

The surveillance program for infectious salmon anaemia (ISA) and bacterial kidney disease (BKD) in Norway 2018



Veterinærinstituttet
Norwegian Veterinary Institute



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Commissioned by

Norwegian Food Safety Authority



ISSN 1894-5678

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Design Cover: Reine Linjer

Photo front page: Rudolf Svensen

Summary

Infectious salmon anaemia (ISA) (pathogenic ISAV HPR-del) and *Renibacterium salmoninarum* were not detected in conjunction with surveillance in ISA free zones or compartments in 2018.

According to the received reports from private laboratories on surveillance carried out in ISA control zones and compartments, ISAV HPR-0 was detected on 29 sites.

Introduction

Infectious salmon anaemia (ISA) is a serious disease in salmon caused by ISA virus (ISAV), within the *Orthomyxoviridae* family. The disease was described for the first time in Atlantic salmon (*Salmo salar*) in Norway in 1984, and has since been reported in several countries: USA, UK, Canada, Faroe Islands, and Chile. In Norway, the number of outbreaks peaked in the early 1990s with more than 80 cases per year. In the late 80ies and early 90ies several measures were implemented by the Norwegian Food Safety Authority (NFSA) in order to combat and limit the spread of the disease. Since 1993, the number of annual outbreaks has varied between 1 and 20, and ISA is still a recurring challenge to the salmon farming industry in Norway. There are two main types of ISAV; one virulent type with varying pathogenicity associated with ISA outbreaks termed HPR-deleted ISAV (ISAV HPR-del), and the other type regarded as non-pathogenic, causing subclinical infections, termed ISAV HPR0. The HPR0 type is now regarded the origin of the virulent HPR-del type through differential mutations of at least two virus genes.

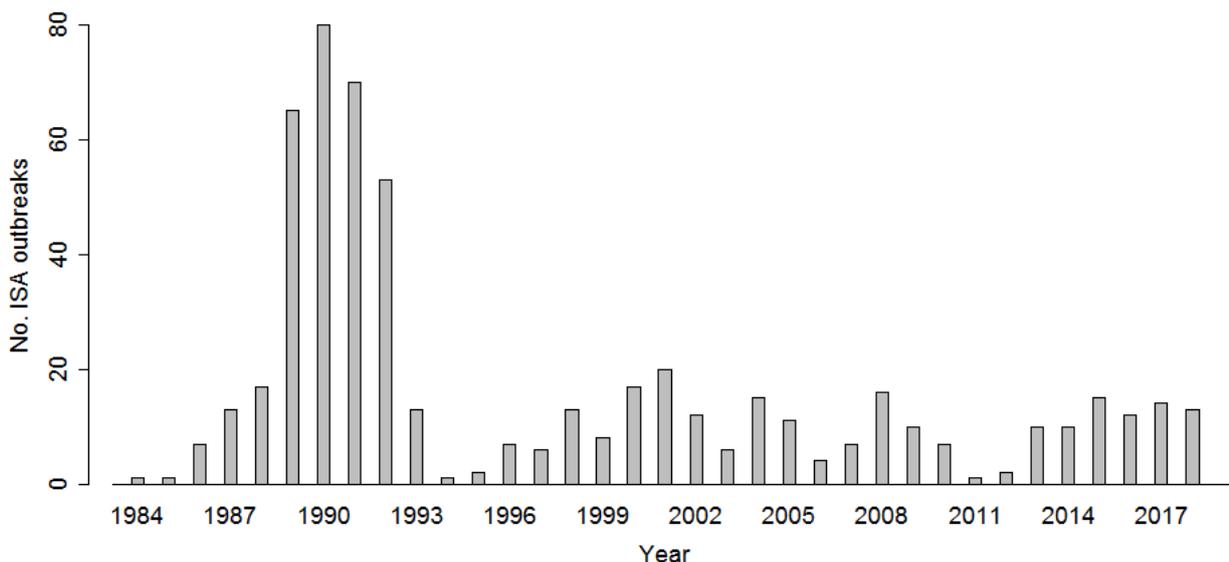


Figure 1. Annual numbers of registered ISA-outbreaks in Norway in the period of 1984 - 2018.

ISA is an OIE listed infection (1) and is notifiable (list 2) in Norway, and within the EU (Council Directive 2006/88/EC). In Norway, there is a legal obligation to report suspicion of ISA to the NFSA. Following a suspicion, the NFSA performs fish sampling at the suspected site, and submits the samples to the national ISA reference laboratory (the Norwegian Veterinary Institute) to perform a diagnostic investigation. If this investigation confirms an ISA diagnosis, this is reported to the NFSA. The NFSA determines the official diagnosis for the site and makes decisions on the implementation of control measurements. The latter includes establishment of a containment area, and restrictions on fish movement. ISA diagnoses are reported to the OIE by the NFSA.

Positive PCR-tests for ISAV HPR0 have so far not been considered notifiable by the law on food production and food safety (<https://lovdata.no/dokument/NL/lov/2003-12-19-124>) in Norway.

Bacterial kidney disease (BKD) is a chronic disease of salmonid fish caused by *Renibacterium salmoninarum*, first diagnosed in Norway in 1980. BKD is a list 3 disease in Norway. *R. salmoninarum* can be transmitted vertically from one generation to the next inside the eggs. Surveillance of brood fish for BKD is therefore important. More information on ISA and BKD can be found at www.vetinst.no.

For ISA-free zones and compartments, the NFSA has declared and received approval for ISA-free farms based on both historical freedom and targeted surveillance of ISA (HPR-del ISAV) in accordance with requirements in the EC Council directive 2006/88/EC and Commission Implementing Decision (EU) 2015/1554. Some farms are, in conjunction with the surveillance in ISA free zones and compartments, also declared free for BKD, based on targeted surveillance for *R. salmoninarum*.

Aims

- 1) To collect and summarize journal data needed to obtain and maintain freedom from ISA and BKD in seawater and freshwater salmonid fish farms in conjunction with ISA-free zones and compartments.
- 2) Collect and summarize journal data in order to provide documentation of the surveillance for ISA (ISAV HPR-del) carried out in containment areas that are established in the vicinity of farms officially diagnosed with ISA.

Materials and methods

The surveillance of Infectious salmon anemia (ISA) (pathogenic ISAV HPR-del) and *Renibacterium salmoninarum* is based on inspections by the NFSA, as well as the health controls performed by the Fish Health Services (FHS).

Infectious salmon anemia virus (ISAV)

There are two types of surveillance for ISAV:

- Surveillance within **ISA free zones**, or areas which wish to obtain an ISA free status. This surveillance includes sampling for ISAV and *Renibacterium salmoninarum*.
- Surveillance within **ISA control areas**. The areas are established upon an ISA outbreak, and encompass a combat zone and a surveillance zone. Within the zones, samples are collected on a monthly basis and screened for ISAV.

When a farm is officially declared infected with ISA (ISAV HPR-del), the NFSA immediately establishes a containment area (including a protection- and a surveillance zone) around the affected site. Since 2015, the industry, FHS and the NFSA have worked together on systematic surveillance within the ISA control zones. This includes targeted surveillance with risk-based sampling for ISAV once a month of all farms until the restrictions for the control zone are lifted. On a daily basis, moribund or freshly dead fish are selected for laboratory investigations for ISAV through PCR analysis. In addition, the FHS may select additional fish for sampling upon their mandatory monthly inspections. A total of 10-20 targeted heart and mid-kidney samples are examined each month from these sites. For rainbow trout (*Oncorhynchus mykiss*), the samples include skin swabs. If there are suspicions of ISA on a salmon site in the control zone (e.g. increased mortality), samples for histological analyses and virus detection are immediately submitted to NVI for further investigation.

The combat zone is lifted when all fish in all farms within the zone have been slaughtered, farming equipment disinfected, and the whole zone fallowed for two months. The previous combat zone is then included in the surveillance zone, which is then kept for an additional two years before the control zone as a whole is lifted.

For ISA free zones and compartments, the NFSA has declared and received approval for ISA-free farms based on both historical freedom and targeted surveillance of ISA (ISAV HPR-del) in accordance with requirements in the Council directive 2006/88/EC. In order to obtain, maintain or expand a status as ISA free, all ISA free sites are included in a surveillance program where the following applies:

- In order to obtain an ISA-free status at a land site, the whole site (or every contagiously isolated unit) must have been fallowed for a minimum of 6 weeks. It is also an option with 2 years of inspections and sampling.
- In order to obtain a new ISA free zone all sea sites within the zone must undergo 2 years of inspections and sampling.
- In order to expand an ISA free zone with additional sea sites, all new sites must undergo 2 years of inspections and sampling.

The FHS or the NFSA, collect screening samples throughout the year according to the following regime:

Category	Total amount of samples:
For the maintenance of ISA free zones, every site is sampled throughout the year	60 samples/year
In order to establish a new ISA free zones, all sites within the area must be sampled throughout the year	150 samples/year for 2 years
In order to expand an existing ISA free zones the new sites must be sampled throughout the year	150 samples/year for 2 years
In order to re-establish an ISA free status (after detection of ISA, or breach of terms), the sites must be sampled throughout the year	150 samples/year for 2 years

The sample material must include heart and mid-kidney for RT-PCR analysis.

Regular fish health inspections are also performed on the sites within the ISA free zones throughout the year, both by the FHS and the NFSA. The NFSA must inspect all sites (on-growing sites, land-based, hatcheries and broodstock sites) within the ISA free zones two times per year. A minimum of four months must pass between inspections at broodstock sites. At one of the yearly inspections, the NFSA will participate along with the FHS. The FHS must perform inspections on the sites at least six times per year, with a maximum of three months between visits. The farming companies must compile an updated list of all sites within their approved and planned ISA free zones. This information must include the timeframe in which there will be fish in the cages. The inspections performed on the sites must include a thorough, risk-based health control including sampling. A "risk-based sampling" means that samples must be collected from individuals that are sick, weak, or newly deceased - but *not* from so-called "loser" -fish. It also means that samples are collected continuously throughout the year, as opposed to on single occasions. In addition, it is recommended to perform autopsies on sick and diseased fish. The collected samples are sent to laboratories appointed by the NFSA, or to the NVI. The laboratories regularly submit their findings to the NVI, who compile an annual rapport of the results.

In addition, a monthly report of the ISA-situation with new outbreaks is published at www.vetinst.no. All suspected or confirmed cases of ISA are shown on an interactive map here:

<https://www.vetinst.no/dyr/oppdrettsfisk/infeksis-lakseanemi-ila>

When there is reason for recall of an ISA free status at one site within an ISA free zone, the whole zone including all sites will lose its ISA free status.

Upon detection of ISAV through these surveillance programmes, samples are sequenced in order to determine whether the virus is ISAV HPR-del or ISAV HPR0. Other than these programmes, there are no additional national surveillance programs for the monitoring of ISAV in Norway.

For further information, please consult the Commission implementing decision (EU) 2015 / 1554 from the 11th of September 2015:

<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L .2015.247.01.0001.01.ENG>

Renibacterium salmoninarum

Ireland, Northern Ireland, Isle of Man and Jersey have been given approval for national measures for BKD. In order to export roe to these countries, targeted surveillance must be conducted in an ISA free zone. Sampling for BKD is an absolute demand only for the sites within the ISA free zone that want to export roe to countries with these national measures for BKD.

There are different routines for stripping stations and for other sites:

- For **stripping stations**, a minimum of 30 fish must be sampled for BKD within the last 9 months before stripping (and in the stripping period).
- For **other sites** within the ISA free zone, a minimum of 30 fish must be sampled for BKD in both of two (long) sampling periods per year → a total of 60 samples / year.

Laboratory analyses (RT-PCR) for ISAV and *R. salmoninarum* were carried out by private laboratories appointed by NFSA (Patogen Analyse AS, Pharmaq Analytiq and Fish Vet Group). Laboratory results from analyses of fish samples (ISAV; heart, organ, gills, eggs, milt, ovarian fluid and fry and for *R. salmoninarum*; kidney, milt and ovarian fluid) should be submitted to the Norwegian Veterinary Institute (NVI) according to a monthly routine.

Results and discussion

In total, 5 810 samples from 28 farms with Atlantic salmon were investigated for ISAV in within ISA free zones or compartments. Geographical locations of the fish farms are shown in Figure 2. ISAV HPR-del was not detected in any of the samples, while ISAV HPR0 was detected in samples from 5 farms.

This summary includes only data from farms in established ISA free zones and segments, and not data from farms that have screened for ISAV in an attempt to obtain an ISA free status.

In conjunction with ISA control zones, 20 503 samples from 143 farms with Atlantic salmon and 60 samples from three farms with rainbow trout were investigated. Two of these farms submitted samples from both Atlantic salmon and rainbow trout. Geographical locations of the fish farms are shown in Figure 3. ISAV HPR-del was not detected in any farms through the screening program. ISAV HPR0 was detected in samples from 29 farms with Atlantic salmon.

With regard to *R. salmoninarum*, a total number of 3 533 samples from 36 farms with Atlantic salmon and 348 samples from seven farms with rainbow trout were investigated. Five of these farms submitted samples from both Atlantic salmon and rainbow trout. Geographical locations of the fish farms are shown in figure 4. *R. salmoninarum* was not detected in any of the samples.

Design and evaluation of the surveillance programmes are not considered in this report.

Table 1: Number of tested farms in ISA free zones, and in ISA control zones.

Category	Number of farms tested	Number of ISAV HPR0+ farms	Number of ISAV HPR-del farms
ISA free zones	28	5	0
Control zones	144	29	0

References

1. Office International des Epizooties, 2016. Manual of Diagnostic tests for Aquatic Animals. Infectious salmon anaemia.
http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/current/chapitre_isav.pdf.

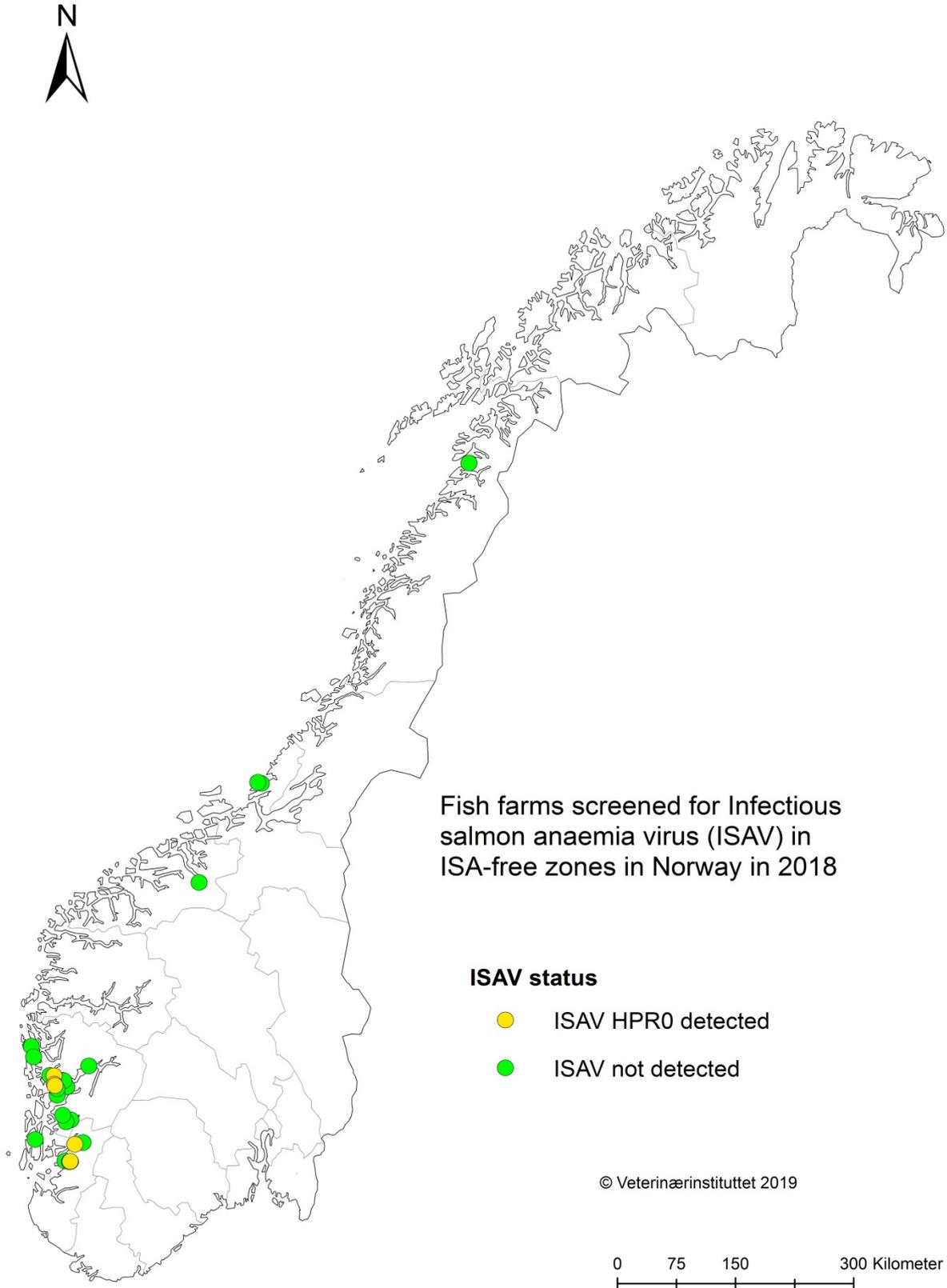


Figure 2: Geographic locations of fish farms tested for infectious salmon anaemia virus (ISAV) in conjunction with infectious salmon anaemia (ISA) free zones and compartments in 2018.

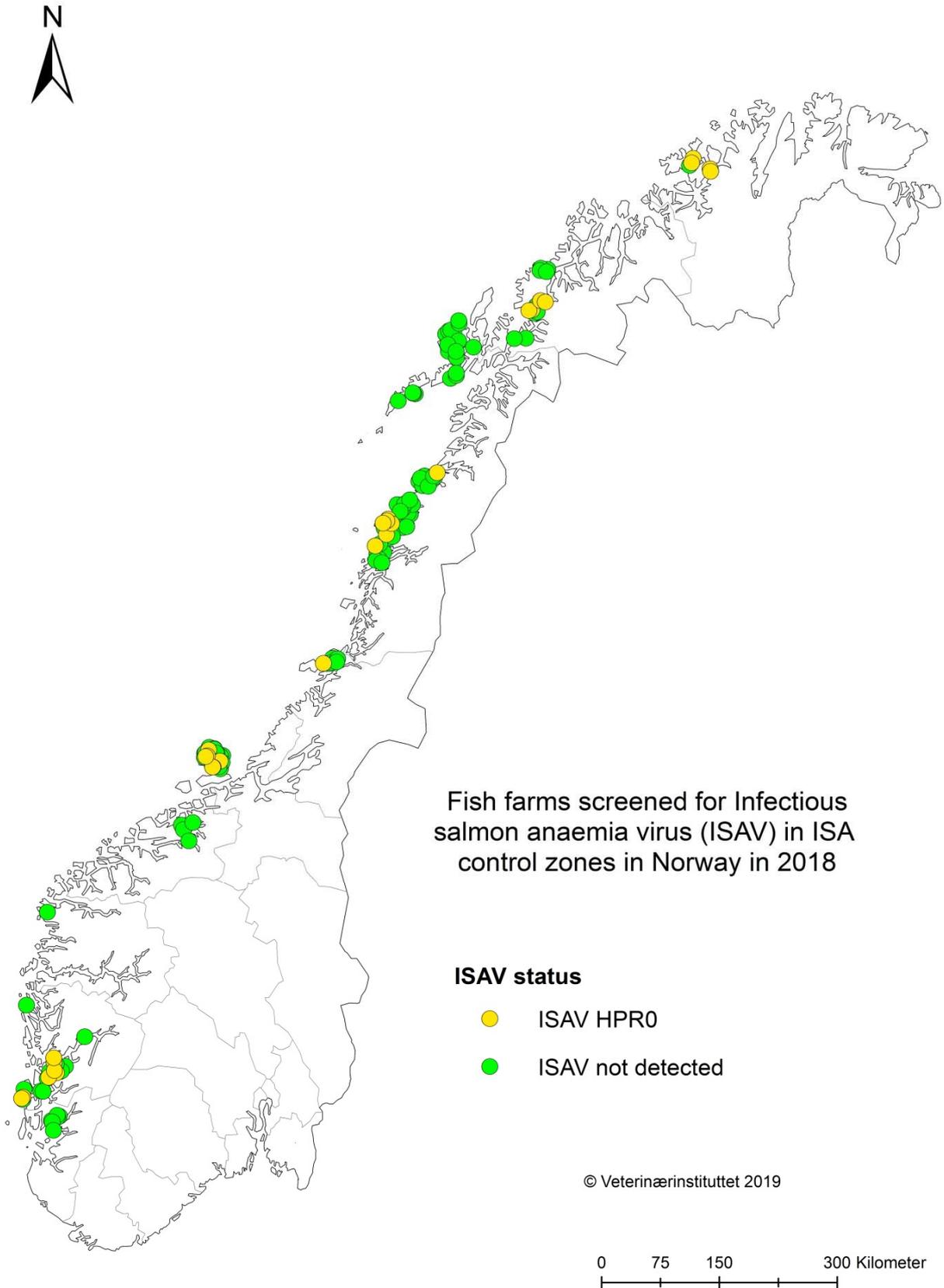


Figure 3: Geographic locations of fish farms tested for infectious salmon anaemia virus (ISAV) in conjunction with infectious salmon anaemia (ISA) control zones in 2018.

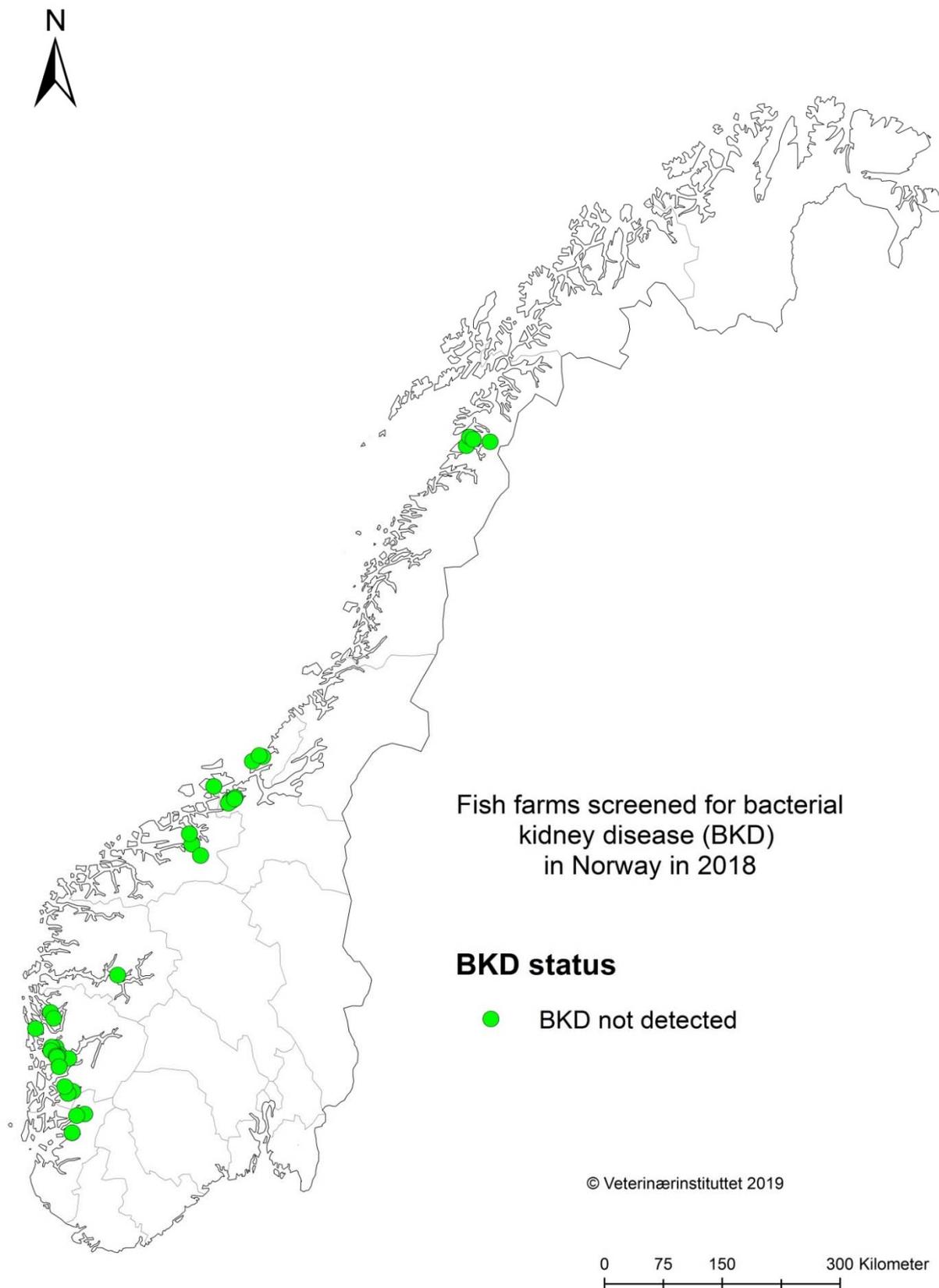


Figure 4. Geographic locations of fish farms tested for *Renibacterium salmoninarum* in 2018. The figure also includes testing from farms not presently in an ISA free zone or segment.

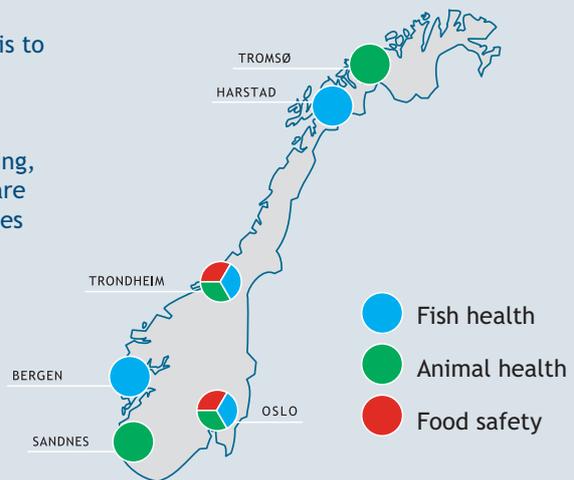
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