



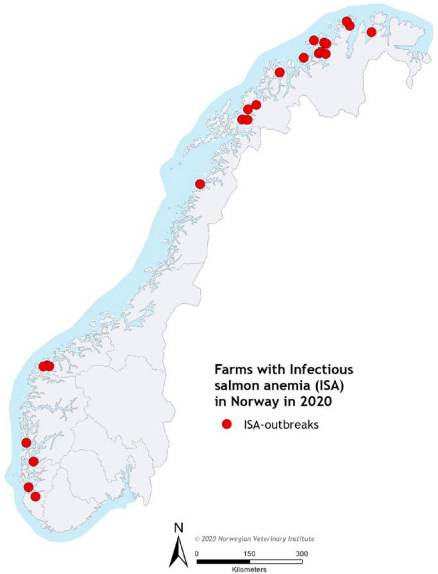
Veterinærinstituttet
Norwegian Veterinary Institute

Confirmed outbreaks from 1984>2020



Veterinærinstituttet
Norwegian Veterinary Institute

Confirmed outbreaks in 2020



23 confirmed outbreaks

- Characteristic lesions
- Detection of virus by two methods
  - Immunohistochemistry
  - PCR followed by sequencing

Five suspicions due to detection of ISAV HPRΔ

Veterinærinstituttet
Norwegian Veterinary Institute

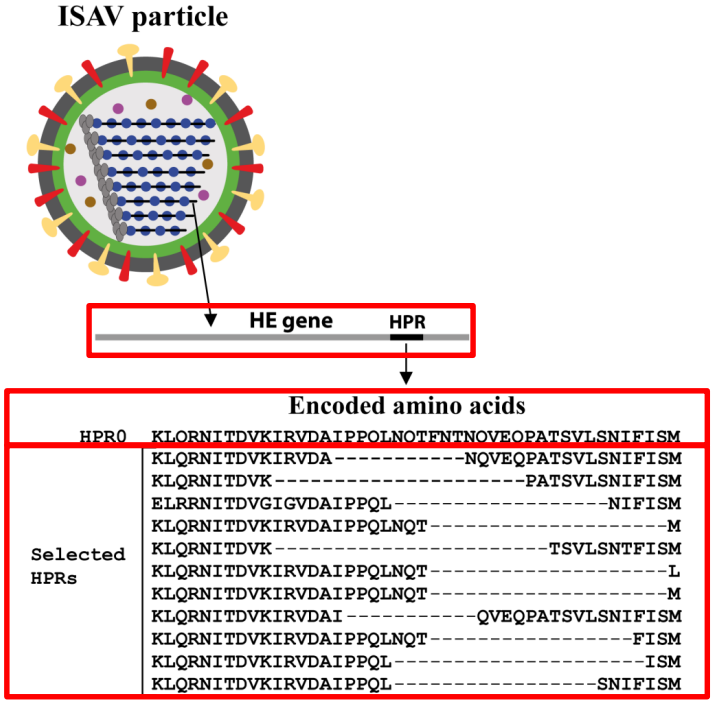
Infectious salmon anaemiavirus (ISAV)

Family *Orthomyxoviridae*

Eigth segments

Two main forms:

- ISAV HPR0 and ISAV HPRΔ
- Sequencing of segment 5 and segment 6 for phylogeny



Veterinærinstituttet
Norwegian Veterinary Institute

Sequences are submitted to GenBank

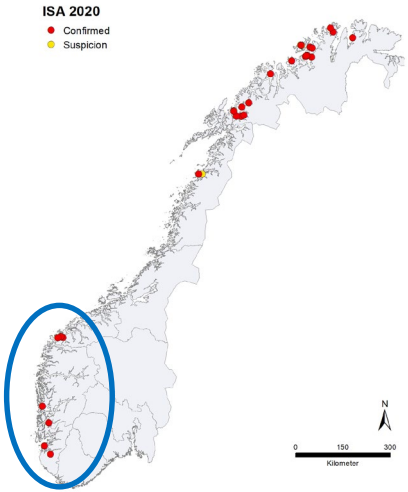
Name and number of the site, sampling date and species

The name of the strain indicates the geographical origin and the record number at NVI, e.g. **NO/Lofoten/NVI-70-231/2015**

```
LOCUS       MG976854               1128 bp    cRNA    linear   VRL 28-NOV-2018
DEFINITION  Salmon isavirus strain NO/Lofoten/NVI-02-149/2015 hemagglutinin
            gene, partial cds.
ACCESSION   MG976854
VERSION     MG976854.1
KEYWORDS    .
SOURCE      Salmon isavirus
  ORGANISM  Salmon isavirus
            Viruses; ssRNA viruses; ssRNA negative-strand viruses;
            Orthomyxoviridae; Isavirus.
REFERENCE   1  (bases 1 to 1128)
  AUTHORS   Alarcon,M., Moldal,T., Aamelfot,M., Sindre,H., Lyngstad,T.M. and
            Falk,K.
  TITLE     Infectious salmon anaemia virus (ISAV) infection in Norwegian
            farmed rainbow trout, Oncorhynchus mykiss (Walbaum)
  JOURNAL   Unpublished
REFERENCE   2  (bases 1 to 1128)
  AUTHORS   Moldal,T.
  TITLE     Direct Submission
  JOURNAL   Submitted (18-FEB-2018) Molecular Biology, Norwegian Veterinary
            Institute, Ullevalsveien 68, Oslo 0454, Norway
FEATURES             Location/Qualifiers
     source          1..1128
                     /organism="Salmon isavirus"
                     /mol_type="viral cRNA"
                     /strain="NO/Lofoten/NVI-02-149/2015"
                     /host="Oncorhynchus mykiss"
                     /db_xref="taxon:55987"
                     /segment="6"
                     /country="Norway: 11193 Gamskjaeran"
                     /collection_date="18-May-2015"
```

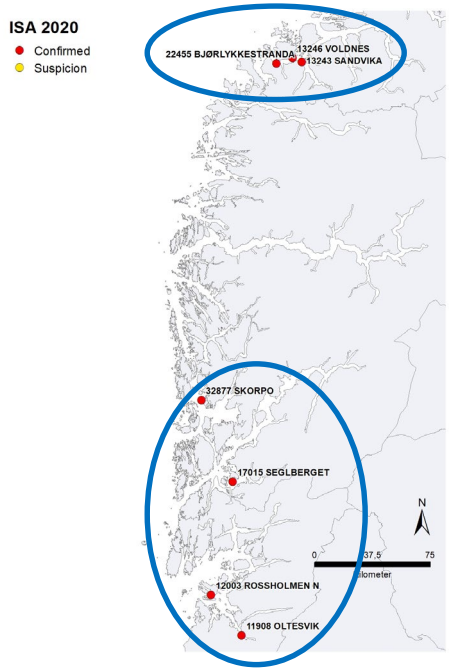
Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks in Western Norway



Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks in Western Norway



Courtesy: Attila Tarpai

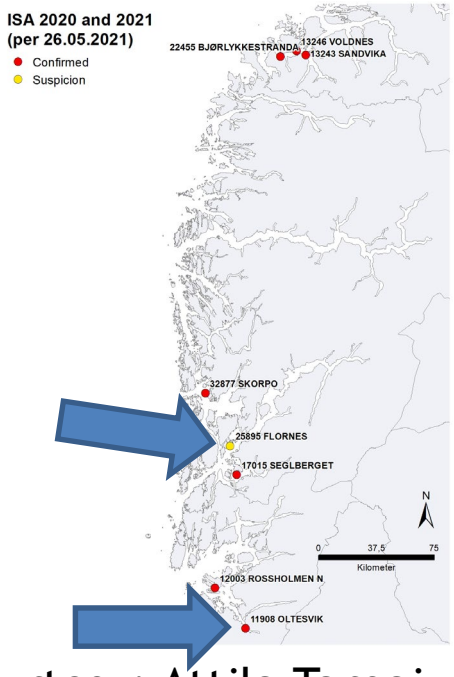
Three outbreaks in the area Sunnmøre

- Same company
- Closely related virus
- Probably horizontal infection

Four outbreaks further south are supposed to be primary or isolated

Veterinærinstituttet
Norwegian Veterinary Institute

One suspicion in this area this year



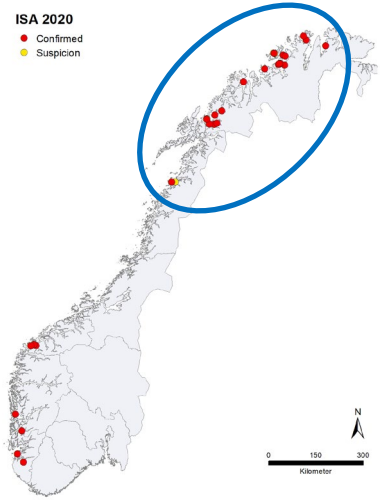
Courtesy: Attila Tarpai

A recent suspicion at the site Flornes

- Virus is closely related to virus that was detected at the site Oltesvik last summer
- Different companies
- No known epidemiological link so far

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks in Northern Norway



Veterinærinstituttet
Norwegian Veterinary Institute

Outbreak and suspicion in Nordland

Courtesy: Attila Tarpai

The virus at site Hestholmen is closely related to ISAV HPR0 detected at the hatchery

Suspicion at site Mulnesodden since December 2019

- Monthly sampling till slaughtering
- No further detections of virus!

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicions in 2021

Courtesy: Attila Tarpai

Three outbreaks in the same area in April and May this year

- Virus is closely related to virus detected at site Hestholmen in May last year

Two more suspicions are under investigation

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicion in Troms

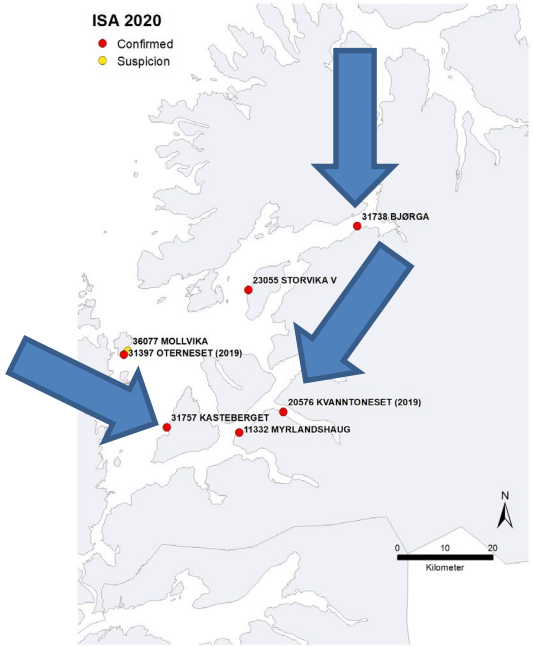
Courtesy: Attila Tarpai

Virus detected at the site Mollvika was closely related to virus from the neighboring site Oterneset in 2019

Mollvika was emptied before a diagnosis was confirmed

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicion in Troms



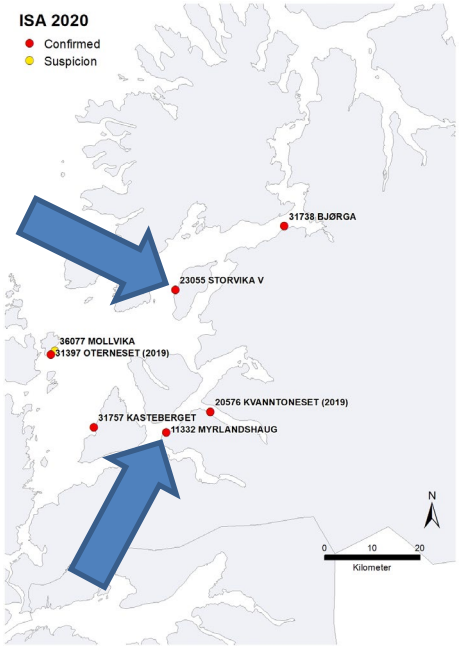
Courtesy: Attila Tarpai

Virus from the sites Kvanntoneset (2019), Bjørga and Kasteberget are closely related

- Same hatchery where ISAV HPR0 detected at the hatchery several times
- No other known epidemiological link

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicion in Troms

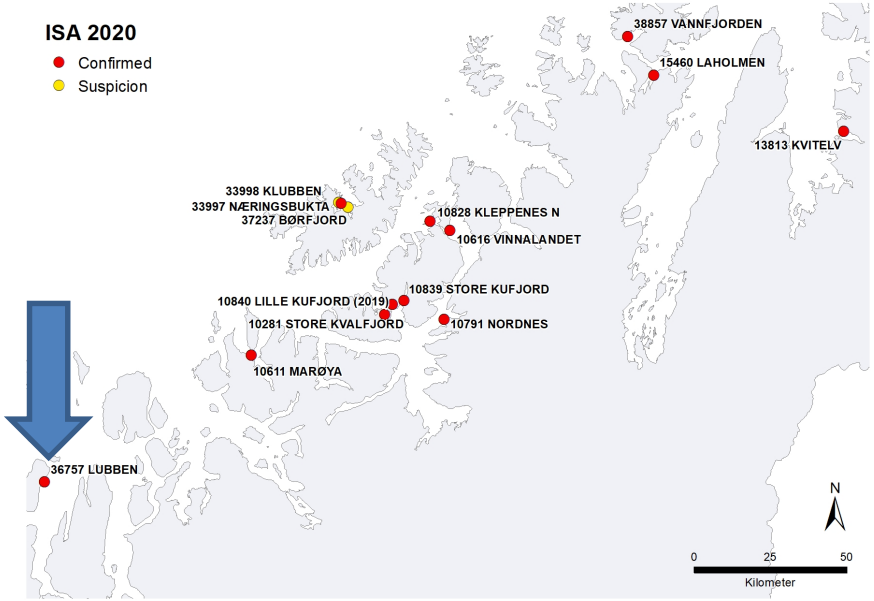


Courtesy: Attila Tarpai

The two last outbreaks in this area are considered to be primary

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicion in Troms



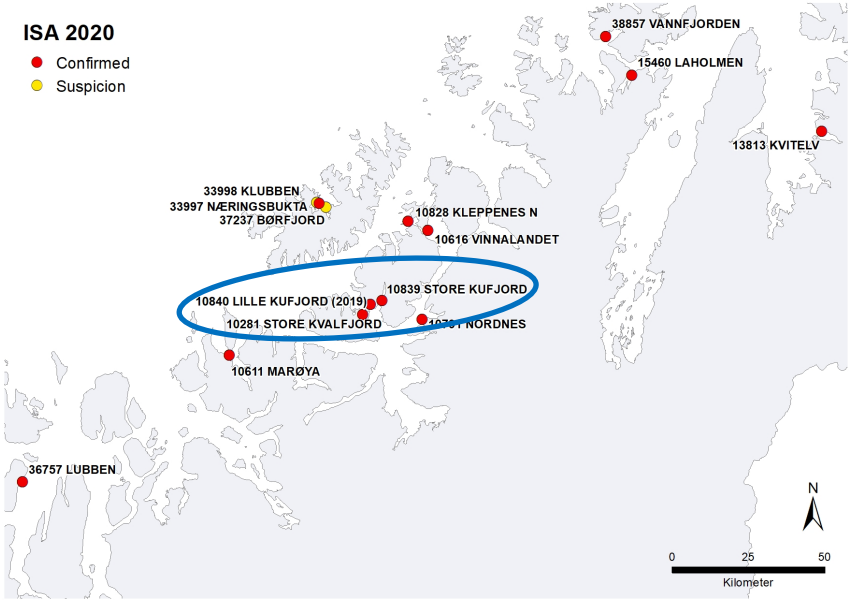
Courtesy: Attila Tarpai

One more outbreak that is considered to be primary

- ISA also in 2018 – not the same virus
- ISA at a neighbouring site was confirmed in May

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicions in Finnmark



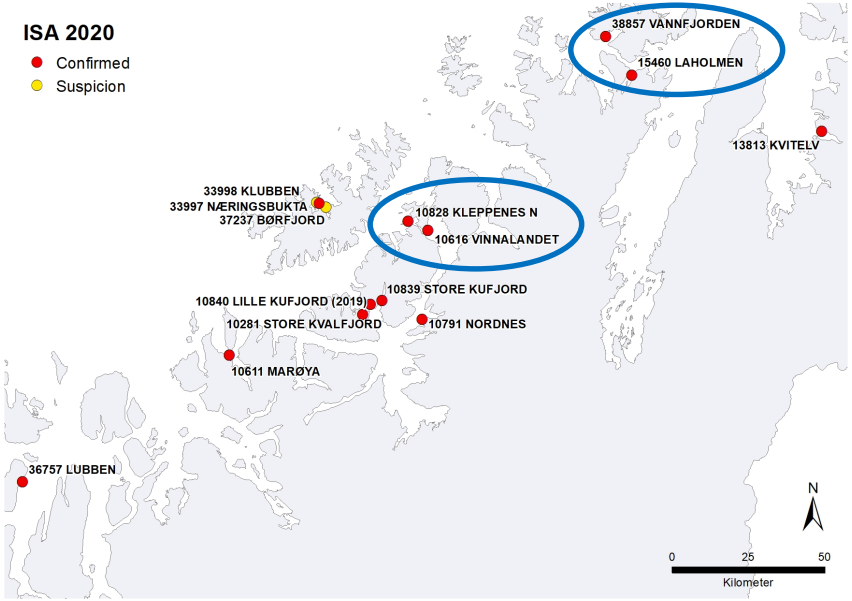
Courtesy: Attila Tarpai

Identical virus at the sites Lille Kufjord (2019), Store Kufjord and Store Kvalfjord

- Probably horizontal infection
- Same company

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicions in Finnmark



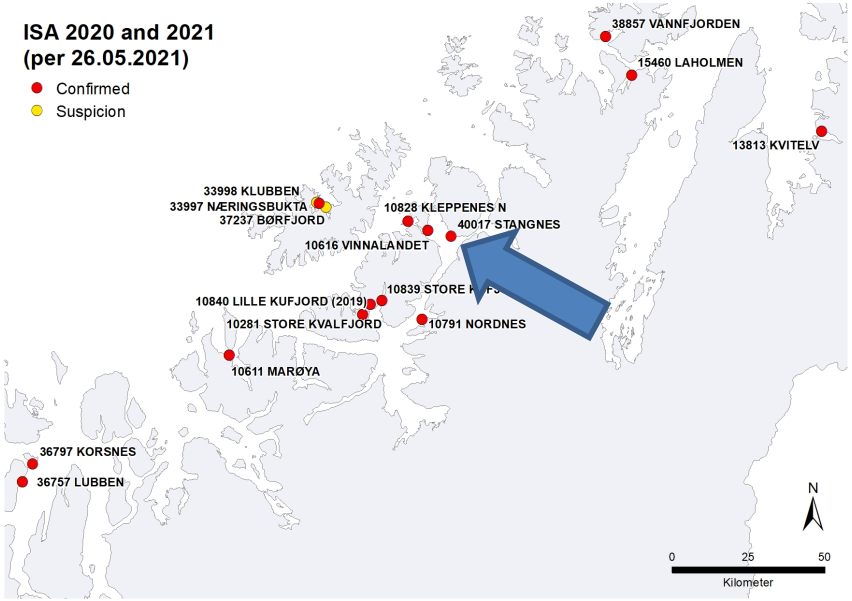
Courtesy: Attila Tarpai

Closely related virus at the four sites Laholmen, Vinnalandet, Vannfjorden and Kleppenes N

- Same company and hatchery where ISAV HPR0 is detected
- Horizontal infection cannot be excluded

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicions in Finnmark

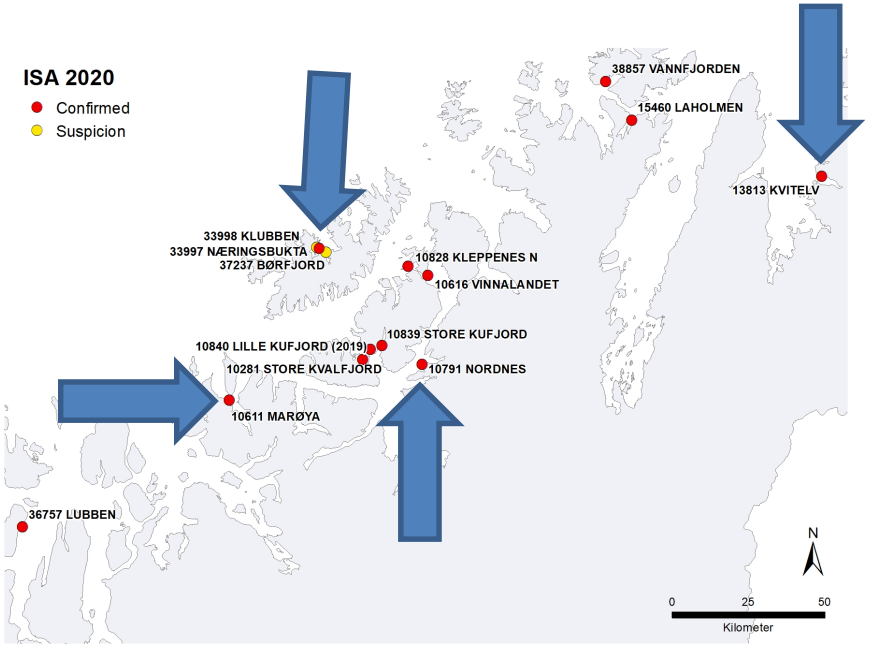


One outbreak at the site Stangnes in the same area in May this year

- Virus is identical to virus detected at the site Kleppenes N in October last year

Veterinærinstituttet
Norwegian Veterinary Institute

Outbreaks and suspicions in Finnmark



Courtesy: Attila Tarpai

Outbreaks at the sites Kvitelv, Næringsbukta and Nordnes are considered to be primary

Suspicions at the sites Børfjord and Klubben close to the site Næringsbukta

Outbreak at site Marøya may be linked to an outbreak in 2019

Veterinærinstituttet
Norwegian Veterinary Institute

Surveillance of ISAV HPR0 in hatcheries

The surveillance programme for infectious salmon anaemia virus HPR0 (ISAV HPR0) in Norway 2020

From 2019

Linked to the New Animal Health Law and changes in the management of ISA

Gill tissue from 90 fish from ten tanks

Every hatchery should be sampled every second year

Veterinærinstituttet
Norwegian Veterinary Institute

ISAV HPR0 in hatcheries

Table 2: Summary of data for ISAV HPR0-positive hatcheries and tanks. (2020)

Hatchery ID	Hatchery			Positive tanks			
	Technology*	No. tanks sampled	No. positive samples	No. positive tanks	Technology*	Seawater addition	Average fish weight (g)
A	GS and RAS	10	3	1	RAS	Yes	118
B	GS	9	12	5	GS	Yes & No	120 - 240
C	GS	10	4	2	GS	Yes	90 130
D	GS and RAS	10	3	1	GS	No	48
E	RAS	4	30	4	RAS	Yes	25 - 71
F	GS and RAS	13	8	4	RAS	Yes	215

* GS = flow-through system, RAS = recirculation system.

Veterinærinstituttet
Norwegian Veterinary Institute

Summary

23 confirmed outbreaks og five suscpicions in 2020

The picture is complex:

- Several primary or isolated outbreaks in the same area
- Also spread outbreaks with closely related virus>Common origin and possible links to several hatcheries
- Also several cases of horizontal infection