

The post-treatment surveillance programme to ascertain freedom from infection with *Gyrodactylus salaris* in Atlantic salmon

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In 2014, *Gyrodactylus salaris* was not detected in any of the rivers included in this control program.

Introduction

During the period of 1975 to 2014 pathogenic strains of *Gyrodactylus salaris* have been detected on Atlantic salmon (*Salmo salar*) fingerlings/parr in 49 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 charr (*Salvelinus alpinus*) in lakes. The policy of the Norwegian Authorities is to eradicate *G. salaris* from infected watersheds and farms. In farms, the eradication procedure is carried out by eliminating the hosts (salmon and rainbow trout). This ensures elimination of the parasite because it lacks specialized free-living stages and do not need intermediate hosts in its life-cycle. In rivers, the eradication procedure is carried out by treatment with rotenone, a poison that kills all the fish hosts. In addition, the use of acidified aluminum sulphate has been used with good results in river Lærdalselva. In contrast to rotenone, aluminum sulphate will kill the parasite but not the fish host. By December 31st 2014, *G. salaris* was confirmed eradicated from 22 rivers and from all hatcheries/fish farms. The eradication has not yet been confirmed for 17 additional rivers. Thus, at the end of 2014, the parasite was present or suspected to be present in 10 Norwegian rivers.

G. salaris is a notifiable (List 3) disease in Norway and it is listed as "Other significant disease" in the World Organisation for Animal Health (OIE). Surveillance of *G. salaris* aiming to declare freedom from the parasite in treated rivers has been performed in Norway since early 1980s. The Norwegian Veterinary Institute (NVI) coordinates the surveillance programme and publishes the overall results in monthly and annual reports available on the NVI website (www.vetinst.no).

An adequate surveillance, in space and time, is required to ascertain freedom from infection with *G. salaris* in the treated rivers. Declaring freedom from the parasite 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.

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 and subsequent species identification of the parasites if *Gyrodactylus* is detected.

Aim

The post-treatment control programme to ascertain freedom from infection with *Gyrodactylus salaris*, aims to document freedom of the parasite in previously infested rivers after implementation of eradication measures. The documentation provides the basis for declaring the salmon populations free from infection. Freedom from infection is declared by the Norwegian Food Safety Authority.

Materials and methods

Wild Atlantic salmon juveniles are sampled along the whole anadromous part of the river. The program recommends sampling of at least 10 salmon juveniles near the river outlet to the sea, and further 10 salmon at every second kilometer, all the way up to the migration barrier in the main river and in tributaries as well. Thus, the total number of sampled fish is dependent of the anadromous length of the river system. Fingerlings/parr/smolts are caught by means of electrofishing. The fish are killed and then

preserved as whole in 96 % ethanol.

All the fish samples are sent to the NVI in Oslo where the whole surface including body, head and fins are examined under a stereo microscope at 10 - 15 times magnification. When *Gyrodactylus* specimens are detected, species determination is performed by morphology and molecular methods.

NVI is the OIE reference laboratory for the disease and the methods used for species identification follows those in the Gyrodactylosis (*Gyrodactylus salaris*) chapter in the Manual of diagnostic tests for aquatic animals from the World Organisation for Animal Health (OIE)

(http://www.oie.int/fileadmin/Home/eng/Health_standards/aahm/current/2.3.03_GYRO.pdf).

Results

Altogether, 1709 salmon juveniles from 14 rivers were examined in 2014 (Table 1). There were no new infections with *G. salaris* detected in any samples from rivers included in the program. The rivers in Nord-Trøndelag were declared free from *G. salaris* in 2014.

Table 1. Number of rivers and number of fish examined for *Gyrodactylus salaris* in 2014.

County	No. of rivers	Species	No. of fish examined	Detections
Nordland	10	Atlantic salmon	828	0
Nord-Trøndelag	3	Atlantic salmon	435	0
Sogn og Fjordane	1	Atlantic salmon	446	0
Total	14		1709	0

Conclusion

In 2014, *G. salaris* was not detected in any of the rivers included in the surveillance program to ascertain freedom from infection with *G. salaris* in Atlantic salmon in Norway. In late autumn 2014, three rivers in Nord-Trøndelag County fulfilled the criteria set by the program, and were declared free from the infection.

The Norwegian Veterinary Institute (NVI) is a nationwide research institute in the fields of animal health, fish health, and food safety. The primary mission of the NVI is to give research-based independent advisory support to ministries and governing authorities. Preparedness, diagnostics, surveillance, reference functions, risk assessments, and advisory and educational functions are the most important areas of operation.

The Norwegian Veterinary Institute has its main laboratory in Oslo, with regional laboratories in Sandnes, Bergen, Trondheim, Harstad og Tromsø, with about 360 employees in total.

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The Norwegian Food Safety Authority (NFSA) is a governmental body whose aim is to ensure through regulations and controls that food and drinking water are as safe and healthy as possible for consumers and to promote plant, fish and animal health and ethical farming of fish and animals. We encourage environmentally friendly production and we also regulate and control cosmetics, veterinary medicines and animal health personnel. The NFSA drafts and provides information on legislation, performs risk-based inspections, monitors food safety, plant, fish and animal health, draws up contingency plans and provides updates on developments in our field of competence.

The NFSA comprises three administrative levels, and has some 1300 employees.

The NFSA advises and reports to the Ministry of Agriculture and Food, the Ministry of Fisheries and Coastal Affairs and the Ministry of Health and Care Services.

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