



# The post-treatment surveillance programme for *Gyrodactylus salaris* in Norway 2022



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## Summary

In 2022, 657 salmon juveniles from the four watercourses Skibotnvassdraget (205.Z), Signaldalelva (204.Z), and Kitdalselva (204.8Z) in Troms og Finnmark County, and Fustavassdraget (152.Z) in Nordland county, were examined in the post-treatment surveillance programme for *Gyrodactylus salaris* in Norway. In addition fins from 533 Arctic char from the lakes Fustvatnet, Mjåvatnet and Ømmervatnet in Fustavassdraget were examined. *G. salaris* was not detected in any of the examined samples.

The rivers Skibotnvassdraget, Signaldalelva, and Kitdalselva, that constitutes the Skibotn infection region, completed their sixth and final year in the surveillance program in 2022. As all samples collected and examined from the rivers during the duration of the program tested negative, the infection region was declared free from infection with *G. salaris*. Thus, by 31.12.2022, *G. salaris* was confirmed eradicated from 42 rivers and from all hatcheries/fish farms in Norway.

The status at the beginning of the year 2022 is that *G. salaris* is confirmed present in two different infection regions including eight river systems; Driva infection region with the rivers Driva (109.Z), Batnfjordselva (108.3Z), Litledalselva (109.5Z) and Usma (109.4Z), and the Drammen infection region with the rivers Drammenselva (012.Z), Lierelva (011.Z), Vesleelva (013.Z) and Selvikvassdraget (013.1Z). In the rivers in the Driva infection region, eradication measures are in progress, while planning is ongoing for future eradication measures in the rivers in the Drammen infection region. For 2023, Fustavassdraget is the only water course included in the post-treatment surveillance programme.

## Introduction

During the period 1975 - 2022, pathogenic strains of *Gyrodactylus salaris* have been detected on Atlantic salmon (*Salmo salar*) fingerlings/parr in 51 rivers, 13 hatcheries/farms with Atlantic salmon parr/smolts and 26 hatcheries/farms with rainbow trout (*Oncorhynchus mykiss*). In addition, both pathogenic and non-pathogenic strains of *G. salaris* have been found on Arctic char (*Salvelinus alpinus*). The latest detection was in 2019, in River Selvikvassdraget, in Vestfold and Telemark County, where *G. salaris* was found on salmon analysed as part of the surveillance program.

The policy of the Norwegian authorities is to eradicate *G. salaris* from infected watersheds and farms (Anon 2014). In farms, this is carried out by eliminating the hosts (Atlantic salmon and rainbow trout). This ensures elimination of the parasite since it lacks specialised free-living stages and does not use intermediate hosts in its life cycle. In rivers, the eradication is done by chemical treatment. In most instances rotenone has been the preferred chemical, but one exception to this is the treatment of River Lærdalselva in 2011-2012, where acidified aluminium sulphate was used to eradicate the parasite. Recently, testing and full-scale

treatment using chlorine as the main chemical has been carried out in river Driva, Møre og Romsdal county.

By 31.12.2021, *G. salaris* was confirmed eradicated from 39 rivers and from all hatcheries/fish farms. At the beginning of the year 2022 *G. salaris* was confirmed present in eight Norwegian river systems belonging to two different infection regions; Driva infection region with the rivers Driva (109.Z), Batnfjordselva (108.3Z), Litledalselva (109.5Z) and Usma (109.4Z), and the Drammen infection region with the rivers Drammenselva (012.Z), Lierelva (011.Z), Vesleelva (013.Z) and Selvikvassdraget (013.1Z). In the rivers in the Driva infection region, eradication measures are in progress, while planning is ongoing for the rivers in the Drammen infection region.

*Gyrodactylus salaris* is included in the list F of nationally listed and notifiable diseases, and Norway has implemented national measures for the parasite which comply with Regulation (EU) 2016/429, article 226 (3). *Gyrodactylus salaris* is also listed as a notifiable aquatic animal disease by the World Organization for Animal Health (WOAH). Surveillance for *G. salaris*, aiming to declare freedom from the parasite in treated rivers, has been ongoing since the early 1980s. The Norwegian Veterinary Institute (NVI) coordinates the surveillance programme on behalf on the Norwegian Food Safety Authority (NFSA) and publishes the overall results in annual reports available on the website of the Norwegian Veterinary Institute (NVI) ([www.vetinst.no](http://www.vetinst.no)).

NVI is responsible for the sampling in the rivers, but County Environmental Departments and other institutions/companies are commissioned to carry out the actual sampling. NVI is responsible for both examination of the fish samples and subsequent species identification if specimens of *Gyrodactylus* are detected.

## Aims

The post-treatment surveillance programme for *Gyrodactylus salaris* aims to document the absence of the parasite in previously infested rivers after the implementation of eradication measures. This documentation provides the basis for the Norwegian Food Safety Authority to declare the salmon populations free from infection.

## Materials and methods

An adequate surveillance, covering both space and time, is required to ascertain freedom from infection with *G. salaris* in the treated rivers. Declaring a river free from parasites requires examination of salmon juveniles sampled over a time period of a minimum of five years after an eradication measure is completed. This time frame is based on a smolt age of four years, adding one year safety margin. In rivers with higher smolt age, the time to ascertain freedom from infection is increased proportionally.

For 2022, the four watercourses Skibotnvassdraget (205.Z), Signaldalelva (204.Z), and Kitdalselva (204.8Z) in Troms og Finnmark County, and Fustavassdraget (152.Z) in Nordland county, were included in the post-treatment surveillance programme for *Gyrodactylus salaris* in Norway (see Table 1). For the rivers in the Skibotn infection region, the smolt age can be up to five years, and thus the duration of the surveillance programme is 6 years.

Wild Atlantic salmon juveniles are sampled along the whole anadromous part of the river. The programme recommends sampling of at least 10 salmon juveniles near the river outlet to the sea, and further 10 salmon at every second kilometre, all the way up to the migration barrier in the main river as well as in the tributaries. Thus, the total number of sampled fish is dependent of the length of the anadromous part of the river system. Fingerlings and parr of an age of 1+ or older (preferred size ranging from 7 - 12 cm) are caught by means of electrofishing. The fish are killed and then preserved whole in 96 % ethanol.

For the watercourse Fustavassdraget both fins of Arctic char, *Salvelinus alpinus*, from the lakes upstream of the migration barrier for salmon, and salmon from the river below the migration barrier are examined. The treatment of this watercourse in 2012 included the three lakes upstream of the migration barrier (Lakes Fustvatnet, Mjåvatnet and Ømmervatnet) as *G. salaris* was detected on Arctic char in these lakes (Hytterød et al, 2011). As Arctic char is not the main host for *G. salaris*, the prevalence and intensity of infection is generally low on this host. Thus, to obtain a detection level of less than 0.5 % infected Arctic char in the lake, the programme recommends that a total of 500 fish are sampled and examined each year for a period of three years. Arctic char are sampled in fish traps or gill nets in different localities within the three lakes during the spawning season in the autumn. The fish are killed and the fins are cut-off with a pair of scissors and then preserved in 96 % ethanol

All samples are sent to the NVI where they are examined. The whole surface of the salmon, including head, gills and fins, and the fins from Arctic char, are examined under a stereo microscope at 10 - 15 times magnification.

When *Gyrodactylus* specimens are detected, species determination is performed by NVI. NVI is the WOAHA reference laboratory for "Infection with *Gyrodactylus salaris*" and the methods used for species identification follow those given by the WOAHA Manual of Diagnostic Tests for Aquatic Animals:

[https://www.woah.org/fileadmin/Home/eng/Health\\_standards/aahm/current/2.3.03\\_G\\_salaris.pdf](https://www.woah.org/fileadmin/Home/eng/Health_standards/aahm/current/2.3.03_G_salaris.pdf)

## Results and discussion

Altogether, 657 salmon juveniles from Skibotnvassdraget, Signaldalelva, Kitdalselva, and Fustavassdraget were examined in 2022 (Table 1). In addition fins from 533 Arctic char from the lakes Fustvatnet, Mjåvatnet and Ømmervatnet in the Fustavassdraget watercourse were examined. *Gyrodactylus salaris* was not detected in any of the samples from these rivers or watercourses.

In 2022, the rivers Skibotnvasdraget, Signaldalselva, and Kitdalselva (Troms og Finnmark county), that constitutes the Skibotn infection region, completed their sixth and final year in the surveillance program. As all samples collected and examined from the rivers during the duration of the program tested negative, the infection region was declared free from infection with *G. salaris*. Fustavassdraget (Nordland county) is as of 31.12.22 the only water course included in the post-treatment surveillance programme.

The status at the beginning of the year 2023 is that *G. salaris* is still confirmed present in eight Norwegian river systems.

*Table 1: Details of the watercourses and the number of Atlantic salmon (AS) examined for Gyrodactylus salaris in 2022.*

County	River	Vassdragskode	No. of AS examined	Positives
Nordland	Fusta	152.Z	155	0
<b>Nordland, total</b>			<b>155</b>	<b>0</b>
Troms and Finnmark	Kitdalselva	204.8Z	1*	0
Troms and Finnmark	Signaldalselva	204.Z	303**	0
Troms and Finnmark	Skibotnelva	205.Z	198	0
<b>Troms and Finnmark, total</b>			<b>502</b>	<b>0</b>
		<b>Totalsum</b>	<b>657</b>	<b>0</b>

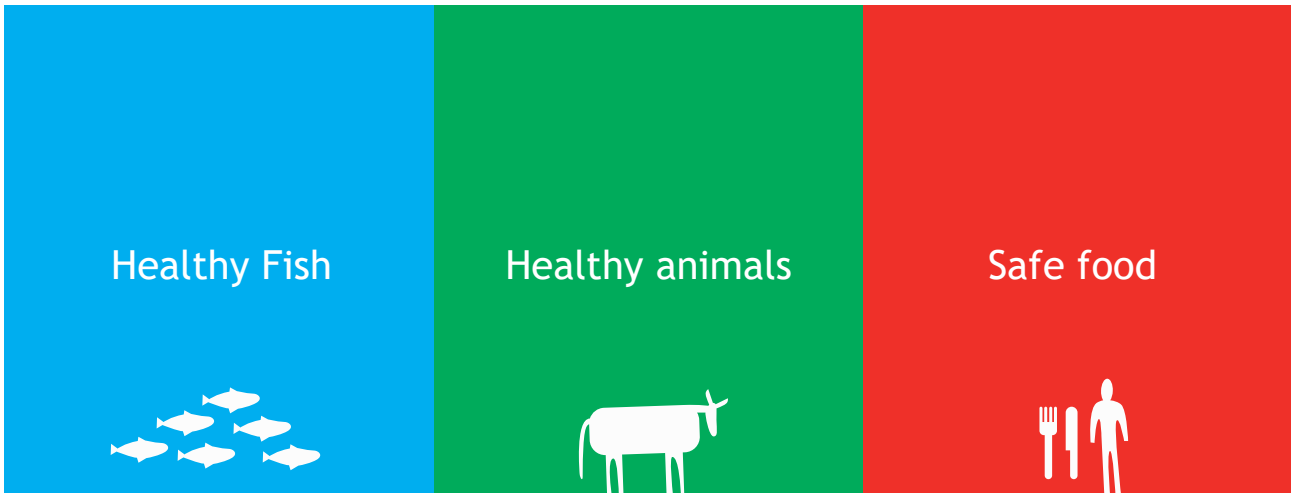
\* The natural salmon population in this river is small and it proved difficult to obtain a full sample. However, as few salmon were available for examination, 4 Arctic char were also sampled, examined, and found negative. \*\* In addition 15 Arctic char were also sampled, examined, and found negative.

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## References

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