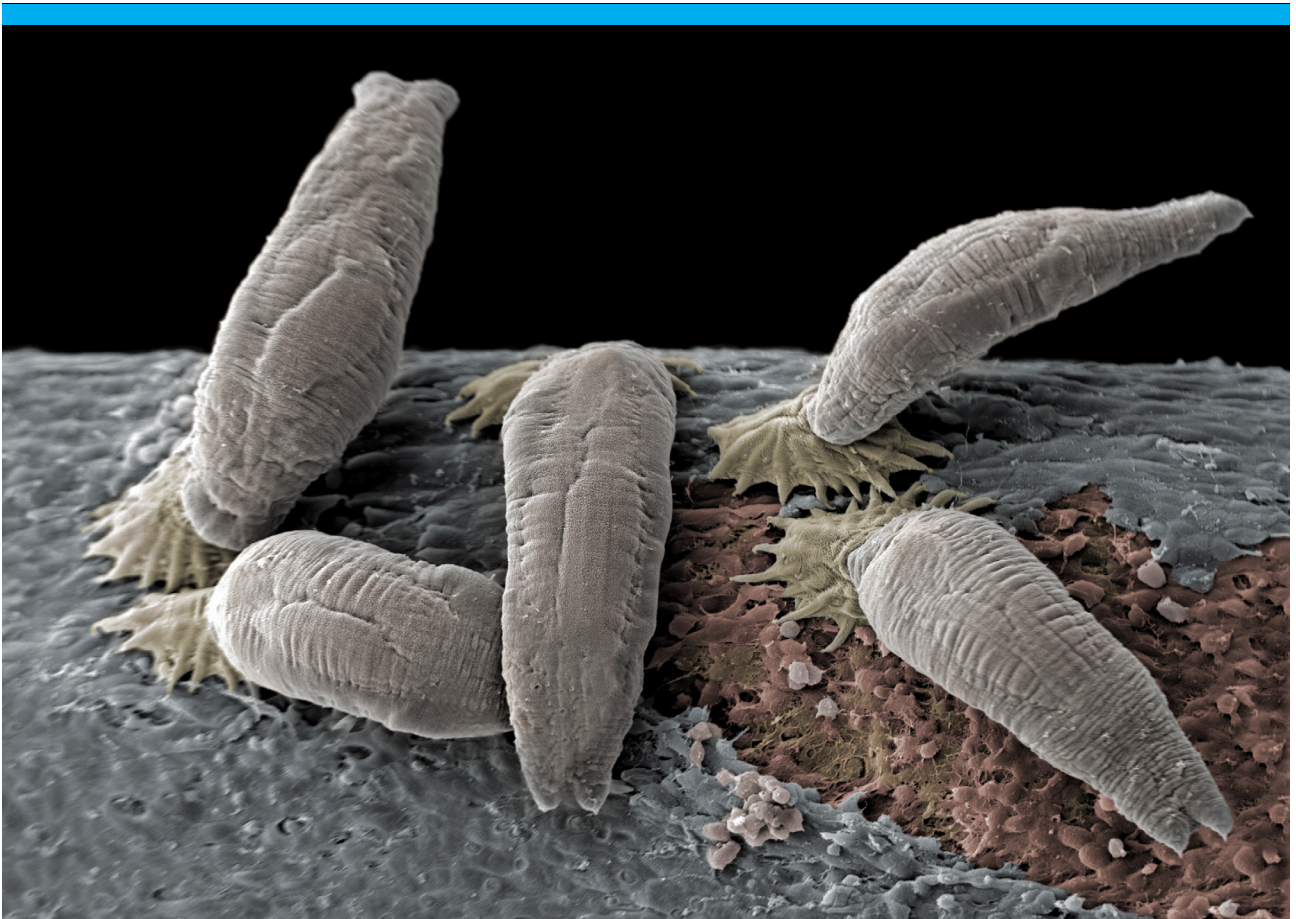


The surveillance programme for *Gyrodactylus salaris* in Atlantic salmon and rainbow trout in Norway 2019



Veterinærinstituttet
Norwegian Veterinary Institute



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Summary

In 2019, *Gyrodactylus salaris* was detected in one river, the River Selvikvassdraget (013.1Z) in Vestfold County. The parasite was not detected in farms with Atlantic salmon or rainbow trout.

Introduction

During the period 1975 - 2019, 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 2015, in River Kitdalselva, in Troms County, where infected fish were found during a rotenone treatment. 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 rotenone treatment. One exception is the treatment of River Lærdalselva in 2011-2012, where acidified aluminum sulphate was used to eradicate the parasite.

By 31.12.2019, *G. salaris* was confirmed eradicated from 38 rivers and from all hatcheries/fish farms. In additional five rivers, eradication measures have been completed, but eradication has not yet been confirmed. Thus, at the end of 2019, the parasite is confirmed present in eight Norwegian rivers.

Gyrodactylus salaris is a notifiable (List 3) disease in Norway and it is listed as "Other significant disease" 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 the 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 the rivers included in the surveillance programme is based on the risk of being infected 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 from each farm. 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 under a 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, 2297 specimens from 71 rivers and 3095 specimens from 94 farms were examined in 2019 (Table 1).

Table 1. Number of rivers, farms and fish examined for *Gyrodactylus salaris* in 2019.

County	Rivers				Farms			
	No.	Fish*	No. of fish examined	Positive	No.	Fish*	No. of fish examined	Positive
Finnmark	10	AS	433	0	1	AS	30	0
Troms	4	AS	120	0	5	AS	150	0
Nordland	16	AS	489	0	12	AS	376	0
Trøndelag	10	AS	303	0	19	AS/RT	633	0
Møre og Romsdal	9	AS	243	0	13	AS/RT	423	0
Sogn og Fjordane	6	AS	198	0	7	AS/RT	288	0
Hordaland	1	AS	29	0	19	AS/RT	644	0
Rogaland	1	AS	36	0	6	AS	183	0
Agder	2	AS	56	0	1	AS	26	0
Telemark	0	-	-	-	2	AS	62	0
Vestfold	3	AS	99	1	0	-	-	-
Buskerud	1	AS	33	0	1	AS	30	0
Oppland	0	-	-	-	5	AS	153	0
Oslo	2	AS	68	0	1	AS	31	0
Akershus	4	AS	128	0	1	AS	32	0
Østfold	2	AS	62	0	1	AS	34	0
Total	71		2297	1	94		3095	0

* AS = Atlantic salmon, RT = rainbow trout.

In 2019, *Gyrodactylus salaris* was detected in one river, the River Selvikvassdraget in Vestfold County. The parasite was not detected in farms with Atlantic salmon or rainbow 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 2019.

County	Watercourse	Watercourse code	No. of Atlantic salmon examined	<i>G. salaris</i> *
Agder	Arendalsvassdraget	019.Z	22	ND
Agder	Mandalselva	022.Z	34	ND
Akershus	Askerelva	009.1Z	33	ND
Akershus	Gjersjøelva	005.4Z	33	ND
Akershus	Hølenelva	004.Z	29	ND
Akershus	Sandvikselva	008.Z	33	ND
Buskerud	Årosvassdraget	009.Z	33	ND
Finnmark	Altaelva	212.Z	30	ND
Finnmark	Børselva	225.Z	33	ND
Finnmark	Komagelva	239.Z	30	ND
Finnmark	Lakselva	162.7Z	30	ND
Finnmark	Lakselva	224.Z	31	ND
Finnmark	Neiden	244.Z	31	ND
Finnmark	Repparfjordelva	213.Z	31	ND
Finnmark	Stabburselva	223.Z	36	ND
Finnmark	Tana	234.Z	150	ND
Finnmark	Vestre jakobselv	240.Z	31	ND
Hordaland	Vosso	062.Z	29	ND
Møre og Romsdal	Aureelva	097.72Z	30	ND
Møre og Romsdal	Bygdaelva	098.6Z	30	ND
Møre og Romsdal	Eidsdalselva	099.1Z	30	ND
Møre og Romsdal	Norddalsvassdraget	099.2Z	30	ND
Møre og Romsdal	Surna	112.Z	30	ND
Møre og Romsdal	Tafjordelva	099.Z	30	ND
Møre og Romsdal	Valldalselva	100.Z	30	ND
Møre og Romsdal	Viddalselva	111.4Z	3	ND
Møre og Romsdal	Vikelva	097.2Z	30	ND
Nordland	Bardalselva	153.6Z	31	ND
Nordland	Beiarelva	161.Z	30	ND
Nordland	Bjerka	155.4Z	30	ND
Nordland	Dagsvikelva	153.11Z	31	ND
Nordland	Drevja	152.2Z	28	ND
Nordland	Halsaelva	149.6Z	31	ND
Nordland	Hestdalselva	149.61Z	27	ND
Nordland	Hundåla	151.1Z	30	ND
Nordland	Leirelva	153.22Z	32	ND
Nordland	Nylandselva	153.1Z	35	ND
Nordland	Røssåga	155.Z	31	ND
Nordland	Saltdalsvassdraget	163.Z	31	ND
Nordland	Sannaelva	155.2Z	31	ND
Nordland	Sletterelva	156.4Z	31	ND
Nordland	Stillelva	153.3Z	30	ND
Nordland	Vefsna	151.Z	30	ND
Oslo	Lysakerelva	007.Z	34	ND
Oslo	Nordmarkvassdraget	006.Z	34	ND
Rogaland	Suldalslågen	036.Z	36	ND
Sogn og Fjordane	Bøvra	112.3Z	29	ND
Sogn og Fjordane	Gaularvassdraget	083.Z	28	ND
Sogn og Fjordane	Loen	088.2Z	32	ND

Sogn og Fjordane	Lærdalselva	073.Z	35	ND
Sogn og Fjordane	Sogndalselva	077.3Z	36	ND
Sogn og Fjordane	Stryneelva	088.Z	38	ND
Troms	Mannalselva	206.1Z	30	ND
Troms	Målselva	196.Z	30	ND
Troms	Nordkjøselva	198.Z	30	ND
Troms	Reisavassdraget	208.Z	30	ND
Trøndelag	Figga	128.3Z	30	ND
Trøndelag	Gaula	122.Z	31	ND
Trøndelag	Namsen	139.Z	30	ND
Trøndelag	Nidelva	123.Z	29	ND
Trøndelag	Orkla	121.Z	30	ND
Trøndelag	Steinkjerelva	128.Z	30	ND
Trøndelag	Stjørdalsvassdraget	124.Z	33	ND
Trøndelag	Stordalselva	135.Z	30	ND
Trøndelag	Verdalsvassdraget	127.Z	30	ND
Trøndelag	Årgårdsvassdraget	138.Z	30	ND
Vestfold	Aulielva	014.Z	33	ND
Vestfold	Numedalslågen	015.Z	33	ND
Vestfold	Selvikvassdraget	013.1Z	33	D
Østfold	Enningdalselva	001.1Z	33	ND
Østfold	Glomma	002.Z	29	ND

* D = Detected, ND = Not detected.

Appendix B

Farms and hatcheries examined for *Gyrodactylus salaris* in 2019.

County	Farms and hatcheries	Hatchery code	No. of AS/RT* examined	<i>G. salaris</i> **
Agder	Fjellsæ I	10581	26	ND
Akershus	Hamang Klekkeri	-	32	ND
Buskerud	Hellefoss	-	30	ND
Finnmark	Adamselv	10665	30	ND
Hordaland	Bjølfvossen	12172	31	ND
Hordaland	Brakedal	13149	31	ND
Hordaland	Eidesvik	11606	31	ND
Hordaland	Femangervågen	12112	34	ND
Hordaland	Fjæra	12073	31	ND
Hordaland	Flatråker	13826	30	ND
Hordaland	Gjæravågen	11589	31	ND
Hordaland	Herand	13157	30	ND
Hordaland	Kjærelva	11493	30	ND
Hordaland	Kvernhusvika	13327	60	ND
Hordaland	Ljonesvågen	12079	30	ND
Hordaland	Marineholmen Forskningspark	36577	30	ND
Hordaland	Skogseidvatnet	12042	32	ND
Hordaland	Skogseidvatnet III	28796	30	ND
Hordaland	Skålavik	11540	31	ND
Hordaland	Strømsnes	11648	30	ND
Hordaland	Sævareid	10141	32	ND
Hordaland	Øyerhamn	12032	30	ND
Hordaland	Ådlandsvatn	13823	60	ND
Møre og Romsdal	Aunvågen	10221	30	ND
Møre og Romsdal	Dale	12217	30	ND
Møre og Romsdal	Dravlaus	12214	30	ND
Møre og Romsdal	Flø	12315	30	ND
Møre og Romsdal	Hjelvik	13672	30	ND
Møre og Romsdal	Hønsvikgulen	12898	33	ND
Møre og Romsdal	Kjørsvikbugen	12415	31	ND
Møre og Romsdal	Moltustranda	12325	30	ND
Møre og Romsdal	Sagvikvatnet	12474	28	ND
Møre og Romsdal	Sætre	13671	31	ND
Møre og Romsdal	Tafjord	18355	60	ND
Møre og Romsdal	Tveekrem	12889	30	ND
Møre og Romsdal	Urke	12269	30	ND
Nordland	Bjerka	-	30	ND
Nordland	Breivika	13811	30	ND
Nordland	Brenna	11180	30	ND
Nordland	Forsan	33217	32	ND
Nordland	Framnes	10496	30	ND
Nordland	Glomfjord II	24016	37	ND
Nordland	Mastermovika II	15315	34	ND
Nordland	Mo Industripark	11064	30	ND
Nordland	Nordneset	13191	30	ND
Nordland	Nyksund	13940	33	ND
Nordland	Reppen	34097	30	ND
Nordland	Steppan	11263	30	ND
Oppland	Begna	12517	27	ND

Oppland	Ferisfjorden	13881	32	ND
Oppland	Lomen Slidrefjorden	12341	31	ND
Oppland	Nedre Hande	13716	32	ND
Oppland	Noraker Gård	10364	31	ND
Oslo	Sørkedalen Ofa	-	31	ND
Rogaland	Fister	10123	30	ND
Rogaland	Lerangsvågen-Land li	11927	30	ND
Rogaland	Lyse Produksjon	-	30	ND
Rogaland	Sauda Jeger og Fisk	-	33	ND
Rogaland	Suldal Elveeigarlag Sa	-	30	ND
Rogaland	Vågafossen	11892	30	ND
Sogn og Fjordane	Arnafjord	12173	67	ND
Sogn og Fjordane	Barlindbotn	13843	30	ND
Sogn og Fjordane	Gjøllanger	11795	30	ND
Sogn og Fjordane	Hermansverk	12165	33	ND
Sogn og Fjordane	Ljøsne Klekkeri	-	35	ND
Sogn og Fjordane	Midtneset	18336	62	ND
Sogn og Fjordane	Sande	10170	31	ND
Telemark	Kjølebrønn	12961	31	ND
Telemark	Telemark Settefisk As	-	31	ND
Troms	Gjøvik	11333	30	ND
Troms	Hellaren	11335	30	ND
Troms	Salangsverket	36357	30	ND
Troms	Skardalen	13192	30	ND
Troms	Sørfjorden	13946	30	ND
Trøndelag	Belsvik	13964	30	ND
Trøndelag	Bessaker	12596	31	ND
Trøndelag	Ervikbukta	12992	60	ND
Trøndelag	Follafoss	13958	32	ND
Trøndelag	Haukvik Kraft-Smolt	-	30	ND
Trøndelag	Kvernkvatnet	12686	30	ND
Trøndelag	Laksåvatnet Laksåvik	12422	30	ND
Trøndelag	Lennavika	13742	30	ND
Trøndelag	Lensvik	13179	31	ND
Trøndelag	Moldtua	12737	29	ND
Trøndelag	Nernesset	13178	29	ND
Trøndelag	Olden	12745	32	ND
Trøndelag	Røyklibotn	10412	30	ND
Trøndelag	Skorstad	13739	29	ND
Trøndelag	Sunnskjør	23735	29	ND
Trøndelag	Survik	12672	30	ND
Trøndelag	Sætran	12639	61	ND
Trøndelag	Tverrvågen	12428	30	ND
Trøndelag	Årvika	10406	30	ND
Østfold	Nedre Glomma og Omland	-	34	ND

*As= Atlantic salmon, Rt= Rainbow trout.

** ND = Not detected.

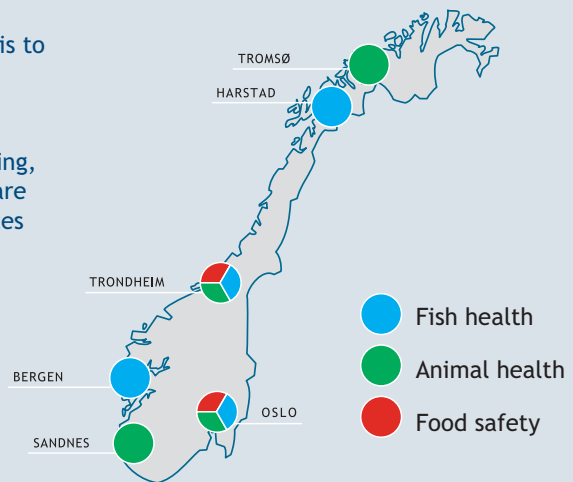
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