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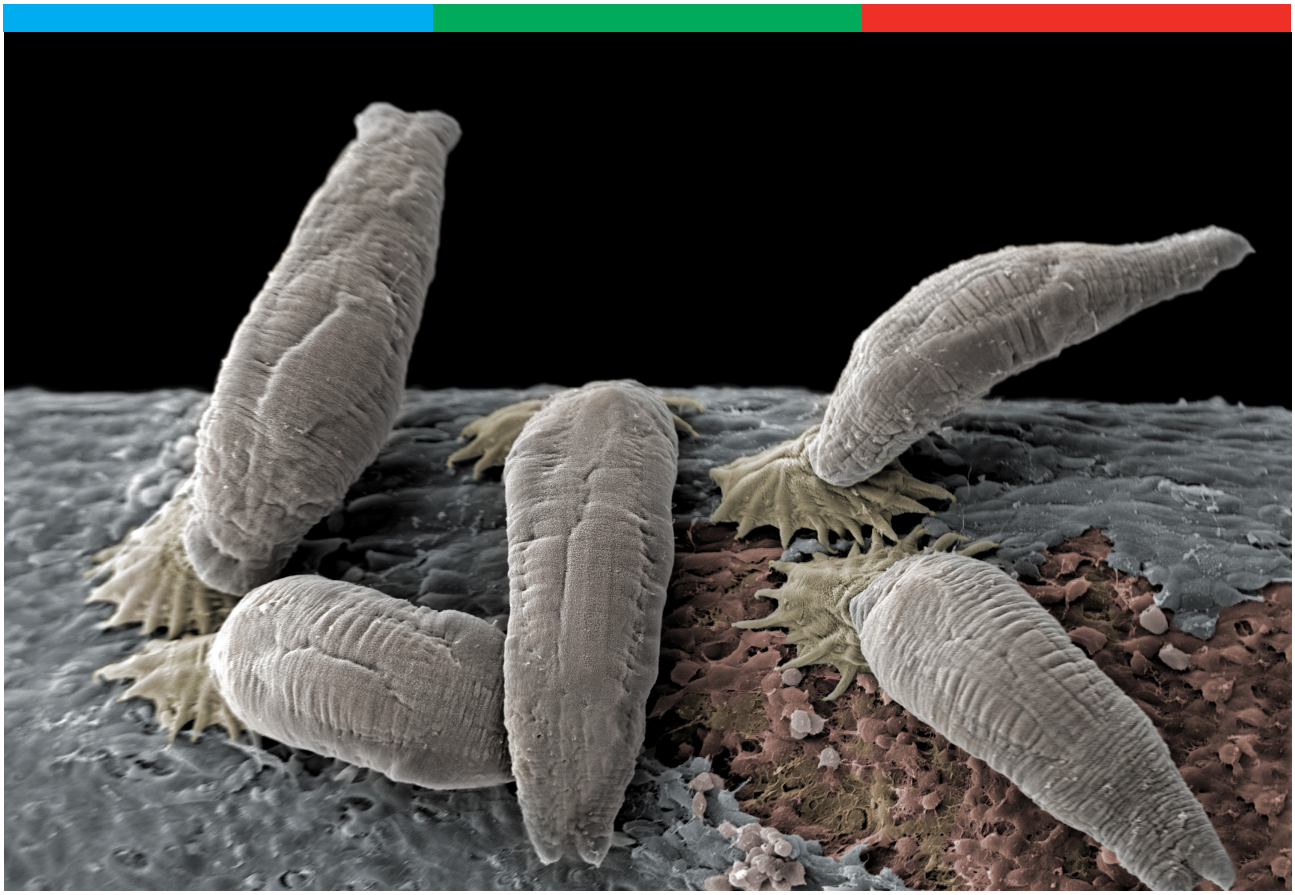
The surveillance programme for *Gyrodactylus salaris* in Atlantic salmon and rainbow trout in Norway 2020



REPORT 35/2021

The surveillance programme for *Gyrodactylus salaris* in Atlantic salmon and rainbow trout in Norway 2020

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Content

Summary

In 2020, *Gyrodactylus salaris* was not detected in any of the rivers or farms included in the surveillance program. At the end of 2020, the parasite is confirmed present in eight Norwegian river systems.

Introduction

During the period 1975 - 2020, 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*). The latest detection was in 2019, in River Selvikvassdraget, in Vestfold and Telemark County, where infected fish were found on samples analysed in the surveillance program. In addition, both pathogenic and non-pathogenic strains of *G. salaris* have been found on Arctic char (*Salvelinus alpinus*).

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 aluminum sulphate was used to eradicate the parasite.

By 31.12.2020, *G. salaris* was confirmed eradicated from 39 rivers and from all hatcheries/fish farms. In additional four rivers, eradication measures have been completed, but eradication has not yet been confirmed. Thus, at the end of 2020, the parasite is confirmed present in eight Norwegian rivers.

Gyrodactylus salaris is a notifiable (List 3) disease in Norway and it is listed under “Fish diseases” by the World Organisation for Animal Health (OIE). Surveillance of *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 and publishes the overall results in annual reports available on the NVI website (www.vetinst.no).

The Norwegian Food Safety Authority is responsible for the sampling in fish farms. The NVI is responsible for the sampling in the rivers, but County Environmental Departments and other institutions/companies are commissioned to do the actual sampling. The NVI is responsible for examination of the fish samples and the subsequent species identification if *Gyrodactylus* is detected.

Aims

The surveillance programme aims to document freedom of *G. salaris* in Norwegian farms and rivers, and to detect and trace any spread of the parasite to new river systems or fish farms.

Materials and methods

The selection of rivers for inclusion in the surveillance programme follow specified criteria which takes into account the risk of infection with *G. salaris*. A total of 30 wild Atlantic salmon juveniles are sampled from each river, preferably from three different sites located far apart. In Tana (Troms and Finnmark county), 150 salmon are sampled at 15 sites due to the large size of this watercourse. Fingerlings/parr/smolts are caught by means of electrofishing. The fish are killed and then preserved whole in 96% ethanol.

In farms and hatcheries, either 30 Atlantic salmon or 60 rainbow trout are sampled by seine net. The fish are killed and all fins (except the adipose fin) are cut off and preserved in 96% ethanol.

All samples are sent to the NVI for examination with stereo microscope at 10 - 15 times magnification. For wild Atlantic salmon, the whole surface of the fish, including the skin, head and fins and gills, is examined, while only the fins from farmed fish are examined.

When *Gyrodactylus* specimens are detected, species determination is performed by NVI. NVI is the OIE reference laboratory for "Infection with *Gyrodactylus salaris*" and the methods used for species identification follow those given by the OIE Manual of Diagnostic Tests for Aquatic Animals.
http://www.oie.int/index.php?id=2439&L=0&htmfile=chapitre_gyrodactylus_salaris.htm

Results and discussion

Altogether, 2375 specimens of Atlantic salmon from 71 rivers and 2901 specimens of Atlantic salmon, rainbow trout and brown trout from 87 farms were examined in 2020 (Table 1).

***Table 1**: Number of rivers, farms and fish examined for* Gyrodactylus salaris *in 2020.*

County	Rivers				Farms			
	No.	Fish*	No. of fish examined	Positive	No.	Fish*	No. of fish examined	Positive
Viken	6	AS	203	0	2	AS	62	0
Innlandet	-	-	-	-	-	-	-	-
Oslo	3	AS	96	0	-	-	-	-
Vestfold og Telemark	2	AS	71	0	2	AS	66	0
Agder	4	AS	132	0	-	-	-	-
Rogaland	3	AS	102	0	8	AS	253	0
Vestland	6	AS	208	0	27	AS/RT/BT	1 019	0
Møre og Romsdal	8	AS	220	0	13	AS/RT	435	0
Trøndelag	10	AS	325	0	15	AS	458	0
Nordland	16	AS	483	0	15	AS	458	0
Troms og Finnmark	13	AS	535	0	5	AS	150	0

* AS = Atlantic salmon, RT = rainbow trout, BT = brown trout

References

1. Anon (2014). Handlingsplan mot lakseparasitten *Gyrodactylus salaris* for perioden 2014-2016. Miljødirektoratet 2014. 114 s.

Appendix A

Table Appendix 1: *Watercourses examined for* Gyrodactylus salaris *in 2020 sorted by watercourse code.*

County	Watercourse	Watercourse code	No. of Atlantic salmon examined	*G. salaris**
Viken	Enningdalselva	001.1Z	36	ND
Viken	Glomma	002.Z	28	ND
Viken	Hølenelva	004.Z	33	ND
Oslo	Gjersjøelva	005.4Z	30	ND
Oslo	Nordmarkvassdraget	006.Z	33	ND
Oslo	Lysakerelva	007.Z	33	ND
Viken	Sandvikselva	008.Z	38	ND
Viken	Askerelva	009.1Z	32	ND
Viken	Årosvassdraget	009.Z	36	ND
Vestfold og Telemark	Aulielva	014.Z	36	ND
Vestfold og Telemark	Numedalslågen	015.Z	35	ND
Agder	Nidelva i Arendal	019.Z	33	ND
Agder	Tovdalselva	020.Z	33	ND
Agder	Otra	021.Z	33	ND
Agder	Mandalselva	022.Z	33	ND
Rogaland	Bjerkreimselva	027.Z	35	ND
Rogaland	Figgjo	028.Z	37	ND
Rogaland	Suldalslågen	036.Z	30	ND
Vestland	Vosso	062.Z	30	ND
Vestland	Lærdalselva	073.Z	33	ND
Vestland	Gaula	083.Z	36	ND
Vestland	Nausta	084.7Z	36	ND
Vestland	Loen	088.2Z	37	ND
Vestland	Strynselva	088.Z	36	ND
Møre og Romsdal	Tafjordelva	099.Z	30	ND
Møre og Romsdal	Måna (Måndalselva)	103.1Z	30	ND
Møre og Romsdal	Innfjordelva	103.2Z	30	ND
Møre og Romsdal	Breidvikelva	103.42Z	30	ND
Møre og Romsdal	Isa (Henselva)	103.4AZ/103.4Z	30	ND
Møre og Romsdal	Skorgeelva	103.5Z	10	ND
Møre og Romsdal	Rauma inkl Istra	103.Z/103.A1Z	29	ND
Møre og Romsdal	Surna	112.Z	31	ND
Trøndelag	Orkla	121.Z	30	ND
Trøndelag	Gaula	122.Z	42	ND
Trøndelag	Nidelva	123.Z	31	ND
Trøndelag	Stjørdalsvassdraget	124.Z	32	ND
Trøndelag	Verdalsvassdraget	127.Z	34	ND
Trøndelag	Figga	128.3Z	31	ND
Trøndelag	Steinkjerelva	128.Z	33	ND
Trøndelag	Stordalselva	135.Z	30	ND

Trøndelag	Årgårdsvassdraget	138.Z	32	ND
Trøndelag	Namsen	139.Z	30	ND
Nordland	Hestdalselva	149.61Z	30	ND
Nordland	Halsanelva	149.6Z	30	ND
Nordland	Hundåla	151.1Z	30	ND
Nordland	Vefsna	151.Z	31	ND
Nordland	Drevja	152.2Z	30	ND
Nordland	Dagsvikelva	153.11Z	30	ND
Nordland	Nylandselva	153.1Z	30	ND
Nordland	Leirelva	153.22Z	30	ND
Nordland	Ranelva	153.3Z	30	ND
Nordland	Bardalselva	153.6Z	31	ND
Nordland	Sannaelva	155.2Z	30	ND
Nordland	Bjerka	155.4Z	30	ND
Nordland	Røssåga	155.Z	30	ND
Nordland	Slettenelva	156.4Z	31	ND
Nordland	Beiarelva	161.Z	30	ND
Nordland	Saltdalsvassdraget	163.Z	30	ND
Troms og Finnmark	Målselva	196.Z	32	ND
Troms og Finnmark	Nordkjoselva	198.Z	30	ND
Troms og Finnmark	Manndalselva	206.1Z	31	ND
Troms og Finnmark	Reisavassdraget	208.Z	31	ND
Troms og Finnmark	Altaelva	212.Z	33	ND
Troms og Finnmark	Repparfjordelva	213.Z	31	ND
Troms og Finnmark	Stabburselva	223.Z	31	ND
Troms og Finnmark	Lakselva	224.Z	30	ND
Troms og Finnmark	Børselva	225.Z	30	ND
Troms og Finnmark	Tana	234.Z	156	ND
Troms og Finnmark	Komagelva	239.Z	36	ND
Troms og Finnmark	Vestre Jacobselv	240.Z	32	ND
Troms og Finnmark	Neiden	244.Z	32	ND

* D = Detected, ND = Not detected.

Appendix B

Table Appendix 2: *Farms and hatcheries examined for* Gyrodactylus salaris *in 2020 sorted by county.*

County	Farms and hatcheries	Hatchery code	No. of AS/RT* examined	*G. salaris***	Fish species
Viken	Hamang klekkeri	-	32	ND	AS
Viken	Glomma kultiveringsanlegg	Ø/S 701	30	ND	AS
Vestfold og Telemark	FOSSING STORSMOLT	38917	35	ND	AS
Vestfold og Telemark	Grenland sportsfiskere	-	31	ND	AS
Rogaland	Dirdal	10131	33	ND	AS
Rogaland	Trosnavåg	11453	34	ND	AS
Rogaland	Eiane	11894	30	ND	AS
Rogaland	IMS II	11954	30	ND	AS
Rogaland	Ilsvåg	12116	31	ND	AS
Rogaland	Hognaland	12964	33	ND	AS
Rogaland	Trovåg	13637	31	ND	AS
Rogaland	Klybbatårnet SSØ	13819	31	ND	AS
Vestland	Skagen	10199	32	ND	AS
Vestland	Nye Årøy Klekkeri	13667	32	ND	AS
Vestland	Fjon	10060	32	ND	AS
Vestland	Rylandsvåg	10076	30	ND	AS
Vestland	Utlebøen	10145	31	ND	AS
Vestland	Matredal	10156	27	ND	AS
Vestland	Alvøen	11579	60	ND	RT
Vestland	Skålvik	11636	30	ND	AS
Vestland	Nesfossen	11682	30	ND	AS
Vestland	Eidestø	12041	34	ND	AS
Vestland	Ospenes	12096	30	ND	AS
Vestland	Drageide	12103	30	ND	AS
Vestland	Kjærefjord	12139	60***	ND	BT
Vestland	Tørvikvatnet	13156	30	ND	AS
Vestland	Kvinge S	13482	30	ND	AS
Vestland	Bjørsvik	13653	60	ND	RT
Vestland	Lønningdal III	14556	30	ND	AS
Vestland	Skogseidvatnet II	27956	32	ND	AS
Vestland	Lianeset	11745	33	ND	AS
Vestland	Sørebø	12177	30	ND	AS
Vestland	Åreneset	12219	60	ND	RT
Vestland	Botnane	13152	66	ND	RT

Vestland	Storevatn	13206	31	ND	AS
Vestland	Haukå	13486	32	ND	AS
Vestland	Norddal	13713	67	ND	RT
Vestland	Sima kraftverk	-	30	ND	AS
Vestland	Dale klekkeri/Dalekvam	-	30	ND	AS
Møre og Romsdal	Vestrefjord	10191	31	ND	AS
Møre og Romsdal	Botn	10220	30	ND	AS
Møre og Romsdal	Steinsvik	12222	30	ND	AS
Møre og Romsdal	Videild	12223	30	ND	AS
Møre og Romsdal	Standal Y.	12278	30	ND	AS
Møre og Romsdal	Sagosen	12460	31	ND	AS
Møre og Romsdal	Sagvikvatnet	12474	30	ND	AS
Møre og Romsdal	Sjølseng	12917	30	ND	AS
Møre og Romsdal	Storelva	12986	30	ND	AS
Møre og Romsdal	Tafjord	18355	62	ND	RT
Møre og Romsdal	Statkraft Eresfjord	-	30	ND	AS
Møre og Romsdal	Rossåa Settefiskanlegg	-	32	ND	AS
Møre og Romsdal	Vassbygdi	-	39	ND	AS
Trøndelag	Kongsmoelva	10265	31	ND	AS
Trøndelag	Hopla	10385	32	ND	AS
Trøndelag	Hundvatnet	12410	30	ND	AS
Trøndelag	Laksåvatnet	12422	30	ND	AS
Trøndelag	Tverrvågen	12428	30	ND	AS
Trøndelag	Lauvsnes	12623	30	ND	AS
Trøndelag	Lonet i Naustbukta	12719	30	ND	AS
Trøndelag	Sagelva	12813	33	ND	AS
Trøndelag	Salsbruket	13180	32	ND	AS
Trøndelag	Osavatnet	13181	30	ND	AS
Trøndelag	Saltbuodden	13740	30	ND	AS
Trøndelag	Vestseøra	24096	30	ND	AS
Trøndelag	Kaldvella	-	30	ND	AS
Trøndelag	Stjørdalsvassdraget klekkeri	-	30	ND	AS
Trøndelag	Slira	13086	30	ND	AS
Nordland	Hopen	10484	30	ND	AS
Nordland	Grytåga	10948	30	ND	AS
Nordland	Nusfjord	11213	30	ND	AS
Nordland	Mølnarodden	11220	34	ND	AS
Nordland	Trollbukta	11264	30	ND	AS
Nordland	Innhavet	11296	30	ND	AS
Nordland	Hustadstranda	11313	36	ND	AS

Nordland	Saglifossen	13183	30	ND	AS
Nordland	Glomfjord I	13188	30	ND	AS
Nordland	Tosbotn	13584	32	ND	AS
Nordland	Holmvåg	13935	30	ND	AS
Nordland	Elvenesstrand	13943	28	ND	AS
Nordland	Åmøya	26375	30	ND	AS
Nordland	Sundsfjord	29316	29	ND	AS
Nordland	Leirfjord Kultiveringsanlegg	-	29	ND	AS
Troms and Finnmark	Storelva Elvevollen	10741	30	ND	AS
Troms and Finnmark	Foldvik	11325	30	ND	AS
Troms and Finnmark	Storelva i Berg	11426	30	ND	AS
Troms and Finnmark	Friarfjord	13140	30	ND	AS
Troms and Finnmark	Neptunbruket	29796	30	ND	AS

*As= Atlantic salmon, Rt= Rainbow trout.
** ND = Not detected.
***=brown trout

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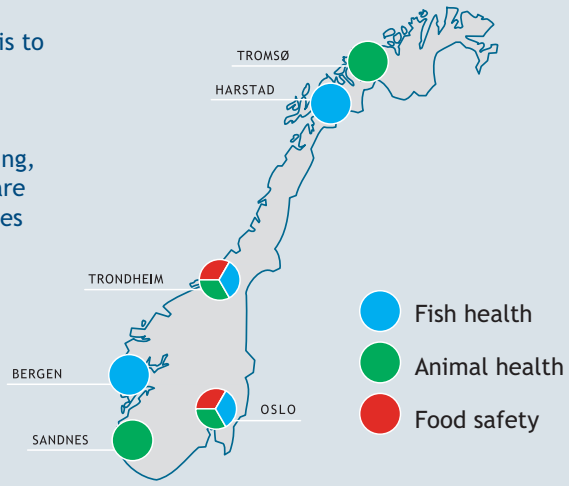

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