



The surveillance programme for infectious salmon anaemia (ISA) and bacterial kidney disease (BKD) in Norway 2021



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Summary

Infectious salmon anaemia virus (pathogenic ISAV HPRdel) and *Renibacterium salmoninarum* were not detected in conjunction with surveillance in ISA-free zones and compartments in 2021.

Introduction

Infectious salmon anaemia (ISA) is a serious disease in salmon caused by ISA virus (ISAV), a virus within the *Orthomyxoviridae* family. The disease was first described 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 1990 with 80 cases per year. In the late 1980s and early 1990s several measures were implemented in order to combat and limit the spread of the disease. Since 1993, the number of annual outbreaks has varied between 1 and 25, and ISA is still a recurring challenge to the salmon farming industry in Norway.

There are two main types of ISAV. The pathogenic type, termed ISAV HPR-deleted (ISAV HPRdel), is associated with ISA outbreaks, while the non-pathogenic type, termed ISAV HPR0, causes subclinical infections only. ISAV HPR0 is now regarded as the origin of the virulent ISAV HPRdel through differential mutations in at least two virus genes. Positive PCR-tests for ISAV HPR0 have so far not been considered notifiable by the Norwegian regulations.

Infection with ISAV is an OIE listed infection and ISAV HPRdel is notifiable within the EU including Norway. In Norway, there is a legal obligation to immediately notify suspicion of ISA to the Norwegian Food Safety Authority (NFSA). Following a suspicion, instant restrictions on fish movement will be implemented and the NFSA will perform fish sampling at the suspected site. The samples will be submitted to the national ISA reference laboratory, the Norwegian Veterinary Institute (NVI), for 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 measures such as the establishment of a containment area. The NFSA reports ISA diagnoses to the EU and the OIE.

The NFSA has declared ISA-free zones and compartments based on both historical freedom and targeted surveillance of ISAV. The declarations of disease-free status must be accepted by the EU in advance of listing of the ISA-free zones and compartments in the Norwegian regulations.

Bacterial kidney disease (BKD) is a chronic disease of salmonid fish caused by *Renibacterium salmoninarum*, first diagnosed in Norway in 1980. BKD is a national listed (list 3) disease in Norway. *R. salmoninarum* can be transmitted vertically from one generation to the next inside the eggs. Some farms have, in conjunction with the surveillance in ISA-free zones and compartments, also performed targeted surveillance for *R. salmoninarum*.

Aims

The aim of the surveillance programme is to document the status of specific salmonid fish farms as ISA-free compartments or zones.

For sites within ISA-free compartments or zones aiming to trade with countries or areas that have national measures for BKD, the surveillance programme additionally documents surveillance conducted for *R. salmoninarum*.

Materials and methods

The surveillance for ISAV (ISAV HPRdel) and *R. salmoninarum* is based on targeted surveillance by the NFSA, including inspections and sample collection, as well as the regular health inspections and investigations performed by private Fish Health Personnel (FHP).

Infectious salmon anaemia virus (ISAV HPRdel)

The NFSA conducts inspections and collects samples according to the regime specified in Table 1.

Table 1: NFSA inspection and sampling regime

Category	Inspections	Sampling
Establishment of an ISA-free zone/compartiment	6/year	2 * 75 fish
Maintenance of an ISA-free zone/compartiment	2/year	2 * 30 fish

Samples must be collected during a one-month period in the spring and another in autumn each year and the sample material must include heart and mid-kidney. Sample collection should be risk-based, meaning that samples must be collected from individuals that are sick, weak, or newly deceased, but not from so-called “loser”-fish unless they show signs indicative of ISA.

Samples are submitted to private, NFSA-appointed laboratories or the NVI for RT-PCR analysis. In the event of a positive result, sequencing is performed to determine whether the virus is the pathogenic ISAV HPRdel or the non-pathogenic ISAV HPR0. Should ISAV HPRdel be detected, the ISA free zone or compartment will immediately be suspended and a diagnostic investigation performed as described in the introduction. The NVI will assist the NFSA with required epidemiological investigations. The NVI receives monthly reports from the appointed laboratories, collates the data and supplies monthly and yearly reports on the data to the NFSA.

In addition to the inspections conducted by the NFSA, all sites are required to have regular inspections by FHP, with additional risk-based sampling in the event of any unexplained morbidity or mortality to rule out ISAV (ISAV HPRdel) as the causative agent.

In the event that one site within an ISA-free compartment or zone has its ISA-free status withdrawn, all sites within the compartment or zone will lose their ISA-free status.

Renibacterium salmoninarum

For placing roe, milt or fish on the market in countries within the EEA with BKD national measures, the live products must come from an ISA-free site located within an ISA-free compartment or zone where targeted surveillance for BKD have been performed by the NFSA for at least two years at all sites within the compartment or zone.

There are separate sampling requirements depending on the type of establishment tested, however the required number of samples are the same both to obtain and maintain surveillance for BKD:

- For stripping stations, a minimum of 30 fish must be sampled per year, with priority to the last 9 months before stripping and the stripping period.
- For other sites, a minimum of 60 fish must be sampled per year.

The NFSA conducts inspections and performs risk-based sampling of kidney tissue. The samples are submitted to NFSA-appointed laboratories for RT-PCR analyses. In the event of a positive result, the NFSA may submit samples for verification to the NVI and the NVI will assist the NFSA with epidemiological investigations. The NVI receives monthly reports from the appointed laboratories, collates the data and supplies monthly and yearly reports on the data to the NFSA.

Results

At the start of 2021 Norway had three ISA-free compartments and one suspended ISA-free zone (status as per 01.01.2021). Two ISA-free compartments had their ISA-free status suspended during 2021 (12917 Sjølseng Hall 2 and 12917 Sjølseng VH 1 & 2 on 01.09.2021). In addition, one compartment had an eradication programme approved during 2021 (10183 Barstadvik on 18.10.2021).

A map of the ISA-free compartment, suspended ISA-free compartments, suspended ISA-free zone and compartment with approved eradication programme is shown in Figure 1, based on their status as per 31.12.2021. As one site, 12917 Sjølseng, contained two suspended ISA-free compartments, only one suspended ISA-free compartment is marked on the map.

The results from the surveillance for ISAV (ISAV HPRdel) are shown in Table 2, while the results from the surveillance for *R. salmoninarum* are given in Table 3. All samples originated from Atlantic salmon. Only samples submitted after the eradication programme approval (10183 Barstadvik) or before suspension of ISA-free status (12917 Sjølseng) are included in the tables. The exception to this is the suspended ISA-free zone (12112 Femangervågen) for which samples from the entire year are included (see discussion for further elaboration).

Any additional, non-statutory tissues sampled and tested for ISAV HPRdel and *R. salmoninarum* are listed in the Appendix Tables A1 and A2, respectively. All samples originated from Atlantic salmon.

Table 2: Number of heart and kidney samples tested for ISAV (ISAV HPRdel) per month in 2021, per compartment/zone.

Category (31.12.2021)	Site	Number of samples (ISAV HPRdel)												Total	Positive
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ISA-free compartment	18000 Rimstad	6	12	0	33	105	0	20	6	30	34	12	0	258	0
Suspended ISA-free zone	12112 Femangervågen	0	0	0	0	160	0	0	0	80	80	0	0	320	0
Suspended ISA-free compartment	12917 Sjølseng Hall 2*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended ISA-free compartment	12917 Sjølseng VH 1&2**	0	64	62	36	28	0	-	-	-	-	-	-	190	0
Compartment with approved eradication programme	10183 Barstadvik***	-	-	-	-	-	-	-	-	-	-	171	20	191	0

* Empty of fish from 01.01.2021, ISA-free status suspended from 01.09.2021

** ISA-free status suspended from 01.09.2021

*** Eradication programme approved from 18.10.2021

Table 3: Number of kidney samples tested for *R. salmoninarum* per month in 2021, per compartment/zone.

Category (31.12.2021)	Site	Number of samples (<i>R. salmoninarum</i>)												Total	Positive
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ISA-free compartment	18000 Rimstad	3	6	0	25	82	0	10	3	46	17	6	0	198	0
Suspended ISA-free zone	12112 Femangervågen	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Suspended ISA-free compartment	12917 Sjølseng Hall 2*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended ISA-free compartment	12917 Sjølseng VH 1&2**	0	32	31	18	14	0	-	-	-	-	-	-	95	0
Compartment with approved eradication programme	10183 Barstadvik***	-	-	-	-	-	-	-	-	-	-	9	10	19	0

* Empty of fish from 01.01.2021, ISA-free status suspended from 01.09.2021

** ISA-free status suspended from 01.09.2021

*** Eradication programme approved from 18.10.2021

Discussion

This report contains data from sampling conducted in the ISA-free compartments, suspended ISA-free zone and compartment with approved eradication programme in Norway in 2021. Sufficient, targeted surveillance for BKD for at least two years has not been conducted. Subsequently, none of the compartments can trade to countries or areas with national measures for BKD.

The ISA-free compartment 18000 Rimstad submitted samples for analyses for both ISAV HPRdel and *R. salmoninarum*. All samples returned a negative result. The number of samples for ISAV HPRdel analyses were above the minimum requirement. The non-pathogenic variant of ISAV, ISAV HPR0, were detected at several sampling points from April 2021 onwards.

Only one of the two ISA-free compartments at site 12917 Sjølseng (12917 Sjølseng VH 1&2) stocked fish and were eligible for sampling in 2021. Regular sampling was performed for both ISAV HPRdel and *R. salmoninarum* prior to suspension of the ISA-free status. All samples returned a negative result. The non-pathogenic variant of ISAV, ISAV HPR0, were detected at the last sampling prior to suspension.

The ISA-free status for the zone 12112 Femangervågen is suspended. The NFSA demands a permanent, strengthened surveillance for this suspended ISA-free zone, with a yearly minimum requirement of 150 samples submitted per year for ISAV HPRdel analysis. The number of submitted samples for 2021 exceeded this requirement and all samples returned a negative result.

After eradication programme approval, samples were submitted from 10183 Barstadvik for both ISAV HPRdel and *R. salmoninarum* analysis. All samples returned a negative result. The number of samples for ISAV HPRdel analysis were above the minimum requirement for a half-year period.

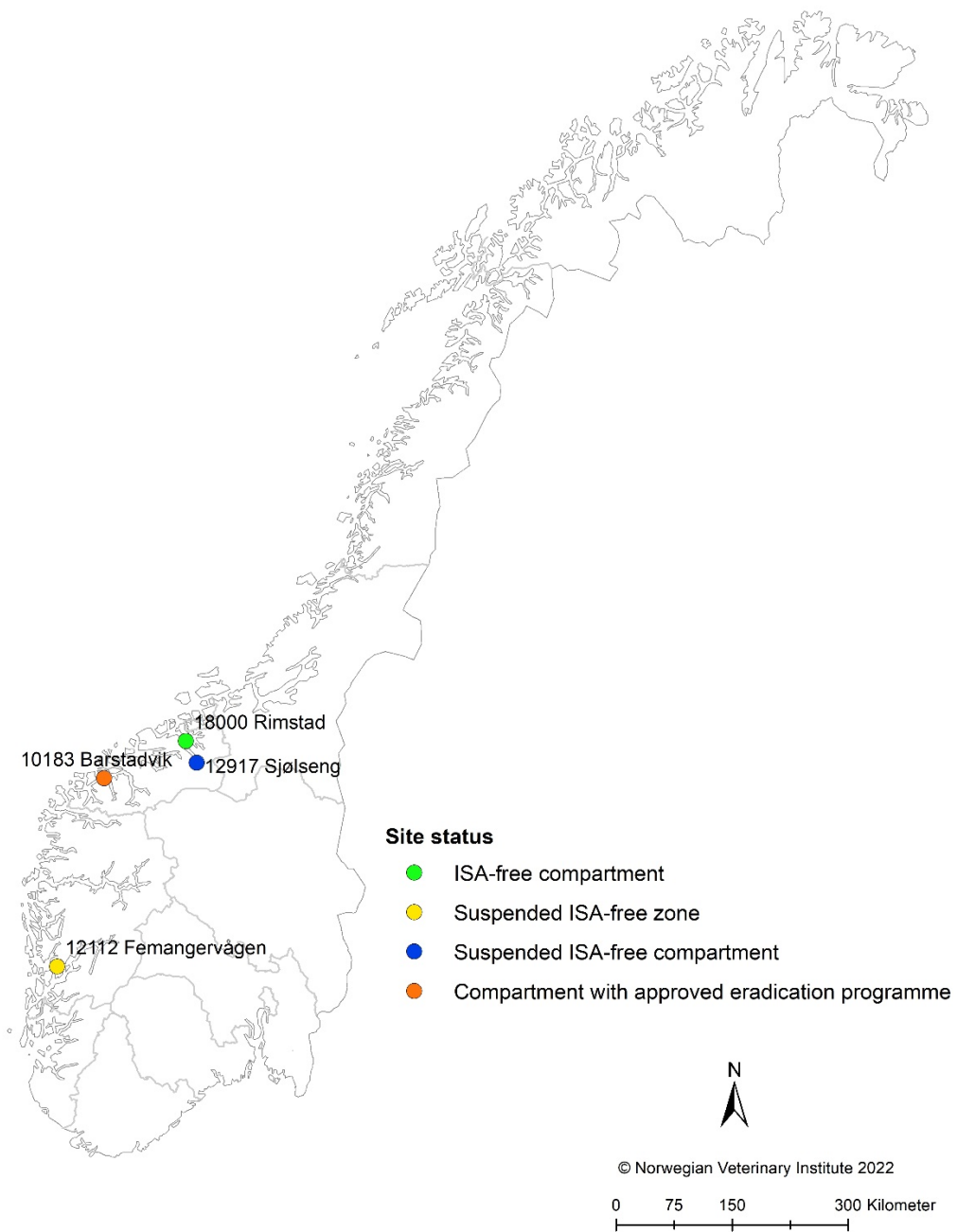


Figure 1: The geographic locations of the ISA-free compartment, suspended ISA-free zone, suspended ISA-free compartments and compartment with approved eradication programme sampled in 2021 (status as per 31.12.2021). Site 12917 Sjølseng consisted of two separate suspended ISA free compartments within one site.

Appendix

Table A1: Additional tissue samples (roe, milt, fry or gills) tested for ISAV (ISAV HPRdel) per month in 2021, per compartment/zone.

Category (31.12.2021)	Site	Number of samples (ISAV HPRdel)												Total	Positive
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ISA-free compartment	18000 Rimstad	0	10	10	0	51	0	10	3	31	0	6	0	121	0
Suspended ISA-free zone	12112 Femangervågen	0	0	0	0	30 [#]	0	0	0	0	0	0	0	30	0
Suspended ISA-free compartment	12917 Sjølseng Hall 2*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended ISA-free compartment	12917 Sjølseng VH 1&2**	0	0	0	0	0	0	-	-	-	-	-	-	0	-
Compartment with approved eradication programme	10183 Barstadvik***	-	-	-	-	-	-	-	-	-	-	0	0	0	-

* Empty of fish from 01.01.2021, ISA-free status suspended from 01.09.2021

** ISA-free status suspended from 01.09.2021

*** Eradication programme approved from 18.10.2021

[#] 30 pooled gill samples from 90 fish

Table A2: Additional tissue samples (fry) tested for *R. salmoninarum* per month in 2021, per compartment/zone.

Category (31.12.2021)	Site	Number of samples (<i>R. salmoninarum</i>)												Total	Positive
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ISA-free compartment	18000 Rimstad	0	10	10	0	0	0	0	0	0	0	0	0	20	0
Suspended ISA-free zone	12112 Femangervågen	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Suspended ISA-free compartment	12917 Sjølseng Hall 2*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended ISA-free compartment	12917 Sjølseng VH 1&2**	0	0	0	0	0	0	-	-	-	-	-	-	0	-
Compartment with approved eradication programme	10183 Barstadvik***	-	-	-	-	-	-	-	-	-	-	0	0	0	-

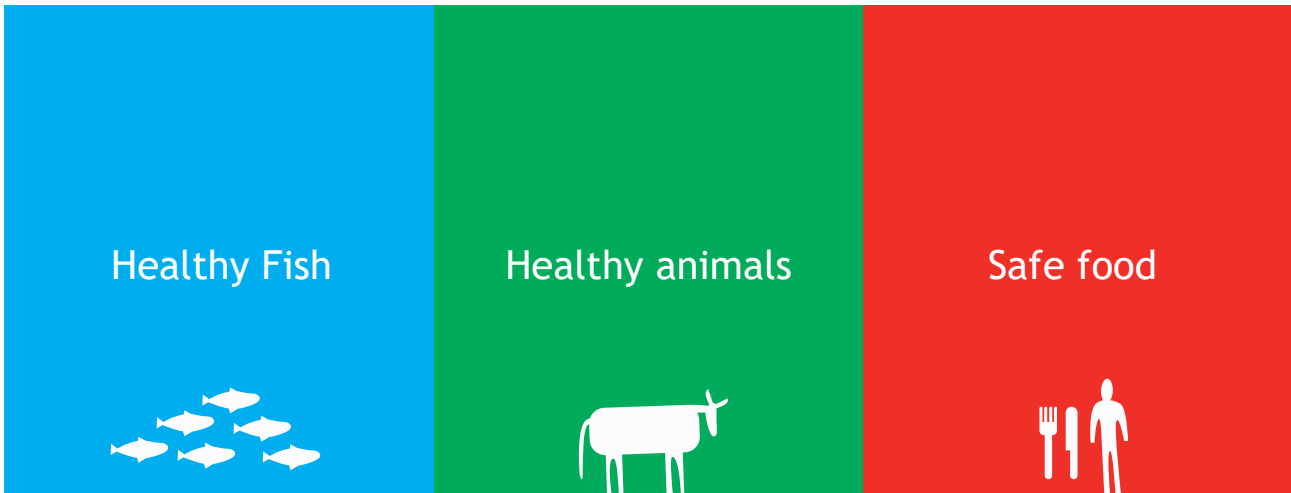
* Empty of fish from 01.01.2021, ISA-free status suspended from 01.09.2021

** ISA-free status suspended from 01.09.2021

*** Eradication programme approved from 18.10.2021

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and collaborative- for one health!*



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